LAW OFFICE OF
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March 15, 2022

Ms. Shonta Dunston
Chief Clerk
North Carolina Utilities Commission
430 N. Salisbury Street, Dobbs Building
Raleigh, North Carolina 27603

Re: Application of Cardinal Pipeline Company, LLC for a Change in its Rates and Charges in Docket No. G-39, Sub 47

Dear Ms. Dunston:

On February 10, 2022, Cardinal Pipeline Company, LLC ("Cardinal") filed in this proceeding its Letter of Intent to file for an adjustment of its rates and charges. Pursuant to Section 133 of the General Statutes of the State of North Carolina and Rule R1-17 of the North Carolina Utilities Commission ("Commission" or "NCUC"), Cardinal hereby submits this Application to adjust its rates and charges for natural gas service consisting of the following documents:

1. Petition and Appendix I
2. Testimony and Exhibits of Kerri Miller
3. Testimony and Exhibits of Michael Cousino
4. Testimony and Exhibits of David Haag
5. Testimony and Exhibits of Steven Fall
6. Cardinal's Form G-1

Pursuant to Commission Rule R1-28, Cardinal will file 15 copies of the filing.

I am also enclosing a check in the amount of $500.00 in payment of the filing fee.

Sincerely,

Cardinal Pipeline Company, LLC

By Robert W. Kaylor

Robert W. Kaylor
Its Attorney
OF COUNSEL:
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Telephone: (919) 828-5250
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Docket No. G-39, Sub 47

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

In the Matter of:

Application of	)	
Cardinal Pipeline Company, LLC	)	
For an Adjustment in its Rates and Charges	)	**APPLICATION**

Pursuant to Section 62-133 of the General Statutes of the State of North Carolina, and Rule R1-17 of the North Carolina Utilities Commission ("Commission" or "NCUC"), Cardinal Pipeline Company, LLC ("Cardinal") hereby applies for authority to adjust its rates and charges for natural gas service, and in support thereof respectfully shows:

I

Background Information Regarding Applicant

Cardinal is a limited liability company originally formed on December 6, 1995 in the name of Cardinal Extension Company, LLC to acquire and extend an existing pipeline owned by the original Cardinal Pipeline Company, LLC in North Carolina. Cardinal's members are: TransCardinal Company, LLC, a wholly owned subsidiary of Williams Partners Operating LLC; PSNC Cardinal Pipeline Company, a wholly owned subsidiary of Public Service Company of North Carolina, Inc.; and Piedmont Intrastate Pipeline Company, a wholly owned subsidiary of Piedmont Natural Gas Company, Inc.

Cardinal acquired the original Cardinal Pipeline on November 1, 1999 after the Cardinal Extension facilities were constructed and placed into service. The original Cardinal Pipeline merged into Cardinal Extension, the separate existence of the original Cardinal Pipeline ceased, and Cardinal Extension became the surviving company operating under the name of Cardinal Pipeline Company, LLC. The surviving company acquired all the rights, privileges, immunities and franchises held by the original Cardinal Pipeline prior to the merger.

Cardinal is managed by a committee consisting of representatives from each member company. Cardinal Operating Company, LLC, a wholly owned subsidiary of Williams Partners Operating LLC, designed and constructed Cardinal and serves as the operator of the Cardinal system.

Cardinal's correct post office address and telephone number is:

Cardinal Pipeline Company, LLC
c/o Cardinal Operating Company, LLC
P.O. Box 1396
Houston, TX 77251-1396
Telephone: (713) 215-2000

The correct names and addresses of the Attorneys for Cardinal are:

David A. Glenn,
Cardinal Operating Company, LLC
Post Office Box 1396
Houston, Texas 77251-1396
Telephone: (713) 215-2341
david.a.glenn@williams.com

and

Robert W. Kaylor
Robert W. Kaylor, P.A.
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Raleigh, North Carolina 27609
Telephone: (919) 828-5250
bkaylor@rwkaylorlaw.com

II

Jurisdiction of the Commission

Cardinal is an intrastate natural gas pipeline extending from Transcontinental Gas Pipe Line Company, LLC's Compressor Station 160 in Rockingham County, North Carolina to the Raleigh, North Carolina area and provides 478,450 dekatherms ("Dth") per day of firm natural gas transportation capacity to customers in North Carolina. Cardinal is engaged in providing natural gas utility service to the public and is a "public utility" as defined in G.S.§62-3(23), subject to the jurisdiction of this Commission pursuant to G.S. §62-2.

III

Reasons Supporting an Increase in Cardinal's General Rates and Charges

On March 15, 2017, Cardinal filed an application in Docket No. G-39, Sub 38 seeking a general decrease in its rates and charges. On June 9, 2017, Cardinal, the Public Staff, Piedmont and PSNC filed a Joint Stipulation in settlement of all aspects of Cardinal's rate application. The NCUC approved the Joint Stipulation on July 27, 2017, in its "Order Decreasing Rates" ("July 27 Order"). The Joint Stipulation and Ordering Paragraph 5 of the July 27 Order requires Cardinal to file a general rate case no later than March 15, 2022. In compliance with the Joint Stipulation and the July 27 Order, Cardinal is submitting the instant Application.

By this Application, Cardinal seeks the approval of an adjustment in its rates that were established in Docket No. G-39 Sub 38, as subsequently adjusted by Docket Nos. M-100, Sub 138 and G-39, Sub 42 to comply with the NCUC Order Addressing the Impacts of the Federal Tax Cuts and Jobs Act on Public Utilities ("Federal Income Tax Reduction Filing"), sufficient to allow Cardinal to recover its cost of service including a just and reasonable return on its investment, as demonstrated in the testimony of Mr. David J. Haag.

Cardinal proposes rate changes that would produce an overall increase from the rates approved in the July 27 Order, as adjusted by the Federal Income Tax Reduction Filing. The increase in Cardinal's proposed rates results in a $919,530 increase in revenue as set forth on Statement G of Exhibit ___ (KM-001). Appendix I to the

Application provides a summary of the proposed changes in revenue by zone. Reasons supporting Cardinal's request for a general rate increase are set forth in the testimony and exhibits filed with this Application.

The rates and charges proposed herein are just, reasonable and nondiscriminatory and will provide Cardinal a fair return on its investment in property used and useful in providing service to the public.

IV

Effective Date of General Rate Change

Cardinal proposes to make the rates set forth in Schedule 2 of Exhibit ___ (KM-001) applicable to gas transported on and after May 1, 2022; however, Cardinal anticipates that the Commission will suspend the rates and set this application for hearing.

V

Exhibits and Schedules

Pursuant to the provisions of Rule R1-17(b) of the Commission's Rules and Regulations, Cardinal is filing with this Application (1) a one page summary of the proposed increases and changes affecting customers, which schedule has been identified as Appendix I (Rule R1-17(b)(9)(f), (2) N.C.U.C. Form G-1 (Rule R1-17(b)(12)), and (3) the direct testimony and exhibits that will be relied upon by Cardinal at the hearing of this Docket (Rule R1-24(g)(2)). Exhibit ___ (KM-001) contains the following schedules required by Rule 1-17(b)(1) to (10):

Schedule 1. Schedule of Cardinal's present rates and charges now on file with and approved by the Commission. Rule R1-17(b)(1).

Schedule 2. Schedule of Cardinal's proposed rates and charges which Cardinal seeks to place in effect on May 1, 2022. Rule R1-17(b)(2).

Schedule 3. A statement showing the original cost of all property of Cardinal used or useful in the public service to which the proposed rates relate as of December 31, 2021. Rule R1-17(b)(3).

Schedule 4. A statement that Cardinal does not intend to offer proof as to the present fair value of its property.

Schedule 5. A statement of accrued depreciation on all property to which the proposed rates relate as of December 31, 2021, and of the rates and methods used in computing the amount charged to depreciation. Rule R1-17(b)(5).

Schedule 6. A statement of materials and supplies as of December 31, 2021. Rule R1-17(b)(6).

Schedule 7. A statement of cash working capital which Cardinal finds necessary to keep on hand for the efficient, economic operation of its business as of December 31, 2021. Rule R1-17(b)(7).

Schedule 8. A statement of gross revenues received, operating expenses and net operating income for return on investment for the twelve months ended December 31, 2021, as the same appear on Cardinal's books, together with (1) accounting and pro forma adjustments, (2) rates of return on the original cost rate base and (3) rates of return on common equity. Rule R1-17(b)(8) & (9).

Schedule 9. A Balance Sheet as of December 31, 2021, and Income Statement for twelve months ended December 31, 2021. Rule R1-17(b)(10).

VI

WHEREFORE, Cardinal respectfully requests that the Commission approve the rates proposed herein and permit them to become effective as scheduled.

Respectfully submitted this 15th day of March, 2022.

CARDINAL PIPELINE COMPANY, LLC

By Robert W. Kaylor

Robert W. Kaylor, P.A.
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VERIFICATION

THE STATE OF TEXAS)
) SS
COUNTY OF HARRIS)

Glen Jasek, being first duly sworn, deposes and says:

That he is a Vice President of Cardinal Operating Company, that he has read the foregoing Application and knows the contents thereof, and that the same is true of his own knowledge except as to those matters and things therein alleged upon information and belief and as to those matters and things, he believes them to be true.

Glen Jasek

Glen Jasek

SUBSCRIBED AND SWORN TO before me this 14th day of March 2022.

JANE M SENTER NOTARY PUBLIC STATE OF TEXAS ID 12404831-5 EXP. 11-19-2025

Jane M Senter

Notary Public, State of Texas
My Commission expires: 11-19-25

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47

APPENDIX I

SUMMARY OF THE CHANGE IN RATES AND CHARGES AFFECTING CUSTOMERS

Cardinal Pipeline Company, LLC is seeking in this proceeding an increase in its annual revenues of $919,530, which is an overall increase of approximately 7.28%.
Statement G of Exhibit ___(KM-002)) shows the revenues under the present and proposed base rates and the related changes by transportation service type.

A summary of the proposed revenue change is as follows:

Service	Amount	Percent
(Piedmont)		
Zone 1A Reservation	$76,819	
Zone 1A Usage	0	
Total Zone 1A	$76,819	13.50%
(PSNC)		
Zone 1B Reservation	$138,999	
Zone 1B Usage	-	
Total Zone 1B	$138,999	13.50%
(PSNC and Piedmont)		
Zone 2 Reservation	$703,712	
Zone 2 Usage	-	
Total Zone 2	$703,712	6.95%

CERTIFICATE OF SERVICE
DOCKET NO. G-39, Sub 47

I hereby certify that copies of the Cardinal Pipeline Company LLC's General Rate Case Application, Testimony and Schedules in Docket No. G-39, Sub 47, were served electronically or via U.S. mail, first class, postage prepaid, upon all parties of record.

This, the 15th day of March, 2022.

Jordan Kirwin
Director – Rates & Regulatory
Cardinal Operating Company, LLC
P.O. Box 1396
Houston, TX 77251
Telephone: (713)215-3723
jordan.kirwin@williams.com

Exhibit ____ (KM-001)

BEFORE THE

NORTH CAROLINA UTILITIES COMMISSION

Docket No. G-39, SUB 47

DIRECT TESTIMONY
OF
KERRI MILLER

ON BEHALF OF

CARDINAL PIPELINE COMPANY, LLC

March 15, 2022

I. <u>Identification of Witness</u>

Q. Please state your name, current position, and business address.

A. My name is Kerri H. Miller. I am a Lead Regulatory Analyst for Cardinal Operating Company, LLC, as Operator of Cardinal Pipeline Company, LLC ("Cardinal"). My business address is 2800 Post Oak Boulevard, Houston, Texas 77056.

Q. Please summarize your education and professional background.

A. In 2006, I graduated from the Indiana University of Pennsylvania with a Bachelor of Arts degree in Economics. In August 2006, I was employed by Strategic Energy, as a Power Portfolio analyst where I created purchasing strategies for wholesale electric customers. From May 2008 until April 2020, I was an Energy Industry Analyst with the Federal Energy Regulatory Commission ("FERC"). From May 2008 until my departure, I focused on the cost of service for interstate natural gas pipeline and electric utility proceedings in the Office of Administrative Litigation. In April 2020, I joined the Transcontinental Gas Pipe Line Company, LLC ("Transco") Rates and Regulatory Department as a Lead Regulatory Analyst.

Q. Please outline your current responsibilities with Cardinal.

A. My current responsibilities involve the preparation of Cardinal's rate, tariff, and report filings made with the North Carolina Utilities Commission ("Commission" or "NCUC").

Q. Have you previously testified before this Commission or any other regulatory Commission?

A. I have not testified before this Commission. However, I have filed testimony and testified before the FERC in the following proceedings:

- *Portland Natural Gas Transmission System*, Docket No. RP10-729-000;
- *Midcontinent Independent System Operator*, *Inc.*, Docket No. ER14-1242-006, *et al*; and
- *Constellation Mystic Power*, *LLC*, Docket No. ER18-1639-000.

In addition, I have filed testimony before the FERC in the following proceedings:

- *Southern California Edison Company*, Docket No. ER09-1534-000;
- *High Island Offshore System, L.L.C*, Docket No. RP09-487-000; and
- *Southwest Power Pool, Inc.*, Docket No. ER15-2028-002.

II. <u>Purpose of Testimony</u>

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to support Cardinal's application in this case ("Application"). I will (1) provide a brief description of Cardinal; (2) provide a brief description of Cardinal's Application in this docket; (3) support the various elements of Cardinal's test period cost of service and rate base, including test period adjustments and the amortization of excess deferred income taxes ("EDIT"); (4) support the billing determinants used in the derivation of Cardinal's rates; (5) support the allocation of the cost of service between Cardinal's two zones; (6) support the continued use of Cardinal's existing rate design methodology in the derivation of the Cardinal rates in this proceeding; and (7) request authority to place certain pipeline integrity management costs in a deferred account for proposed future collection. While I support the calculation of the overall rate of return, the capital structure, cost of debt, and rate of return on equity component are supported by the testimony of Cardinal's expert witness, Mr. David J. Haag, in Exhibit DH-001. The Accumulated Deferred Income Taxes ("ADIT"), as well as federal and state income taxes are supported by the testimony of Mr. Michael P. Cousino in Exhibit MC-001. The depreciation and negative salvage rates are supported by the testimony of Mr. Steven R. Fall in Exhibit CPC-0001.

Q. **Have any exhibits been filed as a part of your testimony?**

A. Yes. I am sponsoring the following Schedules and Statements which are included in Exhibit KM-002:

Schedule 1	Present Rates
Schedule 2	Proposed Rates
Schedule 3	Original Cost of Property Used and Useful
Schedule 4	Present Fair Value (Cardinal elects not to use)
Schedule 5	Accumulated Depreciation
Schedule 6	Materials and Supplies
Schedule 7	Cash Working Capital
Schedule 8	Revenues, Expenses and Rates of Return
Schedule 9	Income Statement and Balance Sheet
Statement A	Overall Cost of Service
Statement B	Rate Base and Return
Statement C	Original Cost of Plant
Statement D	Accumulated Provision for Depreciation, Depletion and Amortization
Statement E	Working Capital
Statement F	Rate of Return, Cost of Capital, and Cost of Debt
Statement G	Quantities and Revenues
Statement H-1	Operation and Maintenance Expenses
Schedule H-1(a)	Tracked Costs Workpaper

Schedule H-1(b)	Property and General Liability Insurance Workpaper
Schedule H-1(c)	Rent Expense Workpaper
Schedule H-1(d)	Rate Case Expense Workpaper
Schedule H-1(e)	Pipeline Integrity Management Deferral Workpaper
Statement H-2	Depreciation, Depletion and Amortization Expense
Statement H-3(a)	Reverse South Georgia Workpaper
Statement H-4	Taxes Other than Income Taxes
Statement I	Cost Allocation and Rate Design

Q. What test period has Cardinal used in preparing this rate filing?

A. Under North Carolina statutes and the rules of the NCUC, Cardinal is required to use a 12-month test period as a basis for determining future expenses. In this proceeding, the test period in Cardinal's rate filing consists of a twelve-month period ended December 31, 2021, adjusted for changes which are known and measurable with reasonable accuracy.

Q. Were these Schedules and Statements prepared by you or under your direction?

A. Yes, they were.

III. Identification of Cardinal

Q. Please describe Cardinal and its business.

A. Cardinal Pipeline Company, LLC is a limited liability company originally formed on December 6, 1995, in the name of Cardinal Extension Company, LLC to acquire and extend an existing pipeline owned by the original Cardinal Pipeline Company, LLC in North Carolina. Cardinal's members and their ownership percentages are: TransCardinal Company, LLC, a wholly owned subsidiary of Williams Partners Operating LLC (45%); PSNC Cardinal Pipeline Company, a wholly owned subsidiary of Public Service Company of North Carolina, Inc. (33%) ("PSNC"); and Piedmont Intrastate Pipeline Company, a wholly owned subsidiary of Piedmont Natural Gas Company, Inc. (22%) ("Piedmont"). Cardinal is managed by a committee consisting of representatives from each member company. Cardinal Operating Company, LLC, a wholly owned subsidiary of Williams Partners Operating LLC, designed and constructed Cardinal and serves as the operator of the Cardinal system.

Cardinal is an intrastate natural gas pipeline extending from Transco's Compressor Station 160 in Rockingham County, North Carolina to the Raleigh, North Carolina area and provides 478,450 dekatherms ("Dth") per day of firm natural gas transportation capacity to customers in North Carolina. The Cardinal pipeline system consists of (a) the original 24-inch-diameter, 37-mile Cardinal Pipeline, which originates in Rockingham County, North

Carolina, and extends to the southeast of Burlington, North Carolina to provide 134,550 Dth per day of firm natural gas transportation capacity, (b) the 24-inch-diameter Cardinal Extension, which was placed into service on November 1, 1999, and extends approximately 67-miles from Burlington, North Carolina to the Raleigh, North Carolina area adding 144,900 Dth per day of firm natural gas transportation capacity, and (c) the 2012 Expansion Project, which was placed into service on June 1, 2012, and includes facilities to uprate Cardinal's Clayton meter station and construct a greenfield gas compressor station (Compressor Station 161) adding 199,000 Dth per day of firm natural gas transportation capacity. Cardinal's service is divided into two zones, Zone 1 consisting of service on the original Cardinal Pipeline facilities and Zone 2 consisting of service on the combined Cardinal Extension and 2012 Expansion Project facilities (collectively, "Cardinal Expansion").

IV. <u>Description of Application</u>

Q. Please explain why it is necessary to file this rate case.

A. On March 15, 2017, Cardinal filed an application in Docket No. G-39, Sub 38 seeking to adjust its rates and charges for natural gas service. On June 9, 2017, Cardinal, PSNC, Piedmont, and the Public Staff filed a Joint Stipulation in settlement of all aspects of Cardinal's rate application. The NCUC approved the Joint Stipulation on July 27, 2017, in its "Order Decreasing Rates" ("July 27 Order"). The Joint Stipulation and Ordering Paragraph 5 of the July 27

Order requires Cardinal to file a rate case no later than March 15, 2022. In compliance with the Joint Stipulation and the July 27 Order, Cardinal is submitting the instant Application.

Q. What is Cardinal seeking in this Application?

A. The Application seeks the approval of an adjustment in the Cardinal rates that were established in Docket No. G-39, Sub 38, as adjusted by Docket Nos. M-100, Sub 138 and G-39, Sub 42 to comply with the federal corporate income tax reduction ("Federal Income Tax Reduction Filing"), sufficient to allow Cardinal to recover its cost of service including a just and reasonable return on its investment, as supported in the testimony of Mr. David Haag in Exhibit No. DH-001.

The Application proposes rate changes that would produce an overall increase from the rates approved in the July 27 Order, as adjusted by the Federal Income Tax Reduction Filing, which allowed Cardinal to charge rates designed to produce annual operating revenues of $11,719,364. With the known and measurable changes identified later in my testimony, Cardinal's proposed rates in this Application result in a cost of service of $12,638,895, which is a $919,530 increase in revenue. Appendix I to the Application provides a summary of the proposed changes in revenue by zone.

Q. Please provide a brief description of the assumptions underlying Cardinal's existing rate design and any proposed adjustments.

A. Cardinal's cost of service is divided into two zones. The Zone 1 cost of service is assigned to Piedmont and PSNC based on their respective ownership shares in the original Cardinal Pipeline. The Zone 2 cost of service is assigned to PSNC and Piedmont based on their peak day entitlements. No changes have been made to the rate design underlying the rates approved by the Commission in its July 27 Order.

V. <u>Cost of Service and Rate Base</u>

Q. Please describe Cardinal's Overall Cost of Service, shown on Statement A of Exhibit ___ (KM-002).

A. Statement A summarizes the items included in Cardinal's cost of service for the test period, as adjusted, totaling $12,638,895 shown on Line 9. The cost of service consists of operations and maintenance expenses including administrative and general expenses (collectively referred to as "O&M"), depreciation, depletion and amortization of gas plant in service, income and other taxes, and an 8.72% overall return on the test period rate base. The details underlying Cardinal's O&M expense are provided on Page 1 of Statement H-1. The depreciation expense shown on Line 3 is supported by Statement H-2 and utilizes the depreciation rates supported by Mr. Steven Fall in Exhibit CPC-0001. The income and other taxes included on Statement A

(Lines 4-6) are supported by Statements H-3 and H-4. The return on rate base amount (Line 7) is supported by Statement B. As further described below, the amortization for the EDIT Regulatory Liability is supported by Statement H-3(a) and the Pipeline Integrity Regulatory Asset is supported by Schedule H-1(e).

Q. Please describe Cardinal's test period Rate Base as shown on Schedule 8, Page 1, as supported by Statement B of Exhibit ___ (KM-002).

A. Statement B summarizes the various items making up Cardinal's test period rate base of $57,088,934 and presents an overall return on the rate base computed at 8.72%, which is supported later in my testimony and the testimony of Mr. David Haag in Exhibit DH-001. The test period rate base includes the December 31, 2021, balance for gas plant in-service supported by Statement C, the accumulated provision for depreciation, depletion and amortization supported by Statement D, working capital supported by Statement E, and the rate base-related accumulated deferred income taxes supported by Statement B-1. Cardinal's test-period recorded rate base has been adjusted (1) to remove non-rate base items from deferred taxes; and (2) to remove the impact of Asset Retirement Obligation ("ARO") on rate base.

Q. Please describe Cardinal's ADIT as shown on Statement B-1 of Exhibit ___ (KM-002).

A. Statement B-1 reflects Cardinal's ADIT and regulatory asset deducted from the test period rate base. The amount of ($26,415,420) shown on Line 68 of Statement B-1 is supported by Mr. Michael Cousino in Exhibit MC-001.

Q. Please describe Cardinal's Gas Plant in Service, shown on Schedule 3 and Statement C of Exhibit ___ (KM-002).

A. Schedule 3 shows a summary of Cardinal's Gas Plant in Service at its original cost as recorded on Cardinal's books as of December 31, 2021, as adjusted. The original cost of Cardinal's plant, which is made up of Transmission Plant, Intangible Plant and General Plant, is $156,507,839. Statement C provides a detailed description of the plant items and their original cost. Cardinal's gas plant in service has been adjusted to remove $6,013 of ARO costs. The ARO recorded on Cardinal's books are for sections of the 24-inch mainline where there is a removal obligation. Consistent with Commission policy, Cardinal is proposing to collect its ARO through a negative salvage rate and has proposed a negative salvage rate sufficient to recover the estimated retirement and decommissioning costs of all its facilities.

As shown on Statement I-1(a), Line 26, Cardinal's adjusted gas plant in service is made up of original Cardinal plant facilities at a cost of

$28,166,694 (Zone 1) and the Cardinal Expansion facilities at a cost of $128,347,157 (collectively, Zone 2).

Q. Please explain Cardinal's Accumulated Depreciation as shown on Schedule 5 and Statement D of Exhibit ___ (KM-002).

A. Schedule 5 sets forth Cardinal's test period accumulated depreciation, by zone. The December 31, 2021, balance in the Accumulated Provision for Depreciation of Gas Utility Plant Account ("Accumulated Reserve") is ($73,410,809). Cardinal's Accumulated Reserve is made up of ($73,355,857) associated with plant facilities and $54,951 of ARO costs. The Accumulated Reserve balance has been adjusted to remove the $54,951 of ARO costs. The resulting Accumulated Reserve used in the calculation of Cardinal's rate base is ($73,355,857).

Q. Please describe Cardinal's Working Capital, supported by Schedule 6, Schedule 7, and Statement E of Exhibit ___ (KM-002).

A. Schedule 6 details the components of working capital shown in Statement B as part of rate base, and Schedule 7 states that Cardinal is not claiming an allowance for cash working capital. Cardinal's working capital is comprised of operating and construction supplies, stores, and line pack. The amount of working capital included in rate base is based on Cardinal's average working capital balance in each of these accounts for the thirteen months ending

December 31, 2021. The calculation of the thirteen-month average is shown on Statement E. The average working capital amount as of December 31, 2021, is $346,360.

Q. Please describe Cardinal's Capital Structure and cost of debt as shown on Statement F of Exhibit ___ (KM-002).

A. The capital structure and cost of debt on Statement F is supported in Mr. David Haag's testimony in Exhibit DH-001. Statement F reflects an imputed capital structure comprised of 60% equity and 40% long-term debt and an average cost of debt of 5.25%.

Q. Please describe Cardinal's O&M Expense (including administrative and general expense) as supported by Statement H-1 of Exhibit ___ (KM-002).

A. Statement H-1 is a summary by FERC account and functional classification of O&M expenses for each month of the test period, the adjustments to various O&M expenses, and the total, as adjusted, O&M expenses included in Cardinal's cost of service. A detailed narrative explanation of, and the basis and supporting work papers for, each of the 5 adjustments is included in Statement H-1 (Statement H-1(a) through Statement H-1(d)). Consistent with Cardinal's existing rate design and historical practice, Cardinal has classified these costs as fixed (Statement H-1, Page 2, Line 32).

Q. Please briefly describe the O&M expense adjustments, which are detailed in Schedule H-1(a) through Schedule H-1(d), beginning with Adjustment No. 1 – Electric Power and Fuel Costs.

A. Adjustment No. 1, in the amount of $30,607, eliminates costs that are tracked by Cardinal, i.e., the cost of fuel and electric power. These costs are not recovered in base rates; instead, they are recovered in Cardinal's electric power and fuel tracking mechanism.

Q. Please describe Adjustment No. 2 – Insurance Premiums.

A. Adjustment No. 2 is required to reflect known and measurable changes in Cardinal's General Liability and Property Insurance premiums. This adjustment, in the amount of $22,908, reflects the 2021-2022 insurance premiums that went into effect in October 2021.

Q. Please describe Adjustment No. 3 – Rent Expenses.

A. Adjustment No. 3, reflects known and measurable changes to Cardinal's test period cost of building rent, in the amount of $2,528. In 2021, Cardinal signed a five-year lease renewal effective August 1, 2021, for its offices in Apex, North Carolina. This adjustment normalizes the lease agreement over five (5) years to provide Cardinal a full year cost.

Q. Please describe Adjustment No. 4 – Legal Expenses.

A. Adjustment No. 4, adjusts Account No. 923, outside services employed, to normalize outside legal expenses. Although Cardinal is billed annually for outside legal expenses, these expenses double in a rate case year. Since 2021 was not a rate case year, this adjustment will normalize rate case expenses over five (5) years, the presumed rate period of the rates proposed in the Application, resulting in a total annual increase to operation and maintenance expense of $2,400.

Q. Please describe Adjustment No. 5 – Rate Case Expenses.

A. Adjustment No. 5, reflects an amortization of projected rate case expenses assuming a fully litigated proceeding. Total projected rate case expenses representing consultant fees are estimated at $250,000. Cardinal proposes to amortize these costs over five (5) years, the presumed rate period of the rates proposed in the Application, resulting in a total annual decrease to operation and maintenance expense of $11,225.

Q. Would you explain Cardinal's annual Depreciation Expense as shown on Schedule 5 and Statement H-2 of Exhibit ___(KM-002)?

A. On October 26, 2021, Cardinal filed a Depreciation Rate Study in Docket No. G-39, Sub 46 ("Depreciation Rate Study"), in accordance with Rule R6-80, which requires natural gas utilities to file a depreciation study every five years. The rates shown on Schedule 5 and Statement H-2 were presented in the Depreciation Rate Study and further supported in this Application by the testimony of Mr. Steven R. Fall in Exhibit CPC-0001.

Statement H-2 calculates Cardinal's annual depreciation, depletion and amortization expense of $4,048,466 using the rates included in Cardinal's Depreciation Rate Study. Statement H-2 further provides the actual annual depreciation, depletion and amortization expense recorded on Cardinal's books as of December 31, 2021, in the amount of $3,856,754.

Q. Please describe the calculation of Income Taxes shown on Statement H-3 of Exhibit ___ (KM-002).

A. Statement H-3 supports the computation of the $1,127,285 in income taxes supported by Mr. Michael Cousino in Exhibit MC-001 in the Application.

Q. Please describe the amortization period for flow back of the excess deferred income taxes ("EDIT"), relating to certain reductions in the corporate income tax rates, supported by Mr. Michael Cousino in Exhibit MC-001.

A. As described by Mr. Michael Cousino in Exhibit MC-001, the EDIT relating to reductions in the corporate income tax rates, specifically the reduction of the Federal Income Tax Rate from 35% to 21% and the reduction of the North Carolina Corporate Income Tax rate from 3% to 2.5%, will be flowed back to customers using the Reverse South Georgia Method and amortized over the remaining service life of the assets. This flow back period is derived by dividing the Net Depreciable Plant over the annual depreciation expense, thereby estimating the remaining depreciable life of the assets. Using that method, Cardinal calculated a flow back period of 26.69 years, as shown on Line 8 of Statement H-3(a). Dividing the excess deferred taxes over the flow back period of 26.69 years generates an annual amortization of ($514,668), as shown on Line 11 of Statement H-3(a). This amount is a reduction to Cardinal's cost of service, which is included on Line 8 of Statement A.

Q. Has Cardinal fully amortized the EDIT addressed by Paragraph 5 of the Joint Stipulation approved by the July 27 Order in Docket No. G-39, Sub 38?

A. No. The EDIT associated with the reduction in the North Carolina corporate income tax change down to 3% addressed in that Joint Stipulation was to be amortized over a 5-year period beginning August 2017. This EDIT is projected to fully amortize August 31, 2022.

Q. How does Cardinal plan to accomplish the flow back to its shippers, in this proceeding, of the remaining unamortized balance of the EDIT addressed by Paragraph 5 of the Joint Stipulation approved by the July 27 Order in Docket No. G-39, Sub 38?

A. Due to the uncertainty of the effective date of new rates in this proceeding, and in order to accomplish the complete flow back of that EDIT while not over- or under-amortizing that amount, Cardinal has not reflected the amortization of this EDIT in the rates in this Application, and is proposing to flow back, in lump-sum payments, each shipper's respective share of the unamortized EDIT balance in accordance with the following schedule:

Effective Date of Rates	Total Unamortized EDIT Balance
May 1, 2022	($154,887)
June 1, 2022	($110,849)
July 1, 2022	($66,811)
August 1, 2022	($22,773)
September 1, 2022	$21,265
October 1, 2022	$65,303
November 1, 2022	$109,341
December 1, 2022	$153,379
January 1, 2023	$197,417
February 1, 2023	$241,455

Within 30 days of the effective date of new rates in this proceeding, Cardinal will refund to its shippers the applicable amount of unamortized EDIT balance if the effective date of rates is on or before August 1, 2022. If the effective date of rates is on or after September 1, 2022, Cardinal will create a regulatory asset for the respective amount listed above for recovery in future rates. This proposal gives effect to and will fulfill the agreement of the parties under Paragraph 5 of the Joint Stipulation, while remaining consistent with the requirement of the Joint Stipulation and Ordering Paragraph 5 of the July 27 Order that Cardinal file a rate case no later than March 15, 2022.

Q. How does Cardinal plan to allocate the applicable lump sum payment to its shippers?

A. Cardinal proposes to allocate the applicable lump sum payment consistent with the EDIT allocation methodology underlying the 2017 Joint Stipulation Exhibit A – Settlement Cost of Service by Zone, i.e. by a rate base zonal allocation factor.

Q. Please describe what is shown on Statement H-4 of Exhibit ___ (KM-002).

A. Statement H-4 reflects Cardinal's taxes other than income taxes, i.e., employment and property taxes for the 12-months ended December 31, 2021, of $523,228, adjusted to include the North Carolina Public Utility Regulatory Fee. The adjusted taxes other than income tax expense is $539,659.

VI. <u>Request for the Continuation of Deferred Treatment of Certain Pipeline Integrity Expenses</u>

Q. Please explain how Cardinal intends to collect the deferred pipeline integrity expenses (regulatory asset) established under Docket No. G-39, Sub 38.

A. In Docket No. G-39, Sub 38, Cardinal received the approval in the July 27 Order on the Joint Stipulation to defer certain pipeline assessment costs for amounts paid for services necessary to be compliant with the United States Department of Transportation Pipeline and Hazardous Materials Safety Administration ("PHMSA") regulations and to ensure the safety and integrity of the Cardinal Pipeline. In 2018, Cardinal completed its assessment and incurred $412,056 in expenses which was placed in a deferred account (regulatory asset) for recovery in future rates. In this proceeding, as detailed on Schedule H-1(e), Cardinal is seeking to collect these expenses over five (5) years, the presumed rate period of the rates proposed in the Application, for an annual amortization of $82,411.

Q. Please explain why Cardinal is requesting to continue its deferred treatment of Pipeline Integrity Expenses.

A. Cardinal has implemented its Integrity Management Program to comply with the rules of the PHMSA and to ensure the safety and integrity of the Cardinal Pipeline. Cardinal's Integrity Management Program requires an assessment of its pipeline every 7 years. Cardinal performed its last assessment in 2018 and will perform its next assessment in 2025. Because the O&M for the test year does not include any expenses for the required pipeline assessment, Cardinal is proposing to place the actual costs of the 2025 assessment in a deferred account (regulatory asset) for proposed recovery in future rates.

Q. What is Cardinal's estimate of O&M expense to be incurred for the 2025 assessment?

A. Cardinal anticipates that the O&M costs for its 2025 assessment will be approximately $450,000.

VII. <u>Request for Deferred Treatment of Cybersecurity Expenses</u>

Q. Is Cardinal proposing a new mechanism to address the extraordinary costs it will incur in response to another Federal mandate?

A. Yes. With the increasing Cybersecurity threat to critical infrastructure and recent cyber-attacks within our industry, governmental agencies are mandating hardening of critical infrastructure against these cyber threats. Cardinal assets are included in these mandates. These hardening efforts may require replacement of non-compliant equipment that cannot be secured, and deployment of new technologies to support Multifactor authentication. These activities are resource intensive. Cardinal continues to work with the governmental agencies driving these efforts to look for effective ways to meet these mandates in the most cost effective and efficient way.

Q. Please explain why Cardinal is requesting deferred treatment of Cybersecurity Expenses.

A. Cardinal is requesting deferred treatment of cybersecurity expenses because the O&M for the test year does not include any expenses for Cardinal to be compliant with Federal mandates. Cardinal is proposing to place the actual costs incurred in a deferred account (regulatory asset) for proposed recovery in future rates.

Q. What is Cardinal's estimate of O&M expense to be incurred for Cybersecurity?

A. Cardinal anticipates that the O&M costs will be approximately $175,000 to $1.2 million. However, this is a preliminary cost estimate as the Department of Homeland Security's Transportation Security Administration may mandate pipeline owners/operators to implement additional cybersecurity mitigation measures. Since these costs are unpredictable and material in nature, this could place additional pressure on Cardinal to file a rate case and threaten the stability of Cardinal's rates.

Q. How does Cardinal propose to collect the deferred Cybersecurity O&M costs in its next rate case?

A. Cardinal is proposing to amortize the deferred O&M cost for recovery in future rates. At this time, Cardinal is not proposing to defer any capital costs incurred as a result of complying with Federal mandates.

VIII. Billing Determinants and Throughput

Q. Please provide an overview of the services provided by Cardinal.

A. Cardinal is a fully subscribed pipeline offering firm transportation service in two zones under Rate Schedule CFT. Cardinal also offers excess firm transportation service designated as Excess CFT. All Excess CFT revenues are flowed back to the CFT shippers. Cardinal has had no Excess CFT revenues since its inception.

Q. Please describe Statement G.

A. Statement G sets forth, by zone, the actual revenues, billing determinants and throughput compared to the proposed revenues, billing determinants and throughput.

The proposed annual revenue shown on Statement G, Column E, Lines 8-13, is calculated using the proposed billing determinants multiplied by the proposed rates. Cardinal's costs have historically been collected solely in its demand rates, and I am not proposing to change this practice. Usage determinants are also shown on Statement G but are not used in determining Cardinal's proposed revenue. The resulting proposed annual revenue is $12,638,895, a $919,530 increase from Cardinal's currently allowed revenue (Column E, Line 21).

IX. Cost Classification and Rate Design

Q. Please identify, in general, the cost classification and allocation methodologies that Cardinal used in this filing.

A. Cardinal has continued to design its transportation rates using the methodology underlying its current rates, which methodology was initially approved by the Commission in its order certificating Cardinal in Docket No. G-39. Consistent with Cardinal's existing rate design methodology, Cardinal's costs are classified as fixed and are recoverable through Cardinal's Zone 1 and Zone 2 reservation charges. Further, the CFT transportation service rates have been designed based on 100% of shipper contract entitlements by zone.

Q. Please explain what is shown in Statement I.

A. Statement I sets forth the classification and allocation of the overall cost of service between Cardinal's rate zones. Cardinal has three firm transportation rate zones – Zone 1A, Zone 1B and Zone 2. The Zone 1 costs and rates relate to the facilities that were part of the original Cardinal Pipeline and the Zone 2 costs and rates relate to the Cardinal Expansion facilities. In the design of the proposed Zone 1 rates, Cardinal has used, where available, the actual rate base and associated costs of the Zone 1 facilities as recorded on the books of Cardinal as of December 31, 2021. In determining the rate base for each zone, Cardinal computed the accumulated deferred income taxes for Zone 1 by comparing the book and tax basis in the gas plant in service for that zone and allocating the remainder to Zone 2, as shown in footnote 3 of Statement I-1. Further, the rate base includes materials and supplies that were allocated between the two zones using a gross plant allocation factor, as shown in footnote 1 of Statement I-1.

The allocation of Cardinal's cost of service by zone is shown on Statement I-1 (Lines 8 through 14). Certain costs including O&M expenses, pipeline integrity deferral, EDIT amortization, income taxes, and taxes other than income are allocated between Zone 1 and Zone 2 using a rate base allocation factor, as shown in footnote 2 of Statement I-1. The overall cost of service for Zone 1 is $1,814,222 and for Zone 2 is $10,824,673. The Zone 1 cost of service is then divided between Piedmont and PSNC based upon their ownership shares in the original Cardinal Pipeline of approximately 36% and 64%, respectively (see Footnote 1 of Statement I-2).

The Zone 1A monthly demand rate is determined by dividing the Zone 1A costs by Piedmont's annual demand determinants of 745,200 Dth (62,100

Dth/day x 12 months). The daily demand rate is computed by multiplying the monthly demand rate by 12, and then dividing the result by 365.

The Zone 1B monthly demand rate is determined by dividing the Zone 1B costs by PSNC's annual demand determinants of 869,400 Dth (72,450 Dth/day x 12 months). The daily demand rate is computed by multiplying the monthly demand rate by 12, and then dividing the result by 365.

The Zone 2 monthly demand rate is determined by dividing the Zone 2 costs by the annual demand determinants of 4,126,800 Dth (343,900 Dth/day x 12 months). The daily demand rate is computed by multiplying the monthly demand rate by 12, and then dividing the result by 365.

Q. Have you proposed a change to the cost allocation or rate design methods underlying the calculation of Cardinal's existing rates?

A. No. The cost allocation and rate design methods underlying the calculation of Cardinal's proposed rates are the same methods underlying the calculation of Cardinal's current rates.

Q. Are you supporting the rates shown on Schedule 2?

A. Yes. Cardinal's proposed rates, shown on Schedule 2 were developed as previously described and are supported by Statement I-1.

IX. <u>Revenue Impact of the Application</u>

Q. Please explain the revenue impact of the Application, as detailed on Schedule 8 of Exhibit ____ (KM-002).

A. Schedule 8, which consists of three pages, provides an overview of the impact of the proposed rates in the instant Application on Cardinal's revenue and the resulting return on rate base. Schedule 8, Page 1, provides a statement of gross revenues received, operating expenses and net operating income for return on investment for the twelve months ended December 31, 2021, as recorded on Cardinal's books, Cardinal's rate of return on its original cost rate base, and rate of return on common equity. The revenue requirement Cardinal is proposing in this Application represents an increase of $919,530 from Cardinal's most recently approved rates in Docket No. G-39, Sub 42. Schedule 8, Page 3, details the adjustments to the recorded rate base, expenses and revenues contained in the instant Application, and the resulting rate of return on rate base.

Page 2 of Schedule 8 shows the overall return on investment and return on equity embedded in Cardinal's present and proposed rates. Upon acceptance, the proposed rates will allow Cardinal an 11.04% return on common equity (Line 9, Column E) and an overall return of 8.72% on its investment (Line 10, Column F).

Q. Are you supporting any other schedules?

A. Yes. I am supporting Schedule 9-A and Schedule 9-B. Schedule 9-A is Cardinal's statement of income as of December 31, 2021. Schedule 9-B is Cardinal's balance sheet for the twelve months ended December 31, 2021.

Q. Does this complete your testimony?

A. Yes, it does.

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Present Rates

Line No.	Description	Present Rates 1/		
	(A)	(B)	(C)	(D)
		Monthly ($/Mcf)	Monthly ($/Dt)	Daily ($/Dt)
1	Reservation Charges			
2	Zone 1A	0.79026	0.76354	0.02510
3	Zone 1B	1.22568	1.18424	0.03893
4	Zone 2	2.53828	2.45244	0.08063
5	Commodity Charges ($/Dt)			
6	Zone 1A			0.00000
7	Zone 1B			0.00000
8	Zone 2			0.00000
9	Excess CFT Service ($/Dt)			
10	Zone 1A			0.02510
11	Zone 1B			0.03893
12	Zone 2			0.08063
13	1/ Present Rates from Cardinal's Approved October 25, 2018 Federal Tax Cuts and			
14	Jobs Act Filing in Docket Nos. M-100, Sub 148 and G-39, Sub 42,			
15	effective January 1, 2018.			

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Schedule 2

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Proposed Rates

Line No.	Description	Present Rates	Proposed Rates
	(A)	(B)	(C)
		$	$
1	Monthly Reservation Charges ($/Mcf)		
2	Zone 1A	0.79026	0.89687
3	Zone 1B	1.22568	1.39104
4	Zone 2	2.53828	2.71483
5	Monthly Reservation Charges ($/Dt)		
6	Zone 1A	0.76354	0.86654
7	Zone 1B	1.18424	1.34400
8	Zone 2	2.45244	2.62302
9	Daily Reservation Charges ($/Dt)		
10	Zone 1A	0.02510	0.02849
11	Zone 1B	0.03893	0.04419
12	Zone 2	0.08063	0.08624
13	Commodity Charges ($/Dt)		
14	Zone 1A	0.00000	0.00000
15	Zone 1B	0.00000	0.00000
16	Zone 2	0.00000	0.00000
17	Excess CFT Service ($/Dt)		
18	Zone 1A	0.02510	0.02849
19	Zone 1B	0.03893	0.04419
20	Zone 2	0.08063	0.08624

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Original Cost of Property Used and Useful
in Public Service in North Carolina
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Particulars (A)	Amount (B) $
1	Intangible Plant	1,074,876
2	Transmission Plant	153,670,332
3	General Plant	1,768,644
4	Asset Retirement Obligation	(6,013)
5	Total Utility Plant	156,507,839

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Schedule 4

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Present Fair Value
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Particulars	Amount
	(A)	(B)
		$
1	Not Applicable	

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Accumulated Depreciation, Depreciation Policy and Rates
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Accumulated Depreciation	Amount
	(A)	(B)
		$
1	Zone 1 Accumulated Depreciation	(18,616,395)
2	Zone 2 Accumulated Depreciation	(54,739,463)
3	ARO	(54,951)
4	Per Books as of December 31, 2021	(73,410,809)
5	Adjustment to remove ARO	54,951
6	Adjusted Accumulated Reserve	(73,355,857)

Depreciation Policy

7 Depreciation expense is computed monthly using the straight-line method
8 applied to end-of the month depreciable base. Set forth below are the
9 rates submitted in Docket No. G-39, Sub 46.

Depreciation Rates

Line No.	Description of Function	Rate
10	Intangible Plant Franchises	0.55%
11	Miscellaneous Intangible Plant	1.57%
12	Land Rights	1.93%
13	Rights of Way	1.97%
14	Compressor Station Structures and Improvements	3.51%
15	M & R Station Structures and Improvements	2.85%
16	Mains	2.50%
17	Compressor Station Equipment	2.94%
18	Measurement and Regulating Station Equiptment	2.49%
	General Plant	
19	In House Developed Software	6.67%
20	Data Process & Computer Equipment	12.50%
21	Office Furniture and Equipment	10.00%
22	Tools, Shop and Garage Equipment	5.00%
23	Power Operated Equipment	10.00%
24	Communications Equipment	4.35%
25	Truck - 5 Years	16.67%
26	Fully Depreciated Plant	0.00%

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Schedule 6

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Materials and Supplies (Average Working Capital)
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Particulars	13-Month Average Amount
	(A)	(B)
		$
1	Materials and Suplies	156,038
2	Line Pack	190,321
3	Total Working Capital	346,360

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Cash Working Capital
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Particulars	Amount
	(A)	(B)
		$
1	Cardinal is not claiming a cash working capital allowance	

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Statement of Gross Revenue Received, Operating Expense
and Net Operating Income for Return on Investment
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Particulars	Per Books December 31, 2021	Accounting and End of Period Adjustments		December 31, 2021, as Adjusted	Revenue Increase / Decrease		Proposed Rates
	(A)	(B)	(C)		(D)	(E)		(F)
		$	$		$	$		$
	Operating Revenues 1/							
1	Transportation of Gas	11,786,686	(67,321)	(1)	11,719,365	919,530	(7)	12,638,895
2	Total Operating Revenues	11,786,686	(67,321)		11,719,365	919,530		12,638,895
	Operating Expenses 1/							
3	Operation and Maintenance Expenses	2,391,583	(30,607)	(2)	2,360,976	16,610	(8)	2,377,586
4	Depreciation Expense	3,846,736	10,018	(3)	3,856,754	191,712	(9)	4,048,466
5	Regulatory Debit / Credit	40,565	(40,565)	(4)	0	0		0
6	Income Taxes	971,861	0		971,861	155,424	(10)	1,127,285
7	Taxes other than Income Taxes	523,228	0		523,228	16,431	(11)	539,659
8	EDIT Amortization	(713,556)	185,105	(5)	(528,451)	13,783	(12)	(514,668)
9	Pipeline Integrity Deferral	0	0		0	82,411	(13)	82,411
10	Accretion Expense	37,546	(37,546)	(6)	0	0		0
11	Total Operating Expenses	7,097,963	86,405		7,184,368	476,372		7,660,739
12	Net Operating Income	4,688,723	(153,726)		4,534,997	443,159	(14)	4,978,156
	Original Cost Rate Base 1/							
13	Plant in Service	156,507,838	6,014	(15)	156,513,852	0		156,513,852
14	Accumulated Depreciation	(72,552,544)	0		(72,552,544)	(803,313)		(73,355,857)
15	Net Plant	83,955,294	6,014		83,961,308	(803,313)		83,157,994
16	Working Capital	346,360	0		346,360	0		346,360
17	Accumulated Deferred Income Taxes	(13,380,354)	(13,366,107)	(16)	(26,746,461)	331,039	(17)	(26,415,422)
18	Total Rate Base	70,921,300	(13,360,093)		57,561,207	(472,274)		57,088,932
19	Rate of Return on Rate Base				7.88%			8.72%

20 1/ See Schedule 8 page 3 for a description of the accouning and proforma adjustments.

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 38
Return on Proprietary Capital and Overall Return of Investment
For the Test Period Ended December 31, 2021, and as Proposed

Line No.	Capital Structure (A)	Capitalization at December 31, 2021 (B) $	Ratio (C)		Rate Base (D) $	Embedded Cost (E)	Weighted Cost of Capital (F)	Net Operating Income (G) $
1	Long-Term Debt	0	0.00%		0	0.00%	0.00%	0
2	Current Portion of Long Term Debt	0	0.00%		0	0.00%	0.00%	0
3	Proprietary Capital	38,038,248	100.00%		57,561,207	7.88%	7.88%	4,534,997
4	Total Capital	38,038,248	100.00%		57,561,207		7.88%	4,534,997
5							Rate Base	57,561,207
6							Return	4,534,997
	After Adjustments for Proposed Rates							
7	Long-Term Debt	0	40.00%	1/	22,835,573	5.25%	2.10%	1,198,868
8	Current Portion of Long Term Debt	0	0.00%		0	0.00%	0.00%	0
9	Proprietary Capital	0	60.00%	1/	34,253,359	11.04%	6.62%	3,779,288
10	Total Capital	0	100.00%		57,088,932		8.72%	4,978,156
11							Rate Base	57,088,932
12							Return	4,978,156

13 1/ Hypothetical capital structure as proposed by Mr. David Haag in Exhibit No. DH-001.

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Accounting and Pro Forma Adjustments
For the Test Period Ended December 31, 2021, As Adjusted

Line No.		Description (A)	Filed Amount (B) $
1		Revenue from Income Statement Dated December 31, 2021	11,786,686
	(1)	**Adjustments to Test Year to Normalize Revenue**	
2		To remove tracked electric power revenue	(67,246)
3		To remove rounding due to billing	(75)
4		Statement G Adjustment	(67,321)
	(2)	**Operating Expenses**	
5		To reverse accounting entry related to fuel tracker	(1,869,762)
6		To reverse accounting entry related to fuel tracker	1,916,509
7		To reverse accounting entry related to electric power tracker	(75,938)
8		To reverse accounting entry related to other tracked costs	(1,416)
9		Total Operating Expense, Statement H-1	(30,607)
10	(3)	To remove ARO Depreciation	10,018
11	(4)	To reflect the removal non-rate base items	(40,565)
		Adjustments to EDIT Flowback	
12		Excess Deferred Income Tax Amortization as recorded on books	(713,556)
13		To reflect the current flowback associated with changes in State Income Tax (Expense)	(528,451)
14	(5)	Current Period Adjustment for EDIT Correction to Books	185,105
15	(6)	To remove the accretion expense associated with ARO	(37,546)
16	(7)	To reflect an increase in revenue at proposed rates	919,530
	(8)	**Adjustments to Test Year to Normalize Expenses**	
17		To reflect new insurance premiums effective October 2021	22,908
18		To reflect signed lease renewal effective August 2021	2,528
19		To reflect rate case year legal expenses	2,400
20		To reflect amortization of rate case related consulting fees	(11,225)
21		Total Operating Expense, Statement H-1 Adjustment	16,611
22	(9)	To reflect an increase in depreciation expense due to the proposed depreciation rates	191,712
23	(10)	To reflect the tax adjustment associated with the change in revenue due to the proposed rates	155,424
24	(11)	Taxes Other Than Income - Include Gross Receipts Tax	16,431
25		Current EDIT flowback associated with State Income Tax Changes down to 3% - Docket No. G-39, Sub 42	(528,451)
26		To reflect the proposed flowback associated with changes in Federal and State Income Tax	(514,668)
27	(12)	Proposed Period Adjustment for EDIT	(13,783)
28	(13)	Pipeline Integrity Deferral - From G-39, Sub 38 Settlement	82,411
29	(14)	To reflect an increase in revenue to reflect the proposed Rate of Return	443,159
		Summary Revenue / Expense - Test Year Adjusted	
30		Total Revenue	12,638,895
31		Total Expense	7,633,175
32		Total Operating Income - Ties to Return on Investment	5,005,719
		Rate Base Adjustments	
33	(15)	Change in Plant in Service - remove ARO	6,014
		ADIT	
34		To remove non-rate base deferred taxes	(26,654)
35		To include AFUDC Regulatory Asset	728,603
36		Excess ADIT from Docket G-39, Sub 42 and M-100, Sub 138	(13,737,017)
37		Remaining EDIT from Docket G-39, Sub 38	(331,039)
38	(16)	Accumulated Deferred Income Taxes - removal of non-rate base deferred income taxes and to	
39		include AFUDC Regulatory Asset	(13,366,107)
40	(17)	Remove EDIT from Docket G-39, Sub 38 - Amortization has ended - See rate case proposal in Exhibit No. KM-001	331,039
41		Total Adjustments to Rate Base	(13,029,054)

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Comparative Income Statements

Line No.	Description	Twelve Months Ended December 31, 2021	Twelve Months Ended December 31, 2020
	(A)	(B)	(C)
		$	$
1	Operating Revenues	11,786,686	11,819,316
	Operating Expenses		
2	Operation Expenses	1,774,033	1,521,360
3	Maintenance Expenses	617,550	718,418
4	Depreciation Expense and Amortization	3,856,754	3,815,401
5	Depreciation for Asset Retirement Costs	(10,018)	(150)
6	Regulatory Debits	68,093	(41,431)
7	(Less) Regulatory Credits	(27,528)	(39,153)
8	Taxes Other Than Income Taxes	523,228	558,350
9	Income Taxes-Federal	780,055	1,528,000
10	Income Taxes-Other	95,006	187,000
11	Provision for Deferred Income Taxes	96,800	(655,000)
12	Excess Deferred Income Tax Amortization	(713,556)	(697,422)
13	Accretion Expense	37,546	39,304
14	Total Utility Operating Expenses	7,097,963	6,934,677
15	Net Utility Operating Income	4,688,723	4,884,639
	Other Deductions and Other (Income)		
16	Interest and Dividend (Income)	(5,828)	(14,083)
17	Allowance for Other Funds Used During Construction	(1,932)	(78,251)
18	Other Deductions	15,139	15,339
19	Income Taxes - Federal	(1,955)	0
20	Interest on Long-Term Debt	1,419,394	1,423,283
21	Amortization of Debt Discount and Expense	12,994	12,994
22	Allowance for Other Funds Used During Construction-Credit	(716)	(29,026)
23	Total Other Deductions and Other (Income)	1,437,096	1,330,256
24	Net Income	3,251,627	3,554,383

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Comparative Balance Sheets

Line No.	Description	December 31, 2021	December 31, 2020
	(A)	(B)	(C)
		$	$
	Assets and Other Debits		
	Utility Plant		
1	Utility Plant	156,507,838	156,727,080
2	Construction Work in Progress	(493,414)	310,072
3	Total Utility Plant	156,014,424	157,037,152
4	(Less) Accumulated Provision for Depr. Amort. Depl.	72,552,544	69,749,812
5	Net Utility Plant	83,461,880	87,287,340
6	System Balancing Gas	189,790	214,023
	Other Property and Investments		
7	Derivative Instrument Assets - Hedges	0	0
8	Total Other Property and Investments	0	0
	Current and Accrued Assets		
9	Cash & Temporary Cash Investments	9,665,992	2,546,920
10	Special Deposits	0	0
11	Customer Accounts Receivable	1,001,128	1,000,832
12	Other Accounts Receivable	460,752	0
13	Accounts Receivable from Associated Companies	0	0
14	Fuel Stock	0	0
15	Plant Materials and Operating Supplies	188,669	112,315
16	Stores Expense Undistributed	(107)	0
17	Prepayments	15,618,098	16,468,296
18	Interest and Dividends Receivable	0	0
19	Miscellaneous Current and Accrued Assets	0	0
20	Total Current and Accrued Assets	26,934,532	20,128,363
	Deferred Debits		
21	Unamortized Debt Expense	4,890	17,884
22	Other Regulatory Assets	1,939,685	1,913,598
23	Clearing Accounts	(49,500)	0
24	Unamortized Loss on Reacquired Debt	0	0
25	Miscellaneous Deferred Debits	57,105	37,054
26	Accumulated Deferred Income Taxes	3,360,738	3,692,894
27	Total Deferred Debits	5,312,918	5,661,430
28	Total Assets and Other Debits	115,899,120	113,291,156
	Liabilities and Other Credits		
	Proprietary Capital		
29	Other Paid-in Capital	33,640,854	33,640,854
30	Retained Earnings	4,452,297	1,200,670
31	Accumulated Other Comprehensive Income	(370,579)	(960,560)
32	Total Proprietary Capital	37,722,572	33,880,964
	Long-Term Debt		
33	Other Long-Term Debt	0	45,000,000
34	Total Long-Term Debt	0	45,000,000
	Other Non-Current Liabilities		
35	Asset Retirement Obligations	725,754	708,847
36	Total Noncurrent Liabilities	725,754	708,847
	Current and Accrued Liabilities		
37	Current Portion of long-term debt	45,000,000	0
38	Accounts Payable	559,441	257,295
39	Accounts Payable to Associated Companies	73,587	99,981
40	Taxes Accrued	196	6,311
41	Interest Accrued	174,994	174,994
42	Miscellaneous Current and Accrued Liabilities	320,179	304,866
43	Derivative Instrument Liabilities - Hedges	373,398	1,140,379
44	Total Current and Accrued Liabilities	46,501,795	1,983,826
	Deferred Credits		
45	Other Deferred Credits	69,359	47,743
46	Other Regulatory Liabilities	14,138,548	14,870,328
47	Accumulated Deferred Income Taxes	16,741,092	16,799,448
48	Total Deferred Credits	30,948,999	31,717,519
49	Total Liabilities and Other Credits	115,899,120	113,291,156

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Statement A

CARDINAL PIPELINE COMPANY, LLC
Overall Cost of Service
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Particulars	Reference	Amount
	(A)	(B)	(C)
			$
1	O&M Expense	Stmt H-1	2,377,586
2	Pipeline Integrity Deferral	Sch H-1(e)	82,411
3	Depreciation, Depletion, and Amortization	Stmt H-2	4,048,466
4	Taxes: Other than Income Taxes	Stmt H-4	539,659
5	State and Local Income Taxes	Stmt H-3	122,664
6	Federal Income Taxes	Stmt H-3	1,004,621
7	Return	Stmt B	4,978,156
8	EDIT Amortization	Stmt H-3(a)	(514,668)
9	Total Cost of Service of Facilities		12,638,895

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Statement B

CARDINAL PIPELINE COMPANY, LLC
Rate Base and Return
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Particulars	Reference	Amount
	(A)	(B)	(C)
			$
1	Gas Plant in Service	Stmt C or Sch 3	156,513,852
2	Accumulated Provision for Depreciation	Stmt D or Sch 5	(73,355,857)
3	Net Utility Plant		83,157,994
4	Working Capital	Stmt E	346,360
5	Accumulated Deferred Income Taxes	Stmt B-1	(26,415,420)
6	Total Rate Base		57,088,934
7	Proposed Rate of Return	Stmt F	8.72%
8	Return on Rate Base		4,978,156

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Accumulated Deferred Income Taxes
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Account No.	Description (A)	Balance at December 31, 2021 (B) $	Adjustment (C) $	Adjusted Balance (D) $
1		FERC Account 190 - Noncurrent DFIT			
2	190	ARO	137,198	(137,198)	0
3	190	CIAC	(88,937)	88,937	0
4	190	Reg Liabilities - State Rate Change	69,518	(69,518)	0
5	190	Reg Liabilities - Current - State Rate Adj	13,389	(13,389)	0
6	190	Reg Liabilities - Reverse South Georgia	2,884,770	0	2,884,770
7	190	Accrual Audit Services - A/P	16,803	(16,803)	0
8	190	Derivatives - FAS 133 - Noncurrent	239,480	(239,480)	0
9	190	SDIT Derivatives - FAS133 - Noncurrent	(5,987)	5,987	0
10	190	DSIT - Account 190 - Noncurrent	(81,406)	9,286	(72,119)
11		Total Account 19006001 - Noncurrent DFIT	3,184,828	(372,177)	2,812,651
12		FERC Account 190 - Noncurrent DSIT			
13	190	ARO	16,333	(16,333)	0
14	190	CIAC	(11,779)	11,779	0
15	190	Reg Liabilities - State Rate Change	8,276	(8,276)	0
16	190	Reg Liabilities - Current - State Rate Adj	1,594	(1,594)	0
17	190	Reg Liabilities - Reverse South Georgia	343,425	0	343,425
18	190	Accrual Audit Services - A/P	2,000	(2,000)	0
19	190	Derivatives - FAS 133 - Noncurrent	28,509	(28,509)	0
20	190	SDIT - FAS133 - Noncurrent	(713)	713	0
21		Total Account 19007001 - Noncurrent DSIT	387,646	(44,221)	343,425
22		FERC Account 282 - Noncurrent DFIT			
23	282	Book Depreciation - Utility	14,883,965	0	14,883,965
24	282	Tax Depreciation - Utility	(29,418,345)	0	(29,418,345)
25	282	Equity AFUDC	(644,719)	0	(644,719)
26	282	Capitalized Software	(201,061)	0	(201,061)
27	282	PP&E Cost Adj - Other	683,563	0	683,563
28	282	PP&E Cost ADJ/ARO	(61,301)	61,301	0
29	282	Tax Gain/Loss-Sale PP&E	(290,365)	0	(290,365)
30	282	DSIT - Account 282 - Noncurrent	376,032	(1,533)	374,499
31		Total Account 28206001 - Noncurrent DFIT	(14,672,232)	59,769	(14,612,463)
32		FERC Account 282 - Noncurrent DSIT			
33	282	Book Depreciation - Utility	1,771,901	0	1,771,901
34	282	Tax Depreciation - Utility	(3,501,350)	0	(3,501,350)
35	282	Equity AFUDC	(76,752)	0	(76,752)
36	282	Capitalized Software	(23,936)	0	(23,936)
37	282	PP&E Cost Adj - Other	81,377	0	81,377
38	282	PP&E Cost ADJ/ARO	(7,298)	7,298	0
39	282	Tax Gain/Loss-Sale PP&E	(34,567)	0	(34,567)
40		Total Account 28207001 - Noncurrent DSIT	(1,790,626)	7,298	(1,783,328)

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Accumulated Deferred Income Taxes
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Account No.	Description	Balance at December 31, 2021	Adjustment	Adjusted Balance
		(A)	(B)	(C)	(D)
			$	$	$
41		FERC Account 283 - Noncurrent DFIT			
42	283	AFUDC - Equity Gross-up	(152,910)		(152,910)
43	283	Reg Asset - NC - Fuel Tracker	(52,129)	52,129	0
44	283	ARO Regulatory Account	(154,148)	154,148	0
45	283	Reg Asset- C-Reserve	0	0	0
46	283	Reg Asset - Pipeline Integrity O&M Deferral	(86,506)	86,506	0
47	283	Reg Liabilities - C - Fuel Tracker	(26,663)	26,663	0
48	283	Reg Liabilities - C - Electric Power Deferral-Demand	(2,442)	2,442	0
49	283	Reg Liab - Current - Tracker Trans Def	28,002	(28,002)	0
50	283	DSIT - Account 283 - Noncurrent	11,476	(7,653)	3,822
51		Total Account 28306001 - Noncurrent DFIT	(435,321)	286,233	(149,087)
52		FERC Account 283 - Noncurrent DSIT			
53	283	AFUDC - Equity Gross-up	(18,204)	0	(18,204)
54	283	Reg Asset - NC - Fuel Tracker	(7,663)	7,663	0
55	283	ARO Regulatory Account	(18,351)	18,351	0
56	283	Reg Asset- C-Reserve	0	0	0
57	283	Reg Asset - Pipeline Integrity O&M Deferral	(10,298)	10,298	0
58	283	Reg Liabilities - C - Fuel Tracker	(3,174)	3,174	0
59	283	Reg Liabilities - C - Electric Power Deferral-Demand	(291)	291	0
60	283	Reg Liab - Current - Tracker Trans Def	3,334	(3,334)	0
61		Total Account 28307001 - Noncurrent DSIT	(54,647)	36,444	(18,204)
62		Total Deferred FIT	(11,922,725)	(26,175)	(11,948,900)
63		Total Deferred SIT	(1,457,627)	(479)	(1,458,106)
64		Total Deferred Taxes	(13,380,352)	(26,654)	(13,407,006)
65		Plus: Regulatory Asset - AFUDC	728,603	0	728,603
66		Plus: Regulatory Liability - Reverse South Georgia 1/	(331,039)	331,039	0
67		Plus: Regulatory Liability - Reverse South Georgia 2/	(13,737,017)	0	(13,737,017)
68		Total Deferred Taxes in Rate Base	(26,719,805)	304,385	(26,415,420)

69 1/ The remaining unamortized balance of Excess ADIT from Docket G-39, Sub 38 - 2017.
70 2/ The Excess ADIT created from the reduction in the Federal Income Tax Rate from 35% to 21% under the Tax Cuts and Jobs Act of 2017
71 and the 2018 reduction of the North Carolina Corporate Income Tax Rate from 3% to 2.5%.

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Statement C

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Original Cost of Plant
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Account Number	Title of Accounts (A)	Balance at December 31, 2021 (B) $	Adjustments (C) $	Balance, As Adjusted (D) $
		Intangible Plant			
1	301	Organization	0		0
2	302	Franchises and Consents	176,783		176,783
3	303	Miscellaneous Intangible Plant	898,093		898,093
4		Total Intangible Plant	1,074,876	0	1,074,876
6		Fully Depreciated / Non-Depreciable	0		0
7		Total Depreciable Intangible Plant	1,074,876	0	1,074,876
		Gas Production Plant			
8	304.1	Land	0		0
9	311.0	Liquefied Pet. Gas Equipment	0		0
10		Total Gas Production Plant	0	0	0
		Other Storage Plant			
11	360	Land	0		0
12	361	Structures and Improvements	0		0
13	362	Gas Holders	0		0
14	363	Purification Equipment	0		0
15	363.1	Liquefaction Equipment	0		0
16	363.2	Vaporizing Equipment	0		0
17	363.3	Compressor Equipment	0		0
18	363.4	Measuring & Reg. Equipment	0		0
19	363.5	Other Equipment	0		0
20		Total Other Storage Plant	0	0	0
		Transmission Plant			
21	365.11	Land	658,662		658,662
22	365.12	Land Rights	96,745		96,745
23	365.2	Rights-of-way	4,011,679		4,011,679
24	366.1	Structures and Improvements	2,673,056		2,673,056
25	366.2	Structures and Improvements Measure	1,428,304		1,428,304
26	367	Mains	100,636,221		100,636,221
27	368	Compressor Station Equipment	35,401,074		35,401,074
28	369	Measuring and Reg. Sta. Equipment	8,764,591		8,764,591
29	371	Other Equipment	0		-
30		Total Transmission Plant	153,670,332	0	153,670,332
31		Fully Depreciated / Non-Depreciable	658,662		658,662
32		Total Depreciable Transmission Plant	153,011,670	0	153,011,670

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Original Cost of Plant
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Account Number	Title of Accounts	Balance at December 31, 2021	Adjustments	Balance, As Adjusted
		(A)	(B)	(C)	(D)
			$	$	$
		Distribution Plant			
33	374	Land and Land Rights	0		0
34	375	Structures and Improvements	0		0
35	376	Mains	0		0
36	377	Compressor Station Equipment	0		0
37	378	Meas. and Reg. Sta. Equip. - General	0		0
38	379	Meas. and Reg. Sta. Equip. - City Gate	0		0
39	380	Services	0		0
40	380.2	House Piping	0		0
41	381	Meters	0		0
42	381.1	Meter Accessories	0		0
43	383	House Regulators	0		0
44	384	House Reg. Installations	0		0
45	385	Industrial Meas. and Reg. Sta. Equip.	0		0
46	386	Other Prop. on Customers' Premises	0		0
47	387	Other Equipment	0		0
48		Total Distributions Plant	0	0	0
		General Plant			
49	390	Structures and Improvements fully depreciated	5,269		5,269
50	391.1	Office Furniture and Equipment - Developed Software	113,437		113,437
51	391.1	Furniture & Equipment - Software fully Depreciated	843,871		843,871
52	391.2	Office Furniture and Equipment - Data Process & Computer Equip.	0		0
53	391.3	Office Furniture and Equipment - Tower Office Furniture & Equip	32,228		32,228
54	392	Transportation Equipment	0		0
55	392	Transportation Equipment fully depreciated	3,761		3,761
56	394	Tools, Shop, and Garage Equipment	553,486		553,486
57	396	Power Operated Equipment	31,910		31,910
58	396	Power Operated Equipment fully depreciated	10,649		10,649
59	397	Communication Equipment	31,632		31,632
60	397	Communication Equipment - Original Cardinal	142,401		142,401
61		Total General Plant	1,768,644	0	1,768,644
62		Fully Depreciated / Non-Depreciable	1,005,951	0	1,005,951
63		Total Depreciable General Plant	762,693	0	762,693
64	372	Asset Retirement Obligations	(6,013)	6,013	0
65		Total Asset Retirement Obligations	(6,013)	6,013	0
66		Total Gas Plant in Service	156,507,839	6,013	156,513,852
67		Fully Depreciated / Non-Depreciable	1,664,612	0	1,664,612
68		Total Depreciable Plant	154,843,226	6,013	154,849,239

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Statement D

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 38
Accumulated Provision for Depreciation, Depletion, and Amortization
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Account Number	Title of Accounts (A)	Balance at December 31, 2021 (B) $	Adjustments (C) $	Balance, As Adjusted (D) $
		Intangible Plant			
1	301	Organization	0		0
2	302	Franchises and Consents	156,125		156,125
3	303	Miscellaneous Intangible Plant	535,129		535,129
4		Original Intangible Plant	691,254	0	691,254
5		Gas Production Plant			
6	304.1	Land	0		0
7	311.0	Liquefied Pet. Gas Equipment	0		0
8		Total Gas Production Plant	0	0	0
9		Other Storage Plant			
10	360	Land	0		0
11	361	Structures and Improvements	0		0
12	362	Gas Holders	0		0
13	363	Purification Equipment	0		0
14	363.1	Liquefaction Equipment	0		0
15	363.2	Vaporizing Equipment	0		0
16	363.3	Compressor Equipment	0		0
17	363.4	Measuring & Reg. Equipment	0		0
18	363.5	Other Equipment	0		0
19		Total Other Storage Plant	0	0	0
		Transmission Plant			
20	365.11	Land	0		0
21	365.12	Land Rights	50,145		50,145
22	365.2	Rights-of-way	2,070,392		2,070,392
23	366.1	Structures and Improvements	693,780		693,780
24	366.2	Structures and Improvements Measure	581,827		581,827
25	367	Mains	53,870,264		53,870,264
26	368	Compressor Station Equipment	9,930,073		9,930,073
27	369	Measuring and Reg. Sta. Equipment	3,941,201		3,941,201
28	371	Other Equipment	0		0
29		Original Transmission Plant	71,137,681	0	71,137,681
30		Distribution Plant			
31	374	Land and Land Rights	0		0
32	375	Structures and Improvements	0		0
33	376	Mains	0		0
34	377	Compressor Station Equipment	0		0
35	378	Meas. and Reg. Sta. Equip. - General	0		0
36	379	Meas. and Reg. Sta. Equip. - City Gate	0		0
37	380	Services	0		0
38	380.2	House Piping	0		0
39	381	Meters	0		0
40	381.1	Meter Accessories	0		0
41	383	House Regulators	0		0
42	384	House Reg. Installations	0		0
43	385	Industrial Meas. and Reg. Sta. Equip.	0		0
44	386	Other Prop. on Customers' Premises	0		0
45	387	Other Equipment	0		0
46		Total Distributions Plant	0	0	0
		General Plant			
47	390	Structures and Improvements fully depreciated	5,269		5,269
48	391.1	Office Furniture and Equipment - Developed Software	66,960		66,960
49	391.1	Furniture & Equipment - Software (fully depreciated)	843,871		843,871
50	391.2	Office Furniture and Equipment - Data Process & Computer Equip.	0		0
51	391.3	Office Furniture and Equipment - Tower Office Furniture & Equip	26,882		26,882
53	392	Transportation Equipment	0		0
52	392	Transportation Equipment (fully depreciated)	3,761		3,761
54	394	Tools, Shop, and Garage Equipment	379,861		379,861
55	396	Power Operated Equipment	27,542		27,542
56	396	Power Operated Equipment (fully depreciated)	10,649		10,649
57	397	Communication Equipment	19,725		19,725
58	397	Communication Equipment - Original (fully depreciated)	142,401		142,401
59		Total General Plant	1,526,922	0	1,526,922
60		Total Accumulated Reserve less ARO and RWIP	73,355,857	0	73,355,857
61	372	Asset Retirement Obligations	54,951	(54,951)	0
62		Total Asset Retirement Obligations	54,951	(54,951)	0
63		Total	73,410,809	(54,951)	73,355,857

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Statement E

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Working Capital
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Month (A)	Line Pack (B) $	Materials and Supplies (C) $	Total (D) $
1	December - 2020	214,023	112,314	326,338
2	January - 2021	214,023	112,314	326,338
3	February - 2021	216,937	112,314	329,252
4	March - 2021	194,912	114,587	309,499
5	April - 2021	105,759	115,821	221,580
6	May - 2021	211,664	140,972	352,636
7	June - 2021	141,781	189,942	331,723
8	July - 2021	219,346	190,235	409,581
9	August - 2021	204,086	187,421	391,507
10	September - 2021	188,392	187,524	375,915
11	October - 2021	204,452	187,615	392,067
12	November - 2021	169,010	188,771	357,781
13	December - 2021	189,790	188,669	378,459
14	Total	2,474,176	2,028,500	4,502,676
15	Thirteen Month Average	190,321	156,038	346,360

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Rate of Return, Cost of Capital, and Cost of Debt
As Proposed

Line No.	Capital Structure (A)	Percent of Capital (B)		Cost (C)	Weighted Cost of Capital (D)
1	Long-Term Debt	40.00%	1/	5.25%	2.10%
2	Current Portion of Long Term Debt	0.00%		0.00%	0.00%
3	Proprietary Capital	60.00%	1/	11.04%	6.62%
4	Total Capital	100.00%	1/		8.72%
5	1/ Hypothetical capital structure as proposed by Mr. David Haag in Exhibit No. DH-001.				

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Statement G

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Quantities and Revenues
For the Test Period Ended December 31, 2021, As Adjusted
And As Proposed

Line No.	Rate Schedule (A)	Annual Reservation Quantity (B) Mcf	Annual Reservation Quantity (C) Dth	Usage Quantity (D) Dth	Annual Revenue (E) $	
	Annual Test Period Ended December 31, 2021					
1	Zone 1A Reservation	60,000	62,100	0	568,929	
2	Zone 1A Usage	0	0	1,677,731	0	
3	Zone 1B Reservation	70,000	72,450	0	1,029,475	
4	Zone 1B Usage	0	0	19,103,530	0	
5	Zone 2 Reservation	332,270	343,900	0	10,120,961	
6	Zone 2 Usage	0	0	65,354,955	0	
7	Total	462,270	478,450	86,136,216	11,719,365	1/
	As Proposed					
8	Zone 1A Reservation	60,000	62,100	0	645,748	
9	Zone 1A Usage	0	0	1,677,731	0	
10	Zone 1B Reservation	70,000	72,450	0	1,168,474	
11	Zone 1B Usage	0	0	19,103,530	0	
12	Zone 2 Reservation	332,270	343,900	0	10,824,673	
13	Zone 2 Usage	0	0	65,354,955	0	
14	Total	462,270	478,450	86,136,216	12,638,895	
	Difference (Proposed less Actual)					
15	Zone 1A Reservation	0	0	0	76,819	
16	Zone 1A Usage	0	0	0	0	
17	Zone 1B Reservation	0	0	0	138,999	
18	Zone 1B Usage	0	0	0	0	
19	Zone 2 Reservation	0	0	0	703,712	
20	Zone 2 Usage	0	0	0	0	
21	Total	0	0	0	919,530	
22	% Difference				7.85%	
23	Zone 1A change				13.50%	
24	Zone 1B change				13.50%	
25	Zone 2 change				6.95%	

25	Notes:	
26	1/ Revenue at December 31, 2021, as Adjusted	
27	Annual Revenue at Current Rates	11,786,686
28	Tracked Electric Power Revenue	(67,246)
29	Rounding - due to Billing	(75)
30	Income Statement dated 12/31/2021	11,719,365

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Operation and Maintenance Expenses
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Acct. No.	Description	1/31/2021	2/28/2021	3/31/2021	4/30/2021	5/31/2021	6/30/2021	7/31/2021	8/31/2021	9/30/2021	10/31/2021	11/30/2021	12/31/2021	Test Period Total	Adjustment	Total As Adjusted
		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(L)	(M)	(N)	(O)	(P)
			$	$	$	$	$	$	$	$	$	$	$	$	$	$	$
1	806	Imbalance Gas	73,650	15,370	(9,908)	(82,737)	96,242	(16,614)	(24,263)	(45,002)	(34,991)	(30,635)	(30,372)	50,657	(38,601)	38,601	0
2	810	Gas Used for Compressor Station Fuel	135,811	136,512	245,874	83,151	71,617	110,359	118,901	142,559	165,771	190,590	242,158	273,206	1,916,509	(1,916,509)	0
3	812	Gas used for Other Utility Operations - Credit	(209,461)	(151,882)	(235,965)	(414)	(167,859)	(93,745)	(94,639)	(97,558)	(130,780)	(159,955)	(211,787)	(323,864)	(1,877,907)	1,877,907	0
4	813	Other Gas Supply Expenses / Gains or Losses	172,606	148,968	257,991	89,566	61,954	163,628	17,074	112,818	146,474	143,894	245,813	308,976	1,869,762	(1,869,762)	0
5	850	Operation Supervision & Engineering	3,128	3,706	3,553	2,308	27,288	(22,325)	3,344	38	0	0	0	0	21,041	0	21,041
6	851	System Control & Load Dispatching	2,726	1,363	0	2,792	1,407	1,407	2,111	1,407	0	2,102	676	1,876	17,869	0	17,869
7	852	Communication System Expenses	3,173	1,413	1,218	2,144	147	2,004	21	520	790	347	695	0	12,472	0	12,472
8	853	Compressor Station Labor & Expenses	4,606	10,316	11,605	141,562	26,030	31,778	14,979	(6,330)	(59,744)	15,224	26,339	41,503	257,867	0	257,867
9	854	Gas for Compressor Station Fuel	(135,811)	(136,512)	(245,874)	(83,151)	(71,617)	(110,359)	(118,901)	(142,559)	(165,771)	(190,590)	(242,158)	(273,206)	(1,916,509)	1,916,509	0
10	855	Other Fuel & Power for Compressor Stations	6,323	6,023	6,106	5,268	5,040	6,228	0	14,406	(7,393)			33,937	75,938	(75,938)	0
11	856	Mains Expenses	21,069	17,996	16,829	67,219	16,890	36,460	8,710	52,028	30,964	80,036	37,710	55,312	441,222	1,112	442,334
12	857	Measuring & Regulating Station Expenses	1,131	1,067	1,202	5,718	894	705	1,041	1,612	21,535	8,435	97,528	(22,743)	118,124	0	118,124
13	859	Other Expenses	0	31	38	0	1,055	0	263	0	0	301	0	0	1,689	0	1,689
14	860	Rents	0	0	0	250	0	0	0	0	0	0	0	0	250	0	250
15	861	Maintenance Supervision & Engineering	0	0	0	0	0	0	52,700	(52,700)	0	0	0	0	0	0	0
16	862	Maintenance of Structures & Improvements	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	863	Maintenance of Mains	13,487	21,465	17,806	29,778	353	16,222	23,940	37,244	(10,110)	9,465	12,834	10,985	183,469	0	183,469
18	864	Maintenance of Compressor Station Equipment	17,213	14,152	13,833	9,518	(9,111)	(41,339)	4,905	196,761	2,527	114	5,111	7,373	221,058	0	221,058
19	865	Maintenance of M&R Station Equipment	193	2,775	2,009	3,315	2,822	7,973	1,533	0	0	4,728	1,699	0	27,046	0	27,046
20	866	Maintenance of Communication Equipment	314	542	519	0	278	413	0	0	0	0	0	0	2,066	0	2,066
21	867	Maintenance of Other Equipment	1,855	24,273	2,311	26,518	1,815	17,447	1,437	(389)	106,126	2,195	325	0	183,911	0	183,911
22	920	Administrative & General Salaries	4,811	4,480	5,937	4,840	11,212	9,210	16,319	9,158	12,707	12,627	12,021	2,898	106,219	0	106,219
23	921	Office Supplies and Expenses	0	0	0	0	0	0	0	0	0	0	0	150	150	0	150
24	922	Administrative Expenses Transferred	0	0	0	0	0	0	8,544	(8,544)	0	0	0	0	0	0	0
25	923	Outside Services Employed	8,334	8,812	9,103	9,397	9,037	9,217	9,076	10,001	8,869	8,844	21,331	9,128	121,149	2,400	123,549
26	924	Property Insurance	21,348	21,348	21,348	21,348	21,348	21,348	21,348	21,348	21,348	21,348	23,754	23,754	260,985	24,063	285,047
27	925	Injury and Damages	10,407	10,407	10,407	10,407	10,407	10,407	10,407	10,407	10,407	10,407	10,292	10,292	124,653	(1,155)	123,498
28	926	Employee Pensions and Benefits	16,083	15,794	18,017	15,396	17,237	16,169	13,811	22,409	14,188	18,680	17,137	14,505	199,427	0	199,427
29	928	Regulatory Commission Expenses	0	500	0	0	0	0	0	0	0	0	61,225	0	61,725	(11,225)	50,500
30	930.2	Miscellaneous General Expenses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	932	Maintenance of General Plant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32		Total	172,998	178,918	153,957	364,194	134,486	176,591	92,661	279,635	132,917	148,158	332,330	224,739	2,391,583	(13,997)	2,377,586

Line No.	Acct. No.	Description	Adjustment
33	806-813	Reverse Fuel Related Accounting Entry	(1,869,762)
34	854	Reverse Fuel Related Accounting Entry	1,916,509
35	855	Reverse Electric Power Related Accounting Entry	(75,938)
36	856	Reverse Other Tracked Costs	(1,416)
37		Total - Tracked Cost Adjustments	(30,607)
38	924	Property Insurance	24,063
39	925	General Liability Insurance	(1,155)
40		Total - Insurance Adjustments	22,908
41	856	Mains Expenses	2,528
42		Total - Rent Adjustment	2,528
43			
	923	External Legal Expense	2,400
44	928	Consultant Fees	(11,225)
45		Total - Rate Case Expense Adjustments	(8,825)
46		Total O&M Adjustments	(13,997)

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Cost Classification of Operating Expense Amounts
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Acct. No.	Description	Total As Adjusted	Fixed	Variable
		(A)	(B)	(C)	(D)
			$	$	$
1	806	Imbalance Gas	0	0	0
2	810	Gas Used for Compressor Station Fuel	0	0	0
3	812	Gas used for Other Utility Operations - Credit	0	0	0
4	813	Other Gas Supply Expenses / Gains or Losses	0	0	0
5	850	Operation Supervision & Engineering	21,041	21,041	0
6	851	System Control & Load Dispatching	17,869	17,869	0
7	852	Communication System Expenses	12,472	12,472	0
8	853	Compressor Station Labor & Expenses	257,867	257,867	0
9	854	Gas for Compressor Station Fuel	0	0	0
10	855	Other Fuel & Power for Compressor Stations	0	0	0
11	856	Mains Expenses	442,334	442,334	0
12	857	Measuring & Regulating Station Expenses	118,124	118,124	0
13	859	Other Expenses	1,689	1,689	0
14	860	Rents	250	250	0
15	861	Maintenance Supervision & Engineering	0	0	0
16	862	Maintenance of Structures & Improvements	0	0	0
17	863	Maintenance of Mains	183,469	183,469	0
18	864	Maintenance of Compressor Station Equipment	221,058	221,058	0
19	865	Maintenance of M&R Station Equipment	27,046	27,046	0
20	866	Maintenance of Communication Equimpment	2,066	2,066	0
21	867	Maintenance of Other Equipment	183,911	183,911	0
22	920	Administrative & General Salaries	106,219	106,219	0
23	921	Office Supplies and Expenses	150	150	0
24	922	Administrative Expenses Transferred	0	0	0
25	923	Outside Services Employed	123,549	123,549	0
26	924	Property Insurance	285,047	285,047	0
27	925	Injury and Damages	123,498	123,498	0
28	926	Employee Pensions and Benefits	199,427	199,427	0
29	928	Regulatory Commission Expenses	50,500	50,500	0
30	930.2	Miscellaneous General Expenses	0	0	0
31	932	Maintentance of General Plant	0	0	0
32		Total	2,377,586	2,377,586	0

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Schedule H-1(a)

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Tracked Costs Workpaper
Adjustment 1
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Account Number	Description	2021 Amount	Total Adjustment
		(A)	(B)	(C)
			$	$
1	806	Imbalance Gas	(38,601.36)	38,601.36
2	810	Gas Used for Compressor Station Fuel	1,916,508.75	(1,916,508.75)
3	812	Gas used for Other Utility Operations - Credit	(1,877,907.39)	1,877,907.39
4	813	Other Gas Supply Expenses / Gains or Losses	1,869,762.09	(1,869,762.09)
5		Total to Reverse Fuel Related Accounting Entry	1,869,762.09	(1,869,762.09)
6	854	Reverse Fuel Related Accounting Entry	(1,916,509)	1,916,509
7	855	Reverse Electric Power Related Accounting Entry	75,938	(75,938)
8	856	Reverse Other Tracked Costs	441,222	(1,416)
9		Total - Tracked Cost Adjustments	470,413	(30,607)

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Property and General Liability Insurance Workpaper
Adjustment 2
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Account Number	Description	2021 Amount	Adjustment	Total As Adjusted
		(A)	(B)	(C)	(D)
			$	$	$
1	924	Property Insurance	260,985	24,063	285,047
2	925	General Liability Insurance	124,653	(1,155)	123,498
3		Total Insurance	385,638	22,908	408,545

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Rent Expense Workpaper
Adjustment 3
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Account Number	Description	2021 Amount	Adjustment	Total As Adjusted
		(A)	(B)	(C)	(D)
			$	$	$
1	856	Mains Expenses	26,243	2,528	28,771
2		Total Rate Case Expenses	26,243	2,528	28,771 1/

Line No.					
3	1/ Details of Adjustment				
4		Year No.	Rent Period	Monthly	Annual
				$	$
5		Year 1	August 1, 2021 - July 31, 2022	2,258	27,096
6		Year 2	August 1, 2022 - July 31, 2023	2,325	27,900
7		Year 3	August 1, 2023 - July 31, 2024	2,395	28,740
8		Year 4	August 1, 2024 - July 31, 2025	2,468	29,616
9		Year 5	August 1, 2025 - July 31, 2026	2,542	30,504
10			Total		143,856
11			Normalized (5 years)		28,771

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Schedule H-1(d)

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Rate Case Expense Workpaper
Adjustment 4 and 5
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Account Number	Description	2021 Amount	Adjustment	Total As Adjusted
		(A)	(B)	(C)	(D)
			$	$	$
1	923	External Legal Expense	12,000	2,400	14,400
2	928	Consultant Fees	61,225	(11,225)	50,000
3		Total Rate Case Expenses	73,225	(8,825)	64,400

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Pipeline Integrity Management Deferral Workpaper
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Account Number	Description (A)	Amount (B) $
1	850	Operation Supervision & Engineering	1,589
2	856	Mains Expenses	410,059
3	863	Maintenance of Mains	408
4		Total Integrity Management Assessment	412,056
5		Amortization Period (Years)	5
6		Yearly Amortization	82,411

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Statement H-2

CARDINAL PIPELINE COMPANY, LLC
Depreciation, Depletion and Amortization Expense
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Description of Function (A)		Depreciable Gas Plant As Adjusted (B) $	Current Annual Depr. Rate (C)	Proposed Annual Depr. Rate (D)	Expense Per Books (E) $	Adjustment (F) $	Depreciation Expense (G) $
1	Franchises and Consents	302	176,783	4.00%	0.55%	7,071	(6,099)	972
2	Miscellaneous Intangible Plant	303	898,093	2.19%	1.57%	19,668	(5,568)	14,100
3	Land Rights	365.12	96,745	2.00%	1.93%	1,935	(68)	1,867
4	Rights-of-way	365.2	4,011,679	2.00%	1.97%	80,234	(1,204)	79,030
5	Structures and Improvements	366.1	2,673,056	3.00%	3.51%	80,192	13,632	93,824
6	Structures and Improvements Measure	366.2	1,428,304	2.63%	2.85%	37,564	3,143	40,707
7	Mains	367	100,636,221	2.20%	2.50%	2,213,997	301,909	2,515,906
8	Compressor Station Equipment	368	35,401,074	3.03%	2.94%	1,072,653	(31,861)	1,040,792
9	Measuring and Reg. Sta. Equipment	369	8,764,591	3.18%	2.49%	278,714	(60,476)	218,238
10	Land	365.11	0	0.00%	0.00%	0	0	0
11	Intangible, Transmission and Land		154,086,547			3,792,028	213,408	4,005,436
12	% of Gross Plant (Net of General Plant)							
	General Plant 1/							
13	Structures and Improvements fully depreciated	390	0	0.00%	10.00%	0	0	0
14	Office Furniture and Equipment - Developed Software	391.1	113,437	7.69%	6.67%	8,723	(1,157)	7,566
15	Furniture & Equipment - Software (fully depreciated)	391.1	0	0.00%	0.00%	0	0	0
16	Office Furniture and Equipment - Data Process & Computer Equip.	391.2	0	25.00%	12.50%	0	0	0
17	Office Furniture and Equipment - Tower Office Furniture & Equip	391.3	32,228	8.33%	10.00%	2,685	538	3,223
18	Transportation Equipment	392	0	18.00%	16.67%	0	0	0
19	Transportation Equipment (fully depreciated)	392	0	0.00%	0.00%	0	0	0
20	Tools, Shop, and Garage Equipment	394	553,486	8.33%	5.00%	46,105	(18,431)	27,674
21	Power Operated Equipment	396	31,910	7.92%	10.00%	2,527	664	3,191
22	Power Operated Equipment (fully depreciated)	396	0	0.00%	0.00%	0	0	0
23	Communication Equipment	397	31,632	7.14%	4.35%	2,259	(883)	1,376
24	Communication Equipment - Original (fully depreciated)	397	0	0.00%	0.00%	0	0	0
25	General Plant Allocated 1/		762,693			62,299	(19,269)	43,030
26	Total Depreciable Gas Plant in Service		154,849,239			3,854,327	194,140	4,048,466
27	Amount Per Books for the 12 Months Ending December 31, 2021							3,856,754
28	Difference							191,712
29	1/ General Plant Allocated is allocated among the zones using a Gross Plant Allocation.							

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Statement H-3

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Allowance for Income Taxes
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Particulars (A)	Amount (B) $
1	Rate Base	57,088,934
2	Return	4,978,156
3	Interest and Debt Expense	(1,198,868)
4	Return After Federal Income Tax Adjustments	3,779,288
5	Federal Income Taxes	1,004,621
6	State Income Taxes	122,664
7	Total Income Taxes	1,127,285
8	State Income Taxes:	
9	Net State Taxable Income (Line 4/(1-(0.21+(0.025*(1-0.21)))))	4,906,573
10	North Carolina Tax Rate	2.50%
11	State Income Tax	122,664
12	Federal Income Taxes:	
13	Net Federal Taxable Income (Line 12 - Line 14)	4,783,909
14	Federal Income Tax Rate	21.00%
15	Federal Income Tax	1,004,621

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Statement H-3(a)

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Reverse South Georgia Workpaper
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Particulars (A)	Amount (B) $
1	Regulatory Liability - Principle Balance	10,527,845
2	Tax Gross Up	3,209,172
3	Total Regulatory Liability - Income Tax Rate Reduction 1/	13,737,017
	Average Remaining Life (ARL)	
4	Depreciable Plant	154,086,547
5	Less Accumulated Depreciation Reserve	(71,607,066)
6	Total Net Depreciable Plant	82,479,481
7	Depreciation Expense	3,090,159
8	Total ARL (Years)	26.69
9	Principle Amortization	(394,434)
10	Gross Up Amount	(120,234)
11	Total RSG Amortization	(514,668)
12	1/ See the testimony of Mr. Michael Cousino in Exhibit MC-001	

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Taxes Other Than Income Taxes
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Particulars		Amount December 31, 2021
	(A)		(B)
			$
1	Ad Valorem - North Carolina		481,020
2	Payroll		42,208
3	Other - Public Utility Regulatory Fee	1/	16,431
4	Total Taxes Other than Income Tax		539,659
5	1/ (.0013 * revenue)		

CARDINAL PIPELINE COMPANY, LLC
Cost of Service / Cost Allocation
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Item (A)		Zone 1 Demand (B) $	Zone 1 Commodity (C) $	Zone 2 Demand (D) $	Zone 2 Commodity (E) $	Total (F) $
1	Gross Plant		28,166,694	0	128,347,157	0	156,513,852
2	Accumulated Depreciation		(18,616,395)	0	(54,739,463)	0	(73,355,857)
3	Net Plant		9,550,300	0	73,607,695	0	83,157,995
4	Materials and Supplies	1/	62,345	0	284,015	0	346,360
5	Deferred Income Taxes	3/	(2,194,181)	0	(24,221,239)	0	(26,415,420)
6	Rate Base		7,418,464	0	49,670,471	0	57,088,935
7	Overall Rate of Return		8.72%		8.72%		8.72%
8	Overall Return on Rate Base		646,890	0	4,331,265	0	4,978,155
9	O&M Expenses	2/	308,848	0	2,068,738	0	2,377,586
10	Pipeline Integrity Deferral	2/	10,705	0	71,706	0	82,411
11	Depreciation		698,098	0	3,350,369	0	4,048,466
12	Taxes Other Than Income	2/	70,102	0	469,557	0	539,659
13	Income Taxes	2/	146,434	0	980,851	0	1,127,285
14	EDIT Amortization	2/	(66,855)	0	(447,813)	0	(514,668)
15	Total Cost of Service		1,814,222	0	10,824,673	0	12,638,895
			Zone 1		Zone 2		
16	Zonal Cost of Service		1,814,222		10,824,673		

Line No.			
17	1/ Allocated between zones based on Gross Plant Factor:		
18	Zone 1 Gross Plant	28,166,694	18.00%
19	Zone 2 Gross Plant	128,347,157	82.00%
20	Total	156,513,852	100.00%
21	2/ Allocated between zones based on Rate Base Factor:		
22	Zone 1 Rate Base	7,418,464	12.99%
23	Zone 2 Rate Base	49,670,471	87.01%
24	Total	57,088,934	100.00%

Line No.		
25	3/ Calculation of Deferred Income Taxes:	
26	Total Deferred Income Taxes (Statement B-1)	(26,415,420)
27	Calculation of Deferred Income Taxes for Zone 1	
28	Book Basis in Plant @ December 31, 2021	Zone 1
29	Gross Plant (Statement D, Line 27)	28,166,694
30	Accumulated Depreciation	(18,616,395) 1/
31	Net Book Plant	9,550,300
32	Tax Basis in Plant @ December 31, 2021	Zone 1
33	Gross Plant (Statement D, Line 27)	28,166,694
34	Accumulated Depreciation	(28,166,694)
35	Net Tax Plant	0
36	Deferred Tax Computation	Zone 1
37	Book Basis (over) Tax Basis	(9,550,300)
38	Effective Income Tax Rate (1-((1-2.5%)*(1-21%))	22.98%
39	Deferred Income Taxes for Zone 1	(2,194,181)
40	Calculation of Deferred Income Taxes for Zone 2	Zone 2
41	Total Deferred Income Taxes (Line 25)	(26,415,420)
42	Deferred Income Taxes for Zone 1 (Line 38)	(2,194,181)
43	Deferred Income Taxes for Zone 2	(24,221,239)

Docket No. G-39, Sub 47
Exhibit __(KM-002)
Statement I-1(a)

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Depreciation, Depletion and Amortization Expense Detail - Functionalized
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Description of Function	Account Number	Gas Plant As Adjusted	Zone 1 Gas Plant	Zone 2 Gas Plant	Proposed Annual Depr. Rate	Zone 1 Depreciation Expense	Zone 2 Depreciation Expense	Total Depreciation Expense
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
			$	$	$		$	$	$
1	Franchises and Consents	302	176,783	-	176,783	0.55%	-	972	972
2	Miscellaneous Intangible Plant	303	898,093	136,135	761,958	1.57%	2,137	11,963	14,100
3	Land Rights	365.12	96,745	-	96,745	1.93%	-	1,867	1,867
4	Rights-of-way	365.2	4,011,679	15,515	3,996,164	1.97%	306	78,724	79,030
5	Structures and Improvements	366.1	2,673,056	-	2,673,056	3.51%	-	93,824	93,824
6	Structures and Improvements Measure	366.2	1,428,304	345,141	1,083,164	2.85%	9,837	30,870	40,707
7	Mains	367	100,636,221	25,212,809	75,423,412	2.50%	630,320	1,885,585	2,515,906
8	Compressor Station Equipment	368	35,401,074	-	35,401,074	2.94%	-	1,040,792	1,040,792
9	Measuring and Reg. Sta. Equipment	369	8,764,591	1,919,094	6,845,497	2.49%	47,785	170,453	218,238
10	Land	365.11	658,662	104,151	554,511	0.00%	-	-	-
11	Intangible, Transmission and Land		154,745,208	27,732,844	127,012,364		690,385	3,315,051	4,005,436
12	% of Gross Plant (Net of General Plant)		100%	17.92%	82.08%				
	General Plant 1/								
13	Structures and Improvements fully depreciated	390	5,269	944	4,325	10.00%	-	-	-
14	Office Furniture and Equipment - Developed Software	391.1	113,437	20,330	93,108	6.67%	1,356	6,210	7,566
15	Furniture & Equipment - Software (fully depreciated)	391.1	843,871	151,235	692,636	0.00%	-	-	-
16	Office Furniture and Equipment - Data Process & Computer Equip.	391.2	-	0	-	12.50%	-	-	-
17	Office Furniture and Equipment - Tower Office Furniture & Equip	391.3	32,228	5,776	26,452	10.00%	578	2,645	3,223
18	Transportation Equipment	392	-	0	-	0.00%	-	-	-
19	Transportation Equipment (fully depreciated)	392	3,761	674	3,087	16.67%	-	-	-
20	Tools, Shop, and Garage Equipment	394	553,486	99,194	454,292	5.00%	4,960	22,715	27,675
21	Power Operated Equipment	396	31,910	5,719	26,191	10.00%	572	2,619	3,191
22	Power Operated Equipment (fully depreciated)	396	10,649	1,908	8,740	0.00%	-	-	-
23	Communication Equipment	397	31,632	5,669	25,963	4.35%	247	1,129	1,376
24	Communication Equipment - Original (fully depreciated)	397	142,401	142,401	-	0.00%	-	-	-
25	General Plant Allocated 1/		1,768,644	433,850	1,334,794		7,713	35,318	43,031
26	Total		156,513,852	28,166,694	128,347,157		698,098	3,350,369	4,048,467
27	Amount Per Books for the 12 Months Ending December 31, 2021						664,746	3,190,306	3,855,052
28	Difference								193,415
29	1/ General Plant is allocated among the zones using a Gross Plant Allocation.								

