ENGINEERING STUDY
of

NATURAL GAS DISTRIBUTION SYSTEM IMPROVEMENTS

at

SHIPPENSBURG UNIVERSITY
Shippensburg, Pennsylvania

for

Noelker and Hull Associates, Inc.
Chambersburg, Pennsylvania

Prepared by

Entech Engineering, Inc.

Reading, Pennsylvania

February 1996

Entech #7124.01

SHIPPENSBURG UNIVERSITY

Natural Gas Distribution System
Engineering Study

TABLE OF CONTENTS

ENTECH

1.0 EXECUTIVE SUMMARY

Entech Engineering was retained by Shippensburg University and Noelker and Hull Associates to analyze multiple options for addressing leaks recently identified in the University's underground natural gas distribution system.

A meeting was held at Shippensburg University on February 12, 1996 to review the gas distribution system. During that meeting, three (3) options were identified. Those options are:

- Option #1 - Repair eleven (11) trouble spots as identified in the Heath Consultants, Inc. survey and by Shippensburg University.
- Option #2 - Replace underground steel gas piping and services along Bucks and Lebanon Drives, and repair remaining trouble spots not repaired by replacing services in this area.
- Option #3 - Replace all underground steel gas piping remaining on campus.

The underground steel piping would be replaced with polyethylene piping, fittings, and valves. A detailed scope for each option is identified in Section 3 of this report.

Entech estimates total project capital costs for the three (3) options as follows:

- Option #1 - $ 70,000
- Option #2 - $ 200,000
- Option #3 - $ 340,000

Option #1 is a cost for completing the absolute minimum scope of work. Option #2 was developed as a less costly alternative than Option #3 while still repairing all currently identified trouble spots. Option #3 represents the cost for an overall system upgrade.

The capital cost estimates are discussed in Section 4 of this report. The cost estimates for each option are included in Section 7, Attachments.

In addition to the estimated construction costs, numerous advantages and disadvantages must be evaluated when selecting an option. The advantages and disadvantages of each option are discussed in Section 5 of this report.

Entech Engineering strongly recommends that Shippensburg University allocate funding to replace all remaining underground steel natural gas piping and valves, thereby addressing the entire scope of work that will inevitably need to be accomplished in the future. Allowing corroded or damaged gas line components to remain in place represents not only a safety hazard but a burdensome drain on maintenance resources and budgets which must be assigned with increasing frequency to assure the continued functionality of

ENTECH

2.0 BACKGROUND INFORMATION

Most of the underground natural gas distribution system at Shippensburg University was installed in 1968, concurrent with a major campus expansion. This original installation consisted of coated steel pipe and cast iron valves.

Approximately half of the gas distribution system was replaced in the early 1990s with Plexco - PE2406, medium density, polyethylene resin pipe, fittings and valves. The replacements were performed under four (4) separate contracts, the largest portion being a replacement designed by Entech and installed by Ben L. May, Inc. in 1992.

Since the 1992 replacement, numerous gas leaks have developed in the piping not replaced. Eight leaks were identified in 1995 in a survey performed by Heath Consultants, Inc. on the entire natural gas underground distribution system on campus. All the leaks identified have occurred in the steel piping portion of the underground system. A copy of the Heath survey is included as Attachment A.

Entech Engineering met with Shippensburg University and Noelker and Hull on February 12, 1996 to review the distribution system problems. A copy of the minutes from that meeting are included as Attachment B.

ENTECH

3.0 IDENTIFICATION OF OPTIONS

Shippensburg University and Entech identified three (3) options for natural gas distribution system improvements. The options range from replacement of piping and valves at locations identified as trouble spots to total replacement of all remaining underground steel gas piping. The specific scope of work, for each option, is as follows:

3.1 Option #1

Option #1 includes local replacement of underground gas distribution piping, fittings, and valves located at eleven (11) trouble spots identified by the Heath Consultants Inc. gas survey and the Shippensburg University Maintenance Department. A summary of the locations requiring attention is as follows:

As identified in the Heath Consultant survey:

a. Two (2) valves along Cumberland Drive near Reisner Dining Hall.
b. Two (2) valves and piping near the intersection of Cumberland and Lebanon Drives.
c. 3" Elbow located in front of Cumberland Union Building.
d. Valve along Bucks Drive serving Lehman Library.
e. By-pass manhole serving Heiges Field House.
f. Valve along Lebanon Drive serving Mowrey Hall.
g. Service to the south end of Seavers Apartments.
h. Two (2) valves along Lebanon Drive at the north end of Seavers Apartments.

As identified by Shippensburg University:

a. Valve near Cumberland and Adams Drives serving Naugle Hall.

b. Above-ground piping at the gas meter serving Henderson Gymnasium.

c. Two (2) valves at the rear of Reisner Dining Hall.

The scope includes replacement of all piping within ten (10) feet of the problem valve or fitting.

3.2 Option #2

Option #2 includes, in part, replacement of the gas distribution mains and the branches extending from the mains along Bucks Drive and Lebanon Drive, including the connection between these two lines along Cumberland Drive. The new pipe, fittings, and valves would be Plexco medium density polyethylene, to match the portions of the underground system replaced during the early 1990s.

Option #2 also includes replacement of four (4) trouble spots, which are not located along the new mains to be replaced. These trouble spots are as follows:

a. Valve near Cumberland and Adams Drives serving Naugle Hall.

b. Two (2) valves along Cumberland Drive near Reisner Dining Hall.

c. Two (2) valves at the rear of Reisner Dining Hall.

d. Above-ground piping at gas meter serving Henderson Gymnasium.

3.3 Option #3

Option #3 includes replacement of all remaining underground steel piping and cast iron valves that were not replaced under previous gas distribution system upgrades. The new pipe, fittings, and valves would be Plexco medium density polyethylene, to match the portions of the underground system replaced during the early 1990s.

Option #3 includes the replacement of the underground steel branch line serving Henderson Gymnasium and the remaining underground steel piping at Grove Stadium.

ENTECH

4.0 CAPITAL COST ESTIMATES

Project capital construction cost estimates for the three (3) natural gas distribution system improvements, are as follows:

- Option #1 - $ 70,000
- Option #2 - $ 200,000
- Option #3 - $ 340,000

The capital cost estimates prepared for this study are "conceptual" in nature. They are conceptual because they are based upon engineering that is less than ten percent of a complete detailed design effort.

The level of costs used in this section are the "most likely" costs, similar to the midpoint of a bell curve. They do not represent either upper or lower limits of costs. Attempts have been made to allow for all costs that normally accompany similar projects. The quantities used to develop costs are estimates; they do not originate from design drawings for the work involved.

The following major assumptions were used in estimating costs for the various options:

1. Cost based on competitive bidding.
2. Normal construction schedules.
3. Meeting all codes and regulations.

Material and labor estimates are based on 1996 price levels. Where many smaller and uncertain quantity amounts are expected, a blanket allowance is made with an estimated dollar level supplied. Costs include materials, direct pay, fringe benefits, taxes, overhead, and reasonable profit.

An allowance of 20% of all direct costs is included as a contingency. This is in accordance with normal estimating procedures and guidelines of the American Association of Cost Engineers (AACE). This level of contingency is reasonable for projects at a comparable stage of design.

The amount of costs covered by contingency are normally expended in completing a project even though they cannot be tied to a work scope item at this time. Contingency covers such things as design development, pricing variations, bid variations, change orders, and working conditions.

The final results of a project can vary significantly from the "conceptual" cost estimate. The American Association of Cost Engineers (AACE) generally state that an accuracy range of plus or minus 20% from the total estimated cost is possible.

An allowance for engineering fees and construction services has been included in each option. This allowance covers Entech Engineering's fees for the services included in our proposal. The fees do not include Noelker and Hull Associates fees.

4.1 Option #1

Costs for Option #1 include replacement of all trouble spots identified under Section 3.1, with new plastic pipe and valves. The cost estimate includes replacement of all piping within ten (10) feet of the problem valve or fitting. A cost estimate for Option #1 is included as Attachment C. The costs estimated assume that all eleven (11) trouble spots are repaired under a single contract.

4.2 Option #2

Option #2 was developed as a less costly alternative to Option #3 while still repairing all current identified leaks. Costs for Option #2 include partial replacement of the underground gas distribution system, as identified under Section 3.2. Option #2 includes new outdoor gas pressure regulators and meters for all buildings scheduled to receive a new service. A cost estimate for Option #2 is included as Attachment D.

4.3 Option #3

Costs for Option #3 include replacement of all remaining underground steel gas distribution piping as identified under Section 3.3. Option #3 also includes new outdoor gas pressure regulators and meters for all buildings scheduled to receive a new service. A cost estimate for Option #3 is included as Attachment E.

ENTECH

5.0 ADVANTAGES / DISADVANTAGES OF OPTIONS

In addition to the estimated construction costs, there are numerous advantages and disadvantages that must be weighed/evaluated when making a decision. These advantages and disadvantages are tabulated below:

5.1 Option #1

Advantages

1. Lowest immediate construction cost.
2. Solves all gas leak problems identified to date.

Disadvantages

1. The remaining underground steel distribution piping has a limited remaining useful life.
2. The underground steel piping which remains is identical in age to that of the trouble spots (23 years). Other areas are likely to have similar states of corrosion, whether leaks have occurred to date or not.
3. The steel piping which remains will have to be replaced in the near future, and replacement costs will increase because of escalation, need for multiple contractor mobilization and other inefficiencies, and the repetition of certain work such as excavation. The University will be inconvenienced by future gas distribution upgrade projects.
4. Safety concerns and leaks will continue.

