



2009 Wise County Wastewater Study
*An Amendment to
The Southwest Virginia Regional Wastewater Study*

Prepared for
Wise County Public Service Authority

Funding provided by
LENOWISCO Planning District Commission
Wise County Board of Supervisors

Prepared by
Maxim Engineering, in association with
Thompson & Litton
The Lane Group

2009 WISE COUNTY WASTEWATER STUDY

FOR THE

**WISE COUNTY PUBLIC SERVICE AUTHORITY
WISE COUNTY, VIRGINIA**

FUNDING PROVIDED BY

LENOWISCO PLANNING DISTRICT COMMISSION

WISE COUNTY BOARD OF SUPERVISORS

PREPARED BY

**MAXIM
ENGINEERING, INC.**

IN ASSOCIATION WITH



AND



TABLE OF CONTENTS

PREFACE	i
EXECUTIVE SUMMARY	1
I. INTRODUCTION	3
II. COST ANALYSIS METHODOLOGY	5
III. DESCRIPTION OF COLLECTION SYSTEM AND DECENTRALIZED SYSTEM PROJECTS	
Introduction	7
Guest River Watershed Projects	8
Powell River Watershed Projects	62
Pound River Watershed Projects.....	87
IV. DESCRIPTION OF TRANSMISSION AND TREATMENT CAPACITY NEEDS	
Introduction.....	103
Guest River Watershed Projects	104
Powell River Watershed Projects	109
Pound River Watershed Projects.....	111
Powell River Wastewater Treatment Plant Project.....	115
V. WASTEWATER SYSTEM MANAGEMENT ALTERNATIVES	
Introduction.....	117
Alternative I: Current Ownership	117
Alternative II: Watershed Authority	119
Hybrid Management Alternatives.....	120
VI. CONCLUSIONS AND RECOMMENDATIONS	123

LIST OF SEWER PROJECTS, PROBABLE PROJECT COST TABLES & EXHIBITS

Guest River Watershed

Coeburn Mountain Sewer Project	
Description.....	9
Probable Project Cost Table.....	12
Exhibit.....	13
Riverview Sewer Project	
Description.....	14
Probable Project Cost Table.....	16
Exhibit.....	17

TABLE OF CONTENTS (Continued)

LIST OF SEWER PROJECTS, PROBABLE PROJECT COST TABLES & EXHIBITS (Continued)

Hoot Owl Hollow Sewer Project	
Description.....	18
Probable Project Cost Table.....	20
Exhibit.....	21
Crab Orchard Sewer Project	
Description.....	22
Probable Project Cost Table.....	24
Exhibit.....	25
Dry Fork Sewer Project	
Description.....	26
Probable Project Cost Table.....	28
Exhibit.....	29
South Coeburn Sewer Project	
Description.....	30
Probable Project Cost Table.....	32
Exhibit.....	33
Sheffield Acres Sewer Project	
Description.....	34
Probable Project Cost Table.....	37
Exhibit.....	38
Timberville Sewer Project	
Description.....	39
Probable Project Cost Table.....	41
Exhibit.....	42
Tacoma Sewer Project	
Description.....	43
Probable Project Cost Table.....	44
Exhibit.....	45
Banner Sewer Project	
Description.....	46
Probable Project Cost Table.....	47
Exhibit.....	48
Cranesnest Sewer Project	
Description.....	49
Probable Project Cost Table.....	50
Exhibit.....	51
Esserville Sewer Project	
Description.....	52
Probable Project Cost Table.....	53
Exhibit.....	54
Stephens Sewer Project	
Description.....	55
Probable Project Cost Table.....	56
Exhibit.....	57

TABLE OF CONTENTS (Continued)

LIST OF SEWER PROJECTS, PROBABLE PROJECT COST TABLES & EXHIBITS (Continued)

Dorchester Sewer Project	
Description.....	58
Probable Project Cost Table.....	60
Exhibit.....	61
<u>Powell River Watershed</u>	
Irondale Sewer Project	
Description.....	63
Probable Project Cost Table.....	65
Exhibit.....	66
Crackers Neck Sewer Project	
Description.....	67
Probable Project Cost Table.....	69
Exhibit.....	70
Wildcat Sewer Project	
Description.....	71
Probable Project Cost Table.....	73
Exhibit.....	74
Powell Valley Sewer Project	
Description.....	75
Probable Project Cost Table.....	77
Exhibits.....	78/79
Roda/Osaka Sewer Project	
Description.....	80
Probable Project Cost Table.....	82
Exhibit.....	83
Dunbar Decentralized Sewer Project	
Description.....	84
Probable Project Cost Table.....	85
Exhibit.....	86
<u>Pound River Watershed</u>	
Bold Camp Sewer Project – Phase II	
Description.....	88
Probable Project Cost Table.....	89
Exhibit.....	90
Indian Creek Sewer Project	
Description.....	91
Probable Project Cost Table.....	93
Exhibit.....	94

TABLE OF CONTENTS (Continued)

LIST OF SEWER PROJECTS, PROBABLE PROJECT COST TABLES & EXHIBITS (Continued)

South Fork Sewer Project

Description.....	95
Probable Project Cost Table - Phase I.....	97
Probable Project Cost Table - Phase II.....	98
Exhibit.....	99

North Fork Sewer Project

Description.....	100
Probable Project Cost Table.....	101
Exhibit.....	102

PREFACE

Wise County, City of Norton and the towns and communities of Wise County are at a critical point in developing wastewater infrastructure. Wise County can become a regional designation for goods and services if adequate wastewater treatment systems are developed to handle the growth and development. Wise County, City of Norton and the towns and surrounding communities have substantial lands that can be devoted to housing developments with added wastewater treatment facilities.

Wastewater treatment facilities to serve Wise County, City of Norton and the towns of the region will be very expensive. To tackle the wastewater treatment issues for Wise County, City of Norton and the towns must take a new approach that will provide cost effective services to the largest number of customers. A new way of thinking will have to be adopted by Wise County, City of Norton and our towns to accomplish this task. To tackle the wastewater needs of Wise County, City of Norton and our towns, we must consider doing things in a different fashion to overcome the obstacles and cost associated with providing public sewer.

To accomplish these goals, a new way of delivering wastewater services will have to be adopted by Wise County, the City of Norton and our towns. It will require intra-county cooperation among all of the sewer providers and communities. This cooperation will allow for wastewater treatment facilities to serve the greatest number of citizens at the most cost effective price. Wise County, City of Norton and our towns can develop a new model for delivering wastewater systems for Southwest Virginia and potentially the state.

- *Delegate Clarence E. "Bud" Phillips*

EXECUTIVE SUMMARY

This Study develops the Wise County wastewater projects identified in the 2005 Southwest Virginia Regional Wastewater Study. Twenty five potential sewer collection system projects in Wise County are described in detail, including a projected probable cost and an exhibit indicating the location of major components of each project. Collectively, these projects would provide wastewater service to 9,929 residents of Wise County at a cost of \$76,600,000 (2009 cost estimates). The collection system projects are organized by the watershed in which each project is located.

An existing regional wastewater treatment plant (WWTP) is located in each of the three major watersheds in Wise County. This includes the Coeburn-Norton-Wise (CNW) WWTP in the Guest River watershed, the Big Stone Gap Regional WWTP in the Powell River watershed, and the Pound WWTP in the Pound River watershed. There is sufficient capacity in the existing infrastructure to convey and treat the wastewater collected in nearly all of the identified projects if excessive inflow and infiltration (I&I) of stormwater and groundwater is reduced.

Currently, wastewater services are provided by the six Towns in the County (Appalachia, Big Stone Gap, Coeburn, Pound, St. Paul, Wise), the City of Norton, the Wise County Public Service Authority, and the CNW Waste Water Authority. Regional cooperation is critical to securing funding needed to address wastewater needs in Wise County.

Most projects will transfer wastewater through existing facilities in order to be treated. In order to progress with project construction, the current ownership and management of existing facilities should be maintained at the present time. Existing inter-municipal agreements should be reviewed and modified appropriately. Where needed, new inter-municipal agreements should be developed and executed.

Over the long-term, Wise County should seek to develop a separate wastewater authority in each of the three watersheds to manage and operate wastewater systems in that watershed. The management approach would enable Wise County to effectively implement the projects identified in this study, provide wastewater service to areas and economic developments

outside of municipality boundaries, and establish true-cost wastewater service funded by rate payers, rather than subsidized by general funds of the localities. The watershed authority approach may provide economies of scale resulting in more efficient operations.

I. INTRODUCTION

In 2005, the Southwest Virginia Regional Wastewater Study (“Study”) was produced by the LENOWISCO Planning District Commission, the Cumberland Plateau Planning District Commission, and the Mt. Rogers Planning District Commission. The Study was funded in part by the United States Department of Agriculture’s Rural Development, The Virginia Tobacco Indemnification and Community Revitalization Commission, and the Virginia Department of Housing and Community Development.

The area studied included thirteen counties, three independent cities, and thirty nine towns that constitute the incorporated localities of the three planning district commissions (PDCs). The intent of the Study was to serve as a “road map” for sewer projects in Southwest Virginia over the next twenty years. Sewer projects were identified, prioritized, and estimated costs were developed. Over 145 potential sewer projects were examined during the preparation of the Study. Preparation of the Study was completed by Thompson & Litton, in association with Maxim Engineering and the Lane Group.

In the Study, twenty-eight sewer projects were identified in Wise County. Since completion of the Study, more detailed descriptions have been developed for five of these projects, in the format of either a preliminary engineering report (PER) or a design of engineering plans. In the fall of 2008, the Wise County Public Service Authority authorized Maxim Engineering, in association with Thompson & Litton and the Lane Group, to prepare an amendment to the Study, addressing the remaining Wise County sewer projects with more detailed cost analyses. Subsequently, in the Amendment, these firms are referred to as the “engineer.”

Of the remaining twenty-three sewer projects in Wise County noted in the Study, eighteen had been identified as conventional (centralized sewer) systems, three as decentralized systems, and two as effluent collection (hybrid) systems. Each project is located in one of the three predominant watersheds in Wise County, and each watershed has one existing public regional wastewater treatment plant (WWTP). The watersheds and their associated wastewater treatment plants (WWTPs) are the Pound River Watershed (Pound WWTP), Guest River Watershed (Coeburn-Norton-Wise WWTP), and the Powell River Watershed (Big Stone Gap

WWTP). Part of a fourth watershed, the Clinch River watershed, is located in the portion of Wise County adjacent to the Town of St. Paul. At the time this Amendment was prepared, the Town of St. Paul, Virginia, was performing a wastewater system evaluation. Therefore, the St. Paul service area of interest to Wise County was not included in this Amendment.

Some projects identified in the original Study have been subdivided into separate components or phases, and others were consolidated. This resulted in twenty-five sewer projects to be addressed in this Amendment.

In the “Collection System Projects” chapter, this Amendment provides more refined cost estimates of the identified sewer projects in Wise County. The associated requirements needed to provide sufficient transmission and treatment of sewage generated in the projects have been discussed in the “Transmission and Treatment Capacity Needs” chapter, in order to evaluate the full capital cost of each project. In addition, the issue of management alternatives is addressed in the chapter titled “Wastewater System Management Alternatives”.

For a general overview of sewer issues such as wastewater systems, health risks, and funding, the Study remains an excellent source of information.

II. COST ANALYSIS METHODOLOGY

The projected cost estimate for each project addressed in this Amendment was refined from the value reported in the original Study. Specifically, the volume of generated wastewater was based on house counts, and house counts were identified from the Wise County GIS system, with field observations for verification.

The projected volume of wastewater originating from each residential connection is 300 gallons per day (gpd) for centralized collection systems and 200 gpd for decentralized and effluent collection systems. Wise County has less than 2.5 residents per household. Sewage generation of 100 gpd per person is typically used for flow estimation, and includes the impact of reasonable collection system inflow and infiltration (I&I). Because there is less I&I in decentralized and effluent collection systems, 200 gpd per connection was used to project wastewater generation in those systems.

Engineer team members agreed upon a standard format and unit price basis for cost estimates, relying heavily on recent bid prices in the area. Relevant construction items were included for each collection system project to generate a construction cost. The construction costs are based on unit prices in the spring of 2009. As these construction costs are reviewed in the future, the costs will need to be updated to reflect economic changes that have occurred since 2009.