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Depreciation, Depletion and Amortization Expense Detail - Functionalized
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Description of Function	Account Number	Accumulated Reserve Balance at December 31, 2021	Zone 1 Accumulated Reserve	Zone 2 Accumulated Reserve
	(A)	(B)	(C)	(D)	(E)
			$	$	$
1	Franchises and Consents	302	156,125	-	156,125
2	Miscellaneous Intangible Plant	303	535,129	111,911	423,218
3	Land Rights	365.12	50,145	-	50,145
4	Rights-of-way	365.2	2,070,392	8,068	2,062,324
5	Structures and Improvements	366.1	693,780	-	693,780
6	Structures and Improvements Measure	366.2	581,827	230,897	350,930
7	Mains	367	53,870,264	16,602,644	37,267,619
8	Compressor Station Equipment	368	9,930,073	-	9,930,073
9	Measuring and Reg. Sta. Equipment	369	3,941,201	1,272,345	2,668,857
10	Land	365.11	0	-	-
11	Intangible, Transmission and Land		71,828,936	18,225,865	53,603,070
	General Plant 1/				
12	Structures and Improvements fully depreciated	390	5,269	944	4,325
13	Office Furniture and Equipment - Developed Software	391.1	66,960	12,000	54,959
14	Furniture & Equipment - Software (fully depreciated)	391.1	843,871	151,235	692,636
15	Office Furniture and Equipment - Data Process & Computer Equip.	391.2	-	0	-
16	Office Furniture and Equipment - Tower Office Furniture & Equip	391.3	26,882	4,818	22,064
17	Transportation Equipment	392	-	0	-
18	Transportation Equipment (fully depreciated)	392	3,761	674	3,087
19	Tools, Shop, and Garage Equipment	394	379,861	68,077	311,784
20	Power Operated Equipment	396	27,542	4,936	22,606
21	Power Operated Equipment (fully depreciated)	396	10,649	1,908	8,740
22	Communication Equipment	397	19,725	3,535	16,190
23	Communication Equipment - Original (fully depreciated)	397	142,401	142,401	-
24	General Plant Allocated 1/		1,526,922	390,529	1,136,392
25	Total		73,355,857	18,616,395	54,739,463
26	Amount Per Books for the 12 Months Ending December 31, 2016				
27	Difference				

28 1/ General Plant is allocated among the zones using a Gross Plant Allocation. For Gross Plant Allocation support, See Statement I-1(a).

29		Zone 1	17.92%
30		Zone 2	82.08%

CARDINAL PIPELINE COMPANY, LLC
Docket No. G-39, Sub 47
Design of Rates
For the Test Period Ended December 31, 2021, As Adjusted

Line No.	Item	Zone 1A Demand 1/	Zone 1A Commodity 1/	Zone 1B Demand 1/	Zone 1B Commodity 1/	Zone 2 Demand	Zone 2 Commodity	Total
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
		$	$	$	$	$	$	$
1	Overall Return on Rate Base	230,252	0	416,638	0	4,331,265	0	4,978,155
2	O&M Expenses	109,930	0	198,918	0	2,068,738	0	2,377,586
3	Pipeline Integrity Deferral	3,810	0	6,895	0	71,706	0	82,411
4	Depreciation	248,479	0	449,619	0	3,350,369	0	4,048,467
5	Taxes Other Than Income	24,952	0	45,150	0	469,557	0	539,659
6	Income Taxes	52,121	0	94,313	0	980,851	0	1,127,285
7	EDIT Amortization	(23,796)	0	(43,059)	0	(447,813)	0	(514,668)
8	Total Cost of Service	645,748	0	1,168,474	0	10,824,673	0	12,638,895
9	Annual Billing Determinants							
10	Demand (Mcf)	720,000		840,000		3,987,240		
11	Demand (Dt)	745,200		869,400		4,126,800		
12	Commodity (Dt) 2/		1,677,731		19,103,530		65,354,955	
13	Rates	$	$	$	$	$	$	
14	Monthly Demand (Mcf)	0.89687		1.39104		2.71483		
15	Monthly Demand (Dt)	0.86654		1.34400		2.62302		
16	Daily Demand (Dt)	0.02849		0.04419		0.08624		
17	Commodity (Dt)		0.0000		0.0000		0.0000	
18	Excess CFT 100% Load (Dt)	$						
19	Zone 1A	0.02849 3/						
20	Zone 1B	0.04419 4/						
21	Zone 2	0.08624 5/						

22 1/ Zone 1 costs are pre-expansion costs divided by previous ownership shares between Piedmont (Zone 1A) and PSNC (Zone 1B).
23 Zones 1A and 1B are allocated 35.5937% and 64.4063%, respectively, of the Zone 1 costs shown on Page 1 of Statement I.
24 2/ Commodity Dt is calculated using the annual level for the year ended December 31, 2021
25 3/ Zone 1A demand rate divided by 1.035 (btu conversion factor) times 12 divided by 365 plus the Zone 1A commodity rate.
26 4/ Zone 1B demand rate divided by 1.035 (btu conversion factor) times 12 divided by 365 plus the Zone 1B commodity rate.
27 5/ Zone 2 demand rate divided by 1.035 (btu conversion factor) times 12 divided by 365 plus the Zone 2 commodity rate.

Exhibit ____ (MC-001)

BEFORE THE

NORTH CAROLINA UTILITIES COMMISSION

Docket No. G-39, SUB 47

DIRECT TESTIMONY
OF
MICHAEL COUSINO

ON BEHALF OF

CARDINAL PIPELINE COMPANY, LLC

March 15, 2022

I. Identification of Witness

Q. Please state your name, current position, and business address.

A. My name is Michael P. Cousino. I am a Tax Consultant – Planning for The Williams Companies, Inc. ("Williams"). My business address is 2800 Post Oak Boulevard, Houston, Texas 77056.

Q. Please summarize your education and professional background.

A. I graduated from the University of St. Thomas in St. Paul, Minnesota in July 1983 and received a Bachelor of Arts Degree in Accounting. I am a Certified Public Accountant in the State of Texas.

I began working for Transco Energy Company in March 1985 as a Tax Analyst in the Corporate Tax Compliance Department. From May 1995 through November 2002, I worked as a Tax Analyst in the Williams Tax Compliance Department, focusing on federal income tax compliance and financial reporting for regulated entities. From November 2002 through March 2019, I worked in the Transcontinental Gas Pipe Line, LLC ("Transco") Rates Department as a Rates Analyst. In March of 2019, I began work in the Williams Regulatory Tax Department.

Q. Please outline your current responsibilities with Cardinal Pipeline Company, LLC ("Cardinal").

A. My current responsibilities involve supervising the preparation of studies as well as the financial reporting of Cardinal's income taxes.

Q. Have you previously submitted testimony before the North Carolina Utilities Commission ("NCUC") or any other regulatory Commission?

A. I have not previously submitted testimony before the NCUC. I submitted testimony before the Federal Energy Regulatory Commission ("FERC") in Transcontinental Gas Pipe Line Company, LLC's general NGA section 4 rate proceedings in Docket No. RP12-993, et al. and RP18-1126, et al.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of my testimony is to support certain tax-related items included in Cardinal's cost of service and rate base in this proceeding.

Q. Are you sponsoring any statements or exhibits related to your direct testimony?

A. Yes. I am sponsoring the following schedules in Cardinal's rate change filing, included in the testimony of Mrs. Kerri Miller in Exhibit No. KM-002.

Schedule B-1	Accumulated Deferred Income Taxes
Statement H-3	Allowance for Income Taxes

Q. Were the exhibits, statements, and supporting schedules you are sponsoring prepared by you or under your supervision?

A. Yes, all identified statements and schedules to which I am testifying were prepared under my supervision and direction.

Q. Please describe Schedule B-1, Accumulated Deferred Income Taxes ("ADIT").

A. Schedule B-1 provides detailed ADIT balances, by specific cumulative timing difference ("CTD"), recorded in Accounts 190, 282, and 283 for the test period ending December 31, 2021. In addition, Schedule B-1 details those regulatory assets and liabilities that impact rate base. The total rate base ADIT as of the end of the test period is $26,415,420.

Q. Please describe any adjustments made to the ADIT balances.

A. Adjustments to the ADIT balance include the removal of CTDs which do not impact rate base. The CTDs classified as non-rate base are those items not related to Plant, Property, and Equipment. Removal of non-rate base CTDs totaled a reduction of $49,402 to the ADIT liability balance. Further, a removal of the Reverse South Georgia Regulatory Liability of $331,039 as of December 31, 2021, for the unamortized excess ADIT ("EDIT") due to the reduction in North Carolina Corporate Income Tax rate down to 3%, results in a net-of-tax reduction of $254,983 to the ADIT liability. The adjustments result in a total reduction to the ADIT liability of $304,385.

The EDIT for the reduction in the North Carolina Corporate Income Tax rate down to 3% was addressed in the Joint Stipulation filed by the parties in Cardinal's previous rate proceeding in Docket No. G-39, Sub 38 and approved by the NCUC on July 27, 2017. Paragraph 5 of the Joint Stipulation provides for the amortization of that EDIT over a 5-year period. Cardinal is proposing to flow back the remaining unamortized

EDIT amount in a lump sum payment to its shippers, coincident with the effective date of new rates in this proceeding, as more fully described in the testimony of Mrs. Kerri Miller in Exhibit No. KM-001.

Q. Please describe the Regulatory Assets and Liabilities included in Rate Base ADIT.

Included in rate base are the Regulatory Asset - AFUDC Equity, and the Regulatory Liability - Reverse South Georgia for the reduction of Federal Income Tax Rate from 35% to 21% under the Tax Cuts and Jobs Act of 2017 ("TCJA") and the reduction of the North Carolina Corporate Income Tax Rate from 3% to 2.5%.

The Regulatory Asset – AFUDC Equity, with a balance of $728,603, relates to the equity component of the allowance for funds used during construction ("AFUDC"), which is necessary to offset the ADIT on the equity portion of AFUDC. That ADIT is recorded pursuant to Generally Accepted Accounting Principles ("GAAP") and the FERC Uniform System of Accounts, but the addition of this "credit" to ADIT is offset by a "debit" to a regulatory asset. Because both are simply journal entries with a net impact of zero, rate base is not affected. This offset accomplishes that result.

The Regulatory Liability – Reverse South Georgia of $13,737,017 is the total amount of EDIT to flow back to customers due to reductions in corporate income tax rates, specifically the reduction of the Federal Corporate Income Tax Rate from 35% to 21% under the TCJA of 2017 and the reduction of the North Carolina Corporate Income Tax rate from 3% to 2.5%.

The first reduction for the decrease in the Federal Corporate Income Tax Rate, resulted in a liability, including an income tax gross-up, of $13,440,983. Cardinal filed with the NCUC on November 9, 2018, a compliance filing under Docket No. M-100, Sub 148 and Docket No. G-39, Sub 42, which provided in Exhibit D a detailed calculation of the liability. By order issued in those dockets on December 17, 2018, the NCUC granted Cardinal's request to file its proposal to flow back this liability by no later than March 15, 2022, which is the filing date of this proceeding.

The second reduction for the decrease in the North Carolina Corporate State Income Tax Rate from 3% to 2.5% for taxable years beginning on or after January 1, 2019 resulted in a liability, including an income tax gross-up, of $296,034.

Q. Please describe the methodology for amortizing the EDIT shown on Statement H-3(a) the Reverse South Georgia workpaper of Exhibit ___ (KM-002).

A. The Reverse South Georgia workpaper details the calculation of the Reverse South Georgia amortization, or flow back, of EDIT. Due to the changes in Cardinal's effective income tax rates, a net regulatory liability for EDIT has been calculated. The net EDIT in the amount of $13,737,017, shown on Line 3 of Statement H-3(a), will be flowed back to customers, using the Reverse South Georgia method in order to avoid a tax normalization violation. Reverse South Georgia is an IRS approved method to determine the amortization period for the flow back of EDIT resulting from income tax rate changes as a reduction to the cost of service, over the remaining service life of the assets. The remaining service life calculation is supported by Mrs. Kerri Miller in Exhibit No. KM-001 and within the workpapers in Exhibit No. KM-002.

Q. Please describe the income tax rates used in the calculation of the income Tax Gross-up on Schedule H-3.

The income tax rates used in the tax gross-up computation are comprised of the Federal Corporate Income Tax of 21% and North Carolina Corporate State Income Tax Rate of 2.5%, for a composite rate of 22.975%.

Q. Does that conclude your direct testimony?

A. Yes.

Exhibit ____ (DH-001)

BEFORE THE

NORTH CAROLINA UTILITIES COMMISSION

Docket No. G-39, SUB 47

DIRECT TESTIMONY
OF
DAVID J. HAAG

ON BEHALF OF

CARDINAL PIPELINE COMPANY, LLC

March 15, 2022

PREPARED DIRECT TESTIMONY OF DAVID J. HAAG ON BEHALF OF CARDINAL PIPELINE COMPANY, LLC

I. WITNESS AND CASE INTRODUCTION

Q.1 Please state your name and employer.

A. My name is David J. Haag. I am President and Chief Executive Officer of Brown, Williams, Moorhead & Quinn, Inc. ("BWMQ"), a nationally recognized energy consulting firm based in the Washington, D.C. area.

Q.2 What is the nature of the work performed by your firm?

A. BWMQ offers technical, economic, and policy assistance to the various segments of the natural gas pipeline industry, oil pipeline industry, and electric utility industry on business and regulatory matters.

Q.3 Please briefly state your educational and professional background.

A. My personal curriculum vitae, which is found in Exhibit No. DH-002, details my career and work experience in the energy industry.

I joined BWMQ as Chief Executive Officer in September 2019 and became President and Chief Executive Officer in September 2020. Prior to this position, I was employed at a number of energy companies in roles of increasing responsibility as detailed in Exhibit No. DH-002. Over the course of my career, I have participated in numerous rate case and certificate proceedings before the Federal Energy Regulatory Commission ("FERC" or "Commission") on behalf of multiple regulated companies. I have filed expert testimony and/or submitted affidavits on numerous topics, including rate design, proxy groups, cost of capital and rate of return on equity, business risk assessment, capital structure, cost classification, cost allocation, billing determinants, discount adjustments, market power, and other rate and tariff related issues.

I graduated with Honors from the University of Calgary, Canada with a Bachelor's Degree majoring in Economics and minoring in Management. I have also completed a Graduate Certificate in Public Utility Regulation and Economics from New Mexico State University. In addition I am currently completing my Master's Degree in Economics with a specialization in Public Utility Regulation and Economics at New Mexico State University. Since 2013, I have instructed a Seminar for the Center for Public Utilities at New Mexico State University on the determination of an interstate natural gas pipeline's regulated cost of service. I am also a Dean of the Energy Bar Association Energy Law Academy, and am responsible for the courses on natural gas industry regulation.

Q.4 Are you sponsoring any exhibits in conjunction with your direct testimony?

A. Yes, I am sponsoring the following exhibits:

Exhibit No. DH-001	Prepared Direct Testimony of David J. Haag
Exhibit No. DH-002:	Curriculum Vitae of David J. Haag
Exhibit No. DH-003:	DCF Analysis
Exhibit No. DH-004:	CAPM Analysis
Exhibit No. DH-005:	Proxy Group Capital Structures and Cost of Debt

Q.5 Were all of the exhibits described in your previous answer prepared by you?

A. Yes, all of the exhibits filed herewith were prepared by me.

II. SCOPE OF TESTIMONY AND SUMMARY

Q.6 On whose behalf are you testifying in this proceeding?

A. I am testifying on behalf of Cardinal Pipeline Company, LLC ("Cardinal").

Q.7 Please provide a brief overview of the scope and purpose of your testimony.

A. The purpose of my testimony is twofold. Firstly, I undertake the required analysis to determine the appropriate cost of capital for Cardinal to include in its cost-of-service calculations in this proceeding. This determination includes a recommended after-tax rate of return on equity ("ROE"), cost of debt, as well as a capital structure for Cardinal in order to determine a just and reasonable cost of capital for Cardinal's natural gas transportation services. My recommended ROE is calculated using the results of the Discounted Cash Flow ("DCF") and Capital Asset Pricing Model ("CAPM") models as applied to both a core and expanded proxy group of natural gas pipeline companies.

Secondly, I discuss and support the reasonableness of the imputed capital structure proposed to be utilized by Cardinal for ratemaking purposes in this proceeding.

Q.8 How is your testimony organized?

A. My testimony is organized as follows:

- In Section III – Facility Background, I provide a brief overview of the Cardinal system.

- In Section IV – Cost of Capital - Background, I define the concepts of cost of capital and rate of return on equity, and discuss how just and reasonable results are calculated.
- In Section V – Proxy Group, I discuss in detail how I selected the proxy group entities in this proceeding, as well as why each of these entities is appropriate for inclusion in either the core or expanded proxy groups for Cardinal at this time.
- In Section VI – DCF Analysis, I provide an overview of the DCF model and discuss how I have applied this financial model to the proxy groups in this proceeding and also present the resulting range of calculated returns.
- In Section VII – CAPM Analysis, I provide an overview of the CAPM model and discuss how I have applied this financial model to the proxy groups in this proceeding and also present the resulting range of calculated returns.
- In Section VIII – Recommended Rate of Return on Equity, I discuss the relative levels of risk faced by Cardinal as compared to the proxy groups, and also explain why the median rate of return on equity (as calculated on a pre-tax basis using the DCF model), is appropriate for determining just and reasonable rates for Cardinal.
- Finally, in Section IX – Capital Structure and Cost of Debt, I discuss and support the appropriate capital structure and cost of debt to be used by Cardinal for its cost-of-capital in this proceeding.

Q.9 How have you determined the cost of equity for Cardinal?

A. I have determined the after-tax rate of return on equity using publicly-available market and financial data applied to a proxy group of natural gas pipeline companies to assess the relative risk, and hence the cost of equity, for Cardinal. To make this determination, I have relied upon two well-recognized financial models, namely the DCF and CAPM. These models were applied using publicly-available market data from the Cardinal proxy group.

Q.10 Please summarize your findings and recommendations.

A. The results of my analysis indicate that Cardinal should reflect an after-tax ROE of 11.04% and a cost of debt of 5.25% for its cost of capital in this proceeding. This ROE represents the median of the range of returns produced by the DCF model using the core proxy group (as further supported by both the CAPM model and the results from the expanded proxy group in this proceeding). The median of the range from the core proxy group is the appropriate level of ROE for Cardinal at this time given the relative level of risks that Cardinal faces as compared to the much larger and more diversified core proxy group entities.

My recommended debt cost of 5.25% reflects the current average cost of debt of the entities included in the core proxy group. This is a reasonable debt cost to use for rate making purposes in light of the fact that as of May 2022 (which is the maturity date of its long-term debt issuance), Cardinal will have paid off all of its long-term debt.

Similarly, with regards to an appropriate capital structure, given that Cardinal will not be issuing any stand-alone replacement debt and instead will be financed entirely by equity from its corporate parents, I recommend that Cardinal utilize an imputed capital structure of 60% equity and 40% debt for rate-making purposes at this time.

III. FACILITY BACKGROUND

Q.11 Please provide a brief description of the Cardinal pipeline.

A. Cardinal is a North Carolina intrastate natural gas pipeline consisting of approximately 104 miles of 24-inch diameter pipeline. The owners of Cardinal include subsidiaries of The Williams Companies, Inc., Public Service Company of North Carolina, Inc. ("PSNC"), and Piedmont Natural Gas Company, Inc ("Piedmont").

The pipeline system consists of (1) the original 24-inch diameter, 37-mile Cardinal Pipeline, which originates in Rockingham County, North Carolina and extends to the southeast of Burlington, North Carolina and provides 134,550 dekatherms (Dth) per day of firm natural gas transportation capacity, (2) the 24-inch diameter Cardinal Extension, which was placed into service on November 1, 1999, and extends approximately 67-miles from Burlington, North Carolina to the Raleigh, North Carolina area providing 144,900 Dth per day of firm natural gas transportation capacity, and (3) the 2012 Expansion Project, which was placed into service on June 1, 2012, and added 199,000 Dth per day of firm natural gas transportation capacity through the installation of compression in Guilford County, North Carolina.

IV. COST OF CAPITAL - BACKGROUND

Q.12 What is cost of capital?

A. In the simplest of terms, cost of capital is the return expected by those who provide capital (*i.e.*, funding) for a given entity. There are two major sources of capital for an entity; namely debt and equity. Debt is provided primarily through corporate bonds and / or loans made to the entity by financial institutions, while equity is provided by investors, either public or private. Investors who invest in an entity expect a return commensurate with the entity's risks – known as a rate of return on equity ("ROE"), and lenders require interest payments on the funds loaned to the company – the cost of debt - these costs reflect the underlying risks of the entity. The cost of capital for an entity is the weighted average rate of the return on equity and the cost of debt, as determined in the market.

The cost of common equity is the rate of return that investors require from a company's common stock, which is determined by the market price of the common stock. Specifically, the rate of return required by investors is reflected by the market through changes in the entity's stock price. When an entity's stock price decreases, the rate of return to investors from dividends will increase (all else being equal), causing the cost of equity for the company to increase. The opposite also holds true.

Q.13 What is return on equity?

A. Return on equity is a measure of the financial performance of a company. Mathematically, it is determined by dividing net income by shareholders' equity at a given point in time.

Q.14 How is a fair and reasonable rate of return on equity determined for a regulated natural gas pipeline?

A. In determining an allowed ROE for a regulated natural gas pipeline, the U.S. Supreme Court's opinions in *Bluefield Water Works & Improvement Co. v. Public Service Commission of West Virginia* ("*Bluefield*"), 262 U.S. 679 (1923), and *Federal Power Commission v. Hope Natural Gas Co*., 320 U.S. 591 (1944) ("*Hope*") provide that the ROE for a regulated entity should be commensurate with the return on investments in other enterprises having comparable risks.

The assessment of the returns received by entities with comparable risks is generally made using a proxy group. The goal is to determine an ROE that is sufficient to (1) maintain the financial integrity of the enterprise in question, (2) enable the company to attract new capital (as necessary), and (3) provide a return to the common equity investor that is in line with the returns of investments in other enterprises of comparable risk.

Regulated natural gas pipelines are typically faced with the rebuttable presumption that all natural gas pipelines fall into a broad range of average risk absent highly unusual circumstances. Thus, as a starting point, regulators typically set a pipeline's rate of return on equity at the median of the range of reasonable returns determined from a risk appropriate proxy group.[1]

Q.15 Why is it necessary to use a proxy group to determine an appropriate rate of return?

A. The current market cost of common equity applicable to the regulated utility is generally viewed as the proper cost-based standard for determining an appropriate rate of return. To estimate the market costs of common equity for a natural gas pipeline entity, two financial models are commonly used. These models are the Discounted Cash Flow ("DCF") model and the Capital Asset Pricing Model ("CAPM"). Both of these models require, amongst various other inputs, stock price and dividend related information in order to estimate the level of ROE required by investors.

Given these data requirements, it is not possible to directly calculate a DCF and CAPM return for Cardinal, as Cardinal is not a publicly traded, stand-alone entity. Therefore, the utilization of a proxy group of publicly traded natural gas pipeline companies is necessary to estimate a range of ROEs that the market requires for an investment in an entity that is comparable to Cardinal. A proxy group is simply a group of representative natural gas pipeline entities with similar risks used to set a range of reasonable returns for a regulated natural gas pipeline.

[1] For an example from FERC, *see* Portland Natural Gas Transmission System, Opinion No. 524, 142 FERC ¶ 61,197 (2013), order on reh'g, Opinion No. 524-A, 150 FERC ¶ 61,107 (2015).

Q.16 How have you determined an appropriate cost of capital for Cardinal in this proceeding?

A. In order to determine an appropriate cost of capital to be used by Cardinal in this proceeding, I have calculated both an ROE and cost of debt for Cardinal utilizing two risk appropriate proxy groups – a core proxy group and an expanded proxy group. Specifically, I have determined an appropriate ROE range for Cardinal using the results of the DCF model. As a check on the reasonableness of the DCF results, I have utilized the CAPM model. This is consistent with the reality that investors are not likely to rely only on the results of only a single model. The data and calculations used in the DCF and CAPM models are provided in my attached Exhibits and are described in detail later in my testimony.

I have also recommended that Cardinal utilize an imputed hypothetical capital structure to ensure that a just and reasonable cost of service is calculated.

Furthermore, in light of the fact that, as of May 2022, Cardinal will not have any long-term debt on its books, I have utilized the average cost of debt calculated across all of the core proxy group entities in order to calculate an appropriate cost of debt for Cardinal to use for ratemaking purposes at this time.

V. PROXY GROUP

Q.17 How did you select a proxy group for Cardinal in this proceeding?

A. At this time there are no stand-alone publicly traded intrastate pipeline companies that can be used to form a comparable proxy group for Cardinal. Many of the companies that own intrastate pipelines are also heavily involved in other upstream activities including: exploration and production, gas gathering and processing, as well as various gas treatment processes. However, there are a number of publicly traded entities that do own material levels of regulated interstate natural gas pipelines in addition to owning intrastate pipeline assets. These entities are generally more focused on the natural gas pipeline business line that Cardinal is involved in.

Therefore, in order to determine a risk appropriate proxy group of natural gas pipeline entities in this proceeding for Cardinal, I began by seeking to identify all entities currently recognized as natural gas pipeline entities, using the list of entities classified by Value Line as being part of either the "Oil/Gas Distribution" (a total of 13 entities) or "Pipeline MLP" industries (a total of 31 entities) as of December 2021. I evaluated each of these 44 companies and selected those entities that currently own material levels of regulated interstate natural gas transmission pipelines. The list of the Value Line entities that I reviewed, as well as the results of my initial screening, are as follows:

Table 1 – Potential Proxy Group Entities

Company Name	Value Line Classification	Initial Screening Result
Altus Midstream	Oil/Gas Distribution	No material interstate natural gas pipelines
Antero Midstream Corp.	Oil/Gas Distribution	No material interstate natural gas pipelines
Blueknight Energy Partners LP LLC	Pipeline MLPs	No material interstate natural gas pipelines
BP Midstream Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
Cheniere Energy Inc.	Oil/Gas Distribution	Potential proxy group entity
Cheniere Energy Partners L.P.	Pipeline MLPs	Potential proxy group entity

Clean Energy Fuels Corp.	Oil/Gas Distribution	No material interstate natural gas pipelines
Crestwood Equity Partners LP	Pipeline MLPs	Natural gas assets are primarily storage assets
DCP Midstream LP	Pipeline MLPs	No material interstate natural gas pipelines
Delek Logistics Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
Enbridge Inc.	Oil/Gas Distribution	Potential proxy group entity
Energy Transfer LP	Pipeline MLPs	Potential proxy group entity
EnLink Midstream, LLC	Oil/Gas Distribution	No material interstate natural gas pipelines
Enterprise Products Partners L.P.	Pipeline MLPs	No material interstate natural gas pipelines
Genesis Energy LP	Pipeline MLPs	No material interstate natural gas pipelines
Global Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
Green Plains Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
Hess Midstream Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
Holly Energy Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
Kimbell Royalty Partners, LP	Pipeline MLPs	No material interstate natural gas pipelines
Kinder Morgan Inc.	Oil/Gas Distribution	Potential proxy group entity
Lehigh Gas Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
Magellan Midstream Partners L.P.	Pipeline MLPs	No material interstate natural gas pipelines
Martin Midstream Partners L.P.	Pipeline MLPs	No material interstate natural gas pipelines
MPLX LP	Pipeline MLPs	No material interstate natural gas pipelines
NGL Energy Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
NuStar Energy LP	Pipeline MLPs	No material interstate natural gas pipelines
Oasis Midstream Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
ONEOK, Inc.	Oil/Gas Distribution	Potential proxy group entity
PBF Logistics LP	Pipeline MLPs	No material interstate natural gas pipelines
Pembina Pipeline Corporation	Oil/Gas Distribution	Potential proxy group entity
Phillips 66 Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
Plains All American Pipeline L.P.	Pipeline MLPs	No material interstate natural gas pipelines
Plains GP Holdings, L.P.	Pipeline MLPs	No material interstate natural gas pipelines
Rattler Midstream LP	Pipeline MLPs	No material interstate natural gas pipelines

Shell Midstream Partners L.P.	Pipeline MLPs	No material interstate natural gas pipelines
Sprague Resources LP	Pipeline MLPs	No material interstate natural gas pipelines
Suburban Propane Partners, L.P.	Pipeline MLPs	No material interstate natural gas pipelines
Summit Midstream Partners LP	Pipeline MLPs	No material interstate natural gas pipelines
TC Energy Corporation	Oil/Gas Distribution	Potential proxy group entity
Tellurian Inc.	Oil/Gas Distribution	Primary business is LNG export
Western Midstream Partners	Pipeline MLPs	No material interstate natural gas pipelines
The Williams Companies Inc.	Oil/Gas Distribution	Potential proxy group entity
World Fuel Services Corporation	Oil/Gas Distribution	No material interstate natural gas pipelines

As shown in Table 1, the initial screen provided the following nine entities that are recognized natural gas pipeline companies for potential inclusion in the Cardinal proxy group:

1. Cheniere Energy Inc. (“Cheniere”)
2. Cheniere Energy Partners, L.P. (“Cheniere Partners”)
3. Enbridge Inc. (“Enbridge”)
4. Energy Transfer LP (“Energy Transfer”)
5. Kinder Morgan Inc. (“Kinder Morgan”)
6. ONEOK, Inc. (“ONEOK”)
7. Pembina Pipeline Corporation (“Pembina”)
8. TC Energy Corporation (“TC Energy”)
9. The Williams Companies, Inc. (“Williams”)

Q.18 Should each of these nine entities be included in the Cardinal proxy group?

A. Each of these nine entities are among some of the largest midstream energy companies in existence today. As such, all of them are involved in a number of other business lines in addition to natural gas pipelines. To assess whether each of these nine entities are in fact appropriate for inclusion in the Cardinal proxy group at this time, I further analyzed each of these nine entities using the following additional screening criteria:

- the entity must have an investment grade credit rating,
- the entity pays regular dividends and has not cut or reduced its dividend in the latest six-month period,
- the entity must have a positive five-year earnings growth estimate as reported by the Institutional Broker's Estimate System ("IBES"),
- the entity has not been involved in any material merger or acquisition activity in the latest six-month period, and
- the entity must have at least 40% of its assets comprised of natural gas pipeline assets.

Q.19 Do each of these nine potential proxy group entities currently have an investment grade credit rating?

A. No. Table 2 below shows the credit ratings for each of these nine entities as of December 2021. To be considered creditworthy, the majority of the credit ratings for an entity must be investment grade, determined as follows: S&P rating of at least BBB-; Moody's rating of at least Baa3; and a Fitch rating of at least BBB-. An entity with a non-investment grade credit rating is by definition riskier than a creditworthy entity and investors will therefore require a higher rate of return to compensate them for this increased risk. As shown, both Cheniere and Cheniere

Partners are not currently investment grade and therefore will not be included in the Cardinal proxy group at this time, in order to ensure that the proxy group is risk appropriate for Cardinal.

Table 2 – Potential Proxy Group Entities - Credit Ratings

Company Name	Standard and Poor's	Moody's	Fitch Ratings
Cheniere	BB	Ba3	n/a
Cheniere Partners	BB	Ba2	BB+
Enbridge	BBB+	Baa1	BBB+
Energy Transfer	BBB-	Baa3	BBB-
Kinder Morgan	BBB	Baa2	BBB
ONEOK	BBB	Baa3	BBB
Pembina	BBB	n/a	n/a
TC Energy	BBB+	Baa2	A-
Williams	BBB	Baa2	BBB

Q.20 Have any of the remaining seven entities cut or reduced their dividend within the past six months?

A. No. None of these seven entities have reduced or cut their dividends in the past six months. Further, each of these entities pays a regular dividend.[2]

Q.21 Why is it important that a potential proxy group entity has not recently cut or reduced its dividend?

A. When an entity cuts its dividend, its calculated dividend yield immediately changes. This often leads to changes in anticipated growth rates as well, causing instability in the entity's stock price, thereby distorting DCF results.

[2] As companies headquartered in Canada, Enbridge, Pembina, and TC Energy pay their respective dividends in Canadian dollars, on a quarterly (Enbridge, TC Energy) or monthly (Pembina) basis. Therefore, the actual dividend amount received by U.S. stockholders will fluctuate based on the effective Canadian / U.S. dollar exchange rate.

Q.22 Please discuss your next screening criteria.

A. My next screening criteria requires that the entity have a positive five-year earnings growth estimate as reported by the Institutional Broker's Estimate System ("IBES"). As I discuss in greater detail later in my testimony, both the DCF and CAPM financial models require as an input an anticipated growth rate that is relied upon by investors. The IBES growth rate is a widely available growth rate commonly used by investors and is publicly available via the Yahoo! Finance website.[3]

From a risk perspective, entities that have been assigned a negative IBES growth rate are expected to experience a decline in earnings. Therefore, to avoid anomalous or illogical results when estimating the return on equity required by investors in natural gas pipelines, I recommend the exclusion of any entities with a negative IBES growth rate from the Cardinal proxy group at this time.

Q.23 Do each of the remaining seven entities currently have a positive five-year earnings growth estimate as reported by IBES?

A. No. Table 3 below shows the IBES growth rates for each of these seven entities as of December 2021. As shown, Energy Transfer does not currently have a positive IBES growth rate estimate and therefore will be excluded from the Cardinal proxy group at this time.

[3] https://finance.yahoo.com/

Table 3 – Potential Proxy Group Entities – IBES Growth Estimates

Company Name	IBES Growth Estimate
Enbridge	8.11%
Energy Transfer	-6.90%
Kinder Morgan	7.39%
ONEOK	9.86%
Pembina	10.61%
TC Energy	1.55%
Williams	2.00%

Q.24 Have any of the remaining six entities been involved in any material merger or acquisition activity in the latest six-month period?

A. While each of these entities are regularly involved in the acquisition and / or divestiture of midstream assets, the majority of these transactions are small in comparison to the overall size and market capitalization of these entities and are therefore not material. Nevertheless, the following is a summary of recent merger, acquisition, and divestiture activity for these entities, none of which I consider to be material.

On June 7, 2021, Enbridge announced that it had entered into a definitive agreement to sell its 38.9% non-operating minority ownership interest in Noverco Inc. ("Noverco") to Trencap L.P. for $1.14 billion in cash. Closing of the transaction was completed in December 2021. Enbridge stated that the sale proceeds will initially be used to repay short term debt, and on this basis the transaction is expected to be neutral to distributable cash flow per share.[4]

[4] See: https://electricenergyonline.com/article/energy/category/mergers-acquisitions/58/903614/enbridge-announces-1-14-billion-sale-of-its-financial-interest-in-noverco.html

More recently, on October 12, 2021, Enbridge announced that it had closed on its previously announced agreement with EnCap Flatrock Midstream to acquire Moda Midstream Operating, LLC for $3.0 billion in cash. The transaction provides Enbridge with a 100 percent operating interest in the Ingleside Energy Center, and related crude oil pipeline and logistics infrastructure, located near Corpus Christi, Texas, along with a 20 percent interest in the FERC regulated 670-thousand-barrel-per-day Cactus II Pipeline.

Recent activity for Kinder Morgan includes a $310 Million acquisition of Kinetrex Energy, a renewable natural gas developer which includes two domestic LNG production and fueling facilities as well as various renewable natural gas facilities. The Kinetrex acquisition closed on August 20, 2021.

On July 9, 2021, Kinder Morgan closed on its $1.225 Billion acquisition of Stagecoach Gas Services LLC. The Stagecoach assets include four regulated natural gas storage facilities with a total FERC-certificated working gas capacity of 41 billion cubic feet and a network of FERC-regulated natural gas transportation pipelines with multiple interconnects to major interstate natural gas pipelines. In the first quarter of 2021, Kinder Morgan and Brookfield Infrastructure Partners L.P. sold a 25% minority interest in Natural Gas Pipeline Company of America LLC to a fund controlled by ArcLight Capital Partners, LLC for $830 million.

As of December 2021, ONEOK, Inc. has not announced any recent material merger, acquisition, and divestiture activity.

On June 1, 2021, Pembina announced that it had entered into an agreement to acquire all of the issued and outstanding shares of Inter Pipeline Ltd. ("IPL"). However, on July 26, 2021, Pembina announced that the agreement with IPL had been terminated and that Pembina was no longer pursuing the proposed acquisition.

On September 16, 2021, TC Energy announced that it was divesting its 15 percent interest in the Northern Courier Pipeline. The $1.3-billion transaction was expected to close in the fourth-quarter 2021.[5]

On July 1, 2021, Williams completed its acquisition of Sequent Energy Management, L.P. ("Sequent") from Southern Company Gas.

Q.25 Should this merger and acquisition activity cause any of these six entities to be excluded from the Cardinal proxy group?

A. No. The first Enbridge transaction is a sale of a non-operated minority ownership interest asset. Furthermore, because the transaction is expected to be neutral to distributable cash flow per share, there is no reason to anticipate any measurable financial impacts to the Enbridge share price as a result of this routine asset sale. The second transaction is a purchase of a crude oil export facility which complements Enbridge's existing business and is expected to be immediately accretive to Enbridge's finances. I would not expect that either of these deals in isolation would be cause for any concern related to the inclusion of Enbridge in a

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5 https://www.ogj.com/pipelines-transportation/article/14210471/tc-energy-sells-northern-courier-pipeline-to-suncor-indigenous-venture

natural gas pipeline proxy group, particularly given the overall size of Enbridge – a company with a market capitalization of over $76 Billion as of December 2021.

Considering the recent Kinder Morgan activity, I would also not expect that any of these deals in isolation would be cause for any concern related to the inclusion of Kinder Morgan in a natural gas pipeline proxy group, particularly given the overall size of Kinder Morgan – a company with a market capitalization of over $35 Billion as of December 2021.

There is also no need to exclude Pembina from the proxy group at this point, as nothing is outstanding. The now terminated acquisition of IPL by Pembina did not cause significant changes to the IBES growth rates and dividend yields of Pembina. Given this fact, the now terminated proposed acquisition of IPL should not disqualify Pembina from inclusion in the Cardinal proxy group at this time.

TC Energy's $1.3-billion divestiture of its ownership stake in the Northern Courier Pipeline should also not have any material impacts on TC Energy, particularly in light of its current $45 Billion market capitalization.

Similarly, Williams' acquisition of Sequent did not have any material impact on the pipeline operations of Williams. Sequent is a natural gas marketer, which focuses on asset management and the wholesale marketing, trading, storage and transportation of gas for consumers, utilities, and producers. Furthermore, Sequent was purchased for $50 Million,[6] an amount which is immaterial to

[6] https://marcellusdrilling.com/2021/05/williams-buys-energy-trader-sequent-for-50m-m-u-volume-profits-up/

Williams, a company with total assets of over $47 Billion as of December 31, 2021. Given that Williams owns some of the largest natural gas pipelines in the United States today, and that the acquisition of Sequent is immaterial to the overall Williams organization, Williams should not be excluded from the Cardinal proxy group as a result of this acquisition.

Q.26 Have you analyzed the pipeline-related asset holdings of these remaining six entities to determine if pipeline operations constitute a high proportion of the business of these entities?

A. Yes. As large, diversified entities, each of the remaining six potential proxy group entities are involved in a number of other business lines in addition to natural gas pipelines. Therefore, to confirm that each of these entities are reasonably comparable to Cardinal (which is engaged solely in the business of operating an intrastate natural gas pipeline), I have analyzed the overall level of pipeline assets, as reported by business segment in the most recently available SEC Form 10-K or Form 40-F for each of these entities to ensure that they are appropriate for inclusion in the proxy group in this proceeding. Table 4 below provides the results of my analysis.

Table 4 – Potential Proxy Group Entities - Pipeline Assets (2020)

Company Name	Reported Business Segment	% of Assets
Enbridge	Gas Transmission and Midstream	27.22%
Kinder Morgan	Natural Gas Pipelines	67.52%
ONEOK	Natural Gas Pipelines	9.45%
Pembina	Pipelines	42.53%
TC Energy	U.S. Natural Gas Pipelines	43.09%
Williams	Transmission & Gulf of Mexico	44.69%

As shown in Table 4, four of these six entities currently have pipeline assets in excess of 40% of their overall assets, which supports that pipelines represent a material focus for these four entities.

Q.27 Please provide a brief overview of the pipeline operations of each of the four potential proxy group entities with pipeline assets in excess of 40%.

A. Kinder Morgan is one of the largest pipeline and storage companies in existence today. With approximately 70,000 miles of natural gas pipelines, Kinder Morgan owns an interest in and operates one of the largest natural gas networks in North America, serving the major consuming markets in the United States. Kinder Morgan pipelines currently transport approximately 40% of the natural gas consumed in the United States, and the company has natural gas pipelines connected to every major natural gas supply area, including the Eagle Ford, Marcellus, Bakken, Utica, Uinta, Permian, Haynesville, Fayetteville, and Barnett.

Pembina is an established transportation and midstream service provider that owns an integrated system of pipelines transporting natural gas as well as various hydrocarbon liquids. Pembina's transmission pipeline assets are positioned in some of the most prolific gas producing regions in western Canada and the

United States and includes ownership interests in the Alliance and Ruby interstate natural gas pipelines.

TC Energy is a well-established pipeline and energy company that operates nearly 58,000 miles of natural gas pipelines and 653 Bcf of natural gas storage across the United States, Canada, and Mexico, in addition to approximately 3,000 miles of crude oil and liquids pipelines. TC Energy currently owns or has ownership interests in fourteen major FERC-regulated interstate natural gas pipelines.

Williams operates one of the largest midstream businesses in the nation, currently handling approximately 30% of all the natural gas volumes in the United States. Williams owns some of the largest natural gas pipelines in the country, including Transcontinental Gas Pipe Line Company, LLC, a 9,800-mile FERC-regulated natural gas pipeline system extending from Texas, Louisiana, Mississippi, and the Gulf of Mexico through Alabama, Georgia, South Carolina, North Carolina, Virginia, Maryland, Delaware, Pennsylvania, and New Jersey to the New York City metropolitan area, and Northwest Pipeline LLC, a 3,900-mile, 3.9 Bcf/d interstate natural gas transportation system which transports gas from the San Juan basin in New Mexico, northwest to Washington state.

Q.28 Have you also examined the pipeline-related asset holdings of Enbridge and ONEOK?

A. Yes. As shown in Table 4, Enbridge reports that 27.22% of its assets are devoted to its Gas Transmission and Midstream segment in 2020. This segment includes investments in natural gas pipelines and gathering and processing facilities in both the United States and Canada. Although these levels do not meet the 40% threshold I have proposed, it is nevertheless important to understand the major role that Enbridge currently plays in the U.S. natural gas pipeline industry. Enbridge has ownership interests in over two dozen natural gas pipelines and storage facilities in North America. In fact, Enbridge's natural gas network moved about 20% of all gas consumed in the United States in 2020. Enbridge also has significant investments in regulated liquids pipelines; its Liquids Pipeline segment represented 51.60% of Enbridge's total assets in 2020.

Regarding ONEOK, as shown in Table 4 above, ONEOK has only 9.45% of its respective assets devoted to natural gas pipelines. Accordingly, ONEOK also falls short of the 40% threshold when considering solely its natural gas pipeline assets and revenues. However, as discussed in the 2020 ONEOK Form 10-K, the majority of ONEOK's business is related to its investments in both natural gas gathering and processing as well as regulated natural gas liquids ("NGL") infrastructure. The calculated percentages are well above the 40% threshold when ONEOK's NGL segment is also considered, reflecting pipeline totals of 70.77% of assets.

Given the importance and prominence of both Enbridge and ONEOK in the natural gas pipeline industry, it is important that these two entities be included in the ROE analysis of natural gas pipeline entities, notwithstanding that neither entity meets the 40% threshold I have established.

Q.29 What proxy group do you recommend be used for Cardinal at this time?

A. In order to ensure that the Cardinal proxy group is both risk appropriate and of a sufficient size, I recommend that the ROE calculations in this proceeding utilize both a core proxy group (which meets all of the criterion above), as well as an expanded proxy group which also includes Enbridge and ONEOK.

The four core proxy group entities include Kinder Morgan, Pembina, TC Energy, and Williams.

In addition, I will also calculate the ROE metrics using an expanded proxy group, which will include Enbridge and ONEOK in addition to the four members of the core proxy group.

VI. DCF ANALYSIS

Q.30 Please provide a brief overview of the DCF model.

A. In its basic form, the DCF model, which is normally used to solve for the price of a stock, is represented by the following mathematical formula:

$$P = D / (k-g)$$

where "P" is the price of the stock, "D" is the current dividend, "k" is the discount rate or rate of return and "g" is the expected constant growth in dividend income to be reflected in capital appreciation.

The DCF model seeks to explain the value of an asset "P" as the present value of future expected cash flows "D" discounted at the appropriate risk-adjusted rate of return. To produce a non-zero result, the DCF model requires that a company pays dividends on its common stock.

Q.31 How is the DCF model utilized to estimate the required rate of return on equity for a natural gas pipeline?

A. To estimate the rate of return on equity for a natural gas pipeline, the DCF formula above is rearranged to solve for "k", which provides an estimate of the rate of return required by investors. The resulting equation is:

$$k = D/P + g$$

Solving for "k" calculates the current market cost of common equity for the specific entity in question.

For cost-of-service calculation purposes, the DCF model is often adjusted to incorporate a two-step procedure for determining growth ("g") in the model, averaging short-term and long-term growth estimates. Utilizing a two-step procedure with appropriate weightings given to both the short-term and long-term growth rates ensures that a proper balance is reflected in the growth rate utilized for the DCF model, as the DCF model (being a constant growth model) assumes that the growth in dividend yields will continue indefinitely. The short-term growth rate estimates provided by IBES are for a five-year period only and therefore should not be presumed to represent an indefinite growth rate for a given entity. As a company and industry matures, we make the reasonable assumption that its long-term growth rate can be approximated by the overall growth rate of the economy in general, all else being equal.

Q.32 What data sources have you used for the long-term growth rates in your two-step DCF model?

A. I have utilized the growth forecasts for the gross domestic product of the entire United States economy for the long-term growth rate estimates in my two-step DCF model. The long-term growth projection I have used is an average of forecasts drawn from three different sources. These sources are: (1) Energy Information Administration, Annual Energy Outlook; (2) Global Insight/IHS Markit: Long-Term Macro Forecast – Baseline (U.S. Economy 30-Year Focus); and (3) the Social Security Administration. Using three distinct data sources is consistent with the notion that rational investors will rely upon multiple sources of available data when making investment decisions.

I have compiled these estimates for long-term growth, as shown in Table 5 below. The average of the three estimates, which I use as the estimated long-term growth rate in this proceeding, is 4.19%.

Table 5 – Long Term Growth Rates as of December 2021

Data Source	Long Term Growth Rates
Energy Information Administration	4.41%
Global Insight/IHS Markit	4.10%
Social Security Administration	4.05%
Average	**4.19%**

Q.33 What data sources have you used for the short-term growth rates in the two-step DCF model?

A. For the short-term growth estimates in the DCF model, I have used the five-year growth forecasts for each proxy group entity produced by IBES shown in Table 3 above. The IBES growth rates for each entity are publicly available on the Yahoo! Finance webpage.[7]

Q.34 What weighting between short-term and long-term growth rates do you recommend?

A. As stated above, it is important that appropriate weightings be given to both the short-term and long-term growth rates in the two-step DCF model to ensure that a proper balance is reflected in the utilized growth rate. While the DCF model assumes a constant growth rate in dividends forever, the cost-of-service rates set for a pipeline do not normally remain in effect in perpetuity, but rather are typically reviewed and updated periodically by regulators. This supports utilizing a weighting that is more dependent upon the short-term growth rates as opposed to long-term growth rates. As such, I recommend applying a two-thirds weighting to the short-term growth forecasts and applying a one-third weighting to the long-term growth forecasts for calculating the growth rate in the DCF model in this proceeding.

Q.35 How have you computed the dividend yield component in the DCF model?

A. I have calculated the dividend yield in the DCF model (calculated as dividends divided by stock price or D/P) using the average of the high and low stock prices for each of the most recently reported six months; dividing the indicated annual dividend for each month by the average stock price for the same month (resulting in a dividend yield for each of the reported six months); and averaging these

[7] *See* https://finance.yahoo.com/

monthly dividend yields. I then multiplied the dividend yield by (1+.5g) to account for the fact that dividends are paid on a quarterly basis. For the purposes of this (1+.5g) adjustment, I have used only the short-term (IBES) growth projection. As such, I have used the following DCF formula to estimate the required rate of return for each member of the Cardinal proxy group:

$$k = D/P(1+0.5g) + g$$

Q.36 Have you computed the average and adjusted dividend yields for each of the proxy group entities?

A. Yes. The average dividend yield for each proxy group company is reported in Table 6 below. As discussed above, I have multiplied the average dividend yields by (1+.5g), with "g" reflecting only the short-term IBES growth rate for this adjustment, to account for the fact that dividends are normally paid on a quarterly basis. The resulting adjusted average dividend yields are also shown in Table 6 below.

Table 6 – Average Dividend Yield (Six months ended December 2021)

Proxy Group Entity	Average Dividend Yield	Adjusted Dividend Yield
Enbridge	6.80%	7.08%
Kinder Morgan	6.46%	6.70%
ONEOK	6.54%	6.86%
Pembina	6.32%	6.66%
TC Energy	5.68%	5.72%
Williams	6.26%	6.32%

Q.37 Have you utilized a low-end and/or high-end outlier test to assess the results of the DCF analysis?

A. Yes. I have applied a standard statistical test to examine whether any of the proxy group members could be considered outliers and thus removed from the analysis. Specifically, I examined whether any of the DCF results (in both the core and expanded proxy groups) were greater than two standard deviations from the mean of the sample and found that all of the results were within this range.[8]

Q.38 Please summarize the results of your DCF analysis.

A. Applying the DCF methodology to the four-member core proxy group yields calculated ROEs that range from 8.15% to 15.13%, with a median of 11.04%.

Applying the DCF methodology to the six-member expanded proxy group yields calculated ROEs that range from 8.15% to 15.13%, with an increased median of 13.45%. The detailed DCF calculations are shown in my Exhibit DH-003.

VII. CAPM ANALYSIS

Q.39 Please provide a brief overview of the CAPM model.

A. The CAPM model is based on the theory that the market-required rate of return for a security is equal to the "risk-free rate" plus a "market-risk premium" associated with that security. Investors use CAPM analysis as a measure of the cost of equity

[8] In statistical analysis, under a normal distribution, 95% percent of data will fall within two standard deviations from the mean.

relative to risk. The CAPM relies on the understanding that investors require higher expected rates of return as risk increases.

Q.40 How have you determined the market-risk premium using the CAPM model?

A. To determine the CAPM market-risk premium, I have utilized the following approach: (1) I have used, as the risk-free rate, the 30-year U.S. Treasury average historical bond yield over the six-month period ending December 2021 (consistent with the dates used to produce the DCF study in this proceeding), (2) I have estimated the expected market return using a forward-looking approach based on a one-step DCF analysis of all dividend paying companies in the S&P 500, and (3) I have excluded all S&P 500 companies with growth rates that are negative or in excess of 20% as outliers. In addition, I have used *Value Line* as the source for the betas required in the CAPM analysis.

Q.41 What is beta?

A. In finance, beta "measures a security's volatility in relation to that of the market as a whole and is generally computed from a linear regression analysis based on past realized returns over some past time period."[9] This volatility is assumed to equate to a security's implied investment risk. To measure beta, a comparison is made between the movements in the price of a given stock and a selected market index, such as the S&P 500 Index or New York Stock Exchange Composite Index. Beta measures the relative risk of an entity compared to the market index as a whole by

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[9] See Roger A. Morin, New Regulatory Finance at 70 (Public Utilities Reports, Inc.) (2006).

assessing the volatility of the asset as compared to the overall volatility of the market index. Thus, a beta of 1.00 indicates that an asset has a similar risk to the market as a whole (as represented by the index). A beta greater than 1.00 indicates that the asset has a greater inherent risk than the market as a whole, while a beta less than 1.00 indicates that an asset has lesser inherent risk than the market as a whole. As such, investors can utilize beta as a tool to evaluate the implied risk of individual entities.

Q.42 How does *Value Line* calculate its beta values?

A. *Value Line* derives its betas from a regression analysis of the relationship between weekly percentage changes in the price of a stock and weekly percentage changes in the New York Stock Exchange Composite Index over a period of five years. In the case of a stock with a shorter price history, a smaller time period is used, but two years is the minimum.[10]

Q.43 How is the CAPM model utilized for ROE estimation purposes for natural gas pipelines?

A. The CAPM model estimates the cost of equity by adding the risk-free rate to the market-risk premium multiplied by beta. Mathematically, the formula for the CAPM is represented as follows:

$$k = Rf + B * (Rm-Rf)$$

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[10] *See*: http://www.valueline.com/Glossary/Glossary.aspx

where "k" is the cost of equity estimate, "Rf" is the risk-free rate, "Rm" is the expected market return, and "B" = *Value Line* beta, which measures the volatility of the security compared to the rest of the market.

A size premium adjustment is also normally utilized when determining the CAPM zone of reasonableness to account for the differences in size between proxy group entities and the dividend-paying companies in the S&P 500.[11]

Therefore, the formula which I have utilized for the CAPM is as follows:

$$k = Rf + B * (Rm-Rf) + s$$

where "s" is the size adjustment for the security to account for the notion that small company betas undercompensate for their risk and large company betas overcompensate for their risk in the CAPM model results.

Q.44 How are the CAPM results applied to the proxy group entities in this proceeding?

A. The results of the CAPM model are applied to each of the members of the Cardinal proxy groups in this proceeding by adding the risk-free rate to each entity's *Value Line* beta multiplied by the market risk premium (*i.e.*, Rm – Rf) calculated in the one-step DCF model applied to the applicable S&P 500 companies. A size adjustment is then added to this result to obtain the CAPM cost of equity for each entity in the proxy group.

[11] For example, see Roger A. Morin, New Regulatory Finance, 187 (Public Utilities Reports, Inc. 2006) (Morin) (finding that use of a size premium adjustment is "a generally accepted approach to CAPM analyses")).

Q.45 What data sources have you used to determine the risk-free rate in the CAPM model?

A. I have used the 30-year U.S. Treasury average historical bond yield for the six-month period ending December 2021 to determine the risk-free rate "Rf", as summarized in Table 7 below.

Table 7 – 30-year U.S. Treasury Average Historical Bond Yields[12]

Month	30-Year Bond Yield
July 2021	1.94%
August 2021	1.92%
September 2021	1.94%
October 2021	2.06%
November 2021	1.94%
December 2021	1.85%
Six-Month Average	**1.94%**

Q.46 What are the *Value Line* betas for each of the proxy group entities?

A. The *Value Line* adjusted betas for each of the proxy group entities as of December 2021 are shown below in Table 8. This data is publicly available at www.valueline.com.

Table 8 – *Value Line* Adjusted Betas as of December 2021

Proxy Group Entity	Value Line Adjusted Beta
Enbridge	0.90
Kinder Morgan	1.15
ONEOK	1.50
Pembina	1.10
TC Energy	1.05
Williams	1.20

[12] Source: https://www.federalreserve.gov/datadownload/Choose.aspx?rel=H15

Q.47 How is the expected market return (Rm) determined by the CAPM model?

A. The expected market return "Rm" is determined using a forward-looking approach based on a one-step DCF analysis of all dividend-paying companies in the S&P 500, excluding any S&P 500 companies with growth rates that are negative or in excess of 20%. The short-term growth projections in the CAPM analysis reflect the IBES growth rates of all dividend-paying S&P 500 companies.

Q.48 Please describe how you have calculated the expected market return (Rm) and market risk premium.

A. As shown in my Exhibit No. DH-004, to calculate the "Rm", I have first removed the S&P 500 companies that (1) do not pay dividends, or (2) that have IBES growth rates that are negative or in excess of 20 percent to avoid anomalous results. The "Rm" is then calculated as the market-capitalization weighted average of the current market dividend yield (1.77%) plus the market-capitalization weighted average IBES five-year growth rate (12.39%) for each eligible stock, yielding a total Rm of 14.16%.

To calculate the market risk premium, we subtract the "Rf" of 1.94% from the Rm of 14.16%, yielding a CAPM market risk premium of 12.22%. This market risk premium is then multiplied by each proxy group entity's *Value Line* beta and added to the risk-free rate to obtain the Unadjusted Returns shown in my Exhibit No. DH-004.

Q.49 Have you applied a size adjustment factor to the CAPM results?

A. Yes. I have applied a size adjustment factor "s" to the Unadjusted Return for each proxy group entity. The size adjustments reflect the December 2020 Duff & Phelps' Cost of Capital Navigator size premia.

Q.50 Have you utilized a low-end and/or high-end outlier test to assess the results of the CAPM analysis?

A. Yes. I have applied a standard statistical test to examine whether any of the proxy group members could be considered outliers. Specifically, I examined whether any of the CAPM results were greater than two standard deviations from the mean of the sample and found that all results were within this range.[13]

Q.51 Please summarize the results of your CAPM analysis.

A. Applying the CAPM methodology to the four-member core proxy group yields a calculated ROE range from 14.55% to 16.38%, with a median result of 15.82%.

Applying the CAPM methodology to the six-member expanded proxy group yields a calculated ROE range from 12.72% to 20.77%, with a median result of 15.82%. The detailed CAPM calculations are shown in my Exhibit DH-004.

[13] In statistical analysis, under a normal distribution, 95% percent of data will fall within two standard deviations from the mean.

VIII. RECOMMENDED RATE OF RETURN ON EQUITY

Q.52 What is the next step in determining the appropriate rate of return on equity for a natural gas pipeline?

A. Once the DCF and CAPM results have been calculated, the next step in determining the appropriate rate of return on equity is to assess the relative levels of risks faced by the entity under examination (*i.e.* Cardinal in this proceeding) compared to the entities included in the proxy group.

As previously discussed, regulated interstate natural gas pipelines are typically faced with the rebuttable presumption that all natural gas pipelines fall into a broad range of average risk absent highly unusual circumstances. Thus, as a starting point, an interstate natural gas pipeline's rate of return on equity is typically set at the median of the range of reasonable returns determined from a risk appropriate proxy group. Applying this approach to Cardinal, it is important to analyze whether Cardinal is facing any unique risks which would warrant an adjustment to its rate of return on equity above the median results of the proxy group. If Cardinal faces risks that are on balance greater than those faced by the members of the proxy group, a rate of return on equity above the median of the proxy group would be warranted in order to ensure that the rate of return on equity utilized properly reflects the underlying risks of the pipeline.

Q.53 Is Cardinal facing any unique risks compared to the proxy group entities?

A. In short, yes. Cardinal is a much smaller entity than each of the six members of the proxy groups, which must be considered when analyzing and comparing Cardinal's overall risks to the proxy group entities. The proxy group entities are large, diversified natural gas pipeline companies, whereas Cardinal is a stand-alone, single intrastate pipeline providing its shippers with access to far fewer markets and supply areas compared to the multiple long-line natural gas pipelines owned by the four proxy group entities. As discussed previously, investment risk increases as company size diminishes, all else remaining constant. The fact that Cardinal is significantly smaller than the entities in the proxy group suggests that it faces risks that are greater than the proxy group entities.

Furthermore, applying an imputed 60/40 equity to debt capital structure to Cardinal is not necessarily reflective of what the actual capital structure would be for such a small intrastate pipeline system – as it is uncertain whether a lender would provide any substantive long-term financing for such a stand-alone entity at interest rates that are comparable to those enjoyed by the much larger and more diversified proxy group entities.

Q.54 Please compare Cardinal's size with the size of the entities at the top of the DCF and CAPM ranges?

A. As shown on my Exhibit No. DH-003, the entity at the top of the DCF range in this proceeding is Pembina, with a calculated DCF return of 15.13%. As shown in its 2020 Annual Report, Pembina currently has property, plant and equipment in-service of over $18 Billion, generating 2020 revenues of approximately $5.9 Billion. Pembina describes itself as having integrated assets and commercial operations along the majority of the hydrocarbon value chain which allow it to offer a full spectrum of midstream and marketing services to the energy sector. Pembina is unquestionably larger in size than Cardinal and is much more diversified, supporting the reasonableness of applying at least the median DCF proxy group result to Cardinal in this proceeding.

Similarly, as shown on my Exhibit No. DH-004, the entity at the top of the CAPM range in this proceeding is ONEOK, with a calculated CAPM return of 20.77%. As reported in its most recent Form 10-K, ONEOK owns, in whole or in part: approximately 1,500 miles of regulated interstate natural gas pipelines with 3.5 Bcf/d of peak transportation capacity; 5,200 miles of regulated intrastate transmission pipelines with peak transportation capacity of 4.1 Bcf/d; and 52.2 Bcf of total active working natural gas storage capacity. ONEOK is also a midstream service provider that owns some of the nation's premier natural gas liquids systems, connecting NGL supply in the Mid-Continent, Permian and Rocky Mountain regions with key market centers and an extensive network of natural gas gathering, processing, storage, and transportation assets.

ONEOK is significantly larger and more diversified than Cardinal, again supporting the reasonableness of applying at least the median proxy group result to Cardinal in this proceeding.

Q.55 What other risks does Cardinal currently face?

A. As an intrastate pipeline, Cardinal faces a number of other risks, including: market risks, competition, and operating risks, amongst other risks. I discuss each of these risks facing Cardinal in greater detail below.

Q.56 Please discuss these other risks currently faced by Cardinal and how they compare to the risks of the four entities in the Cardinal proxy group?

A. The market risks faced by Cardinal are mitigated by the extent to which its available firm capacity has been subscribed. Cardinal's initial system capacity (i.e., the capacity which was in service prior to the 2012 expansion) continues to be contracted on a firm basis by Piedmont and PSNC, which are both established Local Distribution Companies ("LDCs") and part-owners of Cardinal. These contracts currently operate under a year-to-year evergreen basis. Cardinal's 2012 expansion capacity project is also subscribed by Piedmont and PSNC, with the associated firm contracts extending through 2032. With only two firm shippers, Cardinal has a highly concentrated shipper base. As such, Cardinal faces a heightened level of counterparty risk when compared to the proxy group entities. If one of the firm shippers on Cardinal was to provide notice of termination or was to default on its contractual obligations, Cardinal would face significant financial strain. This is not the case for the majority of the natural gas pipelines owned by the proxy group entities, suggesting that Cardinal faces relatively higher market risks than the six proxy group entities.

Regarding competitive risks, Cardinal faces competition from other natural gas pipelines as well as alternative energy suppliers which influence the probability of continued demand for firm services from Cardinal. Other pipelines situated within reasonable proximity to the markets served by Cardinal include Carolina Gas Transmission, LLC, East Tennessee Natural Gas, LLC ("East Tennessee"), Southern Natural Gas Company, L.L.C. and Columbia Gas Transmission, LLC ("Columbia Gas"). Both East Tennessee and Columbia Gas also directly serve Cardinal's customers. In addition, Piedmont holds capacity on other interstate natural gas pipelines including Texas Eastern Transmission, LP, Midwestern Gas Transmission Company, and Tennessee Gas Pipeline Company, L.L.C. PSNC is a shipper on Eastern Gas Transmission and Storage, Inc. as well as Cove Point LNG, LP. Thus, I conclude that Cardinal faces a level of competitive risk that is comparable to the proxy group entities.

Lastly, as a relatively small, newly constructed pipeline system, Cardinal does not face many of the same level of operating risks as compared to many of the pipelines owned by the proxy group entities, some which were built well over 50 years ago and stretch for thousands of miles. Older pipelines generally have relatively higher operating and maintenance costs than newer pipeline facilities, increasing their relative operating risks.

Q.57 How do the business risks faced by Cardinal compare to the risks faced by a local distribution company?

A. In general, LDCs face risks that are much lower than natural gas pipelines such as Cardinal. A local distribution company (sometimes also referred to as a gas utility company) typically transports natural gas from interconnects with interstate pipelines to households, light industrial users, and local businesses through small-diameter distribution pipe. LDCs are generally awarded exclusive rights to distribute natural gas within a specified geographic area - thus LDCs have a monopoly service territory. Cardinal has no such dedicated service territory. Further, because of the high per unit cost of constructing small-diameter distribution infrastructure, it is uneconomic to lay multiple redundant distribution networks in any one area, resulting in only one utility offering distribution services. Hence LDCs do not face bypass risk like natural gas pipelines (such as Cardinal) do. In addition, LDCs generally serve hundreds or even thousands of customers, which greatly reduces their counterparty risk. Therefore the loss of one customer is unlikely to place the LDC in financial distress, which again is not the case for Cardinal. Because of these lower levels of overall risks, LDCs typically require a rate of return on equity that is lower than that required for natural gas pipelines.

Q.58 What is your overall recommendation regarding Cardinal's ROE?

A. As discussed above, Cardinal faces some risks that are greater than and some risks that are less than those faced by the proxy group entities. Thus, I conclude that overall Cardinal faces risks that are comparable to the average-risk natural gas pipeline, a level of risk represented by the median of the proxy group. I recommend that Cardinal utilize the median of the DCF analysis as calculated from the core proxy group for ratemaking purposes in this proceeding, namely 11.04%. The use of the ROE from the core proxy group is conservative and will produce just and reasonable rates that strike a proper balance between the needs of Cardinal and its ratepayers.

Q.59 Is this recommended ROE reasonable for ratemaking purposes at this time?

A. Yes. I have utilized both the CAPM model and the expanded proxy group to provide a check on the reasonableness of the recommended 11.04% rate of return on equity for Cardinal. Using the DCF median from the expanded proxy group would increase the calculated ROE to 13.45%, which is nearly 250 basis points higher than the core proxy group. Likewise, the returns calculated utilizing the CAPM model produce a median result of 15.82% for both the core and expanded proxy group.

The use of the median result as calculated using only the DCF model as applied to the core proxy group in this proceeding is particularly conservative from the standpoint that investors rely upon multiple models to determine the appropriate required rate of return on equity. Therefore the results of both the DCF model as applied to the expanded proxy group (i.e. a median result of 13.45%), and the median results from the CAPM calculations (15.82% for both proxy groups) fully support that Cardinal's proposed ROE of 11.04% is reasonable at this time and will produce just and reasonable rates.

IX. CAPITAL STRUCTURE AND COST OF DEBT

Q.60 What is the purpose of this section of your testimony?

A. In this section of my testimony, I discuss and support the appropriate capital structure and cost of debt to be used by Cardinal for rate-making purposes.

Q.61 Please define what you mean by the term "capital structure" within the context of regulated natural gas pipeline rate-making.

A. The term "capital structure" refers to the combination of equity and long-term debt used by an entity to finance its rate base. Capital structure, and in particular equity thickness, is often an important factor in cost-of-service ratemaking for natural gas pipelines because it directly impacts the overall rate of return on net rate base.

Q.62 What is the appropriate capital structure that should be used by Cardinal in this proceeding?

A. For ratemaking purposes, regulated natural gas pipelines generally utilize (as a starting point) the capital structure reflected on their current balance sheet, as this metric reflects the actual rate base financing that is in place at any given point in time. This is a reasonable approach provided that the pipeline issues its own rated debt and has a capital structure that is within the range of equity ratios of the proxy group companies. When this is not the case, an alternative capital structure should be considered to ensure that just and reasonable rates are determined. An alternative capital structure could include the use of an imputed capital structure or the utilization of the capital structure of the ultimate parent that finances the pipeline entity.

Q.63 What is Cardinal's current capital structure and how is it financed?

A. In Docket No. G-39, Sub 40, the North Carolina Utilities Commission authorized Cardinal to enter into a long-term debt arrangement, whereunder it was permitted to borrow $45,000,000 for a 5-year term. This 5-year long-term debt arrangement matures in May 2022, at which point Cardinal will have paid off all of its long-term debt. Therefore as of May 2022, Cardinal will be 100% equity financed by its owners. Further, as Cardinal is owned by multiple parent companies, there is no single parental capital structure that can be used as an alternative that properly reflects an alternative capital structure for Cardinal.

In these circumstances, an imputed capital structure is generally used to ensure that just and reasonable rates are determined. Utilizing an imputed capital structure is a relatively common approach for regulated entities that do not issue their own stand-alone debt.[14]

Q.64 What imputed capital structure should be used for Cardinal for its cost-of-service calculations in this proceeding?

A. In its last rate proceeding filed in Docket No. G-39, Sub 38, Cardinal's filed cost of service reflected its actual capital structure at the time, as adjusted to reflect the proposed refinancing of its $45 million of long-term debt.[15] As such, the capital structure utilized by Cardinal in its last rate filing was comprised of 59.23% equity and 40.77% long-term debt. Given that Cardinal will no longer have any long-term debt going forward, I would recommend the continued use of its last filed capital structure for rate making purposes in this proceeding, which I have rounded to 60% equity and 40% debt.

[14] For example, the North Carolina Utilities Commission has authorized the use of a hypothetical capital structure in Docket No. E-35, Sub 45. The FERC has also authorized the use of a hypothetical capital structure for some interstate natural gas pipelines. See *Transcontinental Gas Pipeline Corp.,* Opinion No. 414, 80 FERC ¶ 61,157 (1997) ("Opinion No. 414").

[15] As previously discussed, in Docket No. G-39, Sub 40, the North Carolina Utilities Commission authorized Cardinal to enter into a long-term debt arrangement, whereunder it was permitted to borrow $45,000,000 for a 5-year term.

As shown in my Exhibit DH-005, this hypothetical capital structure is within the range of the actual current capital structure ratios of the core and expanded proxy groups.

Utilizing Cardinal's historical 60/40 equity to debt capital structure in this proceeding is reasonable, in light of the small size and relative risks of Cardinal as compared to the proxy group entities.

Q.65 What cost of debt should Cardinal utilize for its cost-of-service purposes in this proceeding?

A. For its cost of debt for in this proceeding, I recommend that Cardinal utilize the average cost of debt across the core proxy group entities, namely 5.25%, as reflected in Exhibit No. DH-005. Using the average cost of debt from the core proxy group is appropriate in light of the fact that Cardinal does not issue any stand-alone debt and is using an imputed capital structure, as it is uncertain whether a lender would provide any substantive long-term financing for Cardinal at interest rates that are comparable to those enjoyed by the larger and more diversified proxy group entities.

Q.66 Does this conclude your Prepared Direct Testimony?

A. Yes, it does.

CURRICULUM VITAE

NAME	David J. Haag
BUSINESS ADDRESS	P.O. Box 10 Sunderland, MD 20689-0010
PRESENT POSITION	President and Chief Executive Officer Brown, Williams, Moorhead & Quinn, Inc.
EDUCATION	B.A. (with Honors) in Economics with Management Minor University of Calgary, Canada Graduate Certificate Public Utility Regulation and Economics New Mexico State University
CONTINUING EDUCATION	Master's in Economics New Mexico State University
TEACHING EXPERIENCE	Seminar Instructor (2013 – Present) Center for Public Utilities New Mexico State University Pipeline Ratemaking Course Seminars Taught: • Determination of a Pipeline's Cost of Service Dean of Energy Law Academy (2021 – Present) Energy Bar Association The Energy Law Academy provides education regarding core regulatory and legal concepts and basic industry fundamentals. Course Taught: Introduction to the Federal Regulation of the Natural Gas Industry • Cost of Service Ratemaking • Emerging Rate Case Issues

NATURE OF WORK PERFORMED WITH FIRM

Mr. Haag joined BWMQ in September 2019 as Chief Executive Officer and became President and Chief Executive Officer in September 2020. Brown Williams provides thorough analytical expertise and advocacy on behalf of clients across a wide range of energy issues, including pipeline Cost of Service and Rate Design, Certificate Applications, Depreciation, and Economic Analysis.

Mr. Haag is highly regarded in the natural gas pipeline industry as a pipeline cost of service, rate design, tariff, and regulatory expert, bringing to the role of President and CEO his extensive experience dealing with the Federal Energy Regulatory Commission, including the filing of expert testimony, management of numerous complex rate case filings, market-based rate studies, certificate filings, compliance filings, as well as gas pipeline and storage tariff filings.

Mr. Haag has filed expert testimony and / or affidavits on various rate and regulatory matters including business risk assessment, proxy groups, return on equity, capital structure, cost of service issues, rate design, cost classification, cost allocation, billing determinants, discount adjustments, market power tariffs, rate levelization, pipeline transportation values, and other rate-related issues.

Mr. Haag is well versed in Government, Public, and Stakeholder Relations, and maintains established relationships with FERC Staff as well as various industry trade associations, including the Interstate Natural Gas Association of America.

Mr. Haag is also seasoned in the analysis of complex commercial, financial, and regulatory matters related to pipelines and storage, and is able to assist with regulatory oversight for ongoing operations, new projects, acquisitions, mergers, and divestitures.

Finally, Mr. Haag is experienced in the management of oil pipeline tariffs under the Interstate Commerce Act, including the requisite depreciation and underlying cost of service issues pertaining to oil and products pipelines.

PREVIOUS EMPLOYMENT

Prior to joining BWMQ, Mr. Haag served as Vice President, Regulatory and Chief Compliance Officer for Tallgrass Energy, LP, where he was responsible for identifying, overseeing, and implementing regulatory strategies across each Tallgrass pipeline entity, including natural gas transmission pipelines, storage facilities, and crude oil pipelines. Mr. Haag was accountable for both the management of all rate and cost of service related filings (including Section 4 Rate Case filings, FERC Form 501-G filings, expert testimony, tariff filings, and the development of complex financial modeling for strategic analysis), as well as all Tallgrass FERC Certificate matters (including filings for the construction, modification, replacement, and abandonment of pipeline facilities).

As Chief Compliance Officer, Mr. Haag was responsible for ensuring that all Tallgrass regulated business was conducted in compliance and adherence with the FERC Standards of Conduct and other applicable regulations.

In addition, Mr. Haag also served at Tallgrass as Vice President of Commercial Operations, managing both the Trailblazer and Tallgrass Interstate Pipeline Systems. In this role, Mr. Haag was responsible to manage all commercial aspects of the business, including contracting, business development, and customer relationships across the two major pipelines.

Prior to joining Tallgrass, Mr. Haag served as Director of Rates for Boardwalk Pipeline Partners, L.P. where he was accountable for the various rate and cost of service matters across all regulated Boardwalk entities, including the provision of expert testimony and preparation of financial models and strategic analysis.

Mr. Haag was also previously employed as Manager, Rates and Regulatory Affairs for Portland Natural Gas Transmission, where he prepared, filed and managed all Portland regulatory filings; major filings included multiple Section 4 FERC rate case filings, FERC certificate applications, NAESB compliance filings, District Court matters, as well as the bankruptcy of a major shipper.

Earlier in his career, Mr. Haag also worked in Sales and Marketing for TransCanada Pipelines and is therefore also familiar with Canadian pipeline operations and regulations.

#	JURISDICTION	CASE OR DOCKET NO.	UTILITY/ORGANIZATION INITIATING PROCEEDING	SUBJECT MATTER
			PIPELINE RATE CASE PROCEEDINGS	
15	FERC	RP21-1188	TEXAS EASTERN TRANSMISSION, LP	Business Risk / Proxy Group
14	FERC	RP21-1187	EASTERN GAS TRANSMISSION AND STORAGE, INC.	Rate Design / Business Risk / Proxy Group
13	FERC	RP21-1001	TEXAS EASTERN TRANSMISSION, LP	Business Risk / Proxy Group
12	FERC	PR21-34	ENABLE OKLAHOMA INTRASTATE TRANSMISSION, LLC	Return on Equity / Proxy Group (Section 311 Proceeding)
11	FERC	RP20-1204	TC ENERGY PIPELINES	Public Interest Impacts of Potential Contract Abrogation
10	FERC	RP20-980	EAST TENNESSEE NATURAL GAS, LLC	Business Risk / Proxy Group / Capital Structure
9	FERC	RP20-921	MARITIMES & NORTHEAST PIPELINE, L.L.C.	Business Risk / Proxy Group / Capital Structure
8	FERC	RP20-908	ALLIANCE PIPELINE L.P.	Business Risk / Proxy Group / Capital Structure
7	FERC	RP20-467	DOMINION ENERGY COVE POINT LNG, LP	Business Risk / Proxy Group
6	FERC	RP20-131	ENABLE MISSISSIPPI RIVER TRANSMISSION	Discount Adjustment
5	FERC	RP18-922	TRAILBLAZER PIPELINE COMPANY, LLC	Section 4 Rate Case
4	FERC	RP16-137	TALLGRASS INTERSTATE GAS TRANSMISSION, LLC	Section 4 Rate Case
3	FERC	RP15-65	GULF SOUTH PIPELINE COMPANY, LP	Section 4 Rate Case
2	FERC	RP10-729	PORTLAND NATURAL GAS TRANSMISSION SYSTEM	Section 4 Rate Case
1	FERC	RP08-306	PORTLAND NATURAL GAS TRANSMISSION SYSTEM	Section 4 Rate Case

#	JURISDICTION	CASE OR DOCKET NO.	UTILITY/ORGANIZATION INITIATING PROCEEDING	SUBJECT MATTER
		SECTION 7 CERTIFICATE FILINGS		
4	FERC	CP18-103	ROCKIES EXPRESS PIPELINE, LLC	Installation of 6 new compressor units
3	FERC	CP18-102	CHEYENNE CONNECTOR, LLC	70 mile large-diameter greenfield pipeline
2	FERC	CP17-485	TALLGRASS INTERSTATE GAS TRANSMISSION, LLC	Partial facility abandonment application
1	FERC	CP15-137	ROCKIES EXPRESS PIPELINE, LLC	Capacity Enhancement Project – 800,000 Dth/d pipeline system expansion

#	JURISDICTION	CASE OR DOCKET NO.	UTILITY/ORGANIZATION INITIATING PROCEEDING	SUBJECT MATTER
		ELECTRIC RATE FILINGS		
2	FERC	ER21-1816-000	KES KINGSBURG, LP	Return on Equity / Proxy Group / Business Risk / Capital Structure
1	FERC	ER21-998-000	MIDWAY SUNSET COGENERATION COMPANY	Return on Equity / Proxy Group / Business Risk / Capital Structure

#	JURISDICTION	CASE OR DOCKET NO.	SUBJECT MATTER
		FEDERAL COURT PROCEEDINGS	
2	U.S. Bankruptcy Court for the Southern District of Texas – Houston Division	Case No. 20-35562 – GULFPORT ENERGY CORPORATION	Report on Motion to Reject Certain FERC Jurisdictional Contracts
1	U.S. Bankruptcy Court for the District of Delaware	Case No. 20-11548 – EXTRACTION OIL AND GAS, INC.	Report on Motion to Reject Certain FERC Jurisdictional Contracts

Proxy ROE Calculations - Core Proxy Group
Return on Equity (Two-Stage DCF) Calculation
Six-Months Ended December 2021

Ticker	Company	Average Dividend Yield	IBES Growth Rate	GDP Growth Rate	IBES 67% Weighting	GDP 33% Weighting	Combined Growth Rate	Adjusted Dividend Yield	DCF Return	Sample Standard Deviation
KMI	Kinder Morgan, Inc.	6.46%	7.39%	4.19%	4.93%	1.40%	6.32%	6.70%	13.02%	
PBA	Pembina Pipeline Corporation	6.32%	10.61%	4.19%	7.07%	1.40%	8.47%	6.66%	15.13%	
TRP	TC Energy Corporation	5.68%	1.55%	4.19%	1.03%	1.40%	2.43%	5.72%	8.15%	
WMB	The Williams Companies, Inc.	6.26%	2.00%	4.19%	1.33%	1.40%	2.73%	6.32%	9.05%	
							Range	8.15% to	15.13%	
							Mean		11.34%	3.29%
							Median		**11.04%**	
							Midpoint		11.64%	

Proxy ROE Calculations - Expanded Proxy Group
Return on Equity (Two-Stage DCF) Calculation
Six-Months Ended December 2021

Ticker	Company	Average Dividend Yield	IBES Growth Rate	GDP Growth Rate	IBES 67% Weighting	GDP 33% Weighting	Combined Growth Rate	Adjusted Dividend Yield	DCF Return	Sample Standard Deviation
ENB	Enbridge Inc.	6.80%	8.11%	4.19%	5.41%	1.40%	6.80%	7.08%	13.88%	
KMI	Kinder Morgan, Inc.	6.46%	7.39%	4.19%	4.93%	1.40%	6.32%	6.70%	13.02%	
OKE	ONEOK, Inc.	6.54%	9.86%	4.19%	6.57%	1.40%	7.97%	6.86%	14.83%	
PBA	Pembina Pipeline Corporation	6.32%	10.61%	4.19%	7.07%	1.40%	8.47%	6.66%	15.13%	
TRP	TC Energy Corporation	5.68%	1.55%	4.19%	1.03%	1.40%	2.43%	5.72%	8.15%	
WMB	The Williams Companies, Inc.	6.26%	2.00%	4.19%	1.33%	1.40%	2.73%	6.32%	9.05%	
							Range	8.15% to	15.13%	
							Mean		12.34%	3.00%
							Median		**13.45%**	
							Midpoint		11.64%	

Dividend Yield Calculation

Ticker	Company	Month	Stock Price High	Stock Price Low	Stock Price Average	Annualized Dividend	Dividend Yield	Average Dividend Yield	Annualized Dividend $ CAD
ENB	Enbridge Inc.	Dec-21	$ 39.13	$ 36.21	$ 37.67	$ 2.66	7.05%		$ 3.34
		Nov-21	$ 43.35	$ 37.22	$ 40.29	$ 2.66	6.59%		$ 3.34
		Oct-21	$ 43.21	$ 39.63	$ 41.42	$ 2.67	6.45%		$ 3.34
		Sep-21	$ 40.57	$ 38.56	$ 39.57	$ 2.67	6.75%		$ 3.34
		Aug-21	$ 40.32	$ 37.06	$ 38.69	$ 2.67	6.91%		$ 3.34
		Jul-21	$ 40.70	$ 37.34	$ 39.02	$ 2.75	7.05%	6.80%	$ 3.34
KMI	Kinder Morgan, Inc.	Dec-21	$ 16.39	$ 15.01	$ 15.70	$ 1.08	6.88%		
		Nov-21	$ 17.10	$ 15.45	$ 16.28	$ 1.08	6.64%		
		Oct-21	$ 18.76	$ 16.52	$ 17.64	$ 1.08	6.12%		
		Sep-21	$ 17.21	$ 15.47	$ 16.34	$ 1.08	6.61%		
		Aug-21	$ 17.72	$ 15.77	$ 16.75	$ 1.08	6.45%		
		Jul-21	$ 18.68	$ 16.91	$ 17.80	$ 1.08	6.07%	6.46%	
OKE	ONEOK, Inc.	Dec-21	$ 63.37	$ 55.65	$ 59.51	$ 3.74	6.28%		
		Nov-21	$ 65.66	$ 59.58	$ 62.62	$ 3.74	5.97%		
		Oct-21	$ 66.78	$ 57.78	$ 62.28	$ 3.74	6.01%		
		Sep-21	$ 59.78	$ 51.70	$ 55.74	$ 3.74	6.71%		
		Aug-21	$ 54.24	$ 48.51	$ 51.38	$ 3.74	7.28%		
		Jul-21	$ 57.55	$ 49.75	$ 53.65	$ 3.74	6.97%	6.54%	
PBA	Pembina Pipeline Corporation	Dec-21	$ 30.87	$ 28.89	$ 29.88	$ 1.97	6.59%		$ 2.52
		Nov-21	$ 34.60	$ 29.17	$ 31.89	$ 1.98	6.21%		$ 2.52
		Oct-21	$ 34.73	$ 31.36	$ 33.05	$ 2.04	6.17%		$ 2.52
		Sep-21	$ 32.09	$ 30.33	$ 31.21	$ 1.97	6.31%		$ 2.52
		Aug-21	$ 33.47	$ 29.63	$ 31.55	$ 1.99	6.31%		$ 2.52
		Jul-21	$ 33.51	$ 30.06	$ 31.79	$ 2.00	6.30%	6.32%	$ 2.52
TRP	TC Energy Corporation	Dec-21	$ 47.77	$ 44.77	$ 46.27	$ 2.72	5.88%		$ 3.48
		Nov-21	$ 54.71	$ 46.58	$ 50.65	$ 2.76	5.44%		$ 3.48
		Oct-21	$ 55.34	$ 47.73	$ 51.54	$ 2.76	5.35%		$ 3.48
		Sep-21	$ 50.71	$ 47.47	$ 49.09	$ 2.76	5.61%		$ 3.48
		Aug-21	$ 49.12	$ 44.83	$ 46.98	$ 2.82	6.00%		$ 3.48
		Jul-21	$ 50.39	$ 46.46	$ 48.43	$ 2.82	5.82%	5.68%	$ 3.48
WMB	The Williams Companies, Inc.	Dec-21	$ 28.03	$ 24.86	$ 26.45	$ 1.64	6.20%		
		Nov-21	$ 29.00	$ 26.73	$ 27.87	$ 1.64	5.89%		
		Oct-21	$ 29.89	$ 25.89	$ 27.89	$ 1.64	5.88%		
		Sep-21	$ 26.61	$ 23.98	$ 25.30	$ 1.64	6.48%		
		Aug-21	$ 25.53	$ 23.53	$ 24.53	$ 1.64	6.69%		
		Jul-21	$ 27.01	$ 24.35	$ 25.68	$ 1.64	6.39%	6.26%	

BROWN, WILLIAMS, MOORHEAD & QUINN, INC.
ENERGY CONSULTANTS

GDP Growth Calculation

Energy Information Administration ("EIA") AEO 2021 Table A20

		Year	Amount	
Real Gross Domestic Product (Ave. Annual Growth 2025 to 2050)		2025	$21,193	
		2050	$34,365	
GDP Chain-Type Price Index (Ave. Annual Growth 2025 to 2050)		2025	1.219	
		2050	2.213	
	RGDP*Index	2025	$25,834	
	RGDP*Index	2050	$76,050	
GDP Growth				**4.41%**

IHS Markit

GDP Growth 2024 - 2049	**4.10%**

Social Security Administration ("SSA") Table VI.G.4 (2021)

	Year	SSA	
	2025	$27,041	
	2050	$73,006	
GDP Growth			**4.05%**

Average **4.19%**

Proxy CAPM Calculations - Core Proxy Group

Uses One Step DCF With Size Adjustment
December 2021

Ticker	Company	Market Return: S&P 500 Dividend Yield	Market Return: S&P 500 Composite Growth Rate	CAPM Cost of Equity	6-Month Hist Avg 30 Yr. Treasury Risk- Free Rate	CAPM Risk Premium	Value Line Adjusted Beta	Unadjusted Return	Market Cap $ Millions	Size Adjustment	CAPM Cost of Equity	Sample Standard Deviation
KMI	Kinder Morgan, Inc.	1.77%	12.39%	14.16%	1.94%	12.22%	1.15	15.99%	$ 35,303.12	-0.22%	15.77%	
PBA	Pembina Pipeline Corporation	1.77%	12.39%	14.16%	1.94%	12.22%	1.10	15.38%	$ 21,153.00	0.49%	15.87%	
TRP	TC Energy Corporation	1.77%	12.39%	14.16%	1.94%	12.22%	1.05	14.77%	$ 45,689.93	-0.22%	14.55%	
WMB	The Williams Companies, Inc.	1.77%	12.39%	14.16%	1.94%	12.22%	1.20	16.60%	$ 31,175.52	-0.22%	16.38%	
									Range	14.55% to	16.38%	
									Mean		15.64%	0.78%
									Median		**15.82%**	
									Midpoint		15.47%	

Proxy CAPM Calculations - Expanded Proxy Group

Uses One Step DCF With Size Adjustment
December 2021

Ticker	Company	Market Return: S&P 500 Dividend Yield	Market Return: S&P 500 Composite Growth Rate	CAPM Cost of Equity	6-Month Hist Avg 30 Yr. Treasury Risk- Free Rate	CAPM Risk Premium	Value Line Adjusted Beta	Unadjusted Return	Market Cap $ Millions	Size Adjustment	CAPM Cost of Equity	Sample Standard Deviation
ENB	Enbridge Inc.	1.77%	12.39%	14.16%	1.94%	12.22%	0.90	12.94%	$ 97,835.54	-0.22%	12.72%	
KMI	Kinder Morgan, Inc.	1.77%	12.39%	14.16%	1.94%	12.22%	1.15	15.99%	$ 35,303.12	-0.22%	15.77%	
OKE	ONEOK, Inc.	1.77%	12.39%	14.16%	1.94%	12.22%	1.50	20.27%	$ 25,766.06	0.49%	20.76%	
PBA	Pembina Pipeline Corporation	1.77%	12.39%	14.16%	1.94%	12.22%	1.10	15.38%	$ 21,153.00	0.49%	15.87%	
TRP	TC Energy Corporation	1.77%	12.39%	14.16%	1.94%	12.22%	1.05	14.77%	$ 45,689.93	-0.22%	14.55%	
WMB	The Williams Companies, Inc.	1.77%	12.39%	14.16%	1.94%	12.22%	1.20	16.60%	$ 31,175.52	-0.22%	16.38%	
									Range	12.72% to	20.76%	
									Mean		16.01%	2.67%
									Median		**15.82%**	
									Midpoint		16.74%	

BROWN, WILLIAMS, MOORHEAD & QUINN, INC.
ENERGY CONSULTANTS

CAPM Analysis - S&P 500

as of December 31, 2021

Data Sources >		Google Finance	Yahoo! Finance		Google Finance		Yahoo! Finance			Single Stage
					Market Cap @					
		12/31/2021	Current Dividend		12/31/2021		IBES 5 Year Annual	Weighted IBES	Weighted	
Ticker	Name	Price	Yield		($ Millions)	Market Cap Weighting	Growth Rate	Growth Rate	Dividend Yield	DCF Result
AAP	Advance Auto Parts	239.88	1.67%	$	14,813,094,032	0.05981%	14.20%	0.00849%	0.00100%	15.87%
AAPL	Apple Inc.	177.57	0.50%	$	2,968,654,358,713	11.98569%	19.61%	2.35039%	0.05993%	20.11%
ABBV	AbbVie Inc.	135.4	4.17%	$	237,532,357,879	0.95902%	4.68%	0.04488%	0.03999%	8.85%
ABC	AmerisourceBergen	132.89	1.38%	$	27,404,911,229	0.11065%	12.35%	0.01366%	0.00153%	13.73%
ABT	Abbott Labs.	140.74	1.34%	$	244,076,514,421	0.98544%	12.53%	0.12348%	0.01320%	13.87%
ACN	Accenture Plc	414.55	0.94%	$	267,789,944,469	1.08118%	11.80%	0.12758%	0.01016%	12.74%
ADI	Analog Devices	175.77	1.57%	$	94,660,185,119	0.38218%	15.90%	0.06077%	0.00600%	17.47%
ADM	Archer Daniels Midl'	67.59	2.19%	$	37,862,973,818	0.15287%	9.55%	0.01460%	0.00335%	11.74%
ADP	Automatic Data Proc.	246.58	1.69%	$	102,255,169,797	0.41285%	10.48%	0.04327%	0.00698%	12.17%
AEE	Ameren Corp.	89.01	2.47%	$	22,623,802,721	0.09134%	7.70%	0.00703%	0.00226%	10.17%
AEP	Amer. Elec. Power	88.97	3.51%	$	44,265,938,816	0.17872%	6.03%	0.01078%	0.00627%	9.54%
AES	AES Corp.	24.3	2.60%	$	16,207,814,552	0.06544%	8.15%	0.00533%	0.00170%	10.75%
AFL	Aflac Inc.	58.39	2.74%	$	38,818,469,109	0.15673%	6.11%	0.00958%	0.00429%	8.85%
AIZ	Assurant Inc.	155.86	1.75%	$	8,935,655,965	0.03608%	17.90%	0.00646%	0.00063%	19.65%
AJG	Gallagher (Arthur J.	169.67	1.13%	$	34,573,971,032	0.13959%	10.60%	0.01480%	0.00158%	11.73%
ALLE	Allegion plc	132.44	1.09%	$	11,599,469,272	0.04683%	10.05%	0.00471%	0.00051%	11.14%
AMCR	Amcor plc	12.01	4.01%	$	18,122,057,112	0.07317%	5.57%	0.00408%	0.00293%	9.58%
AMGN	Amgen	224.97	3.45%	$	126,464,417,370	0.51059%	5.95%	0.03038%	0.01762%	9.40%
AMP	Ameriprise Fin'l	301.66	1.50%	$	34,106,249,655	0.13770%	9.42%	0.01297%	0.00207%	10.92%
AMT	Amer. Tower 'A'	292.5	1.90%	$	128,504,061,627	0.51882%	17.01%	0.08825%	0.00986%	18.91%
ANTM	Anthem, Inc.	463.54	0.98%	$	111,041,975,250	0.44832%	13.55%	0.06075%	0.00439%	14.53%
AON	Aon plc	300.56	0.68%	$	65,359,406,363	0.26388%	14.21%	0.03750%	0.00179%	14.89%
AOS	Smith (A.O.)	85.85	1.30%	$	13,242,286,234	0.05346%	8.00%	0.00428%	0.00070%	9.30%
APD	Air Products & Chem.	304.26	1.97%	$	66,179,413,808	0.26719%	11.96%	0.03196%	0.00526%	13.93%
APH	Amphenol Corp.	87.46	0.91%	$	51,866,944,428	0.20941%	13.20%	0.02764%	0.00191%	14.11%
ARE	Alexandria Real Esta	222.96	2.06%	$	33,737,278,793	0.13621%	0.10%	0.00014%	0.00281%	2.16%
ATO	Atmos Energy	104.77	2.60%	$	13,809,302,788	0.05575%	7.80%	0.00435%	0.00145%	10.40%
ATVI	Activision Blizzard	66.53	0.71%	$	51,788,301,350	0.20909%	13.90%	0.02906%	0.00148%	14.61%
AVB	AvalonBay Communitie	252.59	2.52%	$	34,894,843,113	0.14089%	2.54%	0.00358%	0.00355%	5.06%
AVGO	Broadcom Inc.	665.41	2.46%	$	275,325,016,820	1.11160%	14.74%	0.16385%	0.02735%	17.20%
AVY	Avery Dennison	216.57	1.24%	$	17,656,984,935	0.07129%	10.07%	0.00718%	0.00088%	11.31%
AWK	Amer. Water Works	188.86	1.32%	$	33,362,998,284	0.13470%	8.60%	0.01158%	0.00178%	9.92%
BAX	Baxter Int'l Inc.	85.84	1.41%	$	42,999,539,228	0.17361%	11.57%	0.02009%	0.00245%	12.98%
BBWI	Bath & Body Works	69.79	0.80%	$	18,588,057,953	0.07505%	10.00%	0.00750%	0.00060%	10.80%
BBY	Best Buy Co.	101.6	2.92%	$	25,454,824,183	0.10277%	9.10%	0.00935%	0.00300%	12.02%
BDX	Becton, Dickinson	251.48	1.27%	$	71,018,536,455	0.28673%	10.10%	0.02896%	0.00364%	11.37%
BEN	Franklin Resources	33.49	3.60%	$	16,990,782,392	0.06860%	10.64%	0.00730%	0.00247%	14.24%
BFB	Brown-Forman 'B'	72.86	1.03%	$	33,155,894,138	0.13386%	10.59%	0.01418%	0.00138%	11.62%
BK	Bank of New York Mel	58.08	2.41%	$	48,335,296,268	0.19515%	11.30%	0.02205%	0.00470%	13.71%
BLK	BlackRock, Inc.	915.56	1.84%	$	139,595,106,244	0.56360%	16.66%	0.09390%	0.01037%	18.50%