5. Continued natural gas leaks will increase the University's fuel costs.

5.2 Option #2

Advantages

1. Lower immediate construction cost than Option #3.
2. Eliminates all gas leak problems identified to date.
3. Replaces a substantial amount of piping where a large number of problems have been identified.

Disadvantages

1. Higher immediate construction cost than Option #1.
2. The remaining underground steel piping has a limited remaining useful life.
3. The steel piping which remains will have to be replaced in the near future, and replacement costs will increase because of escalation, need for multiple contractor mobilization and other inefficiencies, and the repetition of certain work such as excavation. The University will be inconvenienced by future gas distribution upgrade projects.
4. Safety concerns and leaks will continue.
5. Continued natural gas leaks will increase the University's fuel costs.

5.3 Option #3

Advantages

1. The useful life of the entire natural gas piping system will be maximized. (Maximum service life is estimated by manufacturers to be in excess of 50 years, however, polyethylene piping systems have not been in use long enough to verify this claim. Installation of this type system started in 1965, and we are not aware of age related problems to date.)
2. Eliminates concerns over deterioration of underground gas piping.
3. Safety and leak concerns of underground gas distribution piping are reduced to a minimum.
4. The need to address gas distribution system replacement in the near future is eliminated.
5. Lower overall cost than a phased repair and replacement.

Disadvantages

1. Highest immediate construction cost.

ENTECH

6.0 RECOMMENDATIONS

Entech Engineering strongly recommends that Shippensburg University allocate funding to replace all remaining underground steel natural gas piping and valves, as outlined under Option #3.

We at Entech believe that the advantages of replacing the remaining underground steel distribution system outweigh the costs, because doing less does not eliminate the potential for leaks and safety concerns. During the time prior to total system replacement, the remaining underground steel piping system will continue to deteriorate, and safety and leak concerns will persist. As the remainder of the underground steel system approaches the end of its useful life, the development of new leaks are likely to increase in frequency.

ENTECH

7.0 ATTACHMENTS

A - Heath Consultants, Inc. - Gas Leak Survey

B - Meeting Minutes of February 12, 1996

C - Construction Cost Estimate - Option #1

D - Construction Cost Estimate - Option #2

E - Construction Cost Estimate - Option #3

ATTACHMENT A

Heath Consultants, Inc. - Gas Leak Survey

HEATH CONSULTANTS

Heath Consultants Incorporated

Headquarters – Mideast Region
R.D. #3, Box 325
Belle Vernon, PA 15012
412-929-2300
1-800-HEATH US (432-8487)
FAX 412-929-4872

September 1, 1995

Mr. Dave Wozinak, Safety Coordinator
Shippensburg University
1871 Old Main Drive
Shippensburg, PA 17257

Dear Mr. Wozinak:

At your request, on August 22 and 23, 1995, Jeff Norman of Heath Consultants Incorporated conducted a gas leak survey for Shippensburg University on all underground mains and services.

The HFI unit used for the survey was a DP III, capable of measuring sensitivity of one part-per-million of hydrocarbon. A Scott D-15 combustible gas indicator was used to verify and classify the leaks according to GPTC guidelines.

Approximately 2.69 miles of main and 32 services were surveyed with a total of eight underground leaks. The majority of leaks detected were on a section north of Lebanon Drive from Cumberland Drive to the east end of Seavers Apartments. The integrity of this pipe is questionable and perhaps replacement of main and steel services should be considered.

Also, due to the construction and drilling for caissons along Lebanon Drive causing excessive surface water, a thorough survey was prohibited along this section.

If there are any questions concerning this report, or if any of our services are needed in the future, please feel free to contact me through our Belle Vernon, PA office at 1-800-432-8487.

Regards,

R. Jeff Norman, ml

R. Jeff Norman
Area Coordinator

RJN/mh
cc: Ken Cowher
File

Northeast Region
306 E. Main Street
P.O. Box 511
Norton, MA 02766
508-285-9891
FAX 508-285-3778

Southeast Region
135 Space Park Drive
P.O. Box 110075
Nashville, TN 37222
615-833-1579
FAX 615-333-2693

Central Southwest Region
9030 Monroe Road
P.O. Box 75130
Houston, TX 77234
713-946-7664
FAX 713-946-3032

Midwest Region
1655 S. Memorial Drive
P.O. Box 546
New Castle, IN 47362
317-521-2068
FAX 317-521-2099

West Region
501-D Harbor Boulevard
P.O. Box 1267
W. Sacramento, CA 95691
916-371-2520
FAX 916-553-3001

HEATH CONSULTANTS

Heath Consultants Incorporated

343-SFI-0003519-12

REFERENCE NUMBER

Summary of

LEAKAGE CONTROL SURVEY

FOR

SHIPPENSBURG UNIVERSITY	SHIPPENSBURG, PA	
CLIENT	CITY AND STATE	DISTRICT OR DIVISION

Conducted by Our Consultant(s) R. Jeff Norman

DATE STARTED 8-22-95 DATE COMPLETED 8-23-95 TOTAL DAYS 2

STREET SURVEY

NUMBER OF DAYS	2
MILES OF MAIN SURVEYED	2.69
NUMBER OF SERVICES INSPECTED	32
NUMBER OF POSITIVE STREET REPORTS	8
NUMBER OF NEGATIVE STREET REPORTS	-
NUMBER OF LEAK LISTING FORMS	-
NUMBER OF LEAK INDICATIONS	8

BUILDING INSPECTION

NUMBER OF DAYS	
TOTAL BUILDINGS INSPECTED	
POSITIVE BUILDING REPORTS	
NEGATIVE BUILDING REPORTS	
NUMBER OF BUILDING LISTING FORMS	
NUMBER OF SERVICE LISTING FORMS	
NUMBER OF LEAK LOCATIONS	

LEAK INDICATION CLASSIFICATION*		
1	2	3
2	4	2

BUILDING STATUS CLASSIFICATION*		
1	2	3

KEY TO MAP SYMBOLS

X Indicated Leak Location

//// Estimated Area Affected

△ Catch Basin

Tree

☐ House or Building

- - - - - Indicates the main

——— Represents curb line or edge of road unless designated as property line.

LEAK INDICATION CLASSIFICATION*

GRADE 1 — Schedule for immediate repair

GRADE 2 — Schedule for repair after Grade 1 indications are completed. Recheck mandatory if leak cannot be repaired within 6 months or before frost

GRADE 3 — Repair as work schedules permit. If indication cannot be repaired within 1 year, indication should be rechecked.

SPECIAL CASES

Contact HEATH CONSULTANTS INCORPORATED for further information regarding any Special Case such as analysis, sample collecting, investigation, verification, survey recheck, etc.

Our Consultant will be available on 24-hour notice to assist you.

* Leak Indication Classification is not an exact science. In spite of the use of the most modern instruments plus complete training and experience by the Consultant it is impossible to determine the exact condition of underground piping and equipment without actually exposing same. In view of this limitation our Classification is intended as an aid in scheduling repairs based upon the information available, consultant's judgment and site conditions at the time the report is prepared. Variable factors beyond our control may alter this Classification at any time. Main and service line leak indications are classified individually. Classifications for buildi

SHIPPENSBURG UNIVERSITY
SHIPPENSBURG, PA

SFI SURVEY
1995

INDEX

POSITIVE STREET REPORTS

HEATH CONSULTANTS

Heath Consultants Incorporated
1039 Monroe Road, Houston, TX 77061

Page No. 01
Date 8-22-95
Status (Circle Status) (Pos.) Neg.
Leak Indication Classification (Circle Leak Indication)
1 2 (3)
TIME REPORTED
1 LEAK ONLY

LEAKAGE CONTROL REPORT
FIELD SURVEY

Company Shippensburg University District Campus
City Shippensburg State PA.
Nearest Street Address
REISNER HALL CUMBERLAND DR

TYPE OF GAS

Natural	X
Manuf.	
LP	
Other	

PIPE DESIGNATION

Distribution	X
Transmission	
Gathering	
Other	

LEAK INDICATION FIRST DETECTED (AT) (IN) (BY)

Atmosphere	X
Bar Hole Test	
Man Hole	
Pit (Reg. or Meter)	
Valve Box	
Main Valve	
Curb Valve	
Meter Box	
Underground Fuel Tank	
Selected Test	

METHOD OF SURVEY

Vegetation	
Portable F I	X
Mobile F I	
Bar Hole	
Other	

PRESSURE

High	
Intermediate	X
Low	

LEAK INDICATION APPEARS TO BE AT:

Main	
Service	
Service Tap	
Main At Tie In	
Drip	
Meter	
Curb Valve	
Main Valve	X
Other	

CGI TEST

Positive	X
Negative	

LEAK INDICATION (Vegetation Only)

Trees	
Shrubs	
Grass	
Lawn	
Weeds	
Odor	
Other Sidewalk	✓

LOCATION OF PIPE

Street	
Between St. & Sidewalk	
Under Sidewalk	X
Lawn	
Easement	
R.O.W.	
Other	

COVER

Concrete	X
Asphalt	
Brick	
Gravel	
Soil	
Other	

Remarks

Leak appears to be in valve. 16% gas read

R. Jeff Moore

HEATH CONSULTANTS

Heath Consultants Incorporated
903 Monroe Road, Houston, TX 77061

Page No. 02
Date 2-23-95
Status (Circle Status) (Pos) Neg.
Leak Indication Classification (Circle Leak Indication)
1 (2) 3
TIME REPORTED
1 LEAK ONLY