Several “typical values” for project construction were used to determine construction cost, unless the individual project site justified using a different value. These include manhole spacing of 250 feet, one-third of manholes were watertight, fifty linear feet (50 L.F.) of four-inch service line per connection, one-fourth of connections require a road crossing, length of a two-lane road crossing is thirty four feet, and length of a stream crossing is twenty feet.

The related cost for each project includes components with fixed cost, in addition to components with cost that varies according to the scope of the construction. Fixed cost components common to each project include preliminary engineering report preparation (\$10,000), permitting (\$20,000), and environmental assessment (\$20,000).

Variable cost components include basic engineering (based on the current USDA Rural Development fee curve), resident project representation (based on \$50/hour rates and 40-hour work weeks for the estimated duration of construction), legal/administration costs (based on two percent of construction cost), survey/geotechnical costs (based on \$10,000 for each lift station in the project), wetlands and waters delineation (based on \$5,000 for each tributary crossed, where applicable), and easements/property acquisition (based on \$5,000 for each project, plus \$5,000 for each lift station site required). Construction contingency in the amount of ten percent (10%) of the construction cost is also included with related cost.

III. DESCRIPTION OF COLLECTION SYSTEM AND DECENTRALIZED SYSTEM PROJECTS

Introduction

Each project is presented in this chapter in a stand-alone format that includes a narrative description, a detailed preliminary statement of probable project cost, and an exhibit that graphically indicates the major components and impacted areas for each project.

The narrative description for each project addresses several aspects of the project. These include the service area and magnitude of project, required facilities and operational overview, identification of conveyance and treatment facilities (where applicable), assessment of constructability, phasing or sequencing of construction activities (where applicable), total projected project cost, annual operations and maintenance cost, and present worth per connection.

The preliminary statement of probable project cost is a single-page table. The methodology used to determine these values was described earlier in this Amendment. The unit costs used to determine project cost were obtained in early 2009. The impact of time and economic changes on unit costs should be considered for future utilization of these statements of probable project cost.

The exhibits are formatted on appropriate U.S.G.S. Quadrangle sheets, with working scales generally between 1"=1000' and 1"=2000'.

Because of potential impact on existing wastewater treatment facilities due to flow originating in these projects, the collection system projects and decentralized system projects have been organized according to the watershed in which each project is located. Projects in the Guest River watershed are presented first, followed by projects in the Powell River watershed and the Pound River watershed. The descriptions of each project follow. Sequencing of certain projects is determined by proximity to a WWTP or existing collection system.

Wise County Sewer Projects in the Guest River Watershed

Fourteen projects were identified within the Guest River Watershed of Wise County. For each project, a description is presented with probable project cost and an exhibit indicating the service area and major components for that project.

Project Name	Population	Flow (GPD)	Project Cost
• Coeburn Mountain Sewer Project	1,098	135,000	\$5.96 million
• Riverview Sewer Project	154	18,900	\$0.73 million
• Hoot Owl Hollow Sewer Project	61	7,500	\$1.05 million
• Crab Orchard Sewer Project	285	35,100	\$3.94 million
• Dry Fork Sewer Project	117	14,400	\$2.57 million
• South Coeburn Sewer Project	371	45,600	\$3.16 million
• Sheffield Acres Sewer Project	144	53,700	\$2.29 million
• Timberville Sewer Project	134	16,500	\$1.71 million
• Tacoma Sewer Project	351	43,200	\$2.07 million
• Banner Sewer Project	412	50,700	\$2.09 million
• Cranesnest Sewer Project	259	21,200	\$1.13 million
• Esserville Sewer Project	305	37,500	\$1.29 million
• Stephens Sewer Project	700	87,000	\$4.60 million
• Dorchester Sewer Project	<u>678</u>	<u>71,200</u>	<u>\$3.32 million</u>
TOTALS	5,069	637,500	\$35.9 million

Additional potential project opportunities

Rockbar Sewer Project

Birchfield Heights Sewer Project

Others as identified

Coeburn Mountain Sewer Project

Project Service Area

This collection system will serve the area east of the Town of Wise as shown in the Exhibit. The major system collection lines are located along State Route 646 (Coeburn Mountain Road, east of the County Social Services Building), State Route 644 (Pole Bridge Road), State Route 704 (White Oak Road), and State Route 706 (Tacoma Mountain Road). The area is served presently by individual septic tanks and drain fields.

Project Magnitude

Approximately 450 residential connections appear feasible in the proposed service area. Assuming each connection contributes 300 gallon/day, this project will generate approximately 135,000 gallon/day wastewater. There is capacity for additional residential development in the service area, although population growth in Wise County has been projected to remain essentially constant through 2040.

Required Facilities

Approximately 44,000 linear feet (L.F.) of 8-inch gravity line, 7,000 L.F. of 4-inch force main, and 1,500 L.F. of 2-inch force main, in combination with four lift stations, will convey the wastewater from this service area into the Town of Wise's collection system for transmission and subsequent treatment.

The first lift station will be located on Rte. 644, approximately 1,000 L.F. north of Rte. 646. This lift station will convey flow from Rte. 644 through 2,000 L.F. of 4-inch force main to a point on Rte. 646 1,000 L.F. northwest of Rte. 644. From this point, the wastewater will flow by gravity through an 8-inch gravity line along Rte. 646 approximately 12,000 L.F. into the Town of Wise's Bear Creek Interceptor. The capacity of this lift station, 196 gpm, will serve approximately 180 residential connections in addition to flow from lift station #3 (which conveys all flow from lift station #2). A peak factor of four is used to size the capacity.

The second lift station will be located at the service area's northernmost point on Rte. 644. This grinder lift station will deliver the flow from about 25 connections 2,000 L.F. through a 4-inch force main into the wet well of the third lift station, located north of the intersection of Reservoir Road with Rte. 644. The elevation change is approximately 150 feet. The lift station design capacity is 21 gpm.

The third lift station will be located north of the intersection of Reservoir Road with Rte. 644, approximately 2,000 L.F. south of the second lift station. This grinder lift station will deliver the flow from the second lift station, plus about 30 connections 3,000 L.F. through a 4-inch force main into the 8-inch gravity line on Rte. 644. The lift station capacity is 46 gpm, and the elevation change is approximately 100 feet.

The fourth lift station will serve the lower elevation of the area bounded by Sunset Drive and Clearwater Road, located west of Tacoma Mountain Road (Rte. 706). This grinder lift station

will convey an average flow of 20 gpm through approximately 1,500 L.F. of 2-inch force main into an 8-inch gravity line that enters the Bear Creek Interceptor about 1,500 L.F. downstream from where the gravity line along Rte. 646 entered the interceptor. The 8-inch gravity sewer originates on Rte. 704 west of Rte. 646, and extends approximately 7,000 L.F. along Rte. 704 and Rte. 706 prior to following the stream bed 2,000 L.F. across country to enter the Bear Creek Interceptor.

All flow from the project enters the Bear Creek Interceptor by gravity. Most flow will enter the interceptor near Rte. 646, with a portion entering the interceptor approximately 1,500 L.F. downstream.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the Town's lines into the CNW Interceptor line, with treatment at the CNW WWTP. Transmission and treatment considerations are addressed in a separate portion of this report.

Constructability Assessment

The amount of rock in the project area appears to be typical for Wise County. There appears to be adequate construction space for installation of the lines. In portions of the project area, the gravity lines will follow topographic contours, rather than roadway. Where appropriate, location of the gravity lines should accommodate sewage discharge plumbing from existing residences.

The gravity line from Rte. 706 to the Town's Bear Creek Interceptor will follow the stream bed approximately 1,000 L.F. across country. The work area is limited.

Phasing of Project Construction

The project contains two separate components. The smaller component contains service areas along Rte. 704 and Rte. 706, including the fourth lift station. The larger component contains connections associated with Rte. 646 and Rte. 644.

Phase I includes the gravity line along Rte. 646 and connection to the Bear Creek Interceptor.

Phase II includes gravity lines along Rte. 644 for approximately 8,000 L.F. and Lift Station #1 with its associated force main and the gravity lines along Rte. 646 that discharge into the lift station.

Phase III includes gravity line along Reservoir Road and Lift Station #3, with its associated force main.

Phase IV includes the gravity line along Rte. 644 north of Lift Station #3, as well as Lift Station #2 and the force main that terminates at Lift Station #3.

Lift Station #3 conveys all flow from Lift Station #2, and all flow from Lift Station #3 enters the first lift station. Lift Station #1 must be operational before the connections served by Lift

Stations #2 and #3 can be provided service. Similarly, Lift Station #3 must be operational before Lift Station #2 is brought online.

Phase V includes the gravity lines along Rte. 704 and Rte. 706, and the connection to the Bear Creek Interceptor.

Phase VI includes Lift Station #4 and its associated force main, and the gravity line that connects with the lift station and with Rte. 706

Phases I - IV must be brought into service in sequence, and Phases V-VI must be brought into service in sequence.

Total Projected Project Cost

The projected construction cost is \$4,718,025. With related costs of \$1,236,882, which includes ten percent construction contingency, the total projected project cost is \$5,954,907. This projection is based on estimated construction costs in spring 2009. Calculation of costs is based on costs in 2009 dollars. Anticipating costs for project construction for any specific future date requires incorporation of unit price changes of the costs between 2009 and the future date. The total project cost does not include any ancillary costs to upgrade existing transmission lines or expand treatment capacity at the CNW WWTP in order to accommodate the flow from this project. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$25,250 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$287,000.

Present Worth per Connection

The present worth per connection is \$13,870.90, based on the above costs for 450 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
COEBURN MOUNTAIN SEWER PROJECT**

CONSTRUCTION COST:

44,000 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$1,980,000
7,000 L.F. 4" Force Main @ \$25/L.F.	\$175,000
1,500 L.F. 2" Force Main @ \$20/L.F.	\$30,000
22,500 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$562,500
3,825 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$669,375
117 EA. Standard Manholes @ \$2,500/EA.	\$292,500
59 EA. Waterproof Manholes @ \$3,000/EA.	\$177,000
4 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$12,000
450 EA. Service Wyes @ \$90/EA.	\$40,500
340 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$71,400
170 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$29,750
60 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$10,500
30 EA. 8-Inch Boring Attempts @ \$500/EA.	\$15,000
15 EA. 4-Inch Boring Attempts @ \$200/EA.	\$3,000
550 Tons Miscellaneous Aggregate @ \$15/Ton	\$8,250
275 C.Y. Miscellaneous Concrete @\$150/C.Y.	\$41,250
1 EA. Lift Station @ \$300,000/EA.	\$300,000
3 EA. Grinder Lift Station @ \$100,000/EA.	\$300,000

TOTAL CONSTRUCTION COST	\$4,718,025
--------------------------------	--------------------

RELATED COST:

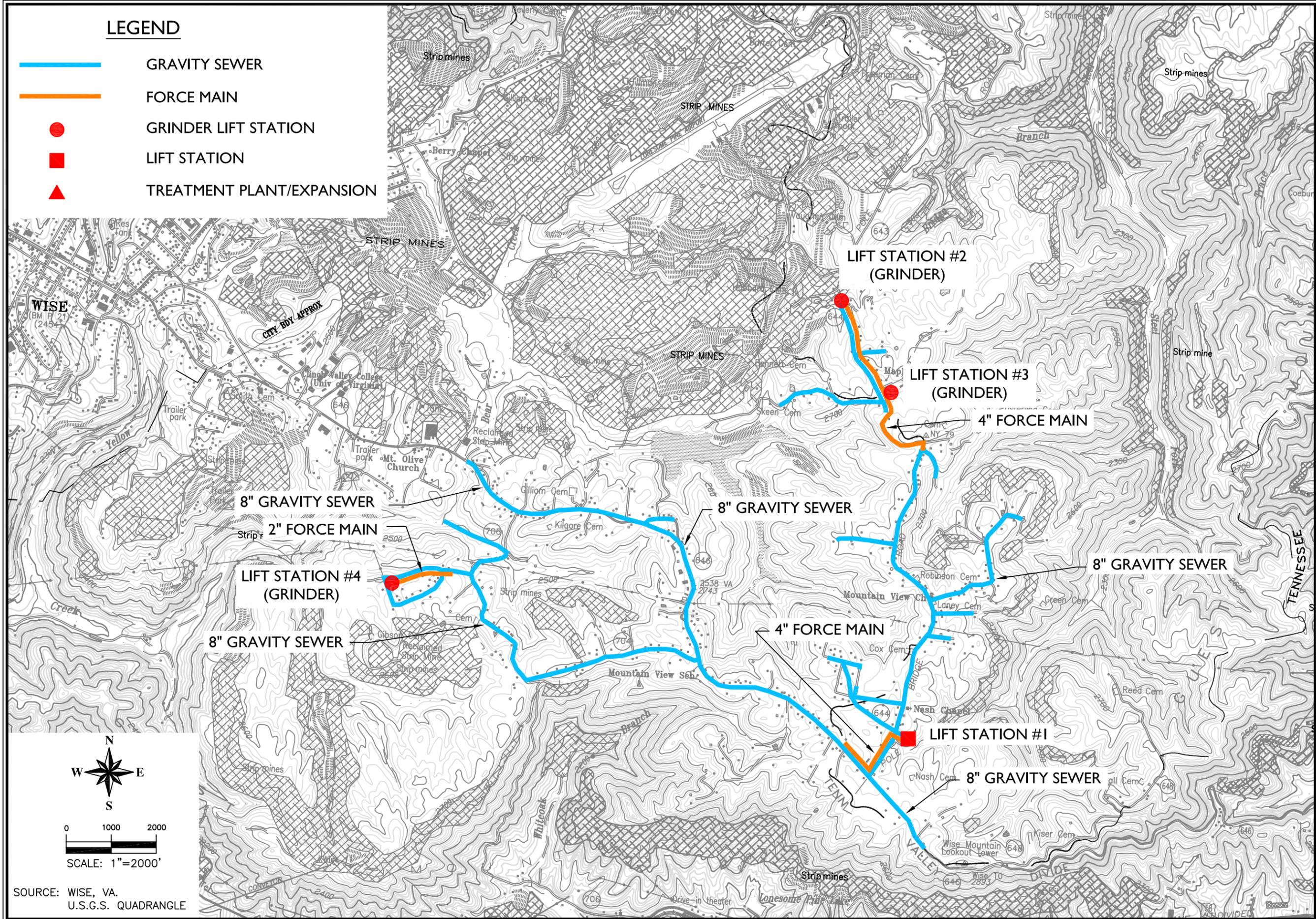
Basic Engineering	\$436,719
RPR	\$104,000
PER	\$10,000
Permits	\$20,000
Surveying/Geotechnical	\$40,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$25,000
Legal/Administration	\$94,361
Wetlands and Waters Delineation (If Required)	\$15,000
Construction Contingency (10%)	\$471,803

Related Subtotal	<u>\$1,236,882</u>
-------------------------	---------------------------

TOTAL PROJECT COST	\$5,954,907
---------------------------	--------------------

LEGEND

- GRAVITY SEWER
- FORCE MAIN
- GRINDER LIFT STATION
- LIFT STATION
- ▲ TREATMENT PLANT/EXPANSION



COEBURN MOUNTAIN SEWER PROJECT
WISE COUNTY, VIRGINIA

No.	Date	Revision

Designed	
Drawn	D.J.L.
Checked	
Date	FEB. 2009
File No.	10279 exhibitall

Project No.
10279



Sheet No.
EXHIBIT

Riverview Sewer Project

Project Service Area

This collection system will provide service to three un-served areas in the Riverview area southwest of Coeburn, as shown in the Exhibit. The immediate Riverview area, which is adjacent to the CNW WWTP, is connected to the collection lines that discharge into the CNW interceptor.

Project Magnitude

A total of approximately 63 residential connections appear feasible within in the proposed three service subsystems. Assuming each connection contributes 300 gallon/day, this project will generate approximately 18,900 gallon/day wastewater. There is limited capacity for additional residences to be built in the service area. Population growth in Wise County has been projected to remain essentially constant through 2040.

Required Facilities

Three collection subsystems that comprise this system are located in three portions of the Riverview area: northwest, northeast, and southwest. Each subsystem is presented in turn.

The Northwest Riverview subsystem will serve approximately 34 residential connections with 2,800 L.F. of 8-inch gravity sewer, discharging to MH 21 of the CNW interceptor. The service area is bounded by the Guest River, Riverview Road, and Morgan Road, extending approximately 800 L.F. south of the bridge on Riverview Road. In the northern portion of the subsystem, which has little change in elevation, residential density is high.

The Northeast Riverview subsystem will serve 14 residential connections in a trailer park along Gunite Road, plus one adjacent residence. Approximately 500 L.F. of 8-inch gravity sewer would connect into MH 578 of the CNW interceptor adjacent to the Guest River.

The Southwest Riverview subsystem will serve 14 residential connections. Many of these residences are accessed via Henrico Road. Approximately 1600 L.F. of 8-inch gravity sewer would connect into MH 593 of the CNW interceptor. This manhole is adjacent to the Pine Camp Road entrance to the CNW WWTP.

Wastewater Conveyance and Treatment

The wastewater originating in each of the three collection subsystems flows a short distance in the CNW interceptor to the CNW WWTP for treatment. Treatment considerations are addressed in a separate portion of this report.

Constructability Assessment

The amount of rock in the project area appears typical for Wise County. There appears to be adequate construction space for installation of the lines. Although no lines cross the Guest River, the River confines the space available for construction activities. Location of the gravity lines should accommodate sewage discharge plumbing from the existing residences.

Total Projected Project Cost

The total construction cost is \$496,040. With related costs of \$230,802, which includes ten percent construction contingency, the total projected project cost is \$726,842. This projection is based on estimated construction costs in spring 2009. To project cost for project construction at a specific future date requires incorporation of unit price changes. This cost does not include any ancillary costs to expand treatment capacity at the CNW WWTP in order to accommodate the flow from this project. Transmission lines outside of the project area that are needed to convey the wastewater to the WWTP are currently in use and available for the Riverview collection systems proposed here. Ancillary costs for treatment capacity at the CNW WWTP are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines, annual project O&M of \$490 is projected. This does not include annual depreciation on the collection system. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$5,565.

Present Worth per Connection

The present worth per connection is \$11,625.51, based on the above costs for 63 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
RIVERVIEW SEWER PROJECT**

CONSTRUCTION COST:

4,900 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$220,500
3,150 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$78,750
544 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$95,200
16 EA. Standard Manholes @ \$2,500/EA.	\$40,000
4 EA. Waterproof Manholes @ \$3,000/EA.	\$12,000
63 EA. Service Wyes @ \$90/EA.	\$5,670
102 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$21,420
20 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$3,500
40 L.F. 8-Inch Railroad Crossings @ \$250/L.F.	\$10,000
9 EA. 8-Inch Boring Attempts @ \$500/EA.	\$4,500
50 Tons Miscellaneous Aggregate @ \$15/Ton	\$750
25 C.Y. Miscellaneous Concrete @\$150/C.Y.	\$3,750

TOTAL CONSTRUCTION COST	\$496,040
--------------------------------	------------------

RELATED COST:

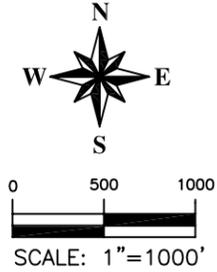
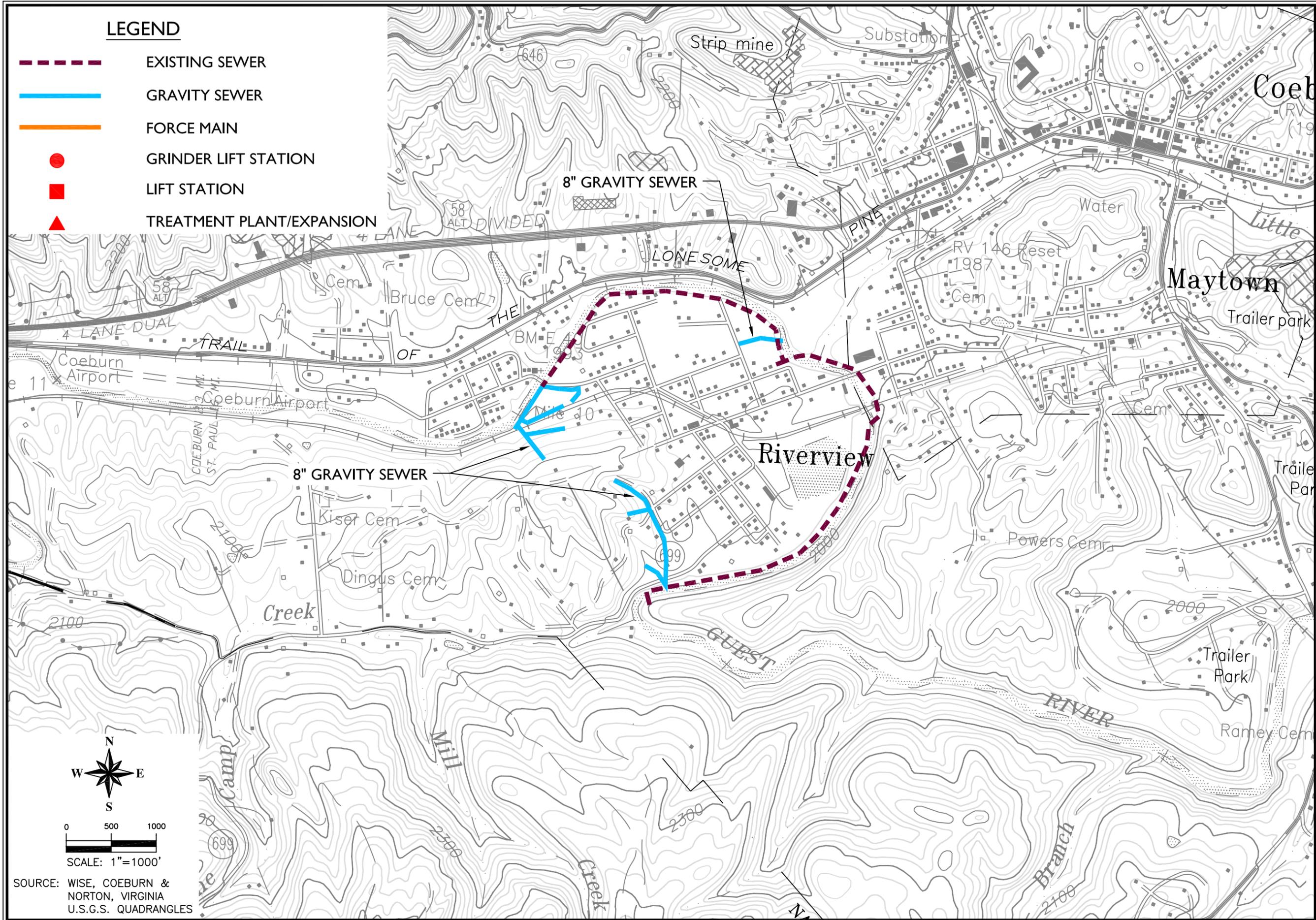
Basic Engineering	\$70,477
RPR	\$40,800
PER	\$10,000
Permits	\$20,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$5,000
Legal/Administration	\$9,921
Wetlands and Waters Delineation (If Required)	\$5,000
Construction Contingency (10%)	\$49,604

Related Subtotal	\$230,802
-------------------------	------------------

TOTAL PROJECT COST	\$726,842
---------------------------	------------------

LEGEND

-  EXISTING SEWER
-  GRAVITY SEWER
-  FORCE MAIN
-  GRINDER LIFT STATION
-  LIFT STATION
-  TREATMENT PLANT/EXPANSION



SOURCE: WISE, COEBURN & NORTON, VIRGINIA
U.S.G.S. QUADRANGLES

RIVERVIEW SEWER PROJECT
WISE COUNTY, VIRGINIA

Revision	Date	No.

Designed	
Drawn	D.J.L.
Checked	
Date	FEB. 2009
File No.	10279 exhibitsall

Project No.
10279



Sheet No.
EXHIBIT

Hoot Owl Hollow Sewer Project

Project Service Area

This collection system will serve the Hoot Owl Hollow Community, partially located within the City of Norton, as shown in the Exhibit. The collection line follows Hoot Owl Hollow Road from Benges Gap approximately 5,500 L.F. west. Four residences along Pines Road are also served. The area is served presently by individual septic tanks and drain fields.

Project Magnitude

Approximately 25 residential connections appear feasible in the proposed service area. Assuming each connection contributes 300 gallon/day, this project will generate approximately 7,500 gallon/day wastewater. There is space for additional residences to be built in the service area, although population growth in both Wise County and the City of Norton has been projected to remain essentially constant through 2040.