BLL	Ball Corp.	96.27	0.86%	$	30,135,107,360	0.12167%	15.05%	0.01831%	0.00105%	15.91%
BMY	Bristol-Myers Squibb	62.35	3.20%	$	137,906,546,220	0.55679%	7.37%	0.04104%	0.01782%	10.57%
BR	Broadridge Fin'l	182.82	1.43%	$	20,964,221,953	0.08464%	11.80%	0.00999%	0.00121%	13.23%
BRO	Brown & Brown	70.28	0.69%	$	19,504,394,118	0.07875%	13.22%	0.01041%	0.00054%	13.91%
BXP	Boston Properties	115.18	3.43%	$	18,354,310,750	0.07410%	7.00%	0.00519%	0.00254%	10.43%
CAG	Conagra Brands	34.15	3.87%	$	16,079,202,315	0.06492%	1.83%	0.00119%	0.00251%	5.70%
CAH	Cardinal Health	51.49	3.87%	$	14,500,805,076	0.05855%	6.56%	0.00384%	0.00227%	10.43%
CARR	Carrier Global	54.24	1.14%	$	45,591,032,117	0.18407%	18.79%	0.03459%	0.00210%	19.93%
CBOE	Cboe Global Markets	130.4	1.55%	$	13,735,605,845	0.05546%	2.50%	0.00139%	0.00086%	4.05%
CDW	CDW Corp.	204.78	1.00%	$	27,735,673,085	0.11198%	12.71%	0.01423%	0.00112%	13.71%
CERN	Cerner Corp.	92.87	1.20%	$	27,140,538,301	0.10958%	11.81%	0.01294%	0.00131%	13.01%
CHD	Church & Dwight	102.5	0.99%	$	24,495,399,386	0.09890%	7.31%	0.00723%	0.00098%	8.30%
CHRW	C.H. Robinson	107.63	2.16%	$	14,201,773,029	0.05734%	10.45%	0.00599%	0.00124%	12.61%
CI	Cigna Corp.	229.63	1.83%	$	76,848,139,180	0.31027%	13.76%	0.04269%	0.00568%	15.59%
CINF	Cincinnati Financial	113.93	2.17%	$	18,532,815,253	0.07482%	14.39%	0.01077%	0.00162%	16.56%
CL	Colgate-Palmolive	85.34	2.11%	$	70,554,863,905	0.28486%	7.19%	0.02048%	0.00601%	9.30%
CLX	Clorox Co.	174.36	2.76%	$	21,128,698,668	0.08531%	1.50%	0.00128%	0.00235%	4.26%
CMCSA	Comcast Corp.	50.33	1.99%	$	232,325,614,320	0.93800%	18.74%	0.17578%	0.01867%	20.73%
CME	CME Group	228.46	1.65%	$	81,162,421,921	0.32769%	4.96%	0.01625%	0.00541%	6.61%
CMI	Cummins Inc.	218.14	2.47%	$	31,435,528,829	0.12692%	18.13%	0.02301%	0.00313%	20.60%
CMS	CMS Energy Corp.	65.05	2.84%	$	18,621,742,090	0.07518%	5.72%	0.00430%	0.00214%	8.56%
CNP	CenterPoint Energy	27.91	2.52%	$	17,356,690,799	0.07008%	4.60%	0.00322%	0.00177%	7.12%
COO	Cooper Cos.	418.94	0.01%	$	20,980,373,612	0.08471%	10.00%	0.00847%	0.00001%	10.01%
COST	Costco Wholesale	567.7	0.70%	$	247,501,804,885	0.99927%	10.84%	0.10832%	0.00699%	11.54%
CPB	Campbell Soup	43.46	3.42%	$	13,045,036,486	0.05267%	4.10%	0.00216%	0.00180%	7.52%
CSCO	Cisco Systems	63.37	2.50%	$	265,224,146,230	1.07082%	6.45%	0.06907%	0.02677%	8.95%
CSX	CSX Corp.	37.6	0.99%	$	82,131,907,782	0.33160%	15.60%	0.05173%	0.00328%	16.59%
CTAS	Cintas Corp.	443.17	0.88%	$	44,314,293,787	0.17892%	11.20%	0.02004%	0.00157%	12.08%
CTSH	Cognizant Technology	88.72	1.13%	$	46,647,593,313	0.18834%	12.03%	0.02266%	0.00213%	13.16%
CTXS	Citrix Sys.	94.59	1.76%	$	11,964,667,835	0.04831%	11.15%	0.00539%	0.00085%	12.91%
CVS	CVS Health	103.16	2.41%	$	135,860,469,862	0.54853%	6.33%	0.03472%	0.01322%	8.74%
D	Dominion Energy	78.56	3.39%	$	62,831,699,752	0.25368%	6.65%	0.01687%	0.00860%	10.04%
DD	DuPont de Nemours	80.78	1.71%	$	42,303,176,060	0.17080%	13.73%	0.02345%	0.00292%	15.44%
DG	Dollar General	235.83	0.76%	$	54,140,518,272	0.21859%	6.61%	0.01445%	0.00166%	7.37%
DHI	Horton D.R.	108.45	0.89%	$	37,606,732,856	0.15183%	7.00%	0.01063%	0.00135%	7.89%
DHR	Danaher Corp.	329.01	0.26%	$	226,456,504,613	0.91430%	17.16%	0.15689%	0.00238%	17.42%
DOV	Dover Corp.	181.6	1.10%	$	25,738,686,305	0.10392%	14.66%	0.01523%	0.00114%	15.76%
DPZ	Domino's Pizza	564.33	0.70%	$	19,954,867,558	0.08057%	12.22%	0.00985%	0.00056%	12.92%
DRE	Duke Realty Corp.	65.64	2.13%	$	24,225,881,454	0.09781%	6.00%	0.00587%	0.00208%	8.13%
DTE	DTE Energy	119.54	2.92%	$	22,976,045,624	0.09276%	2.65%	0.00246%	0.00271%	5.57%
DUK	Duke Energy	104.9	3.87%	$	79,650,110,909	0.32158%	5.45%	0.01753%	0.01245%	9.32%
EBAY	eBay Inc.	66.5	1.08%	$	41,403,884,335	0.16716%	11.87%	0.01984%	0.00181%	12.95%
ECL	Ecolab Inc.	234.59	0.87%	$	65,856,030,513	0.26589%	16.21%	0.04310%	0.00231%	17.08%
ED	Consol. Edison	85.32	4.32%	$	29,877,614,878	0.12063%	2.00%	0.00241%	0.00521%	6.32%
EFX	Equifax, Inc.	292.79	0.53%	$	34,775,308,602	0.14040%	13.68%	0.01921%	0.00074%	14.21%
EIX	Edison Int'l	68.25	4.68%	$	25,469,046,075	0.10283%	4.10%	0.00422%	0.00481%	8.78%
EL	Lauder (Estee)	370.2	0.65%	$	133,360,474,650	0.53843%	18.71%	0.10074%	0.00350%	19.36%
EMN	Eastman Chemical	120.91	2.62%	$	16,296,841,208	0.06580%	13.63%	0.00897%	0.00172%	16.25%
EMR	Emerson Electric	92.97	2.11%	$	54,907,919,902	0.22169%	12.90%	0.02860%	0.00468%	15.01%
EQR	Equity Residential	90.5	2.86%	$	33,552,699,871	0.13547%	6.10%	0.00826%	0.00387%	8.96%
ES	Eversource Energy	90.98	2.82%	$	30,705,286,227	0.12397%	6.68%	0.00828%	0.00350%	9.50%
ESS	Essex Property Trust	352.23	2.37%	$	22,519,741,125	0.09092%	7.90%	0.00718%	0.00215%	10.27%

ETN	Eaton Corp. plc	172.82	1.76%	$	67,554,709,348	0.27275%	18.00%	0.04909%	0.00480%	19.76%
ETR	Entergy Corp.	112.65	3.77%	$	22,441,561,528	0.09061%	3.85%	0.00349%	0.00342%	7.62%
EVRG	Evergy, Inc.	68.61	3.38%	$	15,576,532,480	0.06289%	5.70%	0.00358%	0.00213%	9.08%
EXPD	Expeditors Int'l	134.29	0.91%	$	22,228,318,996	0.08974%	3.40%	0.00305%	0.00082%	4.31%
EXR	Extra Space Storage	226.73	2.91%	$	29,183,057,626	0.11782%	6.00%	0.00707%	0.00343%	8.91%
FAST	Fastenal Co.	64.06	2.01%	$	36,195,020,351	0.14613%	6.33%	0.00925%	0.00294%	8.34%
FBHS	Fortune Brands Home	106.9	1.06%	$	14,143,513,645	0.05710%	8.70%	0.00497%	0.00061%	9.76%
FCX	Freep't-McMoRan Inc.	41.73	0.79%	$	61,360,144,080	0.24774%	18.10%	0.04484%	0.00196%	18.89%
FDS	FactSet Research	486.01	0.70%	$	17,878,868,282	0.07218%	6.29%	0.00454%	0.00051%	6.99%
FDX	FedEx Corp.	258.64	1.12%	$	68,642,946,211	0.27714%	11.65%	0.03229%	0.00310%	12.77%
FIS	Fidelity Nat'l Info.	109.15	1.25%	$	68,633,299,983	0.27710%	17.26%	0.04783%	0.00346%	18.51%
FMC	FMC Corp.	109.89	2.07%	$	14,056,730,453	0.05675%	8.31%	0.00472%	0.00117%	10.38%
FOX	Fox Corp. 'B'	34.27	1.24%	$	21,028,208,143	0.08490%	9.20%	0.00781%	0.00105%	10.44%
FRC	First Republic Bank	206.51	0.45%	$	36,714,674,420	0.14823%	16.35%	0.02424%	0.00067%	16.80%
FRT	Federal Rlty. Inv. T	136.32	3.14%	$	10,635,000,000	0.04294%	6.70%	0.00288%	0.00135%	9.84%
FTV	Fortive Corp.	76.29	0.37%	$	26,584,943,045	0.10733%	10.17%	0.01092%	0.00040%	10.54%
GD	Gen'l Dynamics	208.47	2.28%	$	57,891,263,635	0.23373%	8.35%	0.01952%	0.00533%	10.63%
GILD	Gilead Sciences	72.61	3.92%	$	90,528,818,813	0.36550%	1.30%	0.00475%	0.01433%	5.22%
GIS	Gen'l Mills	67.38	3.01%	$	39,847,833,129	0.16088%	4.61%	0.00742%	0.00484%	7.62%
GL	Globe Life Inc.	93.72	0.84%	$	9,658,660,634	0.03900%	7.37%	0.00287%	0.00033%	8.21%
GPC	Genuine Parts	140.2	2.33%	$	19,695,495,936	0.07952%	4.60%	0.00366%	0.00185%	6.93%
GPS	Gap (The), Inc.	17.65	1.94%	$	6,934,097,310	0.02800%	4.90%	0.00137%	0.00054%	6.84%
GRMN	Garmin Ltd.	136.17	1.70%	$	25,799,995,126	0.10417%	7.30%	0.00760%	0.00177%	9.00%
GWW	Grainger (W.W.)	518.24	1.61%	$	26,279,857,014	0.10610%	15.38%	0.01632%	0.00171%	16.99%
HAS	Hasbro, Inc.	101.78	2.67%	$	14,001,610,350	0.05653%	17.70%	0.01001%	0.00151%	20.37%
HCA	HCA Healthcare	256.92	0.76%	$	78,928,257,284	0.31867%	13.84%	0.04410%	0.00242%	14.60%
HD	Home Depot	415.01	1.61%	$	425,788,452,250	1.71909%	10.60%	0.18222%	0.02768%	12.21%
HIG	Hartford Fin'l Svcs.	69.04	2.23%	$	23,732,843,724	0.09582%	9.36%	0.00897%	0.00214%	11.59%
HII	Huntington Ingalls	186.74	2.62%	$	7,528,661,557	0.03040%	0.70%	0.00021%	0.00080%	3.32%
HON	Honeywell Int'l	208.51	1.68%	$	142,774,408,013	0.57644%	12.73%	0.07338%	0.00968%	14.41%
HPE	Hewlett Packard Ent.	15.77	3.25%	$	21,033,443,900	0.08492%	13.61%	0.01156%	0.00276%	16.86%
HPQ	HP Inc.	37.67	2.68%	$	43,496,031,254	0.17561%	16.52%	0.02901%	0.00471%	19.20%
HRL	Hormel Foods	48.81	2.35%	$	26,211,552,614	0.10583%	7.80%	0.00825%	0.00249%	10.15%
HSY	Hershey Co.	193.47	1.86%	$	39,511,510,288	0.15952%	8.82%	0.01407%	0.00297%	10.68%
HUM	Humana Inc.	463.86	0.64%	$	58,813,394,835	0.23745%	13.38%	0.03177%	0.00152%	14.02%
IBM	Int'l Business Mach.	133.66	4.91%	$	120,700,308,715	0.48732%	16.35%	0.07968%	0.02393%	21.26%
ICE	Intercontinental Exc	136.77	0.99%	$	75,417,299,941	0.30449%	8.88%	0.02704%	0.00301%	9.87%
IEX	IDEX Corp.	236.32	0.91%	$	17,586,841,453	0.07101%	12.00%	0.00852%	0.00065%	12.91%
IFF	Int'l Flavors & Frag	150.65	2.36%	$	38,151,490,614	0.15403%	8.10%	0.01248%	0.00364%	10.46%
INFO	IHS Markit	132.92	0.61%	$	51,705,798,852	0.20876%	11.05%	0.02307%	0.00127%	11.66%
INTC	Intel Corp.	51.5	2.71%	$	213,393,334,274	0.86156%	10.00%	0.08616%	0.02335%	12.71%
INTU	Intuit Inc.	643.22	0.42%	$	179,372,012,916	0.72420%	14.40%	0.10428%	0.00304%	14.82%
IPG	Interpublic Group	37.45	2.88%	$	14,828,817,005	0.05987%	16.60%	0.00994%	0.00172%	19.48%
IRM	Iron Mountain	52.33	5.31%	$	14,706,219,370	0.05938%	6.41%	0.00381%	0.00315%	11.72%
ITW	Illinois Tool Works	246.8	2.00%	$	75,924,602,331	0.30654%	14.37%	0.04405%	0.00613%	16.37%
J	Jacobs Engineering	139.23	0.62%	$	18,082,035,995	0.07300%	14.40%	0.01051%	0.00045%	15.02%
JKHY	Henry (Jack) & Assoc	166.99	1.11%	$	12,364,850,340	0.04992%	9.64%	0.00481%	0.00055%	10.75%
JNJ	Johnson & Johnson	171.07	2.53%	$	447,594,153,187	1.80712%	8.89%	0.16065%	0.04572%	11.42%
JNPR	Juniper Networks	35.71	2.87%	$	11,452,878,738	0.04624%	9.56%	0.00442%	0.00133%	12.43%
JPM	JPMorgan Chase	158.35	2.53%	$	478,664,437,627	1.93257%	8.25%	0.15944%	0.04889%	10.78%
K	Kellogg	64.42	3.65%	$	21,722,693,640	0.08770%	3.29%	0.00289%	0.00320%	6.94%
KEY	KeyCorp	23.13	3.17%	$	22,000,906,847	0.08883%	11.40%	0.01013%	0.00282%	14.57%

KIM	Kimco Realty	24.65	3.13%	$	15,176,455,415	0.06127%	4.60%	0.00282%	0.00192%	7.73%
KLAC	KLA Corp.	430.11	1.02%	$	65,447,678,539	0.26424%	15.15%	0.04003%	0.00270%	16.17%
KMB	Kimberly-Clark	142.92	3.19%	$	47,156,796,451	0.19039%	1.88%	0.00358%	0.00607%	5.07%
KMI	Kinder Morgan Inc.	15.86	6.47%	$	39,433,423,092	0.15921%	6.92%	0.01102%	0.01030%	13.39%
KO	Coca-Cola	59.21	2.92%	$	252,664,468,286	1.02011%	10.12%	0.10324%	0.02979%	13.04%
KR	Kroger Co.	45.26	2.01%	$	33,270,387,738	0.13433%	11.90%	0.01598%	0.00270%	13.91%
L	Loews Corp.	57.76	0.43%	$	14,779,646,892	0.05967%	14.03%	0.00837%	0.00026%	14.46%
LDOS	Leidos Hldgs.	88.9	1.56%	$	12,667,025,517	0.05114%	9.60%	0.00491%	0.00080%	11.16%
LEN	Lennar Corp.	116.16	0.98%	$	34,264,185,297	0.13834%	10.70%	0.01480%	0.00136%	11.68%
LHX	L3Harris Technologie	213.24	1.76%	$	41,633,142,758	0.16809%	10.60%	0.01782%	0.00296%	12.36%
LIN	Linde plc	346.43	1.27%	$	174,781,118,600	0.70566%	14.92%	0.10529%	0.00896%	16.19%
LLY	Lilly (Eli)	276.22	1.57%	$	258,021,624,615	1.04174%	14.80%	0.15418%	0.01636%	16.37%
LMT	Lockheed Martin	355.41	3.20%	$	97,909,684,698	0.39530%	4.35%	0.01720%	0.01265%	7.55%
LNT	Alliant Energy	61.47	2.85%	$	15,149,331,587	0.06116%	5.80%	0.00355%	0.00174%	8.65%
LOW	Lowe's Cos.	258.48	1.28%	$	172,277,156,983	0.69555%	17.70%	0.12311%	0.00890%	18.98%
LRCX	Lam Research	719.15	1.09%	$	101,473,624,808	0.40969%	15.72%	0.06440%	0.00447%	16.81%
LW	Lamb Weston Holdings	63.38	1.59%	$	9,266,572,751	0.03741%	17.40%	0.00651%	0.00059%	18.99%
MAA	Mid-America Apartmen	229.44	1.90%	$	25,849,699,100	0.10437%	7.00%	0.00731%	0.00198%	8.90%
MAS	Masco Corp.	70.22	1.63%	$	16,788,331,074	0.06778%	12.20%	0.00827%	0.00110%	13.83%
MCHP	Microchip Technology	87.06	1.08%	$	48,956,234,900	0.19766%	16.20%	0.03202%	0.00213%	17.28%
MCK	McKesson Corp.	248.57	0.76%	$	37,371,998,269	0.15089%	9.48%	0.01430%	0.00115%	10.24%
MCO	Moody's Corp.	390.58	0.63%	$	71,311,202,774	0.28791%	11.01%	0.03170%	0.00181%	11.64%
MDLZ	Mondelez Int'l	66.31	2.37%	$	90,935,439,674	0.36714%	9.25%	0.03396%	0.00870%	11.62%
MDT	Medtronic plc	103.45	1.94%	$	140,860,843,007	0.56871%	13.57%	0.07717%	0.01103%	15.51%
MET	MetLife Inc.	62.49	3.09%	$	53,573,485,613	0.21630%	7.60%	0.01644%	0.00668%	10.69%
MKC	McCormick & Co.	96.61	1.69%	$	25,501,492,300	0.10296%	6.50%	0.00669%	0.00174%	8.19%
MKTX	MarketAxess Holdings	411.27	0.65%	$	15,286,260,303	0.06172%	6.51%	0.00402%	0.00040%	7.16%
MLM	Martin Marietta	440.52	0.58%	$	27,598,367,759	0.11143%	15.80%	0.01761%	0.00065%	16.38%
MMC	Marsh & McLennan	173.82	1.23%	$	85,559,560,927	0.34544%	12.50%	0.04318%	0.00425%	13.73%
MMM	3M Company	177.63	3.33%	$	101,720,146,718	0.41069%	8.93%	0.03667%	0.01368%	12.26%
MO	Altria Group	47.39	7.83%	$	87,146,708,197	0.35185%	4.67%	0.01643%	0.02755%	12.50%
MOS	Mosaic Company	39.29	1.16%	$	15,278,957,452	0.06169%	7.00%	0.00432%	0.00072%	8.16%
MRK	Merck & Co.	76.64	3.62%	$	192,653,664,130	0.77782%	12.77%	0.09933%	0.02816%	16.39%
MS	Morgan Stanley	98.16	2.75%	$	181,379,168,245	0.73230%	6.07%	0.04445%	0.02014%	8.82%
MSCI	MSCI Inc.	612.69	0.57%	$	48,799,384,389	0.19702%	17.79%	0.03505%	0.00112%	18.36%
MSFT	Microsoft Corp.	336.32	0.74%	$	2,493,024,667,349	10.06538%	15.25%	1.53497%	0.07448%	15.99%
MSI	Motorola Solutions	271.7	1.19%	$	45,287,529,323	0.18284%	13.73%	0.02510%	0.00218%	14.92%
MTB	M&T Bank Corp.	153.58	3.13%	$	20,347,592,511	0.08215%	14.20%	0.01167%	0.00257%	17.33%
NDAQ	Nasdaq, Inc.	210.01	1.04%	$	34,048,888,087	0.13747%	14.44%	0.01985%	0.00143%	15.48%
NEE	NextEra Energy	93.36	1.89%	$	179,637,996,321	0.72527%	7.85%	0.05693%	0.01371%	9.74%
NI	NiSource Inc.	27.61	3.58%	$	10,732,622,154	0.04333%	3.52%	0.00153%	0.00155%	7.10%
NKE	NIKE, Inc. 'B'	166.67	0.72%	$	259,392,057,688	1.04727%	17.00%	0.17804%	0.00754%	17.72%
NLOK	NortonLifeLock Inc.	25.98	1.96%	$	15,058,551,839	0.06080%	14.50%	0.00882%	0.00119%	16.46%
NLSN	Nielsen Hldgs. plc	20.51	1.15%	$	7,533,886,043	0.03042%	5.30%	0.00161%	0.00035%	6.45%
NOC	Northrop Grumman	387.07	1.62%	$	60,940,270,386	0.24604%	6.70%	0.01648%	0.00399%	8.32%
NSC	Norfolk Southern	297.71	1.57%	$	70,735,348,409	0.28559%	14.33%	0.04092%	0.00448%	15.90%
NTAP	NetApp, Inc.	91.99	2.33%	$	20,694,664,880	0.08355%	12.04%	0.01006%	0.00195%	14.37%
NTRS	Northern Trust Corp.	119.61	2.54%	$	25,041,863,347	0.10110%	15.60%	0.01577%	0.00257%	18.14%
NWL	Newell Brands	21.84	3.63%	$	9,299,244,259	0.03754%	4.16%	0.00156%	0.00136%	7.79%
NXPI	NXP Semi. NV	227.78	1.02%	$	61,728,413,085	0.24922%	18.42%	0.04591%	0.00254%	19.44%
O	Realty Income Corp.	71.59	4.21%	$	39,929,409,123	0.16121%	5.45%	0.00879%	0.00679%	9.66%
OKE	ONEOK Inc.	58.76	7.12%	$	26,724,980,574	0.10790%	9.86%	0.01064%	0.00768%	16.98%

OMC	Omnicom Group	73.27	3.81%	$	15,695,311,477	0.06337%	9.50%	0.00602%	0.00241%	13.31%
ORCL	Oracle Corp.	87.21	1.40%	$	235,343,017,728	0.95018%	11.20%	0.10642%	0.01330%	12.60%
OTIS	Otis Worldwide	87.07	1.06%	$	35,977,924,533	0.14526%	11.96%	0.01737%	0.00154%	13.02%
PAYX	Paychex, Inc.	136.5	2.31%	$	48,496,547,424	0.19580%	6.83%	0.01337%	0.00452%	9.14%
PBCT	People's United Fin'	17.82	4.49%	$	7,815,734,771	0.03156%	13.73%	0.00433%	0.00142%	18.22%
PCAR	PACCAR Inc.	88.26	1.57%	$	30,747,758,422	0.12414%	19.78%	0.02456%	0.00195%	21.35%
PEAK	Healthpeak Propertie	36.09	3.53%	$	19,134,370,712	0.07725%	1.70%	0.00131%	0.00273%	5.23%
PEG	Public Serv. Enterpr	66.73	3.23%	$	33,318,180,884	0.13452%	2.35%	0.00316%	0.00434%	5.58%
PEP	PepsiCo, Inc.	173.71	2.79%	$	236,765,336,075	0.95592%	9.82%	0.09387%	0.02667%	12.61%
PFE	Pfizer, Inc.	59.05	2.73%	$	320,606,957,044	1.29442%	12.42%	0.16077%	0.03534%	15.15%
PFG	Principal Fin'l Grou	72.33	3.61%	$	19,538,265,231	0.07888%	15.64%	0.01234%	0.00285%	19.25%
PG	Procter & Gamble	163.58	2.17%	$	388,934,045,514	1.57029%	7.14%	0.11212%	0.03408%	9.31%
PH	Parker-Hannifin	318.12	1.42%	$	40,683,962,834	0.16426%	9.68%	0.01590%	0.00233%	11.10%
PHM	PulteGroup, Inc.	57.16	1.18%	$	14,287,263,485	0.05768%	18.10%	0.01044%	0.00068%	19.28%
PKG	Packaging Corp.	136.15	3.03%	$	12,752,506,845	0.05149%	16.86%	0.00868%	0.00156%	19.89%
PM	Philip Morris Int'l	95	4.91%	$	147,742,884,675	0.59650%	12.57%	0.07498%	0.02929%	17.48%
PNR	Pentair plc	73.03	1.07%	$	11,732,397,542	0.04737%	16.40%	0.00777%	0.00051%	17.47%
PNW	Pinnacle West Capita	70.59	4.10%	$	7,869,111,300	0.03177%	0.10%	0.00003%	0.00130%	4.20%
POOL	Pool Corp.	566	0.58%	$	22,120,937,109	0.08931%	17.00%	0.01518%	0.00052%	17.58%
PPG	PPG Inds.	172.44	1.62%	$	40,571,795,271	0.16381%	9.30%	0.01523%	0.00265%	10.92%
PRU	Prudential Fin'l	108.24	4.32%	$	41,663,149,439	0.16821%	10.40%	0.01749%	0.00727%	14.72%
PSA	Public Storage	374.56	2.39%	$	63,576,527,091	0.25668%	17.00%	0.04364%	0.00613%	19.39%
PWR	Quanta Services	114.66	0.27%	$	16,343,245,064	0.06598%	15.44%	0.01019%	0.00018%	15.71%
REG	Regency Centers Corp	75.35	3.43%	$	13,109,779,357	0.05293%	9.10%	0.00482%	0.00182%	12.53%
RJF	Raymond James Fin'l	100.4	1.01%	$	21,061,469,810	0.08503%	19.42%	0.01651%	0.00086%	20.43%
ROK	Rockwell Automation	348.85	1.30%	$	39,492,053,836	0.15945%	12.19%	0.01944%	0.00207%	13.49%
ROL	Rollins, Inc.	34.21	0.86%	$	16,404,907,067	0.06623%	8.20%	0.00543%	0.00057%	9.06%
ROP	Roper Tech.	491.86	0.49%	$	50,659,075,200	0.20453%	11.90%	0.02434%	0.00100%	12.39%
RSG	Republic Services	139.45	1.32%	$	42,478,021,536	0.17150%	9.67%	0.01658%	0.00226%	10.99%
SBNY	Signature Bank	323.47	0.71%	$	19,922,909,753	0.08044%	6.32%	0.00508%	0.00057%	7.03%
SEE	Sealed Air	67.47	1.43%	$	9,770,933,912	0.03945%	9.60%	0.00379%	0.00056%	11.03%
SHW	Sherwin-Williams	352.16	0.67%	$	89,230,612,704	0.36026%	11.88%	0.04280%	0.00241%	12.55%
SJM	Smucker (J.M.)	135.82	3.24%	$	14,526,087,290	0.05865%	1.11%	0.00065%	0.00190%	4.35%
SNA	Snap-on Inc.	215.38	2.64%	$	11,440,420,788	0.04619%	9.80%	0.00453%	0.00122%	12.44%
SO	Southern Co.	68.58	4.21%	$	71,663,881,770	0.28934%	6.50%	0.01881%	0.01218%	10.71%
SPG	Simon Property Group	159.77	4.00%	$	53,027,971,602	0.21410%	8.60%	0.01841%	0.00856%	12.60%
SPGI	S&P Global	471.93	0.65%	$	111,059,980,680	0.44840%	9.34%	0.04188%	0.00291%	9.99%
SRE	Sempra Energy	132.28	3.32%	$	42,031,187,028	0.16970%	4.30%	0.00730%	0.00563%	7.62%
STE	STERIS plc	243.41	0.75%	$	24,005,520,000	0.09692%	10.00%	0.00969%	0.00073%	10.75%
STT	State Street Corp.	93	2.63%	$	34,566,348,552	0.13956%	15.19%	0.02120%	0.00367%	17.82%
STX	Seagate Technology p	112.98	3.11%	$	25,026,502,334	0.10104%	14.57%	0.01472%	0.00314%	17.68%
STZ	Constellation Brands	250.97	1.21%	$	46,908,943,060	0.18939%	9.14%	0.01731%	0.00229%	10.35%
SWK	Stanley Black & Deck	188.62	1.70%	$	30,523,057,181	0.12323%	14.40%	0.01775%	0.00209%	16.10%
SWKS	Skyworks Solutions	155.14	1.32%	$	26,279,199,850	0.10610%	16.88%	0.01791%	0.00140%	18.20%
SYK	Stryker Corp.	267.42	0.94%	$	101,035,408,897	0.40792%	13.35%	0.05446%	0.00383%	14.29%
T	AT&T Inc.	24.6	8.36%	$	181,202,875,000	0.73159%	2.70%	0.01975%	0.06116%	11.06%
TAP	Molson Coors Beverag	46.35	0.72%	$	10,221,848,744	0.04127%	4.14%	0.00171%	0.00030%	4.86%
TECH	Bio-Techne Corp.	517.34	0.24%	$	19,456,277,129	0.07855%	15.00%	0.01178%	0.00019%	15.24%
TEL	TE Connectivity	161.34	1.35%	$	52,735,492,612	0.21292%	11.00%	0.02342%	0.00287%	12.35%
TER	Teradyne Inc.	163.53	0.37%	$	27,019,591,872	0.10909%	14.45%	0.01576%	0.00040%	14.82%
TFC	Truist Fin'l	58.55	3.48%	$	80,133,565,130	0.32353%	8.90%	0.02879%	0.01126%	12.38%
TFX	Teleflex Inc.	328.48	0.41%	$	15,764,730,966	0.06365%	11.00%	0.00700%	0.00026%	11.41%

TGT	Target Corp.	231.44	1.64%	$	110,140,958,495	0.44468%	13.29%	0.05910%	0.00729%	14.93%
TMO	Thermo Fisher Sci.	667.24	0.18%	$	253,837,902,171	1.02485%	4.99%	0.05114%	0.00184%	5.17%
TPR	Tapestry Inc.	40.6	2.46%	$	11,399,158,001	0.04602%	8.80%	0.00405%	0.00113%	11.26%
TROW	Price (T. Rowe) Grou	196.64	2.05%	$	44,251,283,319	0.17866%	15.80%	0.02823%	0.00366%	17.85%
TRV	Travelers Cos.	156.43	2.24%	$	38,401,943,961	0.15504%	8.15%	0.01264%	0.00347%	10.39%
TSCO	Tractor Supply	238.6	1.07%	$	26,892,184,433	0.10857%	8.95%	0.00972%	0.00116%	10.02%
TSN	Tyson Foods 'A'	87.16	2.12%	$	31,468,246,939	0.12705%	7.50%	0.00953%	0.00269%	9.62%
TXN	Texas Instruments	188.47	2.29%	$	174,897,396,265	0.70613%	10.00%	0.07061%	0.01617%	12.29%
UHS	Universal Health `B'	129.66	0.62%	$	10,510,362,925	0.04243%	7.90%	0.00335%	0.00026%	8.52%
UNH	UnitedHealth Group	502.14	1.39%	$	465,274,492,800	1.87851%	13.02%	0.24458%	0.02611%	14.41%
UNP	Union Pacific	251.93	1.98%	$	159,497,465,093	0.64396%	14.25%	0.09176%	0.01275%	16.23%
UPS	United Parcel Serv.	214.34	1.92%	$	184,258,104,000	0.74393%	15.89%	0.11821%	0.01428%	17.81%
USB	U.S. Bancorp	56.17	2.95%	$	84,727,019,674	0.34208%	12.08%	0.04132%	0.01009%	15.03%
V	Visa Inc.	216.71	0.69%	$	465,330,483,123	1.87873%	19.71%	0.37030%	0.01296%	20.40%
VMC	Vulcan Materials	207.58	0.73%	$	27,630,508,940	0.11156%	17.20%	0.01919%	0.00081%	17.93%
VNO	Vornado R'lty Trust	41.86	4.55%	$	8,236,528,506	0.03325%	17.33%	0.00576%	0.00151%	21.88%
VRSK	Verisk Analytics	228.73	0.54%	$	35,392,633,191	0.14289%	8.79%	0.01256%	0.00077%	9.33%
VTRS	Viatris Inc.	13.53	3.32%	$	17,082,676,125	0.06897%	0.40%	0.00028%	0.00229%	3.72%
VZ	Verizon Communic.	51.96	4.55%	$	216,965,236,961	0.87598%	3.59%	0.03145%	0.03986%	8.14%
WAB	Wabtec Corp.	92.11	0.58%	$	17,355,661,895	0.07007%	7.30%	0.00512%	0.00041%	7.88%
WBA	Walgreens Boots	52.16	3.60%	$	45,661,048,825	0.18435%	5.14%	0.00948%	0.00664%	8.74%
WEC	WEC Energy Group	97.07	3.05%	$	30,082,989,131	0.12146%	6.50%	0.00789%	0.00370%	9.55%
WELL	Welltower Inc.	85.77	2.84%	$	37,259,496,535	0.15043%	13.00%	0.01956%	0.00427%	15.84%
WHR	Whirlpool Corp.	234.66	2.42%	$	14,629,348,765	0.05906%	8.10%	0.00478%	0.00143%	10.52%
WLTW	Willis Towers Wat. p	237.49	1.23%	$	29,441,905,527	0.11887%	7.40%	0.00880%	0.00146%	8.63%
WM	Waste Management	166.9	1.49%	$	67,495,337,558	0.27251%	14.57%	0.03970%	0.00406%	16.06%
WMB	Williams Cos.	26.04	5.79%	$	31,937,037,079	0.12894%	5.00%	0.00645%	0.00747%	10.79%
WMT	Walmart Inc.	144.69	1.51%	$	398,245,684,776	1.60788%	7.99%	0.12847%	0.02428%	9.50%
WRB	Berkley (W.R.)	82.39	0.62%	$	14,472,148,025	0.05843%	9.00%	0.00526%	0.00036%	9.62%
WY	Weyerhaeuser Co.	41.18	1.97%	$	30,710,840,900	0.12399%	5.00%	0.00620%	0.00244%	6.97%
XEL	Xcel Energy Inc.	67.7	2.81%	$	36,312,124,168	0.14661%	6.30%	0.00924%	0.00412%	9.11%
XOM	Exxon Mobil Corp.	61.19	6.38%	$	266,418,372,601	1.07564%	1.00%	0.01076%	0.06863%	7.38%
YUM	Yum! Brands	138.86	1.59%	$	39,833,843,191	0.16083%	15.54%	0.02499%	0.00256%	17.13%
ZBH	Zimmer Biomet Hldgs.	127.04	0.65%	$	26,942,852,118	0.10878%	11.24%	0.01223%	0.00071%	11.89%
ZTS	Zoetis Inc.	244.03	0.46%	$	111,496,827,760	0.45016%	13.50%	0.06077%	0.00207%	13.96%
				$	24,768,314,335,080	100%		**12.39%**	**1.77%**	
								CAPM Weighted Return >	**14.16%**	

Excluded Entities (No Dividend / Negative Growth Rate / > 20% Growth Rate)

A	Agilent Technologies	159.65	0.53%	$	46,758,784,416	53.30%
AAL	Amer. Airlines	17.96	N/A	$	12,283,347,723	-124.20%
ABMD	ABIOMED Inc.	359.17	N/A	$	16,376,363,062	10.03%
ADBE	Adobe Inc.	567.06	N/A	$	267,437,672,131	18.47%
ADSK	Autodesk, Inc.	281.19	N/A	$	61,964,836,581	26.57%
AIG	Amer. Int'l Group	56.86	2.25%	$	47,949,680,625	31.70%
AKAM	Akamai Technologies	117.04	N/A	$	18,807,048,425	12.00%
ALB	Albemarle Corp.	233.77	0.67%	$	27,002,808,663	29.83%
ALGN	Align Techn.	657.18	N/A	$	51,119,648,534	31.83%
ALK	Alaska Air Group	52.1	N/A	$	6,784,023,451	-23.40%
ALL	Allstate Corp.	117.65	2.75%	$	34,214,780,162	-0.80%
AMAT	Applied Materials	157.36	0.61%	$	142,135,409,697	20.42%
AMD	Advanced Micro Dev.	143.9	N/A	$	182,904,618,707	32.44%
AME	AMETEK, Inc.	147.04	0.54%	$	33,359,394,224	-1.20%
AMZN	Amazon.com	3334.34	N/A	$	1,721,284,675,948	35.77%
ANET	Arista Networks	143.75	N/A	$	44,024,522,684	12.50%
ANSS	ANSYS, Inc.	401.12	N/A	$	34,298,476,210	12.14%
APA	APA Corp.	26.89	1.86%	$	10,097,206,416	-24.00%
APTV	Aptiv PLC	164.95	N/A	$	45,248,894,662	47.59%
AXP	Amer. Express	163.6	1.06%	$	133,147,025,928	41.00%
AZO	AutoZone Inc.	2096.39	N/A	$	42,279,865,110	14.00%
BA	Boeing	201.32	N/A	$	123,410,937,237	12.33%
BAC	Bank of America	44.49	1.90%	$	378,472,955,838	24.32%
BIIB	Biogen	239.92	N/A	$	36,130,462,417	-6.50%
BIO	Bio-Rad Labs. 'A'	755.57	N/A	$	21,548,079,865	17.80%
BKNG	Booking Holdings	2399.23	N/A	$	99,543,208,960	210.98%
BKR	Baker Hughes	24.06	2.99%	$	25,916,898,676	348.10%
BRKB	Berkshire Hathaway '	299	N/A	$	674,241,184,830	23.30%
BSX	Boston Scientific	42.48	N/A	$	61,103,658,482	21.40%
BWA	BorgWarner	45.07	1.55%	$	10,916,782,443	21.50%
C	Citigroup Inc.	60.39	3.39%	$	124,354,009,256	28.35%
CAT	Caterpillar Inc.	206.74	2.15%	$	111,785,599,003	32.24%
CB	Chubb Ltd.	193.31	1.73%	$	82,960,757,749	26.32%
CBRE	CBRE Group	108.51	N/A	$	36,368,131,873	11.00%
CCI	Crown Castle Int'l	208.74	2.95%	$	88,588,690,431	21.00%
CCL	Carnival Corp.	20.12	N/A	$	24,136,626,485	-115.60%
CDAY	Ceridian HCM Holding	104.46	N/A	$	15,824,713,994	28.60%
CDNS	Cadence Design Sys.	186.35	N/A	$	50,833,397,447	11.70%
CE	Celanese Corp.	168.06	1.64%	$	18,661,831,090	28.36%
CF	CF Industries	70.78	2.03%	$	15,294,240,250	-5.21%
CFG	Citizens Fin'l Group	47.25	3.35%	$	20,930,657,705	-2.76%
CHTR	Charter Communic.	651.97	N/A	$	116,051,483,732	36.75%
CMA	Comerica Inc.	87	3.75%	$	11,669,602,868	-10.70%
CMG	Chipotle Mex. Grill	1748.25	N/A	$	48,091,840,593	58.20%
CNC	Centene Corp.	82.4	N/A	$	47,864,742,174	11.28%
COF	Capital One Fin'l	145.09	1.45%	$	63,141,026,297	45.20%
COP	ConocoPhillips	72.18	2.40%	$	97,113,990,357	-1.80%
CPRT	Copart, Inc.	151.62	N/A	$	35,075,421,750	22.30%
CRL	Charles River	376.78	N/A	$	18,240,861,592	16.55%
CRM	salesforce.com	254.13	N/A	$	247,266,062,427	10.37%
CTLT	Catalent, Inc.	128.03	N/A	$	21,395,076,814	16.60%

CTRA	Coterra Energy Inc	19	2.14%	$	346,432,000	24.87%
CTVA	Corteva, Inc.	47.28	1.21%		#N/A	21.97%
CVX	Chevron Corp.	117.35	4.60%	$	230,049,920,840	-4.90%
DAL	Delta Air Lines	39.08	N/A	$	26,067,761,781	-23.70%
DE	Deere & Co.	342.89	1.20%	$	106,485,886,843	41.52%
DFS	Discover Fin'l Svcs.	115.56	1.75%	$	34,779,304,649	55.80%
DGX	Quest Diagnostics	173.01	1.67%	$	20,229,459,393	-8.60%
DIS	Disney (Walt)	154.89	N/A	$	285,299,141,003	50.89%
DISCK	Discovery Communic.	22.9	N/A	$	12,729,460,029	20.00%
DISH	Dish Network 'A'	32.44	N/A	$	17,492,446,944	-22.34%
DLR	Digital Realty Trust	176.87	2.62%	$	48,839,813,272	27.70%
DLTR	Dollar Tree, Inc.	140.52	N/A	$	31,713,173,473	7.58%
DOW	Dow Inc.	56.72	5.20%	$	42,387,302,279	-5.43%
DRI	Darden Restaurants	150.64	2.92%	$	19,444,374,668	29.57%
DVA	DaVita Inc.	113.76	N/A	$	11,647,158,880	17.33%
DVN	Devon Energy	44.05	1.45%	$	30,458,226,637	25.00%
DXC	DXC Technology	32.19	N/A	$	8,346,581,930	28.43%
DXCM	DexCom Inc.	536.95	N/A	$	50,631,105,895	16.40%
EA	Electronic Arts	131.9	0.52%	$	37,624,787,725	26.27%
ENPH	Enphase Energy	182.94	N/A	$	25,023,551,375	41.97%
EOG	EOG Resources	88.83	2.33%	$	52,968,187,932	60.06%
EPAM	EPAM Systems	668.45	N/A	$	37,126,922,804	24.75%
EQIX	Equinix, Inc.	845.84	1.36%	$	73,955,788,067	40.10%
ETSY	Etsy, Inc.	218.94	N/A	$	27,331,705,903	52.80%
EW	Edwards Lifesciences	129.55	N/A	$	79,552,688,104	16.11%
EXC	Exelon Corp.	57.76	3.23%	$	54,844,497,211	-0.47%
EXPE	Expedia Group	180.72	N/A	$	28,040,182,842	8.50%
F	Ford Motor	20.77	1.97%	$	86,778,373,924	72.06%
FANG	Diamondback Energy	107.85	1.89%	$	20,217,261,791	52.89%
FB	Meta Platforms	336.35	N/A	$	944,574,079,248	28.60%
FE	FirstEnergy Corp.	41.59	4.22%	$	22,408,306,536	-1.84%
FFIV	F5, Inc.	244.71	N/A	$	14,802,200,197	12.80%
FISV	Fiserv Inc.	103.79	N/A	$	70,644,813,300	18.85%
FITB	Fifth Third Bancorp	43.55	2.91%	$	30,406,683,518	-2.98%
FLT	FleetCor Technologie	223.84	N/A	$	18,734,134,169	15.00%
FTNT	Fortinet Inc.	359.4	N/A	$	55,432,939,685	16.62%
GE	Gen'l Electric	94.47	0.32%	$	106,420,363,781	263.58%
GLW	Corning Inc.	37.23	2.55%	$	31,815,067,838	24.00%
GM	Gen'l Motors	58.63	N/A	$	88,868,349,270	13.30%
GNRC	Generac Holdings	351.92	N/A	$	22,015,242,312	8.00%
GOOG	Alphabet Inc.	2893.59	N/A	$	1,926,107,178,273	24.41%
GOOGL	Alphabet Inc. 'A'	2897.04	N/A	$	1,925,238,104,135	24.41%
GPN	Global Payments	135.18	0.74%	$	40,383,200,136	20.10%
GS	Goldman Sachs	382.55	2.08%	$	132,333,625,431	20.91%
HAL	Halliburton Co.	22.87	0.79%	$	21,140,453,178	55.20%
HBAN	Huntington Bancshs.	15.42	3.75%	$	23,020,426,759	-2.15%

HES	Hess Corp.	74.03	1.45%	$	23,409,152,111	-23.40%
HLT	Hilton Worldwide Hld	155.99	N/A	$	43,430,417,335	278.95%
HOLX	Hologic, Inc.	76.56	N/A	$	18,627,743,924	4.10%
HSIC	Schein (Henry)	77.53	N/A	$	10,687,635,965	16.68%
HST	Host Hotels & Resort	17.39	N/A	$	12,731,243,995	28.40%
HWM	Howmet Aerospace	31.83	N/A	$	13,880,313,537	30.80%
IDXX	IDEXX Labs.	658.46	N/A	$	54,038,960,244	17.22%
ILMN	Illumina Inc.	380.44	N/A	$	59,359,575,831	24.03%
INCY	Incyte Corp.	73.4	N/A	$	16,217,780,105	20.89%
IP	Int'l Paper	46.98	3.89%	$	18,201,361,000	25.83%
IPGP	IPG Photonics	172.14	N/A	$	9,234,159,062	42.00%
IQV	IQVIA Holdings	282.14	N/A	$	51,967,170,245	19.39%
IR	Ingersoll Rand Inc.	61.87	N/A	$	24,736,308,814	17.52%
ISRG	Intuitive Surgical	359.3	N/A	$	127,260,553,650	14.57%
IT	Gartner Inc.	334.32	N/A	$	26,545,933,968	16.40%
IVZ	Invesco Ltd.	23.02	2.98%	$	10,833,735,881	22.55%
JBHT	Hunt (J.B.)	204.4	0.59%	$	21,377,660,035	20.50%
JCI	Johnson Ctrls. Int'l	81.31	1.34%	$	55,990,906,072	20.05%
KEYS	Keysight Technologie	206.51	N/A	$	37,185,062,442	13.97%
KHC	Kraft Heinz Co.	35.9	4.42%	$	43,735,020,099	-2.82%
KMX	CarMax, Inc.	130.23	N/A	$	21,008,236,035	19.60%
LH	Laboratory Corp.	314.21	N/A	$	28,956,428,668	-9.75%
LKQ	LKQ Corp.	60.03	1.75%	$	17,151,330,484	33.50%
LNC	Lincoln Nat'l Corp.	68.26	2.64%	$	12,700,200,187	41.25%
LUMN	Lumen Technologies	12.55	7.66%	$	13,085,365,046	-10.20%
LUV	Southwest Airlines	42.84	N/A	$	25,955,686,711	-21.00%
LVS	Las Vegas Sands	37.64	N/A	$	29,795,594,400	-6.25%
LYB	LyondellBasell Inds.	92.23	4.90%	$	31,334,933,242	51.39%
LYV	Live Nation Entertai	119.69	N/A	$	27,415,247,322	80.30%
MA	MasterCard Inc.	359.32	0.54%	$	359,340,856,955	27.30%
MAR	Marriott Int'l	165.24	N/A	$	53,529,274,514	238.33%
MCD	McDonald's Corp.	268.07	2.06%	$	199,813,415,399	20.42%
MGM	MGM Resorts Int'l	44.88	0.02%	$	21,572,150,800	-129.20%
MHK	Mohawk Inds.	182.18	N/A	$	12,425,499,400	4.00%
MNST	Monster Beverage	96.04	N/A	$	50,725,918,691	14.85%
MPC	Marathon Petroleum	63.99	4.05%	$	40,647,255,079	-17.53%
MPWR	Monolithic Power Sys	493.33	0.49%	$	22,779,161,162	25.00%
MRNA	Moderna, Inc.	253.98	N/A	$	95,653,668,889	16.80%
MRO	Marathon Oil Corp.	16.42	1.45%	$	13,161,170,210	-2.40%
MTCH	Match Group	132.25	N/A	$	38,349,552,389	29.60%
MTD	Mettler-Toledo Int'l	1697.21	N/A	$	37,702,672,574	17.80%
MU	Micron Technology	93.15	0.21%	$	105,911,982,368	58.64%
NCLH	Norwegian Cruise Lin	20.74	N/A	$	9,223,720,012	-24.13%
NEM	Newmont Corp.	62.02	3.81%	$	49,002,399,793	-1.60%
NFLX	Netflix, Inc.	602.44	N/A	$	265,237,495,149	43.04%
NOW	ServiceNow, Inc.	649.11	N/A	$	126,446,584,655	24.73%
NRG	NRG Energy	43.08	3.53%	$	10,359,121,502	41.00%

NUE	Nucor Corp.	114.15	1.55%	$	33,186,980,664	29.06%
NVDA	NVIDIA Corp.	294.11	0.07%	$	761,503,219,604	32.60%
NVR	NVR, Inc.	5908.87	N/A	$	20,025,829,261	4.80%
NWS	News Corp. 'B'	22.5	0.84%	$	13,578,334,267	n/a
ODFL	Old Dominion Freight	358.38	0.22%	$	39,757,036,205	22.70%
OGN	Organon & Co.	30.45	3.73%	$	7,773,842,961	-1.00%
ORLY	O'Reilly Automotive	706.23	N/A	$	46,805,738,083	13.62%
OXY	Occidental Petroleum	28.99	0.12%	$	28,682,555,654	-5.15%
PAYC	Paycom Software	415.19	N/A	$	24,261,832,290	27.00%
PENN	Penn Nat'l Gaming	51.85	N/A	$	8,965,616,512	263.90%
PGR	Progressive Corp.	102.65	0.39%	$	59,787,650,712	-9.80%
PKI	PerkinElmer Inc.	201.06	0.15%	$	24,514,369,425	37.90%
PLD	Prologis	168.36	1.89%	$	120,584,238,212	-6.05%
PNC	PNC Financial Serv.	200.52	2.49%	$	86,992,156,637	-4.02%
PPL	PPL Corp.	30.06	5.83%	$	22,348,812,686	-16.20%
PSX	Phillips 66	72.46	5.25%	$	33,160,728,437	-11.15%
PTC	PTC Inc.	121.15	N/A	$	14,240,681,804	21.41%
PVH	PVH Corp.	106.65	N/A	$	7,772,327,917	-5.57%
PXD	Pioneer Natural Res.	181.88	1.26%	$	45,132,995,926	62.00%
PYPL	PayPal Holdings	188.58	N/A	$	227,548,690,948	20.29%
QCOM	Qualcomm Inc.	182.87	1.49%	$	207,528,723,144	32.19%
QRVO	Qorvo Inc.	156.39	N/A	$	17,536,511,792	15.40%
RCL	Royal Caribbean	76.9	N/A	$	20,658,357,450	58.70%
RE	Everest Re Group Ltd	273.92	2.45%	$	10,792,620,978	72.51%
REGN	Regeneron Pharmac.	631.52	N/A	$	67,254,165,384	4.00%
RF	Regions Financial	21.8	2.88%	$	21,534,651,820	44.80%
RHI	Robert Half Int'l	111.52	1.54%	$	12,304,202,278	27.30%
RL	Ralph Lauren	118.86	2.35%	$	8,930,481,729	74.15%
RMD	ResMed Inc.	260.48	0.66%	$	37,388,176,834	23.00%
ROST	Ross Stores	114.28	1.06%	$	40,724,931,597	89.78%
RTX	Raytheon Technologie	86.06	2.47%	$	130,010,051,133	24.30%
SBAC	SBA Communications	389.02	0.64%	$	40,659,185,305	183.48%
SBUX	Starbucks Corp.	116.97	1.74%	$	136,501,701,859	54.89%
SCHW	Schwab (Charles)	84.1	0.96%	$	161,287,081,384	21.15%
SEDG	SolarEdge Tech.	280.57	N/A	$	14,801,572,798	20.30%
SIVB	SVB Fin'l Group	678.24	N/A	$	40,368,707,225	8.00%
SLB	Schlumberger Ltd.	29.95	1.58%	$	43,509,645,282	53.50%
SNPS	Synopsys, Inc.	368.5	N/A	$	55,705,009,683	16.00%
SYF	Synchrony Financial	46.39	1.76%	$	25,912,717,549	38.20%
SYY	Sysco Corp.	78.55	2.56%	$	40,371,683,625	53.81%
TDG	TransDigm Group	636.28	N/A	$	35,296,305,056	12.80%
TDY	Teledyne Technologie	436.89	N/A	$	20,517,543,598	18.30%
TJX	TJX Companies	75.92	1.51%	$	90,945,016,171	126.20%
TMUS	T-Mobile US	115.98	N/A	$	144,115,731,709	40.25%
TRMB	Trimble Inc.	87.19	N/A	$	21,850,273,281	10.00%
TSLA	Tesla, Inc.	1056.78	N/A	$	1,170,720,758,000	51.75%

TT	Trane Technologies p	202.03	1.20%	$	46,320,319,500	20.91%
TTWO	Take-Two Interactive	177.72	N/A	$	20,139,398,387	12.30%
TWTR	Twitter Inc.	43.22	N/A	$	34,599,120,739	41.00%
TXT	Textron, Inc.	77.2	0.11%	$	17,003,599,793	27.85%
TYL	Tyler Technologies	537.95	N/A	$	21,676,888,733	10.00%
UA	Under Armour 'C'	18.04	N/A	$	9,242,627,924	21.80%
UAL	United Airlines Hldg	43.78	N/A	$	14,898,336,521	-159.00%
UDR	UDR, Inc.	59.99	2.55%	$	18,223,440,097	-34.21%
ULTA	Ulta Beauty	412.34	N/A	$	22,612,472,906	56.90%
URI	United Rentals	332.29	N/A	$	24,105,901,426	16.95%
VFC	V.F. Corp.	73.22	2.88%	$	28,838,068,404	47.71%
VIAC	ViacomCBS Inc.	30.18	2.89%	$	21,226,409,463	-2.99%
VLO	Valero Energy	75.11	5.80%	$	31,905,522,794	-13.00%
VRSN	VeriSign Inc.	253.82	N/A	$	27,929,553,167	8.00%
VRTX	Vertex Pharmac.	219.6	N/A	$	55,833,718,791	9.80%
VTR	Ventas, Inc.	51.12	3.25%	$	20,477,718,235	-10.90%
WAT	Waters Corp.	372.6	N/A	$	21,972,439,041	9.30%
WDC	Western Digital	65.21	N/A	$	20,395,686,946	47.80%
WFC	Wells Fargo	47.98	1.56%	$	200,836,871,581	114.28%
WRK	WestRock Co.	44.36	1.80%	$	11,774,281,771	24.26%
WST	West Pharmac. Svcs.	469.01	0.15%	$	33,078,817,281	25.80%
WYNN	Wynn Resorts	85.04	N/A	$	10,239,193,745	-114.90%
XLNX	Xilinx Inc.	212.03	N/A	$	54,670,518,464	9.00%
XRAY	Dentsply Sirona	55.79	0.67%	$	12,290,085,806	26.35%
XYL	Xylem Inc.	119.92	0.90%	$	21,125,109,170	21.89%
ZBRA	Zebra Techn. 'A'	595.2	N/A	$	31,533,685,458	10.00%
ZION	Zions Bancorp.	63.16	2.39%	$	10,091,107,412	-32.40%

CAPM - Current 30-Year Treasury Yields

Month	Risk-Free Rate 30-Year 1/
Jul-21	1.94
Aug-21	1.92
Sep-21	1.94
Oct-21	2.06
Nov-21	1.94
Dec-21	1.85
Six-Month Average	1.94%

1/ 6-month average of 30-year U.S. Treasury Constant Maturity Rate series, St. Louis FRED.

Source: Federal Reserve statistical release H.15
https://www.federalreserve.gov/datadownload/Choose.aspx?rel=H15

Duff & Phelps - 2020 Valuation Handbook

CSRP Deciles Size Premium as of December 31, 2020 (Duff & Phelps Cost of Capital Navigator)

Breakdown of CSRP Deciles 1 - 10	Market Capitalization (in $ Millions)					Return in Excess of CAPM
1-Largest	$	29,025.803	–	$	1,966,078.882	-0.22%
2	$	13,178.743	–	$	28,808.073	0.49%
3	$	6,743.361	–	$	13,177.828	0.71%
4	$	3,861.858	–	$	6,710.676	0.75%
5	$	2,445.693	–	$	3,836.536	1.09%
6	$	1,591.865	–	$	2,444.745	1.37%
7	$	911.586	–	$	1,591.765	1.54%
8	$	451.955	–	$	911.103	1.46%
9	$	190.019	–	$	451.800	2.29%
10-Smallest	$	20.194	–	$	189.831	5.01%

Proxy Group Capital Structures and Cost of Debt - Core Proxy Group
as of December 31, 2020

Proxy Entity		Equity ($ Millions)			Debt ($ Millions)			Interest Expense ($ Millions)	Debt Cost	Source
Kinder Morgan Inc.	$	31,838	49.77%	$	32,131	50.23%	$	1,595	4.96%	2020 Form 10-K
Pembina Pipeline Corporation	$	15,015	59.37%	$	10,276	40.63%	$	420	4.09%	2020 Form 40-F
TC Energy Corporation	$	33,080	48.65%	$	34,913	51.35%	$	2,228	6.38%	2020 Form 40-F
The Williams Companies, Inc.	$	14,583	40.47%	$	21,451	59.53%	$	1,192	5.56%	2020 Form 10-K
Proxy Group Average			49.57%			50.43%			5.25%	
Proxy Group Median			49.21%			50.79%			5.26%	
Proxy Group Low			40.47%			40.63%			4.09%	
Proxy Group High			59.37%			59.53%			6.38%	

Proxy Group Capital Structures and Cost of Debt - Expanded Proxy Group
as of December 31, 2020

Proxy Entity		Equity ($ Millions)			Debt ($ Millions)			Interest Expense ($ Millions)	Debt Cost	Source
Enbridge, Inc.	$	64,363	50.61%	$	62,819	49.39%	$	2,790	4.44%	2020 Form 10-K
Kinder Morgan Inc.	$	31,838	49.77%	$	32,131	50.23%	$	1,595	4.96%	2020 Form 10-K
ONEOK, Inc.	$	6,042	29.81%	$	14,228	70.19%	$	713	5.01%	2020 Form 10-K
Pembina Pipeline Corporation	$	15,015	59.37%	$	10,276	40.63%	$	420	4.09%	2020 Form 40-F
TC Energy Corporation	$	33,080	48.65%	$	34,913	51.35%	$	2,228	6.38%	2020 Form 40-F
The Williams Companies, Inc.	$	14,583	40.47%	$	21,451	59.53%	$	1,192	5.56%	2020 Form 10-K
Proxy Group Average			46.45%			53.55%			5.07%	
Proxy Group Median			49.21%			50.79%			4.99%	
Proxy Group Low			29.81%			40.63%			4.09%	
Proxy Group High			59.37%			70.19%			6.38%	

Exhibit ____ (CPC-0001)

BEFORE THE

NORTH CAROLINA UTILITIES COMMISSION

Docket No. G-39, SUB 47

DIRECT TESTIMONY
OF
STEVEN FALL

ON BEHALF OF

CARDINAL PIPELINE COMPANY, LLC

March 15, 2022

BEFORE THE
NORTH CAROLINA UTILITIES COMMISSION

	)	
Cardinal Pipeline Company, LLC	)	**Docket No. G-39, Sub 47**
	)	

PREPARED DIRECT TESTIMONY OF STEVEN R. FALL ON BEHALF OF CARDINAL PIPELINE COMPANY, LLC

March 15, 2022

GLOSSARY OF TERMS

ACC	Anchor Construction Corporation
BWMQ	Brown, Williams, Moorhead & Quinn, Inc.
CCI	City Cost Index Adjustment Factor
CM	Construction Management
NCUC	North Carolina Utilities Commission
Commission	North Carolina Utilities Commission
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
Cardinal	Cardinal Pipeline Company, LLC
FEMA	Federal Emergency Management Agency
GSA	General Services Administration
Interim Retirement	The replacement of facilities required to maintain the system during the system's useful life.
M&R	Measuring and Regulating
MTO	Material Take Off. MTO refers to a list of materials with quantities (such as building volume) and types (such as specific grades of steel) that are required to build a designed structure or item.
O&P	Overhead and Profit
ROW	Right-of-way
TDC	Terminal Decommissioning Cost
Terminal Decommissioning	The dismantlement and removal of the entire network at the end of its useful life.
USACE	U.S. Army Corps of Engineers
WSSC	Washington Suburban Sanitary Commission

BEFORE THE
NORTH CAROLINA UTILITIES COMMISSION

Cardinal Pipeline Company, LLC	**)))**	**Docket No. G-39, Sub 47**

Prepared Direct Testimony of Steven R. Fall

I. INTRODUCTION

Q. Please state your name, occupation, and business address.

A. My name is Steven R. Fall. I am a Vice President employed with the firm of Brown, Williams, Moorhead & Quinn, Inc. ("BWMQ"), an energy consulting firm providing thorough analytical expertise and litigation support on behalf of clients across a wide range of energy issues.

Q. What is the nature of the work performed by your firm?

A. We offer technical, economic and policy assistance to the various segments of the natural gas pipeline industry, oil pipeline industry and electric utility industry on business and regulatory matters.

Q. On whose behalf are you submitting this testimony?

A. I am submitting this testimony on behalf of Cardinal Pipeline Company, LLC ("Cardinal").

Q. Briefly describe the purpose of your testimony in this proceeding.

A. The purpose of my testimony is to present my recommendation regarding the proper and adequate depreciation rates for Cardinal based on appropriate remaining life factors applicable to the Cardinal natural gas pipeline system and an economic life. I am also recommending appropriate recovery rates for costs associated with annual plant retirements between now and the 2050 truncation date. In addition, I am recommending recovery rates for the costs associated with the terminal decommissioning, removal, and rehabilitation of the pipeline right of way upon the final abandonment of the pipeline system based on the Terminal Decommissioning Study performed, as submitted to the North Carolina Utilities Commission ("Commission" or "NCUC") on October 26, 2021 in Docket No. G-39, Sub 46.

Q. Please briefly state your professional experience and qualifications.

A. Before joining BWMQ, I was a Project Manager at the Washington D.C. Department of Consumer and Regulatory Affairs, where I handled regulatory compliance for high-impact projects. I coordinated between council members, property owners, private contractors, and city construction inspectors to bring on-going construction projects into compliance with building regulations and codes. Before that, from 2014 to 2017, I was Project Engineer for Anchor Construction Corporation ("ACC") of Washington, D.C., which specializes in major underground utility construction projects.

Since joining BWMQ in 2017, I have been integral in developing terminal decommissioning and depreciation studies before the Federal Energy Regulatory Commission ("FERC").

Q. Have you previously provided testimony before the North Carolina Utilities Commission?

A. I have not provided testimony before the NCUC. However, I prepared a depreciation rate study and terminal decommissioning study ("Depreciation Study") for Cardinal, which was submitted pursuant to NCUC Rule R6-80 on October 26, 2021, in Docket No. G-39, Sub 46. The Depreciation Study is attached as Exhibit No. CPC-0007. In addition, please refer to Exhibit No. CPC-0002 for a more comprehensive list of testimony before the FERC.

Q. Please identify the exhibits and schedules you are sponsoring in this proceeding.

A. In addition to my testimony, I am sponsoring the following exhibits in this proceeding:

- Exhibit No. CPC-0002: Curriculum Vitae of Steven R. Fall
- Exhibit No. CPC-0003: Depreciation Workpapers
- Exhibit No. CPC-0004: Transmission Survivor Curves
- Exhibit No. CPC-0005: TDC Workpapers;
- Exhibit No. CPC-0006: TDC Supporting Documents.
- Exhibit No. CPC-0007: Depreciation Study

I will discuss and explain these exhibits in my testimony.

Q. Were your testimony and exhibits prepared by you or under your supervision?

A. Yes.

Q. Please provide an overview of how your depreciation study estimate is organized.

A. My testimony is organized as follows:

- In Section II of my testimony, I describe the Cardinal Pipeline Company System Operations.
- In Section III, I describe depreciation theory, methodology, and economic life rationale.
- In Section IV, I describe terminal decommissioning calculations.
- In Section V, I conclude with depreciation rate recommendations.

II. CARDINAL SYSTEM OPERATIONS

Q. Please provide a brief description of Cardinals' transmission system.

A. Cardinal is an intrastate natural gas pipeline consisting of 104 miles of 24-inch diameter pipeline extending from Transcontinental Gas Pipe Line Company, LLC's Compressor Station 160 in Rockingham County, North Carolina to the Raleigh, North Carolina area. The Cardinal pipeline system consists of (1) the original 24-inch diameter, 37-mile Cardinal Pipeline, which originates in Rockingham County, North Carolina and extends to the southeast of Burlington, North Carolina to provide 134,550 dekatherms ("Dth") per day of firm natural gas transportation capacity, (2) the 24-inch diameter Cardinal Extension, which was placed into service on November 1, 1999, and extends approximately 67-miles from Burlington, North Carolina to the area of Raleigh, North Carolina adding 144,900 Dth per day of firm natural gas transportation capacity, and (3) the 2012 Expansion Project, which was placed into service on June 1, 2012, adding 199,000 Dth per day of firm natural gas transportation capacity through the installation of a 14,205 horsepower greenfield compressor station in Guilford County, North Carolina, and upgrades at certain existing measuring and regulating stations.

III. DEPRECIATION

Q. What is the definition of "depreciation"?

A. The FERC defines "depreciation" as:

> [T]he loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of gas plant in the course of service from causes which are known to be in current operation and against which the utility is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand and requirements of public authorities, and in the case of natural gas companies, the exhaustion of natural resources.

18 C.F.R. Part 201, Definitions, 12.B (2020).

A. Depreciation Theory

Q. Please describe depreciation theory.

A. Depreciation is a term used in accounting, economics, and finance to convey the concept of the inherent loss of value in an entity's capital assets over time and the associated allocation of that loss in capital value over some defined period. Capital costs are those costs incurred to acquire plant and equipment that will be used over several accounting periods to facilitate the provision of an entity's goods and services. The recovery of the capital costs must occur within the economic lifespan of the asset. The tools used in depreciation analysis are the foundation for allocating capital costs over the useful life of a depreciable asset in order to provide investors the opportunity to recoup their investment in a reasonable and consistent manner during the expected service life of the asset.

Oil and gas pipeline systems are built to safely transport hydrocarbons for many years. Properly maintained, all pipeline assets have very long-life expectancies. However, what goes into the ground as a state-of-the-art industrial asset will, one day, run up against various factors that will cause the asset to be retired. First, simple usage takes its toll on any asset. Under normal usage, every asset has a range of service life expectancy that will define its maximum depreciable life. But various factors can shorten that expectation, such as extreme weather-related damage, third-party damage, or governmental regulations. These often bring an immediate end to the facilities' useful life. Other factors can shorten a life expectation not because the asset itself fails but because changes in technology, methodology, or regulations render the asset obsolete. Improvements in safety, efficiency, or usefulness can lead to the retirement/replacement of assets that might otherwise have remained in service for many years. Depreciation theory allows for the truncation of the useful life of facilities based on these considerations.

Q. Are there any other factors that may influence the useful life of an asset?

A. "Loss in service value" is the diminishment of the ability of an asset to provide useful service to the utility. Loss in service value occurs broadly from two sources: first, physical causes (e.g., wear and tear, decay, and action of the elements), and, second, economic causes (e.g., inadequacy, technological or economic obsolescence, changes in the art, changes in demand, requirements of public authorities, and the exhaustion of natural resources).

B. Depreciation Methodology

Q. Please explain your depreciation methodology.

A. This study uses the broad group, straight line, average remaining life method of depreciation for Cardinal's transmission function and whole life method for general plant. Under this method, all of the assets within a group are considered to be homogeneous units of plant used and treated alike across the system regardless of the vintage, construction techniques, or retirement rate. In practice, there are two levels of grouping – by account and by function. For natural gas pipelines generally, the accounts are combined into a larger functional group, such as storage or transmission, with one depreciation rate for the whole function.

The depreciable lives of a pipeline entity's assets are bound by three life expectancy estimates: 1) the average physical service life expectancy of the various classes of property; 2) the estimated remaining life of the resource base supporting the need for the assets; and 3) the estimated remaining economic life of the demand for services provided by the capital assets. These three factors set the stage for calculating the average remaining depreciable life, which also takes into account the truncation date and interim retirements. The service life measures the physical life expectancy of the plant in service, absent specific economic or resource limitations. The remaining life of the resource base measures the expectations for the exhaustion of natural resources and its impact on the assets in question. The remaining economic life is the life expectancy as impacted by economic forces such as changes in regulations, alternative transportation routes, or alternative energy sources. The average remaining depreciable life takes all these factors into consideration to select a life span for use in the depreciation calculations.

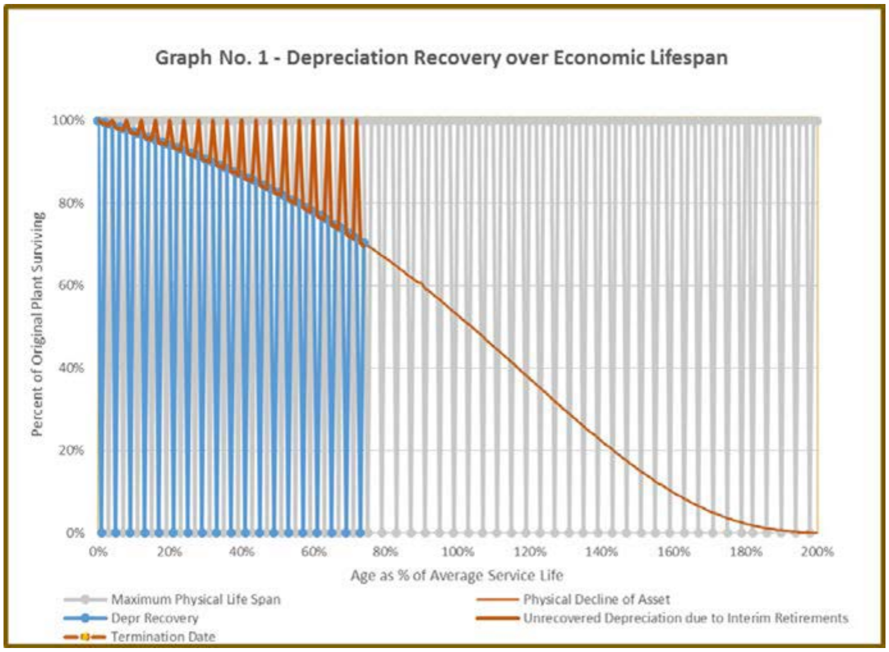
C. Survivor Curve Theory

Q. What is a "survivor curve theory"?

A. The physical plant of large industrial entities is made up of thousands of units of property. For some property accounts, the items in the account are homogeneous in nature, for example, Account No. 367 – Mains is made up of line pipe, period. Other accounts, such as Account No. 368 – Compressor Station Equipment includes mostly the same type of equipment but in a variety of sizes, manufacturers, and operational uses.

The grouping of assets requires the evaluation of lifespans in terms of averages. As with any large grouping, some individuals in the group will live longer than others. While some will drop out of service relatively early, others could physically last long beyond the economic need to use them. It is important that the recovery of investment through depreciation accruals calculates the average life expectancy of each grouping of assets to ensure that all the dollars are recovered over the average usefulness of the assets.

For depreciation purposes, knowing the average service life of plant and equipment allows for an accommodation in the depreciation rate derivation to reflect that plant retires over the years, causing a decline in the depreciation base and a possible shortfall in capital recovery as illustrated in Graph No. 1, "Depreciation Recovery over Economic Lifespan." A straight-line accrual rate (across the top at 100% surviving) will miss the recovery of plant retired before the termination date.



D. Survivor Curves

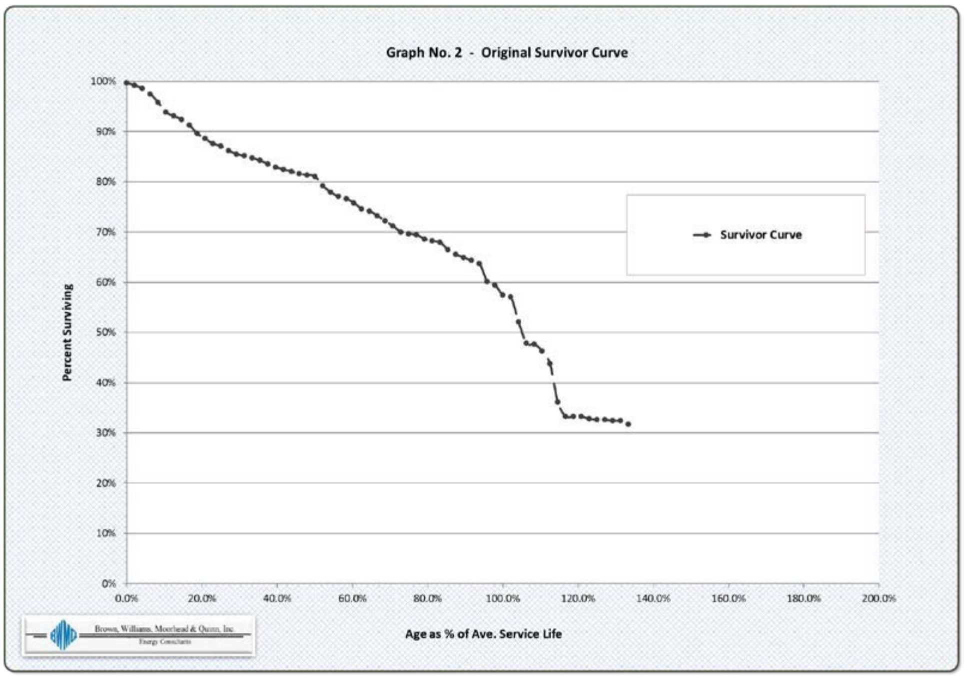
Q. How are your survivor curves derived?

A. Deriving that estimated average service life is the foundation of depreciation rate development. Unfortunately, property account records often do not provide sufficient information to make a judgment of what the service life is. That assessment requires a comparison of the plant record retirement data with a set of already-identified asset survivorship decline curves. A survivor curve analysis reveals which possible survivorship patterns best reflects the experience of the particular property account. This assessment can be made using either of two survivor curve methodologies depending on what kind of data is available. The Vintage Plant Retirement method is preferred when vintaged data is available.

However, the Simulated Plant Record method is the more commonly used method because vintage data is often not available.

Q. Please explain the "Vintage Plant Retirement" method.

A. The "Vintage Plant Retirement" method starts with the development of the Original Survivor Curve, which reflects the survivorship pattern of the original plant data. Vintaged data records the matrix of both the transaction year of the plant retirement and the vintage year in which it was installed. The matrix of transaction year / vintage year data is converted into a matrix of plant exposed to retirement each year by vintage, and then converted again into a third matrix, of plant exposed to retirement each year by age group. A fourth matrix is constructed of plant retirement by age grouping. These matrices provide two data sets: plant exposed by age group and plant retired by age group. In other words, all the plant additions through the study date were at one time one-year old (actually ½ year old because some plant does retire in its first year), hence, the total of all plant additions is the starting point. But not all plant survived to become two years old and of course there is one less year (the most recent year) available to be counted among the two-year-olds. Similarly, not all plant survived to become three years old and there is now two less years (the most recent two years) available to be counted among the three-year-olds. And so on through the history of plant activity. The aged retirement data set is used to calculate a retirement rate (retirements by age divided by plant exposed to retirement by the same age). The retirement rate is then converted into a survivorship decline rate data set. But its average service life is still not known. Once the string of aged retirements is assembled, summation of surviving aged plant and aged retirements reveals the actual experienced survival for the account, which when plotted becomes the original survivor curve for that specific account as illustrated in Graph No. 2. (The graph assumes an average service life for plotting purposes but the next step in the process determines the most likely average service life.)

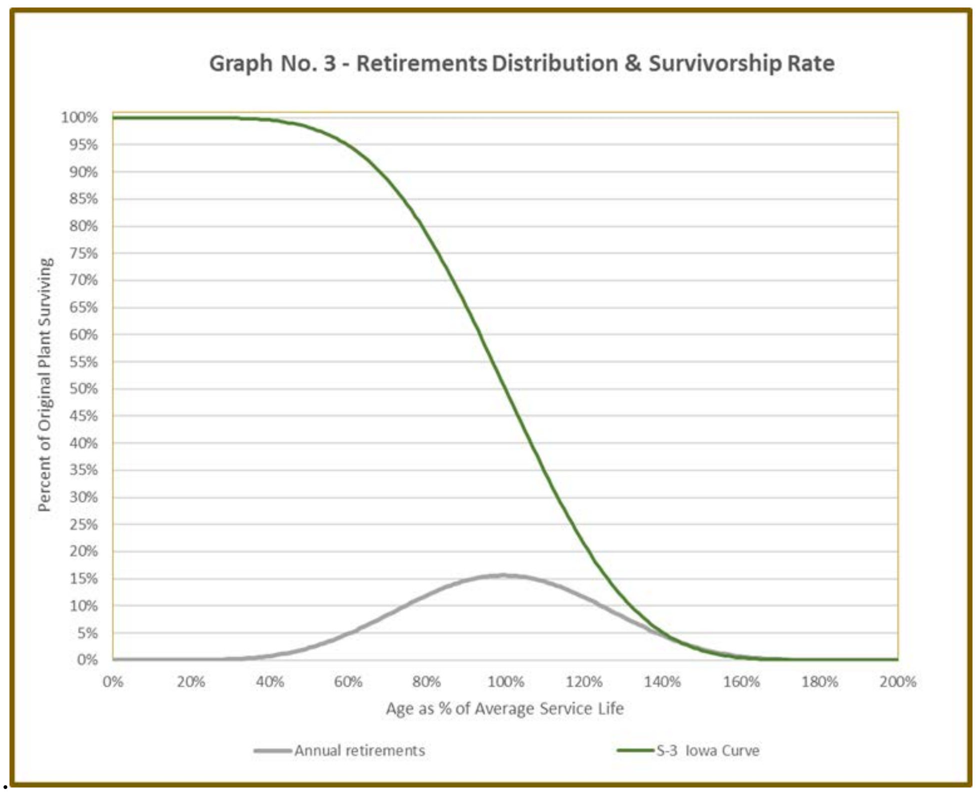


Q. What is the next step once the original survivor curve has been determined?

A. Once the original survivor curve is obtained, the question turns to what should be expected of that account in terms of future retirements. For this aspect of the study, we look to prototype curves that mimic the pattern of our original account activity. The retirement ratios that characterize the curves are applied to the surviving plant in service to generate interim retirement dollars. While there are a few options for typical curve patterns, the Iowa Type Survivor curves are the most commonly used for depreciation purposes and are the curves used for this study.

Q. What are "Iowa Curves"?

Iowa Curves represent standardized retirement patterns of industrial property developed from actuarial studies conducted in the 1930s where it was found that the retirement patterns of industrial property do not follow a straight line but rather are characterized by a complex life trajectory which includes a transition point where survivorship takes a dramatic downward turn. The retirement rate and survivorship rate are inversely related phenomena. The bell curve shape of retirement frequency distribution creates the ski-slope shape survivorship curve created by the frequency distribution of aged retirements as illustrated in Graph No. 3.



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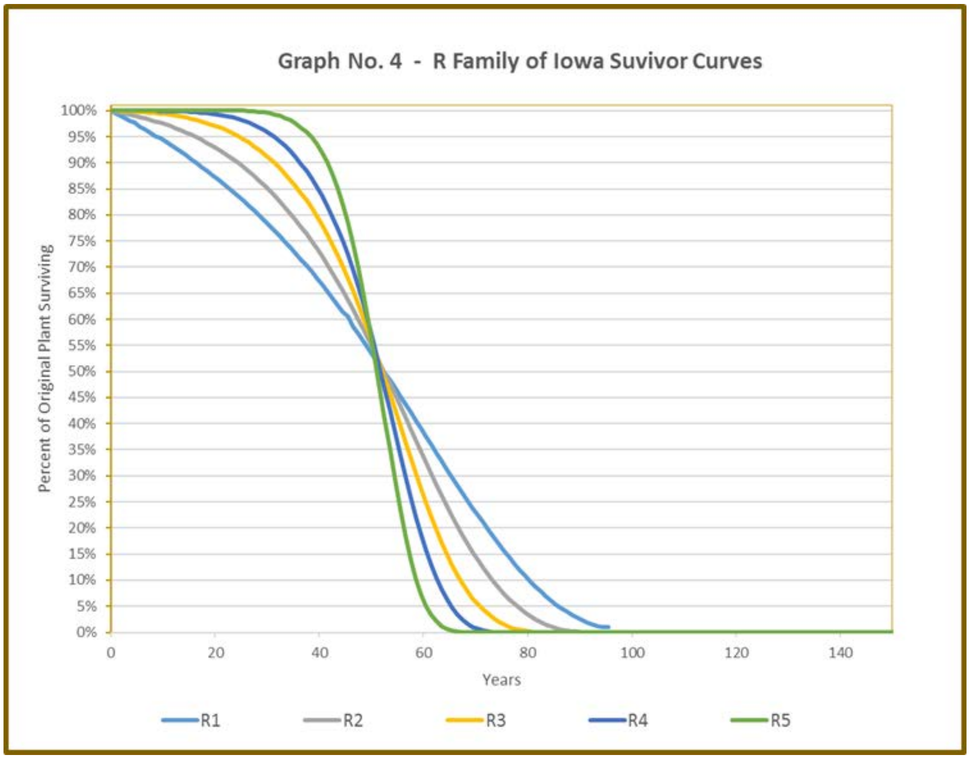
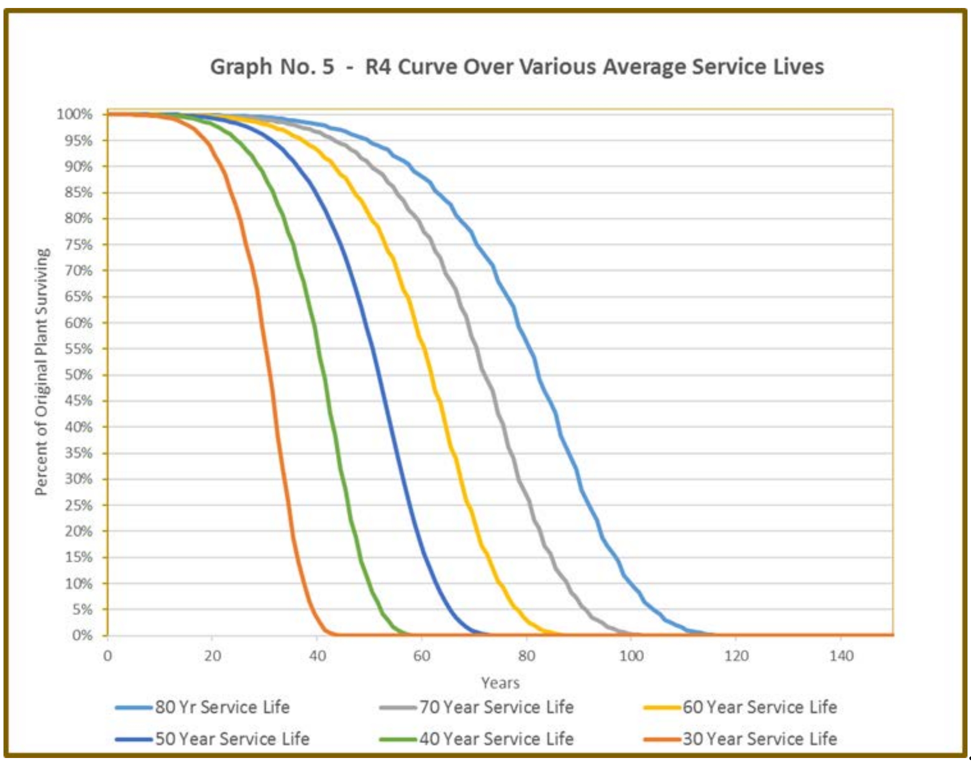
After a period of substantial retirements, the retirement pattern passes through another transition point where retirements fall off, leaving a long tail of lingering survivorship. The overall lifespan survivorship trajectory for most industrial property follows this ski slope pattern that, despite an appearance of simplicity, requires complex mathematical formulae to replicate. The most common patterns were standardized as "the Iowa Survivorship Curves."

Q. How are Iowa Curves aligned?

A. The Iowa Curves consist of families of curves that reflect left-modal, symmetrical-modal, and right-modal frequency distributions, simply called L, S, and R curves, plus a family of origin-related distribution curves, O curves. Each family of curves includes four to five curve sets within the family, labeled R1, R2, R3, and so on, each with slightly different slope configurations (Graph No. 4). Further, each curve has representatives from each average service life age group from 5 years to 120 years (Graph No. 5). The modality of the curves simply reflects whether the most frequently occurring retirement age is 1) younger than the average retirement age – an L Curve (i.e., to the left of the average service life on a graph), or 2) older than the average retirement age – an R Curve (i.e., to the right of the average service life), or 3) equal to the average retirement age – an S Curve (i.e., symmetrical to the average service life).


Graph No. 4 - R Family of Iowa Suvivor Curves
Percent of Original Plant Surviving
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0
20
40
60
80
100
120
140
Years
R1
R2
R3
R4
R5


Graph No. 5 - R4 Curve Over Various Average Service Lives
Percent of Original Plant Surviving
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0
20
40
60
80
100
120
140
Years
80 Yr Service Life
70 Year Service Life
60 Year Service Life
50 Year Service Life
40 Year Service Life
30 Year Service Life

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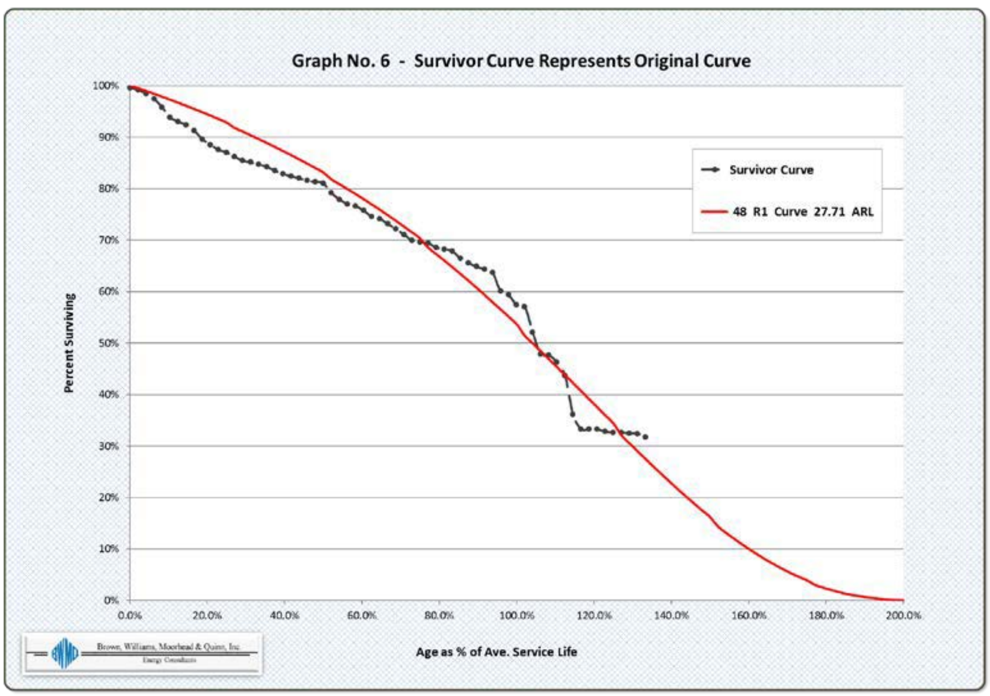
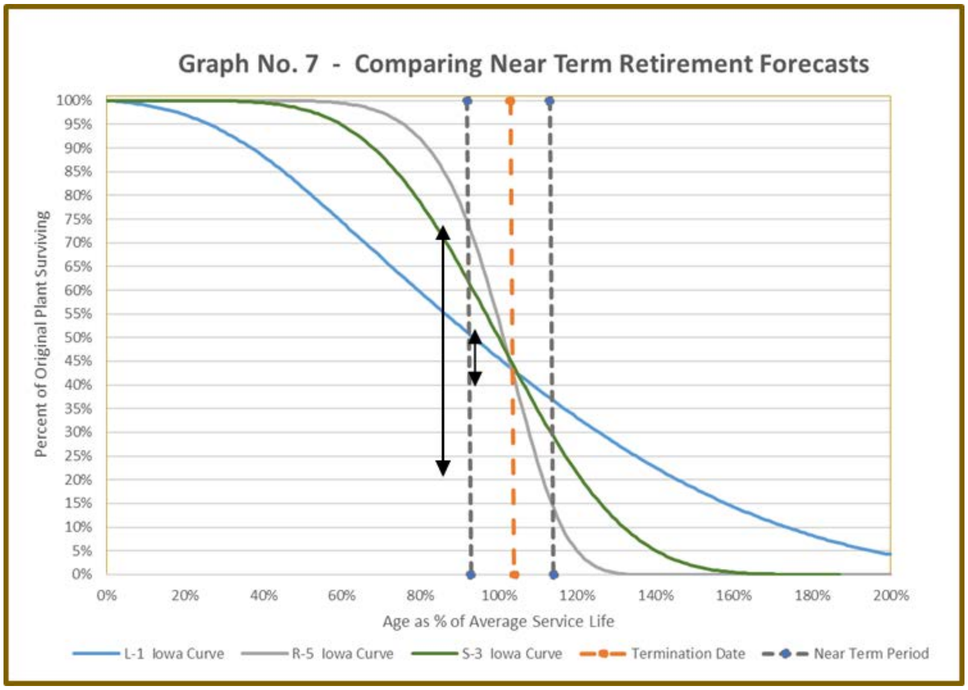
Q. What is “Survivor Curve Analysis”?

A. The “survivor curve analysis” primarily deals with two survivor curves: one being the original curve that traces the actual surviving dollars from each vintage of plant addition and the other a prototypical Iowa Curve selected to carry the trend of the actual data out into the future for forecasting purposes. Once the original data is synthesized into an original experience survival curve (Graph No. 2 above), the curve is compared to prototypical curves (Graph Nos. 4 & 5) to find one that will best forecast the most likely service life experience of the plant (Graph No. 6).



Q. Is there a test for survivor curve accuracy?

A. Survivor curve models generally use a test statistic called the least sum-of-squares test to measure the accuracy of their forecasts. The sum-of-squares calculation measures the differences between the actual and forecasted curves along the entire span of the curve from 0 to 200 percent of the average service life. The differences are squared to eliminate positive and negative differences from cancelling each other out as well as to accentuate deviations. The curve with the least sum of squared difference between the actual book value of the account and the predicted value of the account is generally the best fitting curve and, unless some other factor weighs heavily in the analysis, that curve will be used to forecast future retirements. However, the Iowa Curve with the least sum of squared differences may fit the *overall* pattern of the original survivor curve but may not fit the portion of the original life curve relevant to the timely recovery of the utility's investments. For depreciation purposes, the interim period between the study date and the termination date defines the period over which the remaining undepreciated plant investment must be recovered. The economic lifespan may come to an end long before the physical lifespan. Tracking the retirement pattern over the interim period is more important for estimating the average remaining life relevant to recovery of these assets than tracking a long-term pattern that will not come to pass due to the truncation of the life of the assets. Hence, the selection of a curve is derived by a combination of statistical comparison and informed knowledge of the nature of the assets. There can be a significant difference in the forecasted retirements among the contending curve and average service life ("ASL") pairs, and thus a significant difference in the derived depreciation rate. The slope of the retirement curve during the interim period can be a critical factor, as seen in the difference between the decline in the gray line versus the blue line in Graph No. 7.



E. Average Service Life

Q. Why are the ASL's important?

A. The importance of using survivor curves is that by using them, we can avoid under-recovery of depreciation due to interim retirements between the study date and the termination date. In general, depreciation rates recover the cost of the plant over its life expectancy. The application of a straight-line depreciation rate to the annual rate base builds the depreciation reserves through annual accruals in equal installments. By the truncation date the plant should be fully depreciated. However, if the rate base is declining because of interim retirements, the annual accruals will not add up to the full amount needed for recovery by the truncation date, leaving a shortfall. Calculation of the average remaining life allows us to mitigate that shortfall.

Q. Can you elaborate on the importance of selecting the "best fit" service life/survivor curve pair?

A. As noted in the Survivor Curve Theory discussion earlier, the statistical "best fit" service life/survivor curve pair may reflect physical life span that is much longer than the economic lifespan within which the investment must be recovered. Together, these plant histories help inform the selection of the most appropriate survivor curves and service lives. An analysis of account-by-account retirement patterns and survivor curves is presented below.

In order to make "apples-to-apples" comparisons for best fit status, the service life of the original survivor curve is adjusted to reflect that of the prototype curve against which its being tested. In other words, we assume a 20-year service life when comparing to 20- year curves, and 25-year service life when comparing to 25-year curves, and so on. This is done by converting the age into the age as a percent of the assumed average service life. The prototype curves are also converted into age-as-percent-of-average-service-life. The BWMQ model calculates the best-fitting Iowa Curve.

Q. What are "interim retirements" and how do they affect depreciation rates?

A. "Interim retirements" are the routine retirements of plant and equipment that will occur each year between the study date and the terminal closing of the pipeline system. The importance of interim retirements, for depreciation study purposes, is that such retirements shorten the average depreciable life of the assets. If some units are retired prior to the end of the planned service life, the associated depreciation accruals will not have fully recovered the invested cost in the assets.

Depreciation rates must capture the average life expectancy of the assets in the accounts, which is estimated through the survivor curve analysis of interim retirements. This is more fully explained in the survivor curve discussion later in this section.