LEAKAGE CONTROL REPORT
FIELD SURVEY

Company Shippensburg University District Campus
City Shippensburg State PA.
Nearest Street Address
MOWREY HALL CUMBERLAND DR

TYPE OF GAS

Natural	X
Manuf.	
[illegible]	
Other	

PIPE DESIGNATION

Distribution	X
Transmission	
Gathering	
Other	

LEAK INDICATION FIRST DETECTED (AT) (IN) (BY)

Atmosphere	X
Bar Hole Test	
Man Hole	
Pit (Reg. or Meter)	
Valve Box	
Main Valve	
Curb Valve	
Meter Box	
Underground Fuel Tank	
Selected Test	

METHOD OF SURVEY

Vegetation	
Portable F I	X
Mobile F I	
Bar Hole	
Other	

PRESSURE

High	
Intermediate	X
Low	

LEAK INDICATION APPEARS TO BE AT:

Main	X
Service	
Service Tap	
Main At Tie In	
Drip	
Meter	
Curb Valve	
Main Valve	
Other	

CGI TEST

Positive	X
Negative	

LEAK INDICATION (Vegetation Only)

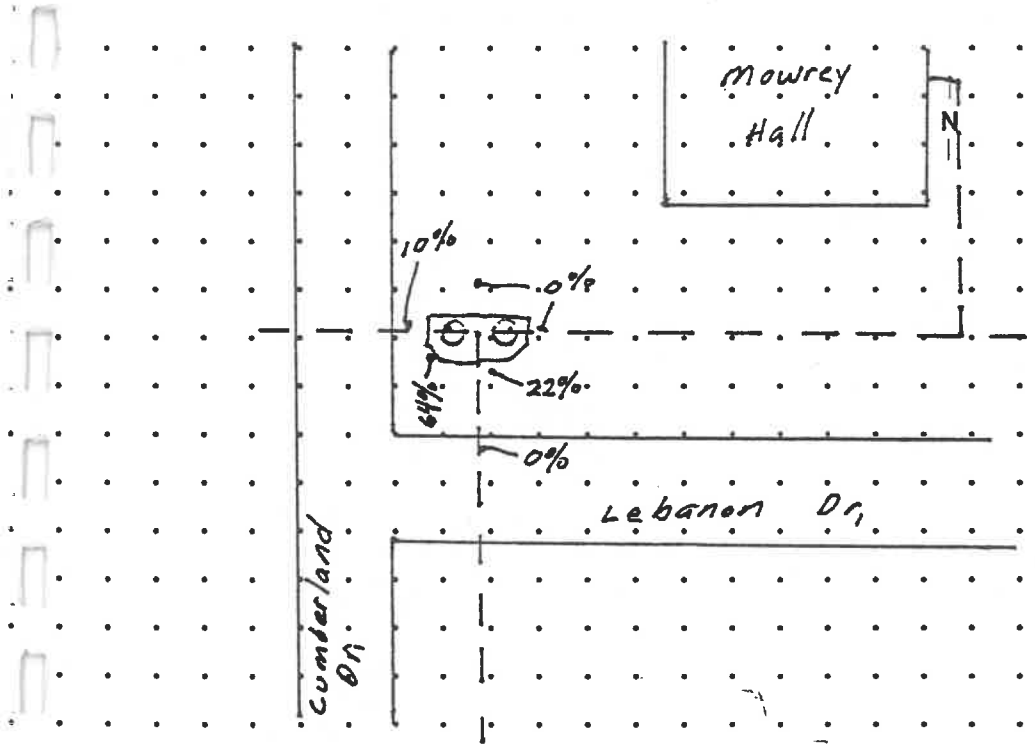
Trees	
Shrubs	
Grass	
Lawn	
Weeds	
Odor	
Other Below Pad	X

LOCATION OF PIPE

Street	
Between St. & Sidewalk	
Under Sidewalk	
Lawn	
Easement	
R.O.W.	
Other Below Pad	X

COVER

Concrete	X
Asphalt	
Brick	
Gravel	
Soil	
Other	



Remarks

Leak appears to be under concrete pad. 0% gas in both valves. 64% gas @ edge

R.O.W.

02

HEATH CONSULTANTS

Heath Consultants Incorporated
100 Tosca Drive, P.O. Box CS-200, Stoughton, MA 02072-1591

Page No. 03
Date 2-23-95
Status (Circle Status) (Pos.) Neg.
Leak Indication Classification (Circle Leak Indication)
1 (C) (2) (B) 3 (A)
TIME REPORTED
1 (C) LEAK ONLY

LEAKAGE CONTROL REPORT
FIELD SURVEY

Company Shippensburg University District Campus
City Shippensburg State PA
Nearest Street Address
UNION BLDG. CUMBERLAND DR.

TYPE OF GAS

Natural	X
Manuf.	
L.P.	
Other	

LEAK INDICATION FIRST DETECTED (AT) (IN) (BY)

Atmosphere	✓
Bar Hole Test	
Man Hole	
Pit (Reg. or Meter)	
Valve Box	
Main Valve	
Curb Valve	
Meter Box	
Underground Fuel Tank	
Selected Test	

METHOD OF SURVEY

Vegetation	
Portable F I	X
Mobile F I	
Bar Hole	
Other	

LEAK INDICATION APPEARS TO BE AT:

Main	X
Service	
Service Tap	
Main at Tie In	
Drip	
Meter	
Curb Valve	
Main Valve	
Other	

PIPE DESIGNATION

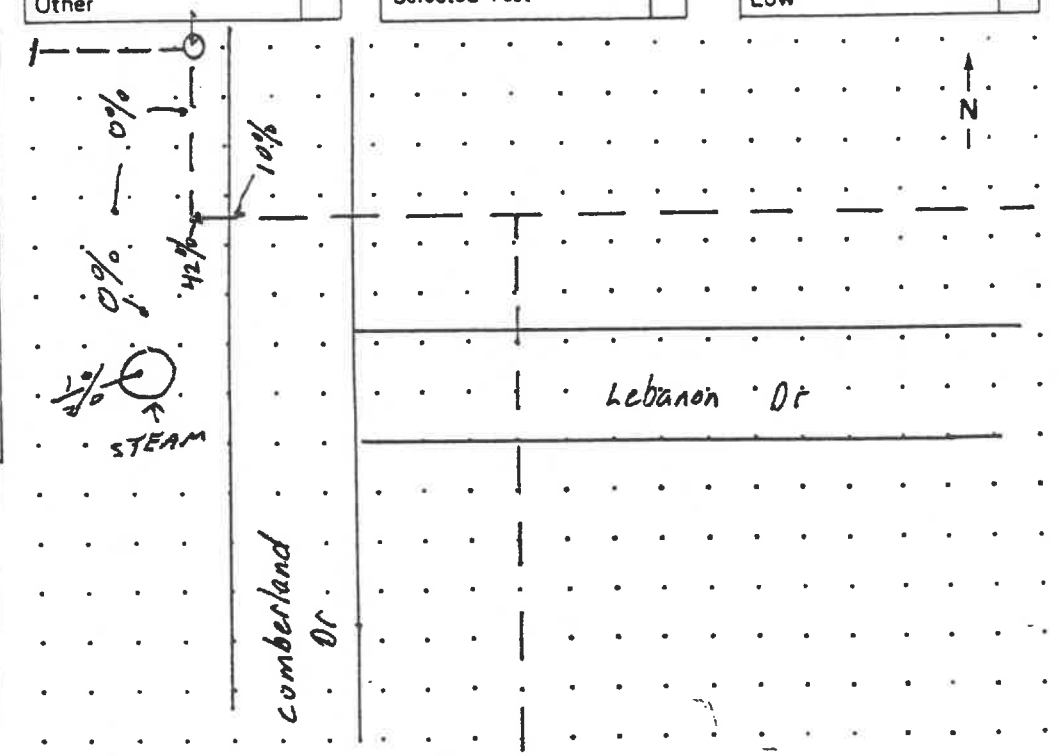
Distribution	X
Transmission	
Gathering	
Other	

PRESSURE

High	
Intermediate	✓
Low	

CGI TEST

Positive	X
Negative	



LEAK INDICATION (Vegetation Only)

Trees	
Shrubs	
Grass	X
Lawn	
Weeds	
Odor	
Other	

LOCATION OF PIPE

Street	
Between St. & Sidewalk	
Under Sidewalk	
Lawn	X
Easement	
R. O. W.	
Other	

COVER

Concrete	
Asphalt	
Brick	
Gravel	
Soil	X
Other	

Remarks

Leak appears to be on main. 42% gas @ edge of sidewalk. approx @ main 90° bend

R. Hall

Page No 06

HEATH CONSULTANTS
Heath Consultants Incorporated
100 Tosca Drive, P.O. Box CS-200, Stoughton, MA 02072-1591

Page No. 04
Date 8-23-95
Status (Circle Status) (Pos.) Neg.
Leak Indication Classification (Circle Leak Indication)
1 (C) 2 (B) 3 (A)
TIME REPORTED
1 (C) LEAK ONLY

LEAKAGE CONTROL REPORT
FIELD SURVEY

Company Shippensburg University District Campus
City Shippensburg State PA
Nearest Street Address
MOWREY HALL LEBANON DR

TYPE OF GAS

Natural	✓
Manuf.	
L.P.	
Other	

LEAK INDICATION FIRST DETECTED (AT) (IN) (BY)