Required Facilities

Approximately 7,500 linear feet (L.F.) of 8-inch gravity line, and 2,000 L.F. of 4-inch force main, in combination with a grinder lift station, will convey the wastewater from this service area into a proposed collection system serving the Josephine community. This wastewater will be conveyed through the City's transmission interceptors and ultimately treated at the Coeburn-Norton-Wise WWTP.

The lift station will be located below the westernmost residence on Hoot Owl Hollow Road. This grinder lift station will convey flow through approximately 2,000 L.F. of 4-inch force main. The capacity of this lift station, 18 gpm, will serve approximately 21 residential connections. A peak factor of four is used to size the capacity of this lift station.

Flow is lifted approximately 100 feet. The force main passes beneath the limited access route U.S. 23, as well as West Norton Road prior to terminating at a manhole in the proposed Josephine Collection system project. Four residences accessed from Pines Road will be able to discharge into the force main through use of individual low-head pumps.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the proposed Josephine Collection System lines into existing City of Norton interceptors, from where it is transmitted to the CNW WWTP for treatment. Construction of the Josephine project (in design in 2009) must precede the Hoot Owl Hollow Sewer project. Transmission and treatment considerations are addressed in a separate portion of this report.

Constructability Assessment

The amount of rock in the project area appears to be typical for Wise County. There appears to be adequate construction space for installation of the lines. The force main bore under U.S. 23 may require additional permitting and accommodation. An environmental aspect, the Carding Machine Branch, is adjacent to a significant portion of the project. The location of the gravity lines should be placed to accommodate sewage discharge plumbing from existing residences. The work area is limited.

Total Projected Project Cost

The projected construction cost is \$724,990. With related costs of \$326,466, which includes ten percent construction contingency, the total projected project cost is \$1,051,456. This projection is based on estimated construction costs in spring 2009. Calculation of costs is based on costs in 2009 dollars. Anticipating costs for project construction for any specific future date requires incorporation of unit price changes of the costs between 2009 and the future date. The total project cost does not include any ancillary costs to upgrade existing transmission lines or expand treatment capacity at the CNW WWTP in order to accommodate the flow from this project. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$5,950 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$67,500.

Present Worth per Connection

The present worth per connection is \$44,758.24, based on the above costs for 25 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
HOOT OWL HOLLOW SEWER PROJECT**

CONSTRUCTION COST:

7,500 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$337,500
2,000 L.F. 4" Force Main @ \$25/L.F.	\$50,000
1,250 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$31,250
140 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$24,500
20 EA. Standard Manholes @ \$2,500/EA.	\$50,000
10 EA. Waterproof Manholes @ \$3,000/EA.	\$30,000
1 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$3,000
25 EA. Service Wyes @ \$90/EA.	\$2,250
54 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$11,340
114 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$19,950
40 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$7,000
100 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$15,000
6 EA. 8-Inch Boring Attempts @ \$500/EA.	\$3,000
6 EA. 4-Inch Boring Attempts @ \$200/EA.	\$1,200
100 Tons Miscellaneous Aggregate @ \$15/Ton	\$1,500
50 C.Y. Miscellaneous Concrete @ \$150/C.Y.	\$7,500
1 EA. Grinder Lift Station @ \$100,000/EA.	\$100,000
4 EA. Individual Grinder Pump @ \$7,500/EA.	\$30,000

TOTAL CONSTRUCTION COST	\$724,990
--------------------------------	------------------

RELATED COST:

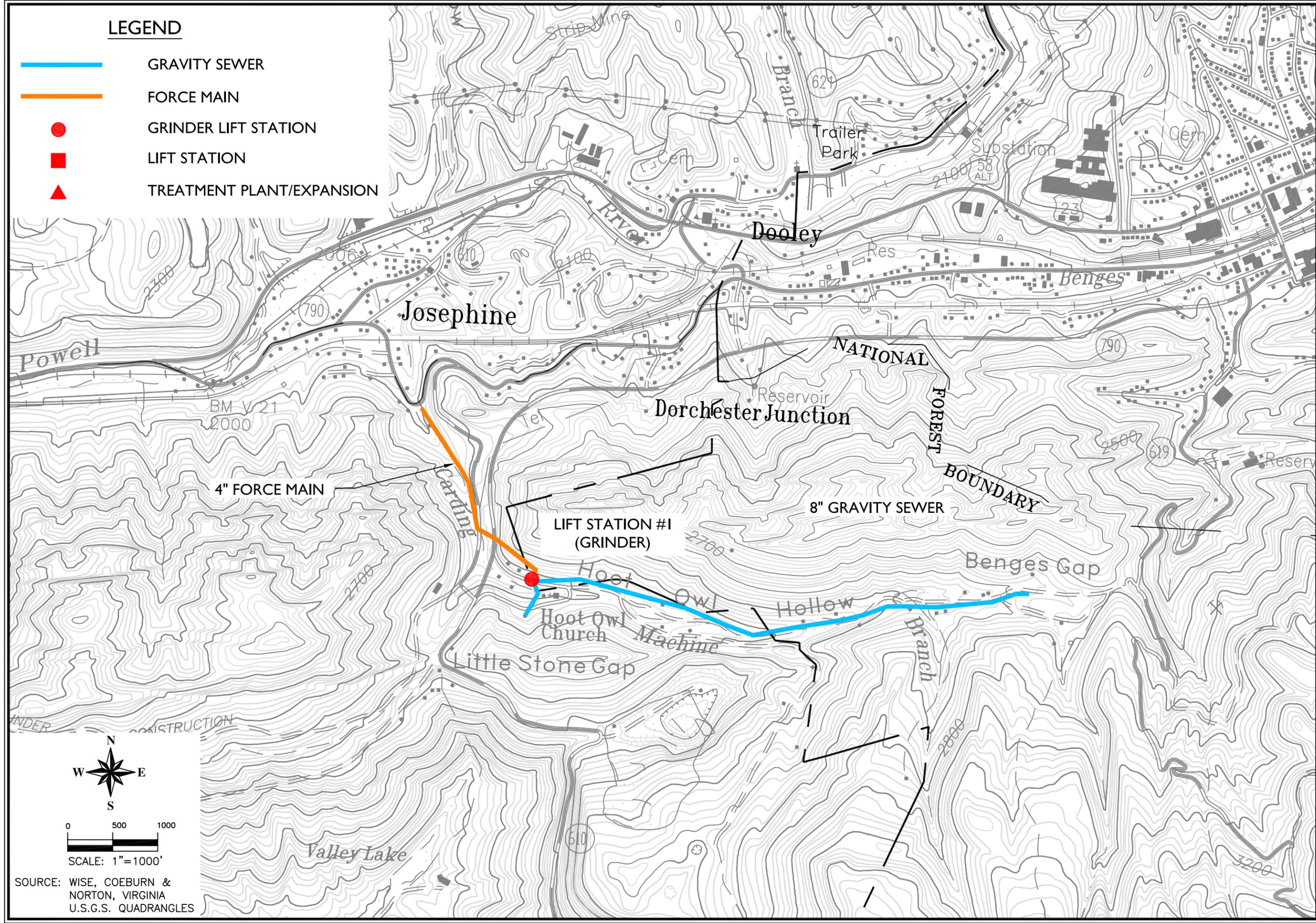
Basic Engineering	\$97,067
RPR	\$62,400
PER	\$10,000
Permits	\$20,000
Surveying/Geotechnical	\$10,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$10,000
Legal/Administration	\$14,500
Wetlands and Waters Delineation (If Required)	\$10,000
 Construction Contingency (10%)	 \$72,499

Related Subtotal	\$326,466
-------------------------	------------------

TOTAL PROJECT COST	\$1,051,456
---------------------------	--------------------

LEGEND

-  GRAVITY SEWER
-  FORCE MAIN
-  GRINDER LIFT STATION
-  LIFT STATION
-  TREATMENT PLANT/EXPANSION



HOOT OWL HOLLOW SEWER PROJECT
WISE COUNTY, VIRGINIA

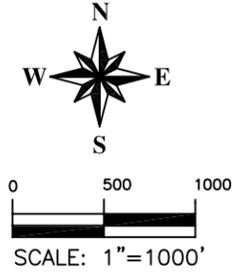
Revision	Date	No.

Designed	
Drawn	D.J.L.
Checked	
Date	FEB. 2009
File No.	10279 exhibitall

Project No.
10279



Sheet No.
EXHIBIT



SOURCE: WISE, COEBURN & NORTON, VIRGINIA
U.S.G.S. QUADRANGLES

Crab Orchard Sewer Project

Project Service Area

This collection system will serve the area southeast of the Town of Coeburn along State Route 658 (Crab Orchard Road), between the Town limits and Bond Gap (Dry Fork Road) as shown in the Exhibit. The major system collection lines are located along Rte. 658 (Crab Orchard Road), Rte. 661 (River Road), and Rte. 660 (Community Road). The area is served presently by individual septic tanks and drain fields.

Project Magnitude

Approximately 117 residential connections appear feasible in the proposed service area. Assuming each connection contributes 300 gallon/day, this project will generate approximately 35,100 gallon/day wastewater. There is space for additional residences to be built in the service area, although population growth in Wise County has been projected to remain essentially constant through 2040.

Required Facilities

Approximately 31,500 linear feet (L.F.) of 8-inch gravity line, and 9,000 L.F. of 6-inch force main, in combination with one lift station, will convey the wastewater from this service area into a proposed collection system serving an area south of Coeburn (the South Coeburn Collection System). This wastewater will be conveyed to and ultimately treated at the Coeburn-Norton-Wise WWTP, discharging into the Guest River.

Approximately 1,500 L.F. of 8-inch gravity sewer will convey wastewater from 17 residential connections located at the extreme northwest portion of Crab Orchard Road. These lines terminate into a proposed collection line on Powerstown Road in the South Coeburn sewer system.

Wastewater generated by the remaining 100 residential connections in the Crab Orchard collection system will flow by gravity to a single lift station. Major 8-inch gravity sewer lines will be installed along Crab Orchard Road, Community Road (Rte. 660), and River Road (Rte. 661). A cross-country 8-inch gravity line following Crab Orchard Branch will convey flow from the eastern portion of Crab Orchard Road to River Road.

The lift station will be located at the southernmost point on River Road (Rte. 661). This is the low elevation in the collection system (1950 feet). The lift station will be about one-fourth mile due north of the Guest River. This lift station will convey flow through approximately 9,000 L.F. of 6-inch force main, terminating at a lift station in the proposed South Coeburn Collection System. The initial portion of force main (6,750 L.F.) will follow River Road to a high elevation of 2,100 feet. The force main will then traverse cross-country 2,250 L.F., decreasing in elevation to the termination point of 2,050 at the South Coeburn Lift Station. The capacity of this lift station, 132 gpm, will serve approximately 100 residential connections, plus any flow originating in the Dry Fork Collection system. A peak factor of four is used to size the capacity of this lift station. To achieve the desired increase in elevation, a double-dual pumping

arrangement will be incorporated into the lift station. Two pumps in series will provide needed pumping head; redundant pumps in series will be installed. This increases the projected cost over a typical lift station.

Wastewater Conveyance and Treatment

Nearly all wastewater originating in this collection system will be conveyed by Lift Station #1 through the 6-inch force main that discharges into the lift station in the proposed South Coeburn Collection System. The South Coeburn Lift Station will pump the wastewater to the CNW WWTP for treatment. Construction of the South Coeburn project must precede the Crab Orchard sewer project. A small volume of flow from 17 connections will enter the South Coeburn collection system via gravity line to Powerstown Road. Transmission and treatment considerations are addressed in a separate portion of this report.

Constructability Assessment

The amount of rock in the project area appears to be typical for Wise County. The limited amount of construction space available appears to be sufficient for installation of the lines. The force main follows the roadway for 6,750 L.F. before going cross-country for 2,250 L.F. Coordination of traffic control along Rte. 658 will be a component of gravity line installation. The location of the gravity lines should accommodate sewage discharge plumbing from existing residences. The work area is limited.

Total Projected Project Cost

The projected construction cost is \$3,060,750. With related costs of \$880,950, which includes ten percent construction contingency, the total projected project cost is \$3,941,700. This projection is based on estimated construction costs in spring 2009. Calculation of costs is based on costs in 2009 dollars. Anticipating costs for project construction for any specific future date requires incorporation of unit price changes of the costs between 2009 and the future date. The total project cost does not include any ancillary costs to upgrade existing transmission lines or expand treatment capacity at the CNW WWTP in order to accommodate the flow from this project. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$9,050 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$102,800.