F. Simulated Plant Record Analysis

Q. Please describe the Simulated Plant Record Analysis.

A. Simulated Plant Record Analysis ("SPR") is a methodology used to estimate the appropriate ASL and retirement patterns that allow us to accurately forecast the average remaining life of industrial assets. The SPR method is based on the same theories and principles as the Survivor Curve Methodology. The advantage of the SPR method is that the data required is simply plant additions by year and the actual surviving plant balance as of the study date. The SPR model applies a prototype Iowa Curve to each annual plant addition and calculates a final balance for the account, assuming all the plant will retire in a pattern similar to that of one of the Iowa Curves. The selected curve is used to forecast future retirements, which provides the average remaining life and ultimately the depreciation rate.

Q. How does the SPR model represent the actual plant activity?

A. As plant ages, the surviving plant ratio falls as it moves along and down the survivor curve. The average age of the plant in each account determines where the account is, vis-à-vis the survivor curve, at the study date. The SPR method calculates a theoretical retirement trajectory that it applies to each iteration of additions. The curve that best forecasts a plant balance closest to the actual plant balance is deemed, generally, to be the best representative pattern for all ages of plant. That declining survival ratio determines the interim retirements expected to take place between the study date and the terminal date. These retirements, in turn, are the foundation for determining the average remaining life for depreciation purposes.

Q. Is there a goodness-of-fit measurement to gauge the accuracy of the predicted survivorship?

A. Yes. I use two measures of the goodness-of-fit to gage whether the forecasted annual retirements and survivorship levels match the actual trends in retirements and survivorship. The traditional measure is called the Conformance Index ("CI"), which measures how close the forecast of survivorship matches the actual surviving balance at the study date. The Retirement Index ("RI") measures how well the forecast of annual retirements matches recent experience of the pipeline.

Q. Please describe the Conformance Index.

A. The traditional goodness-of-fit measurement is called the CI. The CI is derived by dividing the actual ending balance by the absolute value of the difference between the actual ending balance and the predicted ending balance.

The predicted ending value is squared to eliminate negative numbers and then the square root is taken to hold the predicted value as close to the actual value as possible. If the difference between the predicted and actual ending balances is high, then the CI ratio will be low. Conversely, if the difference between the predicted and actual ending balances is low, then the CI ratio will be high. The rule of thumb for ranking CIs is:

Over 75	Excellent fit
50 to 75	Good fit
25 to 50	Fair fit
Under 25	Poor fit

The rationale for the CI valuation is that in order for the CI to reach a value of 75, the difference between the actual ending balance and the predicted ending balance must be within 1.5% of the actual ending balance. A CI value of 50 indicates a differential of only 2%. This ranking system thus requires the forecasted values to fall close to the actual values to be considered even a "fair" fitting of a hypothetical Iowa Survivor curve to the actual data.

Q. Does the Conformance Index provide a unique best fit curve?

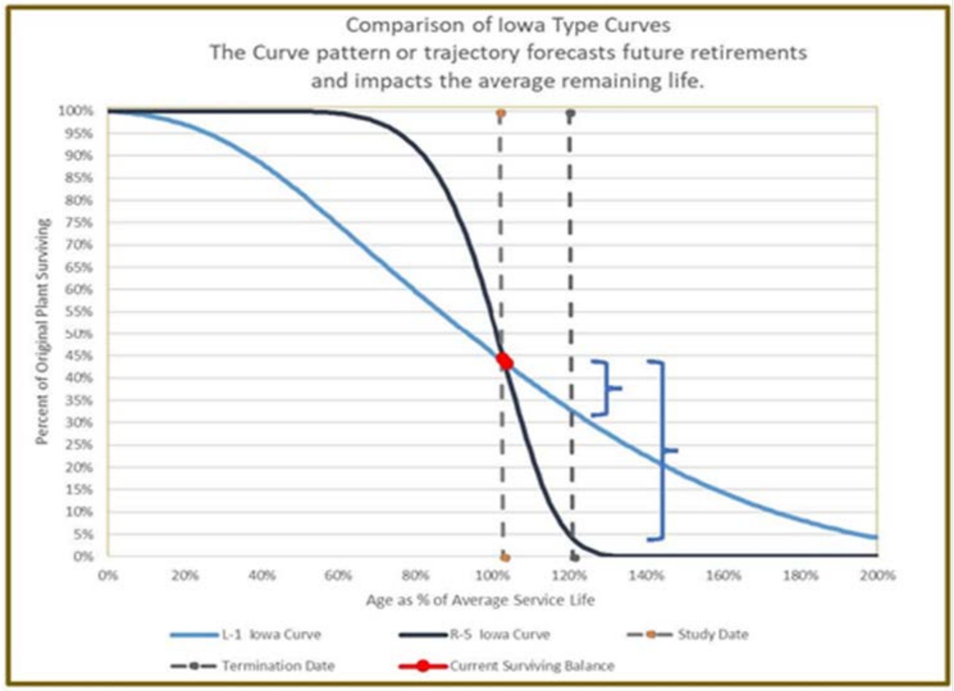
A. Not always. A CI value above 100 indicates a forecast fit that is within 1% of the actual data; larger values for the CI over 100 do not indicate a significantly better fitting curve. As the difference between the predicted ending balance and the actual ending balance gets smaller, the CI value increases. As the difference approaches zero, the CI approaches infinity. It is often the case that several curves are statistically excellent fits for the data. If more than one curve has a CI beyond 100, the analyst incorporates other factors to select an appropriate curve.

Q. Is the Conformance Index a reliable basis for determining a best fit curve?

A. Not always. In fact, the CI often can calculate a fit for an Iowa Curve that significantly misrepresents the likely survivor pattern of a category of property. The CI calculates the closeness of fit that each prototype Iowa Curve achieves in forecasting the actual surviving plant balance, *i.e.*, a specific dollar value at a point in time. However, for depreciation purposes we need more than a forecast of the surviving balance at one point in time; it is also important to glean the trajectory of the decline curve and the amount of annual retirements.

Q. Does the Retirement Index test address the question of the trajectory of the retirement distribution curve?

A. Yes. I believe it does. A good forecast should reflect actual experience as much as possible, but it is often the case that the "best fit" curve and service life pair come from a survivor curve pattern that predicts near-term retirements that are wildly divergent from the pipeline's actual recent experience. For example, the graph below shows that both survivor curves accurately predict the current surviving balance and would thus have high CIs but take very different trajectories to get there. The L_1 Curve has a shallower curvature and forecasts modest retirements over the remaining life of the asset. The R_5 Curve has a steep declining curvature and forecasts the retirement of almost all the plant over the remaining life. In such cases, I try to select an Iowa Curve that forecasts near term retirements as close as possible to the actual experience of retirements so that the resulting depreciation rate reflects the actual average remaining life of the plant. The RI is simply the comparison of the average level of annual plant retirements over the last five years to the forecasted level of annual average plant retirements for the next five years.



G. Economic Life[1]

Q. What is "economic life"?

A. "Economic life" is the expected period of time during which an asset remains useful to the average owner. When an asset is no longer useful to its owner, then it is said to be past its economic life. The economic life of an asset could be different than its actual physical life. Thus, an asset can be in optimal physical condition but may not be economically useful. For example, technology products often become obsolete when their technology becomes obsolete. The obsolescence of pay phones occurred due to the advent of smartphones and not because they ran out of utility.

Q. What economic life was proposed for Cardinal?

A. I proposed a 2050 economic life horizon for Cardinal.

[1] The remaining economic life was developed based on the current political landscape and environmental path. Cardinal is required to file a new depreciation study within 5 years and remaining economic life will be reassessed at that time.

Q. Will there be natural gas available to Cardinal in 2050?

A. Yes, in an era marked by projections of oil and natural gas reserves through 2050[2], contemplating the end-of-life for a natural gas pipeline may seem counterintuitive.

Q. If natural gas reserves were not the driving factor for the 2050 truncation date, what is?

A. While natural gas may still be around in 2050, the obsolescence of natural gas may be the result of overall demand by climate change Executive Orders ("EO") in place, and Cardinal's contractual demand.

Q. What is "climate change"?

A. "Climate change" means a change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels (e.g., coal, oil, and natural gas).

Q. What is an "EO", or Executive Order?

A. An "EO" is a rule or order issued by the president to an executive branch of the government and having the force of law.

Q. Please explain the EO's effecting Cardinal?

A. Climate change concerns are becoming a larger driving force in the development of the future of energy infrastructure. On October 29, 2018, North Carolina Governor Roy Cooper signed Executive Order 80 calling for a "40 percent reduction in statewide greenhouse gas emissions by 2025", and to "reduce electric power sector greenhouse gas emissions by 70% below 2005 levels by 2030 and

[2] https://www.eia.gov/todayinenergy/detail.php?id=49876

attain carbon neutrality by 2050."[3] In addition, on January 27, 2021, the United States president issued Executive Order 140083 ("EO 14008"). Executive Order 14008, Section 201, states:

> **Sec. 201.** *Policy.* Even as our Nation emerges from profound public health and economic crises borne of a pandemic, we face a climate crisis that threatens our people and communities, public health and economy, and, starkly, our ability to live on planet Earth. Despite the peril that is already evident, there is promise in the solutions—opportunities to create well-paying union jobs to build a modern and sustainable infrastructure, deliver an equitable, clean energy future, and put the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050.

Section 201 of EO 14008 establishes that it is the policy of the federal government's agencies to implement government-wide approaches to achieve net-zero emissions, economy-wide, by no later than 2050. Additionally, Section 205 of EO 14008 establishes a plan to reach a "carbon pollution-free electricity sector no later than 2035":

> **Sec. 205.** *Federal Clean Electricity and Vehicle Procurement Strategy.* (a) The Chair of the Council on Environmental Quality, the Administrator of General Services, and the Director of the Office and Management and Budget, in coordination with the Secretary of Commerce, the Secretary of Labor, the Secretary of Energy, and the heads of other relevant agencies, shall assist the National Climate Advisor, through the Task Force established in section 203 of this order, in developing a comprehensive plan to create good jobs and stimulate clean energy industries by revitalizing the Federal Government's sustainability efforts.
>
> (b) The plan shall aim to use, as appropriate and consistent with applicable law, all available procurement authorities to achieve or facilitate:
>
> (i) a carbon pollution-free electricity sector no later than 2035; and
>
> (ii) clean and zero-emission vehicles for Federal, State, local, and Tribal government fleets, including vehicles of the United States Postal Service.
>
> (c) If necessary, the plan shall recommend any additional legislation needed to accomplish these objectives.
>
> (d) The plan shall also aim to ensure that the United States retains the union jobs integral to and involved in running and maintaining clean and zero-emission fleets, while spurring the creation of union jobs in the manufacture of those new vehicles. The plan shall be submitted to the Task Force within 90 days of the date of this order.

[3] https://files.nc.gov/ncdeq/climate-change/clean-energy-plan/NC_Clean_Energy_Plan_OCT_2019_.pdf

Q. How could the federal and state issued EO's impact Cardinal?

A. It is uncertain how the goals of the Executive Orders mentioned above will be achieved, but if they do come to fruition, it is reasonable to believe that the effort to reach net-zero emissions by 2050 may result in (i) a substantial decrease in the consumption of natural gas, including the natural gas transported on Cardinal, (ii) a resulting substantial decrease in the utilization of natural gas infrastructure, and (iii) an increase in the use of alternate energy sources.

In addition, 58 percent of Cardinal's capacity is contracted under agreements that are already in "evergreen" status, i.e., beyond expiration of their primary terms, and subject to unilateral termination by Cardinal's shippers on short notice. The remaining 42 percent of capacity will be in "evergreen" status in 2032. Moreover, Cardinal's competitors are competing for both new and existing business throughout the Cardinal market area through proposed new and existing pipelines with designed expansion capabilities. As such, proposing an economic life truncated at 2050 for ratemaking purposes is reasonable given Cardinal's shippers' rights to terminate their agreements, the potential for development of alternative options to supply their natural gas needs, and the uncertainty of how Executive Orders' 80 and 14008 shared goal of a 2050 net-zero horizon will affect natural gas demand.

H. Average Remaining Lives

Q. Describe the concept of truncation?

A. The incorporation of a truncation date is often unrelated to the physical characteristics of the asset itself but due to reasons such as the loss of reserves supporting its use, technical obsolescence bringing about replacement, or the requirements of public authorities that may lead to economic obsolescence of certain facilities, the truncation may cause the remaining life of the assets to be less than the average physical life.

Q. What economic life have you selected?

A. I have used a 2050 termination date. Please see "Economic Life" section for more details.

Q. Describe the concept of the "average remaining life".

A. The average remaining life ("ARL") calculation is restricted to the time between the study date and the termination date, the period over which the company's remaining net plant will be depreciated. At the end of that period, it is assumed there will be no further opportunity to recover the plant investment. Some plant will expire within a few years; other assets will last the entire remaining economic life – depreciation is recovered over the average lifespan. Dividing the sum of the surviving balances as calculated by the survivor curve by the starting balance provides the ARL, which is used in the depreciation calculations.

a. Intangible Plant

Q. Describe your assessment of Account No. 302 – Franchises and Consents.

A. Account No. 302, Franchises and Consents shall include the book cost paid to the Federal Government, to a State or to a political subdivision thereof in consideration for franchises, consents, or certificates. Account No. 302, which has an average age of 22 years, does not have any recent retirements. As such, the standard goodness-of-fit test measures are not relevant. In lieu of data-driven curve indicators, we have selected the longest ASL in our study of 85 years (Account No. 368) and the corresponding average remaining life ("ARL") in Schedule 7 of Exhibit No. CPC-003 at 28.63 for a resulting depreciation rate of 0.55%. A negative salvage rate was not applied as Intangible plant does not have negative salvage.

Q. Describe your assessment of Account No. 303 – Miscellaneous Intangible Plant.

A. Account No. 303, Miscellaneous Intangible Plant shall include the cost of patent rights, licenses, privileges, and other intangible property necessary or valuable in the conduct of the utility's gas operations. In this account, the costs recorded were for work performed on a third-party system relating to metering facilities. Account No. 303, which has an average age of 20.40 years, does not have any recent retirements and as such, the standard goodness-of-fit test measures are not relevant. Again, in lieu of data-driven curve indicators, and based on the assets within the account, we used an ASL of 60 and ARL of 27.60 calculated in Account No. 369

for a resulting depreciation rate of 1.57%. A negative salvage rate was not applied as Intangible plant does not have negative salvage.

b. Transmission Plant

Q. Describe your assessment of Account Nos. 365.12 and 356.12 – Land.

A. Account Nos. 365.11 and 365.12 are designated for Land (365.11) which includes the cost of land purchased in fee for use in pipeline operations and limited rights to use land (Account No. 365.12). The accounts include the costs of clearing the land of vegetation and structures as needed for pipeline installation. Land is not depreciable; however, Land Rights are depreciable. Account No. 365.12, which has an average age of 22 years, does not have any recent retirements. As such, the standard goodness-of-fit test measures are not relevant. In lieu of data-driven curve indicators, we have selected an industry standard curve, the 65-R2, as a placeholder for curve selection until such time as sufficient retirements can provide better guidance. Given the average age and selected Iowa curve, Account No. 365.12 has an ARL of 26.39 resulting in a depreciation rate of 1.93%. Because, little or no removal cost is incurred and no salvage is received at the retirement of land rights, we recommend a negative salvage rate of 0.0% for this account.

Q. Describe your assessment of Account No. 365.2 – Rights of Way.

A. Account No. 365.2, Rights of Way, includes the cost of acquiring the rights of way, or permission, to use land for pipeline operations. Rights of Way agreements are in use for the entire life span of the facilities placed upon them, hence, the average service life often reflects that of the longest-lived asset, the pipeline itself. Cardinal's 2004-2020 Form 2A data indicated no recent retirement activity. Again, we have selected an industry standard curve, the 65-R2, as a placeholder for curve selection until such time as sufficient retirements can provide better guidance. Given the account's 16.72-year average age, we calculated an ARL of 26.84 which results in a depreciation rate of 1.90%. Adding the negative salvage rate of 0.07% brings about a composite depreciation and negative salvage rate of 1.97%.

Q. Describe your assessment of Account 366.1 – Compressor Station Structures and Improvements.

A. Account No. 366.1, Compressor Station Structures and Improvements includes the cost in place of structures and improvements used in connection with compressor station operations. Cardinal's 2004-2020 Form 2A data indicated no recent retirement activity. We selected an industry standard curve, the 45-R2, as a placeholder for curve selection until such time as sufficient retirements can provide better guidance. Given the account's average age of 9.00 years, we calculated an ARL of 25.70, which generates a depreciation rate of 3.03%. Adding the negative salvage rate of 0.48% brings about a composite total of 3.51%.

Q. Describe your assessment of Account 366.2 – Meter Station Structures and Improvements.

A. Account No. 366.2, Meter Station Structures and Improvements includes the cost in place of structures and improvements used in connection with meter station operations. Cardinal's 2004-2020 Form 2A data indicated no recent retirement activity. We again selected an industry standard curve, the 45-R2, as a placeholder for curve selection until such time as sufficient retirements can provide better guidance. Given the account's average age of 16.30, we calculated an ARL of 24.18

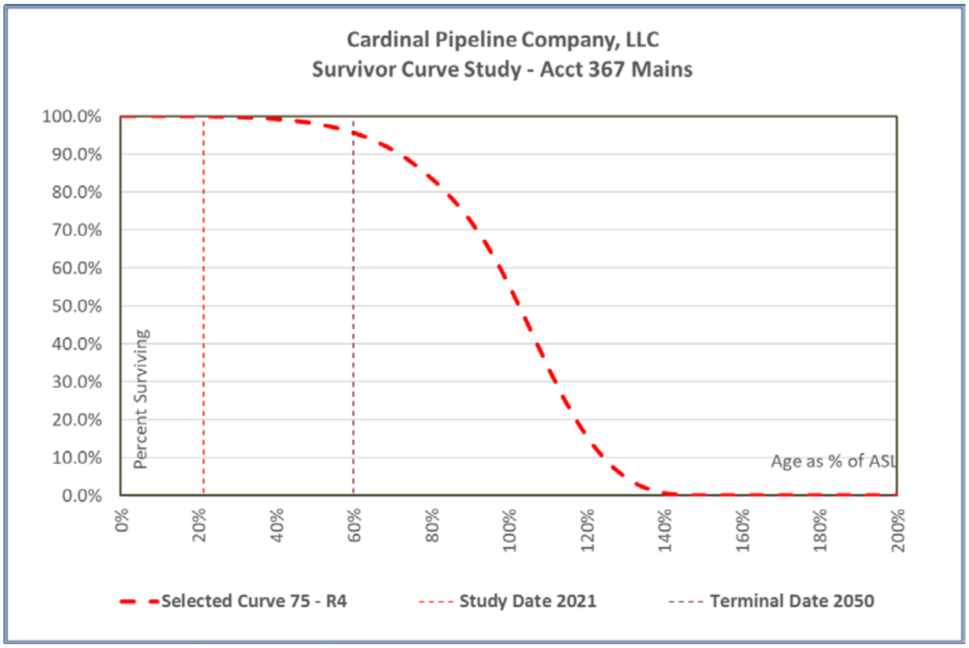
using an industry accepted 45-R2, which results in a depreciation rate of 2.60%. Adding the negative salvage rate of 0.25% generates a composite rate of 2.85%.

Q. Describe your assessment of Account 367 – Mains.

A. Account No. 367, Mains, records the original cost of the line pipe actually installed. Line pipe is a long-lived asset that with proper corrosion maintenance can last for many decades. Cardinal's 2004-2020 Form 2A data indicated that Account No. 367 maintains a long-term stability with few incidents of retirements periods.

The Survivor Curve graph for Account 367, below, presents the best fit pair of average service life and Iowa survivor curve. The 75-R4 Curve appears to fit the data better than the other curves (see Exhibit No. CPC-0004, Best 5-Year Retirement Predictors chart). The 75-R4 Curve will be used to estimate future retirements from current surviving plant balances. Applying the 75-R4 Curve to the current plant in service, with its average age of 16.02 years and a 2050 truncation forecast, results in a 28.63-year ARL with a 1.75% depreciation rate. Adding 0.75%[4] for negative salvage rate brings about a 2.50% composite depreciation rate.

[4] This rate includes the costs of Cardinal's ARO and any negative salvage recovery will be sourced to the recovery of legal obligations first.

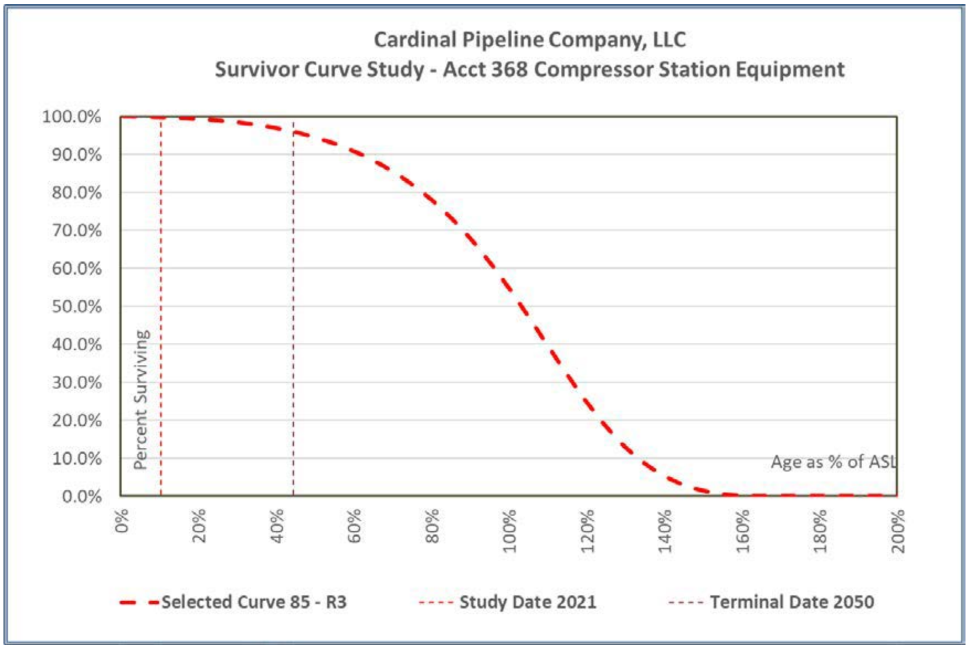


Q. Describe your assessment of Account 368 – Compressor Station Equipment?

A. Account No. 368, Compressor Station Equipment includes the cost installed of compressor station equipment and associated appliances used in connection with transmission system operations. The Account No. 368 asset list is made up of compressor air system equipment, compressors, foundations, electrical systems, firefighting equipment, gas lines, laboratory equipment, lubricating oil systems, office furniture and fixtures, shop tools and water supply systems. Cardinal's 2004-2020 Form 2A data indicates that Account No. 368 maintains a short-term stability with one recent incident of retirement in 2016.

The Net Additions and Retirements graph again reflects only one retirement in its recent history. The Survivor Curve graph for Account 368, below, presents the best fit pairs of average service life and Iowa survivor curve. The 85-R3 Curve appears to fit the data better than the other curves and will be used to estimate future retirements from current surviving plant balances (see Exhibit No. CPC-0004, Best

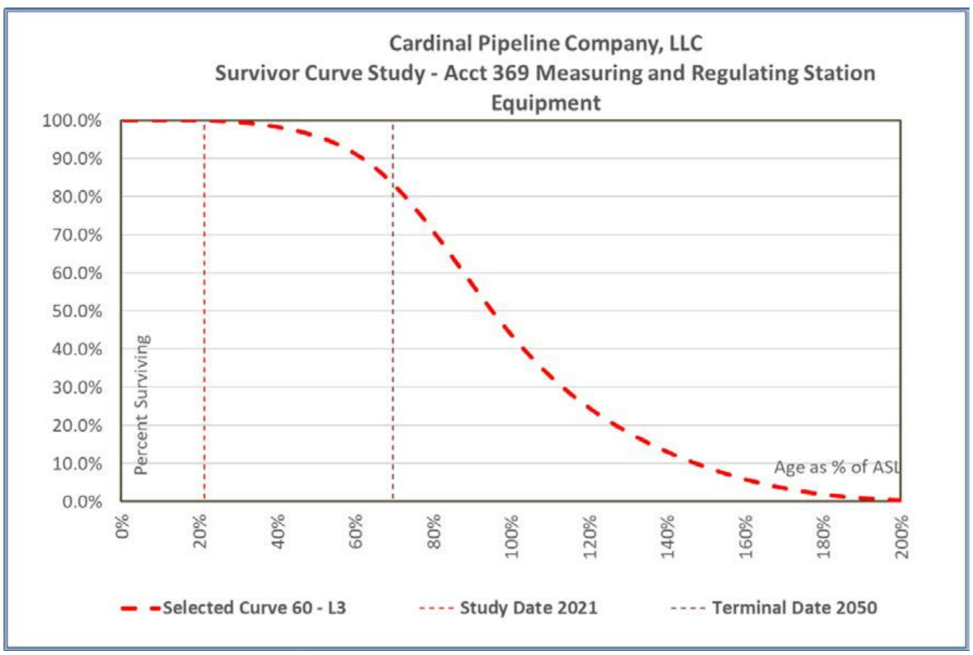
5-Year Retirement Predictors). Applying the 85-R3 Curve to the current plant in service, with its average age of 8.87 years, results in a 28.59-year ARL, which generates a 2.63% depreciation rate. Adding the negative salvage rate of 0.31% brings about a composite total of 2.94%.



Q. Describe your assessment of Account 369 – Measuring & Regulating Equipment?

A. Account No. 369, Meter Station Equipment includes the cost installed of meters, gauges, and other equipment used in measuring or regulating gas in connection with transmission system operations. The Account No. 369 asset list is made up of automatic control equipment, boilers, heaters, foundations, gas cleaners/scrubbers/separators/dehydrators, gauges and instruments, headers, meters, oil fogging equipment, odorizing equipment, regulators and governors, and structures. The 2004-2020 Form 2A data indicate that Account No. 369 maintains a short-term stability with two recent incidents of retirements periods, 2016 and 2019.

The Survivor Curve graph for Account 369, below, presents the best fit pairs of average service life and Iowa survivor curve. The 60-L3 Curve appears to fit the data better than the other curves and will be used to estimate future retirements from current surviving plant balances (see Exhibit No. CPC-0004, Best 5-Year Retirement Predictors chart). Applying the 60-L3 Curve to the current plant in service, with its average age of 12.83 years, results in a 27.60-year ARL, which generates a 2.13% depreciation rate. Adding a negative salvage rate of 0.36% brings about a 2.49% composite depreciation rate.



c. **General Plant**

Q. What were your conclusions regarding General Plant depreciation rates?

A. The depreciation rates for general plant assets and facilities are often calculated on a whole life basis in which depreciation rates are calculated by dividing 1 by the estimated Average Service Life (ASL). When using the whole life basis method, as is generally the case for general plant, there are three methods of estimating the ASL, or lifespan: 1) a survivor curve analysis, 2) the vintage plant accounting method, or 3) by the turn-over method. In addition, the average service life may be set by reference to third parties: such as the US Office of Management and Budget, or by reference to authority of individuals with experience working with the asset. Under vintaged accounting, general plant account assets face retirement at a uniform age regardless of condition of any individual asset. For example, automobiles within a fleet might be retired at four years, regardless of miles driven or condition of the car. Under the turn-over rate model, the depreciation rate is set by the average rate at which plant retires from each account. I selected the whole life rate due to the relatively young age of the plant resulting in limited retirement data. These calculations are shown in Schedule No. 5 of Exhibit No. CPC-003. The average service lives were taken from the United States Office of Management and Budget (US OMB) Useful Life and Disposal Table to calculate an appropriate placeholder depreciation rate for accounts under general plant:

General Plant

		US OMB Life Tables[1]	
390.0	Struct. & Impr. - Office Bldg	10.00	10.00%
391.0	Office Furniture & Equipment		
-	OFF001- Tower Office Furn. & Equip.	10.00	10.00%
-	DPC001-Data Process & Comp. Equip.	8.00	12.50%
-	DEV001-Developed Software	15.00	6.67%
392.1	Transportation Equipment	6.00	16.67%
394.0	Tools Shop & Garage Equipment	20.00	5.00%
396.0	Power Operated Equipment	10.00	10.00%
397.0	Communication Equipment	23.00	4.35%

[1] - Average service lives taken from United States Office of Management and Budget Useful Life and Disposal Table

I. Negative Salvage

Q. What is "negative salvage?

A. "Negative salvage" – also called "net salvage" – is the cost of taking plant out of service where the costs of removal exceed the salvage value of the plant removed from service. In many instances the cost is *de minimis* and treated as maintenance expense but in other instances substantial costs can be incurred. When these costs become sizable, they are treated as part of the recovery of capital costs and debited to the accumulated reserve for depreciation. Similarly, the salvage value of assets removed from service represents a recovery of some of the cost of acquiring the asset and is thus also treated as part of the depreciation of capital costs, in this case a credit to the accumulated reserve for depreciation.

Q. Does Cardinal currently have negative salvage rates?

A. Yes. Cardinal does have negative salvage rates as indicated on Schedule No. 2 of Exhibit No. CPC-003.

Q. How does interim retirement negative salvage differ from terminal

decommissioning negative salvage?

A. Assets removed from service during the pipeline's on-going service life are known as interim retirements – the "interim" being the time between being placed in service and the end of the pipeline's economic service life. Interim retirements are undertaken to maintain system reliability, upgrade or improve plant, expand the system, remove plant no longer needed, or carryout government required activities. The net cost of removing the old assets is considered an interim retirement negative salvage and is part of on-going operations. The cost of removal expenses is charged to Account 108, Reserve for Depreciation.

Upon reaching the end of its economic service life, the pipeline will be decommissioned, the services abandoned, the line purged and cleaned, the aboveground facilities at meter stations and compressor stations removed, rail and road crossings secured and grouted, and the land reclaimed. The cost of returning the right of way to pre-build condition is, like the construction of the system, an obligation that should be borne by all generations of customers who benefitted from those assets to the extent of Cardinal's ability to estimate and allocate those costs. The cost for the terminal abandonment and decommissioning are covered in the Terminal Decommissioning section of this testimony.

Q. What is your recommendation regarding Cardinal's negative salvage on interim retirements?

A. Schedules 8 through 8f of Exhibit No. CPC-0003, Cardinal Depreciation Workpapers reference the terminal costs per plant calculated within the Terminal Decommissioning Cost ("TDC") estimate, utilizing the percent of remaining plant calculated in Schedule 6, to calculate the interim retirement costs and plant subject to terminal decommissioning per account. These costs are then spread over the average remaining life for each account and calculated into an account specific composite negative salvage recovery rate, as shown in Column C, Row 37 for each page in Schedules 8 thought 8f of Exhibit No. CPC-0003.

IV. TERMINAL DECOMMISSIONING COST

Q. Please explain what is encompassed within your TDC estimate.

My TDC estimate is an assessment of the cost for Cardinal to decommission its system, cease operations, remove, as appropriate, plant in service, and restore the rights of way to preconstruction condition at the end of the system's useful life. My TDC estimate includes an estimate of the salvage value of Cardinal's equipment and facilities as an offset against decommissioning and associated costs.

Q. Please briefly discuss the major tasks that form the basis of an abandonment cost analysis.

A. An abandonment cost analysis includes the cost of removal of all above-ground facilities and any costs associated with the restoration of the surface and sub-surface land. There are many steps involved with restoring land. For example, all underground transmission pipe would need to be cleaned and purged, with pipe left in place capped, and other pipe completely removed. All railroad crossings, highway, and road crossings, as well as all small stream and river crossings would be abandoned in place. Further, all remote valve sites, cathodic protection facilities, pipeline markers, measurement and regulation facilities, and compressor stations and other above-ground facilities would be removed, and site restored.

Q. How can you estimate today the cost of an operation that will take place many years in the future?

A. The cost of providing natural gas pipeline transportation service includes construction of the system, operating the system, and eventually dismantling and removing the system. My TDC estimate does not estimate a future cost but rather what it would cost today's customers to dismantle today's plant at today's costs.

Q. Will today's plant and equipment still be around when the system is dismantled and removed?

A. The removal of facilities during the continued operation of the pipeline constitutes "interim retirements." Interim retirements refer to the replacement of facilities required to maintain the system through or until the terminal decommissioning date. The accrual accounting system provides for the build-up of reserves prior to the actual decommissioning. Should some plant be prematurely abandoned, the costs of removal and salvage will flow through Account 108, absorbing some of the accrued reserve.

Q. How does terminal decommissioning differ from interim retirement?

A. Terminal decommissioning refers to the dismantlement and removal of the entire network at the end of its useful life. Terminal decommissioning is, by definition, happening at the end of the useful life so plant will not be replaced, and the full cost of retirement will be apparent and should be fully recovered. By contrast, interim retirement refers to the replacement of facilities required to maintain the system during the system's useful life.

Q. What government materials and resources did you use or consult in developing your TDC estimate?

A. I reviewed the following materials issued by the U.S. Department of Transportation ("DOT"): (1) minimum safety regulations for abandonment of facilities; (2) guidelines to purge pipelines; and (3) line pipe Class Location Guidelines. Secondly, I reviewed 18 C.F.R. § 380.5(b), regarding the environmental assessment of the pipeline's plans for abandonment in place or removal of the assets. Third, I reviewed 33 C.F.R. § 322.3, regarding permits from the U.S. Army Corps of Engineers for work in and around navigable waters of the United States. Fourth, I reviewed 49 CFR Part 192, Section 727, abandonment or deactivation of facilities. Fifth, I reviewed Chapter 11, Contingency, of the U.S. Department of Energy's ("DOE") *Cost Estimating Guide*, as well as the U.S. Army Corps of Engineers' publication, *Engineering and Design: Civil Works Cost Engineering*, relating to contingency costs. Finally, I reviewed Army Corps of Engineers publications *Cost-Competitive Construction Management: A Review of Corps of Engineers Construction Management Costs*[5] and *U.S. Army Corps of Engineers Military Construction Management Cost*[6] regarding construction management cost data used to develop private-sector costs for providing construction management services. See also Exhibit No. CPC-0006, Supporting Documents.

Q. Were you able to review any additional materials or resources for use in developing your TDC estimate?

A. Yes. I reviewed Cardinal plant asset data. In addition, I reviewed current labor rates and construction cost information in engineering industry

[5] USACE, *Cost-Competitive Construction Management: A Review of Corps of Engineers Construction Management Costs* (June 1990), https://apps.dtic.mil/dtic/tr/fulltext/u2/a227175.pdf.

[6] USACE, *U.S. Army Corps of Engineers Military Construction Management Costs* (May 1994), https://apps.dtic.mil/dtic/tr/fulltext/u2/a283018.pdf.

publications. I also reviewed the Federal Emergency Management Agency's ("FEMA") *Debris Estimating Field Guide*, [7] which provides debris measurement guidance and calculations. I utilized construction takeoff software to capture estimated material takeoff ("MTO") quantities from plot plans into a quantifiable data set. MTO refers to a list of materials with quantities (such as building volume) and types (such as specific grades of steel) that are required to build a designed structure or item. This list is generated by analysis of a blueprint or other design documents. For the final step in developing the TDC estimate, I incorporated the quantities generated from the MTO estimate into a proprietary project management takeoff software to generate estimates for labor, material, and equipment costs.

Q. How did you familiarize yourself with Cardinal to develop your estimates?

A. I familiarized myself with Cardinal system maps, schematic drawings, and documentation describing and depicting Cardinal's physical plant in service. Additionally, I reviewed design drawings, standard details of Cardinal's facilities, and pipeline abandonment guidelines.

J. Decommissioning Costs

Q. What were the parameters upon which your Cardinal TDC estimates

[7] FEMA, *Debris Estimating Field Guide* (Sept. 2010), https://www.fema.gov/media-library-data/1558616150217-8ff03e353e675b00c08a84b5916fa397/fema_329_debris_estimating_field_guide_9-1-2010.pdf.

are based?

A. I reviewed the Cardinal Standard Operating Procedures, Exhibit No. CPC-0006, Supporting Documents, page 33, as it includes a list of parameters utilized.

Q. Please comment on how you developed the cost estimate model for your TDC estimates.

A. My cost estimates are based on the removal or abandonment in place of physical property. The amount of physical material to be removed or abandoned is derived by a MTO list developed from company plot plans and profiles, design drawings, and utility details from throughout the Cardinal system, as shown in the Exhibit No. CPC-0005, TDC Workpapers, page 34-42, “Material Takeoff Packet”.

Q. How did you estimate the costs for each phase of removal or abandonment?

A. I broke out work into its major components, such as demolition and removal of compressor station, meter station, and line pipe. Then, in the case of removal, I estimated the cost of removing subsets of each component, e.g., surface and subsurface material. I broke out abandonment work into major components related to, for example, type of crossing—road, railroad line, stream—as well as separately analyzing transmission and storage-related abandonment activities, for purposes of deriving cost estimates. These cost estimates were based on my expertise regarding crew size, and required skill sets, equipment, and time.

a. Labor, Material, and Equipment Cost Estimates

Q. Would Cardinal handle all the work associated with terminal retirement in-house, or hire outside contractors?

A. Given the nature of the work and Cardinal's current workforce, Cardinal would need to hire outside contractors to perform tasks associated with terminal abandonment.

Q. What type of contractors would Cardinal employ to terminally abandon its facilities?

A. Due to the numerous rivers, streams, highways, railroads, and other infrastructure (such as communications lines, electrical lines, and other pipelines) which Cardinal's pipelines cross Cardinal would hire contractors skilled in pipeline construction/demolition techniques suitable for terminal abandonment activities.

Q. What type of skilled workers would be required to terminally abandon its facilities?

A. Skilled operators would be required to safely and efficiently operate heavy equipment necessary to perform specific tasks such as excavation, loading material, and backfill. Pipe fitters skilled at the disassembly of pipe systems, which include pipe and compressor station component removal, would also be required.

Q. What pipeline contractor labor rates have you included in your TDC estimates?

A. I conservatively used non-union labor rates in my estimates. Labor costs are based on working an eight-hour day in daylight hours in moderate temperatures and estimated based on 2021 average wage rates. The 2021 average wage rates were then adjusted to three market locations in North Carolina in which Cardinal operates. See Exhibit No. CPC-0005, TDC Workpapers, page 32. Labor costs and productivity are based on actual working conditions, material receiving and handling, mobilization at site, site movement, breaks and cleanup. Based on my experience, whether or not a contractor is a union labor shop, it will pay some union labor rates to skilled employees in the types of trades required to decommission a pipeline, thus my use of non-union labor rates is conservative.

Q. What is labor burden and is it reflected in your estimates?

A. Labor burden is the full cost to have an employee in a company, aside from the salary the employee earns. Labor burden costs may include, but are not limited to, benefits for employees included on their payroll, payroll taxes, pensions, and health and dental insurance. Similarly, company paid time off, such as paid sick, holiday or training time, are also considered part of the labor burden since they are also a cost to the company. It is assumed that the general contractor hired to perform the abandonment would incur these in-house costs, and thus include them in the cost estimate provided to Cardinal. My estimate includes costs associated with labor burden.

Q. Did you include an allowance for subcontractor overhead and profit ("O&P") costs in your TDC cost estimate?

A. Yes. Total Cost, including O&P for the subcontractor is displayed on the current estimate in the last column on the right for each workpaper in Cardinal's TDC Workpapers, Exhibit No. CPC-0005. This figure is the sum of the bare material cost plus an industry standard ten percent for profit, the base labor cost plus appropriate labor burden, and the bare equipment cost plus ten percent for subcontractor overhead.

Q. What equipment rates did you use in your TDC estimates?

A. Equipment costs include not only rental, but also operating costs for equipment under normal use. The operating costs include parts and labor for routine servicing, such as repair and replacement of pumps, filters and worn lines. Equipment rental rates are obtained from industry sources throughout North America, including contractor, suppliers, dealers, manufacturers, and distributors. Cardinal equipment rates were averaged from the same three applicable Cardinal market locations within North Carolina, available within the cost estimating software package.

Q. What material cost did you use in your TDC estimates?

A. I used direct material cost, which is the cost of the raw materials and components, such as soil and seed utilized in the restoration process, plus the transportation cost of getting materials to the site. A company may buy materials from suppliers, create them on-site, or buy them from its own subsidiaries. I based my estimate of these material costs on my first-hand construction experience, as well as utilizing 2021 Cardinal asset location specific rates previously mentioned, calculated within the project management model.

Q. How did you develop the equipment and labor estimates, and estimate the time needed to carry out specific demolition activities in your TDC estimate?

A. I relied on my experience as a project manager, in particular, as Project Engineer for three years recently at ACC where I directly oversaw every aspect of gas, water and sewer pipeline, and electric project activities. My experience, coupled with the applicable project management software, led to the development of activities outlined in the final TDC cost estimate.

Q. Did you include environmental costs in your TDC?

A. Yes. Environmental costs, such as monitoring during final abandonment activity, conducting tests for hazardous materials, and writing reports were incorporated into each cost estimate.

Q. Similarly, did you include an allowance for pipeline company inspection in your TDC estimate?

A. Yes. An inspector was included in each estimate to account for the supervision necessary to monitor the daily activities required to complete each estimated task. The inspection time required was calculated based on the longest projected production timeline for that estimate.

Q. Did you include an allowance for per diem in your terminal decommissioning study estimate?

A. Yes. Per diem was included in each estimate to account for food and lodging necessary to complete each estimated task. Estimated per diem costs were based on labor hours projected per cost estimate multiplied by FY 2021 General Services Administration ("GSA") average rate of $114/day generated from a GSA list of three North Carolina locations available that relate to Cardinal's market locations. *See* Exhibit No. CPC-0005, TDC Workpapers, page 33, "Per Diem Determination" spreadsheet.

Q. Please explain how the labor, material, and equipment rates from the two locations were used in the TDC estimate.

A. Labor, material, and equipment rates were adjusted to locations in the Cardinal operating footprint utilizing a City Cost Index Adjustment Factor ("CCI") developed within the project management cost estimating software package. For the TDC estimate, a City Cost Index Adjustment Factor of 0.918 was utilized to take into consideration the same 3 applicable Cardinal market locations in North Carolina available within the software package. *See* Exhibit No. CPC-0005, TDC Workpapers, page 32, "City Cost Index Factor Determination" spreadsheet.

Q. You mentioned a City Cost Index Adjustment Factor. Can you please further explain?

A. The City Cost Index Adjustment Factor is a multiplier used to adjust the original estimated costs to reflect the market location in which Cardinal operates. In this case, a City Cost Index Adjustment Factor of 0.918 was utilized to take into consideration the same 3 applicable Cardinal market locations in North Carolina and was applied to each cost estimate to obtain a representative cost estimate dollar amount for the assets in that market, or location, where Cardinal facilities are owned and operated. *See* Ex. No. CPC-0005, TDC Workpapers, page 2, "Cost Estimate Summary" spreadsheet.

K. Cardinal Transmission Facilities

Q. What are the tasks included in your Cardinal transmission TDC

estimate?

A. I estimate that the work to retire Cardinal's transmission plant would include the following tasks:

a. Clean and purge system of hydrocarbons;

b. Abandonment in place;

c. Road crossing abandonment;

d. Remove meter stations;

e. Remove compressor station;

f. Remove cathodic protection facilities;

g. Remove pipeline ROW markers;

h. Remove taps;

i. Remove mainline valves; and,

j. Restore all sites.

These tasks are predicated on using the most economical method of retirement compatible with a sample of Cardinal's ROW agreements, environmental considerations, DOT minimum safety regulations, and Corps of Engineers' regulations pertaining to navigable waters and dredge and fill permits.

a. Clean and Purge System of Hydrocarbons

Q. Please explain what steps Cardinal would take to clean and purge its transmission pipelines.

A. An abandoned pipeline is a pipeline that is permanently removed from service, physically separated from its supply source, and is no longer maintained. The abandonment of pipeline facilities includes the safe disconnection from an operating pipeline system, purging of combustibles, pigging and sealing abandoned facilities left in place to minimize safety and environmental hazards. These costs and tasks are detailed in the TDC Workpapers, Exhibit No. CPC-0005, and Cardinal's Supporting Documents, Exhibit No. CPC-0006.

b. ABANDONMENT IN PLACE

Q. How did you estimate the cost to abandon in place Cardinal's transmission pipelines?

A. Based on my experience as well as referencing Cardinal's Supporting Documents, Exhibit No. CPC-0006, I developed estimates to purge, clean, cut and cap approximately 105 miles of Cardinal transmission pipeline. As further detailed in Exhibit No. CPC-0005, TDC Workpapers, page 3, I estimated that this will cost $41,443 per mile for pipe less than 24 inches in diameter. It should be noted these costs are well within the industry expert quote of $35,000 (approximately $41,000 in 2021 dollars) per mile for a twenty-four inch pipe, as stated in the October 31, 2013 RBN Energy LLC article, *"WOO-PIG-SOOIE"-The Business of Pipeline Integrity II*, by Callie

Mitchell.[8] Please see Exhibit No. CPC-0006, Supporting Documents, page 30.

c. REMOVAL OF PIPELINE FACILITIES

Q. How many miles of pipeline did you estimate would be removed entirely?

A. Approximately 0.3 miles.

Q. What is the basis in your TDC estimate for the complete removal of the 0.3 miles of Cardinal's transmission pipeline?

A. Cardinal personnel estimate that approximately 0.26% percent of Cardinal transmission pipeline would need to be removed upon abandonment based on its ROW agreements and permits. 0.26% percent of 105 miles of pipeline is approximately 0.3 miles.

Q. How did you estimate the cost to remove Cardinal's Transmission pipelines?

A. I estimated the cost to excavate and remove the pipeline on a per-mile basis at $96,404 and $201,377, respectively. I then estimated the cost per mile to backfill and restore the area disturbed to its original condition at $117,728 and $10,769 per mile respectively, as summarized on page 2 of the TDC Workpapers, Exhibit No. CPC-0005, as well as detailed on pages 4-7.

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[8] Callie Mitchell, RBN Energy, Inc., *"Wooo–PIG–SOOIE!" – The Business of Pipeline Integrity* (Oct. 3, 2013), https://rbnenergy.com/woo-pig-sooie-the-business-of-pipeline-integrity.

d. Abandonment of Crossings

Q. What is a "crossing"?

A. A "crossing" is a location at which a pipeline encounters a road, railroad, or water body and, to continue service, must cross underneath or above the asset.

Q. What steps are taken to abandon a crossing?

A. First, the crossing pipeline has to be disconnected from all sources and supplies of gas. Second, the pipeline has to be purged of hydrocarbons and cleaned. Third, the crossing pipeline is cut and capped at the abandoned crossing. Finally, the site is restored to its original condition. For more details, see Exhibit No. CPC-0006 Supporting Documents, pages 33-43.

Q. Will you summarize your estimate to abandon Cardinal's pipeline crossings?

A. Cardinal has a total of 455 crossings throughout its transmission system, broken into four categories: road, highway, railroad, and water. Based on the number and categories of crossings, the total cost to decommission Cardinal's pipeline crossings is estimated at $16,170,093, as shown in Exhibit No. CPC-0005, TDC Workpapers, pages 8-11, and summarized on page 2, "Cost Estimate Summary" spreadsheet.

e. Meter Station Retirement

Q. What is the order of operation underlying your meter station removal estimates?

A. There are six steps that will be undertaken to remove meter stations and underlie my estimate. First, miscellaneous surface material and fencing would be removed to make the site ready for demolition work. Second, valves and yard piping would be removed. This work involves excavation down three feet, cutting and capping, lifting, and hauling. Third, station equipment would be disconnected, lifted, and stockpiled for transportation to a salvage yard. Fourth, buildings would be demolished, and material transported to a salvage yard. Fifth, pavement, gravel and unsuitable materials would be removed and hauled from the site, and the site would then be graded. Finally, the site would be restored by backfilling, grading, placing topsoil, seeding and fertilizing.

Q. How did you develop Cardinal's meter station removal estimates?

A. Cardinal has 7 meter stations throughout its transmission system. First, an MTO was performed to determine the estimated quantity of materials to be removed from the meter station plot plan and standard detail. Second, I estimated the tasks, crew, time, equipment and labor necessary to retire each category of meter station material based on the quantities generated from the MTO. Third, I estimated the costs for the crew and equipment, as shown in

Exhibit No. CPC-0005, TDC Workpapers, pages 12-20. In summary, the total cost to decommission Cardinal's small, medium and large Transmission meter station facilities are estimated at $846,264, as shown in Exhibit No. CPC-0005, TDC Workpapers, page 2, "Cost Estimate Summary" spreadsheet.

f. Compressor Station Retirement

Q. What is the order of operation underlying your transmission compressor station removal estimates?

A. There are seven steps that will be undertaken to remove the compressor stations and underlie my estimate. First, miscellaneous surface material and fencing would be removed to make the site ready for demolition work. Second, valves, blowdowns, and yard piping would be removed. This work involves excavation down three feet, cutting and capping, lifting, and hauling. Third, station equipment would be disconnected, lifted, and stockpiled for transportation to a salvage yard. Fourth, buildings would be demolished, and material transported to a salvage yard. Fifth, compressor blocks and concrete slabs would be broken up and removed to three feet below ground surface. This work also involves excavation, cutting, lifting, and hauling. Sixth, pavement, gravel, and unsuitable materials would be removed and hauled from the site, and the site would be graded. Seventh, and finally, the site would be restored by backfilling, grading, placing topsoil, seeding, and fertilizing.

Q. How did you develop Cardinal's Transmission compressor station removal estimates?

A. I utilized a three-phase cost estimating approach by grouping tasks into the following criteria: (1) surface material, (2) subsurface material, and (3) restoration. The quantity of material to be removed from compressor station locations were derived from each compressor station plot plan and standard detail MTOs (*See* Exhibit No. CPC-0005, TDC Workpapers, "Material Takeoff Packet"). I then estimated the tasks, crew, time, equipment, and labor necessary to retire each category of compressor station material based on the quantities generated from the MTO. Finally, I estimated the costs for the crew and equipment, as shown in Exhibit No. CPC-0005, TDC Workpapers. In summary, the total adjusted cost to decommission Cardinal's transmission compressor station facility along Cardinal's transmission line is estimated to be $3,009,260, as shown in, Exhibit No. CPC-0005, TDC Workpapers, pages 21-25, and summarized on page 2, "Cost Estimate Summary", spreadsheet.

g. Cathodic Protection

Q. Please describe the decommissioning costs related to cathodic protection.

A. Cathodic protection is necessary throughout the pipeline system in order to preserve the pipe integrity by controlling the pipe corrosion through the use of a power source and sacrificial anode. Terminally retiring this equipment requires personnel experienced in electrical work to safely and efficiently decommission the electrical system. Cardinal has a total of 15,077 transmission cathodic protection rectifiers and test sites throughout the system to monitor the system integrity. The total cost to decommission Cardinal's cathodic protection transmission facilities is estimated at $35,680, as shown in Exhibit No. CPC-0005, TDC Workpapers, pages 26-27, and summarize on page 2, "Cost Estimate Summary" spreadsheet.

h. ROW Markers

Q. Please describe the ROW marker decommissioning costs.

A. To identify the location of buried pipelines within the ROWs, marker posts are placed in the ground at intervals above the centerline of the pipeline, or as close as possible. The ROW decommissioning process involves excavating down approximately three feet, removing the marker, backfilling, and seeding the disturbed site location. The Cardinal system has approximately 1,330 ROW markers estimated to cost $70,737, as shown in Exhibit No. CPC-0005, TDC Workpapers, page 28, and summarized on page 2, "Cost Estimate Summary" spreadsheet.

i. Tap Locations

Q. Please describe the decommissioning costs associated with tap locations.

A. Tap locations tie into, or connect to, the existing mainline system. The decommissioning process involves excavating down three feet, cutting and capping, lifting, hauling, and site restoration. The Cardinal transmission system has 44 tap locations estimated to cost $257,865 to remove, as shown in Exhibit No. CPC-0005, TDC Workpapers, page 29, and summarized on page 2, "Cost Estimate Summary" spreadsheet.

j. Mainline Valve Locations

Q. Please describe the decommissioning costs associated with mainline valves.

A. The Cardinal system has roughly 18 mainline valves that provide an additional way of controlling flow on the mainline. The process of decommissioning the mainline valves involves excavating down three feet, cutting and capping, lifting, hauling, and site restoration. The cost associated with these activities are estimated at $178,370, as shown in Exhibit No. CPC-0005, TDC Workpapers, page 30, and summarized on page 2, "Cost Estimate Summary" spreadsheet.

L. Construction Management Fees Associated with Decommissioning

Q. How were CM expenses calculated for the cost estimate?

A. CM is a professional service that provides a project's owner(s) with effective management of the project's schedule, cost, quality, safety, scope, and function.

Q. Did you rely upon any additional information for your CM fee?

A. Yes. As I previously mentioned, I reviewed USACE publications *Cost-Competitive Construction Management: A Review of Corps of Engineers Construction Management Costs* and *U.S. Army Corps of Engineers Military Construction Management Cost* regarding CM firm fees used to develop private-sector costs as a percent of construction contract for providing construction management services. *See* Ex. No. CPC-0006, TDC Supporting Documents, pages 23-26. The tables below are relevant excerpts from Exhibit No. CPC-0006 at 23.

TABLE C-7

SUMMARY OF CONSTRUCTION MANAGEMENT FEE

(As percent of construction contract)

Characteristic	Construction management fee			Number of projects	Number of companies
	25th	Median	75th		
Overall	2.9%	4.7%	7.6%	196	29
Size of company					
1 – 5	4.6	5.3	11.9	9	2
6 – 10	3.5	5.2	7.1	43	8
11 – 15	3.6	4.0	5.0	8	2
16 – 25	0.7	3.2	9.7	48	5
26 – 50	3.8	4.9	7.3	40	5
51 – 100	3.8	6.4	11.0	13	2
Over 100	2.0	4.5	6.7	35	5
Type of company					
General contractor (GC)	2.9	2.9	2.9	1	1
CM firm	2.2	4.6	8.0	113	13
Architect engineering firm (AE)	2.0	2.3	3.3	9	1
GC/CM	3.3	4.4	6.4	47	8
CM/AE	4.4	7.0	8.4	19	5
Other	3.2	4.8	11.7	7	1
Client base					
Government	2.3	4.8	7.4	71	11
Private sector	2.8	4.5	8.0	106	15
Mixed	3.6	5.0	6.7	19	3

Table C-6.
Summary of Construction Management Fee (as a percentage of construction contract)

	CM fee			Number of projects	Number of companies
	25th	Median	75th		
Overall	3.5%	5.0%	7.1%	187	33*
Size of company (number of employees)					
1 – 5	2.4	5.0	6.6	21	4
6 – 10	4.5	5.9	10.5	29	5
11 – 15	4.6	6.0	8.1	17	5
16 – 25	4.0	4.8	5.5	24	4
26 – 50	3.6	4.9	7.5	33	6
51 – 100	4.6	5.4	9.6	12	2
101 – 250	2.6	6.8	10.3	6	1
251 – 500	4.2	5.7	9.1	16	2
Over 500	1.2	2.5	6.0	29	4
Type of company					
CM firm	3.7	5.0	7.2	108	20
GC/CM firm	4.5	5.1	8.6	30	5
A-E/CM firm	2.2	4.5	6.7	49	8
Client base					
Government	2.8	4.6	6.1	92	17
Private sector	3.6	5.0	8.3	42	9
Mixed	3.8	5.7	9.9	53	7

*Two companies did not provide fee information.

The information by the USACE clearly show that a 2.5 percent CM fee is lower than the median 4.6 percent and 5.0 percent of CM firm fees surveyed by USACE applied to construction projects. The estimate CM fee for Cardinal's facilities is $616,676. *See* Ex. No. CPC-0005, TDC Workpapers, page 2, "Cost Estimate Summary" spreadsheet.

M. Contingency Costs

Q. What are contingency costs?

A. Establishing a budget is one of the first steps in planning a construction project.

However, there are always unforeseen issues, or items that arise where additional work will be needed at a cost incremental to the cost estimates established for specific tasks in the budget estimate. A contingency budget is money set aside to cover these unexpected costs during the construction process. This money is on reserve and not allocated to one area of the work. Unknown risks are a factor for determining contingency. By identifying risks, you will better understand where the contingency budget might go, which will elucidate how much you might need. Examples of risks that contribute to a higher contingency cost during construction include (1) the condition of material being removed, (2) market conditions for labor, equipment and materials and their availability, (3) weather, and (4) seasonal delays that impact scheduling. This is a critical component of the budget.

Q. What is your contingency cost estimate and how was that developed?

A. I estimate a conservative ten percent contingency. I base this ten percent contingency estimate on (1) my construction experience, (2) Chapter 11, Contingency, of the DOE's Cost Estimating Guide, and (3) delays due to weather. My ten percent contingency costs for Cardinal total $2,528,373. *See* Ex. No. CPC-0005, TDC Workpapers, "Cost Estimate Summary" spreadsheets. My estimated costs, based on this scope of work, are significantly lower than it would have been had I assumed the use of union labor, installation of temporary access roads to remote locations, and clean-up and removal of hazardous materials at M&R stations, mainline facilities, and pipeline locations. Further, the contingency costs estimated are well within the acceptable range of five percent to fifteen percent documented within Chapter 11 of the *Cost Estimating Guide and Engineering and Design: Civil*

Works Cost Engineering, as well as below the fifteen percent used by Viking Gas Transmission Company and Gas Transmission Northwest in FERC Docket Nos. RP98-290-000 and RP06-407-000, respectively.

N. Salvage Values

Q. Did you consider material salvage in your TDC estimate?

A. Yes. I included gross salvage value allowances for equipment, buildings, valves, and pipe. I followed the recommended construction and demolition debris guidelines of FEMA's *Debris Estimating Filed Guide* that calculated gross salvage weight in tons would be half the volume removed measured in cubic yards. I estimated that the gross salvage value for equipment, buildings, valves, and pipe would be $168 per ton for steel based on Scrap Sales USA pricing, which translated into a transmission total of $656,244. *See* Ex. No. CPC-0005, TDC Workpapers, page 2, "Cost Estimate Summary" spreadsheet.

O. Total Estimated Retirement Cost and Conclusion

Q. Please describe how your TDC estimate is organized.

A. My TDC estimate contains separate estimates of terminal decommissioning costs and salvage value for Cardinal plant. Each of the estimates consists of three sections, as detailed in each of the corresponding Exhibit No. CPC-0005, TDC Workpapers, "Cost Estimate Summary" spreadsheet. The first section, "Decommissioning Costs," details estimated costs by line-item of required tasks to be performed during the terminal abandonment. The second section, "Contingency," details contingency costs included in the TDC estimate, calculated at ten percent of the base cost, plus CM fees. The third and final section, "Salvage," recognizes the gross salvage value of Cardinal's scrap, as applicable, at the time of final abandonment.

Q. What conclusions have you reached with respect to the TDC estimate for Cardinal's facilities?

A. The estimated and market adjusted total TDC costs and credits for abandonment, removal, and restoration of the ROW for Cardinal's facilities in 2021 U.S. dollars are $27,155,857. *See* Ex. No. CPC-0005, TDC Workpapers, page 2, "Cost Estimate Summary" spreadsheet.

Q. How would you characterize the final Cardinal TDC estimate?

A. My final TDC estimate of $27,155,857 in 2021 U.S dollars for Cardinal's facilities is conservative for several reasons. First, my TDC estimate is based upon abandoning in place all underground pipe and crossings, but for 0.3 miles of pipe. My estimated costs, based on this scope of work, are significantly lower than it would have been had I assumed that complete removal and disposal of all Cardinal's pipelines and crossings would be conducted rather than abandoning in place. Second, it is assumed that all pipe is within five feet of the surface, negating the use of trench boxes, engineered shoring, and additional excavation. Third, it is assumed access roads are available to each site and that temporary access roads will not need to be installed. Fourth, ROW costs were conservatively estimated based upon removal or abandonment in place and do not account for unforeseen compensation upon final restoration. For instance, in my experience, using sod versus seed and straw can increase the cost of a typical restoration. However, requirements to undertake more expensive sodding restoration are unknown at this time. Finally, should hazardous material issues arise with respect to Cardinal's M&R stations, mainline facilities, and pipelines, these costs are not specifically identified and are not included in my TDC estimate.

V. DEPRECIATION RATE RECOMMENDATIONS

Q. What is the basis for your depreciation rate recommendations?

A. Once the groundwork of survivor curve analysis, average service life analysis, economic life analysis, remaining economic life analysis, and plant balances have been laid, the calculation of the depreciation rates is a fairly straight-forward endeavor. The basic formula for deriving depreciation rates is to divide the net plant by the remaining life to derive the annual expense, which is then divided by the gross plant to derive the depreciation rate:

$$\frac{\dfrac{\text{Gross Plant – Accum. Res. For Depreciation}}{\text{Remaining Life}}}{\text{Gross Plant}} = \text{Depreciation Rate}$$

Q. Please briefly describe the layout of your depreciation workpapers.

A. The depreciation workpapers in Exhibit No. CPC-0003 lay out the theoretical calculations that underlie the depreciation rate recommendations. The Workpapers are divided into nine schedules.

- Schedule 1 reports the impact of existing and recommended depreciation rates.
- Schedule 2 compares the existing and recommended depreciation rate components.
- Schedule 3 reports the plant and reserve for depreciation by property account.

- Schedule 4 reports the average plant in service.
- Schedule 5 reports the parameters that define the rate calculations.
- Schedule 6 calculates the average remaining lives.
- Schedule 7 shows the actual depreciation rate calculations and recommendations.
- Schedule 8 – 8f calculates the negative salvage rate on interim retirements.
- Schedule 9 Iowa curves sampling.

In sum, this study recommends the following composite depreciation rates:

Table No. 1 Recommended Depreciation Rates

Account No.	Account Name	Depreciation Rate
302	Intangible Plant – Franchises *	0.55%
303	Misc. Intangible Plant *	1.57%
365.11	Land	0.00%
365.12	Land Rights *	1.93%
365.2	Rights of Way *	1.97%
366.1	Compressor Station S & I	3.51%
366.2	M & R Station S & I	2.85%
367	Mains	2.50%
368	Compressor Station Equipment	2.94%
369	Meas & Reg Station Equipment	2.49%
390	Struct. & Impr. – Office Bldg *	10.00%
391	Office Furniture & Equipment	
-	OFF001- Tower Office Furn.&	10.00%
-	DPC001-Data Process & Comp. Equip.*	12.50%
-	DEV001-Developed Software*	6.67%
392.1	Transportation Equipment *	16.67%
394	Tools Shop & Garage Equipment	5.00%
396	Power Operated Equipment *	10.00%
397	Communication Equipment *	4.35%

*- Whole Life Rate.

Q. Does this conclude your prepared Direct Testimony?

A. Yes, it does.

EXHIBIT NO. CPC-0002

STEVEN R FALL - CV

Steven R Fall
on behalf of
Cardinal Pipeline Company, LLC

Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

CURRICULUM VITAE

NAME	Steven Fall
BUSINESS ADDRESS	1155 15th Street N.W., Suite 1004 Washington, DC 20005
EDUCATION	Pennsylvania State University; Bachelor of Science in Biology/Minor in Chemistry Certifications: Maryland State Highway Traffic Control Manager OSHA 30 Card Certificate of Completion – Deck and Ramp Guidelines Certificate of Completion – Chimneys and Vents Confidential Clearance Eligible NUCA – National Utility Contractors Association HeavyBid/HeavyJob Software Foundation Software RSMeans
PRESENT POSITION	Vice President Brown, Williams, Moorhead & Quinn, Inc. 1155 15th Street N.W., Suite 1004 Washington, DC 20005
NATURE OF WORK PERFORMED WITH FIRM	Analysis of terminal negative salvage and pipeline operations. Natural gas pipeline terminal negative salvage testimony provided for the Federal Energy Regulatory Commission. A list of cases in which Mr. Fall provided testimony is attached below.
PREVIOUS EMPLOYMENT	Department of Consumer and Regulatory Affairs Washington, DC (District of Columbia agency responsible for issuance of and adherence to licenses and permits) Project Manager 6/2017 – 10/2017 High impact position designated for situations requiring immediate resolution.

Mobile Inspection Implementation: Research and development of the Mobile Inspection application and platform, which includes but is not limited to development of the Mobile Inspection Standard Operating Provisions Manual, training protocols and regimens.

International Accreditation Services Semi-Annual Report: Collection and interpretation of data from multiple departments summarized into a deliverable report required for inspection and permitting accreditation.

Hot Properties: District of Columbia properties undergoing construction that require guidance to achieve resolution of ongoing compliance difficulties. Understanding of the IRC, IBC, and DC Municipal Regulations required for situational analysis of safety and code compliance.

Anchor Construction Washington, DC
(Anchor Construction specializes in utility construction: water, storm, sewer, and conduits.)

Project Engineer 7/2014 – 6/2017
WSSC ESA IDIQ: Manage a $32.5 million dollar sewer mainline repair, rehabilitation, and/or replacement project in coordination with the WSSC at the Cabin John and Paint Branch Basin. Required hands-on scheduling and management of materials, equipment, and crew members.

DDOT Klingle Valley Trail: $7.6 million dollar green infrastructure installation including: bio-swale, bio-retention structures, permeable asphalt multi-use trail, Klingle Creek restoration, lighting and landscaping. Multi-agency coordination with underground utilities operated byDDOT, Washington Gas, National Park Service, PEPCO, and DC Water.

Howard Hughes Medical Institute Retaining Wall: $1.5 million dollar project designed to remove, salvage and rebuild an existing retaining wall located on a designated conservation area at the Howard Hughes Medical Institute campus. Required understanding and compliance with restrictions imposed on operating areas, materials handling, and site restoration standards.

WSSC Large Meter Vault: $575 thousand dollar large meter vault replacement project at various locations throughout Montgomery County, MD. Required hands-on scheduling and management of materials, equipment, and crew members.

Additional accomplishments and responsibilities include:

- Develop project objectives by reviewing project proposals, blue prints, drawings and required permits.
- Determine project responsibilities by identifying project phases and elements; assigning personnel to phases and elements; reviewing bids from contractors.
- Determine project specifications by studying product design, customer requirements, and performance standards.
- Determine project schedule by studying project plan and specifications; calculating time requirements; sequencing project elements.
- Develop and maintain project schedule by monitoring progress; coordinating activities through weekly and bi-weekly schedule updates.
- Control project plan by reviewing and inspecting design, specifications, and plan and schedule changes; recommending actions.
- Provide leadership through thorough communication of attainable goals, project direction and production analysis of daily/weekly/monthly activities.
- Maintain safe and clean working environment by enforcing OSHA mandated procedures, rules and regulations.

AKA White House Washington, DC
(The fusion of the long-term comfort of a luxury furnished apartment with the style and service of an intimate hotel)

Director of Engineering 7/2012 – 7/2014
Directly oversaw the $1 million dollar renovation improvement, adding another level of hotel luxury suites to the existing facility. Received global recognition from company for outstanding work ethics and policies implemented. Improved department efficiency and established preventative maintenance procedures.
Additional accomplishments and responsibilities include:

Managed electrical systems, mechanical work and safety aspects of a 141 room hotel.
Directly oversaw the implementation of work planned for building maintenance, including assigning and delegating multiple projects to staff and vendors.
Monitored and controlled expenditures to successfully stay within property's monthly budget.
Supervised the maintenance of air conditioning, elevators, room appliances, building wire systems, roofing, landscaping and all operational equipment.
Independently created request for proposals to negotiate contract/vendor proposals.
Interviewed, trained, inspired and evaluated staff; disciplined and implemented corrective actions as necessary.
Developed the implemented the building Emergency Evacuation Plan in coordination with DC Fire Department.

Humanetics Corporation Eden Prairie, MN
(Humanetics is focused in three key areas organized around FDA regulatory boundaries: prescription drugs, medical foods, and consumer products)

Research Analyst 7/2005 – 3/2012
Oversaw and performed research and development of a radioprotectant in coordination with the Armed Forces Radiobiology Research Institute, Henry Jackson Foundation, Uniformed Services University of the Health Sciences, and BioReliance.

Designed and implemented testing of complex experiments to test prospective radiological protective and therapeutic agents.
Completed analysis on test results to assess the biological and physiological effects of designed experimentation.
Effectively communicated research ideas and methodology via written reports and oral presentations.
Generated experimental protocols and methodology.
Conducted laboratory site assessments, including site activation, interim monitoring and close-out visits.
Achieved proof of efficacy through preclinical testing conducted of an experimental radioprotectant designed to combat the effects of Acute Radiation Syndrome (ARS).
Organized and maintained detailed records of new research data as well as relevant published studies.

Provided technical guidance in training to no less than two dozen AFRRI staff and military employees.
Completed yearly detailed FDA summary report.
Designed, implemented and updated experimental SOP's.

BioReliance Corporation Rockville, MD
(Provides nonclinical testing and manufacturing services for biologics)

Senior Research Associate 7/2000 – 7/2005
Team leader hired to assist in experimental development, data documentation and analysis at an established biotech corporation.

- Executed over 50 multi-phased experiments per year to assess the biological and physiological effects of carcinogenic exposure on rodents and cell cultures.
- Captured test results and collated consumable forms for supervisor.
- Assisted in the design of secondary experiments based on initial results.
- Ensured each experiment adhered to FDA mandated GLP standards.
- Provided daily briefings to laboratory manager regarding status and results of experiments.
- Designed and subsequently implemented and updated dozens of experimental SOP's.
- Monitored and maintained laboratory equipment and supplies.

#	JURISDICTION	CASE OR DOCKET NO.	UTILITY/ORGANIZATION INITIATING PROCEEDING	POSITION	SUBJECT MATTER
			Formal Proceedings In Which Steven Fall Testified		
1	FERC	RP18-877	MOGAS PIPE LINE COMPANY	Witness	Natural Gas Terminal Decommissioning
2	FERC	RP18-940	EMPIRE PIPELINE INC.	Witness	Natural Gas Terminal Decommissioning
3	FERC	RP18-922	TRAILBLAZER PIPELINE COMPANY	Witness	Natural Gas Terminal Decommissioning
4	FERC	RP18-923	ENABLE MISSISSIPPI RIVER TRANSMISSION, LLC	Witness	Natural Gas Terminal Decommissioning
5	FERC	RP18-1115	SALTVILLE GAS STORAGE COMPANY	Witness	Natural Gas Terminal Decommissioning
6	FERC	RP18-1126	TRANSCONINENTAL GAS PIPELINE COMPANY	Witness	Natural Gas Terminal Decommissioning
7	FERC	RP19-78	PANHANDLE EASTERN PIPE LINE COMPANY, LP	Witness	Natural Gas Terminal Decommissioning
8	FERC	RP19-165	WBI ENERGY TRANSMISSION, INC.	Witness	Natural Gas Terminal Decommissioning
9	FERC	RP19-343	TEXAS EASTERN TRANSMISSION, LP	Witness	Natural Gas Terminal Decommissioning
10	FERC	RP19-352	SEA ROBIN PIPELINE COMPANY, LLC	Witness	Natural Gas Terminal Decommissioning
11	FERC	RP19-1426	NATIONAL FUEL GAS SUPPLY CORPORATION	Witness	Natural Gas Terminal Decommissioning
12	FERC	RP19-1523	PANHANDLE EASTERN PIPE LINE COMPANY, LP	Witness	Natural Gas Terminal Decommissioning
13	FERC	RP20-131	ENABLE MISSISSIPPI RIVER TRANSMISSION, LLC	Witness	Natural Gas Terminal Decommissioning
14	FERC	RP20-467	DOMINION ENERGY COVE POINT LNG, LP	Witness	Natural Gas Terminal Decommissioning
15	FERC	RP20-908	ALLIANCE PIPELINE, LP	Witness	Natural Gas Terminal Decommissioning
16	FERC	RP20-921	MARITIMES & NORTHEAST PIPELINE, LLC	Witness	Natural Gas Terminal Decommissioning

#	JURISDICTION	CASE OR DOCKET NO.	UTILITY/ORGANIZATION INITIATING PROCEEDING	POSITION	SUBJECT MATTER
17	FERC	RP20-980	EAST TENNESSEE NATURAL GAS, LLC	Witness	Natural Gas Terminal Decommissioning
18	FERC	RP21-441	FLORIDA GAS TRANSMISSION, LLC	Witness	Natural Gas Terminal Decommissioning
19	FERC	RP21-20	SHELL PIPELINE COMPANY, LP	Witness	Oil Pipeline Depreciation Testimony
21	FERC	RP21-1001	TEXAS EASTERN TRANSMISSION, LP	Witness	Natural Gas Terminal Decommissioning

DEPRECIATION STUDY WORKPAPERS
Docket No. G-39, Sub 46

Steven R Fall
on behalf of
Cardinal Pipeline Company, LLC

Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

2/20/2022

Cardinal Pipeline Company, LLC
Depreciation Study
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Docket No. G-39, Sub 47
Exhibit No. CPC-0003

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 1 - Comparison of Proposed and Present Depreciation Rates (Inclusive of Negative Salvage)
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Plant in Service December 31, 2020	Fully Depreciated Plant	Depreciable Plant	Current Rates	Current Expense	Proposed Rates	Proposed Expense	Expense Difference
			(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
			$	$	$	%	$	%	$	$
1	**Intangible Plant**									
2	302	Intangible Plant - Franchises	176,783		176,783	4.00%	7,071	0.55%	972	(6,099)
3	303	Misc. Intangible Plant	898,093		898,093	2.19%	19,668	1.57%	14,100	(5,568)
4		Subtotal Intangible Plant	1,074,876	-	1,074,876	2.49%	26,740	1.40%	15,072	(11,667)
5										
7	**Transmission Plant**									
8	365.11	Land	658,661		-	0.00%	-	0.00%	-	-
9	365.12	Land Rights	96,745		96,745	2.00%	1,935	1.93%	1,867	(68)
10	365.2	Rights of Way	4,011,679		4,011,679	2.00%	80,234	1.97%	79,030	(1,204)
11	366.1	Compressor Station S & I	2,673,056		2,673,056	3.00%	80,192	3.51%	93,824	13,633
12	366.2	M & R Station S & I	1,428,304		1,428,304	2.63%	37,564	2.85%	40,707	3,142
13	367	Mains	100,830,092		100,830,092	2.20%	2,218,262	2.50%	2,520,752	302,490
14	368	Compressor Station Equipment	35,393,767		35,393,767	3.03%	1,072,431	2.94%	1,040,577	(31,854)
15	369	Meas & Reg Station Equipment	8,764,591		8,764,591	3.18%	278,714	2.49%	218,238	(60,476)
16		Subtotal Transmission	153,856,895	-	153,198,234	2.46%	3,769,332	2.61%	3,994,996	225,664
17										
18	**General Plant**									
19	390	Struct. & Impr. - Office Bldg	5,269	5,269	-	0.00%	-	10.00%	-	-
20	391	Office Furniture & Equipment								
21		OFF001- Tower Office Furniture & Equip	32,228	-	32,228	8.33%	2,685	10.00%	3,223	538
22		DPC001-Data Process & Comp. Equip.	-	-	-	25.00%	-	12.50%	-	-
23		DEV001-Developed Software	957,123	843,871	113,252	7.69%	8,709	6.67%	7,550	(1,159)
24	392.1	Transportation Equipment	3,761	3,761	-	18.00%	-	16.67%	-	-
25	394	Tools Shop & Garage Equipment	565,711	-	565,711	8.33%	47,124	5.00%	28,286	(18,838)
26	396	Power Operated Equipment	42,559	10,649	31,910	7.92%	2,527	10.00%	3,191	664
27	397	Communication Equipment	174,033	142,401	31,632	7.14%	2,259	4.35%	1,375	(883)
28			1,780,683	1,005,951	774,732	3.55%	63,303	2.45%	43,625	(19,678)
29										
30		Total	156,712,455	1,005,951	155,047,842	2.46%	3,859,374	2.59%	4,053,693	194,318

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Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 2 - Proposed and Present Depreciation and Negative Salvage Rate Components
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter		Current Depreciation Rate	Current Negative Salvage Rate	Current Total	Proposed Depreciation Rate	Proposed Negative Salvage Rate	Proposed Total
				(A)	(B)	(C)	(D)	(E)	(F)
				%	%	%	%	%	%
1	**Intangible Plant**								
2	302	Intangible Plant - Franchises		4.00%		4.00%	0.55%		0.55%
3	303	Misc. Intangible Plant		2.00%	0.19%	2.19%	1.57%		1.57%
4									
5	**Transmission Plant**								
6	365.11	Land							
7	365.12	Land Rights		2.00%		2.00%	1.93%	0.00%	1.93%
8	365.2	Rights of Way		2.00%		2.00%	1.90%	0.07%	1.97%
9	366.1	Compressor Station S & I		2.86%	0.14%	3.00%	3.03%	0.48%	3.51%
10	366.2	M & R Station S & I		2.50%	0.13%	2.63%	2.60%	0.25%	2.85%
11	367	Mains	1/	2.00%	0.20%	2.20%	1.75%	0.75%	2.50%
12	368	Compressor Station Equipment		3.03%		3.03%	2.63%	0.31%	2.94%
13	369	Meas & Reg Station Equipment		3.03%	0.15%	3.18%	2.13%	0.36%	2.49%
14									
15	**General Plant**								
16	390	Struct. & Impr. - Office Bldg		Various			10.00%		10.00%
17	391	Office Furniture and Equipment							
18		OFF001- Tower Office Furniture & Equip		8.33%		8.33%	10.00%		10.00%
19		DPC001-Data Process & Comp. Equip.		25.00%		25.00%	12.50%		12.50%
20		DEV001-Developed Software		7.69%		7.69%	6.67%		6.67%
21	392.1	Transportation Equipment		18.00%		18.00%	16.67%		16.67%
22	394	Tools Shop & Garage Equipment		8.33%		8.33%	5.00%		5.00%
23	396	Power Operated Equipment		7.92%		7.92%	10.00%		10.00%
24	397	Communication Equipment		7.14%		7.14%	4.35%		4.35%
25									
26	Total Composite Average Depreciation Rate					2.46%			2.59%

1/ Cardinal's negative salvage rate includes the costs of Cardinal's ARO and any negative salvage recovery will be sourced to the recovery of legal obligations first.

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 3 - Plant Balances
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Plant in Service December 31, 2020	Reserve for Negative Salvage December 31, 2020	Reserve for Depreciation December 31, 2020
			Plant		
			(A)	(B)	(C)
			$	$	$
1	**Intangible Plant**				
2	302	Intangible Plant - Franchises	176,783	-	(149,054)
3	303	Misc. Intangible Plant	898,093	(6,257)	(509,204)
4		**Subtotal Intangible Plant**	1,074,876	(6,257)	(658,258)
5					
7	**Transmission Plant**				
8	365.11	Land	658,661	-	-
9	365.12	Land Rights	96,745	-	(48,210)
10	365.2	Rights of Way	4,011,679	-	(1,990,158)
11	366.1	Compressor Station S & I	2,673,056	(13,722)	(599,867)
12	366.2	M & R Station S & I	1,428,304	(6,808)	(537,455)
13	367	Mains	100,830,092	(1,008,248)	(50,908,281)
14	368	Compressor Station Equipment	35,393,767	1,874	(8,859,071)
15	369	Meas & Reg Station Equipment	8,764,591	11,623	(3,674,653)
16		**Subtotal Transmission**	153,856,895	(1,015,281)	(66,617,694)
17					
18	**General Plant**				
19	390	Struct. & Impr. - Office Bldg	5,269		(5,269)
20	391	Office Furniture & Equipment			
21		OFF001- Tower Office Furniture & Equip	32,228		(24,197)
22		DPC001-Data Process & Comp. Equip.	-		-
23		DEV001-Developed Software	957,123		(902,108)
24	392.1	Transportation Equipment	3,761		(3,761)
25	394	Tools Shop & Garage Equipment	565,711		(345,372)
26	396	Power Operated Equipment	42,559		(35,664)
27	397	Communication Equipment	174,033		(159,868)
28		**Subtotal General Plant**	1,780,683	-	(1,476,239)
29					
30		**Total**	156,712,455	(1,021,537)	(68,752,191)

Docket No. G-39, Sub 47
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Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 4 - Near Term Additions
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Current Plant in Service	Plant Balance Ratio	Planned Additions 1/ 2022	2023	2024	Average Plant in Service 2/
			(A)	(B)	(C)	(D)	(E)	(F)
			$	%	$	$	$	$
1	**Intangible Plant**							
2	302	Intangible Plant - Franchises	176,783	16.45%				176,783
3	303	Misc. Intangible Plant	898,093	83.55%	-	-	-	898,093
4		Subtotal Intangible Plant	1,074,876	100.00%	-	-	-	1,074,876
5								
6								
7	**Transmission Plant**							
8	365.11	Land	658,661	0.43%	6,432	6,432	6,432	668,309
9	365.12	Land Rights	96,745	0.06%	945	945	945	98,162
10	365.2	Rights of Way	4,011,679	2.61%	39,173	39,173	39,173	4,070,439
11	366.1	Compressor Station S & I	2,673,056	1.74%	26,102	26,102	26,102	2,712,208
12	366.2	M & R Station S & I	1,428,304	0.93%	13,947	13,947	13,947	1,449,225
13	367	Mains	100,830,092	65.53%	984,582	984,582	984,582	102,306,964
14	368	Compressor Station Equipment	35,393,767	23.00%	345,612	345,612	345,612	35,912,184
15	369	Meas & Reg Station Equipment	8,764,591	5.70%	85,584	85,584	85,584	8,892,968
16		Subtotal Transmission	153,856,895	100.00%	1,502,233	1,502,233	1,502,233	156,110,458
17								
18	**General Plant**							
19	390	Struct. & Impr. - Office Bldg	5,269	0.30%				5,269
20	391	Office Furniture & Equipment						
21		OFF001- Tower Office Furniture & Equip	32,228	1.81%				32,228
22		DPC001-Data Process & Comp. Equip.	-	0.00%				-
23		DEV001-Developed Software	957,123	53.75%				957,123
24	392.1	Transportation Equipment	3,761	0.21%				3,761
25	394	Tools Shop & Garage Equipment	565,711	31.77%				565,711
26	396	Power Operated Equipment	42,559	2.39%				42,559
27	397	Communication Equipment	174,033	9.77%				174,033
28		Subtotal General Plant	1,780,683	100.00%				1,780,683
29								
30								
31		Total	156,712,455		1,502,233	1,502,233	1,502,233	158,966,018

1/ Forecasted 3 years of plant additions based on previous 3 year average of plant additions
2/ Aver = [(A + 1/2C)+(A + C + 1/2D)+(A + C + D + 1/2E)]/3

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 5 - Model Parameters
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Average Age (A)	Average Service Life (B)	Iowa Survivor Curve (C)	Average Remaining Lives 29-Yr (D)
1	**Intangible Plant**					
2	302	Intangible Plant - Franchises	22.00	85.00		28.63
3	303	Misc. Intangible Plant	20.40	60.00		27.60
4						
5						
6	**Transmission Plant**					
7	365.11	Land				
8	365.12	Land Rights	22.00	65.00	R2	26.39
9	365.2	Rights of Way	16.72	65.00	R2	26.84
10	366.1	Compressor Station S & I	9.00	45.00	R2	25.70
11	366.2	M & R Station S & I	16.30	45.00	R2	24.18
12	367	Mains	16.02	75.00	R4	28.63
13	368	Compressor Station Equipment	8.87	85.00	R3	28.59
14	369	Meas & Reg Station Equipment	12.83	60.00	L3	27.60
15						
16	**General Plant**					
17				US OMB Life Tables 1/		
18	390	Struct. & Impr. - Office Bldg		10.00	10.00%	
19	391	Office Furniture & Equipment				
20		OFF001- Tower Office Furniture & Equip		10.00	10.00%	
21		DPC001-Data Process & Comp. Equip.		8.00	12.50%	
22		DEV001-Developed Software		15.00	6.67%	
23	392.1	Transportation Equipment		6.00	16.67%	
24	394	Tools Shop & Garage Equipment		20.00	5.00%	
25	396	Power Operated Equipment		10.00	10.00%	
26	397	Communication Equipment		23.00	4.35%	

1/ Average service lives taken from United States Office of Management and Budget Useful Life and Disposal Table

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 6 - Average Remaining Lives - Transmission
Docket No. G-39, Sub 46

Docket No. G-39, Sub 47
Exhibit No. CPC-0003

How to read this chart

		Acct #	Acct Name		365.12	Land Rights		365.2	Rights of Way	
		Ave Age Plt	Original Investment L109	Curve column	22.00	$96,745	9	16.72	$4,070,439	9
		Ave Serv Life	Curve Type		65.00	R2	$ 1,669	65.00	R2	$ 56,281
		Age % ASL	Ave Rem Life	Interim Retires	33.8%	26.39	$ 20,414	25.7%	26.84	$ 709,768
Yrs	Year	Age	% Surviving	Plant Balance	Age	% Surviving	Plant Balance	Age	% Surviving	Plant Balance
		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
		%	%	$	%	%	$	%	%	$
-	2021	61.57%	83.88%	35,023	33.85%	94.40%	98,162	25.72%	96.29%	4,070,439
1	2022	Plant average	83.88%	35,023	35.38%	94.00%	97,776	27.26%	95.97%	4,057,481
2	2023	age as a	83.88%	35,023	36.92%	93.56%	97,348	28.80%	95.64%	4,043,961
3	2024	percent of	Reference to	34,279	38.46%	93.12%	96,929	30.34%	95.27%	4,028,899
4	2025	proposed	Iowa Curve	34,279	40.00%	92.67%	96,493	31.88%	94.90%	4,014,158
5	2026	service life	Table for	34,279	41.54%	92.17%	96,009	33.42%	94.50%	3,997,750
6	2027	45.07%	% Surviving	Plant	43.08%	91.68%	95,537	34.95%	94.11%	3,981,704
7	2028	46.73%	at each age	surviving	44.62%	91.14%	95,012	36.49%	93.70%	3,964,996
8	2029	48.40%	interval	at each age	46.15%	90.61%	94,501	38.03%	93.24%	3,946,421
9	2030	50.07%	91.04%	interval	47.69%	90.06%	93,970	39.57%	92.79%	3,928,277
10	2031	51.73%	91.00%	3,664,263	49.23%	89.46%	93,381	41.11%	92.30%	3,908,122
11	2032	53.40%	90.96%	3,662,794	50.77%	88.86%	92,807	42.65%	91.82%	3,888,449
12	2033	55.07%	90.93%	3,661,325	52.31%	88.21%	92,172	44.18%	91.31%	3,868,003
13	2034	56.73%	90.89%	3,659,856	53.85%	87.57%	91,553	45.72%	90.76%	3,845,314
14	2035	58.40%	90.86%	3,658,387	55.38%	86.90%	90,912	47.26%	90.21%	3,823,194
15	2036	60.07%	90.82%	3,656,918	56.92%	86.17%	90,202	48.80%	89.65%	3,800,228
16	2037	61.73%	90.78%	3,655,449	58.46%	85.46%	89,512	50.34%	89.02%	3,774,770
17	2038	63.40%	90.75%	3,653,980	60.00%	84.72%	88,797	51.88%	88.41%	3,749,977
18	2039	65.07%	90.71%	3,652,511	61.54%	83.90%	88,007	53.42%	87.74%	3,722,515
19	2040	66.73%	90.67%	3,651,042	63.08%	83.11%	87,240	54.95%	87.08%	3,695,791
20	2041	68.40%	90.64%	3,649,559	64.62%	82.23%	86,393	56.49%	86.40%	3,668,092
21	2042	70.07%	90.60%	3,648,076	66.15%	81.38%	85,571	58.03%	85.65%	3,637,446
22	2043	71.73%	90.56%	3,646,593	67.69%	80.50%	84,721	59.57%	84.92%	3,607,656
23	2044	73.40%	90.53%	3,645,110	69.23%	79.53%	83,783	61.11%	84.11%	3,574,722
24	2045	75.07%	90.49%	3,643,627	70.77%	78.60%	82,875	62.65%	83.32%	3,542,733
25	2046	76.73%	90.45%	3,643,627	72.31%	77.56%	81,874	64.18%	82.51%	3,509,642
26	2047	78.40%	90.42%	3,643,627	73.85%	76.56%	80,906	65.72%	81.61%	3,473,104
27	2048	80.07%	90.42%	3,640,661	75.38%	75.53%	79,907	67.26%	80.74%	3,437,661
28	2049	81.73%	90.42%	3,639,178	76.92%	74.39%	78,809	68.80%	79.84%	3,401,045
29	2050	83.40%	90.34%	3,637,695	78.46%	73.30%	77,747	70.34%	78.85%	3,360,670
					29-Yr Life	26.39	$2,590,745	29-Yr Life	26.84	$109,252,781
							$20,414			$709,768
							79%			83%

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 6 - Average Remaining Lives - Transmission
Docket No. G-39, Sub 46

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		366.1	Compressor Station S & I		366.2	M & R Station S & I		367	Mains	
		9.00	$2,712,208.18	9	16.30	$1,449,224.82	9	16.02	$102,429,201.06	11
		45.00	R2	$ 48,339	45.00	R2	$ 40,350	75.00	R4	$ 89,742
		20.0%	25.70	$ 781,278	36.2%	24.18	$ 583,979	21.4%	28.63	$ 4,398,742
Yrs	Year	Age	% Surviving	Plant Balance	Age	% Surviving	Plant Balance	Age	% Surviving	Plant Balance
		(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)	(R)
		%	%	$	%	%	$	%	%	$
-	2021	20.00%	97.40%	2,712,208	36.22%	93.75%	1,449,225	21.36%	99.91%	102,306,964
1	2022	22.22%	96.98%	2,700,884	38.44%	93.12%	1,440,107	22.69%	99.89%	102,289,451
2	2023	24.44%	96.55%	2,689,316	40.67%	92.46%	1,430,443	24.03%	99.87%	102,267,588
3	2024	26.67%	96.10%	2,676,990	42.89%	91.75%	1,420,210	25.36%	99.84%	102,244,126
4	2025	28.89%	95.61%	2,663,870	45.11%	90.97%	1,408,874	26.69%	99.82%	102,217,222
5	2026	31.11%	95.07%	2,649,260	47.33%	90.18%	1,397,395	28.03%	99.79%	102,183,906
6	2027	33.33%	94.53%	2,634,390	49.56%	89.34%	1,385,267	29.36%	99.75%	102,148,433
7	2028	35.56%	93.94%	2,618,602	51.78%	88.45%	1,372,462	30.69%	99.71%	102,108,059
8	2029	37.78%	93.33%	2,601,852	54.00%	87.52%	1,358,952	32.03%	99.66%	102,058,444
9	2030	40.00%	92.67%	2,584,097	56.22%	86.49%	1,344,044	33.36%	99.61%	102,006,012
10	2031	42.22%	91.95%	2,564,409	58.44%	85.46%	1,329,006	34.69%	99.55%	101,946,758
11	2032	44.44%	91.21%	2,544,452	60.67%	84.36%	1,313,177	36.03%	99.48%	101,874,470
12	2033	46.67%	90.43%	2,523,345	62.89%	83.22%	1,296,529	37.36%	99.41%	101,798,622
13	2034	48.89%	89.61%	2,501,039	65.11%	81.95%	1,278,219	38.69%	99.33%	101,713,487
14	2035	51.11%	88.70%	2,476,382	67.33%	80.68%	1,259,811	40.03%	99.23%	101,610,346
15	2036	53.33%	87.78%	2,451,463	69.56%	79.35%	1,240,504	41.36%	99.12%	101,502,866
16	2037	55.56%	86.81%	2,425,188	71.78%	77.95%	1,220,274	42.69%	99.00%	101,383,010
17	2038	57.78%	85.79%	2,397,503	74.00%	76.49%	1,199,100	44.03%	98.86%	101,238,778
18	2039	60.00%	84.72%	2,368,355	76.22%	74.89%	1,175,933	45.36%	98.72%	101,089,470
19	2040	62.22%	83.53%	2,336,261	78.44%	73.30%	1,152,773	46.69%	98.56%	100,924,019
20	2041	64.44%	82.34%	2,303,958	80.67%	71.63%	1,128,624	48.03%	98.36%	100,726,207
21	2042	66.67%	81.09%	2,270,034	82.89%	69.89%	1,103,480	49.36%	98.16%	100,522,744
22	2043	68.89%	79.78%	2,234,442	85.11%	68.01%	1,076,131	50.69%	97.95%	100,298,663
23	2044	71.11%	78.34%	2,195,399	87.33%	66.13%	1,048,962	52.03%	97.69%	100,032,445
24	2045	73.33%	76.90%	2,156,257	89.56%	64.19%	1,020,822	53.36%	97.42%	99,760,332
25	2046	75.56%	75.39%	2,115,322	91.78%	62.18%	991,735	54.69%	97.13%	99,462,437
26	2047	77.78%	73.81%	2,072,563	94.00%	60.11%	961,734	56.03%	96.79%	99,110,712
27	2048	80.00%	72.17%	2,027,959	96.22%	57.88%	929,439	57.36%	96.44%	98,753,405
28	2049	82.22%	70.37%	1,979,340	98.44%	55.70%	897,716	58.69%	96.06%	98,364,548
29	2050	84.44%	68.59%	1,930,930	100.67%	53.46%	865,246	60.03%	95.61%	97,908,223
		29-Yr Life	25.70	$69,693,860	29-Yr Life	24.18	$35,046,969	29-Yr Life	28.63	$2,929,544,782
				$781,278			$583,979			$4,398,742
				71%			60%			96%

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Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 6 - Average Remaining Lives - Transmission
Docket No. G-39, Sub 46

368	Compressor Station Equipment		369	Meas & Reg Station Equipment	
8.87	$36,000,883.20	10	12.83	$8,957,044	5
85.00	R3	$ 67,474	60.00	L3	$ 26,469
10.4%	28.59	$ 1,373,541	21.4%	27.60	$ 1,484,032

Yrs	Year	Age (S) %	% Surviving (T) %	Plant Balance (U) $	Age (V) %	% Surviving (W) %	Plant Balance (X) $
-	2021	10.44%	99.76%	35,912,184	21.38%	99.88%	8,892,968
1	2022	11.61%	99.72%	35,897,025	23.05%	99.83%	8,888,323
2	2023	12.79%	99.68%	35,881,939	24.72%	99.76%	8,882,373
3	2024	13.96%	99.63%	35,864,095	26.38%	99.68%	8,875,436
4	2025	15.14%	99.57%	35,844,710	28.05%	99.58%	8,866,498
5	2026	16.32%	99.51%	35,823,683	29.72%	99.46%	8,855,803
6	2027	17.49%	99.46%	35,802,873	31.38%	99.33%	8,844,002
7	2028	18.67%	99.39%	35,778,395	33.05%	99.17%	8,829,489
8	2029	19.85%	99.31%	35,751,953	34.72%	98.98%	8,812,807
9	2030	21.02%	99.23%	35,723,426	36.38%	98.78%	8,794,993
10	2031	22.20%	99.16%	35,695,341	38.05%	98.55%	8,773,669
11	2032	23.38%	99.07%	35,662,473	39.72%	98.28%	8,749,696
12	2033	24.55%	98.97%	35,627,150	41.38%	98.00%	8,724,513
13	2034	25.73%	98.86%	35,589,236	43.05%	97.66%	8,694,715
14	2035	26.91%	98.75%	35,548,593	44.72%	97.29%	8,661,460
15	2036	28.08%	98.64%	35,508,815	46.38%	96.90%	8,626,646
16	2037	29.26%	98.51%	35,462,533	48.05%	96.44%	8,585,470
17	2038	30.44%	98.37%	35,413,091	49.72%	95.93%	8,539,444
18	2039	31.61%	98.23%	35,360,332	51.38%	95.39%	8,491,142
19	2040	32.79%	98.08%	35,308,922	53.05%	94.75%	8,433,882
20	2041	33.96%	97.92%	35,249,359	54.72%	94.04%	8,369,802
21	2042	35.14%	97.74%	35,186,006	56.38%	93.29%	8,302,601
22	2043	36.32%	97.56%	35,118,693	58.05%	92.40%	8,223,187
23	2044	37.49%	97.37%	35,053,361	59.72%	91.41%	8,134,837
24	2045	38.67%	97.16%	34,977,969	61.38%	90.39%	8,042,962
25	2046	39.85%	96.94%	34,898,100	63.05%	89.19%	7,935,577
26	2047	41.02%	96.71%	34,813,571	64.72%	87.87%	7,817,733
27	2048	42.20%	96.48%	34,731,833	66.38%	86.53%	7,697,041
28	2049	43.38%	96.22%	34,637,846	68.05%	84.98%	7,558,334
29	2050	44.55%	95.94%	34,538,643	69.72%	83.31%	7,408,936
		29-Yr Life	28.59	$1,026,749,967	29-Yr Life	27.60	$245,421,369
				$1,373,541			$1,484,032
				96%			83%