Atmosphere	A
Bar Hole Test	
Man Hole	
Pit (Reg. or Meter)	
Valve Box	
Main Valve	
Curb Valve	
Meter Box	
Underground Fuel Tank	
Selected Test	

METHOD OF SURVEY

Vegetation	
Portable F I	✓
Mobile F I	
Bar Hole	
Other	

LEAK INDICATION APPEARS TO BE AT:

Main	✓
Service	
Service Tap	
Main at Tie In	
Drip	
Meter	
Curb Valve	
Main Valve	
Other	

PIPE DESIGNATION

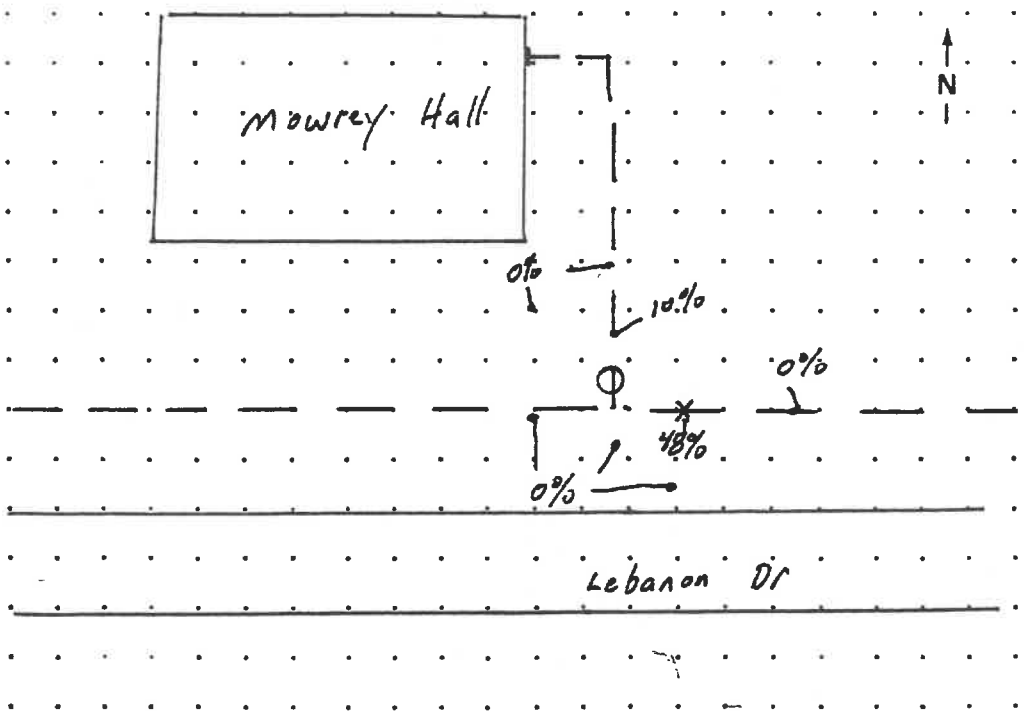
Distribution	✓
Transmission	
Gathering	
Other	

PRESSURE

High	
Intermediate	✓
Low	

CGI TEST

Positive	✓
Negative	



LEAK INDICATION (Vegetation Only)

Trees	
Shrubs	
Grass	
Lawn	✓
Weeds	
Odor	
Other	

LOCATION OF PIPE

Street	
Between St. & Sidewalk	
Under Sidewalk	
Lawn	✓
Easement	
R. O. W.	
Other	

COVER

Concrete	
Asphalt	
Brick	
Gravel	
Soil	✓
Other	

Remarks

Leak appears to be on main. 48% gas approx 5" East of valve 2% gas in valve

Page No. ~~10~~

Page No. 05

Date 8-23-95

Status (Circle Status) (Pos.) Neg.

Leak Indication Classification (Circle Leak Indication)

1 2 (3)

TIME REPORTED _____

1 LEAK ONLY

HEATH CONSULTANTS

Heath Consultants Incorporated

9030 Monroe Road, Houston, TX 77061

LEAKAGE CONTROL REPORT
FIELD SURVEY

Company Shippensburg University District Campus

City Shippensburg State PA.

Nearest Street Address

SEAVERS HALL LEBANON DR

TYPE OF GAS

Natural	~~—~~
Manuf.	
L.P.	
Other	

PIPE DESIGNATION

Distribution	T
Transmission	
Gathering	
Other	

LEAK INDICATION FIRST DETECTED (AT) (IN) (BY)

Atmosphere	T
Bar Hole Test	
Man Hole	
Pit (Reg. or Meter)	
Valve Box	
Main Valve	
Curb Valve	
Meter Box	
Underground Fuel Tank	
Selected Test	

METHOD OF SURVEY

Vegetation	
Portable F I	+
Mobile F I	
Bar Hole	
Other	

PRESSURE

High	
Intermediate	+
Low	

LEAK INDICATION APPEARS TO BE AT:

Main	
Service	
Service Tap	
Main At Tie In	
Drip	
Meter	
Curb Valve	
Main Valve	T
Other	

CGI TEST

Positive	X
Negative	

LEAK INDICATION (Vegetation Only)

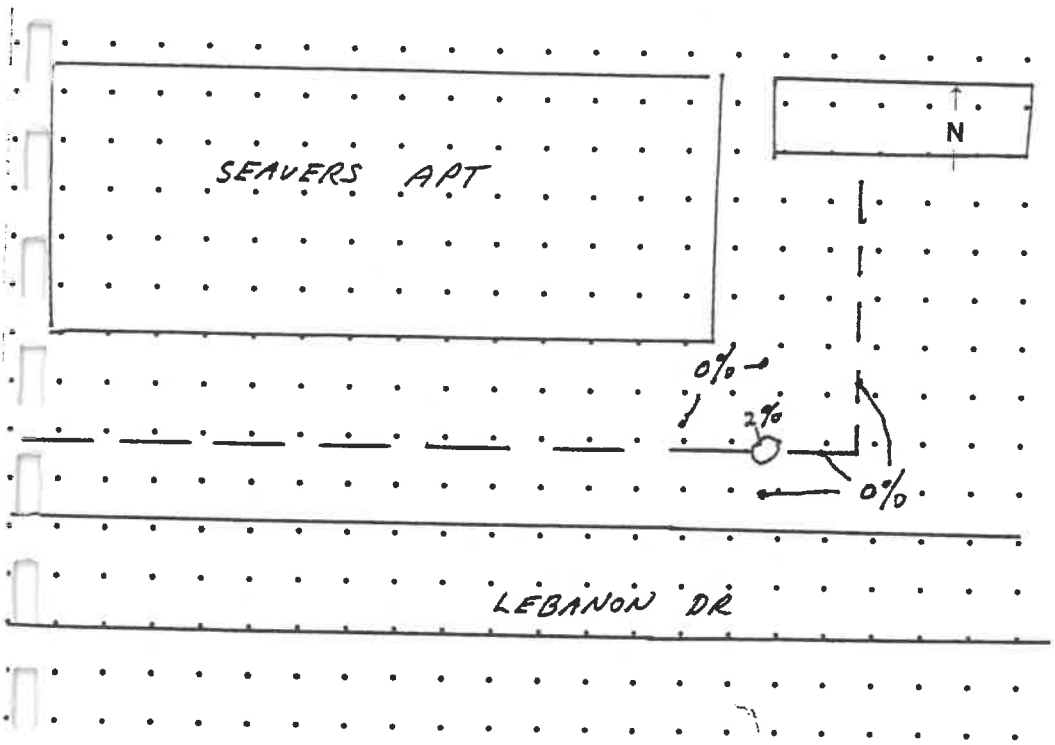
Trees	
Shrubs	
Grass	
Lawn	
Weeds	
Odor	
Other	

LOCATION OF PIPE

Street	
Between St. & Sidewalk	
Under Sidewalk	X
Lawn	
Easement	
R.O.W.	
Other	

COVER

Concrete	X
Asphalt	
Brick	
Gravel	
Soil	
Other	



Remarks Leak appears to be on valve to east side of Seavers Hall.

R. M. M.

Page No. 06
Date 8-23-95

Page No. 06
Date 8-23-95

Status (Circle Status) (Pos.) Neg.