Present Worth per Connection

The present worth per connection is \$34,568.38, based on the above costs for 117 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
CRAB ORCHARD SEWER PROJECT**

CONSTRUCTION COST:

31,500 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$1,417,500
9,000 L.F. 6" Force Main @ \$30/L.F.	\$270,000
5,850 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$146,250
1,020 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$178,500
84 EA. Standard Manholes @ \$2,500/EA.	\$210,000
42 EA. Waterproof Manholes @ \$3,000/EA.	\$126,000
3 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$9,000
117 EA. Service Wyes @ \$90/EA.	\$10,530
442 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$92,820
68 L.F. 6-Inch Bored Road Crossings @ \$200/L.F.	\$13,600
120 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$21,000
30 L.F. 6-Inch Stream Crossings @ \$175/L.F.	\$5,250
39 EA. 8-Inch Boring Attempts @ \$500/EA.	\$19,500
6 EA. 6-Inch Boring Attempts @ \$350/EA.	\$2,100
430 Tons Miscellaneous Aggregate @ \$15/Ton	\$6,450
215 C.Y. Miscellaneous Concrete @\$150/C.Y.	\$32,250
1 EA. Double-Duel Lift Station @ \$500,000/EA.	\$500,000

TOTAL CONSTRUCTION COST	\$3,060,750
--------------------------------	--------------------

RELATED COST:

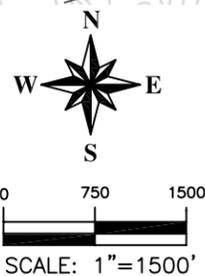
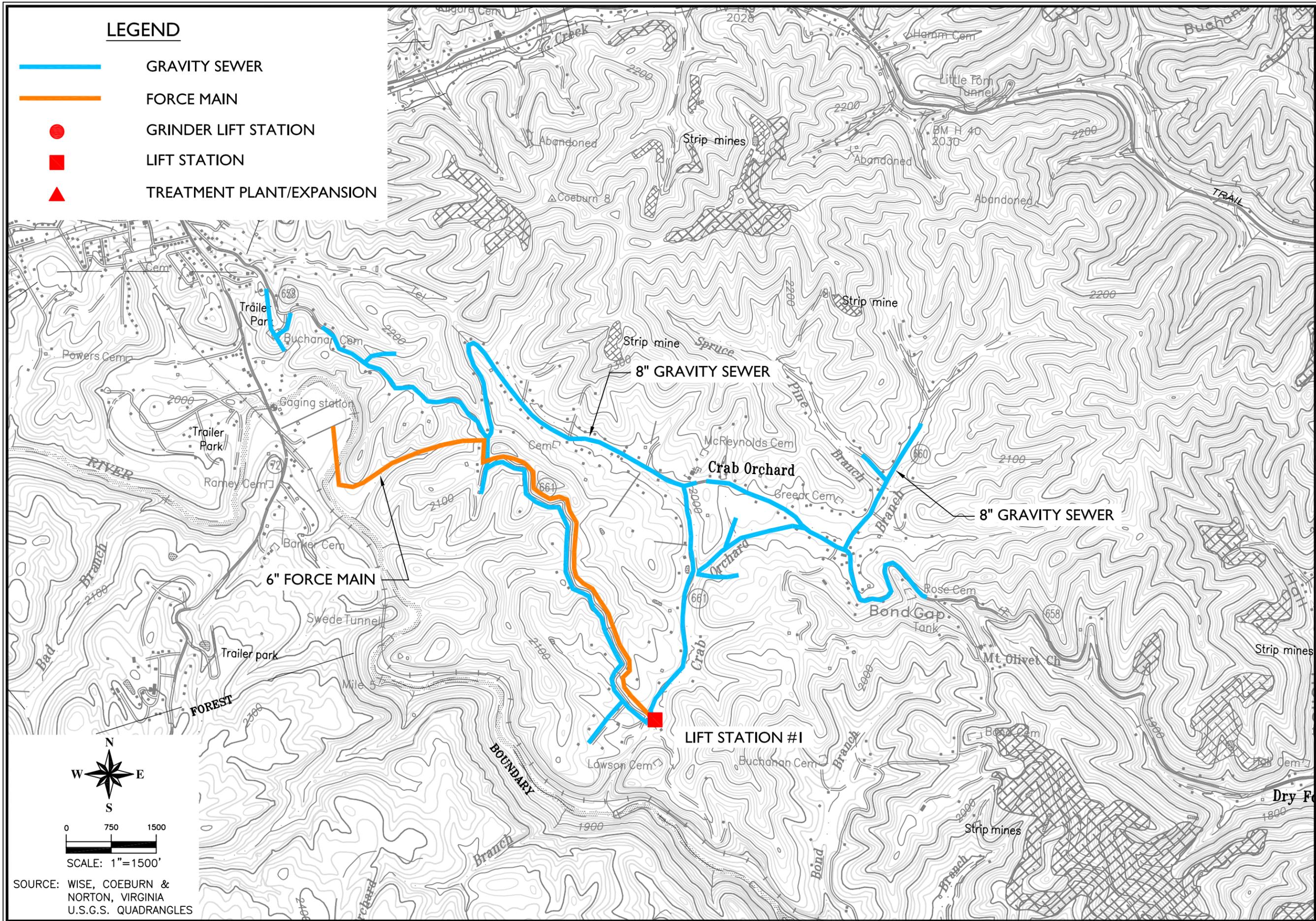
Basic Engineering	\$293,460
RPR	\$115,200
PER	\$10,000
Permits	\$25,000
Surveying/Geotechnical	\$10,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$15,000
Legal/Administration	\$61,215
Wetlands and Waters Delineation (If Required)	\$25,000
Construction Contingency (10%)	\$306,075

Related Subtotal	<u>\$880,950</u>
-------------------------	-------------------------

TOTAL PROJECT COST	\$3,941,700
---------------------------	--------------------

LEGEND

- GRAVITY SEWER
- FORCE MAIN
- GRINDER LIFT STATION
- LIFT STATION
- ▲ TREATMENT PLANT/EXPANSION



SOURCE: WISE, COEBURN & NORTON, VIRGINIA
U.S.G.S. QUADRANGLES

CRAB ORCHARD SEWER PROJECT
WISE COUNTY, VIRGINIA

No.	Date	Revision

Designed	
Drawn	D.J.L.
Checked	
Date	FEB. 2009
File No.	10279 exhibitall

Project No.
10279



Sheet No.
EXHIBIT

Dry Fork Sewer Project

Project Service Area

This collection system will serve the area southeast of the Town of Coeburn, between Bond Gap and Bull Run (Carfax Road) as shown in the Exhibit. The major system collection lines and force main lines are located along State Route 658 (Dry Fork Road), with small portions along Hall Hollow Road and Carfax Road. The area is served presently by individual septic tanks and drain fields.

Project Magnitude

Approximately 48 residential connections appear feasible in the proposed service area. Assuming each connection contributes 300 gallon/day, this project will generate approximately 14,400 gallon/day wastewater. There is capacity for additional residences to be built in the service area, although population growth in Wise County has been projected to remain essentially constant through 2040.

Required Facilities

Approximately 13,500 linear feet (L.F.) of 8-inch gravity line, and 16,500 L.F. of 4-inch force main, in combination with five lift stations, will convey the wastewater from this service area into a proposed collection system serving Crab Orchard Road (Rte. 658) residents between Coeburn and Bond Gap. This wastewater will be conveyed to and ultimately treated at the Coeburn-Norton-Wise WWTP.

The first lift station will be located on Carfax Road south of the intersection with Dry Fork Road. This grinder lift station will convey flow through approximately 8,000 L.F. of 4-inch force main Lift Station #2 on Dry Fork Road. A parallel 8-inch gravity line will bring flow from the 18 residential connections between Lift Stations #1 and #2. The capacity of this lift station, 25 gpm, will serve approximately 30 residential connections. A peak factor of four is used to size the capacity of this lift station.

The second lift station will be located on Dry Fork Road, 1,200 L.F. east of Hall Hollow Road. 4,000 L.F. of 8-inch gravity line delivers flow to Lift Station #2 from 13 residential connections located along Dry Fork Road and Hall Hollow Road. This grinder lift station will deliver the flow from about 25 connections 2500 L.F. through a 4-inch force main into the wet well of the third lift station, located west on Dry Fork Road. The elevation change is approximately 130 feet. Lift station capacity is 46 gpm.

The third lift station located on Dry Fork Road serves to lift flow from Lift Station #2 an additional 130 feet in elevation. This grinder lift station has capacity of 47 gpm. One residential connection pumps directly to the 3,000 L.F. of 4-inch force main discharging to Lift Station #4. The force main generally follows Dry Fork Road.

The fourth grinder lift station will receive flow from two residential connections served by 700 L.F. of 8-inch gravity line, as well as the 47 gpm capacity from Lift Station #3. The lift station capacity is 49 gpm, and the elevation change is approximately 150 feet over the 1,800 L.F. of 4-inch force main that terminates at Lift Station #5.

The fifth grinder lift station will convey flow received from Lift Station #4 to the high point in Bond Gap via 1,200 L.F. of 4-inch force main. This increase in elevation is approximately 130 feet. The force main terminates in a manhole that is the extreme east point of the proposed Crab Orchard Sewer Project.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the proposed Crab Orchard Collection System lines into the proposed South Coeburn Collection System, from where it is pumped to the CNW WWTP for treatment. Construction of the Crab Orchard project and the South Coeburn project must precede the Dry Fork sewer project. Transmission and treatment considerations are addressed in a separate portion of this report.

Constructability Assessment

The amount of rock in the project area appears to be typical for Wise County. The force mains generally follow the roadway. The location of the gravity lines should accommodate sewage discharge plumbing from existing residences. The work area is limited.

Total Projected Project Cost

The projected construction cost is \$1,895,730. With related costs of \$672,665, which includes ten percent construction contingency, the total projected project cost is \$2,568,395. This projection is based on estimated construction costs in spring 2009. Calculation of costs is based on costs in 2009 dollars. Anticipating costs for project construction for any specific future date requires incorporation of unit price changes of the costs between 2009 and the future date. The total project cost does not include any ancillary costs to upgrade existing transmission lines or expand treatment capacity at the CNW WWTP in order to accommodate the flow from this project. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$28,000 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$318,000.

Present Worth per Connection

The present worth per connection is \$60,133.23, based on the above costs for 48 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
DRY FORK SEWER PROJECT**

CONSTRUCTION COST:

13,500 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$607,500
16,500 L.F. 4" Force Main @ \$25/L.F.	\$412,500
2,400 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$60,000
204 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$35,700
36 EA. Standard Manholes @ \$2,500/EA.	\$90,000
18 EA. Waterproof Manholes @ \$3,000/EA.	\$54,000
6 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$18,000
48 EA. Service Wyes @ \$90/EA.	\$4,320
136 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$28,560
34 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$5,950
60 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$10,500
60 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$9,000
12 EA. 8-Inch Boring Attempts @ \$500/EA.	\$6,000
12 EA. 4-Inch Boring Attempts @ \$200/EA.	\$2,400
320 Tons Miscellaneous Aggregate @ \$15/Ton	\$4,800
160 C.Y. Miscellaneous Concrete @ \$150/C.Y.	\$24,000
5 EA. Grinder Lift Station @ \$100,000/EA.	\$500,000
3 EA. Individual Grinder Pump @ \$7,500/EA.	\$22,500

TOTAL CONSTRUCTION COST	\$1,895,730
--------------------------------	--------------------

RELATED COST:

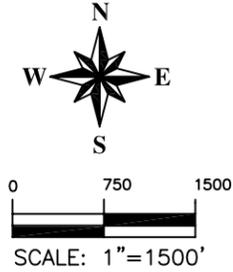
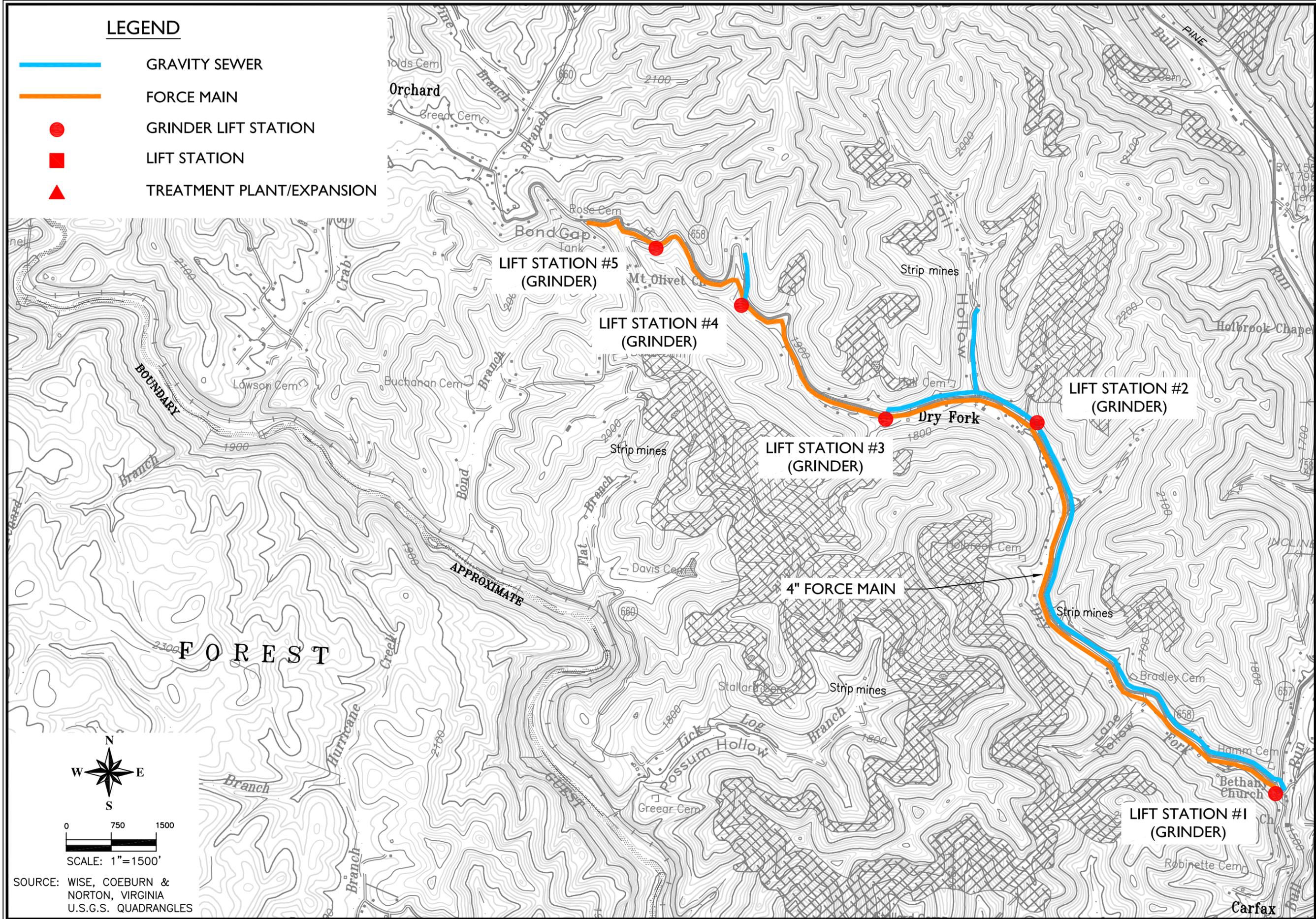
Basic Engineering	\$186,177
RPR	\$104,000
PER	\$10,000
Permits	\$20,000
Surveying/Geotechnical	\$50,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$35,000
Legal/Administration	\$37,915
Wetlands and Waters Delineation (If Required)	\$20,000
Construction Contingency (10%)	\$189,573

Related Subtotal	\$672,665
-------------------------	------------------

TOTAL PROJECT COST	\$2,568,395
---------------------------	--------------------

LEGEND

-  GRAVITY SEWER
-  FORCE MAIN
-  GRINDER LIFT STATION
-  LIFT STATION
-  TREATMENT PLANT/EXPANSION



SOURCE: WISE, COEBURN & NORTON, VIRGINIA
U.S.G.S. QUADRANGLES

DRY FORK SEWER PROJECT
WISE COUNTY, VIRGINIA

Revision	Date	No.

Designed	
Drawn	D.J.L.
Checked	
Date	FEB. 2009
File No.	10279 exhibitall

Project No.
10279



Sheet No.
EXHIBIT

South Coeburn Sewer Project

Project Service Area

This collection system will serve the area south of the Town of Coeburn as shown in the Exhibit. The major system collection lines are located along State Route 72 (Dungannon Road), extending from the Town boundary to the Virginia Department of Corrections Unit 18 facility. The area is served presently by individual septic tanks and drain fields.

Project Magnitude

Approximately 152 residential connections appear feasible in the proposed service area. Assuming each connection contributes 300 gallon/day, this project will generate approximately 45,600 gallon/day wastewater. There is space for additional residences to be built in the service area, although population growth in Wise County has been projected to remain essentially constant through 2040.

Required Facilities

Approximately 21,300 linear feet (L.F.) of 8-inch gravity line and 9,000 L.F. of 6-inch force main, in combination with two lift stations, will convey the wastewater from this service area directly into the CNW WWTP for treatment.

This collection area will serve residential connections south of Coeburn, as well as wastewater received from two adjacent collection systems: Sheffield Acres (incorporating Timberville flows), and Crab Orchard (incorporating Dry Fork flows).

One lift station will be located to replace the existing WWTP at the Virginia Department of Corrections Unit 18 facility on Rte. 72. This grinder pump with 1,000 L.F. of 4-inch force main would allow the WWTP to be removed from service. The high daily flow reported over the past eight years is 13,000 gallon/day. A lift station capacity of 36 gpm would allow a peak flow factor of four, although this could be reduced through use of basins at the existing WWTP for equalization.

South Coeburn Lift Station #1 will be located on Grace Covenant Road, approximately 800 L.F. east of Dungannon Road, close to the Guest River. This lift station will convey all flow through 9,000 L.F. of 6-inch force main to the CNW WWTP. The capacity of this lift station, 454 gpm, will serve approximately 152 residential connections in addition to flow from other lift stations. A peak factor of four resulted in 127 gpm capacity needed to serve the South Coeburn collection system. The capacities of the Jaybird Lift Station in the Sheffield Acres System, Virginia DOC Unit 18 Lift Station, and Crab Orchard Lift Station are 159 gpm, 36 gpm, and 127 gpm, respectively, resulting in 454 gpm total capacity for the South Coeburn Lift Station #1.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the 6-inch force main directly into the CNW WWTP. Treatment considerations are addressed in a separate portion of this report.

Constructability Assessment

The amount of rock in the project area appears to be typical for Wise County. There appears to be adequate construction space for installation of the lines. In portions of the project area, the gravity lines will follow topographic contours, rather than roadway. Where appropriate, location of the gravity lines should accommodate sewage discharge plumbing from existing residences.

The force main to the CNW WWTP will follow the Guest River stream bank approximately 7,500 L.F. across country. The work area is limited.

Total Projected Project Cost

The projected construction cost is \$2,415,450. With related costs of \$743,561, which includes ten percent construction contingency, the total projected project cost is \$3,159,011. This projection is based on estimated construction costs in spring 2009. Calculation of costs is based on costs in 2009 dollars. Anticipating costs for project construction for any specific future date requires incorporation of unit price changes of the costs between 2009 and the future date. The total project cost does not include any ancillary costs to expand treatment capacity at the CNW WWTP in order to accommodate the flow from this project. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$13,030 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$148,000.

Present Worth per Connection

The present worth per connection is \$21,756.65, based on the above costs for 152 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
SOUTH COEBURN SEWER PROJECT**

CONSTRUCTION COST:

21,300 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$958,500
9,000 L.F. 6" Force Main @ \$30/L.F.	\$270,000
7,600 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$190,000
1,292 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$226,100
57 EA. Standard Manholes @ \$2,500/EA.	\$142,500
29 EA. Waterproof Manholes @ \$3,000/EA.	\$87,000
2 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$6,000
152 EA. Service Wyes @ \$90/EA.	\$13,680
272 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$57,120
100 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$17,500
25 L.F. 8-Inch Railroad Crossings @ \$250/L.F.	\$6,250
24 EA. 8-Inch Boring Attempts @ \$500/EA.	\$12,000
320 Tons Miscellaneous Aggregate @ \$15/Ton	\$4,800
160 C.Y. Miscellaneous Concrete @ \$150/C.Y.	\$24,000
1 EA. Lift Station @ \$300,000/EA.	\$300,000
1 EA. Grinder Lift Station @ \$100,000/EA.	\$100,000

TOTAL CONSTRUCTION COST	\$2,415,450
--------------------------------	--------------------

RELATED COST:

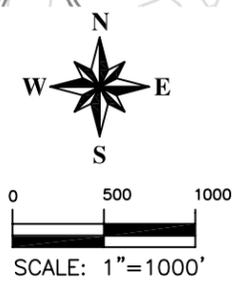
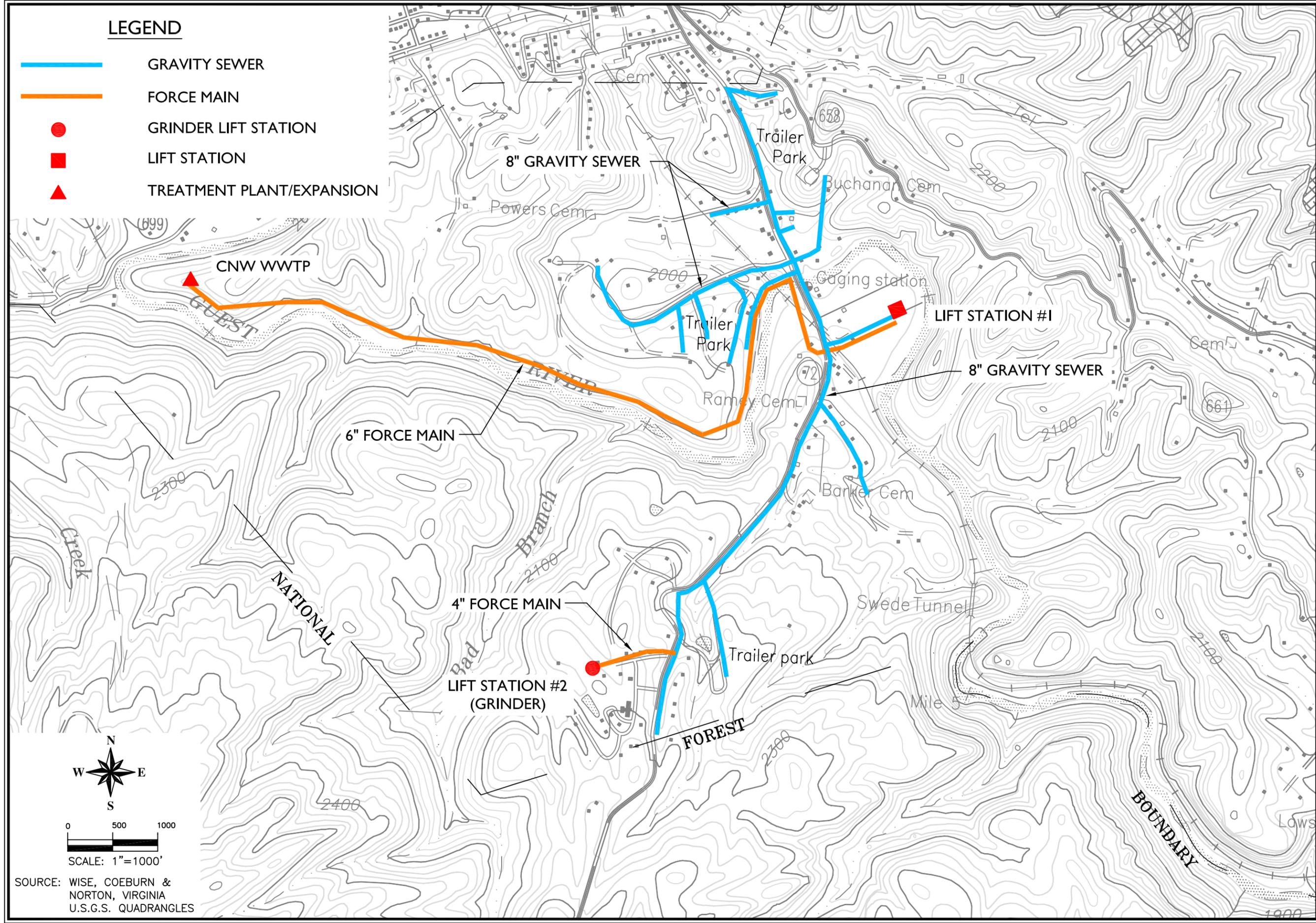
Basic Engineering	\$234,707
RPR	\$104,000
PER	\$10,000
Permits	\$30,000
Surveying/Geotechnical	\$20,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$20,000
Legal/Administration	\$48,309
Wetlands and Waters Delineation (If Required)	\$15,000
Construction Contingency (10%)	\$241,545

Related Subtotal	\$743,561
-------------------------	------------------

TOTAL PROJECT COST	\$3,159,011
---------------------------	--------------------

LEGEND

- GRAVITY SEWER
- FORCE MAIN
- GRINDER LIFT STATION
- LIFT STATION
- ▲ TREATMENT PLANT/EXPANSION



SOURCE: WISE, COEBURN & NORTON, VIRGINIA
U.S.G.S. QUADRANGLES

SOUTH COEBURN SEWER PROJECT
WISE COUNTY, VIRGINIA

No.	Date	Revision

Designed	
Drawn	D.J.L.
Checked	
Date	FEB. 2009
File No.	10279 exhibitsall

Project No.
10279



Sheet No.
EXHIBIT

Sheffield Acres Sewer Project

Project Service Area

This collection system will provide service to an area located along State Route 72 (Dungannon Road), extending south from Jaybird Branch Road (Rte. 663) past Sheffield Acres subdivision and the Flatwoods Job Corp Center as shown in the Exhibit. The Sheffield Acres subdivision and the Flatwoods Center are served presently by package wastewater treatment plants, with adjacent residents served by individual septic tanks and drain fields.