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule No. 7 - Depreciation Rate Calculations

Docket No. G-39, Sub 47
Exhibit No. CPC-0003

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 7 - Depreciation Rate Calculations
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Average Plant in Service 2021-2024	Fully Depreciated Plant	Depreciable Plant	Depreciation Reserve December 31, 2020	Net Plant 2021-2024	Average Remaining Life	Depreciation Expense 1/	Depreciation Rate
			(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
			$	$	$	$	$		$	%
			Sch 4	Sch. 1	c = a - b	Sch. 3	e = a + d	Sch. 6	g = e / f	h = g / a
1	**Intangible Plant**									
2	302	Intangible Plant - Franchises	176,783		176,783	(149,054)	27,729	28.63	968	0.55%
3	303	Misc. Intangible Plant	898,093		898,093	(509,204)	388,889	27.60	14,092	1.57%
4		Subtotal Intangible Plant	1,074,876		1,074,876	(658,258)	416,618	27.66	15,060	1.40%
5										
6	**Transmission Plant**									
7	365.11	Land	668,309			-	668,309	0.00	-	0.00%
8	365.12	Land Rights	98,162		98,162	(48,210)	49,952	26.39	1,893	1.93%
9	365.2	Rights of Way	4,070,439		4,070,439	(1,990,158)	2,080,281	26.84	77,505	1.90%
10	366.1	Compressor Station S & I	2,712,208		2,712,208	(599,867)	2,112,342	25.70	82,204	3.03%
11	366.2	M & R Station S & I	1,449,225		1,449,225	(537,455)	911,770	24.18	37,703	2.60%
12	367.0	Mains	102,306,964		102,306,964	(50,908,281)	51,398,683	28.63	1,794,969	1.75%
13	368.0	Compressor Station Equipment	35,912,184		35,912,184	(8,859,071)	27,053,113	28.59	946,225	2.63%
14	369.0	Meas & Reg Station Equipment	8,892,968		8,892,968	(3,674,653)	5,218,315	27.60	189,088	2.13%
15		Subtotal Transmission	156,110,458		155,442,150	(66,617,694)	88,824,456	28.38	3,129,587	2.01%
16										
17	**General Plant**									
18	390	Struct. & Impr. - Office Bldg	5,269	5,269	-	(5,269)	-		-	10.00%
19	391	Office Furniture and Equipment								
20		OFF001- Tower Office Furniture & Equip	32,228	-	32,228	(24,197)	8,031		3,223	10.00%
21		DPC001-Data Process & Comp. Equip.	-	-	-	-	-		-	12.50%
22		DEV001-Developed Software	957,123	843,871	113,252	(902,108)	55,015		7,550	6.67%
23	392.1	Transportation Equipment	3,761	3,761	-	(3,761)	-		-	16.67%
24	394	Tools Shop & Garage Equipment	565,711	-	565,711	(345,372)	220,339		28,286	5.00%
25	396	Power Operated Equipment	42,559	10,649	31,910	(35,664)	6,894		3,191	10.00%
26	397	Communication Equipment	174,033	142,401	31,632	(159,868)	14,165		1,375	4.35%
27		Subtotal General Plant	1,780,683	1,005,951	774,732	(1,476,239)	304,444	6.98	43,625	2.45%
28										
29										
30		**Total**	158,966,018	1,005,951	157,291,758	(68,752,191)	89,545,519	28.09	3,188,272	2.01%

1/ The expense calculation for General Plant is g = c * h

Docket No. G-39, Sub 47
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Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8 - Negative Salvage Cost Estimate - Total
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates					
2						
3	367	Line Pipe Removal	4,098,783	79%	852,412	3,246,370
4						
5	367	Crossings Abandonment	16,170,093	96%	695,242	15,474,852
6						
7	366.2 / 369	Meter Station Removal	846,264	80%	169,218	677,046
8						
9	366.1 / 368	Compressor Station Removal	3,009,260	94%	167,884	2,841,376
10						
11	365	Right of Way Markers	70,737	83%	12,334	58,402
12						
13	367	Cathodic Protection	35,680	96%	1,534	34,146
14						
15	367	Taps	257,865	96%	11,087	246,778
16						
17	367	Valves	178,370	96%	7,669	170,701
18						
19		Subtotal	24,667,052		1,917,380	22,749,672
20						
21		Construction Management Costs	616,676		47,935	568,742
22						
23		10% Contingency Fees	2,528,373		196,531	2,331,841
24						
25		Salvage	(656,244)			(656,244)
26						
27		Grand Total	27,155,857		2,161,846	24,994,011
28						
29		Reserve for Negative Salvage	(1,015,281)			(1,015,281)
30						
31		Net to Recover	26,140,576		2,161,846	23,978,730
32						
33		Average Remaining Life (Years)	28.53		21.07	29.47
34						
35		Annual Requirement	916,258		102,598	813,660
36						
37		Recovery Rate	**0.60%**		**0.07%**	**0.53%**
38						
39		Depreciable Base	153,101,489			

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Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8a - Negative Salvage Cost Estimate - Account 365.2
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct 365					
2						
3	367	Line Pipe Removal	-	79%	-	-
4						
5	367	Crossings Abandonment	-	96%	-	-
6						
7	366.2 / 369	Meter Station Removal	-	81%	-	-
8						
9	366.1 / 368	Compressor Station Removal	-	94%	-	-
10						
11	365	Right of Way Markers	70,737	83%	12,334	58,402
12						
13	367	Cathodic Protection	-	96%	-	-
14						
15	367	Taps	-	96%	-	-
16						
17	367	Valves	-	96%	-	-
18						
19		Subtotal	70,737		12,334	58,402
20						
21		Construction Management Costs	1,768		308	1,460
22						
23		10% Contingency Fees	7,251		1,264	5,986
24						
25		Salvage				
26						
27		Grand Total	79,756		13,907	65,849
28						
29		Reserve for Negative Salvage	-			-
30						
31		Net to Recover	79,756		13,907	65,849
32						
33		Average Remaining Life (Years)	26.84		26.84	26.84
34						
35		Annual Requirement	2,971		518	2,453
36						
37		Recovery Rate	**0.07%**		**0.01%**	**0.06%**
38						
39		Depreciable Base	4,011,679			

Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

Docket No. G-39, Sub 47
Exhibit No. CPC-0003

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8b - Negative Salvage Cost Estimate - Account 366.1
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct 366.1					
2						
3	367	Line Pipe Removal	-	79%	-	-
4						
5	367	Crossings Abandonment	-	96%	-	-
6						
7	366.2	Meter Station Removal	-	81%	-	-
8						
9	366.1	Compressor Station Removal	300,926	9%	272,512	28,414
10						
11	365	Right of Way Markers	-	83%	-	-
12						
13	367	Cathodic Protection	-	96%	-	-
14						
15	367	Taps	-	96%	-	-
16						
17	367	Valves	-	96%	-	-
18						
19		Subtotal	300,926		272,512	28,414
20						
21		Construction Management Costs	7,523		6,813	710
22						
23		10% Contingency Fees	30,845		27,933	2,912
24						
25		Salvage				
26						
27		Grand Total	339,294		307,258	32,037
28						
29		Reserve for Negative Salvage	(13,722)			(13,722)
30						
31		Net to Recover	325,572		307,258	18,315
32						
33		Average Remaining Life (Years)	25.70		25.70	25.70
34						
35		Annual Requirement	12,670		11,957	713
36						
37		Recovery Rate	**0.48%**		**0.45%**	**0.03%**
38						
39		Depreciable Base	2,673,056			

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8c - Negative Salvage Cost Estimate - Account 366.2
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct. 366.2					
2						
3	367	Line Pipe Removal	-	79%	-	-
4						
5	367	Crossings Abandonment	-	96%	-	-
6						
7	366.2 / 369	Meter Station Removal	84,626	8%	77,856	6,770
8						
9	366.1 / 368	Compressor Station Removal	-	94%	-	-
10						
11	365	Right of Way Markers	-	83%	-	-
12						
13	367	Cathodic Protection	-	96%	-	-
14						
15	367	Taps	-	96%	-	-
16						
17	367	Valves	-	96%	-	-
18						
19		Subtotal	84,626		77,856	6,770
20						
21		Construction Management Costs	2,116		1,946	169
22						
23		10% Contingency Fees	8,674		7,980	694
24						
25		Salvage				
26						
27		Grand Total	95,416		87,783	7,634
28						
29		Reserve for Negative Salvage	(6,808)			(6,808)
30						
31		Net to Recover	88,608		87,783	826
32						
33		Average Remaining Life (Years)	24.18		24.18	24.18
34						
35		Annual Requirement	3,664		3,630	34
36						
37		Recovery Rate	**0.25%**		**0.25%**	**0.00%**
38						
39		Depreciable Base	1,428,304			

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Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8d - Negative Salvage Cost Estimate - Account 367
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct. 367					
2						
3	367	Line Pipe Removal	4,098,783	79%	852,412	3,246,370
4						
5	367	Crossings Abandonment	16,170,093	96%	695,242	15,474,852
6						
7	366.2 / 369	Meter Station Removal	-	81%	-	-
8						
9	366.1 / 368	Compressor Station Removal	-	94%	-	-
10						
11	365	Right of Way Markers	-	83%	-	-
12						
13	367	Cathodic Protection	35,680	96%	1,534	34,146
14						
15	367	Taps	257,865	96%	11,087	246,778
16						
17	367	Valves	178,370	96%	7,669	170,701
18						
19		Subtotal	20,740,791		1,567,944	19,172,847
20						
21		Construction Management Costs	518,520		39,199	479,321
22						
23		10% Contingency Fees	2,125,931		160,714	1,965,217
24						
25		Salvage	(656,244)			(656,244)
26						
27		Grand Total	22,728,998		1,767,857	20,961,141
28						
29		Reserve for Negative Salvage	(1,008,248)			(1,008,248)
30						
31		Net to Recover	21,720,750		1,767,857	19,952,894
32						
33		Average Remaining Life (Years)	28.63		28.63	28.63
34						
35		Annual Requirement	758,542		61,738	696,804
36						
37		Recovery Rate	**0.75%**		**0.06%**	**0.69%**
38						
39		Depreciable Base	100,830,092			

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Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8e - Negative Salvage Cost Estimate - Account 368
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning (A) $	Percent Plant Remaining (B) %	Interim Retirement Cost (C) $	Terminal Decommissioning Interim Retirement Cost (D) $
1	Direct Cost Estimates - Acct. 368					
2						
3	367	Line Pipe Removal	-	79%	-	-
4						
5	367	Crossings Abandonment	-	96%	-	-
6						
7	369	Meter Station Removal	-	81%	-	-
8						
9	368	Compressor Station Removal	2,708,334	85%	406,819	2,301,515
10						
11	365	Right of Way Markers	-	83%	-	-
12						
13	367	Cathodic Protection	-	96%	-	-
14						
15	367	Taps	-	96%	-	-
16						
17	367	Valves	-	96%	-	-
18						
19		Subtotal	2,708,334		406,819	2,301,515
20						
21		Construction Management Costs	67,708		10,170	57,538
22						
23		10% Contingency Fees	277,604		41,699	235,905
24						
25		Salvage				
26						
27		Grand Total	3,053,647		458,689	2,594,958
28						
29		Reserve for Negative Salvage	1,874			1,874
30						
31		Net to Recover	3,055,521		458,689	2,596,832
32						
33		Average Remaining Life (Years)	28.59		28.59	28.59
34						
35		Annual Requirement	106,872		16,043	90,828
36						
37		Recovery Rate	**0.31%**		**0.05%**	**0.26%**
38						
39		Depreciable Base	35,393,767			

Docket No. G-39, Sub 47
Exhibit No. CPC-0003

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8f - Negative Salvage Cost Estimate - Account 369
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct. 369					
2						
3	367	Line Pipe Removal	-	79%	-	-
4						
5	367	Crossings Abandonment	-	96%	-	-
6						
7	369	Meter Station Removal	761,637	72%	213,230	548,407
8						
9	366.1 / 368	Compressor Station Removal	-	94%	-	-
10						
11	365	Right of Way Markers	-	83%	-	-
12						
13	367	Cathodic Protection	-	96%	-	-
14						
15	367	Taps	-	96%	-	-
16						
17	367	Valves	-	96%	-	-
18						
19		Subtotal	761,637		213,230	548,407
20						
21		Construction Management Costs	19,041		5,331	13,710
22						
23		10% Contingency Fees	78,068		21,856	56,212
24						
25		Salvage				
26						
27		Grand Total	858,746		240,417	618,329
28						
29		Reserve for Negative Salvage	11,623			11,623
30						
31		Net to Recover	870,369		240,417	629,952
32						
33		Average Remaining Life (Years)	27.60		27.60	27.60
34						
35		Annual Requirement	31,538		8,712	22,827
36						
37		Recovery Rate	**0.36%**		**0.10%**	**0.26%**
38						
39		Depreciable Base	8,764,591			

Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 9 - Iowa Curves
Docket No. G-39, Sub 46

Age	L0	L1	L2	L3	L4	L5
0.10%	0.99992	0.99995	1.00000	0.99996	1.00000	1.00000
0.20%	0.99983	0.99989	1.00000	0.99993	1.00000	1.00000
0.30%	0.99973	0.99983	1.00000	0.99990	1.00000	1.00000
0.40%	0.99962	0.99978	1.00000	0.99986	1.00000	1.00000
0.50%	0.99950	0.99972	1.00000	0.99984	1.00000	1.00000
0.60%	0.99937	0.99966	1.00000	0.99981	1.00000	1.00000
0.70%	0.99923	0.99960	1.00000	0.99979	1.00000	1.00000
0.80%	0.99909	0.99954	1.00000	0.99976	1.00000	1.00000
0.90%	0.99894	0.99948	1.00000	0.99974	1.00000	1.00000
1.00%	0.99878	0.99942	1.00000	0.99972	1.00000	1.00000
1.10%	0.99862	0.99936	1.00000	0.99970	1.00000	1.00000
1.20%	0.99845	0.99930	1.00000	0.99968	1.00000	1.00000
1.30%	0.99827	0.99924	1.00000	0.99967	1.00000	1.00000
1.40%	0.99809	0.99917	1.00000	0.99965	1.00000	1.00000
1.50%	0.99791	0.99911	1.00000	0.99964	1.00000	1.00000
1.60%	0.99772	0.99905	1.00000	0.99963	1.00000	1.00000
1.70%	0.99752	0.99898	0.99999	0.99961	1.00000	1.00000
1.80%	0.99732	0.99891	0.99999	0.99960	1.00000	1.00000
1.90%	0.99712	0.99885	0.99999	0.99959	1.00000	1.00000
2.00%	0.99691	0.99878	0.99999	0.99958	1.00000	1.00000
2.10%	0.99670	0.99871	0.99999	0.99957	1.00000	1.00000
2.20%	0.99648	0.99864	0.99999	0.99956	1.00000	1.00000
2.30%	0.99626	0.99857	0.99999	0.99956	1.00000	1.00000
2.40%	0.99604	0.99850	0.99998	0.99955	1.00000	1.00000
2.50%	0.99581	0.99843	0.99998	0.99954	1.00000	1.00000
2.60%	0.99558	0.99836	0.99998	0.99954	1.00000	1.00000
2.70%	0.99534	0.99829	0.99998	0.99953	1.00000	1.00000
2.80%	0.99510	0.99821	0.99998	0.99952	1.00000	1.00000
2.90%	0.99486	0.99814	0.99997	0.99952	1.00000	1.00000

ATTACHMENT 2

DEPRECIATION SURVIVOR CURVE WORKPAPERS

Steven R Fall
on behalf of
Cardinal Pipeline Company, LLC

Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

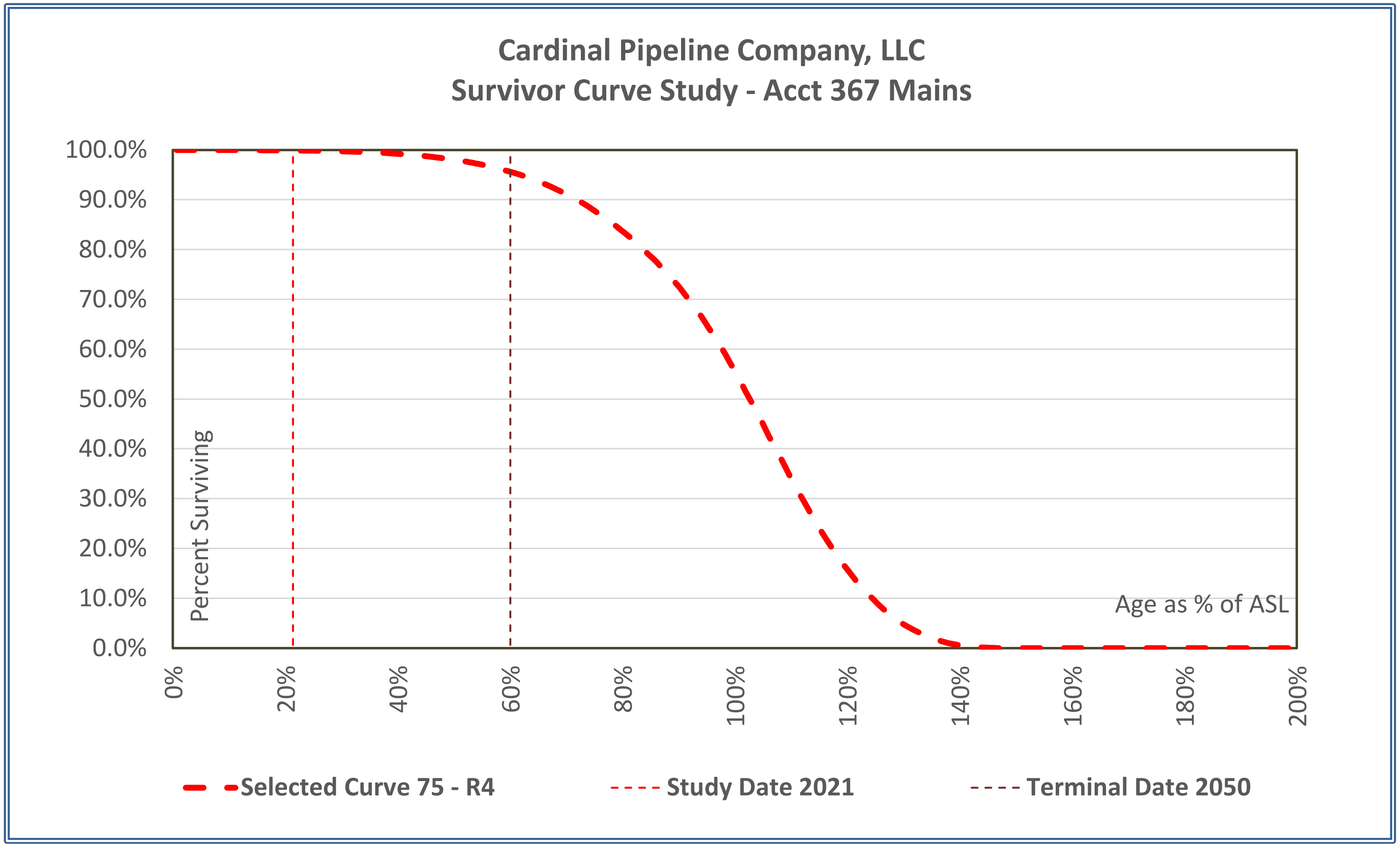
10/2/2021

Docket No. G-39, Sub 47
Exhibit No. CPC-0004

Cardinal Pipeline Company, LLC
Survivor Curve Study - Acct 367 Mains

Salient Statistical Results

Economic Life	Ave Age at Study Date:	Average Service Life	Age as % of ASL	Iowa Curve	Conformance Index	Retirement Index	Average Remaining Life
2050	16.02	75	21.4%	R4	1	98%	**28.63**



Historical Plant Balances

Year	BOY Balance	Additions	Retirements	Adjustments	Transfers	EOY Balance
1990	-	-	-	-	-	-
1991	-	-	-	-	-	-
1992	-	-	-	-	-	-
1993	-	-	-	-	-	-
1994	-	-	-	-	-	-
1995	-	-	-	-	-	-
1996	-	-	-	-	-	-
1997	-	-	-	-	-	-
1998	-	-	-	-	-	-
1999	-	-	-	-	-	-
2000	-	-	-	-	-	-
2001	-	-	-	-	-	-
2002	-	-	-	-	-	-
2003	-	-	-	-	-	-
2004	-	-	-	-	95,319,992	95,319,992
2005	95,319,992	-	-	-	-	95,319,992
2006	95,319,992	554,762	-	-	-	95,874,754
2007	95,874,754	(51,789)	-	-	-	95,822,965
2008	95,822,965	-	-	-	-	95,822,965
2009	95,822,965	95,339	-	-	-	95,918,304
2010	95,918,304	11,823	-	-	-	95,930,127
2011	95,930,127	-	-	-	-	95,930,127
2012	95,930,127	335,866	1,081	-	-	96,264,912
2013	96,264,912	36,710	-	-	-	96,301,622
2014	96,301,622	243,384	-	-	-	96,545,006
2015	96,545,006	2,057	-	-	-	96,547,063
2016	96,547,063	35,320	-	-	-	96,582,383
2017	96,582,383	-	-	-	-	96,582,383
2018	96,582,383	(26,593)	-	-	-	96,555,790
2019	96,555,790	742,236	5,451	-	-	97,292,575
2020	97,292,575	3,653,221	115,705	-	-	100,830,091
		4,404,184	121,156	Σ of last 5 years:	`	
		880,837	24,231	Ave last 5 yrs		

BROWN, WILLIAMS, MOORHEAD & QUINN, INC.
ENERGY CONSULTANTS

Goodness of Fit Test Statistics

Best 5-Year Retirement Predictors

Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
1	75 - R4	28.63	24,612	98.4%	1.07
2	55 - L4	27.54	22,634	93.4%	1.07
3	10 - R3	28.96	26,420	91.0%	182.99
4	100 - S2	28.67	21,797	90.0%	1.07
5	150 - R3	28.84	26,863	89.1%	1.07
6	90 - L3	28.61	26,863	89.1%	1.07
7	95 - S2	28.60	27,284	87.4%	1.07
8	145 - R3	28.83	27,631	86.0%	1.07
9	10 - L5	28.97	20,413	84.2%	211.82
10	40 - R5	23.20	19,538	80.6%	1.07

Best Conformance Indices

Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
L Curves 1	10 - L4	28.66	245,497	-813.1%	655.56
L Curves 2	10 - L5	28.97	20,413	84.2%	211.82
L Curves 3	5 - L0	29.00	-	0.0%	104.05
S Curves 1	10 - S3	28.87	89,047	-167.5%	269.75
S Curves 2	10 - S6	29.00	-	0.0%	208.79
S Curves 3	10 - S5	29.00	0	0.0%	201.07
R Curves 1	10 - R5	29.00	-	0.0%	196.46
R Curves 2	10 - R4	29.00	-	0.0%	185.63
R Curves 3	10 - R3	28.96	26,420	91.0%	182.99

Selected Survivor Curve

	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
Selected	75 - R4	28.63	24,612	98.4%	1.07

Docket No. G-39, Sub 47
Exhibit No. CPC-0004

Selected Curve Forecasted Survivorship & Interim Retirements

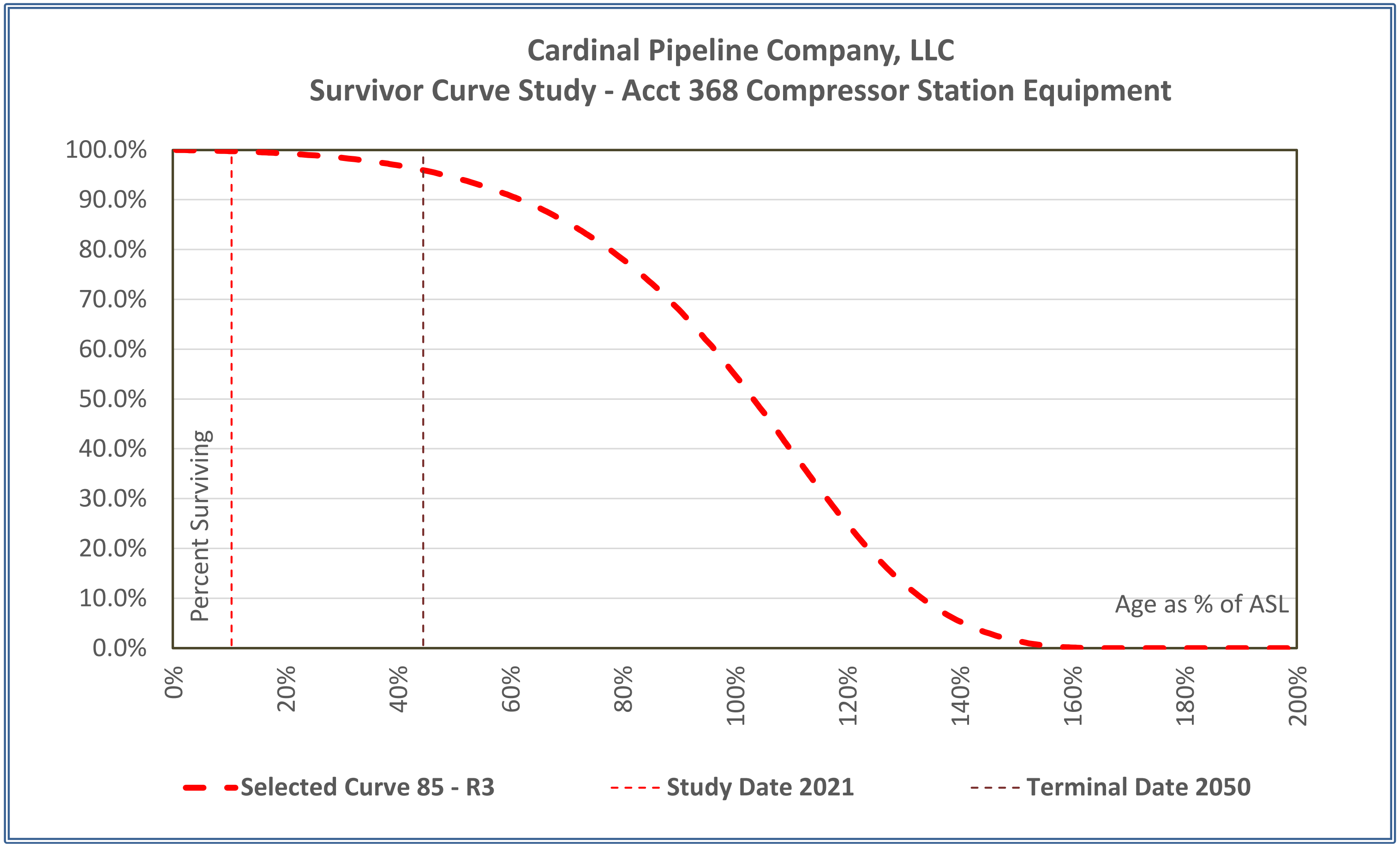
Selected Curve 75 - R4	Year	Age	Age as % of ASL	Percent Surviving	Surviving Plant	Interim Retirements	
Original Installations					102,429,201		
Surviving Balance	2021	16.0	21.36%	99.9063%	102,306,964		
1st Forecast Year	2022	17.0	22.69%	99.8892%	102,289,451	17,513	
2	2023	18.0	24.03%	99.8678%	102,267,588	21,863	
3	2024	19.0	25.36%	99.8449%	102,244,126	23,462	
4	2025	20.0	26.69%	99.8186%	102,217,222	26,904	
5	2026	21.0	28.03%	99.7861%	102,183,906	33,316	
6	2027	22.0	29.36%	99.7515%	102,148,433	35,473	
7	2028	23.0	30.69%	99.7121%	102,108,059	40,374	
8	2029	24.0	32.03%	99.6636%	102,058,444	49,615	
9	2030	25.0	33.36%	99.6124%	102,006,012	52,432	
10	2031	26.0	34.69%	99.5546%	101,946,758	59,254	
11	2032	27.0	36.03%	99.4840%	101,874,470	72,288	
12	2033	28.0	37.36%	99.4100%	101,798,622	75,848	
13	2034	29.0	38.69%	99.3269%	101,713,487	85,135	
14	2035	30.0	40.03%	99.2262%	101,610,346	103,141	
15	2036	31.0	41.36%	99.1212%	101,502,866	107,480	
16	2037	32.0	42.69%	99.0042%	101,383,010	119,855	
17	2038	33.0	44.03%	98.8634%	101,238,778	144,232	
18	2039	34.0	45.36%	98.7176%	101,089,470	149,308	
19	2040	35.0	46.69%	98.5561%	100,924,019	165,451	
20	2041	36.0	48.03%	98.3630%	100,726,207	197,812	
21	2042	37.0	49.36%	98.1644%	100,522,744	203,463	
22	2043	38.0	50.69%	97.9456%	100,298,663	224,081	
23	2044	39.0	52.03%	97.6857%	100,032,445	266,218	
24	2045	40.0	53.36%	97.4200%	99,760,332	272,113	
25	2046	41.0	54.69%	97.1292%	99,462,437	297,895	
26	2047	42.0	56.03%	96.7858%	99,110,712	351,725	
27	2048	43.0	57.36%	96.4370%	98,753,405	357,307	
28	2049	44.0	58.69%	96.0573%	98,364,548	388,857	
29	2050	45.0	60.03%	95.6118%	97,908,223	456,326	
					2,929,544,782	**4,398,742**	Total Interm Retires
				Average Remaining Life	**28.6**	**24,612**	5 Yr Ave Ann Retires

Docket No. G-39, Sub 47
Exhibit No. CPC-0004

Cardinal Pipeline Company, LLC
Survivor Curve Study - Acct 368 Compressor Station Equipment

Salient Statistical Results

Economic Life	Ave Age at Study Date:	Average Service Life	Age as % of ASL	Iowa Curve	Conformance Index	Retirement Index	Average Remaining Life
2050	8.87	85	10.4%	R3	3916	100%	**28.59**



Historical Plant Balances

Year	BOY Balance	Additions	Retirements	Adjustments	Transfers	EOY Balance
1990	-	-	-	-	-	-
1991	-	-	-	-	-	-
1992	-	-	-	-	-	-
1993	-	-	-	-	-	-
1994	-	-	-	-	-	-
1995	-	-	-	-	-	-
1996	-	-	-	-	-	-
1997	-	-	-	-	-	-
1998	-	-	-	-	-	-
1999	-	-	-	-	-	-
2000	-	-	-	-	-	-
2001	-	-	-	-	-	-
2002	-	-	-	-	-	-
2003	-	-	-	-	-	-
2004	-	-	-	-	-	-
2005	-	-	-	-	-	-
2006	-	-	-	-	-	-
2007	-	-	-	-	-	-
2008	-	-	-	-	-	-
2009	-	-	-	-	-	-
2010	-	-	-	-	-	-
2011	-	-	-	-	-	-
2012	-	35,807,448	-	-	(414,452)	35,392,996
2013	35,392,996	38,129	-	-	-	35,431,125
2014	35,431,125	1,307	-	-	-	35,432,432
2015	35,432,432	(41,089)	-	-	-	35,391,343
2016	35,391,343	89,390	88,699	-	-	35,392,034
2017	35,392,034	-	-	-	-	35,392,034
2018	35,392,034	-	-	-	-	35,392,034
2019	35,392,034	-	-	-	-	35,392,034
2020	35,392,034	1,733	-	-	-	35,393,767
		91,123	88,699	Σ of last 5 years: `		
		18,225	17,740	Ave last 5 yrs		

Goodness of Fit Test Statistics

Best 5-Year Retirement Predictors					
Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
1	85 - R3	28.59	17,700	99.8%	3915.74
2	105 - S1	28.49	17,232	97.1%	608.28
3	95 - L2	28.48	16,913	95.3%	584.78
4	100 - S1	28.43	19,407	90.6%	656.35
5	90 - R3	28.64	15,934	89.8%	2425.90
6	90 - L2	28.40	19,684	89.0%	633.53
7	45 - R4	27.51	15,741	88.7%	553.07
8	80 - R3	28.52	19,988	87.3%	38887.97
9	5 - S2	28.94	15,382	86.7%	1.02
10	110 - S1	28.55	15,214	85.8%	578.84

Best Conformance Indices					
Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
L Curves 1	15 - L5	5.68	2,234,094	-12393.7%	988.47
L Curves 2	80 - L2	28.17	27,303	46.1%	829.76
L Curves 3	40 - L3	24.67	61,964	-149.3%	779.58
S Curves 1	25 - S3	15.67	219,511	-1037.4%	993.85
S Curves 2	90 - S1	28.25	26,205	52.3%	850.45
S Curves 3	45 - S2	26.08	48,136	-71.3%	646.84
R Curves 1	80 - R3	28.52	19,988	87.3%	38887.97
R Curves 2	35 - R4	24.38	42,390	-39.0%	882.10
R Curves 3	20 - R5	10.61	160,009	-702.0%	409.60

Selected Survivor Curve					
	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
Selected	85 - R3	28.59	17,700	99.8%	3915.74

Selected Curve Forecasted Survivorship & Interim Retirements

Selected Curve 85 - R3	Year	Age	Age as % of ASL	Percent Surviving	Surviving Plant	Interim Retirements	
Original Installations					36,000,883		
Surviving Balance	2021	8.9	10.44%	99.7592%	35,912,184		
1st Forecast Year	2022	9.9	11.62%	99.7170%	35,897,025	15,159	
2	2023	10.9	12.79%	99.6751%	35,881,939	15,086	
3	2024	11.9	13.97%	99.6256%	35,864,095	17,844	
4	2025	12.9	15.15%	99.5717%	35,844,710	19,385	
5	2026	13.9	16.32%	99.5133%	35,823,683	21,028	
6	2027	14.9	17.50%	99.4555%	35,802,873	20,810	
7	2028	15.9	18.68%	99.3875%	35,778,395	24,478	
8	2029	16.9	19.85%	99.3141%	35,751,953	26,443	
9	2030	17.9	21.03%	99.2348%	35,723,426	28,526	
10	2031	18.9	22.21%	99.1495%	35,692,693	30,733	
11	2032	19.9	23.38%	99.0655%	35,662,473	30,220	
12	2033	20.9	24.56%	98.9674%	35,627,150	35,323	
13	2034	21.9	25.73%	98.8621%	35,589,236	37,914	
14	2035	22.9	26.91%	98.7492%	35,548,593	40,644	
15	2036	23.9	28.09%	98.6387%	35,508,815	39,778	
16	2037	24.9	29.26%	98.5102%	35,462,533	46,282	
17	2038	25.9	30.44%	98.3728%	35,413,091	49,442	
18	2039	26.9	31.62%	98.2263%	35,360,332	52,758	
19	2040	27.9	32.79%	98.0835%	35,308,922	51,411	
20	2041	28.9	33.97%	97.9180%	35,249,359	59,562	
21	2042	29.9	35.15%	97.7420%	35,186,006	63,353	
22	2043	30.9	36.32%	97.5551%	35,118,693	67,314	
23	2044	31.9	37.50%	97.3736%	35,053,361	65,331	
24	2045	32.9	38.68%	97.1642%	34,977,969	75,393	
25	2046	33.9	39.85%	96.9423%	34,898,100	79,869	
26	2047	34.9	41.03%	96.7075%	34,813,571	84,529	
27	2048	35.9	42.21%	96.4593%	34,724,195	89,376	
28	2049	36.9	43.38%	96.2194%	34,637,846	86,349	
29	2050	37.9	44.56%	95.9439%	34,538,643	99,203	
					1,026,739,681	**1,373,541**	Total Interm Retires
				Average Remaining Life	**28.6**	**17,700**	5 Yr Ave Ann Retires

BROWN, WILLIAMS, MOORHEAD & QUINN, INC.
ENERGY CONSULTANTS

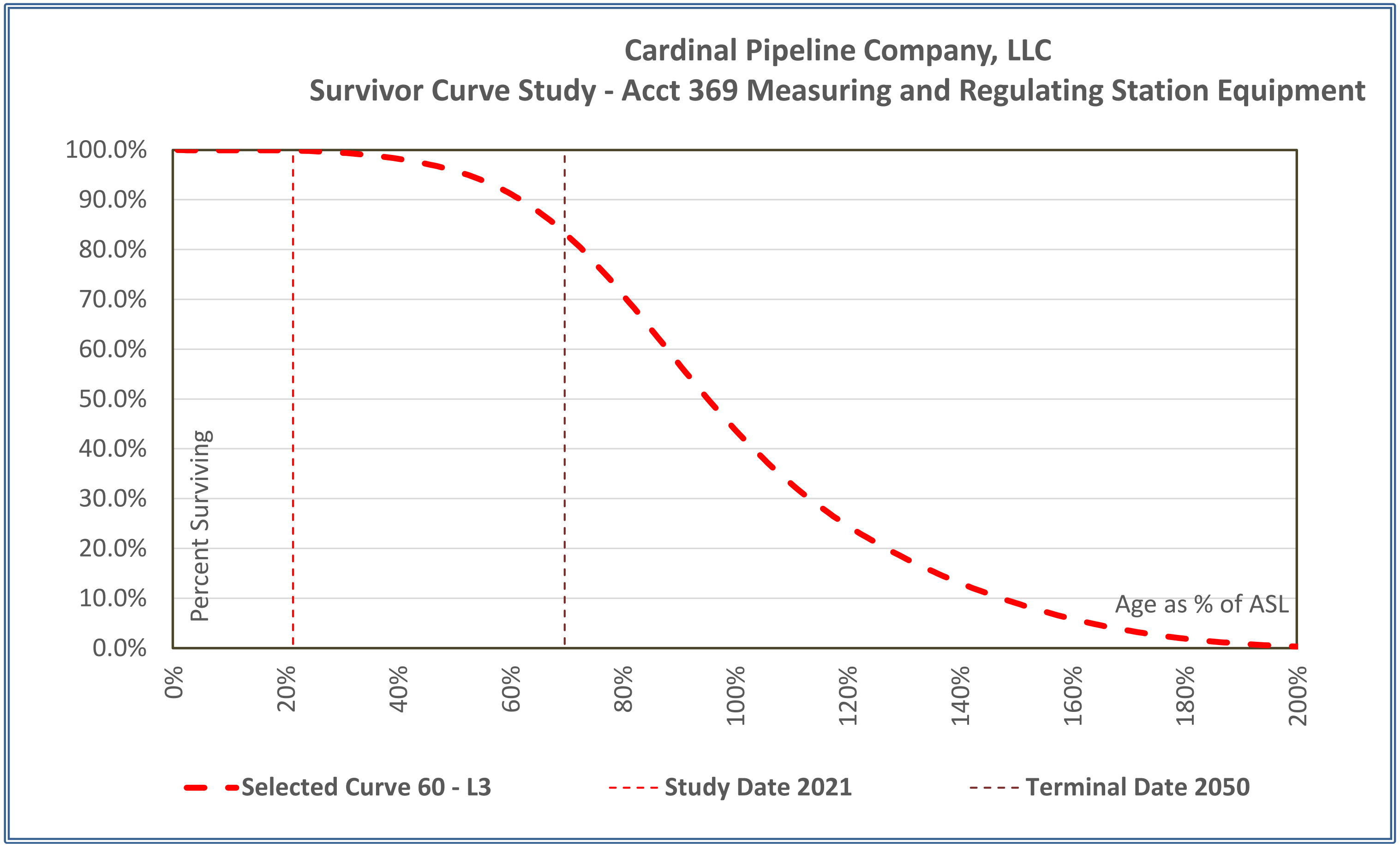
Docket No. G-39, Sub 47
Exhibit No. CPC-0004

Cardinal Pipeline Company, LLC

Survivor Curve Study - Acct 369 Measuring and Regulating Station Equipment

Salient Statistical Results

Economic Life	Ave Age at Study Date:	Average Service Life	Age as % of ASL	Iowa Curve	Conformance Index	Retirement Index	Average Remaining Life
2050	12.83	60	21.4%	L3	2	99%	**27.60**



Historical Plant Balances

Year	BOY Balance	Additions	Retirements	Adjustments	Transfers	EOY Balance
1990	-	-	-	-	-	-
1991	-	-	-	-	-	-
1992	-	-	-	-	-	-
1993	-	-	-	-	-	-
1994	-	-	-	-	-	-
1995	-	-	-	-	-	-
1996	-	-	-	-	-	-
1997	-	-	-	-	-	-
1998	-	-	-	-	-	-
1999	-	-	-	-	-	-
2000	-	-	-	-	-	-
2001	-	-	-	-	-	-
2002	-	-	-	-	-	-
2003	-	-	-	-	-	-
2004	-	-	-	-	4,545,451	4,545,451
2005	4,545,451	20,781	-	-	-	4,566,232
2006	4,566,232	11,443	-	-	-	4,577,675
2007	4,577,675	-	-	-	-	4,577,675
2008	4,577,675	-	-	-	-	4,577,675
2009	4,577,675	-	-	-	-	4,577,675
2010	4,577,675	-	-	-	-	4,577,675
2011	4,577,675	-	-	-	-	4,577,675
2012	4,577,675	3,974,722	27,371	-	-	8,525,026
2013	8,525,026	(1,611)	-	-	-	8,523,415
2014	8,523,415	40,392	-	-	-	8,563,807
2015	8,563,807	16,270	-	-	-	8,580,077
2016	8,580,077	131,734	25,262	-	-	8,686,549
2017	8,686,549	16,566	-	-	-	8,703,115
2018	8,703,115	5,411	-	-	-	8,708,526
2019	8,708,526	67,508	11,443	-	-	8,764,591
2020	8,764,591	-	-	-	-	8,764,591
		221,219	36,705	Σ of last 5 years:	`	
		44,244	7,341	Ave last 5 yrs		

Docket No. G-39, Sub 47
Exhibit No. CPC-0004

Goodness of Fit Test Statistics

Best 5-Year Retirement Predictors					
Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
1	60 - L3	27.60	7,433	98.7%	1.94
2	95 - L2	28.30	7,021	95.6%	1.94
3	150 - R2	28.55	7,690	95.2%	1.96
4	105 - S1	28.32	6,959	94.8%	1.94
5	75 - R3	28.25	7,848	93.1%	1.95
6	80 - R3	28.37	6,788	92.5%	1.95
7	40 - L4	24.00	7,929	92.0%	1.93
8	30 - R5	16.61	7,983	91.3%	1.93
9	145 - R2	28.53	8,011	90.9%	1.96
10	100 - S1	28.23	8,059	90.2%	1.94

Best Conformance Indices					
Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
L Curves 1	10 - L5	27.37	101,668	-1184.9%	15.04
L Curves 2	15 - L0	18.18	323,073	-4200.9%	13.84
L Curves 3	15 - L1	16.79	391,409	-5131.8%	9.93
S Curves 1	10 - S6	29.00	93	1.3%	161.62
S Curves 2	10 - S5	28.78	13,474	16.5%	23.94
S Curves 3	10 - S4	27.49	93,775	-1077.4%	11.86
R Curves 1	10 - R5	28.82	10,775	53.2%	17.96
R Curves 2	10 - R4	27.21	110,409	-1304.0%	10.87
R Curves 3	10 - R3	24.79	263,351	-3387.4%	8.60

Selected Survivor Curve					
	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
Selected	60 - L3	27.60	7,433	98.7%	1.94

Selected Curve Forecasted Survivorship & Interim Retirements

Selected Curve 60 - L3	Year	Age	Age as % of ASL	Percent Surviving	Surviving Plant	Interim Retirements	
Original Installations					8,957,044		
Surviving Balance	2021	12.8	21.38%	99.8775%	8,892,968		
1st Forecast Year	2022	13.8	23.05%	99.8257%	8,888,323	4,644	
2	2023	14.8	24.72%	99.7592%	8,882,373	5,951	
3	2024	15.8	26.38%	99.6818%	8,875,436	6,937	
4	2025	16.8	28.05%	99.5820%	8,866,498	8,937	
5	2026	17.8	29.72%	99.4626%	8,855,803	10,696	
6	2027	18.8	31.38%	99.3308%	8,844,002	11,801	
7	2028	19.8	33.05%	99.1688%	8,829,489	14,513	
8	2029	20.8	34.72%	98.9826%	8,812,807	16,683	
9	2030	21.8	36.38%	98.7837%	8,794,993	17,814	
10	2031	22.8	38.05%	98.5456%	8,773,669	21,323	
11	2032	23.8	39.72%	98.2780%	8,749,696	23,974	
12	2033	24.8	41.38%	97.9968%	8,724,513	25,183	
13	2034	25.8	43.05%	97.6641%	8,694,715	29,798	
14	2035	26.8	44.72%	97.2929%	8,661,460	33,255	
15	2036	27.8	46.38%	96.9042%	8,626,646	34,814	
16	2037	28.8	48.05%	96.4445%	8,585,470	41,176	
17	2038	29.8	49.72%	95.9306%	8,539,444	46,026	
18	2039	30.8	51.38%	95.3914%	8,491,142	48,302	
19	2040	31.8	53.05%	94.7521%	8,433,882	57,259	
20	2041	32.8	54.72%	94.0367%	8,369,802	64,080	
21	2042	33.8	56.38%	93.2864%	8,302,601	67,201	
22	2043	34.8	58.05%	92.3998%	8,223,187	79,415	
23	2044	35.8	59.72%	91.4134%	8,134,837	88,350	
24	2045	36.8	61.38%	90.3877%	8,042,962	91,875	
25	2046	37.8	63.05%	89.1888%	7,935,577	107,386	
26	2047	38.8	64.72%	87.8732%	7,817,733	117,844	
27	2048	39.8	66.38%	86.5257%	7,697,041	120,692	
28	2049	40.8	68.05%	84.9771%	7,558,334	138,707	
29	2050	41.8	69.72%	83.3092%	7,408,936	149,399	
					245,421,369	**1,484,032**	Total Interm Retires
				Average Remaining Life	**27.6**	**7,433**	5 Yr Ave Ann Retires

CARDINAL PIPELINE COMPANY, LLC
COST ESTIMATE PACKET

Cardinal Pipeline Company, LLC
Summary of Terminal Decommissioning Cost Estimate - Transmission

Line No.	Particular	Cost ($)	Item	Total TDC Estimate ($)	Total Adjusted (*) Cost Estimate ($)
	(A)	(B)	(C)	(D)	(E)
1	A. DECOMMISSIONING COSTS				
2	**Transmission Line**	**Cost / Mile**	**Total Miles**	**Total**	
3	1-1 - <24" Pipeline Clean and Purge	$ 41,443	104.9	$ 4,348,608	
4	1-2 - Trench Excavation	$ 96,404	0.3	$ 26,301	
5	1-3 - Pipe Removal	$ 201,377	0.3	$ 54,939	
6	1-4 - Trench Backfill	$ 117,728	0.3	$ 32,118	
7	1-5 - Trench Restoration	$ 10,769	0.3	$ 2,938	
8				*	**$ 4,098,783**
10	**Abandonment**	**Cost /**	**Total Crossing**	**Total**	
12	2-2 - Road Crossing Abandonment	$ 26,565	155	$ 4,117,508	
13	2-4 - Highway Crossing Abandonment	$ 29,324	2	$ 58,648	
14	2-5 - RR Line Crossing Abandonment	$ 45,573	4	$ 182,291	
16	2-7 - Water Crossing Abandonment	$ 45,089	294	$ 13,256,034	
17				*	**$ 16,170,093**
19	**Meter Station**	**Cost / Station**	**Total Stations**	**Total**	
20	3-1 - Small Meter Station Removal	$ 11,144	2	$ 22,288	
21	3-2 - Small Meter Station Sub Material Removal	$ 13,974	2	$ 27,949	
22	3-3 - Small Meter Station Backfill and Restoration	$ 12,524	2	$ 25,048	
23				*	**$ 69,111**
24	3-4 - Medium Meter Station Removal	$ 42,966	2	$ 85,933	
25	3-5 - Medium Meter Station Sub Material Removal	$ 45,977	2	$ 91,954	
26	3-6 - Medium Meter Station Backfill and Restoration	$ 71,288	2	$ 142,576	
27				*	**$ 294,185**
28	3-7 - Large Meter Station Removal	$ 42,422	3	$ 127,267	
29	3-8 - Large Meter Station Sub Material Removal	$ 54,792	3	$ 164,375	
30	3-9 - Large Meter Station Backfill and Restoration	$ 78,155	3	$ 234,466	
31				*	**$ 482,968**
33	**Compressor Station**	**Ave. Cost / Station**	**Total Stations**	**Total**	
34	Compressor Station Removal	$ 3,278,061	1	$ 3,278,061	
35				*	**$ 3,009,260**
37	**Cathodic Protection**	**Cost / CP**	**Total CP**	**Total**	
38	5-1 - Cathodic Protection - Rectifier Removal	$ 3,541	10	$ 35,410	
39	5-2 - Cathodic Protection - Test Site Removal	$ 346	10	$ 3,457	
40				*	**$ 35,680**
42	**Right of Way Markers**	**Cost / ROW**	**Total ROW**	**Total**	
43	6-1 - ROW Marker Removal	$ 58	1330	$ 77,055	
44				*	**$ 70,737**
46	**Tap Removal**	**Cost / Tap**	**Total Taps**	**Total**	
47	7-1 - Tap Locations	$ 6,384	44	$ 280,898	
48				*	**$ 257,865**
58	**Mainline Valve**	**Cost / Location**	**Total Valves**	**Total**	
59	8-1 - Mainline Valve Site	$ 10,795	18	$ 194,303	
60				*	**$ 178,370**
49					
50				Base Total:	$ 24,667,052
51			C.M. Expense	$ 616,676	
52					$ 25,283,728
53	B. CONTINGENCY		10% Contingency Fees	$ 2,528,373	
54				Subtotal:	$ 27,812,101
55	C. SALVAGE				
56				Salvage Material - Scrap Metal:	$ (656,244)
58					
59				**Grand Total:**	**$ 27,155,857**
60	* City Cost Index Adjustment Factor Used	= 0.9180			
61	0.9180 is the Average City Cost Index Adjustment Factor of locations found within CPC's Geographic Locations				

1-1 - Pipeline Clean and Purge
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for small equipment, placed in rear of, or towed by pickup truck	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton	4	2	$ -	$ 130.00	$ 48.50	$ 178.50
16588	C.F.	Gas Pipelines, Nitrogen purge method, lengths 1000' to 10,000'		0	0	$1,824.68	$ 2,156.44	$ 1,824.68	$ 5,805.80
5280	L.F.	Sewer pipelines, cleaning, pig method, lengths 1000' to 10,000', 4" diameter through 24" diameter, minimum		0	0	$ -	$ -	$ -	$ 21,859.20
15	Ton	Hazardous waste cleanup/pickup/disposal, dumpsite disposal charge, maximum		0	0	$ -	$ -	$ -	$ 6,825.00
0.8	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 1,640.00	$ -	$ 1,640.00
0.4	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 820.00	$ -	$ 820.00
0.2	Week	Field personnel, field engineer, engineer,		0	0	$ -	$ 555.00	$ -	$ 555.00
0.2	Week	Field personnel, field engineer, engineer,		0	0	$ -	$ 555.00	$ -	$ 555.00
1	Ea.	Mobilization or demobilization, delivery charge for small equipment, placed in rear of, or towed by pickup truck	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton	4	2	$ -	$ 130.00	$ 48.50	$ 178.50
1	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 535.00	$ -	$ 535.00
0.5	Day	Environmental Engineer		1	8	$ -	$ 257.50	$ -	$ 257.50
114	$/Day	Per Diem		1	100	$ -	$ -	$ -	$ 1,420.83
1	Job	Permitting cost		0	0	$ -	$ 812.61	$ -	$ 812.61

Total **$ 41,442.94**

1-2 - Trench Excavation
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
5280	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 475.20	$ 8,923.20	$ 211.20	$ 9,609.60
10560	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$5,068.80	$ 21,859.20	$ 3,168.00	$ 30,096.00
391	C.Y.	Topsoil stripping and stockpiling, topsoil, sandy loam, ideal conditions, 200 HP dozer	1 Equip. Oper. (medium) .5 Laborer 1 Dozer, 200 H.P.	2300	0	$ -	$ 93.84	$ 285.43	$ 379.27
2124	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering	1 Equip. Oper. (crane) 1 Laborer 1 Hyd. Excavator, .75 C.Y.	270	0.06	$ -	$ 7,709.56	$ 6,074.20	$ 13,783.75
17	Day	Rent truck pickup 3/4 ton 4 wheel drive, Incl. Hourly		0	0	$ -	$ -	$ 4,559.06	$ 4,559.06
3	Week	Field personnel, field engineer, senior engineer,		0	0	$ -	$ 10,875.00	$ -	$ 10,875.00
3	Week	Field personnel, superintendent, maximum		0	0	$ -	$ 9,750.00	$ -	$ 9,750.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
17	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 9,095.00	$ -	$ 9,095.00
8	Day	Environmental Engineer		1	8	$ -	$ 4,120.00	$ -	$ 4,120.00
114	$/Day	Per Diem		1	32.12	$ -	$ -	$ -	$ 456.37
1	Job	Permitting cost		0	0	$ -	$ 1,890.28	$ -	$ 1,890.28

Total **$ 96,404.33**

1-3 - Pipe Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
5280	L.F.	Selective demolition, natural gas, steel pipe, pipe, 18" - 24", excludes excavation	1 Equip. Oper. (crane) 1 Hyd. Crane, 25 Ton (Daily)	160	0.2	$ -	$ 60,456.00	$ 30,888.00	$ 91,344.00
33	Ea.	Delivery charge for pipe, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 16,995.00	$ 12,540.00	$ 29,535.00
33	Day	Crane crew, daily use for small jobs, 25-ton truck-mounted hydraulic crane,	1 Equip. Oper. (crane) 1 Hyd. Crane, 25 Ton (Daily)	1	8	$ -	$ 18,810.00	$ 29,370.00	$ 48,180.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
33	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 17,655.00	$ -	$ 17,655.00
16	Day	Environmental Engineer		1	8	$ -	$ 8,240.00	$ -	$ 8,240.00
114	$/Day	Per Diem		1	48.2	$ -	$ -	$ -	$ 684.84
1	Job	Permitting cost		0	0	$ -	$ 3,948.58	$ -	$ 3,948.58

Total **$ 201,377.42**

1-4 - Trench Backfill

Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
22	M.S.F.	Soil preparation, structural soil mixing, scarify subsoil, municipal, 50 HP skid steer loader w/scarifiers	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	120	0.07	$ -	$ 95.48	$ 53.90	$ 149.38
614	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 4,052.69	$ 5,434.29	$ 9,486.99
614	C.Y.	Soils for earthwork, common borrow, spread with 200 HP dozer, includes load at pit and haul, 2 miles round trip, excludes compaction	1 Equipment Oper. (med.) .5 Laborer 2 Truck Drivers (heavy) 2 Dump Trucks, 12 C.Y., 400 H.P. 1 Dozer, 200 H.P.	600	0.05	$ 9,118.56	$ 1,750.03	$ 3,014.96	$ 13,883.54
3129	C.Y.	Topsoil stripping and stockpiling, topsoil, sandy loam, ideal conditions, 200 HP dozer	1 Equip. Oper. (medium) .5 Laborer 1 Dozer, 200 H.P.	2300	0	$ -	$ 750.96	$ 2,284.17	$ 3,035.13
3129	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$ 36,452.85	$ 18,461.10	$ 54,913.95
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
40	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 21,400.00	$ -	$ 21,400.00
20	Day	Environmental Engineer		1	8	$ -	$ 10,300.00	$ -	$ 10,300.00
114	$/Day	Per Diem		1	32.43	$ -	$ -	$ -	$ 460.78
1	Job	Permitting cost		0	0	$ -	$ 2,308.40	$ -	$ 2,308.40

Total **$117,728.17**

1-5 - Trench Restoration

Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for small equipment, placed in rear of, or towed by pickup truck		4	2	$ -	$ 130.00	$ 48.50	$ 178.50
5	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor		1.5	16	$ -	$ 4,475.00	$ 660.00	$ 5,135.00
2347	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.		2500	0	$610.22	$ 492.87	$ 281.64	$ 1,384.73
1	Ea.	Mobilization or demobilization, delivery charge for small equipment, placed in rear of, or towed by pickup truck		4	2	$ -	$ 130.00	$ 48.50	$ 178.50
4	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 2,140.00	$ -	$ 2,140.00
2	Day	Environmental Engineer		1	8	$ -	$ 1,030.00	$ -	$ 1,030.00
114	$/Day	Per Diem		1	36	$ -	$ -	$ -	$ 511.50
1	Job	Permitting cost		0	0	$ -	$ 211.16	$ -	$ 211.16

Total **$ 10,769.39**

2-2 - Road Crossing Abandonment
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
800	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 72.00	$ 1,352.00	$ 32.00	$ 1,456.00
800	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 384.00	$ 1,656.00	$ 240.00	$ 2,280.00
8	Ea.	8'x16' 3-Ply Temp. Matting, Includes Install/Remove, 6" Mulch		0	0	$14,256.00	$ -	$ -	$ 14,256.00
10	C.Y.	Subsurface investigation, test pits, loader/backhoe, light soil	1 Equipment Oper. (med.) 1 Laborer 1 Backhoe Loader, 80 H.P.	28	0.57	$ -	$ 345.00	$ 92.50	$ 437.50
30	L.F.	Sewer pipelines, cleaning, pig method, lengths 1000' to 10,000', 4" diameter through 24" diameter, minimum		0	0	$ -	$ -	$ -	$ 124.20
0.4	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 820.00	$ -	$ 820.00
0.2	Week	Field personnel, field engineer, engineer, average		0	0	$ -	$ 555.00	$ -	$ 555.00
95	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 11.40	$ 15.20	$ 11.40	$ 38.00
4	C.Y.	Structural concrete, ready mix, flowable fill, 40-80 psi, includes ash, Portland cement Type I, sand and water, delivered, excludes all additives and treatments		0	0	$ 338.00	$ -	$ -	$ 338.00
4	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 288.00	$ -	$ 288.00
4	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,200.00	$ 1,260.00	$ -	$ 2,460.00
10	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$ 116.50	$ 59.00	$ 175.50
14.22	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	2500	0	$ 3.70	$ 2.99	$ 1.71	$ 8.39
2	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,070.00	$ -	$ 1,070.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	65.11	$ -	$ -	$ -	$ 925.10
1	Job	Permitting cost		0	0	$ -	$ 520.87	$ -	$ 520.87

Total **$ 26,564.56**

2-4 - HIghway Crossing Abandonment

Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
800	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 72.00	$ 1,352.00	$ 32.00	$ 1,456.00
800	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 384.00	$ 1,656.00	$ 240.00	$ 2,280.00
10	C.Y.	Subsurface investigation, test pits, loader/backhoe, light soil	1 Equipment Oper. (med.) 1 Laborer 1 Backhoe Loader, 80 H.P.	28	0.57	$ -	$ 345.00	$ 92.50	$ 437.50
8	Ea.	8'x16' 3-Ply Temp. Matting, Includes Install/Remove, 6" Mulch		0	0	$14,256.00	$ -	$ -	$ 14,256.00
150	L.F.	Sewer pipelines, cleaning, pig method, lengths 1000' to 10,000', 4" diameter through 24" diameter, minimum		0	0	$ -	$ -	$ -	$ 621.00
0.4	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 820.00	$ -	$ 820.00
0.2	Week	Field personnel, field engineer, engineer, average		0	0	$ -	$ 555.00	$ -	$ 555.00
472	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 56.64	$ 75.52	$ 56.64	$ 188.80
18	C.Y.	Structural concrete, ready mix, flowable fill, 40-80 psi, includes ash, Portland cement Type I, sand and water, delivered, excludes all additives and treatments		0	0	$ 1,521.00	$ -	$ -	$ 1,521.00
4	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 288.00	$ -	$ 288.00
4	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,200.00	$ 1,260.00	$ -	$ 2,460.00
10	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$ 116.50	$ 59.00	$ 175.50
14.22	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	2500	0	$ 3.70	$ 2.99	$ 1.71	$ 8.39
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	68.11	$ -	$ -	$ -	$ 967.73
1	Job	Permitting cost		0	0	$ -	$ 574.98	$ -	$ 574.98

Total **$ 29,323.90**

2-5 - Railroad Crossing Abandonment
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
800	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman	1000	0.02	$ 72.00	$1,352.00	$ 32.00	$ 1,456.00
800	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light)	650	0.04	$ 384.00	$1,656.00	$ 240.00	$ 2,280.00
16	Ea.	8'x16' 3-Ply Temp. Matting, Includes Install/Remove, 6" Mulch		0	0	$28,512.00	$ -	$ -	$28,512.00
10	C.Y.	Subsurface investigation, test pits, loader/backhoe, light soil	1 Equipment Oper. (med.) 1 Laborer 1 Backhoe Loader, 80 H.P.	28	0.57	$ -	$ 345.00	$ 92.50	$ 437.50
200	L.F.	Sewer pipelines, cleaning, pig method, lengths 1000' to 10,000', 4" diameter through 24" diameter, minimum		0	0	$ -	$ -	$ -	$ 828.00
0.4	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 820.00	$ -	$ 820.00
0.2	Week	Field personnel, field engineer, engineer, average		0	0	$ -	$ 555.00	$ -	$ 555.00
629	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 75.48	$ 100.64	$ 75.48	$ 251.60
24	C.Y.	Structural concrete, ready mix, flowable fill, 40-80 psi, includes ash, Portland cement Type I, sand and water, delivered, excludes all additives and treatments		0	0	$ 2,028.00	$ -	$ -	$ 2,028.00
4	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 288.00	$ -	$ 288.00
4	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,200.00	$1,260.00	$ -	$ 2,460.00
1	Day	Rent tractor with A frame boom and winch 225 HP, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 545.95	$ 545.95
1	Day	Rent crane, flatbed mounted, 3 ton capacity, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 351.60	$ 351.60
10	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$ 116.50	$ 59.00	$ 175.50
14.22	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	2500	0	$ 3.70	$ 2.99	$ 1.71	$ 8.39
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	68.11	$ -	$ -	$ -	$ 967.73
1	Job	Permitting cost		0	0	$ -	$ 893.59	$ -	$ 893.59

Total **$45,572.86**

2-7 - Water Crossing Abandonment
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
2	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 390.00	$ 204.00	$ 594.00
800	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 72.00	$ 1,352.00	$ 32.00	$ 1,456.00
800	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 384.00	$ 1,656.00	$ 240.00	$ 2,280.00
16	Ea.	8'x16' 3-Ply Temp. Matting, Includes Install/Remove, 6" Mulch		0	0	$28,512.00	$ -	$ -	$ 28,512.00
10	C.Y.	Subsurface investigation, test pits, loader/backhoe, light soil	1 Equipment Oper. (med.) 1 Laborer 1 Backhoe Loader, 80 H.P.	28	0.57	$ -	$ 345.00	$ 92.50	$ 437.50
150	L.F.	Sewer pipelines, cleaning, pig method, lengths 1000' to 10,000', 4" diameter through 24" diameter, minimum		0	0	$ -	$ -	$ -	$ 621.00
0.4	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 820.00	$ -	$ 820.00
0.2	Week	Field personnel, field engineer, engineer, average		0	0	$ -	$ 555.00	$ -	$ 555.00
472	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 56.64	$ 75.52	$ 56.64	$ 188.80
18	C.Y.	Structural concrete, ready mix, flowable fill, 40-80 psi, includes ash, Portland cement Type I, sand and water, delivered, excludes all additives and treatments		0	0	$ 1,521.00	$ -	$ -	$ 1,521.00
4	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint		15	1.07	$ -	$ 288.00	$ -	$ 288.00
4	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,200.00	$ 1,260.00	$ -	$ 2,460.00
1	Day	Rent tractor with A frame boom and winch 225 HP, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 545.95	$ 545.95
1	Day	Rent crane, flatbed mounted, 3 ton capacity, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 351.60	$ 351.60
14.22	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	2500	0	$ 3.70	$ 2.99	$ 1.71	$ 8.39
2	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 390.00	$ 204.00	$ 594.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	59.91	$ -	$ -	$ -	$ 851.22
1	Job	Permitting cost		0	0	$ -	$ 884.09	$ -	$ 884.09

Total **$ 45,088.55**

3-1 - Small Meter Station Removal

Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
92	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 8.28	$ 155.48	$ 3.68	$ 167.44
92	L.F.	Fencing demolition, remove chain link posts & fabric, 8' to 10' high	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	445	0.05	$ -	$ 277.84	$ 48.76	$ 326.60
1	Ea.	Steel tank, single wall, above ground, 15,000 thru 30,000 gallon, selective demolition, excluding foundation, pumps or piping	2 Pipe Fitters 1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Flatbed Trailer, 40 Ton 1 Truck Tractor, 6x4, 380 H.P. 1 Hyd. Crane, 80 Ton 1 Hyd. Excavator, 2 C.Y.	2	16	$ -	$ 1,150.00	$ 1,700.00	$ 2,850.00
2	Ea.	Selective demolition, parking appurtenances, pipe bollards, 6"-12" diameter	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	80	0.3	$ -	$ 33.60	$ 5.94	$ 39.54
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
1	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 535.00	$ -	$ 535.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	80.37	$ -	$ -	$ -	$ 1,141.92
1	Job	Permitting cost		0	0	$ -	$ 218.51	$ -	$ 218.51

Total **$ 11,144.01**

3-2 - Small Meter Station Sub Material Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
92	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high		650	0.04	$ 44.16	$ 190.44	$ 27.60	$ 262.20
58	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering		270	0.06	$ -	$ 210.54	$ 165.88	$ 376.42
58	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 382.80	$ 513.30	$ 896.10
4	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 288.00	$ -	$ 288.00
4	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,200.00	$ 1,260.00	$ -	$ 2,460.00
1	Ea.	Selective demolition, utility materials, utility valves, 14"-24", excludes excavation		2	14	$ -	$ 770.00	$ 105.00	$ 875.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		0	0	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	75.49	$ -	$ -	$ -	$ 1,072.59
1	Job	Permitting cost		0	0	$ -	$ 274.01	$ -	$ 274.01

Total **$ 13,974.32**

3-3 - Small Meter Station Backfill and Restoration

Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
92	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 607.20	$ 814.20	$ 1,421.40
2	M.S.F.	Soil preparation, structural soil mixing, scarify subsoil, municipal, 50 HP skid steer loader w/scarifiers		120	0.07	$ -	$ 8.68	$ 4.90	$ 13.58
1	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor		1.5	16	$ -	$ 895.00	$ 132.00	$ 1,027.00
92	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$ 1,071.80	$ 542.80	$ 1,614.60
92	S.Y.	Seeding, mechanical seeding hydro or air seeding for large areas, includes lime, fertilizer and seed with wood fiber mulch added		8900	0	$ 222.64	$ 9.20	$ 6.44	$ 238.28
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
2	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,070.00	$ -	$ 1,070.00
1	Day	Environmental Engineer		0	0	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	72.38	$ -	$ -	$ -	$ 1,028.40
1	Job	Permitting cost		0	0	$ -	$ 245.57	$ -	$ 245.57

Total **$ 12,523.83**

3-4 - Medium Meter Station Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
489	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 44.01	$ 826.41	$ 19.56	$ 889.98
489	L.F.	Fencing demolition, remove chain link posts & fabric, 8' to 10' high	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	445	0.05	$ -	$ 1,476.78	$ 259.17	$ 1,735.95
22529	C.F.	Building demolition, small buildings or single buildings, steel, includes 20 mile haul, excludes salvage, foundation demolition or dump fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (medium) 2 Truck Drivers (heavy) 1 Crawler Loader, 3 C.Y. 2 Dump Trucks, 12 C.Y., 400 H.P.	14800	0	$ -	$ 4,280.51	$ 3,829.93	$ 8,110.44
3	Ea.	Steel tank, single wall, above ground, 15,000 thru 30,000 gallon, selective demolition, excluding foundation, pumps or piping	2 Pipe Fitters 1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Flatbed Trailer, 40 Ton 1 Truck Tractor, 6x4, 380 H.P. 1 Hyd. Crane, 80 Ton 1 Hyd. Excavator, 2 C.Y.	2	16	$ -	$ 3,450.00	$ 5,100.00	$ 8,550.00
1119	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 111.90	$ 134.28	$ 111.90	$ 358.08
356	L.F.	Selective demolition, natural gas, steel pipe, pipe, 18" - 24", excludes excavation	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (crane) 2 Cutting Torches 2 Sets of Gases 1 Hyd. Crane, 12 Ton	160	0.2	$ -	$ 4,076.20	$ 2,082.60	$ 6,158.80
4	Day	Rented truck, flatbed, GVW = 20,000 Lbs, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 1,133.08	$ 1,133.08
4	Day	Crane crew, daily use for small jobs, 25-ton truck-mounted hydraulic crane, portal to portal	1 Equip. Oper. (crane) 1 Hyd. Crane, 25 Ton (Daily)	1	8	$ -	$ 2,280.00	$ 3,560.00	$ 5,840.00
2	Ea.	Selective demolition, utility poles & cross arms, utility poles, wood, 20'-30' high	1 Electrician Foreman 1 Electrician .5 Equip. Oper. (crane) .5 S.P. Crane, 4x4, 5 Ton	6	3.33	$ -	$ 506.00	$ 70.00	$ 576.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	91.6	$ -	$ -	$ -	$ 1,301.48
1	Job	Permitting cost		0	0	$ -	$ 842.48	$ -	$ 842.48

Total **$ 42,966.29**

3-5 - Medium Meter Station Sub Material Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
489	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high		650	0.04	$ 234.72	$ 1,012.23	$ 146.70	$ 1,393.65
72	S.Y.	Demolish, remove pavement & curb, remove concrete, rod reinforced, to 6" thick, excludes hauling and disposal fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (light) 1 Equip. Oper. (medium) 1 Backhoe Loader, 48 H.P. 1 Hyd. Hammer (1200 lb.) 1 F.E. Loader, W.M., 4 C.Y. 1 Pvmt. Rem. Bucket	200	0.12	$ -	$ 482.40	$ 482.40	$ 964.80
12	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 79.20	$ 106.20	$ 185.40
1333	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering		270	0.06	$ -	$ 4,838.79	$ 3,812.38	$ 8,651.17
1333	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 8,797.80	$11,797.05	$ 20,594.85
6	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 432.00	$ -	$ 432.00
6	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,800.00	$ 1,890.00	$ -	$ 3,690.00
1	Ea.	Selective demolition, septic tanks and related components, precast septic tanks, 1000-1250 gal., excludes excavation	1 Labor Foreman (outside) 1 Skilled Worker 1 Laborer .5 Equip. Oper. (crane) .5 S.P. Crane, 4x4, 5 Ton	8	3.5	$ -	$ 193.00	$ 26.50	$ 219.50
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
7	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 3,745.00	$ -	$ 3,745.00
3	Day	Environmental Engineer		0	0	$ -	$ 1,545.00	$ -	$ 1,545.00
114	$/Day	Per Diem		1	65.22	$ -	$ -	$ -	$ 926.67
1	Job	Permitting cost		0	0	$ -	$ 953.96	$ -	$ 953.96

Total **$ 45,977.00**

3-6 - Medium Meter Station Backfill and Restoration
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
1333	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 8,797.80	$11,797.05	$ 20,594.85
12	M.S.F.	Soil preparation, structural soil mixing, scarify subsoil, municipal, 50 HP skid steer loader w/scarifiers		120	0.07	$ -	$ 52.08	$ 29.40	$ 81.48
12	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor		1.5	16	$ -	$10,740.00	$ 1,584.00	$ 12,324.00
1333	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$15,529.45	$ 7,864.70	$ 23,394.15
1333	S.Y.	Seeding, mechanical seeding hydro or air seeding for large areas, includes lime, fertilizer and seed with wood fiber mulch added		8900	0	$ 3,225.86	$ 133.30	$ 93.31	$ 3,452.47
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
8	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 4,280.00	$ -	$ 4,280.00
4	Day	Environmental Engineer		0	0	$ -	$ 2,060.00	$ -	$ 2,060.00
114	$/Day	Per Diem		1	72.38	$ -	$ -	$ -	$ 1,028.40
1	Job	Permitting cost		0	0	$ -	$ 1,397.81	$ -	$ 1,397.81

Total **$ 71,288.16**

3-7 - Large Meter Station Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
439	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 39.51	$ 741.91	$ 17.56	$ 798.98
439	L.F.	Fencing demolition, remove chain link posts & fabric, 8' to 10' high	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	445	0.05	$ -	$ 1,325.78	$ 232.67	$ 1,558.45
13	Ea.	Selective demolition, parking appurtenances, pipe bollards, 6"-12" diameter	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	80	0.3	$ -	$ 218.40	$ 38.61	$ 257.01
40079	C.F.	Building demolition, small buildings or single buildings, steel, includes 20 mile haul, excludes salvage, foundation demolition or dump fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (medium) 2 Truck Drivers (heavy) 1 Crawler Loader, 3 C.Y. 2 Dump Trucks, 12 C.Y., 400 H.P.	14800	0	$ -	$ 7,615.01	$ 6,813.43	$ 14,428.44
2	Ea.	Steel tank, single wall, above ground, 15,000 thru 30,000 gallon, selective demolition, excluding foundation, pumps or piping	2 Pipe Fitters 1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Flatbed Trailer, 40 Ton 1 Truck Tractor, 6x4, 380 H.P. 1 Hyd. Crane, 80 Ton 1 Hyd. Excavator, 2 C.Y.	2	16	$ -	$ 2,300.00	$ 3,400.00	$ 5,700.00
1348	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 134.80	$ 161.76	$ 134.80	$ 431.36
429	L.F.	Selective demolition, natural gas, steel pipe, pipe, 18" - 24", excludes excavation	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (crane) 2 Cutting Torches 2 Sets of Gases 1 Hyd. Crane, 12 Ton	160	0.2	$ -	$ 4,912.05	$ 2,509.65	$ 7,421.70
3	Day	Rented truck, flatbed, GVW = 20,000 Lbs, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 849.81	$ 849.81
3	Day	Crane crew, daily use for small jobs, 25-ton truck-mounted hydraulic crane, portal to portal	1 Equip. Oper. (crane) 1 Hyd. Crane, 25 Ton (Daily)	1	8	$ -	$ 1,710.00	$ 2,670.00	$ 4,380.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	64.57	$ -	$ -	$ -	$ 917.43
1	Job	Permitting cost		0	0	$ -	$ 884.26	$ -	$ 884.26

Total **$ 42,422.44**

3-8 - Large Meter Station Sub Material Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
439	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high		650	0.04	$ 210.72	$ 908.73	$ 131.70	$ 1,251.15
128	S.Y.	Demolish, remove pavement & curb, remove concrete, rod reinforced, to 6" thick, excludes hauling and disposal fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (light) 1 Equip. Oper. (medium) 1 Backhoe Loader, 48 H.P. 1 Hyd. Hammer (1200 lb.) 1 F.E. Loader, W.M., 4 C.Y. 1 Pvmt. Rem. Bucket	200	0.12	$ -	$ 857.60	$ 857.60	$ 1,715.20
22	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 145.20	$ 194.70	$ 339.90
1329	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering		270	0.06	$ -	$ 4,824.27	$ 3,800.94	$ 8,625.21
1329	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 8,771.40	$11,761.65	$ 20,533.05
6	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 432.00	$ -	$ 432.00
6	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,800.00	$ 1,890.00	$ -	$ 3,690.00
8	Ea.	Selective demolition, utility materials, utility valves, 14"-24", excludes excavation		2	14	$ -	$ 6,160.00	$ 840.00	$ 7,000.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
5	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 2,675.00	$ -	$ 2,675.00
2	Day	Environmental Engineer		0	0	$ -	$ 1,030.00	$ -	$ 1,030.00
114	$/Day	Per Diem		1	75.72	$ -	$ -	$ -	$ 1,075.86
1	Job	Permitting cost		0	0	$ -	$ 1,074.35	$ -	$ 1,074.35

Total **$ 54,791.72**

3-9 - Large Meter Station Backfill and Restoration
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
1329	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 8,771.40	$11,761.65	$ 20,533.05
12	M.S.F.	Soil preparation, structural soil mixing, scarify subsoil, municipal, 50 HP skid steer loader w/scarifiers		120	0.07	$ -	$ 52.08	$ 29.40	$ 81.48
12	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor		1.5	16	$ -	$10,740.00	$ 1,584.00	$ 12,324.00
1329	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$15,482.85	$ 7,841.10	$ 23,323.95
1329	S.Y.	Seeding, mechanical seeding hydro or air seeding for large areas, includes lime, fertilizer and seed with wood fiber mulch added		8900	0	$ 3,216.18	$ 132.90	$ 93.03	$ 3,442.11
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
17	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 9,095.00	$ -	$ 9,095.00
8	Day	Environmental Engineer		0	0	$ -	$ 4,120.00	$ -	$ 4,120.00
114	$/Day	Per Diem		1	72.38	$ -	$ -	$ -	$ 1,028.40
1	Job	Permitting cost		0	0	$ -	$ 1,532.46	$ -	$ 1,532.46

Total **$ 78,155.45**

Cardinal Pipeline Company, LLC
Compressor Station Summary Report

Line No.		Particular (A)		Cost ($) (B)	Total Cost ($)
1	1	**Clayton**		**Cost / Phase**	
2		4-1 - Compressor Station Removal	$	453,588	
3		4-2 - Compressor Station Sub Material Removal	$	1,988,334	
4		4-3 - Compressor Station Backfill and Restoration	$	836,139	
5				Total	**$3,278,061**

4-1 - Clayton Compressor Station Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
2014	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 181.26	$ 3,403.66	$ 80.56	$ 3,665.48
2014	L.F.	Fencing demolition, remove chain link posts & fabric, 8' to 10' high	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	445	0.05	$ -	$ 6,082.28	$ 1,067.42	$ 7,149.70
2639	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 263.90	$ 316.68	$ 263.90	$ 844.48
840	L.F.	Selective demolition, natural gas, steel pipe, pipe, 18" - 24", excludes excavation	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (crane) 2 Cutting Torches 2 Sets of Gases 1 Hyd. Crane, 12 Ton	160	0.2	$ -	$ 9,618.00	$ 4,914.00	$ 14,532.00
494369	C.F.	Building demolition, small buildings or single buildings, steel, includes 20 mile haul, excludes salvage, foundation demolition or dump fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (medium) 2 Truck Drivers (heavy) 1 Crawler Loader, 3 C.Y. 2 Dump Trucks, 12 C.Y., 400 H.P.	14800	0	$ -	$ 93,930.11	$84,042.73	$ 177,972.84
3	Ea.	Boiler, gas and or oil or solid, 12,200 thru 25,000 MBH, selective demolition	1 Steamfitter Foreman (inside) 2 Steamfitters 1 Steamfitter Apprentice	0.12	267	$ -	$ 56,100.00	$ -	$ 56,100.00
11	Ea.	Air conditioner, split unit air conditioner, package unit, 3 ton, selective demolition	2 Steamfitters 1 Steamfitter Apprentice	3	8	$ -	$ 5,940.00	$ -	$ 5,940.00
27	Ea.	Steel tank, single wall, above ground, 15,000 thru 30,000 gallon, selective demolition, excluding foundation, pumps or piping	2 Pipe Fitters 1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Flatbed Trailer, 40 Ton 1 Truck Tractor, 6x4, 380 H.P. 1 Hyd. Crane, 80 Ton 1 Hyd. Excavator, 2 C.Y.	2	16	$ -	$ 31,050.00	$45,900.00	$ 76,950.00
9	Ea.	Selective demolition, utility poles & cross arms, utility poles, wood, 20'-30' high	1 Electrician Foreman 1 Electrician .5 Equip. Oper. (crane) .5 S.P. Crane, 4x4, 5 Ton	6	3.33	$ -	$ 2,277.00	$ 315.00	$ 2,592.00
1	Ea.	Selective demolition, radio towers, guyed, 200' high, 70 lb section	1 Struc. Steel Foreman (outside) 1 Struc. Steel Worker 1 Truck Driver (light) 1 Flatbed Truck, Gas, 3 Ton	0.7	34.29	$ -	$ 2,350.00	$ 1,325.00	$ 3,675.00
42	Day	Crane crew, daily use for small jobs, 25-ton truck-mounted hydraulic crane, portal to portal	1 Equip. Oper. (crane) 1 Hyd. Crane, 25 Ton (Daily)	1	8	$ -	$ 23,940.00	$37,380.00	$ 61,320.00
42	Day	Rent trailer, platform, flush deck 2 axle, 25 ton, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 9,031.26	$ 9,031.26
40	Ton	Selective demolition, dump charges, typical urban city, rubbish only, includes tipping fees only		0	0	$2,780.00	$ -	$ -	$ 2,780.00

1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
14	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 7,490.00	$ -	$ 7,490.00
7	Day	Environmental Engineer		1	8	$ -	$ 3,605.00	$ -	$ 3,605.00
114	$/Day	Per Diem		1	400.9	$ -	$ -	$ -	$ 5,695.98
1	Job	Permitting cost		0	0	$ -	$ 8,893.87	$ -	$ 8,893.87

Total **$ 453,587.61**

4-2 - Clayton Compressor Station Sub Material Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
2014	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 966.72	$ 4,168.98	$ 604.20	$ 5,739.90
26529	C.F.	Selective demolition, cutout, concrete, elevated slab, bar reinforced, over 6 C.F., excludes loading and disposal	1 Labor Foreman (outside) 4 Laborers 1 Air Compressor, 250 cfm 2 Breakers, Pavement, 60 lb. 2 -50' Air Hoses, 1.5	50	0.8	$ -	$ 1,100,953.50	$ 206,926.20	$ 1,307,879.70
5263	S.Y.	Demolish, remove pavement & curb, remove concrete, rod reinforced, to 6" thick, excludes hauling and disposal fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (light) 1 Equip. Oper. (medium) 1 Backhoe Loader, 48 H.P. 1 Hyd. Hammer (1200 lb.) 1 F.E. Loader, W.M., 4 C.Y. 1 Pvmt. Rem. Bucket	200	0.12	$ -	$ 35,262.10	$ 35,262.10	$ 70,524.20
1860	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 12,276.00	$ 16,461.00	$ 28,737.00
15280	B.C.Y.	Excavating, bulk, dozer, open site, bank measure, sand and gravel, 200 HP dozer, 300' haul	1 Equip. Oper. (medium) .5 Laborer 1 Dozer, 200 H.P.	310	0.03	$ -	$ 27,351.20	$ 82,512.00	$ 109,863.20
15280	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 100,848.00	$ 135,228.00	$ 236,076.00
2	Month	Rent front end loader, 4WD, art. frame, diesel, 7 - 9 CY 475 HP, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 83,420.48	$ 83,420.48
8	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 576.00	$ -	$ 576.00
8	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 2,400.00	$ 2,520.00	$ -	$ 4,920.00
40	Ton	Selective demolition, dump charges, typical urban city, rubbish only, includes tipping fees only		0	0	$ 2,780.00	$ -	$ -	$ 2,780.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
117	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 62,595.00	$ -	$ 62,595.00
58	Day	Environmental Engineer		1	9	$ -	$ 29,870.00	$ -	$ 29,870.00
114	$/Day	Per Diem		1	71.49	$ -	$ -	$ -	$ 1,015.75
1	Job	Permitting cost		0	0	$ -	$ 38,986.94	$ -	$ 38,986.94

Total **$ 1,988,334.17**

4-3 - Albany Compressor Station Backfill and Restoration

Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,525.00	$ 1,000.00	$ 2,525.00
138	M.S.F.	Soil preparation, structural soil mixing, scarify subsoil, municipal, 50 HP skid steer loader w/scarifiers	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	120	0.07	$ -	$ 590.64	$ 304.98	$ 895.62
15280	C.Y.	Soils for earthwork, common borrow, spread with 200 HP dozer, includes load at pit and haul, 2 miles round trip, excludes compaction	1 Equipment Oper. (med.) .5 Laborer 2 Truck Drivers (heavy) 2 Dump Trucks, 12 C.Y., 400 H.P. 1 Dozer, 200 H.P.	600	0.05	$211,628.00	$ 42,784.00	$ 74,260.80	$ 328,672.80
15280	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 99,320.00	$133,700.00	$ 233,020.00
138	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	1.5	16	$ -	$121,440.00	$ 17,940.00	$ 139,380.00
15280	E.C.Y.	Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with vibrating roller	1 Equip. Oper. (medium) .5 Laborer 1 Dozer, 200 H.P. 1 Vibratory Roller, Towed, 23 Ton	800	0.01	$ -	$ 10,543.20	$ 42,936.80	$ 53,480.00
15280	S.Y.	Seeding, mechanical seeding hydro or air seeding for large areas, includes lime, fertilizer and seed with wood fiber mulch added	1 Laborer 1 Equip. Oper. (medium) 1 Truck Driver (heavy) 1 Hydromulcher, T.M., 3000 Gal. 1 Truck Tractor, 220 H.P.	8900	0	$ 34,838.40	$ 1,528.00	$ 1,069.60	$ 37,436.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,525.00	$ 1,000.00	$ 2,525.00
26	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 13,780.00	$ -	$ 13,780.00
13	Day	Environmental Engineer		1	8	$ -	$ 6,890.00	$ -	$ 6,890.00
114	$/Day	Per Diem		1	80.24	$ -	$ -	$ -	$ 1,140.08
1	Job	Permitting cost		0	0	$ -	$ 16,394.89	$ -	$ 16,394.89

Total **$ 836,139.39**

5-1 - Cathodic Protection - Rectifier Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
3	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 585.00	$ 306.00	$ 891.00
10	Ea.	Cathodic protection, rectifiers, silicon type, air cooled, 28 V/10 A, underground storage tanks	.5 Electrician Foreman 2 Electricians	3.5	5.71	########	$ 4,400.00	$ -	$ 30,400.00
0.25	Ton	Selective demolition, dump charges, typical urban city, reclamation station, usual charge, includes tipping fees only		0	0	$ 20.25	$ -	$ -	$ 20.25
3	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 585.00	$ 306.00	$ 891.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	27.71	$ -	$ -	$ -	$ 393.71
1	Job	Permitting cost		0	0	$ -	$ 694.32	$ -	$ 694.32

Total **$ 35,410.28**

5-2 - Cathodic Protection - Test Site Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
10	Ea.	Signs, traffic sign removal, to 10 S.F., including supports	3 Laborers 1 Equip. Oper. (light) 1 Crane, Flatbed Mounted, 3 Ton	16	2	$ -	$ 1,100.00	$ 164.00	$ 1,264.00
0.25	Ton	Selective demolition, dump charges, typical urban city, reclamation station, usual charge, includes tipping fees only		0	0	$ 20.25	$ -	$ -	$ 20.25
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
1	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 535.00	$ -	$ 535.00
1	Day	Environmental Engineer		1	8	$ -	$ 635.00	$ -	$ 635.00
114	$/Day	Per Diem		1	24	$ -	$ -	$ -	$ 341.00
1	Job	Permitting cost		0	0	$ -	$ 67.79	$ -	$ 67.79

Total **$ 3,457.04**

6-1 - ROW Marker Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
10	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 1,950.00	$ 1,020.00	$ 2,970.00
1330	C.L.F.	Utility line signs, markers, and flags, underground tape, detectable, reinforced, aluminum foil core, 6", excludes excavation and backfill		140	0.06	$ 56,525.00	$ 3,910.20	$ -	$ 60,435.20
2	Ton	Selective demolition, dump charges, typical urban city, reclamation station, usual charge, includes tipping fees only		0	0	$ 162.00	$ -	$ -	$ 162.00
1330	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.	1 Equip. Oper. (light) 1 Loader-Backhoe, 40	2500	0	$ 345.80	$ 279.30	$ 159.60	$ 784.70
10	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 1,950.00	$ 1,020.00	$ 2,970.00
10	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 5,350.00	$ -	$ 5,350.00
5	Day	Environmental Engineer		1	8	$ -	$ 2,575.00	$ -	$ 2,575.00
114	$/Day	Per Diem		1	22.06	$ -	$ -	$ -	$ 313.44
1	Job	Permitting cost		0	0	$ -	$ 1,511.21	$ -	$ 1,511.21

Total **$ 77,071.55**

7-1 - Tap Locations
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
200	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 18.00	$ 338.00	$ 8.00	$ 364.00
200	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 96.00	$ 414.00	$ 60.00	$ 570.00
10	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering	1 Equip. Oper. (crane) 1 Laborer 1 Hyd. Excavator, .75 C.Y.	270	0.06	$ -	$ 36.30	$ 28.60	$ 64.90
2	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint		15	1.07	$ -	$ 144.00	$ -	$ 144.00
2	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$600.00	$ 630.00	$ -	$ 1,230.00
5	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 33.00	$ 44.25	$ 77.25
1	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	1.5	16	$ -	$ 880.00	$ 130.00	$ 1,010.00
0.03	M.S.F.	Seeding, mechanical seeding grass seed, 4.5 lb./M.S.F., hand push spreader		180	0.04	$ 0.89	$ 0.07	$ -	$ 0.95
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
2	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,070.00	$ -	$ 1,070.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	43.55	$ -	$ -	$ -	$ 618.77
1	Job	Permitting cost		0	0	$ -	$ 125.18	$ -	$ 125.18

Total **$ 6,384.05**

8-1 - Mainline Valve Locations
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
120	L.F.	Selective demolition, miscellaneous metal fences & gates, fence, miscellaneous steel mesh, 4'-6' high	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	600	0.04	$ -	$ 268.80	$ 48.00	$ 316.80
800	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 72.00	$ 1,352.00	$ 32.00	$ 1,456.00
800	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 384.00	$ 1,656.00	$ 240.00	$ 2,280.00
4	Ea.	Selective demolition, parking appurtenances, pipe bollards, 6"-12" diameter	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	80	0.3	$ -	$ 67.20	$ 11.88	$ 79.08
19	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering	1 Equip. Oper. (crane) 1 Laborer 1 Hyd. Excavator, .75 C.Y.	270	0.06	$ -	$ 68.97	$ 54.34	$ 123.31
36	L.F.	Selective demolition, natural gas, steel pipe, pipe, 5" - 10", excludes excavation	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (crane) 2 Cutting Torches 2 Sets of Gases 1 Hyd. Crane, 12 Ton	360	0.09	$ -	$ 183.60	$ 93.24	$ 276.84
2	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 600.00	$ 630.00	$ -	$ 1,230.00
2	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 144.00	$ -	$ 144.00
1	Ea.	Selective demolition, utility materials, utility valves, 14"-24", excludes excavation	1 Labor Foreman (outside) 1 Skilled Worker 1 Laborer	2	14	$ -	$ 770.00	$ 105.00	$ 875.00
36	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 237.60	$ 318.60	$ 556.20
1	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	1.5	16	$ -	$ 880.00	$ 130.00	$ 1,010.00
0.8	M.S.F.	Seeding, mechanical seeding grass seed, 4.5 lb./M.S.F., hand push spreader		180	0.04	$ 23.60	$ 1.82	$ -	$ 25.42
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
1	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 535.00	$ -	$ 535.00
0.5	Day	Environmental Engineer		1	8	$ -	$ 257.50	$ -	$ 257.50
114	$/Day	Per Diem		1	57.98	$ -	$ -	$ -	$ 823.80
1	Job	Permitting cost		0	0	$ -	$ 211.66	$ -	$ 211.66

Total **$ 10,794.61**

Cardinal Pipeline Company, LLC
System Salvage Scrap Metal Calculations - Transmission

7/21/2021 Price / Ton (Nat. Ave.) = 167.00
https://iscrapapp.com/prices/

(A)	(B)	(C)	(D)	(E)		(F)
1.3 Pipe Removal - Transmission	Length Removed (ft)	lb/ft	Total Weight (lb)	Total Weight (ton)		Salvage Amt.
24"	1440.48	94.71	136427.77	68.21		$ (11,392)
	1440.48			Subtotal:		$ (11,392)
				Total		$ (11,392)
	Weight/Site (ton)	Scrap Value	Estimated	No. of Stations		Salvage Amt.
3.3 M&R Stations - Transmission						
Small M&R Station	5.00	167.00	835.00	2		$ (1,670)
Medium M&R Station	10.00	167.00	1670.00	2		$ (3,340)
Large M&R Station	15.00	167.00	2505.00	3		$ (7,515)
				Subtotal:		$ (12,525)
				Total:		$ (12,525)
4.3 Compressor Station - Storage	Ave. No./Site	Weight/Site (ton)	Total Weight (ton)	Scrap Value (ton)	Total Stations	Salvage Amt.
Compressor Engine (Ave.)	2	160.00	320.00	$ 167.00	1	$ (53,440)
LNG Tank	2	6091	6091	$ 167.00	0	$ -
Equipment (Ave.)	18	22.50	405.00	$ 167.00	1	$ (67,635)
Bldg (Ave.)	3	#REF!	3021.14	$ 167.00	1	$ (504,530)
				Subtotal:		$ (625,605)
				Total:		$ (625,605)
5.3 Cathodic Protection - Transmission	No.	Weight/Site (ton)	Total Weight (ton)	Scrap Value (ton)		Salvage Amt.
Rectifier	10	0.03	0.25	$ 167.00		$ (42)
Test Site	10	0.002	0.02	$ 167.00		$ (3)
				Subtotal:		$ (45)
				Total:		$ (45)
6.2 ROW Marker - Transmission	No.	Weight/Site (ton)	Total Weight (ton)	Scrap Value (ton)		Salvage Amt.
Marker	1330	0.002	2.66	$ 167.00		$ (444)
				Subtotal:		$ (444)
				Total:		$ (444)
7.2 Mainline Valve Site - Transmission	No.	Weight/Site (ton)	Total Weight (ton)	Scrap Value (ton)		Salvage Amt.
Typical Valve Site	18	2.00	36.00	$ 167.00		$ (6,012)
				Subtotal:		$ (6,012)
				Total:		$ (6,012)
7.2 Tap Site - Transmission	No.	Weight/Site (ton)	Total Weight (ton)	Scrap Value (ton)		Salvage Amt.
Typical Tap Site	44	0.03	1.32	$ 167.00		$ (220)
				Subtotal:		$ (220)
				Total:		$ (220)
				Total Salvage Amount:		$ (656,244)

Cardinal Pipeline Company, LLC
City Cost Index Factor Determination

Line No.		(A) State	(B) City	(C)[1] CCI	(D)[2] Total Mi/State	(E) Weighting Factor (D) / 3878.5	(F) % of Weighted Ave. (C) / (E)
1		North Carolina	Durham	89.9	104.9	1.00	91.80
			Greensboro	89.8			
4			Raleigh	95.7			
5			Ave.	91.8			
2							
12							Total
13				Average CCI	Total Mileage		% Weighted Ave.*
14				92.3	104.9		91.80
15	*	National Average = 100%					
16	(C)[1]	Data developed within cost estimating software package					

Cardinal Pipeline Company, LLC
Per Diem Determination

Line No.	(A) State	(B) City	(C)[1] Per Diem ($)	(D)[2] Total Mi/State	(E) Weighting Factor (D) / 3878.5	(F) % of Weighted Ave. (C) / (E)
1	North Carolina	Durham	115.0	104.9	1.00	113.67
		Greensboro	103.0			
4		Raleigh	123.0			
5		Ave.	113.7			
2						
9						Total
10			Average	Total Mileage		Weighted Ave.
11			$ 130	104.9		$ 114
12						

13 (C)[1] https://www.gsa.gov/travel/plan-book/per-diem-rates

14 (D)[2] Cardinal Pipeline Company, LLC Provided Data

original facilities were installed, and no significant nonjurisdictional facilities would be constructed in association with construction of the interconnection facilities;

(25) Review of natural gas rate filings, including any curtailment plans other than those specified in §380.5(b)(5), and establishment of rates for transportation and sale of natural gas under sections 4 and 5 of the Natural Gas Act and sections 311 and 401 through 404 of the Natural Gas Policy Act of 1978;

(26) Review of approval of oil pipeline rate filings under Parts 340 and 341 of this chapter;

(27) Sale, exchange, and transportation of natural gas under sections 4, 5 and 7 of the Natural Gas Act that require no construction of facilities;

(28) Abandonment in place of a minor natural gas pipeline (short segments of buried pipe of 6-inch inside diameter or less), or abandonment by removal of minor surface facilities such as metering stations, valves, and taps under section 7 of the Natural Gas Act so long as appropriate erosion control and site restoration takes place;

(29) Abandonment of service under any gas supply contract pursuant to section 7 of the Natural Gas Act;

(30) Approval of filing made in compliance with the requirements of a certificate for a natural gas project under section 7 of the Natural Gas Act or a preliminary permit, exemption, license, or license amendment order for a water power project under Part I of the Federal Power Act;

(31) Abandonment of facilities by sale that involves only minor or no ground disturbance to disconnect the facilities from the system;

(32) Conversion of facilities from use under the NGPA to use under the NGA;

(33) Construction or abandonment of facilities constructed entirely in Federal offshore waters that has been approved by the Minerals Management Service and the Corps of Engineers, as necessary;

(34) Abandonment or construction of facilities on an existing offshore platform;

(35) Abandonment, construction or replacement of a facility (other than compression) solely within an existing building within a natural gas facility (other than LNG facilities), if it does not increase the noise or air emissions from the facility, as a whole; and

(36) Conversion of compression to standby use if the compressor is not moved, or abandonment of compression if the compressor station remains in operation.