Leak Indication Classification (Circle Leak Indication)
(1) 2 3

TIME REPORTED 10:05 AM

1 LEAK ONLY

HEATH CONSULTANTS

Heath Consultants Incorporated
9030 Monroe Road, Houston, TX 77061

LEAKAGE CONTROL REPORT
FIELD SURVEY

Company Shippensburg University District Campus

City Shippensburg State PA

Nearest Street Address

SEAVERS APTS LEBANON DR

TYPE OF GAS

Natural	X
Manuf.	
L...	
Other	

PIPE DESIGNATION

Distribution	X
Transmission	
Gathering	
Other	

LEAK INDICATION FIRST DETECTED (AT) (IN) (BY)

Atmosphere	✓
Bar Hole Test	
Man Hole	
Pit (Reg. or Meter)	
Valve Box	
Main Valve	
Curb Valve	
Meter Box	
Underground Fuel Tank	
Selected Test	

METHOD OF SURVEY

Vegetation	
Portable F I	X
Mobile F I	
Bar Hole	
Other	

PRESSURE

High	
Intermediate	X
Low	

LEAK INDICATION APPEARS TO BE AT:

Main	
Service	X
Service Tap	
Main At Tie In	
Drip	
Meter	
Curb Valve	
Main Valve	
Other	

CGI TEST

Positive	X
Negative	

LEAK INDICATION (Vegetation Only)

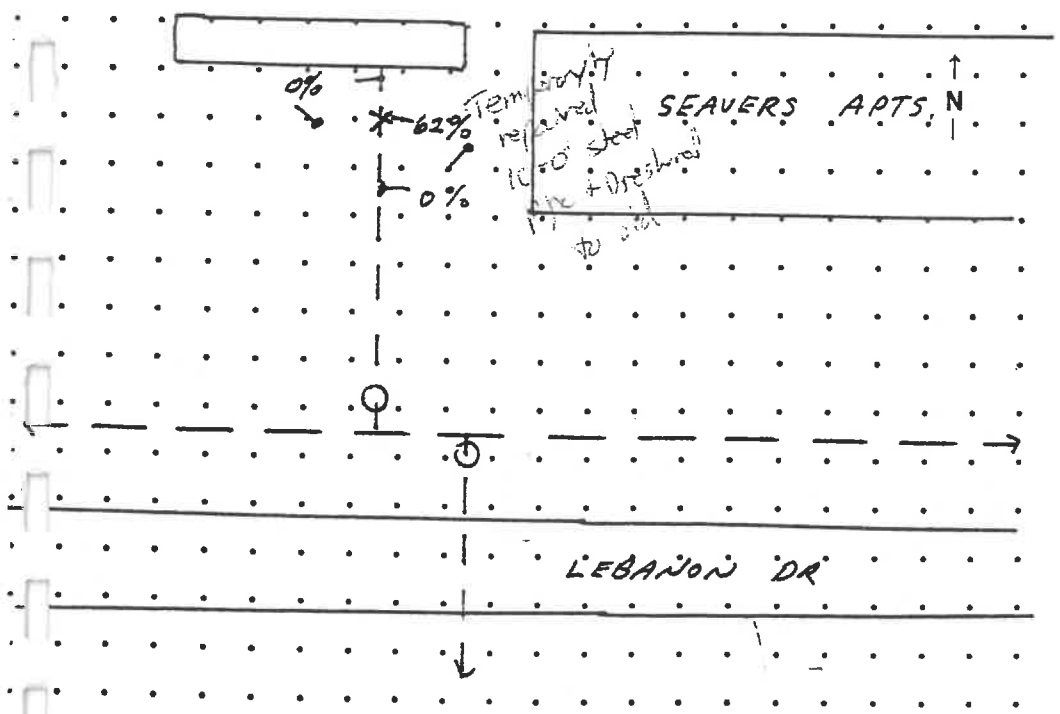
Trees	
Shrubs	
Grass	
Lawn	
Weeds	
Odor	
Other	

LOCATION OF PIPE

Street	
Between St. & Sidewalk	
Under Sidewalk	
Lawn	
Easement	
R.O.W.	
Other Below Trees	X

COVER

Concrete	
Asphalt	
Brick	
Gravel	
Soil	X
Other	



Remarks

Leak appears to be on service line west side of Seavers Hall. 62% gas 4½' South of wall.

Heath Consultants Incorporated
100 Tosca Drive, P.O. Box CS-200, Stoughton, MA 02072-1591

Page No. 07
Date 8-23-95
Status (Circle Status) Pos Neg.
Leak Indication Classification (Circle Leak Indication)
1 (C) 2 (B) 3 (A)
TIME REPORTED
1 (C) LEAK ONLY

LEAKAGE CONTROL REPORT
FIELD SURVEY

Company Shippensburg University District Campus
City Shippensburg State PA
Nearest Street Address
LEHMAN LIBRARY, BUCKS DR

TYPE OF GAS

Natural	X
Manuf.	
L.P.	
Other	

PIPE DESIGNATION

Distribution	X
Transmission	
Gathering	
Other	

LEAK INDICATION FIRST DETECTED (AT) (IN) (BY)

Atmosphere	X
Bar Hole Test	
Man Hole	
Pit (Reg. or Meter)	
Valve Box	
Main Valve	
Curb Valve	
Meter Box	
Underground Fuel Tank	
Selected Test	

METHOD OF SURVEY

Vegetation	
Portable F I	X
Mobile F I	
Bar Hole	
Other	

PRESSURE

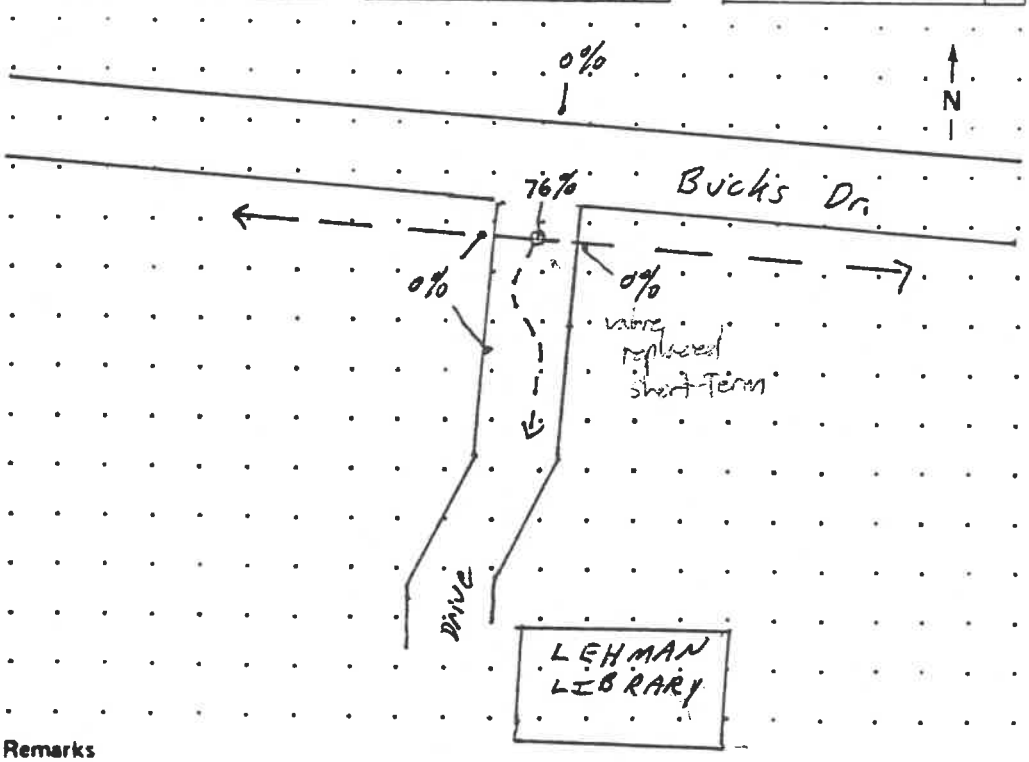
High	
Intermediate	X
Low	

LEAK INDICATION APPEARS TO BE AT:

Main	
Service	
Service Tap	X
Main at Tie In	
Drip	
Meter	
Curb Valve	
Main Valve	
Other	

CGI TEST

Positive	X
Negative	



LEAK INDICATION (Vegetation Only)

Trees	
Shrubs	
Grass	
Lawn	
Weeds	
Odor	
Other	

LOCATION OF PIPE

Street	X
Between St. & Sidewalk	
Under Sidewalk	
Lawn	
Easement	
R. O. W.	
Other	

COVER

Concrete	
Asphalt	X
Brick	
Gravel	
Soil	
Other	

Remarks

Leak appears to be in valve. 76% gas read.

R. Jeff Norris

Heath Consultants

Heath Consultants Incorporated

100 Tosca Drive, P.O. Box CS-200, Stoughton, MA 02072-1591

LEAKAGE CONTROL REPORT
FIELD SURVEY

Page No. 08

Date 8-23-95

Status (Circle Status) (Pos.) Neg.

Leak Indication Classification (Circle Leak Indication)

(1 (C)) 2 (B) 3 (A)

TIME REPORTED 12:05 PM

1 (C) LEAK ONLY

Company Shippensburg University District Campus

City Shippensburg State PA

Nearest Street Address

FIELD HOUSE BUCKS DR

TYPE OF GAS

Natural	✗
Manuf.	
L.P.	
Other	

PIPE DESIGNATION

Distribution	✗
Transmission	
Gathering	
Other	

LEAK INDICATION FIRST DETECTED (AT) (IN) (BY)

Atmosphere	✗
Bar Hole Test	
Man Hole	
Pit (Reg. or Meter)	
Valve Box	
Main Valve	
Curb Valve	
Meter Box	
Underground Fuel Tank	
Selected Test	

METHOD OF SURVEY

Vegetation	
Portable F I	
Mobile F I	
Bar Hole	
Other	

PRESSURE

High	
Intermediate	✗
Low	

LEAK INDICATION APPEARS TO BE AT:

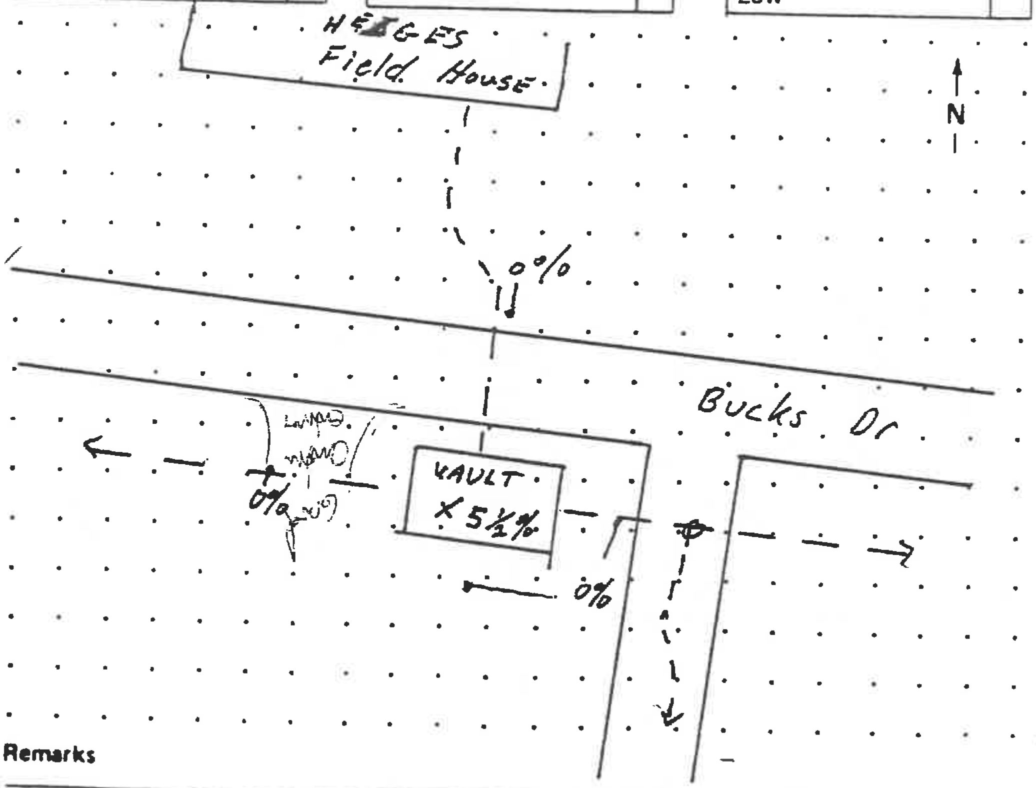
Main	
Service	
Service Tap	
Main at Tie In	
Drip	
Meter	
Curb Valve	
Main Valve	
Other Vault	✗

CGI TEST

Positive	✗
Negative	

LEAK INDICATION (Vegetation Only)

Trees	
Shrubs	
Grass	
Lawn	
Weeds	
Odor	
Other	



LOCATION OF PIPE

Street	
Between St. & Sidewalk	
Under Sidewalk	
Lawn	
Easement	
R. O. W.	
Other VAULT	✗

COVER

Concrete	
Asphalt	
Brick	
Gravel	
Soil	
Other	

Remarks

Leak appears to be in vault. 5½% gas read.

[signature] R. Jeff Noon [signature]

Heath Consultant

ATTACHMENT B

Meeting Minutes of February 12, 1996

Entech Engineering, Inc.

Consulting Engineers

Reading • Pottsville • Lehigh Valley

Principals:
Daniel J. Castellani, PE
Thomas M. McMahon, PE
William M. McMahon Jr., PE

ENTECH

MEETING MINUTES

PROJECT: Shippensburg University - Natural Gas Pipeline Replacement

MEETING DATE: February 12, 1996

MEETING LOCATION: Shippensburg University

PURPOSE OF MEETING: Project Kickoff Meeting
Natural Gas Pipeline Replacement

CLIENT: Noelker and Hull Associates, Inc.

ATTENDEES:

Shippensburg University
- Terrence E. Durbin
- Norm Kelley
- Dave Wozniak
- Daniel Stine
- Wesley Neghey
- Dick Daihl
- Scott Miller

Noelker and Hull Associates - Donald Scruggs

Entech Engineering, Inc.
- Mark Ray
- Craig Snyder
- Bob Eshbach

DISTRIBUTION: Attendees

MINUTES RECORDED BY: Robert M. Eshbach

A kickoff meeting was held for the purpose of defining the specific scope of work and to collect information relevant to the completion of Phase I of the referenced project. Phase I is a study to be performed by Entech Engineering which will identify the construction costs associated with implementing various alternatives for repairing

4 South Fourth Street
P.O. Box 32
Reading
Pennsylvania 19603

Office 610.373.6667

Fax 610.373.7537

and/or replacing underground natural gas lines on the University's campus. The issues discussed can be summarized as follows:

1. The overall objective of the study is to identify the costs associated with the various alternatives for eliminating the leakage problems identified by the leak survey conducted by Heath Consultants. The options being considered are:

   a. Replace all existing underground steel piping and valves with plastic (polyethylene) piping and valves.
   b. Replace only the underground steel pipe and valves along Bucks and Lebanon Drives (including all branches to buildings) and fix the leak near Reisner Hall.
   c. Fix the leaks and replace any adjacent valves.

2. Mark Ray summarized the study completed in 1991 by Entech which resulted in the replacement of a large portion of the underground steel gas piping, valves, regulators and meters on the Shippensburg University campus. That work included building-by-building tabulation of actual and planned load sources for the campus, calculation of pipe sizes and pressures, and compilation of appropriate cost estimates.

3. Dave Wozniak described the findings of a leak survey recently completed by Heath Consultants. A total of eight (8) gas leaks were reported, primarily along Bucks and Lebanon Drives.

4. Information provided by the University, required for preparation of the study, included:

   a. Operating underground gas pressure of 7 psi is currently being utilized.
   b. Many valves do not turn off tightly so that lines cannot be isolated. Deterioration of the seats is the probable cause. Since valve replacement is likely to be cost effective, replacement of inoperable valves should be included in Option c., the minimum replacement effort. The length of pipe to be replaced with the valve must be defined so that we have a high assurance of attaching to solid pipe. Doing so may be difficult since corrosion is a potential problem.
   c. All valves should be operable with a single key.
   d. New pressure regulators should be provided at all buildings that will have new branch lines.
   e. All buildings should have gas meters. Heiges Field House currently does not.
   f. The last 40 feet of underground piping at Grove Stadium is steel.
   g. The spec should require use of a controllable moler.

h. Additional loads not previously identified include:
   - Martin House
   - Proposed boiler for Cumberland Union (need capacity)
   - Proposed boiler for Lehman Library (need capacity)
   - New generator for Dauphin Addition (need capacity)
   - New generator for Grove Hall (need capacity)

4. It was noted that Class I leaks have been repaired along Bucks Drive and at Seavers Apartments. The Seavers Apartment repair is a temporary repair.

5. The report should be definitive with respect to making recommendations for remedial action by the University, as required to ensure safety and minimize the potential for future leaks.

6. This will be a single prime contract.

7. Don Scruggs indicated that he would forward Entech a tabulation of new gas loads at Martin House. (The tabulation has been received.)

8. Natural gas clothes dryers, previously considered for installation, were never installed.

9. An agreement was reached that the study to be prepared by Entech would be utilized as the basis for choosing one construction option. Subsequent design work and drawing preparation would then be limited to consideration of that single option only. In this regard it was further noted that the proposed engineering costs were developed on the basis of considering a single construction option.

10. The study and cost estimates will be completed by February 23, 1996.

11. Follow-up note: Please forward a site plan for the new Grove Hall Building (Norm Kelley).

END OF MINUTES

RME/mfs

G:\PROJECTS\7124.01\WP\MEETMIN1.DOC

ATTACHMENT C

Cost Estimate - Option #1

Shippensburg University
Natural Gas Pipeline Replacement
Option 1 - Conceptual Cost Estimate

Description	Qty	Units	Matl Cost	Labor Cost	Total Matl	Total Labor	Total Cost
Mobilization	1	LS	$0.00	$3,000.00	$0	$3,000	$3,000
Locate Underground Utilities	10	MH	$0.00	$50.00	$0	$500	$500
Excavate Trench	700	LF	$0.00	$2.65	$0	$1,855	$1,855
Rock Removal	100	CF	$0.00	$2.65	$0	$265	$265
Pipe Bedding	400	LF	$0.27	$0.40	$108	$160	$268
Backfill & Compact Trench	700	LF	$0.00	$4.72	$0	$3,304	$3,304
Haul Excess Soil	400	LF	$0.00	$1.00	$0	$400	$400
Dewatering of Excavation	700	LF	$0.00	$0.25	$0	$175	$175
Barriers	700	LF	$0.00	$0.30	$0	$210	$210
Difficult Spot (ie: bushes, hill)	40	LF	$0.00	$20.00	$0	$800	$800
Dig under a curb	2	EA	$0.00	$32.00	$0	$64	$64
Remove Conc. Sidewalk	480	SF	$0.00	$2.00	$0	$960	$960
Replace Conc. Sidewalk	480	SF	$1.65	$4.00	$792	$1,920	$2,712
Remove Macadam Paving	1080	SF	$0.00	$1.00	$0	$1,080	$1,080
Saw Cut & Seal Paving	460	LF	$0.25	$3.50	$115	$1,610	$1,725
Replace Macadam Paving	1080	SF	$1.25	$3.00	$1,350	$3,240	$4,590
Steel Plate Bridging	3	EA	$0.00	$200.00	$0	$600	$600
Top Soil and Final Grade	800	SF	$0.05	$0.20	$40	$160	$200
Seeding	800	SF	$0.03	$0.20	$24	$160	$184
Remove curb box	11	EA	$0.00	$40.00	$0	$440	$440
Remove Steel Pipe, 2 1/2" +	200	LF	$0.00	$4.00	$0	$800	$800
Remove Steel Pipe, 1" to 2"	80	LF	$0.00	$1.85	$0	$148	$148
Plastic Pipe, Undergrd 3"	300	LF	$1.90	$3.85	$570	$1,155	$1,725
Plastic Pipe, Undergrd 2"	100	LF	$0.90	$2.30	$90	$230	$320
Plastic Pipe, Undergrd 1 1/4"	0	LF	$0.48	$2.10	$0	$0	$0
Plastic Pipe, Undergrd 1"	10	LF	$0.30	$1.90	$3	$19	$22
Locate Wire	300	LF	$0.08	$0.30	$24	$90	$114
Warning Tape	300	LF	$0.12	$0.30	$36	$90	$126
Service Tap, Plastic 2"	1	EA	$44.00	$50.00	$44	$50	$94
Service Tap, Plastic 1 1/4"	0	EA	$26.00	$41.50	$0	$0	$0
Service Tap, Plastic 1"	0	EA	$13.00	$37.50	$0	$0	$0
Tee, Plastic 3"	10	EA	$22.00	$55.00	$220	$550	$770
Tee, Plastic 2"	0	EA	$14.00	$37.50	$0	$0	$0
Elbow or Rdcr, Plastic 3"	4	EA	$20.00	$43.00	$80	$172	$252
Elbow or Rdcr, Plastic 2"	5	EA	$13.00	$28.00	$65	$140	$205
Plastic to steel adapter	24	EA	$55.00	$250.00	$1,320	$6,000	$7,320
Valve, Plastic 3"	5	EA	$380.00	$57.00	$1,900	$285	$2,185
Valve, Plastic 2"	6	EA	$220.00	$45.00	$1,320	$270	$1,590
Valve, Plastic 1 1/4"	1	EA	$110.00	$36.00	$110	$36	$146
Valve, Plastic 1"	1	EA	$75.00	$33.00	$75	$33	$108
Valve Box	13	EA	$40.00	$40.00	$520	$520	$1,040