Project Magnitude

Approximately 59 residential connections appear feasible in the proposed service area. Assuming each connection contributes 300 gallon/day, this project will generate approximately 17,700 gallon/day wastewater. The average daily flows treated at the existing Sheffield Acres and Flatwoods WWTPs are 30,000 gallons/day and 6,000 gallons/day, respectively. In addition, 16,500 gallons/day wastewater from the Timberville community could be conveyed into the Sheffield Acres system for additional transmission. The cumulative volume of these flows is approximately 70,000 gallon/day, although the design capacity is greater to account for inflow and infiltration in the existing collection systems. There is space for additional residences to be built in the service area. Population growth in Wise County has been projected to remain essentially constant through 2040.

Required Facilities

The general description of this collection system follows the direction of flow, roughly north along Rte. 72 from the Flatwoods Center, passing through the Sheffield Acres community towards Coeburn, and receiving flow from connections along Rte. 72 and Jaybird Branch Road (Rte. 663). All flow from the service area enters a lift station at the intersection of Rte. 72 and Jaybird Branch Road, and is pumped into a collection system south of Coeburn for subsequent transmission and treatment. That collection system must be constructed and operational before the Sheffield Acres system is built.

Approximately 10,200 linear feet (L.F.) of 8-inch gravity line, and 3,500 L.F. of 4-inch force main, in combination with two lift stations, will convey the wastewater from this service area into a lift station at the intersection of Jaybird Branch Road and Rte. 72, about one-half mile north of the Sheffield Acres community. This wastewater is conveyed from the Jaybird Lift Station through 4,800 L.F. of 4-inch force main along Rte. 72, entering the proposed South Coeburn collection system, in which this flow will be conveyed north on Rte. 72 toward the Town of Coeburn, entering another lift station adjacent to the Guest River, with additional pumping to the CNW WWTP for subsequent treatment.

The Flatwoods Lift Station will be located at the existing Flatwoods WWTP. This lift station will convey all flow from Flatwoods to the Sheffield Acres Lift Station via approximately 1,000 L.F. of 4-inch force main. Existing basins at the WWTP will provide storage capacity to reduce the necessary peak pumping capacity. Because the lift stations are roughly the same elevation, a

grinder pump with 20 gpm capacity will convey the flow of 15,000 gallon/day from the Flatwoods Center. No additional gravity lines are needed in this area.

Two portions of the Sheffield Acres community are presently served by private septic systems. East of Rte. 72, 17 connections will be served with 3,000 L.F. of 8-inch gravity line that connects to the existing collection system. Four road crossings will be installed. Northwest of the subdivision, 11 connections will be served with approximately 2,000 L.F. of 8-inch gravity line. The Sheffield Acres Lift Station will have capacity to pump 190,000 gallon/day (133 gpm) through 2,500 L.F. of 4-inch force main along Rte. 72, lifting the wastewater 100 feet, to an elevation of 2,500 feet. At this point, the force main enters an 8-inch gravity sewer. Approximately 17 connections to the gravity line will contribute 5,100 gallon/day through the 2,500 L.F. of 8-inch gravity line between the force main and the Jaybird Lift Station, including two road crossings and one stream crossing.

Fourteen connections on Jaybird Branch Road will discharge to the Jaybird Lift Station through 2,700 L.F. of 8-inch gravity sewer line. At 300 gallon/day per connection, 4,200 gallon/day will be added to the 105,100 gallon/day from the Sheffield Acres community. The Jaybird Lift Station will have sufficient capacity to lift 228,960 gallon/day (159 gpm) approximately 50 feet in elevation over the first 2,400 L.F. of the 4-inch force main. The remaining 2,400 L.F. of force main declines in elevation by 140 feet to the place of connection with an 8-inch gravity line near the Virginia Department of Corrections Unit 18 facility, in the South Coeburn collection system.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will ultimately be conveyed along Rte. 72 to a lift station south of Coeburn adjacent to the Guest River. From that point flow is directed through a force main following the Guest River into the CNW WWTP for treatment. Transmission and treatment considerations are addressed in a separate portion of this report.

This collection system would remove two existing package WWTPs from service.

Constructability Assessment

The amount of rock in the project area appears typical for Wise County. There appears to be adequate construction space for installation of the lines. In portions of the project area, the gravity lines will follow topological contours, rather than roadway. Where appropriate, location of the gravity lines should accommodate sewage discharge plumbing from existing residences. Two lift stations will be constructed at sites of existing WWTPs.

Total Projected Project Cost

The projected construction cost is \$1,766,330. With related costs of \$520,921, which includes ten percent construction contingency, the total projected project cost is \$2,287,251. This projection is based on estimated construction costs in spring 2009. To project cost for construction at a specific future date requires incorporation of unit price changes. This cost does not include any ancillary costs to expand treatment capacity at the CNW WWTP in order to accommodate the flow from this project. Any transmission lines and lift stations

outside of the project area that are needed to convey the wastewater to the WWTP are not existent at the time of the preparation of this report and must be in place prior to operation of the Timberville service area sewer system. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$16,872 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$191,400. This does not include a reduction in operating costs resulting from converting the two existing WWTPs into lift stations.

Present Worth per Connection

The present worth per connection is \$42,011.03, based on the above costs for 59 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
SHEFFIELD SEWER PROJECT**

CONSTRUCTION COST:

10,200 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$459,000
8,300 L.F. 4" Force Main @ \$25/L.F.	\$207,500
2,950 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$73,750
502 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$87,850
36 EA. Standard Manholes @ \$2,500/EA.	\$90,000
5 EA. Waterproof Manholes @ \$3,000/EA.	\$15,000
4 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$12,000
59 EA. Service Wyes @ \$90/EA.	\$5,310
272 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$57,120
136 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$23,800
20 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$3,500
24 EA. 8-Inch Boring Attempts @ \$500/EA.	\$12,000
12 EA. 4-Inch Boring Attempts @ \$200/EA.	\$2,400
190 Tons Miscellaneous Aggregate @ \$15/Ton	\$2,850
95 C.Y. Miscellaneous Concrete @ \$150/C.Y.	\$14,250
2 EA. Lift Station @ \$300,000/EA.	\$600,000
1 EA. Grinder Lift Station @ \$100,000/EA.	\$100,000

TOTAL CONSTRUCTION COST	\$1,766,330
--------------------------------	--------------------

RELATED COST:

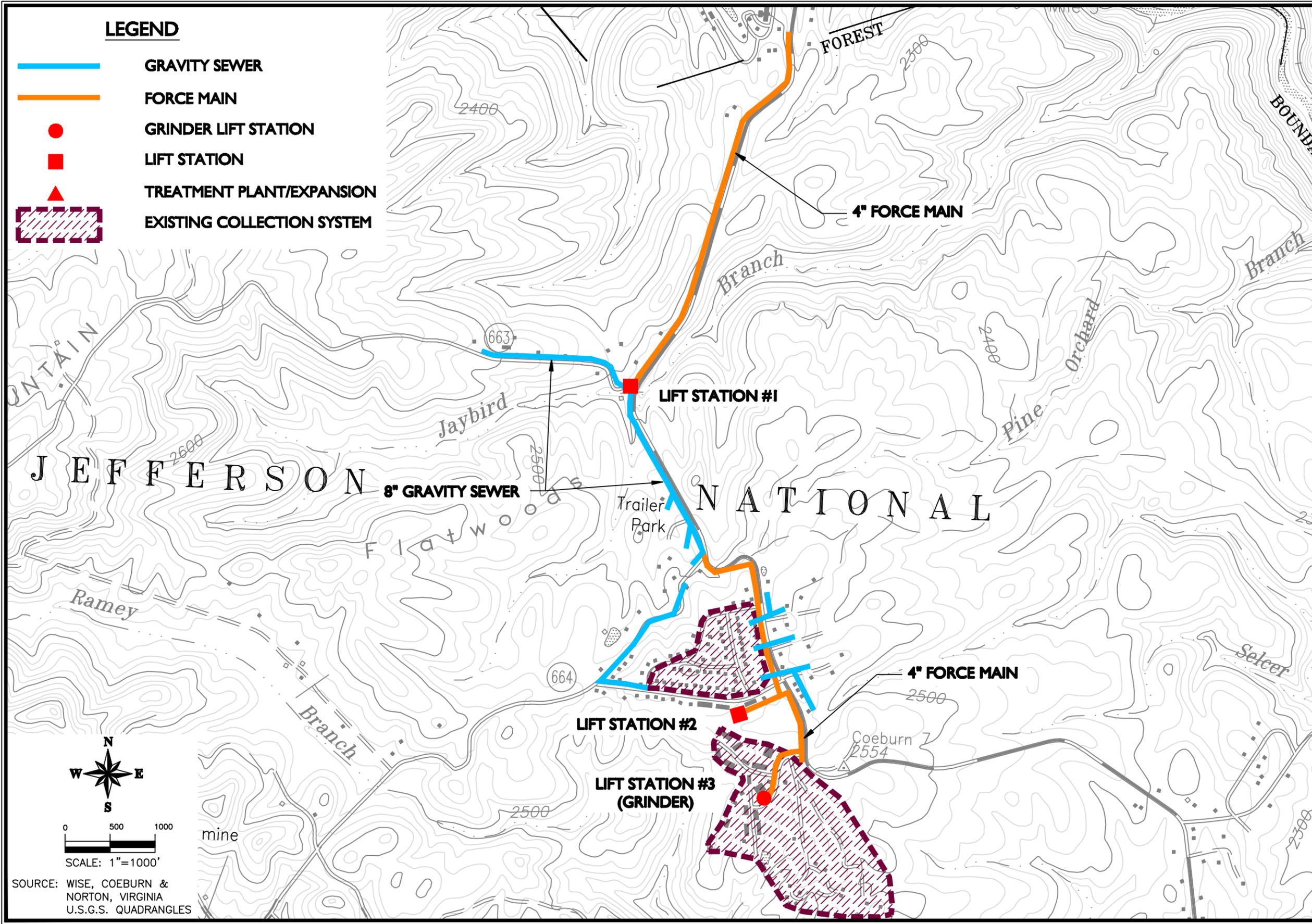
Basic Engineering	\$173,661
RPR	\$52,800
PER	\$10,000
Permits	\$10,000
Surveying/Geotechnical	\$30,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$7,500
Legal/Administration	\$35,327
Wetlands and Waters Delineation (If Required)	\$5,000
Construction Contingency (10%)	\$176,633

Related Subtotal	<u>\$520,921</u>
-------------------------	-------------------------

TOTAL PROJECT COST	\$2,287,251
---------------------------	--------------------

LEGEND

-  GRAVITY SEWER
-  FORCE MAIN
-  GRINDER LIFT STATION
-  LIFT STATION
-  TREATMENT PLANT/EXPANSION
-  EXISTING COLLECTION SYSTEM



0 500 1000
SCALE: 1"=1000'

SOURCE: WISE, COEBURN & NORTON, VIRGINIA
U.S.G.S. QUADRANGLES

SHEFFIELD ACRES SEWER PROJECT
WISE COUNTY, VIRGINIA

No.	Date	Revision

Designed	
Drawn	D.J.L.
Checked	
Date	FEB. 2009
File No.	10279 exhb1a.dwg

Project No.
10279



Sheet No.
EXHIBIT

Timberville Sewer Project

Project Service Area

This collection system will serve a community located along State Route 72 (Dungannon Road), extending from the Scott County boundary approximately 3,000 feet north, including the Timberville subdivision, as shown in the Exhibit. The area is served presently by individual septic tanks and drain fields.