(b) *Exceptions to categorical exclusions.* (1) In accordance with 40 CFR 1508.4, the Commission and its staff will independently evaluate environmental information supplied in an application and in comments by the public. Where circumstances indicate that an action may be a major Federal action significantly affecting the quality of the human environment, the Commission:

(i) May require an environmental report or other additional environmental information, and

(ii) Will prepare an environmental assessment or an environmental impact statement.

(2) Such circumstances may exist when the action may have an effect on one of the following:

(i) Indian lands;

(ii) Wilderness areas;

(iii) Wild and scenic rivers;

(iv) Wetlands;

(v) Units of the National Park System, National Refuges, or National Fish Hatcheries;

(vi) Anadromous fish or endangered species; or

(vii) Where the environmental effects are uncertain.

However, the existence of one or more of the above will not automatically require the submission of an environmental report or the preparation of an environmental assessment or an environmental impact statement.

[Order 486, 52 FR 47910, Dec. 17, 1987, as amended at 53 FR 8177, Mar. 14, 1988; Order 486-B, 53 FR 26437, July 13, 1988; 54 FR 48740, Nov. 27, 1989; Order 603, 64 FR 26611, May 14, 1999; Order 609, 64 FR 57392, Oct. 25, 1999; Order 756, 77 FR 4895, Feb. 1, 2012]

§ 380.5 Actions that require an environmental assessment.

(a) An environmental assessment will normally be prepared first for the actions identified in this section. Depending on the outcome of the environmental assessment, the Commission may or may not prepare an environmental impact statement. However, depending on the location or scope of the proposed action, or the resources affected, the Commission may in specific circumstances proceed directly to prepare an environmental impact statement.

(b) The projects subject to an environmental assessment are as follows:

(1) Except as identified in §§ 380.4, 380.6 and 2.55 of this chapter, authorization for the site of new gas import/export facilities under DOE Delegation No. 0204–112 and authorization under section 7 of the Natural Gas Act for the construction, replacement, or abandonment of compression, processing, or interconnecting facilities, onshore and offshore pipelines, metering facilities, LNG peak-shaving facilities, or other facilities necessary for the sale, exchange, storage, or transportation of natural gas;

(2) Prior notice filings under § 157.208 of this chapter for the rearrangement of any facility specified in §§ 157.202 (b)(3) and (6) of this chapter or the acquisition, construction, or operation of any eligible facility as specified in §§ 157.202 (b)(2) and (3) of this chapter;

(3) Abandonment or reduction of natural gas service under section 7 of the Natural Gas Act unless excluded under § 380.4 (a)(21), (28) or (29);

(4) Except as identified in § 380.6, conversion of existing depleted oil or natural gas fields to underground storage fields under section 7 of the Natural Gas Act.

(5) New natural gas curtailment plans, or any amendment to an existing curtailment plan under section 4 of the Natural Gas Act and sections 401 through 404 of the Natural Gas Policy Act of 1978 that has a major effect on an entire pipeline system;

(6) Licenses under Part I of the Federal Power Act and part 4 of this chapter for construction of any water power project—existing dam;

(7) Exemptions under section 405 of the Public Utility Regulatory Policies Act of 1978, as amended, and §§ 4.30(b)(29) and 4.101–4.108 of this chapter for small hydroelectric power projects of 5 MW or less;

(8) Licenses for additional project works at licensed projects under Part I of the Federal Power Act whether or not these are styled license amendments or original licenses;

(9) Licenses under Part I of the Federal Power Act and part 4 of this chapter for transmission lines only;

(10) Applications for new licenses under section 15 of the Federal Power Act;

(11) Approval of electric interconnections and wheeling under section 202(b), 210, 211, and 212 of the Federal Power Act, unless excluded under § 380.4(a)(17);

(12) Regulations or proposals for legislation not included under § 380.4(a)(2);

(13) Surrender of water power licenses and exemptions where project works exist or ground disturbing activity has occurred and amendments to water power licenses and exemptions that require ground disturbing activity or changes to project works or operations; and

(14) Except as identified in § 380.6, authorization to site new electric transmission facilities under section 216 of the Federal Power Act and DOE Delegation Order No. 00–004.00A.

[Order 486, 52 FR 47910, Dec. 17, 1987; Order 486, 53 FR 4817, Feb. 17, 1988, as amended by 53 FR 8177, Mar. 14, 1988; Order 486-B, 53 FR 26437, July 13, 1988; Order 689, 71 FR 69470, Dec. 1, 2006; Order 756, 77 FR 4895, Feb. 1, 2012]

§ 380.6 Actions that require an environmental impact statement.

(a) Except as provided in paragraph (b) of this section, an environmental impact statement will normally be prepared first for the following projects:

(1) Authorization under sections 3 or 7 of the Natural Gas Act and DOE Delegation Order No. 0204–112 for the siting, construction, and operation of jurisdictional liquefied natural gas import/export facilities used wholly or in part to liquefy, store, or regasify liquefied natural gas transported by water;

(2) Certificate applications under section 7 of the Natural Gas Act to develop an underground natural gas storage facility except where depleted oil or natural gas producing fields are used;

(3) Major pipeline construction projects under section 7 of the Natural Gas Act using rights-of-way in which there is no existing natural gas pipeline;

§192.727	Abandonment or Inactivation of Facilities

Existing Code Language:	(a) Each operator shall conduct abandonment or deactivation of pipelines in accordance with the requirements of this section. (b) Each pipeline abandoned in place must be disconnected from all sources and supplies of gas; purged of gas; in the case of offshore pipelines, filled with water or inert materials; and sealed at the ends. However, the pipeline need not be purged when the volume of gas is so small that there is no potential hazard. (c) Except for service lines, each inactive pipeline that is not being maintained under this part must be disconnected from all sources and supplies of gas; purged of gas; in the case of offshore pipelines, filled with water or inert materials; and sealed at the ends. However, the pipeline need not be purged when the volume of gas is so small that there is no potential hazard. (d) Whenever service to a customer is discontinued, one of the following must be complied with: (1) The valve that is closed to prevent the flow of gas to the customer must be provided with a locking device or other means designed to prevent the opening of the valve by persons other than those authorized by the operator. (2) A mechanical device or fitting that will prevent the flow of gas must be installed in the service line or in the meter assembly. (3) The customer's piping must be physically disconnected from the gas supply and the open pipe ends sealed. (e) If air is used for purging, the operator shall insure that a combustible mixture is not present after purging. (f) Each abandoned vault must be filled with a suitable compacted material. (g) For each abandoned offshore pipeline facility or each abandoned onshore pipeline facility that crosses over, under or through a commercially navigable waterway, the last operator of that facility must file a report upon abandonment of that facility. (1) The preferred method to submit data on pipeline facilities abandoned after October 10, 2000 is to the National Pipeline Mapping System (NPMS) in accordance with the NPMS "Standards for Pipeline and Liquefied Natural Gas Operator Submissions." To obtain a copy of the NPMS Standards, please refer to the NPMS homepage at www.npms.rspa.dot.gov or contact the NPMS National Repository at 703-317-3073. A digital data format is preferred, but hard copy submissions are acceptable if they comply with the NPMS Standards. In addition to the NPMS-required attributes, operators must submit the date of abandonment, diameter, method of abandonment, and certification that, to the best of the operator's knowledge, all of the reasonably available information requested was provided and, to the best of the operator's knowledge, the abandonment was completed in accordance with applicable laws. Refer to the NPMS Standards for details in preparing your data for submission. The NPMS Standards also include details of how to submit data. Alternatively, operators may submit reports by mail, fax or e-mail to the Information Officer, Research and Special Programs Administration, Department of Transportation, Room 7128, 400 Seventh Street, SW, Washington DC 20590; fax (202) 366-4566; e-mail, roger.little@rspa.dot.gov. The information in the report must contain all

	reasonably available information related to the facility, including information in the possession of a third party. The report must contain the location, size, date, method of abandonment, and a certification that the facility has been abandoned in accordance with all applicable laws. (2) Data on pipeline facilities abandoned before October 10, 2000 must be filed by before April 10, 2000. Operators may submit reports by mail, fax or e-mail to the Information Officer, Research and Special Programs Administration, Department of Transportation, Room 7128, 400 Seventh Street, SW, Washington DC 20590; fax (202) 366-4566; e-mail, roger.little@rspa.dot.gov. The information in the report must contain all reasonably available information related to the facility, including information in the possession of a third party. The report must contain the location, size, date, method of abandonment, and a certification that the facility has been abandoned in accordance with all applicable laws.
Origin of Code	Original Code Document, 08-19-70
Last FR Amendment	192-89, 08-28-00
Interpretation Summary	None provided.
GPTC	Industry guidance available.
Other Ref. Material & Source	None noted
New Guidance Material	- An abandoned pipeline must be physically isolated (does not require an air gap) from active pipelines and disconnected from all sources of gas. (§192.3). - An inactive (idle) pipeline is a pipeline that is being maintained under Part 192 but is not presently being used to transport gas; that may or may not contain pressurized gas. - Deactivation (inactivation) is the process of making the pipeline inactive.
Examples of a Violation	- An offshore pipeline was abandoned in place and was not disconnected from all sources and supplies of gas; purged of gas; filled with water or inert materials, or sealed at the ends. - A customer has been inactive for an extended period of time, and its connection has not either been locked, blinded or otherwise separated (§192.727(d)). - The operator did not file a report to OPS-NPMS for each abandoned offshore facility, as required by §192.727(g). - The operator did not file a report to OPS-NPMS for each on shore over, under or through a commercially navigable waterway, as required by §192.727(g).

§192.727	**Abandonment or Inactivation of Facilities**

Evidence Guidance	- Documentation/Photos/Statements that show the operator did not disconnect the abandoned pipeline from all sources and supplies of gas, and purged of gas. - Operator did not fill an abandoned offshore pipeline with water or inert materials; and sealed at the ends. - If air is used for purging, documentation showing that operator did not insure that a combustible mixture was not present after purging. - Documentation/Photos/Statements that shows an abandoned vault was not filled with a suitable compacted material.
Other Special Notations	None noted

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§192.629	**Purging of Pipelines**		

Existing Code Language:	(a) When a pipeline is being purged of air by use of gas, the gas must be released into one end of the line in a moderately rapid and continuous flow. If gas cannot be supplied in sufficient quantity to prevent the formation of a hazardous mixture of gas and air, a slug of inert gas must be released into the line before the gas. (b) When a pipeline is being purged of gas by use of air, the air must be released into one end of the line in a moderately rapid and continuous flow. If air cannot be supplied in sufficient quantity to prevent the formation of a hazardous mixture of gas and air, a slug of inert gas must be released into the line before the air.
Origin of Code	Original Code Document, 08-19-70
Last FR Amendment	None
GPTC	Industry guidance available.
Other Ref. Material & Source	AGA XK0101, APurging Principles and Practice@
New Guidance Material	- The operator should determine the time required to complete the purge operation to assure that gas-air mixtures are minimized. - Instruments may be used to verify completion of purge. - Selection of gas venting location should not be near electric high voltage lines, or other overhead obstructions.
Examples of a Violation	- The gas/air was not released into the line in a moderately rapid and continuous flow, resulting in the formation of a hazardous mixture. - The gas/air was not supplied in sufficient quantity, resulting in the formation of a hazardous mixture.
Evidence Guidance	- Operator=s procedures. - Records and documentation of any pipeline purging operations. - Operator field checklists or procedures used during purging operations. - Documented statements from operator.
Other Special Notations	None noted

Pipeline environment includes soil resistivity (high or low), soil moisture (wet or dry), soil contaminants that may promote corrosive activity, and other known conditions that could affect the probability of active corrosion.

Pipeline facility means new and existing pipelines, rights-of-way, and any equipment, facility, or building used in the transportation of gas or in the treatment of gas during the course of transportation.

Service line means a distribution line that transports gas from a common source of supply to an individual customer, to two adjacent or adjoining residential or small commercial customers, or to multiple residential or small commercial customers served through a meter header or manifold. A service line ends at the outlet of the customer meter or at the connection to a customer's piping, whichever is further downstream, or at the connection to customer piping if there is no meter.

Service regulator means the device on a service line that controls the pressure of gas delivered from a higher pressure to the pressure provided to the customer. A service regulator may serve one customer or multiple customers through a meter header or manifold.

SMYS means specified minimum yield strength is:

(1) For steel pipe manufactured in accordance with a listed specification, the yield strength specified as a minimum in that specification; or

(2) For steel pipe manufactured in accordance with an unknown or unlisted specification, the yield strength determined in accordance with § 192.107(b).

State means each of the several States, the District of Columbia, and the Commonwealth of Puerto Rico.

Supervisory Control and Data Acquisition (SCADA) system means a computer-based system or systems used by a controller in a control room that collects and displays information about a pipeline facility and may have the ability to send commands back to the pipeline facility.

Transmission line means a pipeline, other than a gathering line, that: (1) Transports gas from a gathering line or storage facility to a distribution center, storage facility, or large volume customer that is not down-stream from a distribution center; (2) operates at a hoop stress of 20 percent or more of SMYS; or (3) transports gas within a storage field.

NOTE: A large volume customer may receive similar volumes of gas as a distribution center, and includes factories, power plants, and institutional users of gas.

Transportation of gas means the gathering, transmission, or distribution of gas by pipeline or the storage of gas, in or affecting interstate or foreign commerce.

[Amdt. 192–13, 38 FR 9084, Apr. 10, 1973, as amended by Amdt. 192–27, 41 FR 34605, Aug. 16, 1976; Amdt. 192–58, 53 FR 1635, Jan. 21, 1988; Amdt. 192–67, 56 FR 63771, Dec. 5, 1991; Amdt. 192–72, 59 FR 17281, Apr. 12, 1994; Amdt. 192–78, 61 FR 28783, June 6, 1996; Amdt. 192–81, 62 FR 61695, Nov. 19, 1997; Amdt. 192–85, 63 FR 37501, July 13, 1998; Amdt. 192–89, 65 FR 54443, Sept. 8, 2000; 68 FR 11749, Mar. 12, 2003; Amdt. 192–93, 68 FR 53900, Sept. 15, 2003; Amdt. 192–98, 69 FR 48406, Aug. 10, 2004; Amdt. 192–94, 69 FR 54592, Sept. 9, 2004; 70 FR 3148, Jan. 21, 2005; 70 FR 11139, Mar. 8, 2005; Amdt. 192–112, 74 FR 63326, Dec. 3, 2009; Amdt. 192–114, 75 FR 48601, Aug. 11, 2010]

§ 192.5 Class locations.

(a) This section classifies pipeline locations for purposes of this part. The following criteria apply to classifications under this section.

(1) A ''class location unit'' is an onshore area that extends 220 yards (200 meters) on either side of the centerline of any continuous 1- mile (1.6 kilometers) length of pipeline.

(2) Each separate dwelling unit in a multiple dwelling unit building is counted as a separate building intended for human occupancy.

(b) Except as provided in paragraph (c) of this section, pipeline locations are classified as follows:

(1) A Class 1 location is:

(i) An offshore area; or

(ii) Any class location unit that has 10 or fewer buildings intended for human occupancy.

(2) A Class 2 location is any class location unit that has more than 10 but fewer than 46 buildings intended for human occupancy.

(3) A Class 3 location is:

(i) Any class location unit that has 46 or more buildings intended for human occupancy; or

(ii) An area where the pipeline lies within 100 yards (91 meters) of either a building or a small, well-defined outside area (such as a playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least 5 days a week for 10 weeks in any 12-month period. (The days and weeks need not be consecutive.)

(4) A Class 4 location is any class location unit where buildings with four or more stories above ground are prevalent.

(c) The length of Class locations 2, 3, and 4 may be adjusted as follows:

(1) A Class 4 location ends 220 yards (200 meters) from the nearest building with four or more stories above ground.

(2) When a cluster of buildings intended for human occupancy requires a Class 2 or 3 location, the class location ends 220 yards (200 meters) from the nearest building in the cluster.

[Amdt. 192–78, 61 FR 28783, June 6, 1996; 61 FR 35139, July 5, 1996, as amended by Amdt. 192–85, 63 FR 37502, July 13, 1998]

§ 192.7 What documents are incorporated by reference partly or wholly in this part?

(a) Any documents or portions thereof incorporated by reference in this part are included in this part as though set out in full. When only a portion of a document is referenced, the remainder is not incorporated in this part.

(b) All incorporated materials are available for inspection in the Office of Pipeline Safety, Pipeline and Hazardous Materials Safety Administration, 1200 New Jersey Avenue, SE., Washington, DC, 20590–0001, 202–366–4595, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030 or go to: *http://www.archives.gov/federal__register/code__of__federal__regulations/ibr__locations.html*. These materials have been approved for incorporation by reference by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. In addition, the incorporated materials are available from the respective organizations listed in paragraph (c) (1) of this section.

(c) The full titles of documents incorporated by reference, in whole or in part, are provided herein. The numbers in parentheses indicate applicable editions. For each incorporated document, citations of all affected sections are provided. Earlier editions of currently listed documents or editions of documents listed in previous editions of 49 CFR part 192 may be used for materials and components designed, manufactured, or installed in accordance with these earlier documents at the time they were listed. The user must refer to the appropriate previous edition of 49 CFR part 192 for a listing of the earlier listed editions or documents.

(1) *Incorporated by reference (IBR).*

List of Organizations and Addresses:

A. Pipeline Research Council International, Inc. (PRCI), c/o Technical Toolboxes, 3801 Kirby Drive, Suite 520, Houston, TX 77098.

B. American Petroleum Institute (API), 1220 L Street, NW., Washington, DC 20005.

C. American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428.

D. ASME International (ASME), Three Park Avenue, New York, NY 10016–5990.

E. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS), 127 Park Street, NE., Vienna, VA 22180.

F. National Fire Protection Association (NFPA), 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269–9101.

G. Plastics Pipe Institute, Inc. (PPI), 1825 Connecticut Avenue, NW., Suite 680, Washington, DC 20009.

H. NACE International (NACE), 1440 South Creek Drive, Houston, TX 77084.

I. Gas Technology Institute (GTI), 1700 South Mount Prospect Road, Des Plaines, IL 60018.

(2) *Documents incorporated by reference.*

Source and name of referenced material	49 CFR reference
A. Pipeline Research Council International (PRCI):	

the United States, including the territorial seas, pursuant to section 404 of the Clean Water Act (33 U.S.C. 1344; see 33 CFR part 323) and the transportation of dredged material by vessel for purposes of dumping in ocean waters, including the territorial seas, pursuant to section 103 of the Marine Protection, Research and Sanctuaries Act of 1972, as amended (33 U.S.C. 1413; see 33 CFR part 324). A DA permit will also be required under these additional authorities if they are applicable to structures or work in or affecting navigable waters of the United States. Applicants for DA permits under this part should refer to the other cited authorities and implementing regulations for these additional permit requirements to determine whether they also are applicable to their proposed activities.

§ 322.2 Definitions.

For the purpose of this regulation, the following terms are defined:

(a) The term *navigable waters of the United States* and all other terms relating to the geographic scope of jurisdiction are defined at 33 CFR part 329. Generally, they are those waters of the United States that are subject to the ebb and flow of the tide shoreward to the mean high water mark, and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce.

(b) The term *structure* shall include, without limitation, any pier, boat dock, boat ramp, wharf, dolphin, weir, boom, breakwater, bulkhead, revetment, riprap, jetty, artificial island, artificial reef, permanent mooring structure, power transmission line, permanently moored floating vessel, piling, aid to navigation, or any other obstacle or obstruction.

(c) The term *work* shall include, without limitation, any dredging or disposal of dredged material, excavation, filling, or other modification of a navigable water of the United States.

(d) The term *letter of permission* means a type of individual permit issued in accordance with the abbreviated procedures of 33 CFR 325.2(e).

(e) The term *individual permit* means a DA authorization that is issued following a case-by-case evaluation of a specific structure or work in accordance with the procedures of this regulation and 33 CFR part 325, and a determination that the proposed structure or work is in the public interest pursuant to 33 CFR part 320.

(f) The term *general permit* means a DA authorization that is issued on a nationwide or regional basis for a category or categories of activities when:

(1) Those activities are substantially similar in nature and cause only minimal individual and cumulative environmental impacts; or

(2) The general permit would result in avoiding unnecessary duplication of the regulatory control exercised by another Federal, state, or local agency provided it has been determined that the environmental consequences of the action are individually and cumulatively minimal. (See 33 CFR 325.2(e) and 33 CFR part 330.)

(g) The term *artificial reef* means a structure which is constructed or placed in the navigable waters of the United States or in the waters overlying the outer continental shelf for the purpose of enhancing fishery resources and commercial and recreational fishing opportunities. The term does not include activities or structures such as wing deflectors, bank stabilization, grade stabilization structures, or low flow key ways, all of which may be useful to enhance fisheries resources.

§ 322.3 Activities requiring permits.

(a) *General*. DA permits are required under section 10 for structures and/or work in or affecting navigable waters of the United States except as otherwise provided in § 322.4 below. Certain activities specified in 33 CFR part 330 are permitted by that regulation (''nationwide general permits''). Other activities may be authorized by district or division engineers on a regional basis (''regional general permits''). If an activity is not exempted by section 322.4 of this part or authorized by a general permit, an individual section 10 permit will be required for the proposed activity. Structures or work are in navigable waters of the United States if they are within limits defined in 33 CFR part 329. Structures or work outside these limits are subject to the provisions of law cited in paragraph (a) of this section, if these structures or work affect the course, location, or condition of the waterbody in such a manner as to impact on its navigable capacity. For purposes of a section 10 permit, a tunnel or other structure or work under or over a navigable water of the United States is considered to have an impact on the navigable capacity of the waterbody.

(b) *Outer continental shelf.* DA permits are required for the construction of artificial islands, installations, and other devices on the seabed, to the seaward limit of the outer continental shelf, pursuant to section 4(f) of the Outer Continental Shelf Lands Act as amended. (See 33 CFR 320.2(b).)

(c) *Activities of Federal agencies.* (1) Except as specifically provided in this paragraph, activities of the type described in paragraphs (a) and (b) of this section, done by or on behalf of any Federal agency are subject to the authorization procedures of these regulations. Work or structures in or affecting navigable waters of the United States that are part of the civil works activities of the Corps of Engineers, unless covered by a nationwide or regional general permit issued pursuant to these regulations, are subject to the procedures of separate regulations. Agreement for construction or engineering services performed for other agencies by the Corps of Engineers does not constitute authorization under this regulation. Division and district engineers will therefore advise Federal agencies accordingly, and cooperate to the fullest extent in expediting the processing of their applications.

(2) Congress has delegated to the Secretary of the Army in section 10 the duty to authorize or prohibit certain work or structures in navigable waters of the United States, upon recommendation of the Chief of Engineers. The general legislation by which Federal agencies are enpowered to act generally is not considered to be sufficient authorization by Congress to satisfy the purposes of section 10. If an agency asserts that it has Congressional authorization meeting the test of section 10 or would otherwise be exempt from the provisions of section 10, the legislative history and/or provisions of the Act should clearly demonstrate that Congress was approving the exact location and plans from which Congress could have considered the effect on navigable waters of the United States or that Congress intended to exempt that agency from the requirements of section 10. Very often such legislation reserves final approval of plans or construction for the Chief of Engineers. In such cases evaluation and authorization under this regulation are limited by the intent of the statutory language involved.

(3) The policy provisions set out in 33 CFR 320.4(j) relating to state or local certifications and/or authorizations, do not apply to work or structures undertaken by Federal agencies, except where compliance with non-Federal authorization is required by Federal law or Executive policy, e.g., section 313 and section 401 of the Clean Water Act.

§ 322.4 Activities not requiring permits.

(a) Activities that were commenced or completed shoreward of established Federal harbor lines before May 27, 1970 (see 33 CFR 320.4(o)) do not require section 10 permits; however, if those activities involve the discharge of dredged or fill material into waters of the United States after October 18, 1972, a section 404 permit is required. (See 33 CFR part 323.)

(b) Pursuant to section 154 of the Water Resource Development Act of 1976 (Pub. L. 94–587), Department of the Army permits are not required under section 10 to construct wharves and piers in any waterbody, located entirely within one state, that is a navigable water of the United States solely on the basis of its historical use to transport interstate commerce.

§ 322.5 Special policies.

The Secretary of the Army has delegated to the Chief of Engineers the authority to issue or deny section 10 permits. The following additional special policies and procedures shall also be applicable to the evaluation of permit applications under this regulation.

(a) *General.* DA permits are required for structures or work in or affecting navigable waters of the United States. However, certain structures or work

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COST ESTIMATING

GUIDE

U.S. DEPARTMENT OF ENERGY

Associate Deputy Secretary for Field Management

Distribution:
All Departmental Elements

Initiated By:
Associate Deputy Secretary for Field Management

CHAPTER 11

CONTINGENCY

1. INTRODUCTION

The application of contingency for various types of cost estimates covers the entire life cycle of a project from feasibility studies through execution to closeout. The purpose of the contingency guidelines presented in this chapter is to provide for a standard approach to determining project contingency and improve the understanding of contingency in the project management process. These guidelines have been adopted by the DOE estimating community and should be incorporated into the operating procedures of DOE and operating contractor project team members.

2. CONTINGENCY DEFINITIONS

A. General Contingency

Contingency is an integral part of the total estimated costs of a project. It has been defined as—

> [a] specific provision for unforeseeable elements of cost within the defined project scope. [Contingency is] particularly important where previous experience relating estimates and actual costs has shown that unforeseeable events which will increase costs are likely to occur.

This definition has been adopted by the American Association of Cost Engineers. DOE has elected to narrow the scope of this definition and defines contingency as follows.

> Covers costs that may result from incomplete design, unforeseen and unpredictable conditions, or uncertainties within the defined project scope. The amount of the contingency will depend on the status of design, procurement, and construction; and the complexity and uncertainties of the component parts of the project. Contingency is not to be used to avoid making an accurate assessment of expected cost.

It is not DOE practice to set aside contingency for major schedule changes or unknown design factors, unanticipated regulatory standards or changes, incomplete or additions to project scope definition, force majeure situations, or congressional budget cuts. Project and operations estimates will always contain contingency. Estimators should be aware that contingency is an integral part of the estimate.

B. Buried Contingencies

Some estimators have sought to hide contingency estimates in order to protect the project so that the final project does not go over budget because the contingency has been removed by outside sources. This is affectionately known as buried contingency. All internal and external estimators should refrain from burying extra contingency allowances within the estimate. A culture of honesty should be promoted so that it is not necessary to bury contingency. In addition, estimators should be aware that estimate reviews will identify buried contingency. The estimate reviewer is obligated to remove buried contingency.

3. SPECIFICATIONS FOR CONTINGENCY ANALYSIS

Considerable latitude has been reserved for estimators and managers in the following contingency analysis specifications. These guidelines are to be followed by both the operating contractor and the DOE field office cost estimators to ensure a consistent and standard approach by the project team. Each contractor and field office should incorporate these guidelines into their operating procedures.

A written contingency analysis and estimate will be performed on all cost estimates and maintained in the estimate documentation file. This analysis is mandatory.

Estimators may use the ranges provided in this chapter of the cost guide for estimating small projects; however, larger projects require a more detailed analysis, including a cost estimate basis and a written description for each contingency allowance assigned to the various parts of the estimate.

Justification must be documented in writing when guide ranges for contingency are not followed. If extraordinary conditions exist that call for higher contingencies, the rationale and basis will be documented in the estimate. Computer programs, such as Independent Cost Estimating Contingency Analyzer (ICECAN), a Monte Carlo analysis program, are available to estimators and should be used to develop contingency factors. Risk analysis may also be necessary.

A. Construction Projects

Table 11-1 presents the contingency allowances by type of construction estimate for the seven standard DOE estimate types, and Table 11-2 presents the guidelines for the major components of a construction project.

Estimate types “a” through “e” in Table 11-1 are primarily an indication of the degree of completeness of the design. Type “f,” current working estimates, found in Table 11-2, depends upon the completeness of design, procurement, and construction. Contingency is calculated on the basis of remaining costs not incurred. Type “g,” the Independent Estimate, may occur at any time, and the corresponding contingency would be used (i.e., “a,” “b,” etc.).

Table 11-1. Contingency Allowance Guide By Type of Estimate

Type of Estimate	Overall Contingency Allowances % of Remaining Costs Not Incurred
PLANNING (Prior to CDR) Standard Experimental/Special Conditions	 20% to 30% Up to 50%
BUDGET (Based upon CDR) Standard Experimental/Special Conditions	 15% to 25% Up to 40%
TITLE I	10% to 20%
TITLE II DESIGN	5% to 15%
GOVERNMENT (BID CHECK)	5% to 15% adjusted to suit market conditions
CURRENT WORKING ESTIMATES	See Table 11-2
INDEPENDENT ESTIMATE	To suit status of project and estimator's judgment

The following factors need to be considered to select the contingency for specific items in the estimate while staying within the guideline ranges for each type of estimate.

1. Project Complexity

Unforeseen, uncertain, and unpredictable conditions will exist. Therefore, using the DOE cost code of accounts for construction, the following percents are provided for planning and budget estimates. They are listed in order of increasing complexity:

- Land and Land Rights 5% to 10%
- Improvements to Land/Standard Equipment 10% to 15%

• New Buildings and Additions, Utilities, Other Structures	15% to 20%
• Engineering	15% to 25%
• Building Modifications	15% to 25%
• Special Facilities (Standard)	20% to 30%
• Experimental/Special Conditions	Up to 50%

Considerations that affect the selection in the ranges are: state-of-the-art design, required reliability, equipment complexity, construction restraints due to continuity of operation, security, contamination, environmental (weather, terrain, location), scheduling, and other items unique to the project, such as nuclear and waste management permits and reviews.

2. Design Completeness or Status

Regardless of the complexity factors listed above, the degree of detailed design to support the estimate is the more important factor. This factor is the major reason that the ranges in Table 11-1 vary from the high of 20 to 30 percent in the planning estimate to 5 to 15 percent at the completion of Title II design. Again, parts of the estimate may have different degrees of design completion, and the appropriate contingency percent must be used. As can be seen from Figure 11-1, as a project progresses, the contingency range and amount of contingency decreases.

3. Market Conditions

Market condition considerations are an addition or a subtraction from the project cost that can be accounted for in contingency. Obviously, the certainty of the estimate prices will have a major impact. The closer to a firm quoted price for equipment or a position of construction work, the less the contingency can be until reaching 1 to 5 percent for the current working type estimate for fixed-price procurement contracts, 3 to 8 percent for fixed-price construction contracts, and 15 to 17.5 percent contingency for cost-plus contracts that have been awarded.

4. Special Conditions

When the technology has not been selected for a project, an optimistic-pessimistic analysis can be completed. For each competing technology, an estimate is made. The difference in these estimates of the optimistic and pessimistic alternative can be used as the contingency.

Table 11-2. Contingency Allowances for Current Working Estimates

	Item Contingency On Remaining Cost Not Incurred
a. ENGINEERING	
Before Detailed Estimates:	15% to 25%
After Detailed Estimates:	10%
b. EQUIPMENT PROCUREMENT	
Before Bid:	
Budget	15% to 25%
Title I	10% to 20%
Title II	5% to 15%
After Award:	
Cost Plus Award Fee (CPAF) Contract	15%
Fixed-Price Contract	1% to 5%
After Delivery to Site (if no rework)	0%
c. CONSTRUCTION	
Prior to Award:	
Budget	15% to 25%
Title I	10% to 20%
Title II	5% to 15%
After Award:	
CPAF Contract	15% to 17-1/2%
Fixed-Price Contract	3% to 8%
d. TOTAL CONTINGENCY (CALCULATED)	Total of above item contingencies

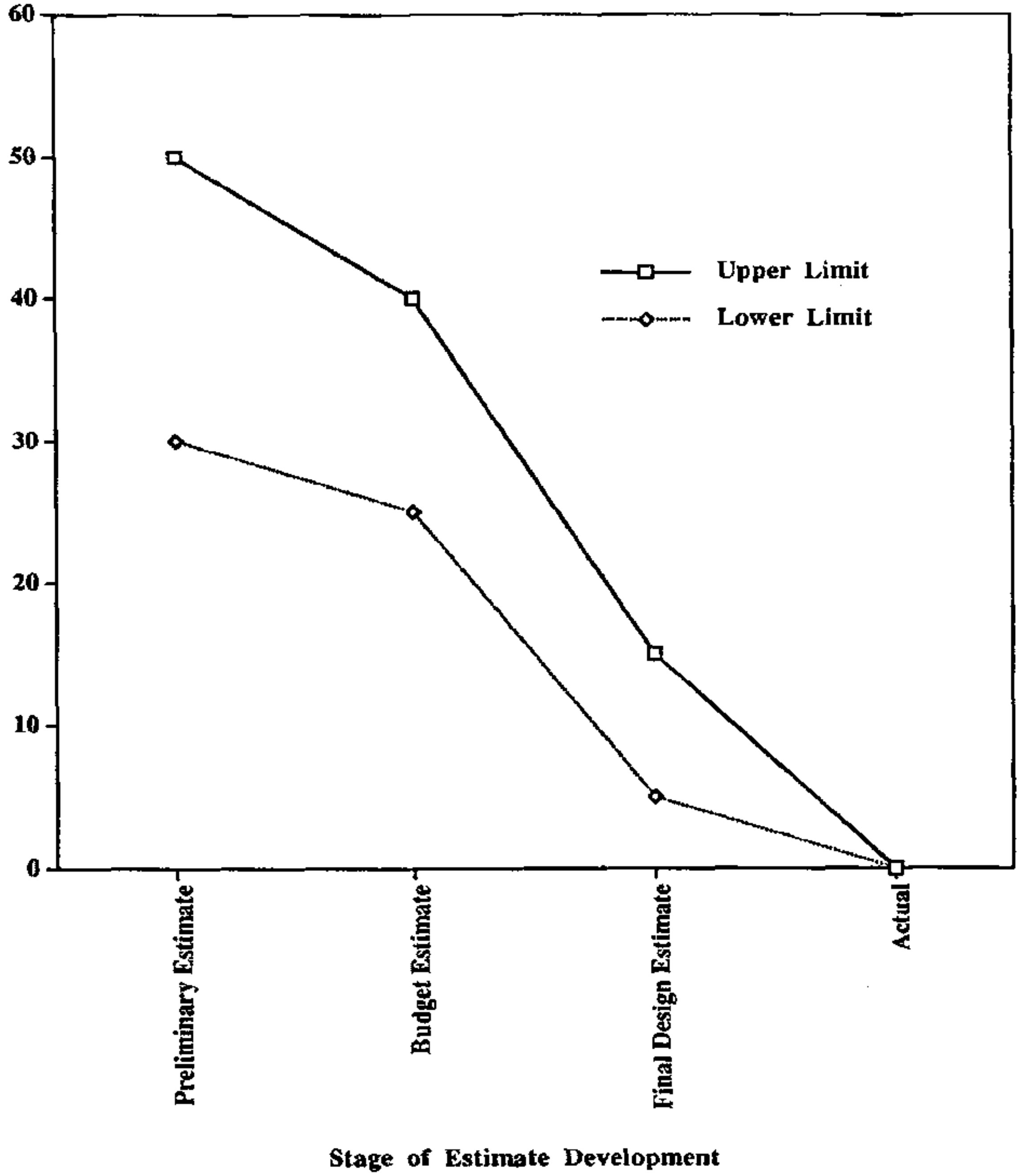

Figure 11-1. Contingency As a Function of Project Life

B. Environmental Restoration Projects

Environmental restoration projects usually consist of an assessment phase and a remediation/cleanup phase. Contingency plays a major role in the cost estimates for both phases. Recommended contingency guidelines for each phase will be discussed below. Table 11-3 lists contingency guidelines for assessment and remediation/cleanup project phases.

1. Assessment Phase

Unlike the remediation phase, the assessment phase does not include the physical construction of a remedy. An assessment determines and evaluates the threat presented by the release and evaluates proposed remedies. As a result, the assessment encompasses such items as field investigations, data analysis, screening and evaluation studies, and the production of reports.

The degree of project definition will depend on how well the scope of the assessment is defined. Higher levels of project definition will correspond to increasing levels of work completed on the assessment. Since the assessment is one of the initial stages of the environmental restoration process, there is a high degree of uncertainty regarding the technical characteristics, legal circumstances, and level of community concern. As a result, the scope of the assessment often evolves into additional operable units, and more than one assessment may be required.

Other considerations that affect the section of contingency ranges are—

- number of alternatives screened and evaluated;
- level and extent of sampling analysis and data evaluation;
- technical and physical characteristics of a site; and
- level of planning required.

Table 11-3 shows the estimate types for the assessment phase of an environmental restoration project and their corresponding expected contingency ranges. No contingency ranges for planning estimates have been provided. The contingencies become smaller as the project progresses and becomes better defined. However, it should be noted that these are only general guidelines based on the level of project definition. A higher or lower contingency may be appropriate depending on the level of project complexity, technical innovation, market innovation, and public acceptance.

Table 11-3. Contingency Guidelines for Environmental Restoration Projects

Activity and Estimate Type	Expected Contingency Range
Preliminary Assessment/Site Investigation Planning Estimate for All Assessment Activities	Up to 100%
Preliminary Estimate for All Assessment Activities	30% to 70%
Remedial Investigation/Feasibility Study Detailed Estimate for All Assessment Activities	15% to 55%
Planning Estimate for All Cleanup Phase Activities	20 to 100%
Contingency Guidelines for Remediation/Cleanup Phase	
Pre-Design Preliminary Estimate for All Remediation/Cleanup Phase Activities	Up to 50%
Remedial Design and Action Detailed Estimate for All Remediation/Cleanup Phase Activities	0% to 25%

2. Remediation/Cleanup Phase

For the remediation/cleanup phase, contingency factors are applied to the remaining design work. Remaining design work will use the same contingency factor as established in the ROD, permit, or current baseline for the project. This contingency percentage will depend upon the degree of uncertainty associated with the project, particularly the degree of uncertainty in the scheduled completion dates.

Table 11-3 shows the estimate types for the remediation/cleanup phase and their corresponding contingency ranges. While the ranges are relatively broad, they reflect the amount of contingency that would have been needed for a set of completed projects. The wide variance accounts for differences in project definition when the estimate was generated, project complexity, technical innovation, and other factors.

Other considerations that affect the section of contingency ranges are:

- innovative technology;
- required reliability;
- equipment complexity;
- construction restraints due to continuity of operation security and contamination;
- environmental conditions (weather, terrain, location, etc.);
- scheduling; and
- other unique items to the project such as waste management permits and reviews.

Prior to the completion of a remedial/corrective measure design estimate, the contingency applied to remaining cleanup work will be no more than that established in the ROD, permit, or current baseline for that project. The percent contingency will depend upon the complexity of the work and the degree of uncertainties involved.

When the construction work is defined by definitive design but the cleanup contract has not yet been awarded, a 15 to 20 percent contingency will be provided on the estimated cost. Usually, the cost estimate is based on detailed drawings and bills of material. When the cleanup work is to be performed by a Cost Plus Award Fee contractor, and the contractor has prepared a detailed estimate of the cleanup cost, and it has been reviewed and approved, a contingency of 15 to 18 percent is applied to only that portion of the cost and commitments remaining to be accrued. On fixed-price cleanup contracts where no significant change orders, modifications, or potential claims are outstanding, a contingency of 3 to 8 percent of the uncompleted portion of the work is provided depending upon the type of work involved and the general status of the contract.

C. Contingency Tools - Monte Carlo Analyses Methodology

Many tools are available to assist estimators with contingency. There is no required tool or program, but Monte Carlo analyses may be performed for all major system acquisitions. Monte Carlo or risk analysis is used when establishing a baseline or baseline change during budget formulation. The contingency developed from the Monte Carlo analyses should fall within the contingency allowance ranges in Table 11-1.

Monte Carlo analyses and other risk assessment techniques use similar methodology to obtain contingency estimates; however, for illustrative purposes, the ICECAN program developed for DOE will be discussed in this section.

The estimator must subdivide the estimate into separate phases or tasks and assess the accuracy of the cost estimate data in each phase. After the project data have been input and checked, the computer program will calculate various contingencies for the overall project based on the probability project underrun. The random number generator accounts for the known estimate accuracy. Once the program has completed its iterations (usually 1000), it produces an overall contingency for the project with a certain accuracy.

The following information is an example project estimate that was input into the ICECAN program.

Base Cost	$1,000,000	Fixed Price
Land Rights	40% $100,000 to $250,000 40% $250,000 to $500,000 20% $500,000 to $600,000	Step-Rectangular Distribution
Labor	50% Less than $100,000 20% $100,000 to $200,000 30% $200,000 to $220,000	Discrete Distribution
Profit	Mean = $235,000 Standard Deviation = $25,000	Normal Distribution

The distribution of the ranges is based on the estimator's judgment. For example, the base cost is a fixed price of $1,000,000 with no anticipated change orders. For landrights, there is a 40 percent chance the cost will be between $100,000 and $250,000, a 40 percent chance the cost will be between $250,000 and $500,000, and a 20 percent chance it will be between $500,000 and $600,000. A step-rectangular distribution was chosen.

The ICECAN program uses the mean cost calculated by the iterations as the base estimate. With the base estimate, there is a 50 percent probability that the project will be underrun. The results in Figure 11-2 show the contingency that should be used to achieve various probabilities overrun. For example, a contingency of 11.1 percent should be used to achieve an 85 percent probability of project underrun. Therefore, the total cost estimate would be $1,901,842. If the worst case cost of each variable had been used, the total estimate would be $2,080,000 or 21.5 percent contingency.

ICECAN

STIMATE FILE: EXAMPLE Contingency Report

Cost Estimate: ***$1,711,863

Probability of Underrun	Contingency Required	Contingency + Estimate
0.50	***********$0 (0.0%)	***$1,711,863
0.55	*********$228 (0.0%)	***$1,712,091
0.60	******$33,137 (1.9%)	***$1,745,000
0.65	******$76,269 (4.5%)	***$1,788,132
0.70	*****$111,558 (6.5%)	***$1,823,421
0.75	*****$140,282 (8.2%)	***$1,852,145
0.80	*****$163,372 (9.5%)	***$1,875,235
0.85	*****$189,979 (11.1%)	***$1,901,842
0.90	*****$224,928 (13.1%)	***$1,936,791
0.91	*****$235,725 (13.8%)	***$1,947,588
0.92	*****$248,795 (14.5%)	***$1,960,658
0.93	*****$257,706 (15.1%)	***$1,969,569
0.94	*****$266,618 (15.6%)	***$1,978,481
0.95	*****$278,856 (16.3%)	***$1,990,719
0.96	*****$292,907 (17.1%)	***$2,004,770
0.97	*****$308,836 (18.0%)	***$2,020,699
0.98	*****$321,089 (18.8%)	***$2,032,952
0.99	*****$343,554 (20.1%)	***$2,055,417
1.00	*****$366,427 (21.4%)	***$2,078,290

Figure 11-2. Contingency Data Results

COST-COMPETITIVE CONSTRUCTION MANAGEMENT: A REVIEW OF CORPS OF ENGINEERS CONSTRUCTION MANAGEMENT COSTS

Report AR603R3

June 1990

William B. Moore
Jeffrey A. Hawkins

Prepared pursuant to Department of Defense Contract MDA903-85-C-0139. The views expressed here are those of the Logistics Management Institute at the time of issue but not necessarily those of the Department of Defense. Permission to quote or reproduce any part must – except for Government purposes – be obtained from the Logistics Management Institute.

LOGISTICS MANAGEMENT INSTITUTE
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TABLE C-7

SUMMARY OF CONSTRUCTION MANAGEMENT FEE

(As percent of construction contract)

Characteristic	Construction management fee			Number of projects	Number of companies
	25th	Median	75th		
Overall	2.9%	4.7%	7.6%	196	29
Size of company					
1 - 5	4.6	5.3	11.9	9	2
6 - 10	3.5	5.2	7.1	43	8
11 - 15	3.6	4.0	5.0	8	2
16 - 25	0.7	3.2	9.7	48	5
26 - 50	3.8	4.9	7.3	40	5
51 - 100	3.8	6.4	11.0	13	2
Over 100	2.0	4.5	6.7	35	5
Type of company					
General contractor (GC)	2.9	2.9	2.9	1	1
CM firm	2.2	4.6	8.0	113	13
Architect engineering firm (AE)	2.0	2.3	3.3	9	1
GC/CM	3.3	4.4	6.4	47	8
CM/AE	4.4	7.0	8.4	19	5
Other	3.2	4.8	11.7	7	1
Client base					
Government	2.3	4.8	7.4	71	11
Private sector	2.8	4.5	8.0	106	15
Mixed	3.6	5.0	6.7	19	3

May 1994

ADA283018

U.S. Army Corps of Engineers Military Construction Management Costs

CE309R1

Jordan W. Cassell
Jeffrey A. Hawkins

Prepared pursuant to U.S. Army Corps of Engineers Contract DACW31-90-D-0076. The views expressed here are those of the Logistics Management Institute at the time of issue but not necessarily those of the U.S. Army Corps of Engineers. Permission to quote or reproduce any part except for Government purposes must be obtained from the Logistics Management Institute.

Logistics Management Institute
2000 Corporate Ridge
McLean, Virginia 22102-7805

Table C-6 is a summary of the CM fees for all projects by size of company, type of company, and client base. This analysis supports the earlier statement that the CM fee is not affected by the size of the company. However, this table indicates that the pure CM companies are providing CM services at the least cost regardless of the type of construction project. Also, CM companies providing services primarily for the government are doing so at lower cost than those CM companies providing services primarily for the private sector.

Table C-6.
Summary of Construction Management Fee
(as a percentage of construction contract)

	CM fee			Number of projects	Number of companies
	25th	Median	75th		
Overall	3.5%	5.0%	7.1%	187	33*
Size of company (number of employees)					
1 – 5	2.4	5.0	6.6	21	4
6 – 10	4.5	5.9	10.5	29	5
11 – 15	4.6	6.0	8.1	17	5
16 – 25	4.0	4.8	5.5	24	4
26 – 50	3.6	4.9	7.5	33	6
51 – 100	4.6	5.4	9.6	12	2
101 – 250	2.6	6.8	10.3	6	1
251 – 500	4.2	5.7	9.1	16	2
Over 500	1.2	2.5	6.0	29	4
Type of company					
CM firm	3.7	5.0	7.2	108	20
GC/CM firm	4.5	5.1	8.6	30	5
A-E/CM firm	2.2	4.5	6.7	49	8
Client base					
Government	2.8	4.6	6.1	92	17
Private sector	3.6	5.0	8.3	42	9
Mixed	3.8	5.7	9.9	53	7

*Two companies did not provide fee information.

Table C-7 summarizes the CM services provided during each construction project, by survey participants, for all projects. In addition, the table shows the relative weight associated with each phase of CM as it relates to the total cost of the CM contract. The results indicate that the level of services provided during the CM projects has increased from that provided during a 1989 survey. Since the level of service is a major determinant of the total CM cost, the higher level of services would account for the fact that the CM fee determined by the current survey was slightly higher than that calculated from the 1989 survey.

Docket No. G-39, Sub 47
Exhibit No. CPC-0006

Debris Estimating Field Guide

FEMA 329 / September 2010

FEMA

BUILDINGS AND RESIDENCES

General Building Formula

To estimate the amount of debris generated by a building, multiply the building length, width, and height in feet by a constant of 0.33 to account for the air space in the building, and divide the resulting number by 27 to convert from cubic feet to cubic yards:

$$\frac{\text{Length} \times \text{Width} \times \text{Height} \times 0.33}{27} = \text{CY}$$

Single Family Residence Formula

FEMA conducted an empirical study following Hurricane Floyd in North Carolina in 1999, and developed a formula for estimating debris associated with demolished single family residences:

$$\text{Length} \times \text{Width} \times \text{S} \times 0.20 \times \text{VCM} = \text{CY}$$

Length and Width must be in feet
S = number of stories in the building
0.20 = a constant based on the study data
VCM = a vegetative cover multiplier

The building square footage used in the formula is the total living space at and above ground level and includes attached garages.

If buildings or residences are completely destroyed, square footage can still be calculated by measuring the length and width of the foundation and inquiring about the number of stories that were present before the disaster.

CONVERSION FACTORS

USACE has developed several conversion factors for converting between tons and cubic yards of debris that FEMA has determined are reasonable:

Construction and demolition debris:
1 ton = 2 CY

Mixed debris:
1 ton = 4 CY

Vegetative debris:
Hardwoods: 1 ton = 4 CY
Softwoods: 1 ton = 6 CY

Actual conversion values for a particular disaster may be very different; therefore, field tests coordinated with the State and applicant may be necessary to confirm an appropriate conversion factor.

AERIAL ESTIMATES

Applications where debris estimates based on aerial or satellite photography may be appropriate include:

- Rough estimates that must be developed quickly, such as for a PDA
- Validation or extrapolation of debris estimating information obtained through ground measurements or computer models

RBN Energy LLC

“WOOO – PIG – SOOIE!” - The Business of Pipeline Integrity II

Thursday, 10/31/2013
Published by: Callie Mitchell

The oil and gas pipeline industry depends on “Pigs” (pipeline integrity gauges) to verify pipelines. They help avoid leaks, fractures and costly unscheduled service interruptions. As massive new oil and gas pipeline construction continues in the US and as existing pipelines get older the pig business is becoming more valuable. But like anything else, they aren’t perfect; and pigging experts and pipeline operators are motivated to make them better. Today we continue our analysis of the pig business with a look at what some of the movers and shakers are doing to support new demands and challenges in this booming industry.

In the first part of this series, “**WOOO – PIG – SOOIE!” – The Business of Pipeline Integrity***(http://www.rbnenergy.com/woo-pig-sooie-the-business-of-pipeline-integrity)*” we talked about how oil and gas products have been traveling through pipelines for about 100 years. Pigs have been responsible for keeping pipelines clean and operational since the 1940s, when WWII emergency pipelines (carrying crude and refined products overland to avoid submarine attacks) needed a way to eliminate the buildup of contaminants. Pigs are by far the most dependable pipeline integrity technology today and account for over 90% of all petroleum liquid pipeline inspections (the other 10% is hydro pressure testing and direct assessment). Pigging is big business and while most manufacturers are enjoying the fruits of the current energy boom, they also have plenty of challenges. Companies like TD Williamson, Girard, Enduro, and Inline Services are aggressively competing to provide the best and most effective pig and/or pig support products out there.

More Big Pig Business

Included in the larger pig industry family are pipe manufacturers, pipeline construction companies, pipeline operators, pipeline service providers, state and federal regulators and pig manufacturers. In recent years, there has been increased scrutiny and regulation of the pipeline business for environmental and public safety reasons. Market players need to pay attention to these concerns at the same time as they keep a tight lid on costs.

In addition to pig cleaning and gauging service, and smart pigging or Inline Inspection (ILI) pigs also require specialty support products and services to make them work. These include pig traps (where the pig goes into and out of the pipe), launching and receiving stations, and pig trackers and signalers. Third party suppliers that are not pig manufacturers typically provide these ancillary services.

Inline Services and Girard are top cleaning and gauge pig manufacturers. T.D. Williamson and Enduro Pipeline Services produce pigs that pretty much cover the gamut; cleaning, gauging, batching, and smart pigs that include varying specialized design and technologies. The latest smart pig technologies include Deformation (DEF) that is specific to finding dents, Magnetic Flux Leakage (MFL) specific to corrosion, and Multi Data Set (MDS) for multiple discoveries like dents, corrosion and seam defects. New ultrasonic tools are proving even better than traditional MFL tools for finding corrosion and cracks. Unfortunately, they can only be run in a liquid medium pipeline such as oil, water or diesel – not in a gas pipeline. TD Williamson and others have also been working on perfecting Electro Magnetic Acoustic Transducer (EMAT) technology, which can be run in gas lines. We should see these in the marketplace soon.

Top Pigging Challenges

The following are some of the industry's top challenges:

- **Pigging is not cheap:** An industry expert shared this typical example to illustrate: To chemically clean (cleaning pig) a 24" 15 mile gas pipeline would cost between $210,000 - $250,000 plus a disposal fee of $25,000 - $30,000. This cleaning is typically done before an ILI smart pig operation that costs another $100,000. So the total pigging cost on that 15 miles of pipeline would be $335,000 - $380,000 or roughly $35,000 per mile. To get an idea of how much money can be spent on pigging you can extrapolate that $35,000/mile number to arrive at $59 billion to run this standard pigging operation on all US pipelines one time.
- **Pigs are labor intensive:** Each pig can only handle a few miles at a time on average. Also, they can be quite messy and generate problems for downstream equipment if not filtered properly. They are generally used in "in-service" pipelines necessitating lots of careful planning for operations. Each time a pig is launched, it can take two or three man hours of preparation prior to each launch and some pigging projects require 50-60 launches or more. A typical pigging system requires the opening and/or closing of at least three major valves, the draining and venting of a barrel, and the opening and closing of a closure door. In some cases, it can take up to four hours for a single crew to load and launch a single pig (and that doesn't even include the time to receive and remove the pig). Beyond the time and labor constraints, there are also wear and safety considerations. And of course, should there be any problems with the process, all of this must be done again.
- **Pigs do not catch every glitch in every pipe:** While smart pigs do spot corrosion and potential areas of concern, they can miss pinholes and/or corrosion that is less than 1" in size. And if a cleaning pig does not clean the pipe before the smart pig does its thing, those "misses" multiply. Cleaning pigs generally go hand in hand with smart pigging programs.
- **Not all pipes are piggable:** Many pipelines or parts of pipelines out there simply can't accommodate pigs at all. These are often referred to as "unpiggable" or "not-so-piggable" pipe. There are several reasons for a pipe to be considered unpiggable, including: (1) it has no access for the pig; (2) it has multiple diameters; (3) it has impassable valves or fittings, or valve restrictions; (4) the pipe bends; (5) there are external pipe defects, and/or (6) there is a buildup of contaminants preventing the pig from moving. Of the 2.4 million miles of pipeline in the U.S., roughly 30% falls into the unpiggable category and another 10% are considered "difficult to pig".

To access the remainder of *"WOOO – PIG – SOOIE!" - The Business of Pipeline Integrity II* you must be logged as a **RBN Backstage Pass™** *(/subscriber/info)* subscriber.

Full access to the RBN Energy blog archive which includes any posting more than 5 days old is available only to **RBN Backstage Pass™** *(/subscriber/info)* subscribers. In addition to blog archive access, **RBN Backstage Pass™** *(/subscriber/info)* resources include Drill-Down Reports, Spotlight Reports, Spotcheck Indicators, Market Fundamentals Webcasts, Get-Togethers and more. If you have already purchased a subscription, be sure you are **logged in** *(/user)* For additional help or information, contact us at **info@rbnenergy.com** *(mailto:info@rbnenergy.com)* or 888-613-8874.

Gas Pipes Abandonment or Deactivation of Facilities

07.16.50.05	Revision 00	Effective Date 12/14/2017

Overview & Applicability

Policy

It is Williams policy to:

1. **Abandoned Pipelines in Place**
   - Disconnect each abandoned in place pipeline from all sources and supplies of gas.
   - Purge the pipeline of gas and seal the ends.
   - Fill offshore pipelines with water or inert materials and then seal the ends.
2. **Inactive Pipelines**
   - Disconnect inactive pipelines, except service lines, that are not being maintained from all sources and supplies of gas.
   - Purge the pipeline of gas and seal the ends.
   - Fill offshore pipelines with water or inert materials and then seal the ends.
3. **Service Disconnection**
   - Provide the customer a locking device or other means designed to prevent the closed valve from being opened by unauthorized persons.
   - Install a mechanical device or fitting to prevent the flow of gas in the service line or in the meter assembly.
   - Disconnect the customer's piping from the gas supply and then seal the open ends.

Purpose

This procedure establishes a standardized method for abandoning or deactivating a pipeline facility, which includes:

- Abandonment by Sale, Removal, or In-Place
- Retirement
- Deactivation
- Service Disconnection

The procedure to abandon or deactivate facilities affects any Williams pipeline facility that crosses over, under, or through an area on land or in a waterway.

Key Activities

Description	Frequency	OMS Activity Number[1]	Maximo Activity Number
Abandonment or Deactivation of Facilities	Varying (V)	0045	

[1] Applicable to Transco, NWP, and Gulfstream.

Qualification References – None for this Operating Requirement

Summary of Responsibilities

Title/Role	Summary of Responsibilities
Manager, Operations	Review requests for an abandonment or deactivation of pipeline facilities from Customer Services.
	Obtain approval from Director, Operations.
Abandonment Coordinator	Single point of contact for the abandonment process (Operations/Project Manager).
	Originator and Owner of WGP-0125A – Facility Abandonment Form.
Manager, Land	Report to Federal and State regulatory agencies regarding the abandonment, retirement, or deactivation of offshore facilities.
Manager, Pipeline Safety	Note all abandoned facilities for purposes of updating the DOT Annual Mileage Report and other relevant information maintained by Pipeline & Process Safety.
Manager, GIS Systems & Development	Submit data to the National Pipeline Mapping System (NPMS) for all abandoned offshore or onshore pipeline facilities.

1.0. Abandoning Pipeline (Atlantic–Gulf Operating Areas)

Responsible Party	Action	
Obtaining Authorization		
Manager, Operations	1.1	If Abandonment by Sale, follow the process described in 07.16.50.05-A – Gas Pipes Attachment A—Abandonments by Sale.
	1.2	If Abandonment in Place or by Removal, follow the process described in 07.16.50.05-B – Gas Pipes Attachment B—Abandonments In Place By Removal.
	1.3	Complete WGP-0125A – Facility Abandonment Form (Automated form in SharePoint). **NOTES**: • This form meets the required elements outlined by 09.00.00.01 – Management of Change; therefore, the form serves as an MOCR and a separate MOCR, F09-001A – Management of Change Form form is not required. • Use WGP-0125A – Facility Abandonment Form to track authorization and progress during the Abandonment approval process and the physical work.
Abandonment		
Manager, Operations	1.4	If the abandonment involves gas handling, complete a Gas Handling Plan according to 02.10.102-OG – Gas Pipes Gas Handling Plans and receive appropriate approvals. If the abandonment does not involve gas handling, complete a Work Plan according to 02.10.01.02 – Work Planning and receive appropriate approvals.
	1.5	Include contact with affected customers and landowners in the plan.
	1.6	Disconnect the pipeline to be abandoned from all delivery and receipt points.
	1.7	Purge the pipeline of gas and ensure that a combustible mixture is not present after purging.
	1.8	Fill onshore pipeline with nitrogen, unless special conditions exist.
	1.9	Fill onshore pipeline to be abandoned under roadways with concrete or grout for safety purposes, unless special conditions exist.

Responsible Party	Action	
	1.10	Mark location of abandoned onshore pipelines according to 07.16.01.03 – Installing and Maintaining Line Markers.
	1.11	Fill offshore pipeline with water or inert material and seals both ends. Seals the pipelines with the applicable method: • Use normal end closures (caps, plugs, and blind flanges) • Weld steel plates to pipe ends
Report Abandoned Facilities to Authorities		
Manager, Land	1.12	Report to Mineral Management Service, all abandoned facilities that cross over, under, or through offshore Federal waters.
	1.13	Report to the Army Corp. of Engineers all abandoned facilities that cross over, under, or through offshore state waters.
	1.14	Report to Coastal Zone Management all abandoned facilities that are in State waters in Louisiana.
	1.15	Report to the General Land Office all abandoned facilities that are in State waters in Texas.
Manager, Pipeline Safety	1.16	Note all abandoned facilities for the purpose of updating the DOT Annual Mileage Report and other relevant information maintained by Pipeline and Process Safety.
Manager, GIS Systems & Development	1.17	Submit data on abandoned offshore pipeline facility or each abandoned onshore pipeline facility that crosses over, under, or through a commercially navigable waterway to the National Pipeline Mapping System (NPMS).
	1.18	The data submitted to NPMS, in addition to the required attributes, shall contain all reasonably available information related to the facility. Reasonably available information consists of location, diameter, date of abandonment, and method of abandonment. Submittals to the NPMS shall be considered certification that, to the best of Williams knowledge, all of the reasonably available information requested was provided and, to the best of the operator's knowledge, the abandonment was completed in accordance with applicable laws.

2.0. Abandoning Pipeline (West Operating Areas)

Responsible Party	Action
Obtaining Authorization	

Responsible Party	Action	
Manager, Operations	2.1	Review requests for an abandonment or deactivation of pipeline facilities from Customer Services.
	2.2	Obtain approval from Director, Operations.
	2.3	Request assistance of Tactical Projects & Technical Services, if needed.
	2.4	Complete F09-001A – Management of Change Form - Standard or F09-001 – Management of Change Form – Word Version (for temporary and multi-location changes), as applicable, in accordance with 09.00.00.01 – Management of Change.
Abandonment		
Manager, Operations	2.5	If the abandonment involves gas handling, complete a Gas Handling Plan according to 02.10.102-OG – Gas Pipes Gas Handling Plans and receive appropriate approvals. If the abandonment does not involve gas handling, complete a Work Plan according to 02.10.01.02 – Work Planning and receive appropriate approvals.
	2.6	Include contact with affected customers and landowners in the plan.
	2.7	Disconnect the pipeline to be abandoned from all delivery and receipt points.
	2.8	Purge the pipeline of gas and ensure that a combustible mixture is not present after purging.
	2.9	Fill onshore pipeline with nitrogen, unless special conditions exist.
	2.10	Fill onshore pipeline to be abandoned under roadways with concrete or grout for safety purposes, unless special conditions exist.
	2.11	Mark location of abandoned onshore pipelines according to 07.16.01.03 – Installing and Maintaining Line Markers.
	2.12	Fill offshore pipeline with water or inert material and seal both ends. Seal the pipelines with the applicable method: • Use normal end closures (caps, plugs, and blind flanges) • Weld steel plates to pipe ends
	2.13	Complete G07-150 – Gas Pipes Abandonment-Deactivation Report (Word version), including an as-built drawing showing the changes. Depict abandoned lines on alignment sheets and Diagrammatic Valve Charts or System Line Diagrams.

Responsible Party		Action
	2.14	Distribute the completed G07-150 – Gas Pipes Abandonment-Deactivation Report properly and file a copy at the local office. It is recommended that the completed form be scanned and attached to OMS Activity ID #0045.
Report Abandoned Facilities to Authorities		
Manager, Land	2.15	Report to Mineral Management Service, all abandoned facilities that cross over, under, or through offshore Federal waters.
	2.16	Report to the Army Corp of Engineers all abandoned facilities that cross over, under, or through offshore state waters.
	2.17	Report to Coastal Zone Management all abandoned facilities that are in State waters in Louisiana.
	2.18	Report to the General Land Office all abandoned facilities that are in State waters in Texas.
Manager, Pipeline Safety	2.19	Note all abandoned facilities for the purpose of updating the DOT Annual Mileage Report and other relevant information maintained by Pipeline and Process Safety.
Manager, GIS Systems & Development	2.20	Submit data on abandoned offshore pipeline facility or each abandoned onshore pipeline facility that crosses over, under, or through a commercially navigable waterway to the National Pipeline Mapping System (NPMS).
	2.21	The data submitted to NPMS, in addition to the required attributes, shall contain all reasonably available information related to the facility. Reasonably available information consists of location, diameter, date of abandonment, and method of abandonment. Submittals to the NPMS shall be considered certification that, to the best of Williams knowledge, all of the reasonably available information requested was provided and, to the best of the operator's knowledge, the abandonment was completed in accordance with applicable laws.

3.0. Deactivating a Pipeline (All Operating Areas)

The District Manager treats a temporarily deactivated pipeline using the following process:

Responsible Party		Action
Manager, Operations	3.1	Remove residual hydrocarbons prior to filling the segment of line with water or nitrogen.
	3.2	Put corrosion inhibitor in water if a pipeline segment is offshore and filled with water.

Responsible Party	Action	
	3.3	Do not fill road crossings with grout or concrete until permanently abandoned.
	3.4	Maintain line markers as if the pipeline is in service.
	3.5	Continue DOT—49 CFR Part 192 required activities on the pipeline throughout the period of deactivation.
	3.6	Complete G07-150 – Gas Pipes Abandonment-Deactivation Report (Word version), including an as-built drawing showing the changes. Depict abandoned lines on alignment sheets and Diagrammatic Valve Charts or System Line Diagrams.
	3.7	Distribute the completed G07-150 – Gas Pipes Abandonment-Deactivation Report properly and file a copy at the local office. It is recommended that the completed form be scanned and attached to OMS Activity ID #0045.

4.0. Deactivating a Meter Station Facility (All Operating Areas)

The District Manager must comply with one of the following when temporarily deactivating a customer meter station facility:

Responsible Party	Action	
Manager, Operations	4.1	Use a locking device or other means to lock the valve that is closed to prevent the flow of gas or the opening of the valve by unauthorized personnel. **NOTE**: Meter station facilities must be maintained according to DOT—49 CFR Part 192 as long as the facilities are physically connected to pipelines containing gas.
	4.2	Install a mechanical device or fitting that prevents the flow of gas in the service line, lateral, or the meter assembly. The mechanical device or fitting installed has a pressure rating commensurate with the Maximum Allowable Operating Pressure (MAOP).
	4.3	Disconnect the piping from the customer's facilities.
	4.4	Complete G07-150 – Gas Pipes Abandonment-Deactivation Report (Word version), including an as-built drawing showing the changes. Depict abandoned lines on alignment sheets and Diagrammatic Valve Charts or System Line Diagrams.
	4.5	Distribute the completed G07-150 – Gas Pipes Abandonment-Deactivation Report properly and file a copy at the local office. It is

Responsible Party	Action	
		recommended that the completed form be scanned and attached to OMS Activity ID #0045.

Recordkeeping

NOTE: For more recordkeeping and retention information, refer to the WIMS Forms Matrix or the Records & Information Management (RIM) website.

Record	Record Location *(Retention requirements apply.)*	Retention Period	Distribution Requirements *(Retention does not apply.)*
WGP-0125A – Facility Abandonment Form (Automated form in SharePoint)	SharePoint	Life of Facility, until sold or removed*	N/A
G07-150 – Gas Pipes Abandonment-Deactivation Report (Word version)	Pipeline & Process Safety Backup: Local Office	Life of Facility, until sold or removed*	GIS Systems & Development Rates & Tariffs Asset Integrity Supervisor Land (Offshore facilities only)
F09-001A – Management of Change Form (Automated form in SharePoint)	SharePoint	Life of Facility	N/A
F09-001 – Management of Change Form (Word version)	Complete header information in SharePoint. Attach completed electronic Word form.	Life of Facility	N/A

Definitions

NOTE: For a complete list of WIMS terms and definitions, refer to the WIMS Glossary.

Term	Definition
Abandoned Pipeline/Segment of Pipeline	Pipeline or segment that is physically separated from its source of gas and is no longer maintained according to DOT—49 CFR Part 192.
Abandoned in Place Meter Station	Meter station that is physically separated from its source of gas and no longer maintained according to DOT—49 CFR Part 192.
Abandoned by Removal Meter Station Facility	Meter station that has been physically removed.
Active Meter Station Facility	Meter station that is being maintained according to DOT—49 CFR Part 192 and is being used to receive or deliver gas.
Deactivation	The process of making the pipeline inactive.
Emergency Plan and Preparedness Manual (EPPM)	The manual that addresses emergency information used in the field at all types of facilities.
Inactive Pipeline	A pipeline that is being maintained according to DOT—49 CFR Part 192, but is not presently being used to transport gas.
Retirement	The permanent inactivation, removal, and closure of an asset rendering it permanently inoperable, such as pipeline abandonment or facility decommissioning.

WIMS References

- 02.10.102-OG – Gas Pipes Gas Handling Plans
- 09.00.00.01 – Management of Change
- 07.16.01.03 – Installing and Maintaining Line Markers
- 02.10.01.02 – Work Planning
- 07.16.50.05-A – Gas Pipes Attachment A—Abandonments by Sale
    - 07.16.50.05-F1 – Gas Pipes Flowchart 1—Abandonments by Sale Decision Making_Communication Process
- 07.16.50.05-B – Gas Pipes Attachment B—Abandonments In Place By Removal
    - 07.16.50.05-F2 – Gas Pipes Flowchart 2—Abandonments In Place or by Removal Decision Making_Communication Process.pdf
- 07.16.50.05-C – Gas Pipes Attachment C—Abandonments Job Aid

Supplemental Information

- N/A

Regulatory References

- DOT 49 CFR 192.727

Change Requests

Responsible Party	Action
Employee	If areas for improvement are observed or this procedure is ineffective, please submit feedback using the Change Request Form.

Revision History

Rev Date	Rev #	Request #	Section #	Description
12/14/2017	00	N/A	N/A	WilSOP port to WIMS.

Submittal Coversheet Guide

Document Titles and Numbers *(Numbers to be assigned by WIMS Team)*
07.16.50.05 – Gas Pipes Abandonment or Deactivation of Facilities
WilSOP Documents to be Replaced/Archived *(Indicate if any SIP feedback requests are being addressed)*
70.15.01 Abandonment or Deactivation of Facilities

Cardinal Pipeline Company, LLC
P.O. Box 1396
Houston, Texas 77251-1396

October 26, 2021

Ms. Shonta Dunston
Chief Clerk
North Carolina Utilities Commission
430 N. Salisbury Street, Dobbs Building
Raleigh, North Carolina 27603

Reference: Depreciation Study, Docket No. G-39, Sub 46

Dear Ms. Dunston:

Cardinal Pipeline Company, LLC (Cardinal or Company) hereby submits for filing its "Depreciation Rate Study" as required by the North Carolina Utilities Commission (Commission) Rule R6-80. The Rule requires each natural gas utility to submit a depreciation study for Commission approval every five years. Cardinal's existing depreciation rates were contained in Cardinal's 2016 Depreciation Study and were implemented in Docket No. G-39, Sub 38, Cardinal's last general rate case effective May 1, 2017.

Cardinal's Depreciation Rate Study recommends changes in the Company's existing depreciation rates. The proposed depreciation rates for all accounts are provided in Schedule 1 of the workpapers. Cardinal believes that the depreciation rates reflected on Schedule 1 are reasonable, and requests that the Commission allow Cardinal to implement the proposed changes in conjunction with Cardinal's next rate case to be filed no later than March 15, 2021.

Any communications regarding this filing should be sent to:

Cardinal Pipeline Company
c/o Cardinal Operating Company, LLC
Jordan Kirwin
Director – Rates & Regulatory
Cardinal Operating Company, LLC
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Email: jordan.kirwin@williams.com

Cardinal Pipeline Company
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Respectfully submitted,

CARDINAL PIPELINE COMPANY, LLC
By its operator,
Cardinal Operating Company, LLC

By ______________________________

Ronald P. Goetze
Manager – Rates & Regulatory
Email: ronald.p.goetze@williams.com
(713) 215-4631

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

BROWN, WILLIAMS, MOORHEAD & QUINN, INC.
ENERGY CONSULTANTS

CARDINAL PIPELINE COMPANY, LLC

DEPRECIATION RATE STUDY AS OF DECEMBER 31, 2020

DOCKET NO. G-39, SUB 46

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

CARDINAL PIPELINE COMPANY, LLC

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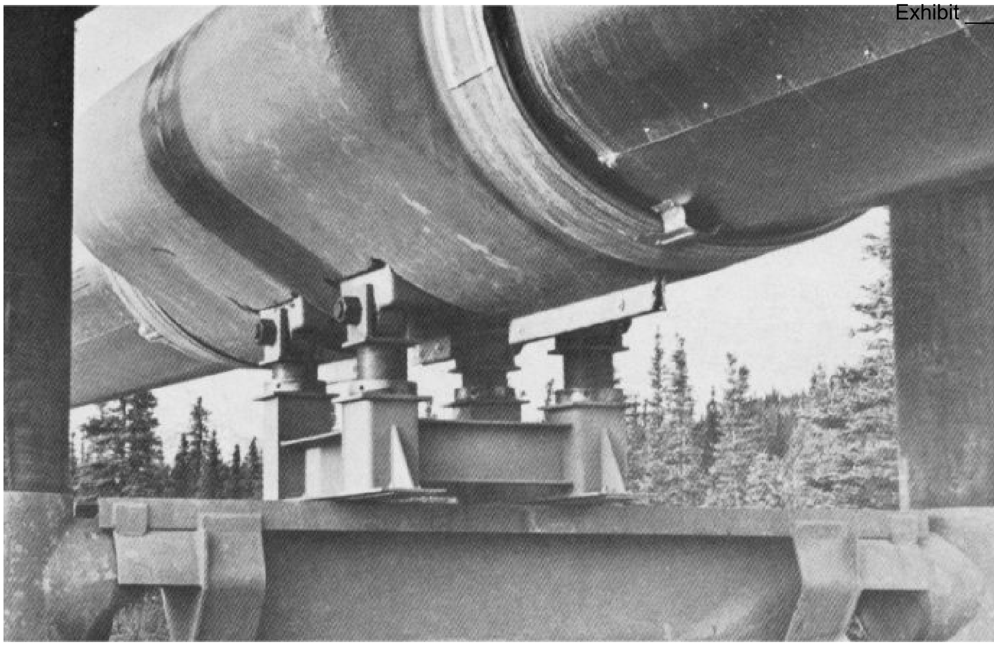


PART I INTRODUCTION AND OVERVIEW

Brown, Williams, Moorhead & Quinn (BWMQ) is an energy consulting firm providing clients with a wide range of economic and rate-making services in energy transmission industries. The firm concentrates on regulatory energy litigation matters before federal and state regulatory commissions and specializes in those areas that make up the elements of rate case litigation, including advanced depreciation analysis. BWMQ has been engaged by Cardinal Pipeline Company, LLC (Cardinal) to provide analyses, workpapers, and expert support for its planned depreciation rate filing at the North Carolina Utilities Commission (NCUC). See Attachment 4, Steven R. Fall CV for additional background information.

This depreciation study is based on a 2050 remaining economic horizon for Cardinal's trunkline function pipeline assets starting in 2021. This study calculated a set of specific depreciation rates for each property account predicated on survivor curve methodology for the Cardinal system. Our recommendation is that Cardinal adjust its depreciation rates such that the overall composite rate is 2.59%. Specific account-by-account recommendations can be found in Part VI.

PART II CARDINAL PIPELINE COMPANY SYSTEM OPERATIONS

Cardinal is an intrastate natural gas pipeline consisting of 104 miles of 24-inch-diameter pipeline extending from Transcontinental Gas Pipe Line Company, LLC's (Transco) Compressor Station 160 in Rockingham County, North Carolina to the Raleigh, North Carolina area. The Cardinal pipeline system consists of (1) the original 24-inch diameter, 37-mile Cardinal Pipeline, which originates in Rockingham County, North Carolina and extends to the southeast of Burlington, North Carolina to provide 134,550 dekatherms (Dth) per day of firm natural gas transportation capacity, (2) the 24-inch diameter Cardinal Extension, which was placed into service on November 1, 1999, and extends approximately 67-miles from Burlington, North Carolina to the area of Raleigh, North Carolina adding 144,900 Dth per day of firm natural gas transportation capacity, and (3) the 2012 Expansion Project, which was placed into service on June 1, 2012, adding 199,000 Dth per day of firm natural gas transportation capacity through the installation of a 14,205 horsepower greenfield compressor station in Guilford County, North Carolina, and upgrades at certain existing measuring and regulating stations.

The members/owners of Cardinal include subsidiaries of Transco, Public Service Company of North Carolina, Inc., and Piedmont Natural Gas Company, Inc. Cardinal provides 478,450 Dth per day of firm natural gas transportation capacity to its two North Carolina gas utility customers. Gas deliveries from Cardinal for the five years ended December 31, 2020, ranged between approximately 83,000,000 Dth and 89,000,000 Dth per year.

PART III DEPRECIATION THEORY

Definition

Depreciation is a term used in accounting, economics, and finance to convey the concept of the inherent loss of value in an entity's capital assets over time and the associated allocation of that loss in capital value over some defined period. Capital costs are those costs incurred to acquire plant and equipment that will be used over several accounting periods to facilitate the provision of an entity's goods and services. The recovery of the capital costs must occur within the economic lifespan of the asset. The tools used in depreciation analysis are the foundation for allocating capital costs over the useful life of a depreciable asset in order to provide investors the opportunity to recoup their investment in a reasonable and consistent manner during the expected service life of the asset.

Oil and gas pipeline systems are built to safely transport hydrocarbons for many years. Properly maintained, all pipeline assets have very long-life expectancies. However, what goes into the ground as a state-of-the-art industrial asset will, one day, run up against various factors that will cause the asset to be retired. First, simple usage takes its toll on any asset. Under normal usage, every asset has a range of service life expectancy that will define its maximum depreciable life. But various factors can shorten that expectation, such as extreme weather-related damage, third-party damage, or governmental regulations. These often bring an immediate end to the facilities' useful life. Other factors can shorten a life expectation not because the asset itself fails but because changes in technology, methodology, or regulations render the asset obsolete. Improvements in safety, efficiency, or usefulness can lead to the retirement/replacement of assets that might otherwise have remained in service for many years. Depreciation theory allows for the truncation of the useful life of facilities based on these considerations.

A "loss in service value" is the diminishment of the ability of an asset to provide useful service to the entity. Loss in service value occurs broadly from two sources: 1) physical causes such as wear and tear, decay, and action of the elements; and 2) what can be classified as economic causes (inadequacy, technological or economic obsolescence, changes in the art, changes in demand, requirements of public authorities, and the exhaustion of natural resources).

Depreciation Methodology

This study uses the broad group, straight line, average remaining life method of depreciation. Under this method all of the assets within a group are considered to be homogeneous units of plant used and treated alike across the system regardless of the vintage, construction techniques, or retirement rate. In practice, there are two levels of grouping – by account and by function. For natural gas pipelines generally, the accounts are combined into a larger functional group, such as storage or transmission, with one depreciation rate for the whole function.

The depreciable lives of a pipeline entity's assets are bound by three life expectancy estimates: 1) the average physical service life expectancy of the various classes of property; 2) the estimated remaining life of the resource base supporting the need for the assets; and 3) the estimated remaining economic life of the demand for services provided by the capital assets. These three factors set the stage for calculating the average remaining depreciable life, which also takes into account the truncation date and interim retirements. The service life measures the physical life expectancy of the plant in service, absent specific economic or resource limitations. The remaining life of the resource base measures the expectations for the exhaustion of natural resources and its impact on the assets in question. The remaining economic life is the life expectancy as impacted by economic forces such as changes in regulations, alternative transportation routes, or alternative energy sources. The average remaining depreciable life takes all these factors into consideration to select a life span for use in the depreciation calculations.

Most pipelines incorporate a truncation date in their derivations of depreciation rates to reflect the fact that the average actual useful lifespan of the assets is often significantly shorter than the physical average service life. The incorporation of a truncation date is often unrelated to the physical characteristics of the asset itself but is due to reasons such as the loss of reserves supporting its use, technical obsolescence bringing about replacement, or the requirements of public authorities that may lead to economic obsolescence of certain facilities. The incorporation of a truncation date may cause the remaining life of the assets to be less than the average physical life.

PART IV   ECONOMIC LIFE [1]

In an era marked by projections of oil and natural gas reserves approaching a hundred-year supply, contemplating the end-of-life for a natural gas pipeline may seem counterintuitive. Yet climate change concerns are becoming a larger driving force in the development of the future of energy infrastructure. On October 29, 2018, North Carolina Governor Roy Cooper signed Executive Order 80 calling for a "40 percent reduction in statewide greenhouse gas emissions by 2025", and to "reduce electric power sector greenhouse gas emissions by 70% below 2005 levels by 2030, and attain carbon neutrality by 2050."[2] In addition, on January 27, 2021, the United States president issued Executive Order 14008[3] ("EO 14008"). Executive Order 14008, Section 201, states:

[1] The remaining economic life was developed based on the current political landscape and environmental path. Cardinal is required to file a new depreciation study within 5 years and remaining economic life will be reassessed at that time.

[2] https://files.nc.gov/ncdeq/climate-change/clean-energy-plan/NC_Clean_Energy_Plan_OCT_2019_.pdf

[3] https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/

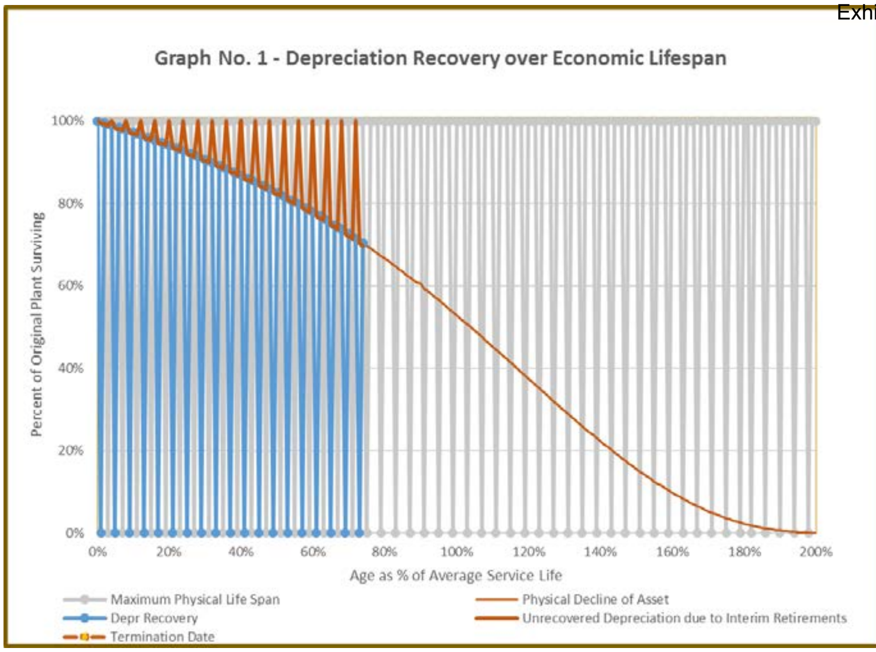
> **Sec. 201.** *Policy.* Even as our Nation emerges from profound public health and economic crises borne of a pandemic, we face a climate crisis that threatens our people and communities, public health and economy, and, starkly, our ability to live on planet Earth. Despite the peril that is already evident, there is promise in the solutions—opportunities to create well-paying union jobs to build a modern and sustainable infrastructure, deliver an equitable, clean energy future, and put the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050.

Section 201 of EO 14008 establishes that it is the policy of the federal government's agencies to implement government-wide approaches to achieve net-zero emissions, economy-wide, by no later than 2050. Additionally, Section 205 of EO 14008 establishes a plan to reach a "carbon pollution-free electricity sector no later than 2035":

> **Sec. 205.** *Federal Clean Electricity and Vehicle Procurement Strategy.* (a) The Chair of the Council on Environmental Quality, the Administrator of General Services, and the Director of the Office and Management and Budget, in coordination with the Secretary of Commerce, the Secretary of Labor, the Secretary of Energy, and the heads of other relevant agencies, shall assist the National Climate Advisor, through the Task Force established in section 203 of this order, in developing a comprehensive plan to create good jobs and stimulate clean energy industries by revitalizing the Federal Government's sustainability efforts.
>
> (b) The plan shall aim to use, as appropriate and consistent with applicable law, all available procurement authorities to achieve or facilitate:
>
> (i) a carbon pollution-free electricity sector no later than 2035; and
>
> (ii) clean and zero-emission vehicles for Federal, State, local, and Tribal government fleets, including vehicles of the United States Postal Service.
>
> (c) If necessary, the plan shall recommend any additional legislation needed to accomplish these objectives.
>
> (d) The plan shall also aim to ensure that the United States retains the union jobs integral to and involved in running and maintaining clean and zero-emission fleets, while spurring the creation of union jobs in the manufacture of those new vehicles. The plan shall be submitted to the Task Force within 90 days of the date of this order.

It is uncertain how the goals of these Executive Orders will be achieved, but if they do come to fruition, it is reasonable to believe that the effort to reach net-zero emissions by 2050 may result in (i) a substantial decrease in the consumption of natural gas, including the natural gas transported on Cardinal, (ii) a resulting substantial decrease in the utilization of natural gas infrastructure, and (iii) an increase in the use of alternate energy sources.

In addition, 58 percent of Cardinal's capacity is contracted under agreements that are already in "evergreen" status, i.e., beyond expiration of their primary terms, and subject to unilateral termination by Cardinal's shippers on short notice. The remaining 42 percent of capacity will be in "evergreen" status in 2032. Moreover, Cardinal's competitors are competing for both new and existing business throughout the Cardinal market area through proposed new and existing pipelines with designed expansion capabilities. As such, proposing an economic life truncated at 2050 for ratemaking purposes is reasonable given Cardinal's shippers' rights to terminate their agreements, the potential for development of alternative options to supply their natural gas needs, and the uncertainty of how Executive Orders' 80 and 14008 shared goal of a 2050 net-zero horizon will affect natural gas demand.



PART V SURVIVOR CURVE THEORY

The physical plant of large industrial entities is made up of thousands of units of property. For some property accounts, the items in the account are homogeneous in nature, for example, Account No. 367 – Mains is made up of line pipe, period. Other accounts, such as Account No. 368 – Compressor Station Equipment includes mostly the same type of equipment but in a variety of sizes, manufacturers, and operational uses.

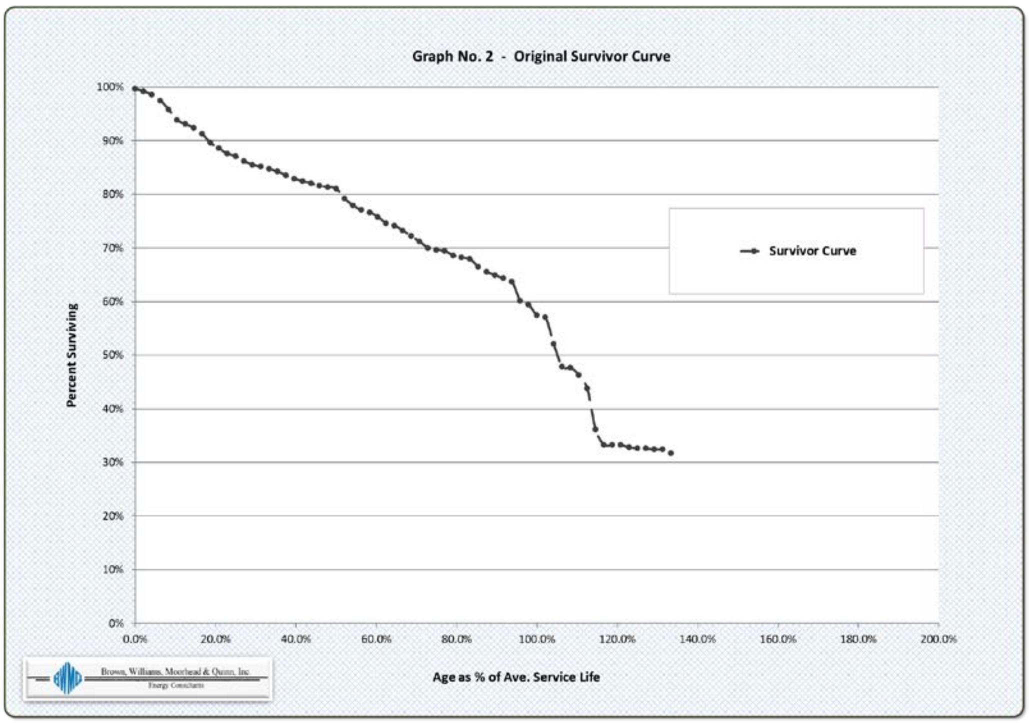
The grouping of assets requires the evaluation of lifespans in terms of averages. As with any large grouping, some individuals in the group will live longer than others. While some will drop out of service relatively early, others could physically last long beyond the economic need to use them. It is important that the recovery of investment through depreciation accruals calculates the *average* life expectancy of each grouping of assets to ensure that all the dollars are recovered over the average usefulness of the assets.

For depreciation purposes, knowing the average service life of plant and equipment allows for an accommodation in the depreciation rate derivation to reflect that plant retires over the years, causing a decline in the depreciation base and a possible shortfall in capital recovery as illustrated in Graph No. 1. A straight-line accrual rate (across the top at 100% surviving) will miss the recovery of plant retired before the termination date.

Survivor Curves

Deriving that estimated average service life is the foundation of depreciation rate development. Unfortunately, property account records often do not provide sufficient information to make a judgment of what the service life is. That assessment requires a comparison of the plant record retirement data with a set of already-identified asset survivorship decline curves. A survivor curve analysis reveals which of the 660 possible survivorship patterns best reflects the experience of the particular property account. This assessment can be made using either of two survivor curve methodologies depending on what kind of data is available. The Vintage Plant Retirement method is preferred when vintaged data is available. However, the Simulated Plant Record method is the more commonly used method because vintage data is often not available.

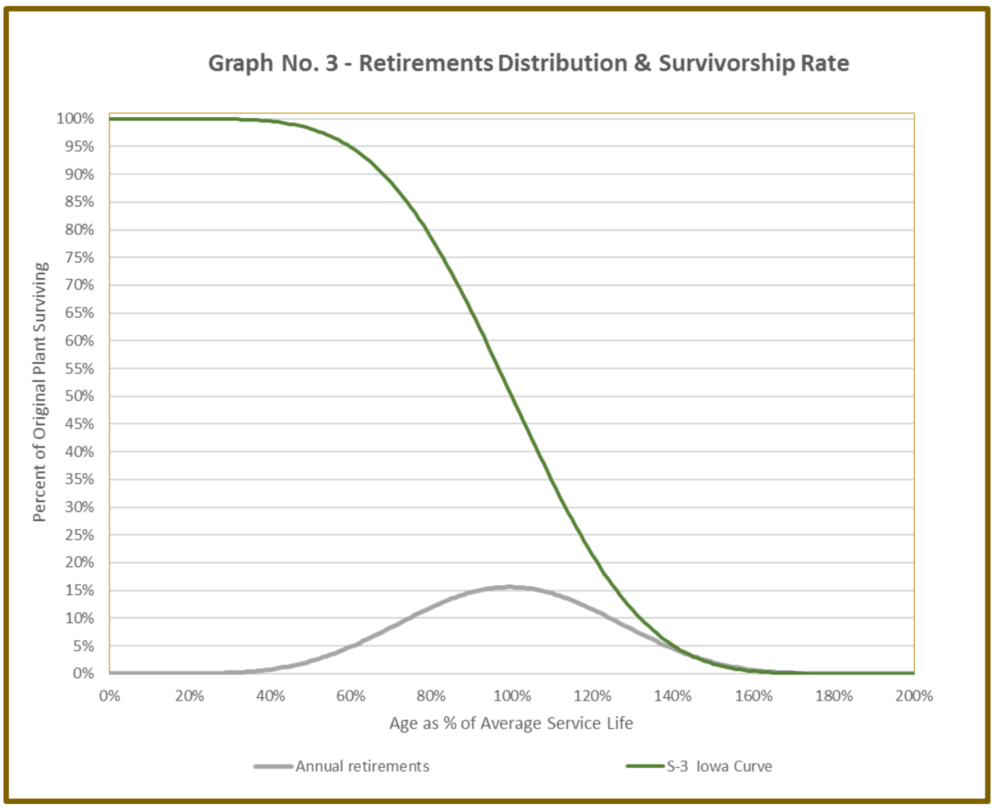
The Vintage Plant Retirement method starts with the development of the Original Survivor Curve, which reflects the survivorship pattern of the original plant data. Vintaged data records the matrix of both the *transaction year* of the plant retirement and the *vintage year* in which it was installed. The matrix of transaction year / vintage year data is converted into a matrix of plant exposed to retirement each year by vintage, and then converted again into a third matrix, of plant exposed to retirement each year by age group. A fourth matrix is constructed of plant retirement by age grouping. These matrices provide two data sets: plant exposed by age group and plant retired by age group. In other words, all the plant additions through the study date were at one time one-year old (actually ½ year old because some plant does retire in its first year), hence, the total of all plant additions is the starting point. But not all plant survived to become two years old and of course there is one less year (the most recent year) available to be counted among the two-year-olds. Similarly, not all plant survived to become three years old and there is now two less years (the most recent two years) available to be counted among the three-year-olds. And so on through the history of plant activity. The aged retirement data set is used to calculate a retirement rate (retirements by age divided by plant exposed to retirement by the same age). The retirement rate is then converted into a survivorship decline rate data set. But its average service life is still not known. Once the string of aged retirements is assembled, summation of surviving aged plant and aged retirements reveals the actual experienced survival for the account, which when plotted becomes the original survivor curve for that specific account as illustrated in Graph No. 2. (The graph assumes an average service life for plotting purposes but the next step in the process determines the most likely average service life.)



Iowa Curves

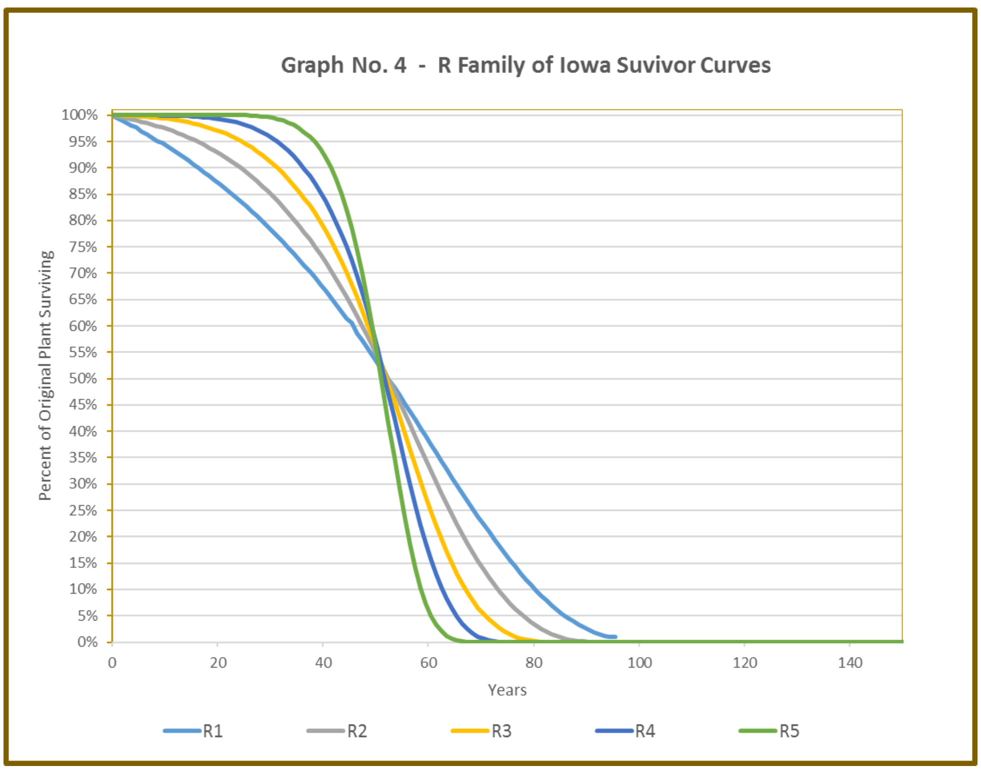
Once the original survivor curve is obtained, the question turns to what should be expected of that account in terms of future retirements. For this aspect of the study, we look to prototype curves that mimic the pattern of our original account activity. The retirement ratios that characterize the curves are applied to the surviving plant in service to generate interim retirement dollars. While there are a few options for typical curve patterns, the Iowa Type Survivor curves are the most commonly used for depreciation purposes and are the curves used for this study.