Shippensburg University
Natural Gas Pipeline Replacement
Option 1 - Conceptual Cost Estimate

Description	Qty	Units	Matl Cost	Labor Cost	Total Matl	Total Labor	Total Cost
Valve Box Conc. Pad	13	EA	$10.00	$37.50	$130	$488	$618
Meter Riser, 2"	0	EA	$92.00	$125.00	$0	$0	$0
Meter Riser, 1 1/4"	0	EA	$55.00	$62.00	$0	$0	$0
Meter Riser, 1"	1	EA	$36.00	$50.00	$36	$50	$86
Service Valve, 2"	0	EA	$140.00	$45.00	$0	$0	$0
Service Valve, 1 1/4"	1	EA	$110.00	$30.00	$110	$30	$140
Service Valve, 1"	1	EA	$93.00	$26.00	$93	$26	$119
Pipe, Steel 2"	0	LF	$5.00	$10.30	$0	$0	$0
Pipe, Steel 1 1/4"	10	LF	$3.25	$7.45	$33	$75	$107
Pipe, Steel 1"	10	LF	$2.75	$7.00	$28	$70	$98
Fittings, Steel 2"	0	EA	$8.00	$37.00	$0	$0	$0
Fittings, Steel 1 1/4"	5	EA	$3.60	$30.00	$18	$150	$168
Fittings, Steel 1"	5	EA	$2.50	$28.50	$13	$143	$155
Pressure Regulator, 2"	0	EA	$350.00	$35.00	$0	$0	$0
Pressure Regulator, 1 1/2"	0	EA	$310.00	$30.00	$0	$0	$0
Pressure Regulator, 1 1/4"	0	EA	$80.00	$25.00	$0	$0	$0
Pressure Regulator, 3/4 or 1"	1	EA	$78.00	$20.00	$78	$20	$98
Gas Meter w/ pad, Large	0	EA	$2,000.00	$200.00	$0	$0	$0
Gas Meter w/ pad, Medium	0	EA	$1,100.00	$140.00	$0	$0	$0
Gas Meter, Small	1	EA	$300.00	$75.00	$300	$75	$375
Remove Gas Meter, Medium	0	EA	$0.00	$40.00	$0	$0	$0
Remove Gas Meter, Small	1	EA	$0.00	$30.00	$0	$30	$30
Bldg penetration w/ sleeve	1	EA	$10.00	$50.00	$10	$50	$60
Painting	3	HR	$5.00	$35.00	$15	$105	$120
Clean-up	1	LS	$0.00	$1,000.00	$0	$1,000	$1,000
Sub-Total					$9,669	$33,802	$43,470
Small Job Multiplier	25	%					$10,868
General Conditions	10	%					$5,434
Contigency	20	%					$11,954
Total Construction Cost							$60,858
Engineering							$14,000
						Total Project Cost	$70,000

G:\PROJECTS\7124.01\SS\COSTEST1.WK1

03/01/96

ATTACHMENT D

Cost Estimate - Option #2

Shippensburg University
Natural Gas Pipeline Replacement
Option 2 - Conceptual Cost Estimate

Description	Qty	Units	Matl Cost	Labor Cost	Total Matl	Total Labor	Total Cost
Mobilization	1	LS	$0.00	$5,000.00	$0	$5,000	$5,000
Locate Underground Utilities	44	MH	$0.00	$50.00	$0	$2,200	$2,200
Excavate Trench	3,210	LF	$0.00	$2.65	$0	$8,507	$8,507
Rock Removal	3,210	CF	$0.00	$2.65	$0	$8,507	$8,507
Pipe Bedding	3,210	LF	$0.27	$0.40	$867	$1,284	$2,151
Backfill & Compact Trench	3,210	LF	$0.00	$4.72	$0	$15,151	$15,151
Haul Excess Soil	3,210	LF	$0.00	$1.00	$0	$3,210	$3,210
Dewatering of Excavation	3,210	LF	$0.00	$0.25	$0	$803	$803
Barriers	3,210	LF	$0.00	$0.30	$0	$963	$963
Difficult Spot (ie: bushes, hill)	40	LF	$0.00	$20.00	$0	$800	$800
Dig under a curb	19	EA	$0.00	$32.00	$0	$608	$608
Remove Conc. Sidewalk	1,390	SF	$0.00	$2.00	$0	$2,780	$2,780
Replace Conc. Sidewalk	1,390	SF	$1.65	$4.00	$2,294	$5,560	$7,854
Remove Macadam Paving	3,140	SF	$0.00	$1.00	$0	$3,140	$3,140
Saw Cut & Seal Paving	1,325	LF	$0.25	$3.50	$331	$4,638	$4,969
Replace Macadam Paving	3,140	SF	$1.25	$3.00	$3,925	$9,420	$13,345
Steel Plate Bridging	8	EA	$0.00	$200.00	$0	$1,600	$1,600
Top Soil and Final Grade	11,240	SF	$0.05	$0.20	$562	$2,248	$2,810
Seeding	11,240	SF	$0.03	$0.20	$337	$2,248	$2,585
Remove curb box	18	EA	$0.00	$40.00	$0	$720	$720
Remove Steel Pipe, 2 1/2" +	120	LF	$0.00	$4.00	$0	$480	$480
Remove Steel Pipe, 1" to 2"	110	LF	$0.00	$1.85	$0	$204	$204
Plastic Pipe, Undergrd 3"	1,750	LF	$1.90	$3.85	$3,325	$6,738	$10,063
Plastic Pipe, Undergrd 2"	1,050	LF	$0.90	$2.30	$945	$2,415	$3,360
Plastic Pipe, Undergrd 1 1/4"	200	LF	$0.48	$2.10	$96	$420	$516
Plastic Pipe, Undergrd 1"	200	LF	$0.30	$1.90	$60	$380	$440
Locate Wire	3,200	LF	$0.08	$0.30	$256	$960	$1,216
Warning Tape	3,200	LF	$0.12	$0.30	$384	$960	$1,344
Service Tap, Plastic 2"	4	EA	$44.00	$50.00	$176	$200	$376
Service Tap, Plastic 1 1/4"	1	EA	$26.00	$41.50	$26	$42	$68
Service Tap, Plastic 1"	2	EA	$13.00	$37.50	$26	$75	$101
Tee, Plastic 3"	4	EA	$22.00	$55.00	$88	$220	$308
Tee, Plastic 2"	1	EA	$14.00	$37.50	$14	$38	$52
Elbow or Rdcr, Plastic 3"	9	EA	$20.00	$43.00	$180	$387	$567
Elbow or Rdcr, Plastic 2"	8	EA	$13.00	$28.00	$104	$224	$328
Plastic to steel adapter	10	EA	$50.00	$250.00	$500	$2,500	$3,000
Valve, Plastic 3"	6	EA	$380.00	$57.00	$2,280	$342	$2,622
Valve, Plastic 2"	9	EA	$220.00	$45.00	$1,980	$405	$2,385
Valve, Plastic 1 1/4"	1	EA	$110.00	$36.00	$110	$36	$146
Valve, Plastic 1"	2	EA	$75.00	$33.00	$150	$66	$216
Valve Box	18	EA	$40.00	$40.00	$720	$720	$1,440

Shippensburg University
Natural Gas Pipeline Replacement
Option 2 - Conceptual Cost Estimate

Description	Qty	Units	Matl Cost	Labor Cost	Total Matl	Total Labor	Total Cost
Valve Box Conc. Pad	18	EA	$10.00	$37.50	$180	$675	$855
Meter Riser, 2"	3	EA	$92.00	$125.00	$276	$375	$651
Meter Riser, 1 1/4"	1	EA	$55.00	$62.00	$55	$62	$117
Meter Riser, 1"	2	EA	$36.00	$50.00	$72	$100	$172
Service Valve, 2"	3	EA	$140.00	$45.00	$420	$135	$555
Service Valve, 1 1/4"	2	EA	$110.00	$30.00	$220	$60	$280
Service Valve, 1"	2	EA	$93.00	$26.00	$186	$52	$238
Pipe, Steel 2"	60	LF	$5.00	$10.30	$300	$618	$918
Pipe, Steel 1 1/4"	20	LF	$3.25	$7.45	$65	$149	$214
Pipe, Steel 1"	50	LF	$2.75	$7.00	$138	$350	$488
Fittings, Steel 2"	36	EA	$8.00	$37.00	$288	$1,332	$1,620
Fittings, Steel 1 1/4"	11	EA	$3.60	$30.00	$40	$330	$370
Fittings, Steel 1"	12	EA	$2.50	$28.50	$30	$342	$372
Pressure Regulator, 2"	3	EA	$350.00	$35.00	$1,050	$105	$1,155
Pressure Regulator, 1 1/2"	0	EA	$310.00	$30.00	$0	$0	$0
Pressure Regulator, 1 1/4"	1	EA	$80.00	$25.00	$80	$25	$105
Pressure Regulator, 3/4 or 1"	2	EA	$78.00	$20.00	$156	$40	$196
Gas Meter w/ pad, Large	3	EA	$2,000.00	$200.00	$6,000	$600	$6,600
Gas Meter w/ pad, Medium	1	EA	$1,100.00	$140.00	$1,100	$140	$1,240
Gas Meter, Small	2	EA	$300.00	$75.00	$600	$150	$750
Remove Gas Meter, Medium	3	EA	$0.00	$40.00	$0	$120	$120
Remove Gas Meter, Small	2	EA	$0.00	$30.00	$0	$60	$60
Bldg penetration w/ sleeve	6	EA	$10.00	$50.00	$60	$300	$360
Painting	24	HR	$5.00	$35.00	$120	$840	$960
Clean-up	1	LS	$0.00	$1,000.00	$0	$1,000	$1,000
Sub-Total					$31,171	$105,155	$136,326
Small Job Multiplier	8	%					$10,906
General Conditions	10	%					$14,723
Contigency	20	%					$32,391
Total Construction Cost							$183,440
Engineering							$16,500
						Total Project Cost	$200,000

G:\PROJECTS\7124.01\SS\COSTEST2.WK1

03/01/96

ATTACHMENT E

Cost Estimate - Option #3

Shippensburg University
Natural Gas Pipeline Replacement
Option 3 - Conceptual Cost Estimate

Description	Qty.	Units	Matl Cost	Labor Cost	Total Matl	Total Labor	Total Cost
Mobilization	1	LS	$0.00	$5,000.00	$0	$5,000	$5,000
Locate Underground Utilities	80	MH	$0.00	$50.00	$0	$4,000	$4,000
Excavate Trench	6,320	LF	$0.00	$2.65	$0	$16,748	$16,748
Rock Removal	6,320	CF	$0.00	$2.65	$0	$16,748	$16,748
Pipe Bedding	6,320	LF	$0.27	$0.40	$1,706	$2,528	$4,234
Backfill & Compact Trench	6,320	LF	$0.00	$4.72	$0	$29,830	$29,830
Haul Excess Soil	6,320	LF	$0.00	$1.00	$0	$6,320	$6,320
Dewatering of Excavation	6,320	LF	$0.00	$0.25	$0	$1,580	$1,580
Barriers	6,320	LF	$0.00	$0.30	$0	$1,896	$1,896
Difficult Spot (ie: bushes, hill)	40	LF	$0.00	$20.00	$0	$800	$800
Dig under a curb	25	EA	$0.00	$32.00	$0	$800	$800
Remove Conc. Sidewalk	3,500	SF	$0.00	$2.00	$0	$7,000	$7,000
Replace Conc. Sidewalk	3,500	SF	$1.65	$4.00	$5,775	$14,000	$19,775
Remove Macadam Paving	3,600	SF	$0.00	$1.00	$0	$3,600	$3,600
Saw Cut & Seal Paving	1,500	LF	$0.25	$3.50	$375	$5,250	$5,625
Replace Macadam Paving	3,600	SF	$1.25	$3.00	$4,500	$10,800	$15,300
Steel Plate Bridging	12	EA	$0.00	$200.00	$0	$2,400	$2,400
Top Soil and Final Grade	24,500	SF	$0.05	$0.20	$1,225	$4,900	$6,125
Seeding	24,500	SF	$0.03	$0.20	$735	$4,900	$5,635
Remove curb box	20	EA	$0.00	$40.00	$0	$800	$800
Remove Steel Pipe, 2 1/2" +	140	LF	$0.00	$4.00	$0	$560	$560
Remove Steel Pipe, 1" to 2"	130	LF	$0.00	$1.85	$0	$241	$241
Plastic Pipe, Undergrd 3"	4,500	LF	$1.90	$3.85	$8,550	$17,325	$25,875
Plastic Pipe, Undergrd 2"	1,500	LF	$0.90	$2.30	$1,350	$3,450	$4,800
Plastic Pipe, Undergrd 1 1/4"	200	LF	$0.48	$2.10	$96	$420	$516
Plastic Pipe, Undergrd 1"	200	LF	$0.30	$1.90	$60	$380	$440
Locate Wire	6,400	LF	$0.08	$0.30	$512	$1,920	$2,432
Warning Tape	6,400	LF	$0.12	$0.30	$768	$1,920	$2,688
Service Tap, Plastic 2"	7	EA	$44.00	$50.00	$308	$350	$658
Service Tap, Plastic 1 1/4"	3	EA	$26.00	$41.50	$78	$125	$203
Service Tap, Plastic 1"	2	EA	$13.00	$37.50	$26	$75	$101
Tee, Plastic 3"	4	EA	$22.00	$55.00	$88	$220	$308
Tee, Plastic 2"	1	EA	$14.00	$37.50	$14	$38	$52
Elbow or Rdcr, Plastic 3"	14	EA	$20.00	$43.00	$280	$602	$882
Elbow or Rdcr, Plastic 2"	11	EA	$13.00	$28.00	$143	$308	$451
Plastic to steel adapter	0	EA	$55.00	$250.00	$0	$0	$0
Valve, Plastic 3"	6	EA	$350.00	$57.00	$2,100	$342	$2,442
Valve, Plastic 2"	11	EA	$200.00	$45.00	$2,200	$495	$2,695
Valve, Plastic 1 1/4"	1	EA	$100.00	$36.00	$100	$36	$136
Valve, Plastic 1"	2	EA	$67.00	$33.00	$134	$66	$200
Valve Box	20	EA	$40.00	$40.00	$800	$800	$1,600

03/01/96

Shippensburg University
Natural Gas Pipeline Replacement
Option 3 - Conceptual Cost Estimate

Description	Qty	Units	Matl Cost	Labor Cost	Total Matl	Total Labor	Total Cost
Valve Box Conc. Pad	20	EA	$10.00	$37.50	$200	$750	$950
Meter Riser, 2"	8	EA	$92.00	$125.00	$736	$1,000	$1,736
Meter Riser, 1 1/4"	2	EA	$55.00	$62.00	$110	$124	$234
Meter Riser, 1"	2	EA	$36.00	$50.00	$72	$100	$172
Service Valve, 2"	8	EA	$140.00	$45.00	$1,120	$360	$1,480
Service Valve, 1 1/4"	2	EA	$110.00	$30.00	$220	$60	$280
Service Valve, 1"	2	EA	$93.00	$26.00	$186	$52	$238
Pipe, Steel 2"	160	LF	$5.00	$10.30	$800	$1,648	$2,448
Pipe, Steel 1 1/4"	40	LF	$3.25	$7.45	$130	$298	$428
Pipe, Steel 1"	40	LF	$2.75	$7.00	$110	$280	$390
Fittings, Steel 2"	96	EA	$8.00	$37.00	$768	$3,552	$4,320
Fittings, Steel 1 1/4"	12	EA	$3.60	$30.00	$43	$360	$403
Fittings, Steel 1"	12	EA	$2.50	$28.50	$30	$342	$372
Pressure Regulator, 2"	8	EA	$350.00	$35.00	$2,800	$280	$3,080
Pressure Regulator, 1 1/2"	0	EA	$310.00	$30.00	$0	$0	$0
Pressure Regulator, 1 1/4"	2	EA	$80.00	$25.00	$160	$50	$210
Pressure Regulator, 3/4 or 1"	2	EA	$78.00	$20.00	$156	$40	$196
Gas Meter w/ pad, Large	6	EA	$2,000.00	$200.00	$12,000	$1,200	$13,200
Gas Meter w/ pad, Medium	3	EA	$1,100.00	$140.00	$3,300	$420	$3,720
Gas Meter, Small	2	EA	$300.00	$75.00	$600	$150	$750
Remove Gas Meter, Medium	8	EA	$0.00	$40.00	$0	$320	$320
Remove Gas Meter, Small	2	EA	$0.00	$30.00	$0	$60	$60
Bldg penetration w/ sleeve	6	EA	$10.00	$50.00	$60	$300	$360
Painting	40	HR	$5.00	$35.00	$200	$1,400	$1,600
Clean-up	1	LS	$0.00	$1,000.00	$0	$1,000	$1,000
Sub-Total					$55,725	$183,718	$239,443
Small Job Multiplier	0	%					$0
General Conditions	10	%					$23,944
Contigency	20	%					$52,677
Total Construction Cost							$316,064
Engineering							$20,000
						Total Project Cost	$340,000

G:\PROJECTS\7124.01\SS\COSTEST3.WK1

03/01/96