Iowa Curves represent standardized retirement patterns of industrial property developed from actuarial studies conducted in the 1930s where it was found that the retirement patterns of industrial property do not follow a straight line but rather are characterized by a complex life trajectory which includes a transition point where survivorship takes a dramatic downward turn. The retirement rate and survivorship rate are inversely related phenomena. The upside-down bell curve shape of retirement frequency distribution creates the ski-slope shape survivorship curve created by the frequency distribution of aged retirements as illustrated in Graph No. 3.

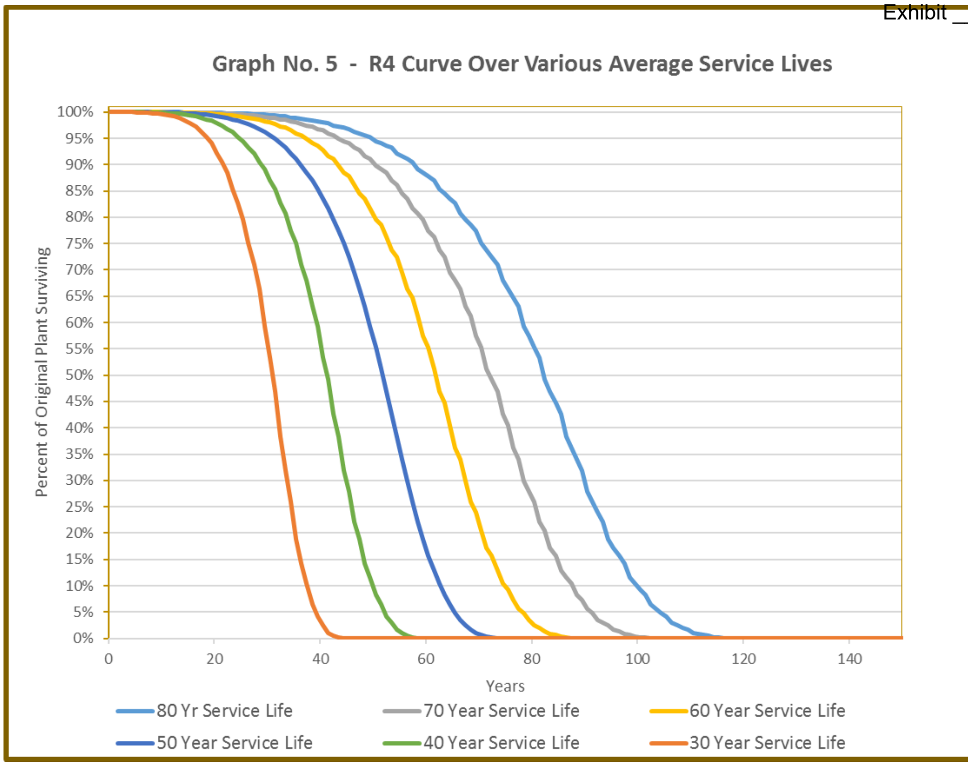


After a period of substantial retirements, the retirement pattern passes through another transition point where retirements fall off, leaving a long tail of lingering survivorship. The overall lifespan survivorship trajectory for most industrial property follows this ski slope pattern that, despite an appearance of simplicity, requires complex mathematical formulae to replicate. The most common patterns were standardized as "the Iowa Survivorship Curves."

The Iowa Curves consist of families of curves that reflect left-modal, symmetrical-modal, and right-modal frequency distributions, simply called L, S, and R curves, plus a family of origin-related distribution curves, O curves. Each family of curves includes four to five curve sets within the family, labeled R_1, R_2, R_3, and so on, each with slightly different slope configurations (Graph No. 4). Further, each curve has representatives from each average service life age group from 5 years to 120 years (Graph No. 5). The modality of the curves simply reflects whether the most frequently occurring retirement age is 1) younger than the average retirement age – an L Curve (i.e., to the left of the average service life on a graph), or 2) older than the average retirement age – an R Curve (i.e., to the right of the average service life), or 3) equal to the average retirement age – an S Curve (i.e., symmetrical to the average service life).

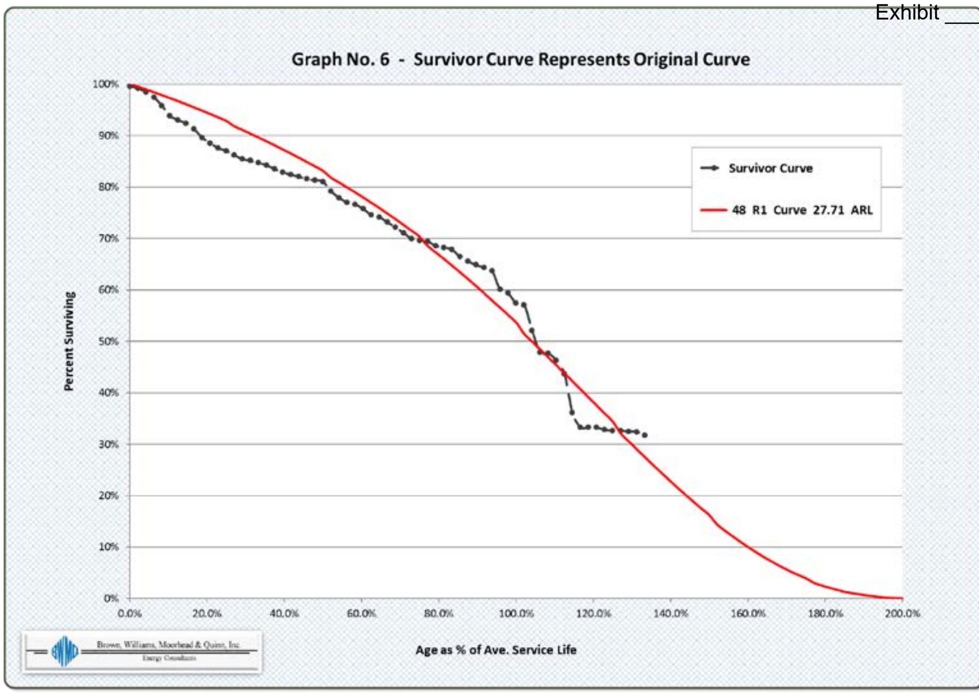


Graph No. 4 - R Family of Iowa Suvivor Curves



Survivor Curve Analysis

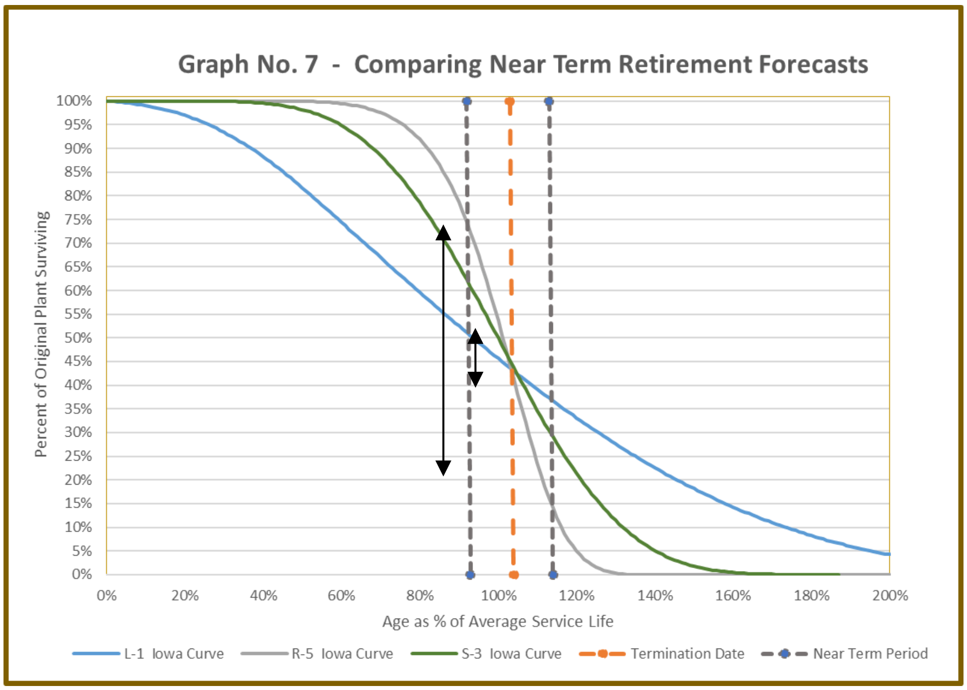
The survivor curve analysis primarily deals with two survivor curves: one being the original curve that traces the actual surviving dollars from each vintage of plant addition and the other a prototypical Iowa Curve selected to carry the trend of the actual data out into the future for forecasting purposes. Once the original data is synthesized into an original experience survival curve (Graph No. 2 above), the curve is compared to 2,530 prototypical curves (Graph Nos. 4 & 5) to find one that will best forecast the most likely service life experience of the plant (Graph No. 6).



Judgment

Survivor curve models generally use a test statistic called the least sum-of-squares test to measure the accuracy of their forecasts. The sum-of-squares calculation measures the differences between the actual and forecasted curves along the entire span of the curve from 0 to 200 percent of the average service life. The differences are squared to eliminate positive and negative differences from cancelling each other out as well as to accentuate deviations. The curve with the least sum of squared difference between the actual book value of the account and the predicted value of the account is generally the best fitting curve and, unless some other factor weighs heavily in the analysis, that curve will be used to forecast future retirements.

However, the Iowa Curve with the least sum of squared differences may fit the *overall* pattern of the original survivor curve but may not fit the portion of the original life curve relevant to the timely recovery of the utility's investments. For depreciation purposes, the interim period between the study date and the termination date defines the period over which the remaining undepreciated plant investment must be recovered. The economic lifespan may come to an end long before the physical lifespan. Tracking the retirement pattern over the interim period is more important for estimating the average remaining life relevant to recovery of these assets than tracking a long-term pattern that will not come to pass due to the truncation of the life of the assets. Hence, the selection of a curve is derived by a combination of statistical comparison and informed knowledge of the nature of the assets. There can be a significant difference in the forecasted retirements among the contending curve and average service life (ASL) pairs, and thus a significant difference in the derived depreciation rate. The slope of the retirement curve during the interim period can be a critical factor, as seen in the difference between the decline in the gray line versus the blue line in Graph No. 7.



As noted in the Survivor Curve Theory discussion earlier, the statistical "best fit" service life/survivor curve pair may reflect physical life span that is much longer than the economic lifespan within which the investment must be recovered. Together, these plant histories help inform the selection of the most appropriate survivor curves and service lives. An analysis of account-by-account retirement patterns and survivor curves is presented below.

In order to make "apples-to-apples" comparisons for best fit status, the service life of the original survivor curve is adjusted to reflect that of the prototype curve against which its being tested. In other words, we assume a 20-year service life when comparing to 20-year curves, and 25-year service life when comparing to 25-year curves, and so on. This is done by converting the age into the age as a percent of the assumed average service life. The prototype curves are also converted into age-as-percent-of-average-service-life. The BWMQ model calculates the best-fitting Iowa Curve.

PART VI AVERAGE REMAINING LIVES

Using the selected best fit service life and survivor curve pairing, the BWMQ model proceeds to estimate the average remaining life. The future annual surviving plant balance is calculated via the survivor curve decline rate given the approximate average age of the plant in service and the surviving plant balance at the time of the study. Then the future annual balances are summed and divided by the beginning balance to arrive at the average remaining life estimate. The calculations are truncated at 2050 to reflect a reasonable economic useful horizon for the assets. The results of the application of the BWMQ model to Cardinal are calculated in Attachment 1 and discussed in detail below.

Intangible Plant

Account No. 302

Account No. 302, Franchises and Consents shall include the book cost paid to the Federal Government, to a State or to a political subdivision thereof in consideration for franchises, consents, or certificates. Account No. 302, which has an average age of 22 years, does not have any recent retirements. As such, the standard goodness-of-fit test measures are not relevant. In lieu of data-driven curve indicators, we have selected the longest ASL in our study of 85 (Account No. 368) and the corresponding average remaining life (ARL) in Schedule 7 of Attachment 1 at 28.63 for a resulting depreciation rate of 0.55%. A negative salvage rate was not applied as Intangible plant does not have negative salvage.

Account No. 303

Account No. 303, Miscellaneous Intangible Plant shall include the cost of patent rights, licenses, privileges, and other intangible property necessary or valuable in the conduct of the utility's gas operations. In this account, the costs recorded were for work performed on a third-party system relating to metering facilities. Account No. 303, which has an average age of 20.40 years, does not have any recent retirements and as such, the standard goodness-of-fit test measures are not relevant. Again, in lieu of data-driven curve indicators, and based on the assets within the account, we used an ASL of 60 and ARL of 27.60 calculated in Account No. 369 for a resulting depreciation rate of 1.57%. A negative salvage rate was not applied as Intangible plant does not have negative salvage.

Account Nos. 365.11 and 365.12

Account Nos. 365.11 and 365.12 are designated for Land (365.11) which includes the cost of land purchased in fee for use in pipeline operations and limited rights to use land (Account No. 365.12). The accounts include the costs of clearing the land of vegetation and structures as needed for pipeline installation. Land is not depreciable; however, Land Rights are depreciable. Account No. 365.12, which has an average age of 22 years, does not have any recent retirements. As such, the standard goodness-of-fit test measures are not relevant. In lieu of data-driven curve indicators, we have selected an industry standard curve, the 65-R2, as a placeholder for curve selection until such time as sufficient retirements can provide better guidance. Given the average age and selected Iowa curve, Account No. 365.12 has an ARL of 26.39 resulting in a depreciation rate of

1.93%. Because, little or no removal cost is incurred and no salvage is received at the retirement of land rights, we recommend a negative salvage rate of 0.0% for this account.

Account No. 365.2

Account No. 365.2, Rights of Way, includes the cost of acquiring the rights of way, or permission, to use land for pipeline operations. Rights of Way agreements are in use for the entire life span of the facilities placed upon them, hence, the average service life often reflects that of the longest-lived asset, the pipeline itself. Cardinal's 2004-2020 Form 2A data indicated no recent retirement activity. Again, we have selected an industry standard curve, the 65-R2, as a placeholder for curve selection until such time as sufficient retirements can provide better guidance. Given the account's 16.72-year average age, we calculated an ARL of 26.84 which results in a depreciation rate of 1.90%. Adding the negative salvage rate of 0.07% brings about a composite depreciation and negative salvage rate of 1.97%.

Account No. 366.1

Account No. 366.1, Compressor Station Structures and Improvements includes the cost in place of structures and improvements used in connection with compressor station operations. Cardinal's 2004-2020 Form 2A data indicated no recent retirement activity. We selected an industry standard curve, the 45-R2, as a placeholder for curve selection until such time as sufficient retirements can provide better guidance. Given the account's average age of 9.00 years, we calculated an ARL of 25.70, which generates a depreciation rate of 3.03%. Adding the negative salvage rate of 0.48% brings about a composite total of 3.51%.

Account No. 366.2

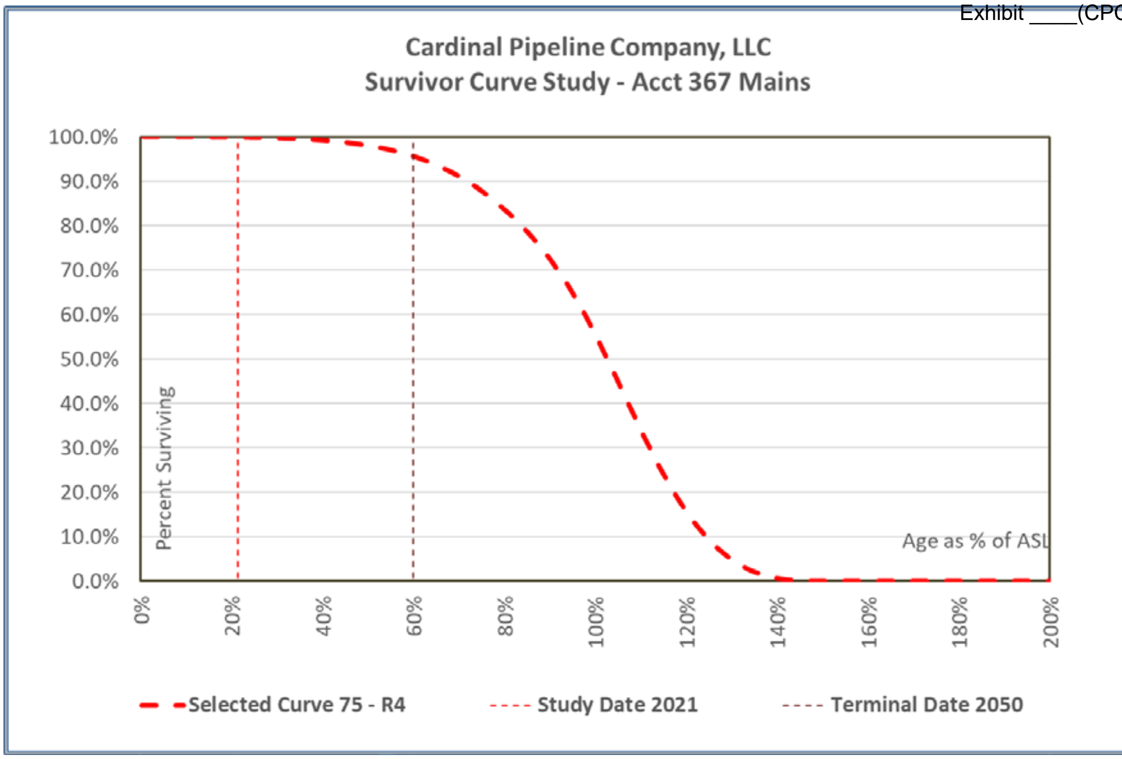
Account No. 366.2, Meter Station Structures and Improvements includes the cost in place of structures and improvements used in connection with meter station operations. Cardinal's 2004-2020 Form 2A data indicated no recent retirement activity. We again selected an industry standard curve, the 45-R2, as a placeholder for curve selection until such time as sufficient retirements can provide better guidance. Given the account's average age of 16.30, we calculated an ARL of 24.18 using an industry accepted 45-R2, which results in a depreciation rate of 2.60%. Adding the negative salvage rate of 0.25% generates a composite rate of 2.85%.

Account No. 367

Account No. 367, Mains, records the original cost of the line pipe actually installed. Line pipe is a long-lived asset that with proper corrosion maintenance can last for many decades. Cardinal's 2004-2020 Form 2A data indicated that Account No. 367 maintains a long-term stability with few incidents of retirements periods.

The Survivor Curve graph for Account 367, below, presents the best fit pair of average service life and Iowa survivor curve. The 75-R4 Curve appears to fit the data better than the other curves (see Attachment 2, Best 5-Year Retirement Predictors chart). The 75-R4 Curve will be used to estimate future retirements from current surviving plant balances. Applying the 75-R4 Curve to the current plant in service, with its average age of 16.02 years and a 2050 truncation forecast, results in a 28.63-year ARL with a 1.75% depreciation rate. Adding 0.75%[4] for negative salvage rate brings about a 2.50% composite depreciation rate.

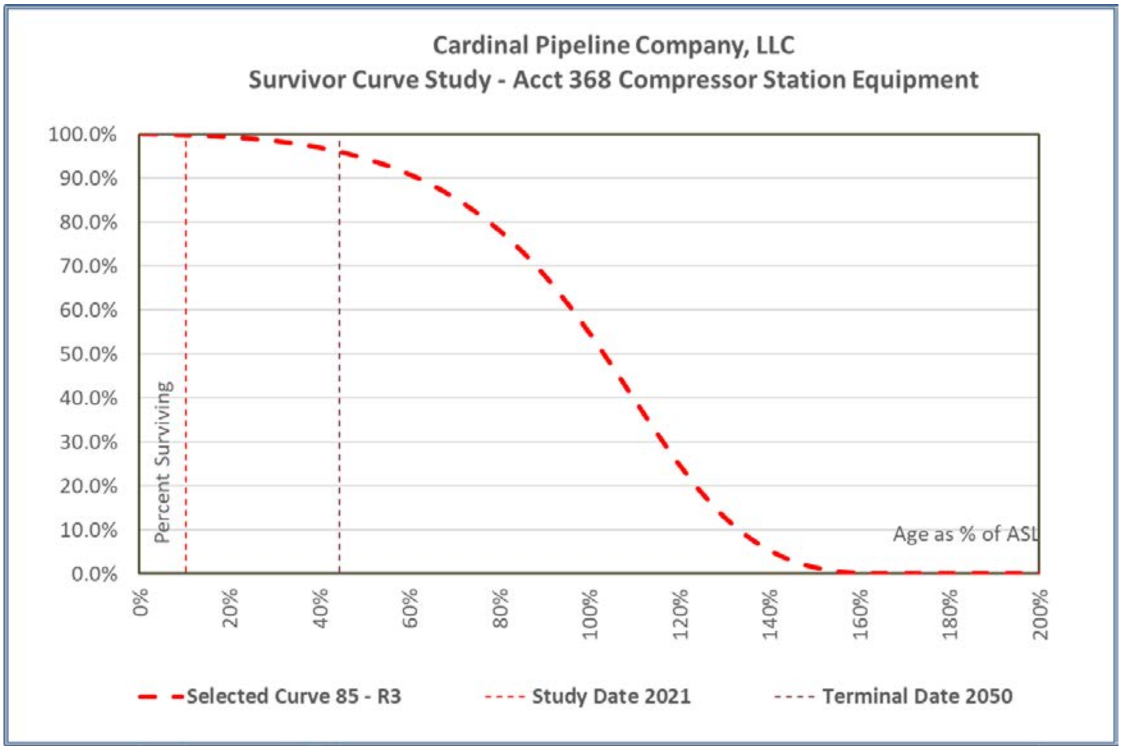
[4] This rate includes the costs of Cardinal's ARO and any negative salvage recovery will be sourced to the recovery of legal obligations first.



Account No. 368

Account No. 368, Compressor Station Equipment includes the cost installed of compressor station equipment and associated appliances used in connection with transmission system operations. The Account No. 368 asset list is made up of compressor air system equipment, compressors, foundations, electrical systems, firefighting equipment, gas lines, laboratory equipment, lubricating oil systems, office furniture and fixtures, shop tools and water supply systems. Cardinal's 2004-2020 Form 2A data indicates that Account No. 368 maintains a short-term stability with one recent incident of retirement in 2016.

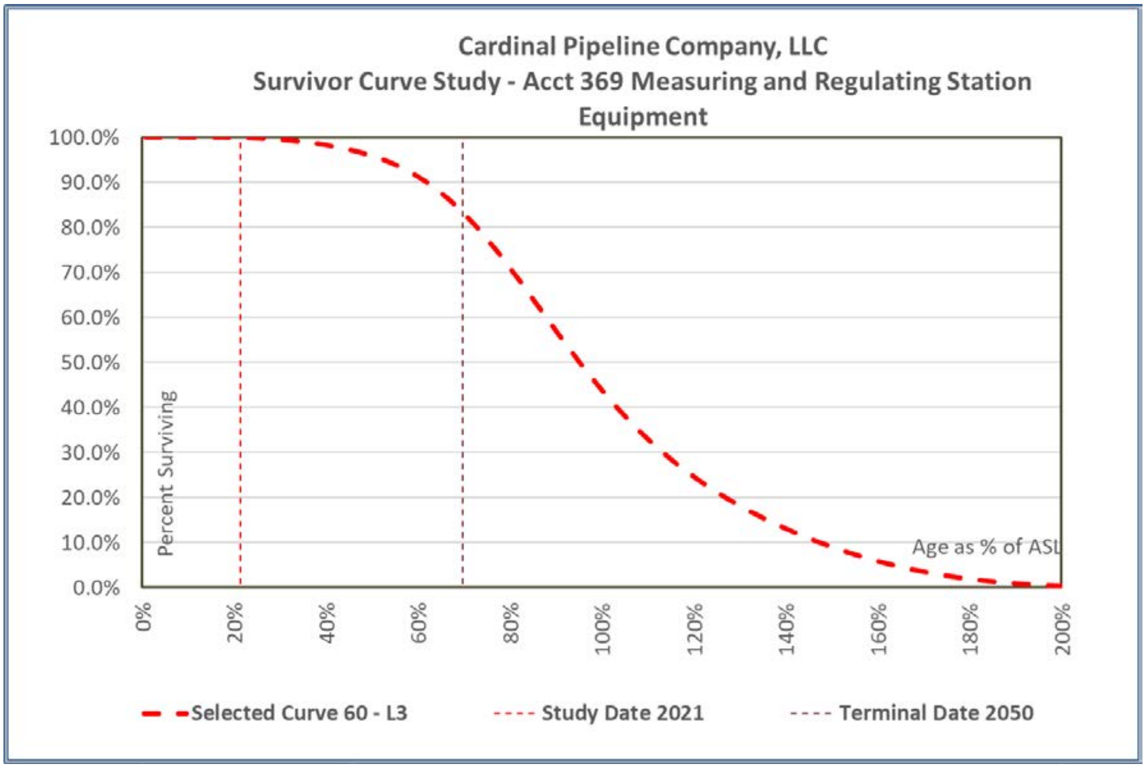
The Net Additions and Retirements graph again reflects only one retirement in its recent history. The Survivor Curve graph for Account 368, below, presents the best fit pairs of average service life and Iowa survivor curve. The 85-R3 Curve appears to fit the data better than the other curves and will be used to estimate future retirements from current surviving plant balances (see Attachment 2, Best 5-Year Retirement Predictors). Applying the 85-R3 Curve to the current plant in service, with its average age of 8.87 years, results in a 28.59-year ARL, which generates a 2.63% depreciation rate. Adding the negative salvage rate of 0.31% brings about a composite total of 2.94%



Account No. 369

Account No. 369, Meter Station Equipment includes the cost installed of meters, gauges, and other equipment used in measuring or regulating gas in connection with transmission system operations. The Account No. 369 asset list is made up of automatic control equipment, boilers, heaters, foundations, gas cleaners/scrubbers/separators/dehydrators, gauges and instruments, headers, meters, oil fogging equipment, odorizing equipment, regulators and governors, and structures. The 2004-2020 Form 2A data indicate that Account No. 369 maintains a short-term stability with two recent incidents of retirements periods, 2016 and 2019.

The Survivor Curve graph for Account 369, below, presents the best fit pairs of average service life and Iowa survivor curve. The 60-L3 Curve appears to fit the data better than the other curves and will be used to estimate future retirements from current surviving plant balances (see Attachment 2, Best 5-Year Retirement Predictors chart). Applying the 60-L3 Curve to the current plant in service, with its average age of 12.83 years, results in a 27.60-year ARL, which generates a 2.13% depreciation rate. Adding a negative salvage rate of 0.36%brings about a 2.49% composite depreciation rate.



General Plant

The depreciation rates for general plant assets and facilities are often calculated on a basis that reflects a higher turnover and shorter lifespan. There are three common methods of developing general plant depreciation rates: whole life, vintage plant accounting, and turn-over. Whole life rates are calculated by dividing 1 by the estimated ASL. Under vintaged accounting, general plant account assets face retirement at a uniform age regardless of condition of any individual asset. For example, automobiles within a fleet might be retired at four years, regardless of miles driven or condition of the car. Under the turn-over rate model, the depreciation rate is set by the average rate at which plant retires from each account. I selected the whole life rate due to the relatively young age of the plant resulting in limited retirement data. These calculations are shown in Schedule No. 5 of Attachment 1. The average service lives were taken from the United States Office of Management and Budget (US OMB) Useful Life and Disposal Table to calculate an appropriate placeholder depreciation rate for accounts under general plant:

General Plant

		US OMB Life Tables[1]	
390.0	Struct. & Impr. - Office Bldg	10.00	10.00%
391.0	Office Furniture & Equipment		
-	OFF001- Tower Office Furn. & Equip.	10.00	10.00%
-	DPC001-Data Process & Comp. Equip.	8.00	12.50%
-	DEV001-Developed Software	15.00	6.67%
392.1	Transportortation Equipment	6.00	16.67%
394.0	Tools Shop & Garage Equipment	20.00	5.00%
396.0	Power Operated Equipment	10.00	10.00%
397.0	Comunication Equipment	23.00	4.35%

[1] - Average service lives taken from United States Office of Management and Budget Useful Life and Disposal Table

PART VII TERMINAL DECOMMISSIONING

Definition

Terminal decommissioning refers to the dismantlement and removal of the entire network at the end of its useful life. Terminal decommissioning is, by definition, happening at the end of the useful life so it will not be replaced, and the full cost of retirement will be apparent and should be fully recovered. By contrast, interim retirement refers to the replacement of facilities required to maintain the system during the system's useful life captured within Cardinal's negative salvage calculation and rate determination.

Overview

A Terminal Decommissioning Cost (TDC) estimate is an assessment of the cost for Cardinal to cease system operations, remove, as appropriate, plant in service, and restore the rights of way to preconstruction condition at the end of the system's useful life. Cardinal's TDC estimate includes an estimate of the salvage value of equipment and facilities as an offset against decommissioning and associated costs.

A retirement cost analysis includes the cost of removal of all above-ground facilities and any costs associated with the restoration of the surface and sub-surface land. There are many steps involved with restoring land. All underground transmission pipe would need to be cleaned and purged, capped, and abandoned through complete removal or in place. All railroad crossings, highway and road crossings, and small stream and river crossings would be abandoned in place. Further, all remote valve sites, cathodic protection facilities, pipeline markers, measurement and regulation facilities, compressor stations and other above-ground facilities would be removed, and the sites restored.

Although there are many unknowns regarding the cost of a future decommissioning of the system, it is certain that, eventually, the services will be discontinued, and the system will be dismantled. This study reports the estimated cost to dismantle and remove today's pipeline system at today's costs so that current customers pay their fair share of abandonment costs. The retirement of plant between now and the terminal date, known as "interim retirements," generates costs of removal.

Materials and Resources Consulted

I reviewed the following materials issued by the U.S. Department of Transportation ("DOT"): (1) minimum safety regulations for abandonment of facilities; (2) guidelines to purge pipelines; and (3) line pipe Class Location Guidelines. Secondly, I reviewed 33 C.F.R. § 322.3, regarding permits from the U.S. Army Corps of Engineers for work in and around navigable waters of the United States. Third, I reviewed 49 CFR Part 192, Section 727, abandonment or deactivation of facilities. Fourth, I reviewed Chapter 11, Contingency, of the U.S. Department of Energy's ("DOE") *Cost Estimating Guide*, as well as the U.S. Army Corps of Engineers' publication, *Engineering and Design: Civil Works Cost Engineering*, relating to contingency costs. Finally, I reviewed Army Corps of Engineers publications *Cost-Competitive Construction Management: A Review of Corps of Engineers Construction Management Costs* and *U.S. Army Corps of Engineers Military Construction Management Cost* regarding construction management cost data used to develop private-sector costs for providing construction management services.

I also reviewed Cardinal plant asset data. In addition, I reviewed current labor rates and construction cost information in engineering industry publications. I also reviewed the Federal Emergency Management Agency's ("FEMA") *Debris Estimating Field Guide*,[3] which provides debris measurement guidance and calculations. I utilized construction takeoff software to capture estimated material takeoff ("MTO") quantities from plot plans into a quantifiable data set. MTO refers to a list of materials with quantities (such as building volume) and types (such as specific grades of steel) that are required to build a designed structure or item (see Attachment 3, page 34-42). This list is generated by analysis of a blueprint or other design documents. For the final step in developing the TDC estimate, I incorporated the quantities generated from the MTO estimate into a proprietary project management takeoff software to generate estimates for labor, material, and equipment costs.

Decommissioning Costs

The cost estimates are based on the removal or abandonment in place of physical property. The amount of physical material to be removed or abandoned is derived by a MTO list developed from company plot plans and profiles, design drawings, and utility details throughout the Cardinal system, as shown in the Attachment No. 3, TDC Workpapers, "Material Takeoff Packet."

I broke out work into its major components, such as demolition and removal of compressor station, meter station, and line pipe. Then, in the case of removal, I estimated the cost of removing subsets of each component, *e.g.*, surface and subsurface material. I broke out abandonment work into major components related to, for example, type of crossing—road, railroad line, stream—as well as separately analyzing transmission for purposes of deriving cost estimates. These cost estimates were based on my expertise regarding crew size, and required skill sets, equipment, and time.

TDC Estimate

The Cardinal system can be summarized as having approximately 104 miles of pipeline, 455 crossings, 7 meter stations, 1 compressor station, 10 cathodic protection rectifier and test sites, 1,330 right-of-way markers, 44 taps, and 18 valves in the transmission system.

The total cost to decommission the Cardinal transmission facilities in 2021 dollars is $27,155,857, as summarized on page 2, and detailed within pages 3-33 of Attachment 3.

Negative Salvage Calculation

Schedules 8 through 8f of Attachment 1, Cardinal Depreciation Workpapers reference the terminal costs per plant calculated within the TDC estimate, utilizing the percent of remaining plant calculated in Schedule 6, to calculate the interim retirement costs and plant subject to terminal decommissioning per account. These costs are then spread over the average remaining life for each account and calculated into an account specific composite negative salvage recovery rate (C38).

PART VIII DEPRECIATION RATE RECOMMENDATIONS

Once the groundwork of survivor curve analysis, average service life analysis, economic life analysis, remaining economic life analysis, and plant balances have been laid, the calculation of the depreciation rates is a fairly straight-forward endeavor. The basic formula for deriving depreciation rates is to divide the net plant by the remaining life to derive the annual expense, which is then divided by the gross plant to derive the depreciation rate:

$$\frac{\dfrac{\text{Gross Plant - Accum. Res. for Depreciation}}{\text{Remaining Life}}}{\text{Gross Plant}} = \text{Depreciation Rate}$$

Depreciation Workpapers

The depreciation workpapers in Attachment 1 lay out the theoretical calculations that underlie the depreciation rate recommendations. The Workpapers are divided into nine schedules.

- Schedule 1 reports the impact of existing and recommended depreciation rates.
- Schedule 2 compares the existing and recommended depreciation rate components.
- Schedule 3 reports the plant and reserve for depreciation by property account.
- Schedule 4 reports the average plant in service.
- Schedule 5 reports the parameters that define the rate calculations.
- Schedule 6 calculates the average remaining lives.
- Schedule 7 shows the actual depreciation rate calculations and recommendations.
- Schedule 8 – 8f calculates the negative salvage rate on interim retirements.
- Schedule 9 Iowa curves sampling.

In sum, this study recommends the following composite depreciation rates:

Table No. 1 Recommended Depreciation Rates

Account No.	Account Name	Depreciation Rate
302	Intangible Plant – Franchises *	0.55%
303	Misc. Intangible Plant *	1.57%
365.11	Land	0.00%
365.12	Land Rights *	1.93%
365.2	Rights of Way *	1.97%
366.1	Compressor Station S & I	3.51%
366.2	M & R Station S & I	2.85%
367	Mains	2.50%
368	Compressor Station Equipment	2.94%
369	Meas & Reg Station Equipment	2.49%
390	Struct. & Impr. - Office Bldg *	10.00%
391	Office Furniture & Equipment	
-	OFF001- Tower Office Furn.& Equip*	10.00%
-	DPC001-Data Process & Comp. Equip.*	12.50%
-	DEV001-Developed Software*	6.67%
392.1	Transportation Equipment *	16.67%
394	Tools Shop & Garage Equipment *	5.00%
396	Power Operated Equipment *	10.00%
397	Communication Equipment *	4.35%

* - Whole Life Rate.

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This concludes the Depreciation Study for Cardinal Pipeline Company, LLC.

ATTACHMENT 1

DEPRECIATION STUDY WORKPAPERS
Docket No. G-39, Sub 46

Steven R Fall

on behalf of

Cardinal Pipeline Company, LLC

Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
Depreciation Study
Table of Contents

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 1 - Comparison of Proposed and Present Depreciation Rates (Inclusive of Negative Salvage)
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Plant in Service December 31, 2020	Fully Depreciated Plant	Depreciable Plant	Current Rates	Current Expense	Proposed Rates	Proposed Expense	Expense Difference
			(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
			$	$	$	%	$	%	$	$
1	**Intangible Plant**									
2	302	Intangible Plant - Franchises	176,783		176,783	4.00%	7,071	0.55%	972	(6,099)
3	303	Misc. Intangible Plant	898,093		898,093	2.19%	19,668	1.57%	14,100	(5,568)
4		Subtotal Intangible Plant	1,074,876	-	1,074,876	2.49%	26,740	1.40%	15,072	(11,667)
5										
7	**Transmission Plant**									
8	365.11	Land	658,661		-	0.00%	-	0.00%	-	-
9	365.12	Land Rights	96,745		96,745	2.00%	1,935	1.93%	1,867	(68)
10	365.2	Rights of Way	4,011,679		4,011,679	2.00%	80,234	1.97%	79,030	(1,204)
11	366.1	Compressor Station S & I	2,673,056		2,673,056	3.00%	80,192	3.51%	93,824	13,633
12	366.2	M & R Station S & I	1,428,304		1,428,304	2.63%	37,564	2.85%	40,707	3,142
13	367	Mains	100,830,092		100,830,092	2.20%	2,218,262	2.50%	2,520,752	302,490
14	368	Compressor Station Equipment	35,393,767		35,393,767	3.03%	1,072,431	2.94%	1,040,577	(31,854)
15	369	Meas & Reg Station Equipment	8,764,591		8,764,591	3.18%	278,714	2.49%	218,238	(60,476)
16		Subtotal Transmission	153,856,895	-	153,198,234	2.46%	3,769,332	2.61%	3,994,996	225,664
17										
18	**General Plant**									
19	390	Struct. & Impr. - Office Bldg	5,269	5,269	-	0.00%	-	10.00%	-	-
20	391	Office Furniture & Equipment								
21		OFF001- Tower Office Furniture & Equip	32,228	-	32,228	8.33%	2,685	10.00%	3,223	538
22		DPC001-Data Process & Comp. Equip.	-	-	-	25.00%	-	12.50%	-	-
23		DEV001-Developed Software	957,123	843,871	113,252	7.69%	8,709	6.67%	7,550	(1,159)
24	392.1	Transportation Equipment	3,761	3,761	-	18.00%	-	16.67%	-	-
25	394	Tools Shop & Garage Equipment	565,711	-	565,711	8.33%	47,124	5.00%	28,286	(18,838)
26	396	Power Operated Equipment	42,559	10,649	31,910	7.92%	2,527	10.00%	3,191	664
27	397	Communication Equipment	174,033	142,401	31,632	7.14%	2,259	4.35%	1,375	(883)
28			1,780,683	1,005,951	774,732	3.55%	63,303	2.45%	43,625	(19,678)
29										
30		Total	156,712,455	1,005,951	155,047,842	2.46%	3,859,374	2.59%	4,053,693	194,318

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 2 - Proposed and Present Depreciation and Negative Salvage Rate Components
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter		Current Depreciation Rate	Current Negative Salvage Rate	Current Total	Proposed Depreciation Rate	Proposed Negative Salvage Rate	Proposed Total
				(A)	(B)	(C)	(D)	(E)	(F)
				%	%	%	%	%	%
1	**Intangible Plant**								
2	302	Intangible Plant - Franchises		4.00%		4.00%	0.55%		0.55%
3	303	Misc. Intangible Plant		2.00%	0.19%	2.19%	1.57%		1.57%
4									
5	**Transmission Plant**								
6	365.11	Land							
7	365.12	Land Rights		2.00%		2.00%	1.93%	0.00%	1.93%
8	365.2	Rights of Way		2.00%		2.00%	1.90%	0.07%	1.97%
9	366.1	Compressor Station S & I		2.86%	0.14%	3.00%	3.03%	0.48%	3.51%
10	366.2	M & R Station S & I		2.50%	0.13%	2.63%	2.60%	0.25%	2.85%
11	367	Mains	1/	2.00%	0.20%	2.20%	1.75%	0.75%	2.50%
12	368	Compressor Station Equipment		3.03%		3.03%	2.63%	0.31%	2.94%
13	369	Meas & Reg Station Equipment		3.03%	0.15%	3.18%	2.13%	0.36%	2.49%
14									
15	**General Plant**								
16	390	Struct. & Impr. - Office Bldg		Various			10.00%		10.00%
17	391	Office Furniture and Equipment							
18		OFF001- Tower Office Furniture & Equip		8.33%		8.33%	10.00%		10.00%
19		DPC001-Data Process & Comp. Equip.		25.00%		25.00%	12.50%		12.50%
20		DEV001-Developed Software		7.69%		7.69%	6.67%		6.67%
21	392.1	Transportation Equipment		18.00%		18.00%	16.67%		16.67%
22	394	Tools Shop & Garage Equipment		8.33%		8.33%	5.00%		5.00%
23	396	Power Operated Equipment		7.92%		7.92%	10.00%		10.00%
24	397	Communication Equipment		7.14%		7.14%	4.35%		4.35%
25									
26	Total Composite Average Depreciation Rate					2.46%			2.59%

1/ Cardinal's negative salvage rate includes the costs of Cardinal's ARO and any negative salvage recovery will be sourced to the recovery of legal obligations first.

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 3 - Plant Balances
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Plant: Plant in Service December 31, 2020 (A) $	Plant: Reserve for Negative Salvage December 31, 2020 (B) $	Plant: Reserve for Depreciation December 31, 2020 (C) $
1	**Intangible Plant**				
2	302	Intangible Plant - Franchises	176,783	-	(149,054)
3	303	Misc. Intangible Plant	898,093	(6,257)	(509,204)
4		**Subtotal Intangible Plant**	1,074,876	(6,257)	(658,258)
5					
7	**Transmission Plant**				
8	365.11	Land	658,661	-	-
9	365.12	Land Rights	96,745	-	(48,210)
10	365.2	Rights of Way	4,011,679	-	(1,990,158)
11	366.1	Compressor Station S & I	2,673,056	(13,722)	(599,867)
12	366.2	M & R Station S & I	1,428,304	(6,808)	(537,455)
13	367	Mains	100,830,092	(1,008,248)	(50,908,281)
14	368	Compressor Station Equipment	35,393,767	1,874	(8,859,071)
15	369	Meas & Reg Station Equipment	8,764,591	11,623	(3,674,653)
16		**Subtotal Transmission**	153,856,895	(1,015,281)	(66,617,694)
17					
18	**General Plant**				
19	390	Struct. & Impr. - Office Bldg	5,269		(5,269)
20	391	Office Furniture & Equipment			
21		OFF001- Tower Office Furniture & Equip	32,228		(24,197)
22		DPC001-Data Process & Comp. Equip.	-		-
23		DEV001-Developed Software	957,123		(902,108)
24	392.1	Transportation Equipment	3,761		(3,761)
25	394	Tools Shop & Garage Equipment	565,711		(345,372)
26	396	Power Operated Equipment	42,559		(35,664)
27	397	Communication Equipment	174,033		(159,868)
28		**Subtotal General Plant**	1,780,683	-	(1,476,239)
29					
30		**Total**	156,712,455	(1,021,537)	(68,752,191)

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 4 - Near Term Additions
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Current Plant in Service (A) $	Plant Balance Ratio (B) %	Planned Additions 1/ 2022 (C) $	2023 (D) $	2024 (E) $	Average Plant in Service 2/ (F) $
1	**Intangible Plant**							
2	302	Intangible Plant - Franchises	176,783	16.45%				176,783
3	303	Misc. Intangible Plant	898,093	83.55%	-	-	-	898,093
4		Subtotal Intangible Plant	1,074,876	100.00%	-	-	-	1,074,876
5								
6								
7	**Transmission Plant**							
8	365.11	Land	658,661	0.43%	6,432	6,432	6,432	668,309
9	365.12	Land Rights	96,745	0.06%	945	945	945	98,162
10	365.2	Rights of Way	4,011,679	2.61%	39,173	39,173	39,173	4,070,439
11	366.1	Compressor Station S & I	2,673,056	1.74%	26,102	26,102	26,102	2,712,208
12	366.2	M & R Station S & I	1,428,304	0.93%	13,947	13,947	13,947	1,449,225
13	367	Mains	100,830,092	65.53%	984,582	984,582	984,582	102,306,964
14	368	Compressor Station Equipment	35,393,767	23.00%	345,612	345,612	345,612	35,912,184
15	369	Meas & Reg Station Equipment	8,764,591	5.70%	85,584	85,584	85,584	8,892,968
16		Subtotal Transmission	153,856,895	100.00%	1,502,233	1,502,233	1,502,233	156,110,458
17								
18	**General Plant**							
19	390	Struct. & Impr. - Office Bldg	5,269	0.30%				5,269
20	391	Office Furniture & Equipment						
21		OFF001- Tower Office Furniture & Equip	32,228	1.81%				32,228
22		DPC001-Data Process & Comp. Equip.	-	0.00%				-
23		DEV001-Developed Software	957,123	53.75%				957,123
24	392.1	Transportation Equipment	3,761	0.21%				3,761
25	394	Tools Shop & Garage Equipment	565,711	31.77%				565,711
26	396	Power Operated Equipment	42,559	2.39%				42,559
27	397	Communication Equipment	174,033	9.77%				174,033
28		Subtotal General Plant	1,780,683	100.00%				1,780,683
29								
30								
31		Total	156,712,455		1,502,233	1,502,233	1,502,233	158,966,018

1/ Forecasted 3 years of plant additions based on previous 3 year average of plant additions

2/ Aver = [(A + 1/2C)+(A + C + 1/2D)+(A + C + D + 1/2E)]/3

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 5 - Model Parameters
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Average Age (A)	Average Service Life (B)	Iowa Survivor Curve (C)	Average Remaining Lives 29-Yr (D)
1	**Intangible Plant**					
2	302	Intangible Plant - Franchises	22.00	85.00		28.63
3	303	Misc. Intangible Plant	20.40	60.00		27.60
4						
5						
6	**Transmission Plant**					
7	365.11	Land				
8	365.12	Land Rights	22.00	65.00	R2	26.39
9	365.2	Rights of Way	16.72	65.00	R2	26.84
10	366.1	Compressor Station S & I	9.00	45.00	R2	25.70
11	366.2	M & R Station S & I	16.30	45.00	R2	24.18
12	367	Mains	16.02	75.00	R4	28.63
13	368	Compressor Station Equipment	8.87	85.00	R3	28.59
14	369	Meas & Reg Station Equipment	12.83	60.00	L3	27.60
15						
16	**General Plant**					
17				US OMB Life Tables 1/		
18	390	Struct. & Impr. - Office Bldg		10.00	10.00%	
19	391	Office Furniture & Equipment				
20		OFF001- Tower Office Furniture & Equip		10.00	10.00%	
21		DPC001-Data Process & Comp. Equip.		8.00	12.50%	
22		DEV001-Developed Software		15.00	6.67%	
23	392.1	Transportation Equipment		6.00	16.67%	
24	394	Tools Shop & Garage Equipment		20.00	5.00%	
25	396	Power Operated Equipment		10.00	10.00%	
26	397	Communication Equipment		23.00	4.35%	

1/ Average service lives taken from United States Office of Management and Budget Useful Life and Disposal Table

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 6 - Average Remaining Lives - Transmission
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How to read this chart

		Acct #	Acct Name		365.12	Land Rights		365.2	Rights of Way	
		Ave Age Plt	Original Investment L109	Curve column	22.00	$96,745	9	16.72	$4,070,439	9
		Ave Serv Life	Curve Type		65.00	R2	$ 1,669	65.00	R2	$ 56,281
		Age % ASL	Ave Rem Life	Interim Retires	33.8%	26.39	$ 20,414	25.7%	26.84	$ 709,768
Yrs	Year	Age	% Surviving	Plant Balance	Age	% Surviving	Plant Balance	Age	% Surviving	Plant Balance
		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
		%	%	$	%	%	$	%	%	$
-	2021	61.57%	83.88%	35,023	33.85%	94.40%	98,162	25.72%	96.29%	4,070,439
1	2022	Plant average	83.88%	35,023	35.38%	94.00%	97,776	27.26%	95.97%	4,057,481
2	2023	age as a	83.88%	35,023	36.92%	93.56%	97,348	28.80%	95.64%	4,043,961
3	2024	percent of	Reference to	34,279	38.46%	93.12%	96,929	30.34%	95.27%	4,028,899
4	2025	proposed	Iowa Curve	34,279	40.00%	92.67%	96,493	31.88%	94.90%	4,014,158
5	2026	service life	Table for	34,279	41.54%	92.17%	96,009	33.42%	94.50%	3,997,750
6	2027	45.07%	% Surviving	Plant	43.08%	91.68%	95,537	34.95%	94.11%	3,981,704
7	2028	46.73%	at each age	surviving	44.62%	91.14%	95,012	36.49%	93.70%	3,964,996
8	2029	48.40%	interval	at each age	46.15%	90.61%	94,501	38.03%	93.24%	3,946,421
9	2030	50.07%	91.04%	interval	47.69%	90.06%	93,970	39.57%	92.79%	3,928,277
10	2031	51.73%	91.00%	3,664,263	49.23%	89.46%	93,381	41.11%	92.30%	3,908,122
11	2032	53.40%	90.96%	3,662,794	50.77%	88.86%	92,807	42.65%	91.82%	3,888,449
12	2033	55.07%	90.93%	3,661,325	52.31%	88.21%	92,172	44.18%	91.31%	3,868,003
13	2034	56.73%	90.89%	3,659,856	53.85%	87.57%	91,553	45.72%	90.76%	3,845,314
14	2035	58.40%	90.86%	3,658,387	55.38%	86.90%	90,912	47.26%	90.21%	3,823,194
15	2036	60.07%	90.82%	3,656,918	56.92%	86.17%	90,202	48.80%	89.65%	3,800,228
16	2037	61.73%	90.78%	3,655,449	58.46%	85.46%	89,512	50.34%	89.02%	3,774,770
17	2038	63.40%	90.75%	3,653,980	60.00%	84.72%	88,797	51.88%	88.41%	3,749,977
18	2039	65.07%	90.71%	3,652,511	61.54%	83.90%	88,007	53.42%	87.74%	3,722,515
19	2040	66.73%	90.67%	3,651,042	63.08%	83.11%	87,240	54.95%	87.08%	3,695,791
20	2041	68.40%	90.64%	3,649,559	64.62%	82.23%	86,393	56.49%	86.40%	3,668,092
21	2042	70.07%	90.60%	3,648,076	66.15%	81.38%	85,571	58.03%	85.65%	3,637,446
22	2043	71.73%	90.56%	3,646,593	67.69%	80.50%	84,721	59.57%	84.92%	3,607,656
23	2044	73.40%	90.53%	3,645,110	69.23%	79.53%	83,783	61.11%	84.11%	3,574,722
24	2045	75.07%	90.49%	3,643,627	70.77%	78.60%	82,875	62.65%	83.32%	3,542,733
25	2046	76.73%	90.45%	3,643,627	72.31%	77.56%	81,874	64.18%	82.51%	3,509,642
26	2047	78.40%	90.42%	3,643,627	73.85%	76.56%	80,906	65.72%	81.61%	3,473,104
27	2048	80.07%	90.42%	3,640,661	75.38%	75.53%	79,907	67.26%	80.74%	3,437,661
28	2049	81.73%	90.42%	3,639,178	76.92%	74.39%	78,809	68.80%	79.84%	3,401,045
29	2050	83.40%	90.34%	3,637,695	78.46%	73.30%	77,747	70.34%	78.85%	3,360,670
					29-Yr Life	26.39	$2,590,745	29-Yr Life	26.84	$109,252,781
							$20,414			$709,768
							79%			83%

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		366.1	Compressor Station S & I		366.2	M & R Station S & I		367	Mains	
		9.00	$2,712,208	9	16.30	$1,449,225	9	16.02	$102,429,201	11
		45.00	R2	$ 48,339	45.00	R2	$ 40,350	75.00	R4	$ 89,742
		20.0%	25.70	$ 781,278	36.2%	24.18	$ 583,979	21.4%	28.63	$ 4,398,742
Yrs	Year	Age	% Surviving	Plant Balance	Age	% Surviving	Plant Balance	Age	% Surviving	Plant Balance
		(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)	(R)
		%	%	$	%	%	$	%	%	$
-	2021	20.00%	97.40%	2,712,208	36.22%	93.75%	1,449,225	21.36%	99.91%	102,306,964
1	2022	22.22%	96.98%	2,700,884	38.44%	93.12%	1,440,107	22.69%	99.89%	102,289,451
2	2023	24.44%	96.55%	2,689,316	40.67%	92.46%	1,430,443	24.03%	99.87%	102,267,588
3	2024	26.67%	96.10%	2,676,990	42.89%	91.75%	1,420,210	25.36%	99.84%	102,244,126
4	2025	28.89%	95.61%	2,663,870	45.11%	90.97%	1,408,874	26.69%	99.82%	102,217,222
5	2026	31.11%	95.07%	2,649,260	47.33%	90.18%	1,397,395	28.03%	99.79%	102,183,906
6	2027	33.33%	94.53%	2,634,390	49.56%	89.34%	1,385,267	29.36%	99.75%	102,148,433
7	2028	35.56%	93.94%	2,618,602	51.78%	88.45%	1,372,462	30.69%	99.71%	102,108,059
8	2029	37.78%	93.33%	2,601,852	54.00%	87.52%	1,358,952	32.03%	99.66%	102,058,444
9	2030	40.00%	92.67%	2,584,097	56.22%	86.49%	1,344,044	33.36%	99.61%	102,006,012
10	2031	42.22%	91.95%	2,564,409	58.44%	85.46%	1,329,006	34.69%	99.55%	101,946,758
11	2032	44.44%	91.21%	2,544,452	60.67%	84.36%	1,313,177	36.03%	99.48%	101,874,470
12	2033	46.67%	90.43%	2,523,345	62.89%	83.22%	1,296,529	37.36%	99.41%	101,798,622
13	2034	48.89%	89.61%	2,501,039	65.11%	81.95%	1,278,219	38.69%	99.33%	101,713,487
14	2035	51.11%	88.70%	2,476,382	67.33%	80.68%	1,259,811	40.03%	99.23%	101,610,346
15	2036	53.33%	87.78%	2,451,463	69.56%	79.35%	1,240,504	41.36%	99.12%	101,502,866
16	2037	55.56%	86.81%	2,425,188	71.78%	77.95%	1,220,274	42.69%	99.00%	101,383,010
17	2038	57.78%	85.79%	2,397,503	74.00%	76.49%	1,199,100	44.03%	98.86%	101,238,778
18	2039	60.00%	84.72%	2,368,355	76.22%	74.89%	1,175,933	45.36%	98.72%	101,089,470
19	2040	62.22%	83.53%	2,336,261	78.44%	73.30%	1,152,773	46.69%	98.56%	100,924,019
20	2041	64.44%	82.34%	2,303,958	80.67%	71.63%	1,128,624	48.03%	98.36%	100,726,207
21	2042	66.67%	81.09%	2,270,034	82.89%	69.89%	1,103,480	49.36%	98.16%	100,522,744
22	2043	68.89%	79.78%	2,234,442	85.11%	68.01%	1,076,131	50.69%	97.95%	100,298,663
23	2044	71.11%	78.34%	2,195,399	87.33%	66.13%	1,048,962	52.03%	97.69%	100,032,445
24	2045	73.33%	76.90%	2,156,257	89.56%	64.19%	1,020,822	53.36%	97.42%	99,760,332
25	2046	75.56%	75.39%	2,115,322	91.78%	62.18%	991,735	54.69%	97.13%	99,462,437
26	2047	77.78%	73.81%	2,072,563	94.00%	60.11%	961,734	56.03%	96.79%	99,110,712
27	2048	80.00%	72.17%	2,027,959	96.22%	57.88%	929,439	57.36%	96.44%	98,753,405
28	2049	82.22%	70.37%	1,979,340	98.44%	55.70%	897,716	58.69%	96.06%	98,364,548
29	2050	84.44%	68.59%	1,930,930	100.67%	53.46%	865,246	60.03%	95.61%	97,908,223
		29-Yr Life	25.70	$69,693,860	29-Yr Life	24.18	$35,046,969	29-Yr Life	28.63	$2,929,544,782
				$781,278			$583,979			$4,398,742
				71%			60%			96%

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		368	Compressor Station Equipment		369	Meas & Reg Station Equipment	
		8.87	$36,000,883	10	12.83	$8,957,044	5
		85.00	R3	$ 67,474	60.00	L3	$ 26,469
		10.4%	28.59	$ 1,373,541	21.4%	27.60	$ 1,484,032
Yrs	Year	Age	% Surviving	Plant Balance	Age	% Surviving	Plant Balance
		(S)	(T)	(U)	(V)	(W)	(X)
		%	%	$	%	%	$
-	2021	10.44%	99.76%	35,912,184	21.38%	99.88%	8,892,968
1	2022	11.61%	99.72%	35,897,025	23.05%	99.83%	8,888,323
2	2023	12.79%	99.68%	35,881,939	24.72%	99.76%	8,882,373
3	2024	13.96%	99.63%	35,864,095	26.38%	99.68%	8,875,436
4	2025	15.14%	99.57%	35,844,710	28.05%	99.58%	8,866,498
5	2026	16.32%	99.51%	35,823,683	29.72%	99.46%	8,855,803
6	2027	17.49%	99.46%	35,802,873	31.38%	99.33%	8,844,002
7	2028	18.67%	99.39%	35,778,395	33.05%	99.17%	8,829,489
8	2029	19.85%	99.31%	35,751,953	34.72%	98.98%	8,812,807
9	2030	21.02%	99.23%	35,723,426	36.38%	98.78%	8,794,993
10	2031	22.20%	99.16%	35,695,341	38.05%	98.55%	8,773,669
11	2032	23.38%	99.07%	35,662,473	39.72%	98.28%	8,749,696
12	2033	24.55%	98.97%	35,627,150	41.38%	98.00%	8,724,513
13	2034	25.73%	98.86%	35,589,236	43.05%	97.66%	8,694,715
14	2035	26.91%	98.75%	35,548,593	44.72%	97.29%	8,661,460
15	2036	28.08%	98.64%	35,508,815	46.38%	96.90%	8,626,646
16	2037	29.26%	98.51%	35,462,533	48.05%	96.44%	8,585,470
17	2038	30.44%	98.37%	35,413,091	49.72%	95.93%	8,539,444
18	2039	31.61%	98.23%	35,360,332	51.38%	95.39%	8,491,142
19	2040	32.79%	98.08%	35,308,922	53.05%	94.75%	8,433,882
20	2041	33.96%	97.92%	35,249,359	54.72%	94.04%	8,369,802
21	2042	35.14%	97.74%	35,186,006	56.38%	93.29%	8,302,601
22	2043	36.32%	97.56%	35,118,693	58.05%	92.40%	8,223,187
23	2044	37.49%	97.37%	35,053,361	59.72%	91.41%	8,134,837
24	2045	38.67%	97.16%	34,977,969	61.38%	90.39%	8,042,962
25	2046	39.85%	96.94%	34,898,100	63.05%	89.19%	7,935,577
26	2047	41.02%	96.71%	34,813,571	64.72%	87.87%	7,817,733
27	2048	42.20%	96.48%	34,731,833	66.38%	86.53%	7,697,041
28	2049	43.38%	96.22%	34,637,846	68.05%	84.98%	7,558,334
29	2050	44.55%	95.94%	34,538,643	69.72%	83.31%	7,408,936
		29-Yr Life	28.59	$1,026,749,967	29-Yr Life	27.60	$245,421,369
				$1,373,541			$1,484,032
				96%			83%

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule No. 7 - Depreciation Rate Calculations

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 7 - Depreciation Rate Calculations
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Average Plant in Service 2021-2024	Fully Depreciated Plant	Depreciable Plant	Depreciation Reserve December 31, 2020	Net Plant 2021-2024	Average Remaining Life	Depreciation Expense 1/	Depreciation Rate
			(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
			$	$	$	$	$		$	%
			Sch 4	Sch. 1	c = a - b	Sch. 3	e = a + d	Sch. 6	g = e / f	h = g / a
1	**Intangible Plant**									
2	302	Intangible Plant - Franchises	176,783		176,783	(149,054)	27,729	28.63	968	0.55%
3	303	Misc. Intangible Plant	898,093		898,093	(509,204)	388,889	27.60	14,092	1.57%
4		Subtotal Intangible Plant	1,074,876		1,074,876	(658,258)	416,618	27.66	15,060	1.40%
5										
6	**Transmission Plant**									
7	365.11	Land	668,309			-	668,309	0.00	-	0.00%
8	365.12	Land Rights	98,162		98,162	(48,210)	49,952	26.39	1,893	1.93%
9	365.2	Rights of Way	4,070,439		4,070,439	(1,990,158)	2,080,281	26.84	77,505	1.90%
10	366.1	Compressor Station S & I	2,712,208		2,712,208	(599,867)	2,112,342	25.70	82,204	3.03%
11	366.2	M & R Station S & I	1,449,225		1,449,225	(537,455)	911,770	24.18	37,703	2.60%
12	367.0	Mains	102,306,964		102,306,964	(50,908,281)	51,398,683	28.63	1,794,969	1.75%
13	368.0	Compressor Station Equipment	35,912,184		35,912,184	(8,859,071)	27,053,113	28.59	946,225	2.63%
14	369.0	Meas & Reg Station Equipment	8,892,968		8,892,968	(3,674,653)	5,218,315	27.60	189,088	2.13%
15		Subtotal Transmission	156,110,458		155,442,150	(66,617,694)	88,824,456	28.38	3,129,587	2.01%
16										
17	**General Plant**									
18	390	Struct. & Impr. - Office Bldg	5,269	5,269	-	(5,269)	-		-	10.00%
19	391	Office Furniture and Equipment								
20		OFF001- Tower Office Furniture & Equip	32,228	-	32,228	(24,197)	8,031		3,223	10.00%
21		DPC001-Data Process & Comp. Equip.	-	-	-	-	-		-	12.50%
22		DEV001-Developed Software	957,123	843,871	113,252	(902,108)	55,015		7,550	6.67%
23	392.1	Transportation Equipment	3,761	3,761	-	(3,761)	-		-	16.67%
24	394	Tools Shop & Garage Equipment	565,711	-	565,711	(345,372)	220,339		28,286	5.00%
25	396	Power Operated Equipment	42,559	10,649	31,910	(35,664)	6,894		3,191	10.00%
26	397	Communication Equipment	174,033	142,401	31,632	(159,868)	14,165		1,375	4.35%
27		Subtotal General Plant	1,780,683	1,005,951	774,732	(1,476,239)	304,444	6.98	43,625	2.45%
28										
29										
30		**Total**	158,966,018	1,005,951	157,291,758	(68,752,191)	89,545,519	28.09	3,188,272	2.01%

1/ The expense calculation for General Plant is g = c * h

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
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Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8 - Negative Salvage Cost Estimate - Total
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates					
2						
3	367	Line Pipe Removal	4,098,783	79%	852,412	3,246,370
4						
5	367	Crossings Abandonment	16,170,093	96%	695,242	15,474,852
6						
7	366.2 / 369	Meter Station Removal	846,264	80%	169,218	677,046
8						
9	366.1 / 368	Compressor Station Removal	3,009,260	94%	167,884	2,841,376
10						
11	365	Right of Way Markers	70,737	83%	12,334	58,402
12						
13	367	Cathodic Protection	35,680	96%	1,534	34,146
14						
15	367	Taps	257,865	96%	11,087	246,778
16						
17	367	Valves	178,370	96%	7,669	170,701
18						
19		Subtotal	24,667,052		1,917,380	22,749,672
20						
21		Construction Management Costs	616,676		47,935	568,742
22						
23		10% Contingency Fees	2,528,373		196,531	2,331,841
24						
25		Salvage	(656,244)			(656,244)
26						
27		Grand Total	27,155,857		2,161,846	24,994,011
28						
29		Reserve for Negative Salvage	(1,015,281)			(1,015,281)
30						
31		Net to Recover	26,140,576		2,161,846	23,978,730
32						
33		Average Remaining Life (Years)	28.53		21.07	29.47
34						
35		Annual Requirement	916,258		102,598	813,660
36						
37		Recovery Rate	**0.60%**		**0.07%**	**0.53%**
38						
39		Depreciable Base	153,101,489			

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8a - Negative Salvage Cost Estimate - Account 365.2
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct 365					
2						
3	367	Line Pipe Removal	-	79%	-	-
4						
5	367	Crossings Abandonment	-	96%	-	-
6						
7	366.2 / 369	Meter Station Removal	-	81%	-	-
8						
9	366.1 / 368	Compressor Station Removal	-	94%	-	-
10						
11	365	Right of Way Markers	70,737	83%	12,334	58,402
12						
13	367	Cathodic Protection	-	96%	-	-
14						
15	367	Taps	-	96%	-	-
16						
17	367	Valves	-	96%	-	-
18						
19		Subtotal	70,737		12,334	58,402
20						
21		Construction Management Costs	1,768		308	1,460
22						
23		10% Contingency Fees	7,251		1,264	5,986
24						
25		Salvage				
26						
27		Grand Total	79,756		13,907	65,849
28						
29		Reserve for Negative Salvage	-			-
30						
31		Net to Recover	79,756		13,907	65,849
32						
33		Average Remaining Life (Years)	26.84		26.84	26.84
34						
35		Annual Requirement	2,971		518	2,453
36						
37		Recovery Rate	**0.07%**		**0.01%**	**0.06%**
38						
39		Depreciable Base	4,011,679			

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8b - Negative Salvage Cost Estimate - Account 366.1
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct 366.1					
2						
3	367	Line Pipe Removal	-	79%	-	-
4						
5	367	Crossings Abandonment	-	96%	-	-
6						
7	366.2	Meter Station Removal	-	81%	-	-
8						
9	366.1	Compressor Station Removal	300,926	9%	272,512	28,414
10						
11	365	Right of Way Markers	-	83%	-	-
12						
13	367	Cathodic Protection	-	96%	-	-
14						
15	367	Taps	-	96%	-	-
16						
17	367	Valves	-	96%	-	-
18						
19		Subtotal	300,926		272,512	28,414
20						
21		Construction Management Costs	7,523		6,813	710
22						
23		10% Contingency Fees	30,845		27,933	2,912
24						
25		Salvage				
26						
27		Grand Total	339,294		307,258	32,037
28						
29		Reserve for Negative Salvage	(13,722)			(13,722)
30						
31		Net to Recover	325,572		307,258	18,315
32						
33		Average Remaining Life (Years)	25.70		25.70	25.70
34						
35		Annual Requirement	12,670		11,957	713
36						
37		Recovery Rate	**0.48%**		**0.45%**	**0.03%**
38						
39		Depreciable Base	2,673,056			

Testimony of Steven R. Fall
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Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8c - Negative Salvage Cost Estimate - Account 366.2
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct. 366.2					
2						
3	367	Line Pipe Removal	-	79%	-	-
4						
5	367	Crossings Abandonment	-	96%	-	-
6						
7	366.2 / 369	Meter Station Removal	84,626	8%	77,856	6,770
8						
9	366.1 / 368	Compressor Station Removal	-	94%	-	-
10						
11	365	Right of Way Markers	-	83%	-	-
12						
13	367	Cathodic Protection	-	96%	-	-
14						
15	367	Taps	-	96%	-	-
16						
17	367	Valves	-	96%	-	-
18						
19		Subtotal	84,626		77,856	6,770
20						
21		Construction Management Costs	2,116		1,946	169
22						
23		10% Contingency Fees	8,674		7,980	694
24						
25		Salvage				
26						
27		Grand Total	95,416		87,783	7,634
28						
29		Reserve for Negative Salvage	(6,808)			(6,808)
30						
31		Net to Recover	88,608		87,783	826
32						
33		Average Remaining Life (Years)	24.18		24.18	24.18
34						
35		Annual Requirement	3,664		3,630	34
36						
37		Recovery Rate	**0.25%**		**0.25%**	**0.00%**
38						
39		Depreciable Base	1,428,304			

Testimony of Steven R. Fall
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Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8d - Negative Salvage Cost Estimate - Account 367
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct. 367					
2						
3	367	Line Pipe Removal	4,098,783	79%	852,412	3,246,370
4						
5	367	Crossings Abandonment	16,170,093	96%	695,242	15,474,852
6						
7	366.2 / 369	Meter Station Removal	-	81%	-	-
8						
9	366.1 / 368	Compressor Station Removal	-	94%	-	-
10						
11	365	Right of Way Markers	-	83%	-	-
12						
13	367	Cathodic Protection	35,680	96%	1,534	34,146
14						
15	367	Taps	257,865	96%	11,087	246,778
16						
17	367	Valves	178,370	96%	7,669	170,701
18						
19		Subtotal	20,740,791		1,567,944	19,172,847
20						
21		Construction Management Costs	518,520		39,199	479,321
22						
23		10% Contingency Fees	2,125,931		160,714	1,965,217
24						
25		Salvage	(656,244)			(656,244)
26						
27		Grand Total	22,728,998		1,767,857	20,961,141
28						
29		Reserve for Negative Salvage	(1,008,248)			(1,008,248)
30						
31		Net to Recover	21,720,750		1,767,857	19,952,894
32						
33		Average Remaining Life (Years)	28.63		28.63	28.63
34						
35		Annual Requirement	758,542		61,738	696,804
36						
37		Recovery Rate	**0.75%**		**0.06%**	**0.69%**
38						
39		Depreciable Base	100,830,092			

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8e - Negative Salvage Cost Estimate - Account 368
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct. 368					
2						
3	367	Line Pipe Removal	-	79%	-	-
4						
5	367	Crossings Abandonment	-	96%	-	-
6						
7	369	Meter Station Removal	-	81%	-	-
8						
9	368	Compressor Station Removal	2,708,334	85%	406,819	2,301,515
10						
11	365	Right of Way Markers	-	83%	-	-
12						
13	367	Cathodic Protection	-	96%	-	-
14						
15	367	Taps	-	96%	-	-
16						
17	367	Valves	-	96%	-	-
18						
19		Subtotal	2,708,334		406,819	2,301,515
20						
21		Construction Management Costs	67,708		10,170	57,538
22						
23		10% Contingency Fees	277,604		41,699	235,905
24						
25		Salvage				
26						
27		Grand Total	3,053,647		458,689	2,594,958
28						
29		Reserve for Negative Salvage	1,874			1,874
30						
31		Net to Recover	3,055,521		458,689	2,596,832
32						
33		Average Remaining Life (Years)	28.59		28.59	28.59
34						
35		Annual Requirement	106,872		16,043	90,828
36						
37		Recovery Rate	**0.31%**		**0.05%**	**0.26%**
38						
39		Depreciable Base	35,393,767			

Testimony of Steven R. Fall
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Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 8f - Negative Salvage Cost Estimate - Account 369
Docket No. G-39, Sub 46

Line No.	Account No.	Parameter	Total Terminal Decommissioning	Percent Plant Remaining	Interim Retirement Cost	Terminal Decommissioning Interim Retirement Cost
			(A)	(B)	(C)	(D)
			$	%	$	$
1	Direct Cost Estimates - Acct. 369					
2						
3	367	Line Pipe Removal	-	79%	-	-
4						
5	367	Crossings Abandonment	-	96%	-	-
6						
7	369	Meter Station Removal	761,637	72%	213,230	548,407
8						
9	366.1 / 368	Compressor Station Removal	-	94%	-	-
10						
11	365	Right of Way Markers	-	83%	-	-
12						
13	367	Cathodic Protection	-	96%	-	-
14						
15	367	Taps	-	96%	-	-
16						
17	367	Valves	-	96%	-	-
18						
19		Subtotal	761,637		213,230	548,407
20						
21		Construction Management Costs	19,041		5,331	13,710
22						
23		10% Contingency Fees	78,068		21,856	56,212
24						
25		Salvage				
26						
27		Grand Total	858,746		240,417	618,329
28						
29		Reserve for Negative Salvage	11,623			11,623
30						
31		Net to Recover	870,369		240,417	629,952
32						
33		Average Remaining Life (Years)	27.60		27.60	27.60
34						
35		Annual Requirement	31,538		8,712	22,827
36						
37		Recovery Rate	**0.36%**		**0.10%**	**0.26%**
38						
39		Depreciable Base	8,764,591			

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
Depreciation Study
Schedule 9 - Iowa Curves
Docket No. G-39, Sub 46

Age	L0	L1	L2	L3	L4	L5
0.10%	0.99992	0.99995	1.00000	0.99996	1.00000	1.00000
0.20%	0.99983	0.99989	1.00000	0.99993	1.00000	1.00000
0.30%	0.99973	0.99983	1.00000	0.99990	1.00000	1.00000
0.40%	0.99962	0.99978	1.00000	0.99986	1.00000	1.00000
0.50%	0.99950	0.99972	1.00000	0.99984	1.00000	1.00000
0.60%	0.99937	0.99966	1.00000	0.99981	1.00000	1.00000
0.70%	0.99923	0.99960	1.00000	0.99979	1.00000	1.00000
0.80%	0.99909	0.99954	1.00000	0.99976	1.00000	1.00000
0.90%	0.99894	0.99948	1.00000	0.99974	1.00000	1.00000
1.00%	0.99878	0.99942	1.00000	0.99972	1.00000	1.00000
1.10%	0.99862	0.99936	1.00000	0.99970	1.00000	1.00000
1.20%	0.99845	0.99930	1.00000	0.99968	1.00000	1.00000
1.30%	0.99827	0.99924	1.00000	0.99967	1.00000	1.00000
1.40%	0.99809	0.99917	1.00000	0.99965	1.00000	1.00000
1.50%	0.99791	0.99911	1.00000	0.99964	1.00000	1.00000
1.60%	0.99772	0.99905	1.00000	0.99963	1.00000	1.00000
1.70%	0.99752	0.99898	0.99999	0.99961	1.00000	1.00000
1.80%	0.99732	0.99891	0.99999	0.99960	1.00000	1.00000
1.90%	0.99712	0.99885	0.99999	0.99959	1.00000	1.00000
2.00%	0.99691	0.99878	0.99999	0.99958	1.00000	1.00000
2.10%	0.99670	0.99871	0.99999	0.99957	1.00000	1.00000
2.20%	0.99648	0.99864	0.99999	0.99956	1.00000	1.00000
2.30%	0.99626	0.99857	0.99999	0.99956	1.00000	1.00000
2.40%	0.99604	0.99850	0.99998	0.99955	1.00000	1.00000
2.50%	0.99581	0.99843	0.99998	0.99954	1.00000	1.00000
2.60%	0.99558	0.99836	0.99998	0.99954	1.00000	1.00000
2.70%	0.99534	0.99829	0.99998	0.99953	1.00000	1.00000
2.80%	0.99510	0.99821	0.99998	0.99952	1.00000	1.00000
2.90%	0.99486	0.99814	0.99997	0.99952	1.00000	1.00000

ATTACHMENT 2

DEPRECIATION SURVIVOR CURVE WORKPAPERS

Steven R Fall

on behalf of

Cardinal Pipeline Company, LLC

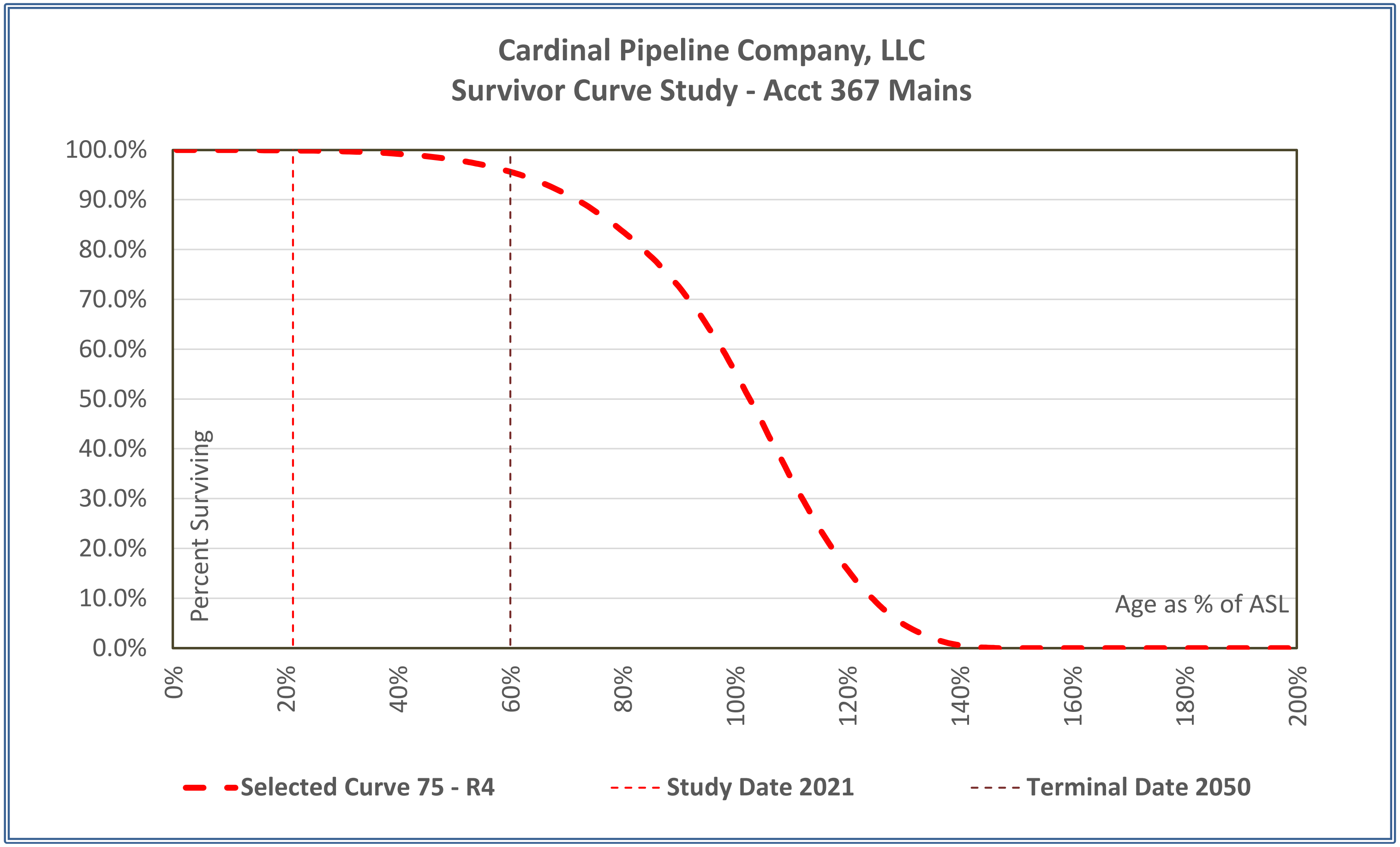
Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
Survivor Curve Study - Acct 367 Mains

Salient Statistical Results

Economic Life	Ave Age at Study Date:	Average Service Life	Age as % of ASL	Iowa Curve	Conformance Index	Retirement Index	Average Remaining Life
2050	16.02	75	21.4%	R4	1	98%	**28.63**



Historical Plant Balances

Year	BOY Balance	Additions	Retirements	Adjustments	Transfers	EOY Balance
1990	-	-	-	-	-	-
1991	-	-	-	-	-	-
1992	-	-	-	-	-	-
1993	-	-	-	-	-	-
1994	-	-	-	-	-	-
1995	-	-	-	-	-	-
1996	-	-	-	-	-	-
1997	-	-	-	-	-	-
1998	-	-	-	-	-	-
1999	-	-	-	-	-	-
2000	-	-	-	-	-	-
2001	-	-	-	-	-	-
2002	-	-	-	-	-	-
2003	-	-	-	-	-	-
2004	-	-	-	-	95,319,992	95,319,992
2005	95,319,992	-	-	-	-	95,319,992
2006	95,319,992	554,762	-	-	-	95,874,754
2007	95,874,754	(51,789)	-	-	-	95,822,965
2008	95,822,965	-	-	-	-	95,822,965
2009	95,822,965	95,339	-	-	-	95,918,304
2010	95,918,304	11,823	-	-	-	95,930,127
2011	95,930,127	-	-	-	-	95,930,127
2012	95,930,127	335,866	1,081	-	-	96,264,912
2013	96,264,912	36,710	-	-	-	96,301,622
2014	96,301,622	243,384	-	-	-	96,545,006
2015	96,545,006	2,057	-	-	-	96,547,063
2016	96,547,063	35,320	-	-	-	96,582,383
2017	96,582,383	-	-	-	-	96,582,383
2018	96,582,383	(26,593)	-	-	-	96,555,790
2019	96,555,790	742,236	5,451	-	-	97,292,575
2020	97,292,575	3,653,221	115,705	-	-	100,830,091
		4,404,184	121,156	Σ of last 5 years:	`	
		880,837	24,231	Ave last 5 yrs		

Goodness of Fit Test Statistics

Best 5-Year Retirement Predictors					
Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
1	75 - R4	28.63	24,612	98.4%	1.07
2	55 - L4	27.54	22,634	93.4%	1.07
3	10 - R3	28.96	26,420	91.0%	182.99
4	100 - S2	28.67	21,797	90.0%	1.07
5	150 - R3	28.84	26,863	89.1%	1.07
6	90 - L3	28.61	26,863	89.1%	1.07
7	95 - S2	28.60	27,284	87.4%	1.07
8	145 - R3	28.83	27,631	86.0%	1.07
9	10 - L5	28.97	20,413	84.2%	211.82
10	40 - R5	23.20	19,538	80.6%	1.07

Best Conformance Indices					
Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
L Curves 1	10 - L4	28.66	245,497	-813.1%	655.56
L Curves 2	10 - L5	28.97	20,413	84.2%	211.82
L Curves 3	5 - L0	29.00	-	0.0%	104.05
S Curves 1	10 - S3	28.87	89,047	-167.5%	269.75
S Curves 2	10 - S6	29.00	-	0.0%	208.79
S Curves 3	10 - S5	29.00	0	0.0%	201.07
R Curves 1	10 - R5	29.00	-	0.0%	196.46
R Curves 2	10 - R4	29.00	-	0.0%	185.63
R Curves 3	10 - R3	28.96	26,420	91.0%	182.99

Selected Survivor Curve					
	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
Selected	75 - R4	28.63	24,612	98.4%	1.07

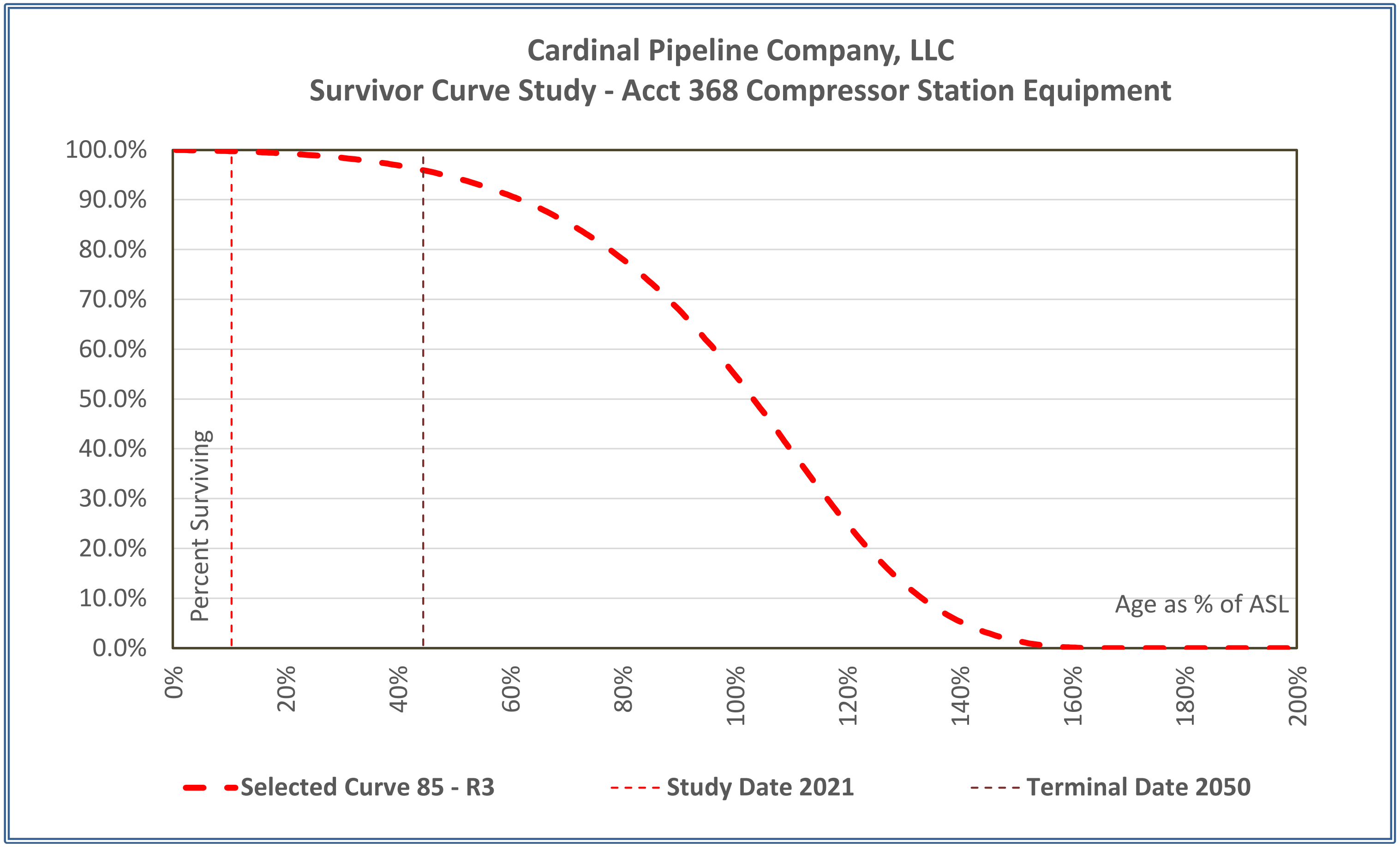
Selected Curve Forecasted Survivorship & Interim Retirements

Selected Curve 75 - R4	Year	Age	Age as % of ASL	Percent Surviving	Surviving Plant	Interim Retirements	
Original Installations					102,429,201		
Surviving Balance	2021	16.0	21.36%	99.9063%	102,306,964		
1st Forecast Year	2022	17.0	22.69%	99.8892%	102,289,451	17,513	
2	2023	18.0	24.03%	99.8678%	102,267,588	21,863	
3	2024	19.0	25.36%	99.8449%	102,244,126	23,462	
4	2025	20.0	26.69%	99.8186%	102,217,222	26,904	
5	2026	21.0	28.03%	99.7861%	102,183,906	33,316	
6	2027	22.0	29.36%	99.7515%	102,148,433	35,473	
7	2028	23.0	30.69%	99.7121%	102,108,059	40,374	
8	2029	24.0	32.03%	99.6636%	102,058,444	49,615	
9	2030	25.0	33.36%	99.6124%	102,006,012	52,432	
10	2031	26.0	34.69%	99.5546%	101,946,758	59,254	
11	2032	27.0	36.03%	99.4840%	101,874,470	72,288	
12	2033	28.0	37.36%	99.4100%	101,798,622	75,848	
13	2034	29.0	38.69%	99.3269%	101,713,487	85,135	
14	2035	30.0	40.03%	99.2262%	101,610,346	103,141	
15	2036	31.0	41.36%	99.1212%	101,502,866	107,480	
16	2037	32.0	42.69%	99.0042%	101,383,010	119,855	
17	2038	33.0	44.03%	98.8634%	101,238,778	144,232	
18	2039	34.0	45.36%	98.7176%	101,089,470	149,308	
19	2040	35.0	46.69%	98.5561%	100,924,019	165,451	
20	2041	36.0	48.03%	98.3630%	100,726,207	197,812	
21	2042	37.0	49.36%	98.1644%	100,522,744	203,463	
22	2043	38.0	50.69%	97.9456%	100,298,663	224,081	
23	2044	39.0	52.03%	97.6857%	100,032,445	266,218	
24	2045	40.0	53.36%	97.4200%	99,760,332	272,113	
25	2046	41.0	54.69%	97.1292%	99,462,437	297,895	
26	2047	42.0	56.03%	96.7858%	99,110,712	351,725	
27	2048	43.0	57.36%	96.4370%	98,753,405	357,307	
28	2049	44.0	58.69%	96.0573%	98,364,548	388,857	
29	2050	45.0	60.03%	95.6118%	97,908,223	456,326	
					2,929,544,782	**4,398,742**	Total Interm Retires
				Average Remaining Life	**28.6**	**24,612**	5 Yr Ave Ann Retires

Cardinal Pipeline Company, LLC
Survivor Curve Study - Acct 368 Compressor Station Equipment

Salient Statistical Results

Economic Life	Ave Age at Study Date:	Average Service Life	Age as % of ASL	Iowa Curve	Conformance Index	Retirement Index	Average Remaining Life
2050	8.87	85	10.4%	R3	3916	100%	**28.59**



Historical Plant Balances

Year	BOY Balance	Additions	Retirements	Adjustments	Transfers	EOY Balance
1990	-	-	-	-	-	-
1991	-	-	-	-	-	-
1992	-	-	-	-	-	-
1993	-	-	-	-	-	-
1994	-	-	-	-	-	-
1995	-	-	-	-	-	-
1996	-	-	-	-	-	-
1997	-	-	-	-	-	-
1998	-	-	-	-	-	-
1999	-	-	-	-	-	-
2000	-	-	-	-	-	-
2001	-	-	-	-	-	-
2002	-	-	-	-	-	-
2003	-	-	-	-	-	-
2004	-	-	-	-	-	-
2005	-	-	-	-	-	-
2006	-	-	-	-	-	-
2007	-	-	-	-	-	-
2008	-	-	-	-	-	-
2009	-	-	-	-	-	-
2010	-	-	-	-	-	-
2011	-	-	-	-	-	-
2012	-	35,807,448	-	-	(414,452)	35,392,996
2013	35,392,996	38,129	-	-	-	35,431,125
2014	35,431,125	1,307	-	-	-	35,432,432
2015	35,432,432	(41,089)	-	-	-	35,391,343
2016	35,391,343	89,390	88,699	-	-	35,392,034
2017	35,392,034	-	-	-	-	35,392,034
2018	35,392,034	-	-	-	-	35,392,034
2019	35,392,034	-	-	-	-	35,392,034
2020	35,392,034	1,733	-	-	-	35,393,767
		91,123	88,699	Σ of last 5 years:	`	
		18,225	17,740	Ave last 5 yrs		

BROWN, WILLIAMS, MOORHEAD & QUINN, INC.
ENERGY CONSULTANTS

Goodness of Fit Test Statistics

Best 5-Year Retirement Predictors					
Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
1	85 - R3	28.59	17,700	99.8%	3915.74
2	105 - S1	28.49	17,232	97.1%	608.28
3	95 - L2	28.48	16,913	95.3%	584.78
4	100 - S1	28.43	19,407	90.6%	656.35
5	90 - R3	28.64	15,934	89.8%	2425.90
6	90 - L2	28.40	19,684	89.0%	633.53
7	45 - R4	27.51	15,741	88.7%	553.07
8	80 - R3	28.52	19,988	87.3%	38887.97
9	5 - S2	28.94	15,382	86.7%	1.02
10	110 - S1	28.55	15,214	85.8%	578.84

Best Conformance Indices					
Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
L Curves 1	15 - L5	5.68	2,234,094	-12393.7%	988.47
L Curves 2	80 - L2	28.17	27,303	46.1%	829.76
L Curves 3	40 - L3	24.67	61,964	-149.3%	779.58
S Curves 1	25 - S3	15.67	219,511	-1037.4%	993.85
S Curves 2	90 - S1	28.25	26,205	52.3%	850.45
S Curves 3	45 - S2	26.08	48,136	-71.3%	646.84
R Curves 1	80 - R3	28.52	19,988	87.3%	38887.97
R Curves 2	35 - R4	24.38	42,390	-39.0%	882.10
R Curves 3	20 - R5	10.61	160,009	-702.0%	409.60

Selected Survivor Curve					
	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
Selected	85 - R3	28.59	17,700	99.8%	3915.74

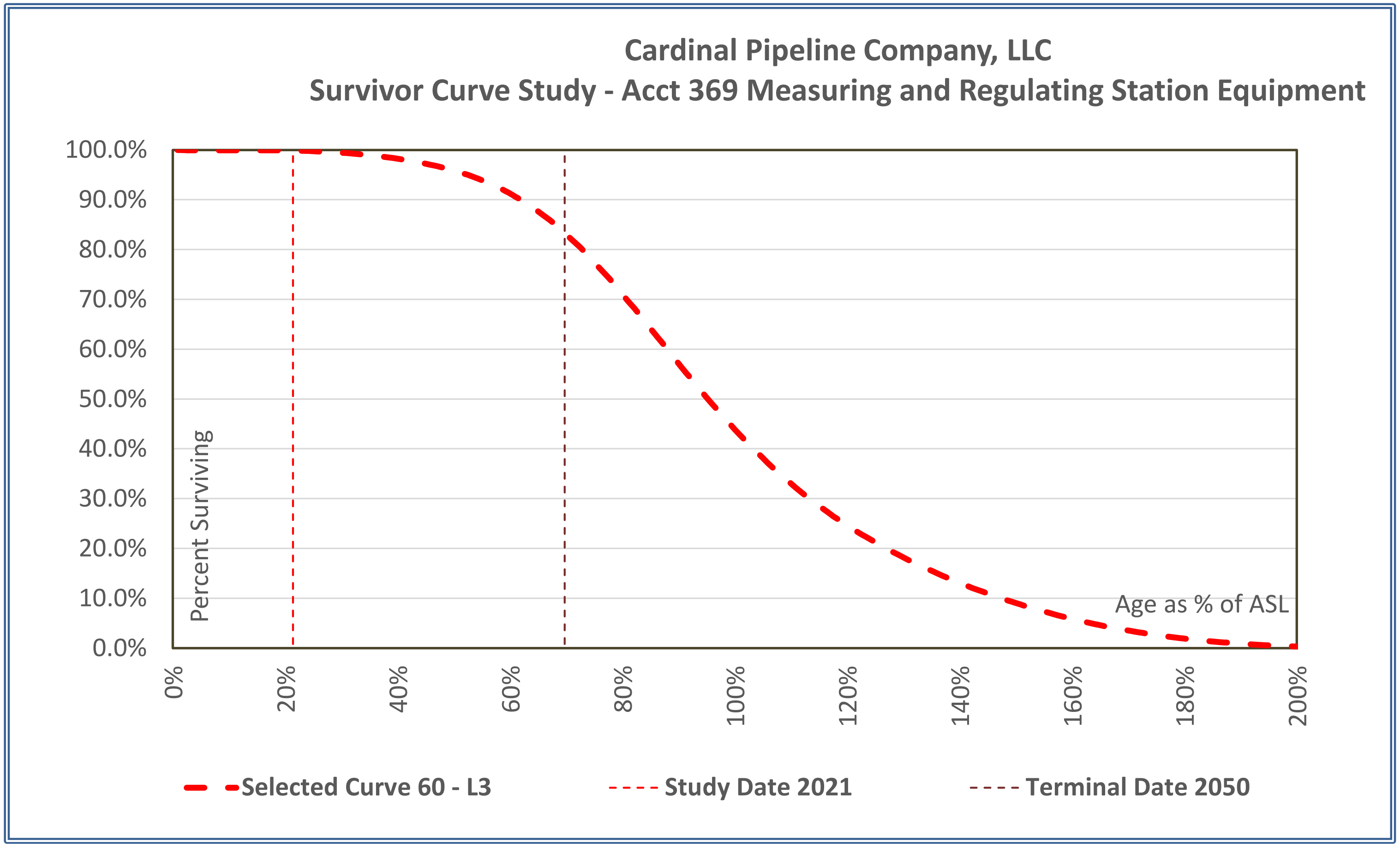
Selected Curve Forecasted Survivorship & Interim Retirements

Selected Curve 85 - R3	Year	Age	Age as % of ASL	Percent Surviving	Surviving Plant	Interim Retirements	
Original Installations					36,000,883		
Surviving Balance	2021	8.9	10.44%	99.7592%	35,912,184		
1st Forecast Year	2022	9.9	11.62%	99.7170%	35,897,025	15,159	
2	2023	10.9	12.79%	99.6751%	35,881,939	15,086	
3	2024	11.9	13.97%	99.6256%	35,864,095	17,844	
4	2025	12.9	15.15%	99.5717%	35,844,710	19,385	
5	2026	13.9	16.32%	99.5133%	35,823,683	21,028	
6	2027	14.9	17.50%	99.4555%	35,802,873	20,810	
7	2028	15.9	18.68%	99.3875%	35,778,395	24,478	
8	2029	16.9	19.85%	99.3141%	35,751,953	26,443	
9	2030	17.9	21.03%	99.2348%	35,723,426	28,526	
10	2031	18.9	22.21%	99.1495%	35,692,693	30,733	
11	2032	19.9	23.38%	99.0655%	35,662,473	30,220	
12	2033	20.9	24.56%	98.9674%	35,627,150	35,323	
13	2034	21.9	25.73%	98.8621%	35,589,236	37,914	
14	2035	22.9	26.91%	98.7492%	35,548,593	40,644	
15	2036	23.9	28.09%	98.6387%	35,508,815	39,778	
16	2037	24.9	29.26%	98.5102%	35,462,533	46,282	
17	2038	25.9	30.44%	98.3728%	35,413,091	49,442	
18	2039	26.9	31.62%	98.2263%	35,360,332	52,758	
19	2040	27.9	32.79%	98.0835%	35,308,922	51,411	
20	2041	28.9	33.97%	97.9180%	35,249,359	59,562	
21	2042	29.9	35.15%	97.7420%	35,186,006	63,353	
22	2043	30.9	36.32%	97.5551%	35,118,693	67,314	
23	2044	31.9	37.50%	97.3736%	35,053,361	65,331	
24	2045	32.9	38.68%	97.1642%	34,977,969	75,393	
25	2046	33.9	39.85%	96.9423%	34,898,100	79,869	
26	2047	34.9	41.03%	96.7075%	34,813,571	84,529	
27	2048	35.9	42.21%	96.4593%	34,724,195	89,376	
28	2049	36.9	43.38%	96.2194%	34,637,846	86,349	
29	2050	37.9	44.56%	95.9439%	34,538,643	99,203	
					1,026,739,681	**1,373,541**	Total Interm Retires
				Average Remaining Life	**28.6**	**17,700**	5 Yr Ave Ann Retires

Cardinal Pipeline Company, LLC
Survivor Curve Study - Acct 369 Measuring and Regulating Station Equipment

Salient Statistical Results

Economic Life	Ave Age at Study Date:	Average Service Life	Age as % of ASL	Iowa Curve	Conformance Index	Retirement Index	Average Remaining Life
2050	12.83	60	21.4%	L3	2	99%	**27.60**



Historical Plant Balances

Year	BOY Balance	Additions	Retirements	Adjustments	Transfers	EOY Balance
1990	-	-	-	-	-	-
1991	-	-	-	-	-	-
1992	-	-	-	-	-	-
1993	-	-	-	-	-	-
1994	-	-	-	-	-	-
1995	-	-	-	-	-	-
1996	-	-	-	-	-	-
1997	-	-	-	-	-	-
1998	-	-	-	-	-	-
1999	-	-	-	-	-	-
2000	-	-	-	-	-	-
2001	-	-	-	-	-	-
2002	-	-	-	-	-	-
2003	-	-	-	-	-	-
2004	-	-	-	-	4,545,451	4,545,451
2005	4,545,451	20,781	-	-	-	4,566,232
2006	4,566,232	11,443	-	-	-	4,577,675
2007	4,577,675	-	-	-	-	4,577,675
2008	4,577,675	-	-	-	-	4,577,675
2009	4,577,675	-	-	-	-	4,577,675
2010	4,577,675	-	-	-	-	4,577,675
2011	4,577,675	-	-	-	-	4,577,675
2012	4,577,675	3,974,722	27,371	-	-	8,525,026
2013	8,525,026	(1,611)	-	-	-	8,523,415
2014	8,523,415	40,392	-	-	-	8,563,807
2015	8,563,807	16,270	-	-	-	8,580,077
2016	8,580,077	131,734	25,262	-	-	8,686,549
2017	8,686,549	16,566	-	-	-	8,703,115
2018	8,703,115	5,411	-	-	-	8,708,526
2019	8,708,526	67,508	11,443	-	-	8,764,591
2020	8,764,591	-	-	-	-	8,764,591
		221,219	36,705	Σ of last 5 years:	`	
		44,244	7,341	Ave last 5 yrs		

Goodness of Fit Test Statistics

Best 5-Year Retirement Predictors					
Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
1	60 - L3	27.60	7,433	98.7%	1.94
2	95 - L2	28.30	7,021	95.6%	1.94
3	150 - R2	28.55	7,690	95.2%	1.96
4	105 - S1	28.32	6,959	94.8%	1.94
5	75 - R3	28.25	7,848	93.1%	1.95
6	80 - R3	28.37	6,788	92.5%	1.95
7	40 - L4	24.00	7,929	92.0%	1.93
8	30 - R5	16.61	7,983	91.3%	1.93
9	145 - R2	28.53	8,011	90.9%	1.96
10	100 - S1	28.23	8,059	90.2%	1.94

Best Conformance Indices					
Ranking	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
L Curves 1	10 - L5	27.37	101,668	-1184.9%	15.04
L Curves 2	15 - L0	18.18	323,073	-4200.9%	13.84
L Curves 3	15 - L1	16.79	391,409	-5131.8%	9.93
S Curves 1	10 - S6	29.00	93	1.3%	161.62
S Curves 2	10 - S5	28.78	13,474	16.5%	23.94
S Curves 3	10 - S4	27.49	93,775	-1077.4%	11.86
R Curves 1	10 - R5	28.82	10,775	53.2%	17.96
R Curves 2	10 - R4	27.21	110,409	-1304.0%	10.87
R Curves 3	10 - R3	24.79	263,351	-3387.4%	8.60

Selected Survivor Curve					
	ASL / Curve	Average Remaining Life	Annual Retirements	Retirement Index	Conformance Index
Selected	60 - L3	27.60	7,433	98.7%	1.94

Selected Curve Forecasted Survivorship & Interim Retirements

Selected Curve 60 - L3	Year	Age	Age as % of ASL	Percent Surviving	Surviving Plant	Interim Retirements	
Original Installations					8,957,044		
Surviving Balance	2021	12.8	21.38%	99.8775%	8,892,968		
1st Forecast Year	2022	13.8	23.05%	99.8257%	8,888,323	4,644	
2	2023	14.8	24.72%	99.7592%	8,882,373	5,951	
3	2024	15.8	26.38%	99.6818%	8,875,436	6,937	
4	2025	16.8	28.05%	99.5820%	8,866,498	8,937	
5	2026	17.8	29.72%	99.4626%	8,855,803	10,696	
6	2027	18.8	31.38%	99.3308%	8,844,002	11,801	
7	2028	19.8	33.05%	99.1688%	8,829,489	14,513	
8	2029	20.8	34.72%	98.9826%	8,812,807	16,683	
9	2030	21.8	36.38%	98.7837%	8,794,993	17,814	
10	2031	22.8	38.05%	98.5456%	8,773,669	21,323	
11	2032	23.8	39.72%	98.2780%	8,749,696	23,974	
12	2033	24.8	41.38%	97.9968%	8,724,513	25,183	
13	2034	25.8	43.05%	97.6641%	8,694,715	29,798	
14	2035	26.8	44.72%	97.2929%	8,661,460	33,255	
15	2036	27.8	46.38%	96.9042%	8,626,646	34,814	
16	2037	28.8	48.05%	96.4445%	8,585,470	41,176	
17	2038	29.8	49.72%	95.9306%	8,539,444	46,026	
18	2039	30.8	51.38%	95.3914%	8,491,142	48,302	
19	2040	31.8	53.05%	94.7521%	8,433,882	57,259	
20	2041	32.8	54.72%	94.0367%	8,369,802	64,080	
21	2042	33.8	56.38%	93.2864%	8,302,601	67,201	
22	2043	34.8	58.05%	92.3998%	8,223,187	79,415	
23	2044	35.8	59.72%	91.4134%	8,134,837	88,350	
24	2045	36.8	61.38%	90.3877%	8,042,962	91,875	
25	2046	37.8	63.05%	89.1888%	7,935,577	107,386	
26	2047	38.8	64.72%	87.8732%	7,817,733	117,844	
27	2048	39.8	66.38%	86.5257%	7,697,041	120,692	
28	2049	40.8	68.05%	84.9771%	7,558,334	138,707	
29	2050	41.8	69.72%	83.3092%	7,408,936	149,399	
					245,421,369	**1,484,032**	Total Interm Retires
				Average Remaining Life	**27.6**	**7,433**	5 Yr Ave Ann Retires

ATTACHMENT 3

TERMINAL DECOMMISSIONING WORKPAPERS

Steven R Fall

on behalf of

Cardinal Pipeline Company, LLC

Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

Cardinal Pipeline Company, LLC
Summary of Terminal Decommissioning Cost Estimate - Transmission

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Line No.	Particular (A)	Cost ($) (B)	Item (C)	Total TDC Estimate ($) (D)	Total Adjusted (*) Cost Estimate ($) (E)
1	A. DECOMMISSIONING COSTS				
2	**Transmission Line**	**Cost / Mile**	**Total Miles**	**Total**	
3	1-1 - <24" Pipeline Clean and Purge	$ 41,443	104.9	$ 4,348,608	
4	1-2 - Trench Excavation	$ 96,404	0.3	$ 26,301	
5	1-3 - Pipe Removal	$ 201,377	0.3	$ 54,939	
6	1-4 - Trench Backfill	$ 117,728	0.3	$ 32,118	
7	1-5 - Trench Restoration	$ 10,769	0.3	$ 2,938	
8				*	**$ 4,098,783**
10	**Abandonment**	**Cost /**	**Total Crossing**	**Total**	
12	2-2 - Road Crossing Abandonment	$ 26,565	155	$ 4,117,508	
13	2-4 - Highway Crossing Abandonment	$ 29,324	2	$ 58,648	
14	2-5 - RR Line Crossing Abandonment	$ 45,573	4	$ 182,291	
16	2-7 - Water Crossing Abandonment	$ 45,089	294	$ 13,256,034	
17				*	**$ 16,170,093**
19	**Meter Station**	**Cost / Station**	**Total Stations**	**Total**	
20	3-1 - Small Meter Station Removal	$ 11,144	2	$ 22,288	
21	3-2 - Small Meter Station Sub Material Removal	$ 13,974	2	$ 27,949	
22	3-3 - Small Meter Station Backfill and Restoration	$ 12,524	2	$ 25,048	
23				*	**$ 69,111**
24	3-4 - Medium Meter Station Removal	$ 42,966	2	$ 85,933	
25	3-5 - Medium Meter Station Sub Material Removal	$ 45,977	2	$ 91,954	
26	3-6 - Medium Meter Station Backfill and Restoration	$ 71,288	2	$ 142,576	
27				*	**$ 294,185**
28	3-7 - Large Meter Station Removal	$ 42,422	3	$ 127,267	
29	3-8 - Large Meter Station Sub Material Removal	$ 54,792	3	$ 164,375	
30	3-9 - Large Meter Station Backfill and Restoration	$ 78,155	3	$ 234,466	
31				*	**$ 482,968**
33	**Compressor Station**	**Ave. Cost / Station**	**Total Stations**	**Total**	
34	Compressor Station Removal	$ 3,278,061	1	$ 3,278,061	
35				*	**$ 3,009,260**
37	**Cathodic Protection**	**Cost / CP**	**Total CP**	**Total**	
38	5-1 - Cathodic Protection - Rectifier Removal	$ 3,541	10	$ 35,410	
39	5-2 - Cathodic Protection - Test Site Removal	$ 346	10	$ 3,457	
40				*	**$ 35,680**
42	**Right of Way Markers**	**Cost / ROW**	**Total ROW**	**Total**	
43	6-1 - ROW Marker Removal	$ 58	1330	$ 77,055	
44				*	**$ 70,737**
46	**Tap Removal**	**Cost / Tap**	**Total Taps**	**Total**	
47	7-1 - Tap Locations	$ 6,384	44	$ 280,898	
48				*	**$ 257,865**
58	**Mainline Valve**	**Cost / Location**	**Total Valves**	**Total**	
59	8-1 - Mainline Valve Site	$ 10,795	18	$ 194,303	
60				*	**$ 178,370**
49					
50				Base Total:	$ 24,667,052
51			C.M. Expense	$ 616,676	
52					$ 25,283,728
53	B. CONTINGENCY		10% Contingency Fees	$ 2,528,373	
54				Subtotal:	$ 27,812,101
55	C. SALVAGE				
56				Salvage Material - Scrap Metal:	$ (656,244)
58					
59				**Grand Total:**	**$ 27,155,857**
60	* City Cost Index Adjustment Factor Used = 0.9180				
61	0.9409 is the Average City Cost Index Adjustment Factor of locations found within CPC's Geographic Locations				

1-1 - Pipeline Clean and Purge
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for small equipment, placed in rear of, or towed by pickup truck	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton	4	2	$ -	$ 130.00	$ 48.50	$ 178.50
16588	C.F.	Gas Pipelines, Nitrogen purge method, lengths 1000' to 10,000'		0	0	$1,824.68	$ 2,156.44	$ 1,824.68	$ 5,805.80
5280	L.F.	Sewer pipelines, cleaning, pig method, lengths 1000' to 10,000', 4" diameter through 24" diameter, minimum		0	0	$ -	$ -	$ -	$ 21,859.20
15	Ton	Hazardous waste cleanup/pickup/disposal, dumpsite disposal charge, maximum		0	0	$ -	$ -	$ -	$ 6,825.00
0.8	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 1,640.00	$ -	$ 1,640.00
0.4	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 820.00	$ -	$ 820.00
0.2	Week	Field personnel, field engineer, engineer,		0	0	$ -	$ 555.00	$ -	$ 555.00
0.2	Week	Field personnel, field engineer, engineer,		0	0	$ -	$ 555.00	$ -	$ 555.00
1	Ea.	Mobilization or demobilization, delivery charge for small equipment, placed in rear of, or towed by pickup truck	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton	4	2	$ -	$ 130.00	$ 48.50	$ 178.50
1	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 535.00	$ -	$ 535.00
0.5	Day	Environmental Engineer		1	8	$ -	$ 257.50	$ -	$ 257.50
114	$/Day	Per Diem		1	100	$ -	$ -	$ -	$ 1,420.83
1	Job	Permitting cost		0	0	$ -	$ 812.61	$ -	$ 812.61

Total **$ 41,442.94**

1-2 - Trench Excavation
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
5280	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 475.20	$ 8,923.20	$ 211.20	$ 9,609.60
10560	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$5,068.80	$ 21,859.20	$ 3,168.00	$ 30,096.00
391	C.Y.	Topsoil stripping and stockpiling, topsoil, sandy loam, ideal conditions, 200 HP dozer	1 Equip. Oper. (medium) .5 Laborer 1 Dozer, 200 H.P.	2300	0	$ -	$ 93.84	$ 285.43	$ 379.27
2124	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering	1 Equip. Oper. (crane) 1 Laborer 1 Hyd. Excavator, .75 C.Y.	270	0.06	$ -	$ 7,709.56	$ 6,074.20	$ 13,783.75
17	Day	Rent truck pickup 3/4 ton 4 wheel drive, Incl. Hourly		0	0	$ -	$ -	$ 4,559.06	$ 4,559.06
3	Week	Field personnel, field engineer, senior engineer,		0	0	$ -	$ 10,875.00	$ -	$ 10,875.00
3	Week	Field personnel, superintendent, maximum		0	0	$ -	$ 9,750.00	$ -	$ 9,750.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
17	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 9,095.00	$ -	$ 9,095.00
8	Day	Environmental Engineer		1	8	$ -	$ 4,120.00	$ -	$ 4,120.00
114	$/Day	Per Diem		1	32.12	$ -	$ -	$ -	$ 456.37
1	Job	Permitting cost		0	0	$ -	$ 1,890.28	$ -	$ 1,890.28

Total **$ 96,404.33**

1-3 - Pipe Removal
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
5280	L.F.	Selective demolition, natural gas, steel pipe, pipe, 18" - 24", excludes excavation	1 Equip. Oper. (crane) 1 Hyd. Crane, 25 Ton (Daily)	160	0.2	$ -	$ 60,456.00	$ 30,888.00	$ 91,344.00
33	Ea.	Delivery charge for pipe, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 16,995.00	$ 12,540.00	$ 29,535.00
33	Day	Crane crew, daily use for small jobs, 25-ton truck-mounted hydraulic crane,	1 Equip. Oper. (crane) 1 Hyd. Crane, 25 Ton (Daily)	1	8	$ -	$ 18,810.00	$ 29,370.00	$ 48,180.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
33	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 17,655.00	$ -	$ 17,655.00
16	Day	Environmental Engineer		1	8	$ -	$ 8,240.00	$ -	$ 8,240.00
114	$/Day	Per Diem		1	48.2	$ -	$ -	$ -	$ 684.84
1	Job	Permitting cost		0	0	$ -	$ 3,948.58	$ -	$ 3,948.58

Total **$ 201,377.42**

1-4 - Trench Backfill
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
22	M.S.F.	Soil preparation, structural soil mixing, scarify subsoil, municipal, 50 HP skid steer loader w/scarifiers	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	120	0.07	$ -	$ 95.48	$ 53.90	$ 149.38
614	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 4,052.69	$ 5,434.29	$ 9,486.99
614	C.Y.	Soils for earthwork, common borrow, spread with 200 HP dozer, includes load at pit and haul, 2 miles round trip, excludes compaction	1 Equipment Oper. (med.) .5 Laborer 2 Truck Drivers (heavy) 2 Dump Trucks, 12 C.Y., 400 H.P. 1 Dozer, 200 H.P.	600	0.05	$ 9,118.56	$ 1,750.03	$ 3,014.96	$ 13,883.54
3129	C.Y.	Topsoil stripping and stockpiling, topsoil, sandy loam, ideal conditions, 200 HP dozer	1 Equip. Oper. (medium) .5 Laborer 1 Dozer, 200 H.P.	2300	0	$ -	$ 750.96	$ 2,284.17	$ 3,035.13
3129	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$ 36,452.85	$ 18,461.10	$ 54,913.95
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 40-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (medium) 1 Truck Tractor, 6x4, 380 H.P. 1 Flatbed Trailer, 40 Ton	2	8	$ -	$ 515.00	$ 380.00	$ 895.00
40	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 21,400.00	$ -	$ 21,400.00
20	Day	Environmental Engineer		1	8	$ -	$ 10,300.00	$ -	$ 10,300.00
114	$/Day	Per Diem		1	32.43	$ -	$ -	$ -	$ 460.78
1	Job	Permitting cost		0	0	$ -	$ 2,308.40	$ -	$ 2,308.40

Total **$117,728.17**

1-5 - Trench Restoration
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for small equipment, placed in rear of, or towed by pickup truck		4	2	$ -	$ 130.00	$ 48.50	$ 178.50
5	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor		1.5	16	$ -	$ 4,475.00	$ 660.00	$ 5,135.00
2347	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.		2500	0	$610.22	$ 492.87	$ 281.64	$ 1,384.73
1	Ea.	Mobilization or demobilization, delivery charge for small equipment, placed in rear of, or towed by pickup truck		4	2	$ -	$ 130.00	$ 48.50	$ 178.50
4	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 2,140.00	$ -	$ 2,140.00
2	Day	Environmental Engineer		1	8	$ -	$ 1,030.00	$ -	$ 1,030.00
114	$/Day	Per Diem		1	36	$ -	$ -	$ -	$ 511.50
1	Job	Permitting cost		0	0	$ -	$ 211.16	$ -	$ 211.16

Total **$ 10,769.39**

2-2 - Road Crossing Abandonment
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
800	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 72.00	$ 1,352.00	$ 32.00	$ 1,456.00
800	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 384.00	$ 1,656.00	$ 240.00	$ 2,280.00
8	Ea.	8'x16' 3-Ply Temp. Matting, Includes Install/Remove, 6" Mulch		0	0	$14,256.00	$ -	$ -	$ 14,256.00
10	C.Y.	Subsurface investigation, test pits, loader/backhoe, light soil	1 Equipment Oper. (med.) 1 Laborer 1 Backhoe Loader, 80 H.P.	28	0.57	$ -	$ 345.00	$ 92.50	$ 437.50
30	L.F.	Sewer pipelines, cleaning, pig method, lengths 1000' to 10,000', 4" diameter through 24" diameter, minimum		0	0	$ -	$ -	$ -	$ 124.20
0.4	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 820.00	$ -	$ 820.00
0.2	Week	Field personnel, field engineer, engineer, average		0	0	$ -	$ 555.00	$ -	$ 555.00
95	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 11.40	$ 15.20	$ 11.40	$ 38.00
4	C.Y.	Structural concrete, ready mix, flowable fill, 40-80 psi, includes ash, Portland cement Type I, sand and water, delivered, excludes all additives and treatments		0	0	$ 338.00	$ -	$ -	$ 338.00
4	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 288.00	$ -	$ 288.00
4	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,200.00	$ 1,260.00	$ -	$ 2,460.00
10	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$ 116.50	$ 59.00	$ 175.50
14.22	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	2500	0	$ 3.70	$ 2.99	$ 1.71	$ 8.39
2	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,070.00	$ -	$ 1,070.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	65.11	$ -	$ -	$ -	$ 925.10
1	Job	Permitting cost		0	0	$ -	$ 520.87	$ -	$ 520.87

Total **$ 26,564.56**

2-4 - HIghway Crossing Abandonment
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
800	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 72.00	$ 1,352.00	$ 32.00	$ 1,456.00
800	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 384.00	$ 1,656.00	$ 240.00	$ 2,280.00
10	C.Y.	Subsurface investigation, test pits, loader/backhoe, light soil	1 Equipment Oper. (med.) 1 Laborer 1 Backhoe Loader, 80 H.P.	28	0.57	$ -	$ 345.00	$ 92.50	$ 437.50
8	Ea.	8'x16' 3-Ply Temp. Matting, Includes Install/Remove, 6" Mulch		0	0	$14,256.00	$ -	$ -	$ 14,256.00
150	L.F.	Sewer pipelines, cleaning, pig method, lengths 1000' to 10,000', 4" diameter through 24" diameter, minimum		0	0	$ -	$ -	$ -	$ 621.00
0.4	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 820.00	$ -	$ 820.00
0.2	Week	Field personnel, field engineer, engineer, average		0	0	$ -	$ 555.00	$ -	$ 555.00
472	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 56.64	$ 75.52	$ 56.64	$ 188.80
18	C.Y.	Structural concrete, ready mix, flowable fill, 40-80 psi, includes ash, Portland cement Type I, sand and water, delivered, excludes all additives and treatments		0	0	$ 1,521.00	$ -	$ -	$ 1,521.00
4	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 288.00	$ -	$ 288.00
4	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,200.00	$ 1,260.00	$ -	$ 2,460.00
10	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$ 116.50	$ 59.00	$ 175.50
14.22	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	2500	0	$ 3.70	$ 2.99	$ 1.71	$ 8.39
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	68.11	$ -	$ -	$ -	$ 967.73
1	Job	Permitting cost		0	0	$ -	$ 574.98	$ -	$ 574.98

Total **$ 29,323.90**

2-5 - Railroad Crossing Abandonment
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
800	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman	1000	0.02	$ 72.00	$1,352.00	$ 32.00	$ 1,456.00
800	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light)	650	0.04	$ 384.00	$1,656.00	$ 240.00	$ 2,280.00
16	Ea.	8'x16' 3-Ply Temp. Matting, Includes Install/Remove, 6" Mulch		0	0	$28,512.00	$ -	$ -	$28,512.00
10	C.Y.	Subsurface investigation, test pits, loader/backhoe, light soil	1 Equipment Oper. (med.) 1 Laborer 1 Backhoe Loader, 80 H.P.	28	0.57	$ -	$ 345.00	$ 92.50	$ 437.50
200	L.F.	Sewer pipelines, cleaning, pig method, lengths 1000' to 10,000', 4" diameter through 24" diameter, minimum		0	0	$ -	$ -	$ -	$ 828.00
0.4	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 820.00	$ -	$ 820.00
0.2	Week	Field personnel, field engineer, engineer, average		0	0	$ -	$ 555.00	$ -	$ 555.00
629	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 75.48	$ 100.64	$ 75.48	$ 251.60
24	C.Y.	Structural concrete, ready mix, flowable fill, 40-80 psi, includes ash, Portland cement Type I, sand and water, delivered, excludes all additives and treatments		0	0	$ 2,028.00	$ -	$ -	$ 2,028.00
4	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 288.00	$ -	$ 288.00
4	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,200.00	$1,260.00	$ -	$ 2,460.00
1	Day	Rent tractor with A frame boom and winch 225 HP, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 545.95	$ 545.95
1	Day	Rent crane, flatbed mounted, 3 ton capacity, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 351.60	$ 351.60
10	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$ 116.50	$ 59.00	$ 175.50
14.22	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	2500	0	$ 3.70	$ 2.99	$ 1.71	$ 8.39
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	68.11	$ -	$ -	$ -	$ 967.73
1	Job	Permitting cost		0	0	$ -	$ 893.59	$ -	$ 893.59

Total **$45,572.86**

2-7 - Water Crossing Abandonment
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
2	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 390.00	$ 204.00	$ 594.00
800	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 72.00	$ 1,352.00	$ 32.00	$ 1,456.00
800	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 384.00	$ 1,656.00	$ 240.00	$ 2,280.00
16	Ea.	8'x16' 3-Ply Temp. Matting, Includes Install/Remove, 6" Mulch		0	0	$28,512.00	$ -	$ -	$ 28,512.00
10	C.Y.	Subsurface investigation, test pits, loader/backhoe, light soil	1 Equipment Oper. (med.) 1 Laborer 1 Backhoe Loader, 80 H.P.	28	0.57	$ -	$ 345.00	$ 92.50	$ 437.50
150	L.F.	Sewer pipelines, cleaning, pig method, lengths 1000' to 10,000', 4" diameter through 24" diameter, minimum		0	0	$ -	$ -	$ -	$ 621.00
0.4	Week	Field personnel, general purpose laborer, average		0.2	40	$ -	$ 820.00	$ -	$ 820.00
0.2	Week	Field personnel, field engineer, engineer, average		0	0	$ -	$ 555.00	$ -	$ 555.00
472	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 56.64	$ 75.52	$ 56.64	$ 188.80
18	C.Y.	Structural concrete, ready mix, flowable fill, 40-80 psi, includes ash, Portland cement Type I, sand and water, delivered, excludes all additives and treatments		0	0	$ 1,521.00	$ -	$ -	$ 1,521.00
4	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint		15	1.07	$ -	$ 288.00	$ -	$ 288.00
4	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,200.00	$ 1,260.00	$ -	$ 2,460.00
1	Day	Rent tractor with A frame boom and winch 225 HP, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 545.95	$ 545.95
1	Day	Rent crane, flatbed mounted, 3 ton capacity, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 351.60	$ 351.60
14.22	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	2500	0	$ 3.70	$ 2.99	$ 1.71	$ 8.39
2	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 390.00	$ 204.00	$ 594.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	59.91	$ -	$ -	$ -	$ 851.22
1	Job	Permitting cost		0	0	$ -	$ 884.09	$ -	$ 884.09

Total **$ 45,088.55**

3-1 - Small Meter Station Removal
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
92	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 8.28	$ 155.48	$ 3.68	$ 167.44
92	L.F.	Fencing demolition, remove chain link posts & fabric, 8' to 10' high	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	445	0.05	$ -	$ 277.84	$ 48.76	$ 326.60
1	Ea.	Steel tank, single wall, above ground, 15,000 thru 30,000 gallon, selective demolition, excluding foundation, pumps or piping	2 Pipe Fitters 1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Flatbed Trailer, 40 Ton 1 Truck Tractor, 6x4, 380 H.P. 1 Hyd. Crane, 80 Ton 1 Hyd. Excavator, 2 C.Y.	2	16	$ -	$ 1,150.00	$ 1,700.00	$ 2,850.00
2	Ea.	Selective demolition, parking appurtenances, pipe bollards, 6"-12" diameter	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	80	0.3	$ -	$ 33.60	$ 5.94	$ 39.54
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
1	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 535.00	$ -	$ 535.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	80.37	$ -	$ -	$ -	$ 1,141.92
1	Job	Permitting cost		0	0	$ -	$ 218.51	$ -	$ 218.51

Total **$ 11,144.01**

3-2 - Small Meter Station Sub Material Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
92	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high		650	0.04	$ 44.16	$ 190.44	$ 27.60	$ 262.20
58	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering		270	0.06	$ -	$ 210.54	$ 165.88	$ 376.42
58	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 382.80	$ 513.30	$ 896.10
4	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 288.00	$ -	$ 288.00
4	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,200.00	$ 1,260.00	$ -	$ 2,460.00
1	Ea.	Selective demolition, utility materials, utility valves, 14"-24", excludes excavation		2	14	$ -	$ 770.00	$ 105.00	$ 875.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		0	0	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	75.49	$ -	$ -	$ -	$ 1,072.59
1	Job	Permitting cost		0	0	$ -	$ 274.01	$ -	$ 274.01

Total **$ 13,974.32**

3-3 - Small Meter Station Backfill and Restoration
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
92	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 607.20	$ 814.20	$ 1,421.40
2	M.S.F.	Soil preparation, structural soil mixing, scarify subsoil, municipal, 50 HP skid steer loader w/scarifiers		120	0.07	$ -	$ 8.68	$ 4.90	$ 13.58
1	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor		1.5	16	$ -	$ 895.00	$ 132.00	$ 1,027.00
92	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$ 1,071.80	$ 542.80	$ 1,614.60
92	S.Y.	Seeding, mechanical seeding hydro or air seeding for large areas, includes lime, fertilizer and seed with wood fiber mulch added		8900	0	$ 222.64	$ 9.20	$ 6.44	$ 238.28
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
2	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,070.00	$ -	$ 1,070.00
1	Day	Environmental Engineer		0	0	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	72.38	$ -	$ -	$ -	$ 1,028.40
1	Job	Permitting cost		0	0	$ -	$ 245.57	$ -	$ 245.57

Total **$ 12,523.83**

Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

3-4 - Medium Meter Station Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
489	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 44.01	$ 826.41	$ 19.56	$ 889.98
489	L.F.	Fencing demolition, remove chain link posts & fabric, 8' to 10' high	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	445	0.05	$ -	$ 1,476.78	$ 259.17	$ 1,735.95
22529	C.F.	Building demolition, small buildings or single buildings, steel, includes 20 mile haul, excludes salvage, foundation demolition or dump fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (medium) 2 Truck Drivers (heavy) 1 Crawler Loader, 3 C.Y. 2 Dump Trucks, 12 C.Y., 400 H.P.	14800	0	$ -	$ 4,280.51	$ 3,829.93	$ 8,110.44
3	Ea.	Steel tank, single wall, above ground, 15,000 thru 30,000 gallon, selective demolition, excluding foundation, pumps or piping	2 Pipe Fitters 1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Flatbed Trailer, 40 Ton 1 Truck Tractor, 6x4, 380 H.P. 1 Hyd. Crane, 80 Ton 1 Hyd. Excavator, 2 C.Y.	2	16	$ -	$ 3,450.00	$ 5,100.00	$ 8,550.00
1119	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 111.90	$ 134.28	$ 111.90	$ 358.08
356	L.F.	Selective demolition, natural gas, steel pipe, pipe, 18" - 24", excludes excavation	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (crane) 2 Cutting Torches 2 Sets of Gases 1 Hyd. Crane, 12 Ton	160	0.2	$ -	$ 4,076.20	$ 2,082.60	$ 6,158.80
4	Day	Rented truck, flatbed, GVW = 20,000 Lbs, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 1,133.08	$ 1,133.08
4	Day	Crane crew, daily use for small jobs, 25-ton truck-mounted hydraulic crane, portal to portal	1 Equip. Oper. (crane) 1 Hyd. Crane, 25 Ton (Daily)	1	8	$ -	$ 2,280.00	$ 3,560.00	$ 5,840.00
2	Ea.	Selective demolition, utility poles & cross arms, utility poles, wood, 20'-30' high	1 Electrician Foreman 1 Electrician .5 Equip. Oper. (crane) .5 S.P. Crane, 4x4, 5 Ton	6	3.33	$ -	$ 506.00	$ 70.00	$ 576.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	91.6	$ -	$ -	$ -	$ 1,301.48
1	Job	Permitting cost		0	0	$ -	$ 842.48	$ -	$ 842.48

Total **$ 42,966.29**

3-5 - Medium Meter Station Sub Material Removal
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
489	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high		650	0.04	$ 234.72	$ 1,012.23	$ 146.70	$ 1,393.65
72	S.Y.	Demolish, remove pavement & curb, remove concrete, rod reinforced, to 6" thick, excludes hauling and disposal fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (light) 1 Equip. Oper. (medium) 1 Backhoe Loader, 48 H.P. 1 Hyd. Hammer (1200 lb.) 1 F.E. Loader, W.M., 4 C.Y. 1 Pvmt. Rem. Bucket	200	0.12	$ -	$ 482.40	$ 482.40	$ 964.80
12	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 79.20	$ 106.20	$ 185.40
1333	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering		270	0.06	$ -	$ 4,838.79	$ 3,812.38	$ 8,651.17
1333	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 8,797.80	$11,797.05	$ 20,594.85
6	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 432.00	$ -	$ 432.00
6	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,800.00	$ 1,890.00	$ -	$ 3,690.00
1	Ea.	Selective demolition, septic tanks and related components, precast septic tanks, 1000-1250 gal., excludes excavation	1 Labor Foreman (outside) 1 Skilled Worker 1 Laborer .5 Equip. Oper. (crane) .5 S.P. Crane, 4x4, 5 Ton	8	3.5	$ -	$ 193.00	$ 26.50	$ 219.50
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
7	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 3,745.00	$ -	$ 3,745.00
3	Day	Environmental Engineer		0	0	$ -	$ 1,545.00	$ -	$ 1,545.00
114	$/Day	Per Diem		1	65.22	$ -	$ -	$ -	$ 926.67
1	Job	Permitting cost		0	0	$ -	$ 953.96	$ -	$ 953.96

Total **$ 45,977.00**

3-6 - Medium Meter Station Backfill and Restoration
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
1333	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 8,797.80	$11,797.05	$ 20,594.85
12	M.S.F.	Soil preparation, structural soil mixing, scarify subsoil, municipal, 50 HP skid steer loader w/scarifiers		120	0.07	$ -	$ 52.08	$ 29.40	$ 81.48
12	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor		1.5	16	$ -	$10,740.00	$ 1,584.00	$ 12,324.00
1333	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$15,529.45	$ 7,864.70	$ 23,394.15
1333	S.Y.	Seeding, mechanical seeding hydro or air seeding for large areas, includes lime, fertilizer and seed with wood fiber mulch added		8900	0	$ 3,225.86	$ 133.30	$ 93.31	$ 3,452.47
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
8	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 4,280.00	$ -	$ 4,280.00
4	Day	Environmental Engineer		0	0	$ -	$ 2,060.00	$ -	$ 2,060.00
114	$/Day	Per Diem		1	72.38	$ -	$ -	$ -	$ 1,028.40
1	Job	Permitting cost		0	0	$ -	$ 1,397.81	$ -	$ 1,397.81

Total **$ 71,288.16**

3-7 - Large Meter Station Removal
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
439	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 39.51	$ 741.91	$ 17.56	$ 798.98
439	L.F.	Fencing demolition, remove chain link posts & fabric, 8' to 10' high	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	445	0.05	$ -	$ 1,325.78	$ 232.67	$ 1,558.45
13	Ea.	Selective demolition, parking appurtenances, pipe bollards, 6"-12" diameter	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	80	0.3	$ -	$ 218.40	$ 38.61	$ 257.01
40079	C.F.	Building demolition, small buildings or single buildings, steel, includes 20 mile haul, excludes salvage, foundation demolition or dump fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (medium) 2 Truck Drivers (heavy) 1 Crawler Loader, 3 C.Y. 2 Dump Trucks, 12 C.Y., 400 H.P.	14800	0	$ -	$ 7,615.01	$ 6,813.43	$ 14,428.44
2	Ea.	Steel tank, single wall, above ground, 15,000 thru 30,000 gallon, selective demolition, excluding foundation, pumps or piping	2 Pipe Fitters 1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Flatbed Trailer, 40 Ton 1 Truck Tractor, 6x4, 380 H.P. 1 Hyd. Crane, 80 Ton 1 Hyd. Excavator, 2 C.Y.	2	16	$ -	$ 2,300.00	$ 3,400.00	$ 5,700.00
1348	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 134.80	$ 161.76	$ 134.80	$ 431.36
429	L.F.	Selective demolition, natural gas, steel pipe, pipe, 18" - 24", excludes excavation	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (crane) 2 Cutting Torches 2 Sets of Gases 1 Hyd. Crane, 12 Ton	160	0.2	$ -	$ 4,912.05	$ 2,509.65	$ 7,421.70
3	Day	Rented truck, flatbed, GVW = 20,000 Lbs, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 849.81	$ 849.81
3	Day	Crane crew, daily use for small jobs, 25-ton truck-mounted hydraulic crane, portal to portal	1 Equip. Oper. (crane) 1 Hyd. Crane, 25 Ton (Daily)	1	8	$ -	$ 1,710.00	$ 2,670.00	$ 4,380.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	64.57	$ -	$ -	$ -	$ 917.43
1	Job	Permitting cost		0	0	$ -	$ 884.26	$ -	$ 884.26

Total **$ 42,422.44**

3-8 - Large Meter Station Sub Material Removal
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
439	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high		650	0.04	$ 210.72	$ 908.73	$ 131.70	$ 1,251.15
128	S.Y.	Demolish, remove pavement & curb, remove concrete, rod reinforced, to 6" thick, excludes hauling and disposal fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (light) 1 Equip. Oper. (medium) 1 Backhoe Loader, 48 H.P. 1 Hyd. Hammer (1200 lb.) 1 F.E. Loader, W.M., 4 C.Y. 1 Pvmt. Rem. Bucket	200	0.12	$ -	$ 857.60	$ 857.60	$ 1,715.20
22	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 145.20	$ 194.70	$ 339.90
1329	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering		270	0.06	$ -	$ 4,824.27	$ 3,800.94	$ 8,625.21
1329	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 8,771.40	$11,761.65	$ 20,533.05
6	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 432.00	$ -	$ 432.00
6	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 1,800.00	$ 1,890.00	$ -	$ 3,690.00
8	Ea.	Selective demolition, utility materials, utility valves, 14"-24", excludes excavation		2	14	$ -	$ 6,160.00	$ 840.00	$ 7,000.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
5	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 2,675.00	$ -	$ 2,675.00
2	Day	Environmental Engineer		0	0	$ -	$ 1,030.00	$ -	$ 1,030.00
114	$/Day	Per Diem		1	75.72	$ -	$ -	$ -	$ 1,075.86
1	Job	Permitting cost		0	0	$ -	$ 1,074.35	$ -	$ 1,074.35

Total **$ 54,791.72**

3-9 - Large Meter Station Backfill and Restoration
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
1329	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment		72	0.11	$ -	$ 8,771.40	$11,761.65	$ 20,533.05
12	M.S.F.	Soil preparation, structural soil mixing, scarify subsoil, municipal, 50 HP skid steer loader w/scarifiers		120	0.07	$ -	$ 52.08	$ 29.40	$ 81.48
12	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor		1.5	16	$ -	$10,740.00	$ 1,584.00	$ 12,324.00
1329	E.C.Y.	Backfill, bulk, air tamped compaction, add	1 Equipment Oper. (light) 1 Laborer 1 Air Powered Tamper 1 Air Compressor, 365 cfm 2 -50' Air Hoses, 1.5	80	0.2	$ -	$15,482.85	$ 7,841.10	$ 23,323.95
1329	S.Y.	Seeding, mechanical seeding hydro or air seeding for large areas, includes lime, fertilizer and seed with wood fiber mulch added		8900	0	$ 3,216.18	$ 132.90	$ 93.03	$ 3,442.11
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
17	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 9,095.00	$ -	$ 9,095.00
8	Day	Environmental Engineer		0	0	$ -	$ 4,120.00	$ -	$ 4,120.00
114	$/Day	Per Diem		1	72.38	$ -	$ -	$ -	$ 1,028.40
1	Job	Permitting cost		0	0	$ -	$ 1,532.46	$ -	$ 1,532.46

Total **$ 78,155.45**

Cardinal Pipeline Company, LLC
Compressor Station Summary Report

Line No.		Particular (A)		Cost ($) (B)	Total Cost ($)
1	1	**Clayton**		**Cost / Phase**	
2		4-1 - Compressor Station Removal	$	453,588	
3		4-2 - Compressor Station Sub Material Removal	$	1,988,334	
4		4-3 - Compressor Station Backfill and Restoration	$	836,139	
5				Total	**$3,278,061**

4-1 - Clayton Compressor Station Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
2014	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 181.26	$ 3,403.66	$ 80.56	$ 3,665.48
2014	L.F.	Fencing demolition, remove chain link posts & fabric, 8' to 10' high	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	445	0.05	$ -	$ 6,082.28	$ 1,067.42	$ 7,149.70
2639	C.F.	Gas pipelines, nitrogen purge method		0	0	$ 263.90	$ 316.68	$ 263.90	$ 844.48
840	L.F.	Selective demolition, natural gas, steel pipe, pipe, 18" - 24", excludes excavation	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (crane) 2 Cutting Torches 2 Sets of Gases 1 Hyd. Crane, 12 Ton	160	0.2	$ -	$ 9,618.00	$ 4,914.00	$ 14,532.00
494369	C.F.	Building demolition, small buildings or single buildings, steel, includes 20 mile haul, excludes salvage, foundation demolition or dump fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (medium) 2 Truck Drivers (heavy) 1 Crawler Loader, 3 C.Y. 2 Dump Trucks, 12 C.Y., 400 H.P.	14800	0	$ -	$ 93,930.11	$84,042.73	$ 177,972.84
3	Ea.	Boiler, gas and or oil or solid, 12,200 thru 25,000 MBH, selective demolition	1 Steamfitter Foreman (inside) 2 Steamfitters 1 Steamfitter Apprentice	0.12	267	$ -	$ 56,100.00	$ -	$ 56,100.00
11	Ea.	Air conditioner, split unit air conditioner, package unit, 3 ton, selective demolition	2 Steamfitters 1 Steamfitter Apprentice	3	8	$ -	$ 5,940.00	$ -	$ 5,940.00
27	Ea.	Steel tank, single wall, above ground, 15,000 thru 30,000 gallon, selective demolition, excluding foundation, pumps or piping	2 Pipe Fitters 1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Flatbed Trailer, 40 Ton 1 Truck Tractor, 6x4, 380 H.P. 1 Hyd. Crane, 80 Ton 1 Hyd. Excavator, 2 C.Y.	2	16	$ -	$ 31,050.00	$45,900.00	$ 76,950.00
9	Ea.	Selective demolition, utility poles & cross arms, utility poles, wood, 20'-30' high	1 Electrician Foreman 1 Electrician .5 Equip. Oper. (crane) .5 S.P. Crane, 4x4, 5 Ton	6	3.33	$ -	$ 2,277.00	$ 315.00	$ 2,592.00
1	Ea.	Selective demolition, radio towers, guyed, 200' high, 70 lb section	1 Struc. Steel Foreman (outside) 1 Struc. Steel Worker 1 Truck Driver (light) 1 Flatbed Truck, Gas, 3 Ton	0.7	34.29	$ -	$ 2,350.00	$ 1,325.00	$ 3,675.00
42	Day	Crane crew, daily use for small jobs, 25-ton truck-mounted hydraulic crane, portal to portal	1 Equip. Oper. (crane) 1 Hyd. Crane, 25 Ton (Daily)	1	8	$ -	$ 23,940.00	$37,380.00	$ 61,320.00
42	Day	Rent trailer, platform, flush deck 2 axle, 25 ton, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 9,031.26	$ 9,031.26
40	Ton	Selective demolition, dump charges, typical urban city, rubbish only, includes tipping fees only		0	0	$2,780.00	$ -	$ -	$ 2,780.00

1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
14	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 7,490.00	$ -	$ 7,490.00
7	Day	Environmental Engineer		1	8	$ -	$ 3,605.00	$ -	$ 3,605.00
114	$/Day	Per Diem		1	400.9	$ -	$ -	$ -	$ 5,695.98
1	Job	Permitting cost		0	0	$ -	$ 8,893.87	$ -	$ 8,893.87

Total **$ 453,587.61**

4-2 - Clayton Compressor Station Sub Material Removal
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
2014	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 966.72	$ 4,168.98	$ 604.20	$ 5,739.90
26529	C.F.	Selective demolition, cutout, concrete, elevated slab, bar reinforced, over 6 C.F., excludes loading and disposal	1 Labor Foreman (outside) 4 Laborers 1 Air Compressor, 250 cfm 2 Breakers, Pavement, 60 lb. 2 -50' Air Hoses, 1.5	50	0.8	$ -	$ 1,100,953.50	$ 206,926.20	$ 1,307,879.70
5263	S.Y.	Demolish, remove pavement & curb, remove concrete, rod reinforced, to 6" thick, excludes hauling and disposal fees	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (light) 1 Equip. Oper. (medium) 1 Backhoe Loader, 48 H.P. 1 Hyd. Hammer (1200 lb.) 1 F.E. Loader, W.M., 4 C.Y. 1 Pvmt. Rem. Bucket	200	0.12	$ -	$ 35,262.10	$ 35,262.10	$ 70,524.20
1860	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 12,276.00	$ 16,461.00	$ 28,737.00
15280	B.C.Y.	Excavating, bulk, dozer, open site, bank measure, sand and gravel, 200 HP dozer, 300' haul	1 Equip. Oper. (medium) .5 Laborer 1 Dozer, 200 H.P.	310	0.03	$ -	$ 27,351.20	$ 82,512.00	$ 109,863.20
15280	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 100,848.00	$ 135,228.00	$ 236,076.00
2	Month	Rent front end loader, 4WD, art. frame, diesel, 7 - 9 CY 475 HP, Incl. Hourly Oper. Cost.		0	0	$ -	$ -	$ 83,420.48	$ 83,420.48
8	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 576.00	$ -	$ 576.00
8	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 2,400.00	$ 2,520.00	$ -	$ 4,920.00
40	Ton	Selective demolition, dump charges, typical urban city, rubbish only, includes tipping fees only		0	0	$ 2,780.00	$ -	$ -	$ 2,780.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,575.00	$ 1,100.00	$ 2,675.00
117	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 62,595.00	$ -	$ 62,595.00
58	Day	Environmental Engineer		1	9	$ -	$ 29,870.00	$ -	$ 29,870.00
114	$/Day	Per Diem		1	71.49	$ -	$ -	$ -	$ 1,015.75
1	Job	Permitting cost		0	0	$ -	$ 38,986.94	$ -	$ 38,986.94

Total **$ 1,988,334.17**

4-3 - Albany Compressor Station Backfill and Restoration
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,525.00	$ 1,000.00	$ 2,525.00
138	M.S.F.	Soil preparation, structural soil mixing, scarify subsoil, municipal, 50 HP skid steer loader w/scarifiers	1 Equip. Oper. (light) 1 Loader-Backhoe, 40 H.P.	120	0.07	$ -	$ 590.64	$ 304.98	$ 895.62
15280	C.Y.	Soils for earthwork, common borrow, spread with 200 HP dozer, includes load at pit and haul, 2 miles round trip, excludes compaction	1 Equipment Oper. (med.) .5 Laborer 2 Truck Drivers (heavy) 2 Dump Trucks, 12 C.Y., 400 H.P. 1 Dozer, 200 H.P.	600	0.05	$211,628.00	$ 42,784.00	$ 74,260.80	$ 328,672.80
15280	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 99,320.00	$133,700.00	$ 233,020.00
138	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	1.5	16	$ -	$121,440.00	$ 17,940.00	$ 139,380.00
15280	E.C.Y.	Backfill, bulk, 6" to 12" lifts, dozer backfilling, compaction with vibrating roller	1 Equip. Oper. (medium) .5 Laborer 1 Dozer, 200 H.P. 1 Vibratory Roller, Towed, 23 Ton	800	0.01	$ -	$ 10,543.20	$ 42,936.80	$ 53,480.00
15280	S.Y.	Seeding, mechanical seeding hydro or air seeding for large areas, includes lime, fertilizer and seed with wood fiber mulch added	1 Laborer 1 Equip. Oper. (medium) 1 Truck Driver (heavy) 1 Hydromulcher, T.M., 3000 Gal. 1 Truck Tractor, 220 H.P.	8900	0	$ 34,838.40	$ 1,528.00	$ 1,069.60	$ 37,436.00
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 50-ton capacity towed trailer	1 Truck Driver (heavy) 1 Equip. Oper. (crane) 1 Equip. Oper. (light) 1 Truck Tractor, 6x4, 450 H.P. 1 Equipment Trailer, 50 Ton 1 Pickup Truck, 4x4, 3/4 Ton	1	24	$ -	$ 1,525.00	$ 1,000.00	$ 2,525.00
26	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 13,780.00	$ -	$ 13,780.00
13	Day	Environmental Engineer		1	8	$ -	$ 6,890.00	$ -	$ 6,890.00
114	$/Day	Per Diem		1	80.24	$ -	$ -	$ -	$ 1,140.08
1	Job	Permitting cost		0	0	$ -	$ 16,394.89	$ -	$ 16,394.89

Total **$ 836,139.39**

5-1 - Cathodic Protection - Rectifier Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
3	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 585.00	$ 306.00	$ 891.00
10	Ea.	Cathodic protection, rectifiers, silicon type, air cooled, 28 V/10 A, underground storage tanks	.5 Electrician Foreman 2 Electricians	3.5	5.71	########	$ 4,400.00	$ -	$ 30,400.00
0.25	Ton	Selective demolition, dump charges, typical urban city, reclamation station, usual charge, includes tipping fees only		0	0	$ 20.25	$ -	$ -	$ 20.25
3	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 585.00	$ 306.00	$ 891.00
3	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,605.00	$ -	$ 1,605.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	27.71	$ -	$ -	$ -	$ 393.71
1	Job	Permitting cost		0	0	$ -	$ 694.32	$ -	$ 694.32

Total **$ 35,410.28**

5-2 - Cathodic Protection - Test Site Removal
Unit Cost Estimate

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
10	Ea.	Signs, traffic sign removal, to 10 S.F., including supports	3 Laborers 1 Equip. Oper. (light) 1 Crane, Flatbed Mounted, 3 Ton	16	2	$ -	$ 1,100.00	$ 164.00	$ 1,264.00
0.25	Ton	Selective demolition, dump charges, typical urban city, reclamation station, usual charge, includes tipping fees only		0	0	$ 20.25	$ -	$ -	$ 20.25
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
1	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 535.00	$ -	$ 535.00
1	Day	Environmental Engineer		1	8	$ -	$ 635.00	$ -	$ 635.00
114	$/Day	Per Diem		1	24	$ -	$ -	$ -	$ 341.00
1	Job	Permitting cost		0	0	$ -	$ 67.79	$ -	$ 67.79

Total **$ 3,457.04**

6-1 - ROW Marker Removal
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
10	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 1,950.00	$ 1,020.00	$ 2,970.00
1330	C.L.F.	Utility line signs, markers, and flags, underground tape, detectable, reinforced, aluminum foil core, 6", excludes excavation and backfill		140	0.06	$ 56,525.00	$ 3,910.20	$ -	$ 60,435.20
2	Ton	Selective demolition, dump charges, typical urban city, reclamation station, usual charge, includes tipping fees only		0	0	$ 162.00	$ -	$ -	$ 162.00
1330	S.Y.	Seeding, mechanical seeding, 44 lb/M.S.Y.	1 Equip. Oper. (light) 1 Loader-Backhoe, 40	2500	0	$ 345.80	$ 279.30	$ 159.60	$ 784.70
10	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 1,950.00	$ 1,020.00	$ 2,970.00
10	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 5,350.00	$ -	$ 5,350.00
5	Day	Environmental Engineer		1	8	$ -	$ 2,575.00	$ -	$ 2,575.00
114	$/Day	Per Diem		1	22.06	$ -	$ -	$ -	$ 313.44
1	Job	Permitting cost		0	0	$ -	$ 1,511.21	$ -	$ 1,511.21

Total **$ 77,071.55**

Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

7-1 - Tap Locations
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
200	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 18.00	$ 338.00	$ 8.00	$ 364.00
200	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 96.00	$ 414.00	$ 60.00	$ 570.00
10	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering	1 Equip. Oper. (crane) 1 Laborer 1 Hyd. Excavator, .75 C.Y.	270	0.06	$ -	$ 36.30	$ 28.60	$ 64.90
2	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint		15	1.07	$ -	$ 144.00	$ -	$ 144.00
2	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$600.00	$ 630.00	$ -	$ 1,230.00
5	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 33.00	$ 44.25	$ 77.25
1	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	1.5	16	$ -	$ 880.00	$ 130.00	$ 1,010.00
0.03	M.S.F.	Seeding, mechanical seeding grass seed, 4.5 lb./M.S.F., hand push spreader		180	0.04	$ 0.89	$ 0.07	$ -	$ 0.95
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
2	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 1,070.00	$ -	$ 1,070.00
1	Day	Environmental Engineer		1	8	$ -	$ 515.00	$ -	$ 515.00
114	$/Day	Per Diem		1	43.55	$ -	$ -	$ -	$ 618.77
1	Job	Permitting cost		0	0	$ -	$ 125.18	$ -	$ 125.18

Total **$ 6,384.05**

8-1 - Mainline Valve Locations
Unit Cost Estimate

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Quantity	Unit	Description	Crew Description	Daily Output	Labor Hours	Ext. Mat. O&P	Ext. Labor O&P	Ext. Equip. O&P	Ext. Total O&P
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
120	L.F.	Selective demolition, miscellaneous metal fences & gates, fence, miscellaneous steel mesh, 4'-6' high	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	600	0.04	$ -	$ 268.80	$ 48.00	$ 316.80
800	L.F.	Boundary & survey markers, property lines, perimeter, cleared land	1 Chief of Party 1 Instrument Man 1 Rodman/Chainman 1 Level, Electronic	1000	0.02	$ 72.00	$ 1,352.00	$ 32.00	$ 1,456.00
800	L.F.	Synthetic erosion control, silt fence, install and remove, 3' high	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	650	0.04	$ 384.00	$ 1,656.00	$ 240.00	$ 2,280.00
4	Ea.	Selective demolition, parking appurtenances, pipe bollards, 6"-12" diameter	2 Laborers 1 Equip. Oper. (light) 1 Backhoe Loader, 48 H.P.	80	0.3	$ -	$ 67.20	$ 11.88	$ 79.08
19	B.C.Y.	Excavating, trench or continuous footing, common earth, 3/4 C.Y. excavator, 1' to 4' deep, excludes sheeting or dewatering	1 Equip. Oper. (crane) 1 Laborer 1 Hyd. Excavator, .75 C.Y.	270	0.06	$ -	$ 68.97	$ 54.34	$ 123.31
36	L.F.	Selective demolition, natural gas, steel pipe, pipe, 5" - 10", excludes excavation	1 Labor Foreman (outside) 2 Laborers 1 Equip. Oper. (crane) 2 Cutting Torches 2 Sets of Gases 1 Hyd. Crane, 12 Ton	360	0.09	$ -	$ 183.60	$ 93.24	$ 276.84
2	Ea.	Gasket and bolt set, for flanges, 150 lb., 24" pipe size		1.9	4.21	$ 600.00	$ 630.00	$ -	$ 1,230.00
2	Ea.	Pipe, cut one groove, labor only, 24" pipe size, grooved-joint	1 Plumber 1 Plumber Apprentice	15	1.07	$ -	$ 144.00	$ -	$ 144.00
1	Ea.	Selective demolition, utility materials, utility valves, 14"-24", excludes excavation	1 Labor Foreman (outside) 1 Skilled Worker 1 Laborer	2	14	$ -	$ 770.00	$ 105.00	$ 875.00
36	L.C.Y.	Cycle hauling(wait, load, travel, unload or dump & return) time per cycle, excavated or borrow, loose cubic yards, 15 min load/wait/unload, 12 C.Y. truck, cycle 50 miles, 50 MPH, excludes loading equipment	1 Truck Driver (heavy) 1 Dump Truck, 12 C.Y., 400 H.P.	72	0.11	$ -	$ 237.60	$ 318.60	$ 556.20
1	Ea.	Rough grading sites, 1,100-3,000 S.F., skid steer & labor	2 Laborers 1 Equip. Oper. (light) 1 Loader, Skid Steer, 30 H.P.	1.5	16	$ -	$ 880.00	$ 130.00	$ 1,010.00
0.8	M.S.F.	Seeding, mechanical seeding grass seed, 4.5 lb./M.S.F., hand push spreader		180	0.04	$ 23.60	$ 1.82	$ -	$ 25.42
1	Ea.	Mobilization or demobilization, delivery charge for equipment, hauled on 3-ton capacity towed trailer	1 Equip. Oper. (light) 1 Pickup Truck, 4x4, 3/4 Ton 1 Flatbed Trailer, 3 Ton	2.67	3	$ -	$ 195.00	$ 102.00	$ 297.00
1	Day	Testing and inspecting, supervision of earthwork		1	8	$ -	$ 535.00	$ -	$ 535.00
0.5	Day	Environmental Engineer		1	8	$ -	$ 257.50	$ -	$ 257.50
114	$/Day	Per Diem		1	57.98	$ -	$ -	$ -	$ 823.80
1	Job	Permitting cost		0	0	$ -	$ 211.66	$ -	$ 211.66

Total **$ 10,794.61**

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Cardinal Pipeline Company, LLC
System Salvage Scrap Metal Calculations - Transmission

7/21/2021 Price / Ton (Nat. Ave.) = 167.00
https://iscrapapp.com/prices/

(A)	(B)	(C)	(D)	(E)	(F)
1.3 Pipe Removal - Transmission	Length Removed (ft)	lb/ft	Total Weight (lb)	Total Weight (ton)	Salvage Amt.
24"	1440.48	94.71	136427.77	68.21	$ (11,392)
	1440.48			Subtotal:	$ (11,392)
				Total	**$ (11,392)**

	Weight/Site (ton)	Scrap Value	Estimated	No. of Stations	Salvage Amt.
3.3 M&R Stations - Transmission					
Small M&R Station	5.00	167.00	835.00	2	$ (1,670)
Medium M&R Station	10.00	167.00	1670.00	2	$ (3,340)
Large M&R Station	15.00	167.00	2505.00	3	$ (7,515)
				Subtotal:	$ (12,525)
				Total:	**$ (12,525)**

4.3 Compressor Station - Storage	Ave. No./Site	Weight/Site (ton)	Total Weight (ton)	Scrap Value (ton)	Total Stations	Salvage Amt.
Compressor Engine (Ave.)	2	160.00	320.00	$ 167.00	1	$ (53,440)
LNG Tank	2	6091	6091	$ 167.00	0	$ -
Equipment (Ave.)	18	22.50	405.00	$ 167.00	1	$ (67,635)
Bldg (Ave.)	3	#REF!	3021.14	$ 167.00	1	$ (504,530)
				Subtotal:		$ (625,605)
				Total:		**$ (625,605)**

5.3 Cathodic Protection - Transmission	No.	Weight/Site (ton)	Total Weight (ton)	Scrap Value (ton)	Salvage Amt.
Rectifier	10	0.03	0.25	$ 167.00	$ (42)
Test Site	10	0.002	0.02	$ 167.00	$ (3)
				Subtotal:	**$ (45)**
				Total:	**$ (45)**

6.2 ROW Marker - Transmission	No.	Weight/Site (ton)	Total Weight (ton)	Scrap Value (ton)	Salvage Amt.
Marker	1330	0.002	2.66	$ 167.00	$ (444)
				Subtotal:	**$ (444)**
				Total:	**$ (444)**

7.2 Mainline Valve Site - Transmission	No.	Weight/Site (ton)	Total Weight (ton)	Scrap Value (ton)	Salvage Amt.
Typical Valve Site	18	2.00	36.00	$ 167.00	$ (6,012)
				Subtotal:	**$ (6,012)**
				Total:	**$ (6,012)**

7.2 Tap Site - Transmission	No.	Weight/Site (ton)	Total Weight (ton)	Scrap Value (ton)	Salvage Amt.
Typical Tap Site	44	0.03	1.32	$ 167.00	$ (220)
				Subtotal:	**$ (220)**
				Total:	**$ (220)**

Total Salvage Amount: **$ (656,244)**

Northwest Pipeline LP
City Cost Index Factor Determination

Line No.		(A) State	(B) City	(C)[1] CCI	(D)[2] Total Mi/State	(E) Weighting Factor (D) / 3878.5	(F) % of Weighted Ave. (C) / (E)
1		North Carolina	Durham	89.9	104.9	1.00	91.80
			Greensboro	89.8			
4			Raleigh	95.7			
5			Ave.	91.8			
2							
12							Total
13				Average CCI	Total Mileage		% Weighted Ave.*
14				92.3	104.9		91.80
15	*	National Average = 100%					
16	(C)[1]	Data developed within cost estimating software package					

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

Texas Eastern Transmission, LP
Per Diem Determination

Line No.	(A) State	(B) City		(C)[1] Per Diem ($)	(D)[2] Total Mi/State	(E) Weighting Factor (D) / 3878.5	(F) % of Weighted Ave. (C) / (E)
1	North Carolina	Durham		115.0	104.9	1.00	113.67
		Greensboro		103.0			
4		Raleigh		123.0			
5			Ave.	113.7			
2							
9							Total
10				Average	Total Mileage		Weighted Ave.
11				$ 130	104.9		$ 114
12							
13	(C)[1] https://www.gsa.gov/travel/plan-book/per-diem-rates						
14	(D)[2] Cardinal Pipeline Company, LLC Provided Data						

Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)

CARDINAL PIPELINE COMPANY, LLC
MATERIAL TAKEOFF PACKET

Clayton Compressor Station

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Markup Summary

Subject	Color	Page	Comment	Count	Length	Area	Volume	Surface Area
Perimeter Fence (1 items)					2013.45			
Surface Pipe (3 items)					839.02			
Bldg (6 items)					976.12	14124.8	494368.3	34164.3
Tank (18 items)				18				
Exhaust (9 items)				9				
Cooler (11 items)				11				
Compressor (3 items)				3				
Utility Pole (9 items)				9				
Tower (1 items)				1				
3' Concrete (1 items)					401.19	8842.97	26528.9	1203.56
6" Concrete (7 items)					3982.4	47360.92	23680.47	1991.22
						5262.324	1859.606	
Unsuitable Material (3 items)					2521.14	137515.4	412546.1	7563.42
						15279.49	15279.48	
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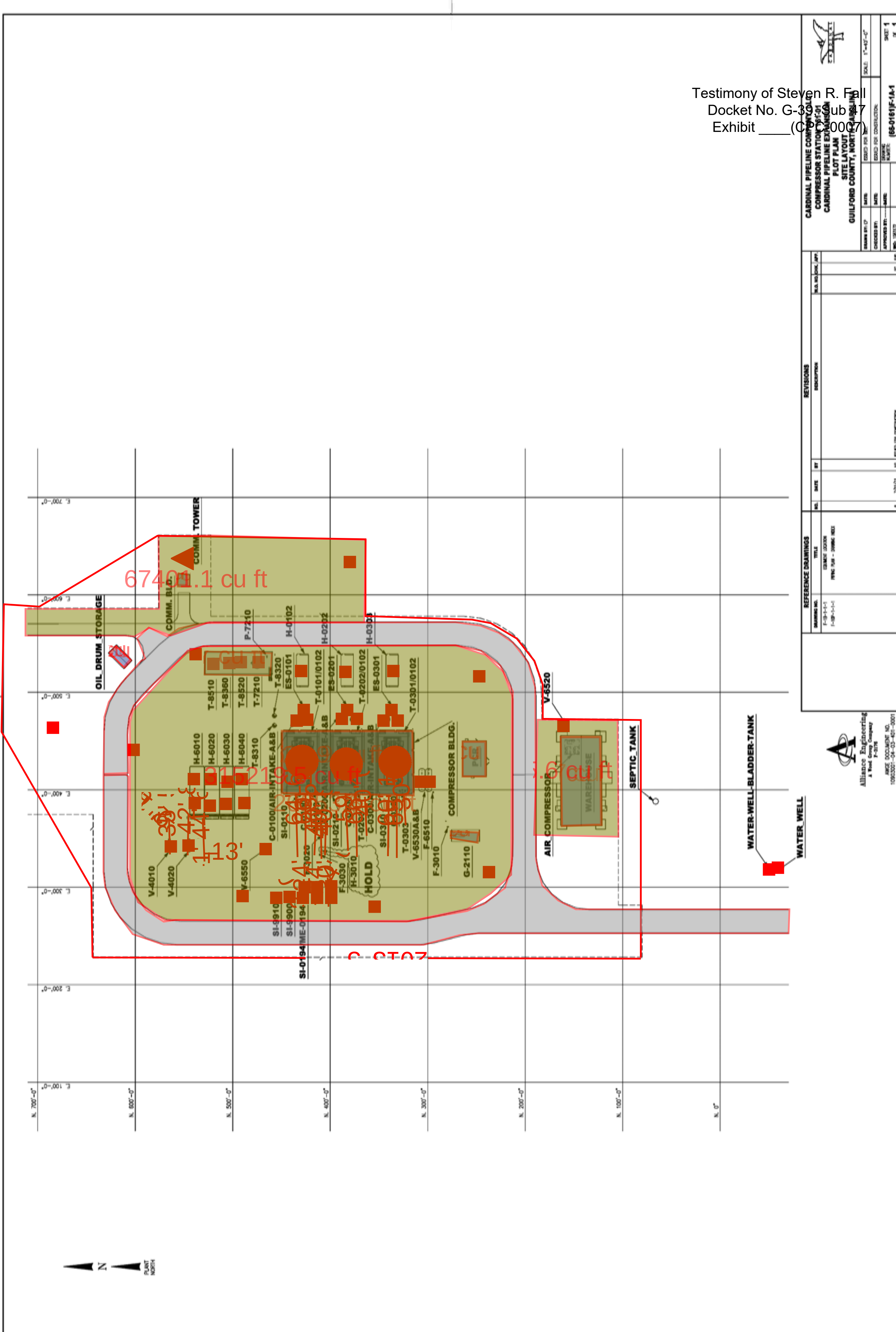
Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit ____(CPC-0007)



Markup Details
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Markup Summary

Subject	Color	Page	Comment	Count	Length	Area	Volume	Surface Area
Perimeter Fence (1 items)					91.29			
Tank (1 items)				1				
Bollard (2 items)				2				
Cut and Cap (4 items)				4				
Valve (1 items)				1				
Unsuitable Material (1 items)					91.48	513.35	1540.04	274.43
						57.03889	57.03852	
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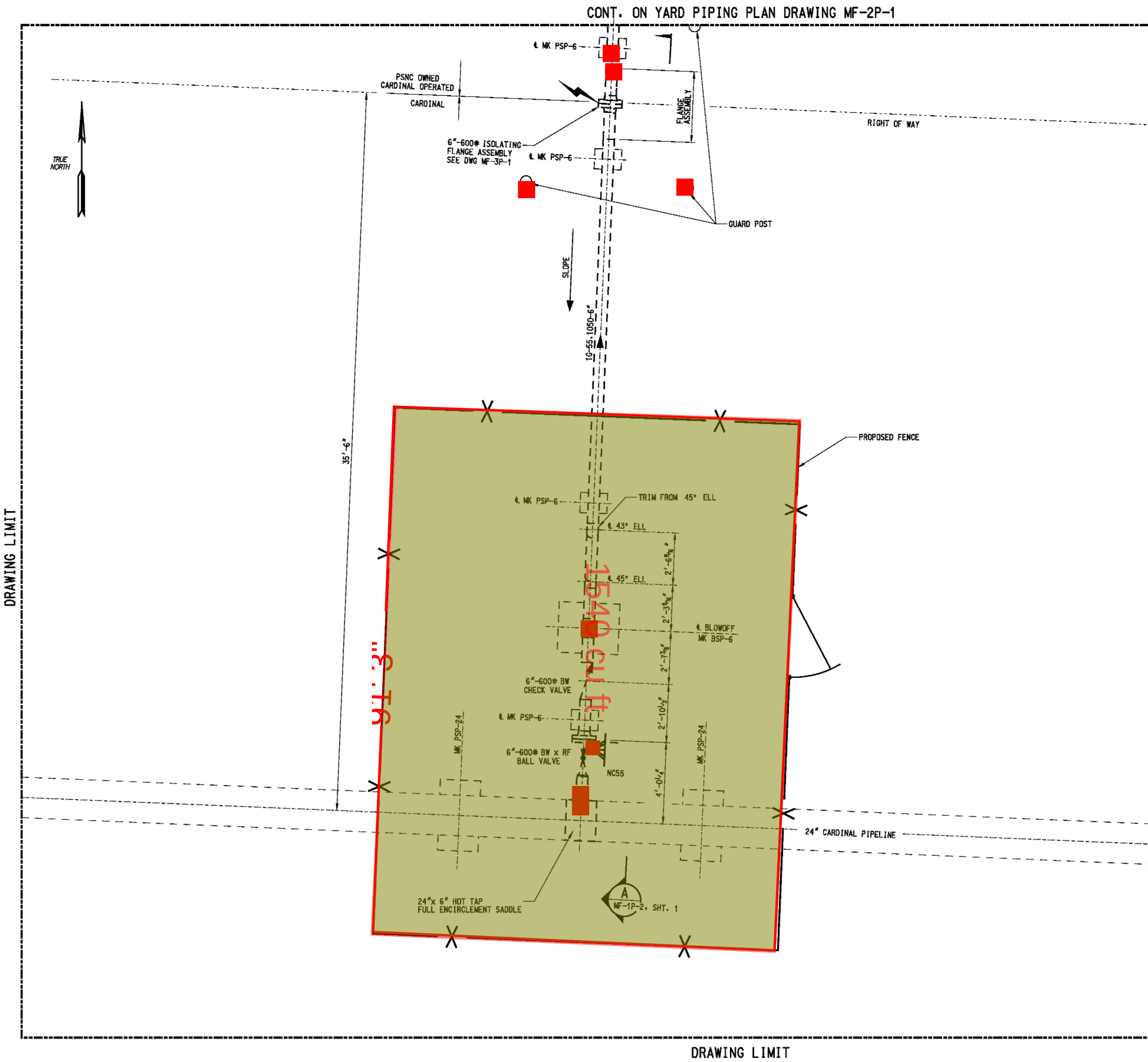
CONT. ON YARD PIPING PLAN DRAWING MF-2P-1



DRAWING LIMIT

GENERAL NOTES:

1. HEAVY LINES INDICATE PROPOSED PIPING.
2. LIGHT LINES INDICATE EXISTING PIPING.
3. DASHED LINES INDICATES UNDERGROUND PIPING.
4. TEST LEADS SHALL BE INSTALLED IN ACCORDANCE WITH DETAIL #1 DRAWING F-12E-3, SHT. 1 FOR ABOVE GROUND ISOLATION AND DETAIL #21 DRAWING F-12E-3, SHT. 3 FOR BELOW GROUND ISOLATION.
5. ALL ABOVE GRADE PIPING, EXCEPT STAINLESS STEEL, SHALL BE PAINTED IN ACCORDANCE WITH TRANSCO'S PAINT SPECIFICATIONS.
6. ALL BELOW GRADE PIPING, EXCEPT STAINLESS STEEL, SHALL BE COATED AS LISTED IN THE JOB DESCRIPTION. FIELD JOINTS, BURIED FABRICATED ASSEMBLIES AND COATING FIELD REPAIRS SHALL BE WITH MATERIALS LISTED IN THE JOB DESCRIPTION AND AS DIRECTED BY THE CONSTRUCTION SPECIFICATIONS.
7. ALL PIPING WELDS 2" & LARGER TO BE 100% X-RAYED.
8. INDICATES ELECTRICALLY INSULATED MAKE-UP.
9. HYDROSTATIC TEST PRESSURE FOR FABRICATED PIG TRAP ASSEMBLIES, VALVE ASSEMBLIES, HEADERS, TIE-IN ASSEMBLIES AND COMPRESSOR STATION YARD PIPING- MINIMUM 1600 psi MAXIMUM 1650 psi FOR A MINIMUM OF EIGHT (8) CONTINUOUS HOURS WITH VALVES IN HALF-OPEN POSITION.
10. SMALL PIPING AND TUBING FOR INSTRUMENTATION AND CONTROL SYSTEMS SHALL BE LEAK TESTED WITH NITROGEN AT A MINIMUM TEST PRESSURE 1600 psig FOR A MINIMUM OF ONE (1) CONTINUOUS HOUR. A SOAPY SOLUTION OR PREPARED TEST SOLUTION SHALL BE APPLIED ON ALL JOINTS IMMEDIATELY AFTER THE TEST SECTION HAS REACHED TEST PRESSURE AND IMMEDIATELY PRIOR TO REMOVAL FROM TEST PRESSURE.
11. WHEN TYING INTO EXISTING FACILITIES, IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY ALL MEASUREMENTS AND ELEVATIONS BEFORE STARTING ANY FABRICATION.
12. CONTRACTOR SHALL VERIFY ALL VALVE LENGTHS PRIOR TO FABRICATION.
13. "I" INDICATES GASKET. WHEN GASKET MARKER IS INSIDE DIMENSION LINE, GASKET THICKNESS HAS BEEN ADDED TO OVER ALL DIMENSION. ALL GASKETS ARE IN SPECIFICATION UNLESS OTHERWISE NOTED.

DRAWING LIMIT

DRAWING LIMIT

REFERENCE DRAWINGS	
DRAWING NO.	TITLE
MF-1P-2,SHT. 1	PIPING SECTION

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	06-15-2011	PT	ISSUED FOR BID	1092038	TB	TB
0	08-03-2011	PT	ISSUED FOR CONSTRUCTION	1092038	TB	TB
1	02-24-2011	PT	REVISED PER AS-BUILT INFORMATION	1092038	TB	TB

CARDINAL PIPELINE COMPANY, LLC
PSNC CHAPEL HILL INTERCONNECT PROJECT
CARDINAL PIPELINE
@ M.P. 63.8
PIPING PLAN
CHATHAM COUNTY, NORTH CAROLINA

DRAWN BY: PT	DATE: 03-09-2011		SCALE: 3/8"=1'-0"
CHECKED BY: TB	DATE: 08-01-2011		
APPROVED BY: TB	DATE: 08-01-2011	DRAWING NUMBER: (34-2470) MF-1P-1	SHEET 1 OF 2
WO: 1092037		9:09:43 AM 3/1/2012 K:\MR342470\Piping\Drawing\34-2470_mf1p1001.dgn	

34-2470_mf1p1001.dgn 3/1/2012 9:09:43 AM

Markup Details
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Markup Summary

Subject	Color	Page	Comment	Count	Length	Area	Volume	Surface Area
Perimeter Fence (1 items)					488.35			
Surface Pipe (12 items)					355.36			
Bldg (2 items)					152.05	643.67	22528.48	5321.85
Tank (3 items)				3				
Tank Septic (1 items)				1				
Utility Pole (2 items)				2				
Cut and Cap (6 items)				6				
6" Concrete (2 items)					152.05	643.67	321.84	76.03
						71.51889	11.92	
Unsuitable Material (1 items)					486.93	11989.73	35969.2	1460.8
						1332.192	1332.193	
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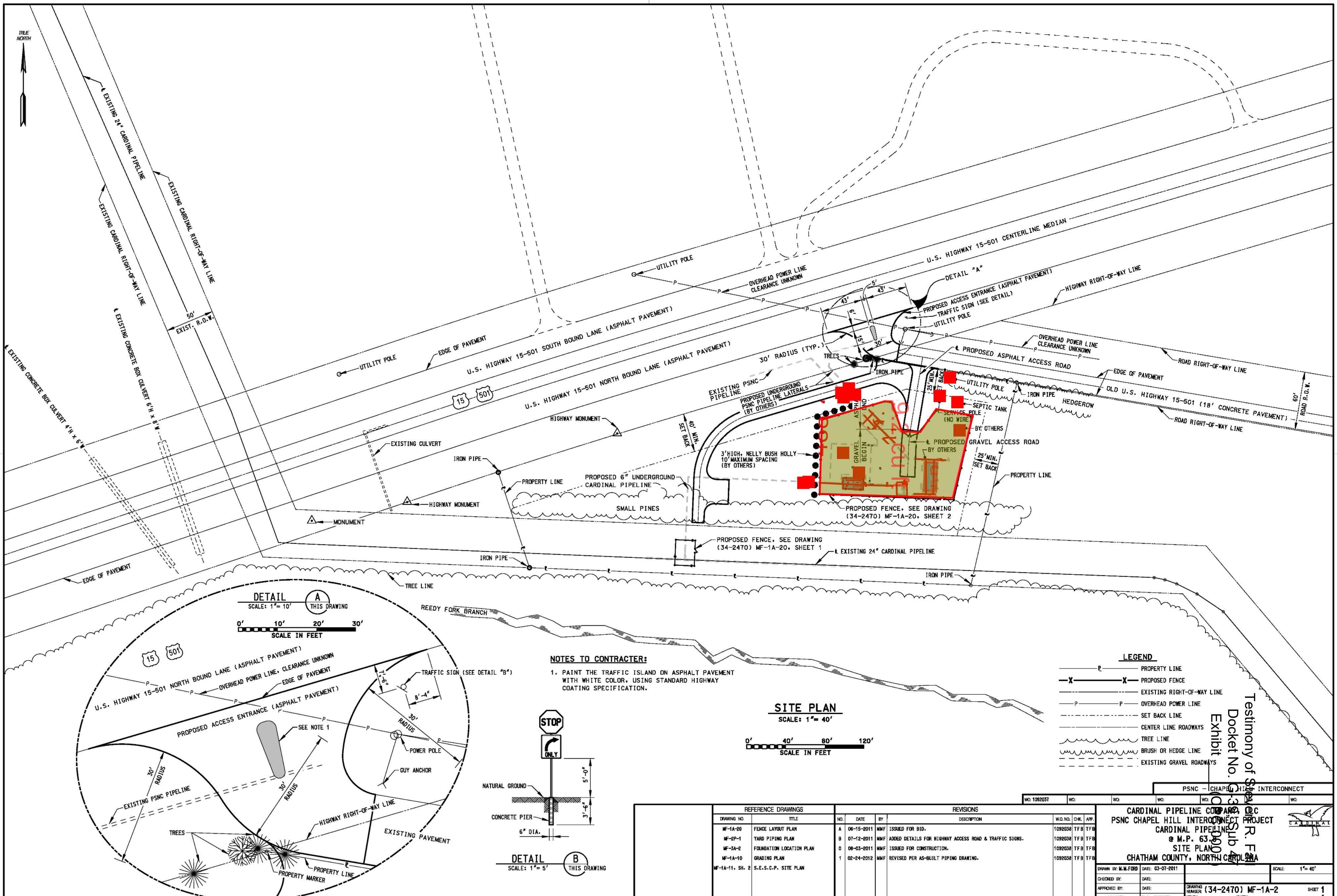
Testimony of Steven R. Fall
Docket No. G-39, Sub 47
Exhibit (CF-000[illegible])



NOTES TO CONTRACTER:

1. PAINT THE TRAFFIC ISLAND ON ASPHALT PAVEMENT WITH WHITE COLOR, USING STANDARD HIGHWAY COATING SPECIFICATION.

LEGEND

- PROPERTY LINE
- PROPOSED FENCE
- EXISTING RIGHT-OF-WAY LINE
- OVERHEAD POWER LINE
- SET BACK LINE
- CENTER LINE ROADWAYS
- TREE LINE
- BRUSH OR HEDGE LINE
- EXISTING GRAVEL ROADWAYS

REFERENCE DRAWINGS

DRAWING NO.	TITLE
MF-1A-20	FENCE LAYOUT PLAN
MF-2P-1	YARD PIPING PLAN
MF-3A-2	FOUNDATION LOCATION PLAN
MF-1A-10	GRADING PLAN
MF-1A-11, SH. 2	S.E.S.C.P. SITE PLAN

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.
A	06-15-2011	MWF	ISSUED FOR BID.	1092038	TFB	TFB
B	07-12-2011	MWF	ADDED DETAILS FOR HIGHWAY ACCESS ROAD & TRAFFIC SIGNS.	1092038	TFB	TFB
0	08-03-2011	MWF	ISSUED FOR CONSTRUCTION.	1092038	TFB	TFB
1	02-24-2012	MWF	REVISED PER AS-BUILT PIPING DRAWING.	1092038	TFB	TFB

PSNC – CHAPEL HILL INTERCONNECT

WO: 1092037 | WO: | WO: | WO: | WO: | WO:

CARDINAL PIPELINE COMPANY, LLC
PSNC CHAPEL HILL INTERCONNECT PROJECT
CARDINAL PIPELINE
@ M.P. 63.0
SITE PLAN
CHATHAM COUNTY, NORTH CAROLINA

CARDINAL

DRAWN BY: M.M.FORD	DATE: 03-07-2011	SCALE: 1"= 40'	
CHECKED BY:	DATE:		
APPROVED BY:	DATE:	DRAWING NUMBER: (34-2470) MF-1A-2	SHEET 1
WO: 1092038	W.O. 1092037	%TIME% %PATH% %DATE%	OF 1

Mar 15 2022

OFFICIAL COPY

Markup Details
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Markup Summary

Subject	Color	Page	Comment	Count	Length	Area	Volume	Surface Area
Perimeter Fence (1 items)					438.48			
Surface Pipe (11 items)					428.9			
Bldg (2 items)					199.98	1145.1	40078.67	6999.24
Bollard (13 items)				13				
Tank (2 items)				2				
Cut and Cap (6 items)				6				
Valve (8 items)				8				
6" Concrete (2 items)					199.98	1145.1	572.56	99.99
						127.2333	21.20593	
Unsuitable Material (1 items)					439.03	11952.82	35858.46	1317.08
						1328.091	1328.091	
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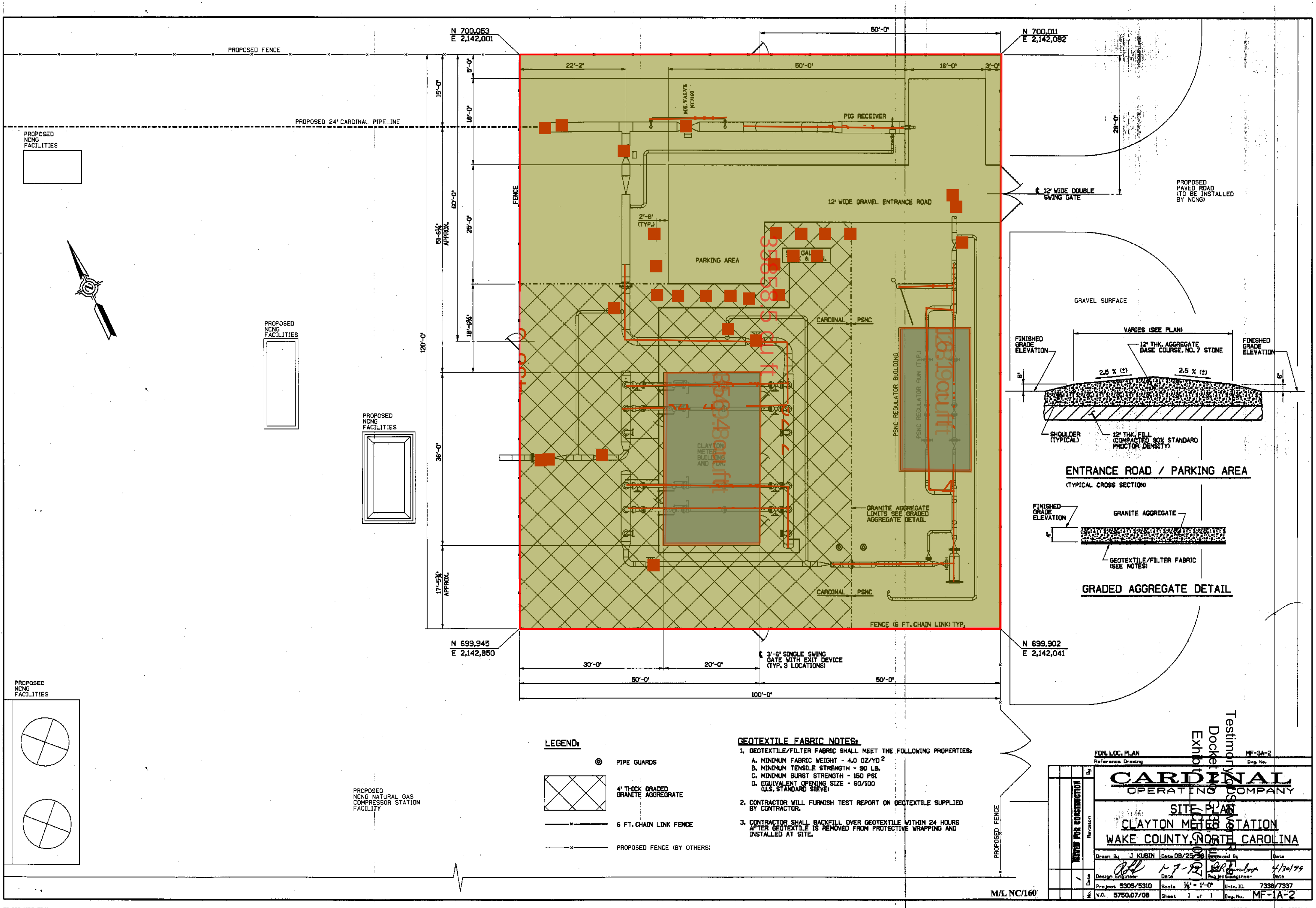

Mar 15 2022

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ATTACHMENT 4

STEVEN R FALL - CV

Steven R Fall

on behalf of

Cardinal Pipeline Company, LLC

Brown, Williams, Moorhead & Quinn, Inc.
Energy Consultants

CURRICULUM VITAE

NAME	Steven Fall
BUSINESS ADDRESS	1155 15th Street N.W., Suite 1004 Washington, DC 20005
EDUCATION	Pennsylvania State University; Bachelor of Science in Biology/Minor in Chemistry Certifications: Maryland State Highway Traffic Control Manager OSHA 30 Card Certificate of Completion – Deck and Ramp Guidelines Certificate of Completion – Chimneys and Vents Confidential Clearance Eligible NUCA – National Utility Contractors Association HeavyBid/HeavyJob Software Foundation Software RSMeans
PRESENT POSITION	Vice President Brown, Williams, Moorhead & Quinn, Inc. 1155 15th Street N.W., Suite 1004 Washington, DC 20005
NATURE OF WORK PERFORMED WITH FIRM	Analysis of terminal negative salvage and pipeline operations. Natural gas pipeline terminal negative salvage testimony provided for the Federal Energy Regulatory Commission. A list of cases in which Mr. Fall provided testimony is attached below.
PREVIOUS EMPLOYMENT	Department of Consumer and Regulatory Affairs Washington, DC (District of Columbia agency responsible for issuance of and adherence to licenses and permits) Project Manager 6/2017 – 10/2017 High impact position designated for situations requiring immediate resolution.

Mobile Inspection Implementation: Research and development of the Mobile Inspection application and platform, which includes but is not limited to development of the Mobile Inspection Standard Operating Provisions Manual, training protocols and regimens.

International Accreditation Services Semi-Annual Report: Collection and interpretation of data from multiple departments summarized into a deliverable report required for inspection and permitting accreditation.

Hot Properties: District of Columbia properties undergoing construction that require guidance to achieve resolution of ongoing compliance difficulties. Understanding of the IRC, IBC, and DC Municipal Regulations required for situational analysis of safety and code compliance.

Anchor Construction Washington, DC
(Anchor Construction specializes in utility construction: water, storm, sewer, and conduits.)

Project Engineer 7/2014 – 6/2017
WSSC ESA IDIQ: Manage a $32.5 million dollar sewer mainline repair, rehabilitation, and/or replacement project in coordination with the WSSC at the Cabin John and Paint Branch Basin. Required hands-on scheduling and management of materials, equipment, and crew members.

DDOT Klingle Valley Trail: $7.6 million dollar green infrastructure installation including: bio-swale, bio-retention structures, permeable asphalt multi-use trail, Klingle Creek restoration, lighting and landscaping. Multi-agency coordination with underground utilities operated byDDOT, Washington Gas, National Park Service, PEPCO, and DC Water.

Howard Hughes Medical Institute Retaining Wall: $1.5 million dollar project designed to remove, salvage and rebuild an existing retaining wall located on a designated conservation area at the Howard Hughes Medical Institute campus. Required understanding and compliance with restrictions imposed on operating areas, materials handling, and site restoration standards.

WSSC Large Meter Vault: $575 thousand dollar large meter vault replacement project at various locations throughout Montgomery County, MD. Required hands-on scheduling and management of materials, equipment, and crew members.

Additional accomplishments and responsibilities include:

- Develop project objectives by reviewing project proposals, blue prints, drawings and required permits.
- Determine project responsibilities by identifying project phases and elements; assigning personnel to phases and elements; reviewing bids from contractors.
- Determine project specifications by studying product design, customer requirements, and performance standards.
- Determine project schedule by studying project plan and specifications; calculating time requirements; sequencing project elements.
- Develop and maintain project schedule by monitoring progress; coordinating activities through weekly and bi-weekly schedule updates.
- Control project plan by reviewing and inspecting design, specifications, and plan and schedule changes; recommending actions.
- Provide leadership through thorough communication of attainable goals, project direction and production analysis of daily/weekly/monthly activities.
- Maintain safe and clean working environment by enforcing OSHA mandated procedures, rules and regulations.

AKA White House Washington, DC
(The fusion of the long-term comfort of a luxury furnished apartment with the style and service of an intimate hotel)

Director of Engineering 7/2012 – 7/2014
Directly oversaw the $1 million dollar renovation improvement, adding another level of hotel luxury suites to the existing facility. Received global recognition from company for outstanding work ethics and policies implemented. Improved department efficiency and established preventative maintenance procedures.
Additional accomplishments and responsibilities include:

Managed electrical systems, mechanical work and safety aspects of a 141 room hotel.
Directly oversaw the implementation of work planned for building maintenance, including assigning and delegating multiple projects to staff and vendors.
Monitored and controlled expenditures to successfully stay within property's monthly budget.
Supervised the maintenance of air conditioning, elevators, room appliances, building wire systems, roofing, landscaping and all operational equipment.
Independently created request for proposals to negotiate contract/vendor proposals.
Interviewed, trained, inspired and evaluated staff; disciplined and implemented corrective actions as necessary.
Developed the implemented the building Emergency Evacuation Plan in coordination with DC Fire Department.

Humanetics Corporation Eden Prairie, MN
(Humanetics is focused in three key areas organized around FDA regulatory boundaries: prescription drugs, medical foods, and consumer products)

Research Analyst 7/2005 – 3/2012
Oversaw and performed research and development of a radioprotectant in coordination with the Armed Forces Radiobiology Research Institute, Henry Jackson Foundation, Uniformed Services University of the Health Sciences, and BioReliance.

Designed and implemented testing of complex experiments to test prospective radiological protective and therapeutic agents.
Completed analysis on test results to assess the biological and physiological effects of designed experimentation.
Effectively communicated research ideas and methodology via written reports and oral presentations.
Generated experimental protocols and methodology.
Conducted laboratory site assessments, including site activation, interim monitoring and close-out visits.
Achieved proof of efficacy through preclinical testing conducted of an experimental radioprotectant designed to combat the effects of Acute Radiation Syndrome (ARS).
Organized and maintained detailed records of new research data as well as relevant published studies.

Provided technical guidance in training to no less than two dozen AFRRI staff and military employees.
Completed yearly detailed FDA summary report.
Designed, implemented and updated experimental SOP's.

BioReliance Corporation Rockville, MD
(Provides nonclinical testing and manufacturing services for biologics)

Senior Research Associate 7/2000 – 7/2005
Team leader hired to assist in experimental development, data documentation and analysis at an established biotech corporation.

- Executed over 50 multi-phased experiments per year to assess the biological and physiological effects of carcinogenic exposure on rodents and cell cultures.
- Captured test results and collated consumable forms for supervisor.
- Assisted in the design of secondary experiments based on initial results.
- Ensured each experiment adhered to FDA mandated GLP standards.
- Provided daily briefings to laboratory manager regarding status and results of experiments.
- Designed and subsequently implemented and updated dozens of experimental SOP's.
- Monitored and maintained laboratory equipment and supplies.

#	JURISDICTION	CASE OR DOCKET NO.	UTILITY/ORGANIZATION INITIATING PROCEEDING	POSITION	SUBJECT MATTER
Formal Proceedings In Which Steven Fall Testified					
1	FERC	RP18-877	MOGAS PIPE LINE COMPANY	Witness	Natural Gas Terminal Decommissioning
2	FERC	RP18-940	EMPIRE PIPELINE INC.	Witness	Natural Gas Terminal Decommissioning
3	FERC	RP18-922	TRAILBLAZER PIPELINE COMPANY	Witness	Natural Gas Terminal Decommissioning
4	FERC	RP18-923	ENABLE MISSISSIPPI RIVER TRANSMISSION, LLC	Witness	Natural Gas Terminal Decommissioning
5	FERC	RP18-1115	SALTVILLE GAS STORAGE COMPANY	Witness	Natural Gas Terminal Decommissioning
6	FERC	RP18-1126	TRANSCONINENTAL GAS PIPELINE COMPANY	Witness	Natural Gas Terminal Decommissioning
7	FERC	RP19-78	PANHANDLE EASTERN PIPE LINE COMPANY, LP	Witness	Natural Gas Terminal Decommissioning
8	FERC	RP19-165	WBI ENERGY TRANSMISSION, INC.	Witness	Natural Gas Terminal Decommissioning
9	FERC	RP19-343	TEXAS EASTERN TRANSMISSION, LP	Witness	Natural Gas Terminal Decommissioning
10	FERC	RP19-352	SEA ROBIN PIPELINE COMPANY, LLC	Witness	Natural Gas Terminal Decommissioning
11	FERC	RP19-1426	NATIONAL FUEL GAS SUPPLY CORPORATION	Witness	Natural Gas Terminal Decommissioning
12	FERC	RP19-1523	PANHANDLE EASTERN PIPE LINE COMPANY, LP	Witness	Natural Gas Terminal Decommissioning
13	FERC	RP20-131	ENABLE MISSISSIPPI RIVER TRANSMISSION, LLC	Witness	Natural Gas Terminal Decommissioning
14	FERC	RP20-467	DOMINION ENERGY COVE POINT LNG, LP	Witness	Natural Gas Terminal Decommissioning
15	FERC	RP20-908	ALLIANCE PIPELINE, LP	Witness	Natural Gas Terminal Decommissioning
16	FERC	RP20-921	MARITIMES & NORTHEAST PIPELINE, LLC	Witness	Natural Gas Terminal Decommissioning

#	JURISDICTION	CASE OR DOCKET NO.	UTILITY/ORGANIZATION INITIATING PROCEEDING	POSITION	SUBJECT MATTER
17	FERC	RP20-980	EAST TENNESSEE NATURAL GAS, LLC	Witness	Natural Gas Terminal Decommissioning
18	FERC	RP21-441	FLORIDA GAS TRANSMISSION, LLC	Witness	Natural Gas Terminal Decommissioning
19	FERC	RP21-20	SHELL PIPELINE COMPANY, LP	Witness	Oil Pipeline Depreciation Testimony
21	FERC	RP21-1001	TEXAS EASTERN TRANSMISSION, LP	Witness	Natural Gas Terminal Decommissioning