Project Magnitude

Approximately 55 residential connections appear feasible in the proposed service area. Assuming each connection contributes 300 gallon/day, this project will generate approximately 16,500 gallon/day wastewater. There is capacity for additional residences to be built in the service area, both in the Timberville subdivision, as well as along Rte. 72. Population growth in Wise County has been projected to remain essentially constant through 2040.

Required Facilities

Approximately 8,200 linear feet (L.F.) of 8-inch gravity line, and 10,520 L.F. of 4-inch force main, in combination with three lift stations, will convey the wastewater from this service area into a lift station at the Sheffield Acres subdivision, about one mile west of the service area via Rte. 72. From Sheffield Acres, the wastewater will be conveyed north on Rte. 72 toward the Town of Coeburn, entering another lift station adjacent to the Guest River, with additional pumping to the CNW WWTP for subsequent treatment.

The first lift station will be located west of the intersection of Rte. 72 and Mosswood Lane. This lift station will convey all flow from the project area to an adjacent collection system for further transmission and treatment. Four connections flow by gravity into the lift station through 400 L.F. of 8-inch gravity line, and the remaining flow from the service area is pumped from Lift Station #2 and Lift Station #3.

Lift Station #1 pumps 16,500 gallons/day through 5,600 L.F. of 4-inch force main following Rte. 72 to a lift station in the Sheffield Acres community located at the site of the existing package wastewater treatment plant. From Sheffield Acres, the flow will be conveyed to the CNW WWTP for treatment. The force main will increase in elevation by 120 feet over the initial 3,000 L.F., and then decrease entering the Sheffield Acres community. The capacity of this lift station, 46 gpm, can be met with a grinder pump design.

The second lift station will be located at the service area's northernmost point on Mosswood Lane. This grinder lift station will deliver the flow from about 24 connections 2,120 L.F. through a 4-inch force main into the wet well of the first lift station. Two road crossings are required for this force main. Approximately 3,000 L.F. of 8-inch gravity line would deliver flow from the residential connections to the lift station. The elevation change is approximately 110 feet. Lift station capacity of 20 gpm would convey 7,200 gallons/day.

The third lift station will be located at the service area's southernmost point on Country Lane, two hundred feet from Rte. 72. This grinder lift station will deliver the flow from about 27 connections 2,800 L.F. through a 4-inch force main into the wet well of the first lift station, following Rte. 72. One road crossing and one stream crossing are required for this force main. Approximately 4,800 L.F. of 8-inch gravity line would deliver flow from the residential connections to the lift station, with one stream crossing and one road crossing required. The elevation change is approximately 80 feet. 8,100 gallons per day would be conveyed with Lift Station #3 capacity of 23 gpm.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed to the Sheffield Acres community, and subsequently transferred north along Rte. 72 to a lift station south of Coeburn adjacent to the Guest River. From that point flow is directed through a force main following the Guest River into the CNW WWTP for treatment. Transmission and treatment considerations are addressed in a separate portion of this report.

Constructability Assessment

The amount of rock in the project area appears to be typical for Wise County. There appears to be adequate construction space for installation of the lines. In portions of the project area, the gravity lines will follow topological contours, rather than roadway. Where appropriate, location of the gravity lines should accommodate sewage discharge plumbing from existing residences.

Total Projected Project Cost

The projected construction cost is \$1,284,050. With related costs of \$424,562, which includes ten percent construction contingency, the total projected project cost is \$1,708,612. This projection is based on estimated construction costs in spring 2009. To project cost for construction at a specific future date requires incorporation of unit price changes. This cost does not include any ancillary costs to expand treatment capacity at the CNW WWTP in order to accommodate the flow from this project. Any transmission lines and lift stations outside of the project area that are needed to convey the wastewater to the WWTP are not existent at the time of the preparation of this report and must be constructed prior to operation of the Timberville service area sewer system. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$16,872 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$191,700.

Present Worth per Connection

The present worth per connection is \$34,551.13, based on the above costs for 55 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
TIMBERVILLE SEWER PROJECT**

CONSTRUCTION COST:

8,200 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$369,000
10,520 L.F. 4" Force Main @ \$25/L.F.	\$263,000
2,750 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$68,750
468 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$81,900
30 EA. Standard Manholes @ \$2,500/EA.	\$75,000
3 EA. Waterproof Manholes @ \$3,000/EA.	\$9,000
4 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$12,000
55 EA. Service Wyes @ \$90/EA.	\$4,950
170 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$35,700
170 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$29,750
20 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$3,500
20 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$3,000
15 EA. 8-Inch Boring Attempts @ \$500/EA.	\$7,500
15 EA. 4-Inch Boring Attempts @ \$200/EA.	\$3,000
200 Tons Miscellaneous Aggregate @ \$15/Ton	\$3,000
100 C.Y. Miscellaneous Concrete @ \$150/C.Y.	\$15,000
3 EA. Grinder Lift Station @ \$100,000/EA.	\$300,000

TOTAL CONSTRUCTION COST	\$1,284,050
--------------------------------	--------------------

RELATED COST:

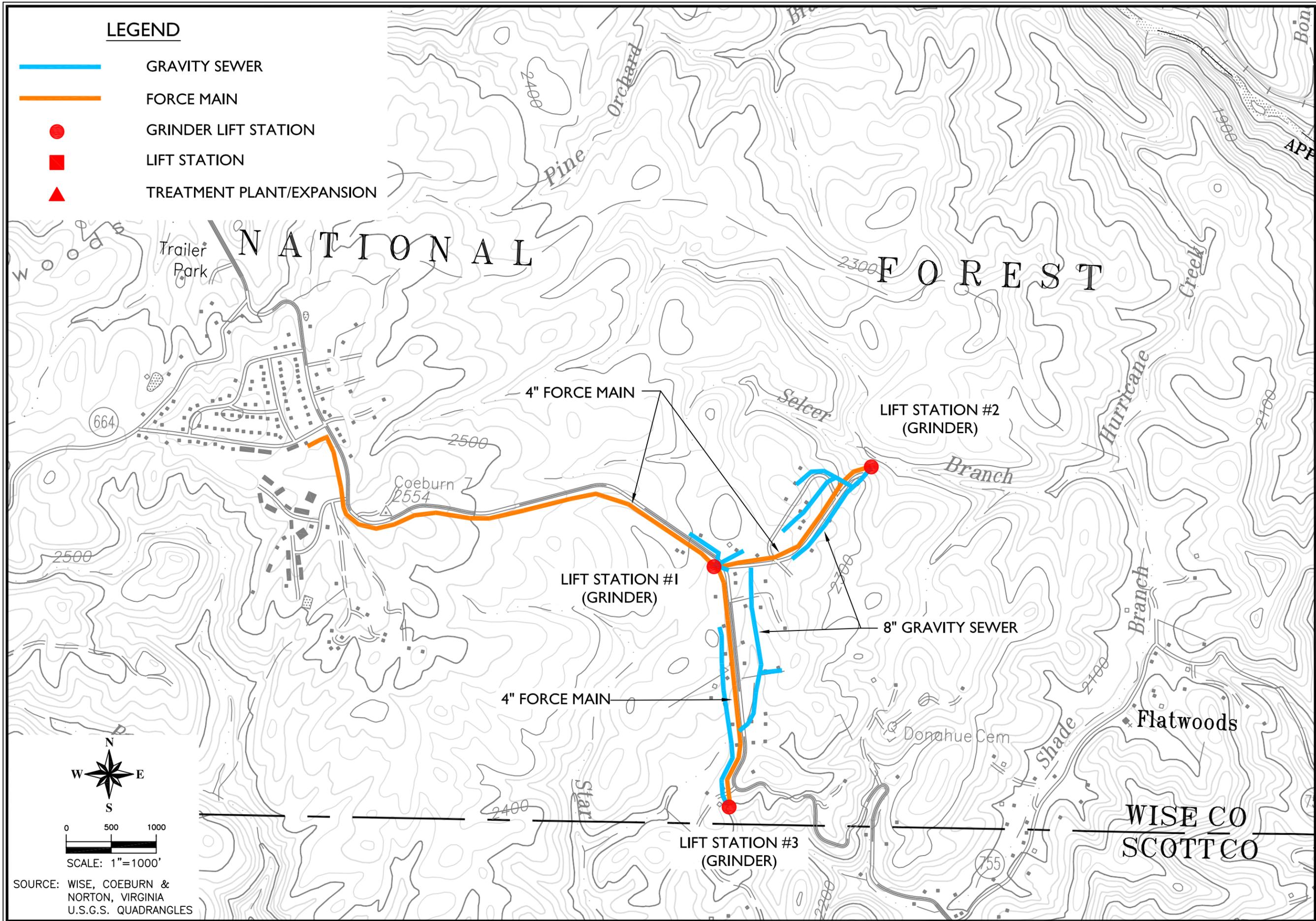
Basic Engineering	\$127,676
RPR	\$52,800
PER	\$10,000
Permits	\$10,000
Surveying/Geotechnical	\$30,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$15,000
Legal/Administration	\$25,681
Wetlands and Waters Delineation (If Required)	\$5,000
 Construction Contingency (10%)	 \$128,405

Related Subtotal	\$424,562
-------------------------	------------------

TOTAL PROJECT COST	\$1,708,612
---------------------------	--------------------

LEGEND

-  GRAVITY SEWER
-  FORCE MAIN
-  GRINDER LIFT STATION
-  LIFT STATION
-  TREATMENT PLANT/EXPANSION



SOURCE: WISE, COEBURN & NORTON, VIRGINIA
U.S.G.S. QUADRANGLES

TIMBERVILLE SEWER PROJECT
WISE COUNTY, VIRGINIA

Revision	Date	No.

Designed	
Drawn	D.J.L.
Checked	
Date	FEB. 2009
File No.	10279 exhibitsall

Project No.
10279



Sheet No.
EXHIBIT

Tacoma Sewer Project

Project Service Area

The Tacoma area lies west from the Town of Coeburn along U.S. Route 58, as shown in the Exhibit. The existing Coeburn-Norton-Wise (CNW) interceptor currently runs through Tacoma, but no connections have been made.

Project Magnitude

There are 144 existing homes in the Tacoma area.

Required Facilities

The proposed facilities include approximately 20,000 linear feet of 8-inch gravity sewer. The extension will connect to the CNW sewage interceptor system and all wastewater generated in the project area will be conveyed to and treated at the Coeburn-Norton-Wise (CNW) Regional Wastewater Treatment Plant. A flow of 300 gallons per day (GPD) per connection has been estimated, for a total flow of 43,200 GPD.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed into the CNW interceptor to the CNW WWTP for treatment. Transmission and treatment considerations are addressed in a separate portion of the report.

Total Project Costs

The preliminary project cost is \$2,071,100, or \$14,383 per residential connection.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot of gravity sewer, an annual project O&M of \$2,000 is projected. The present worth of 30 years' annual O&M cost (calculated at 8%) is \$22,516.

Present Worth per Connection

The present worth per connection is \$14,539.00, based on the above costs for 144 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
TACOMA SEWER PROJECT**

CONSTRUCTION COST:

20,000 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$900,000
7,200 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$180,000
40 EA. Standard Manholes @ \$2,500/EA.	\$100,000
40 EA. Waterproof Manholes @ \$3,000/EA.	\$120,000
80 L.F. 8-Inch Railroad Crossings @ \$250/L.F.	\$20,000
400 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$84,000
400 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$70,000
200 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$35,000
200 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$30,000
144EA. Service Connections @ \$350/EA.	<u>\$50,400</u>

TOTAL CONSTRUCTION COST	\$1,589,400
--------------------------------	--------------------

RELATED COST:

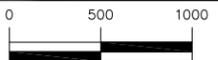
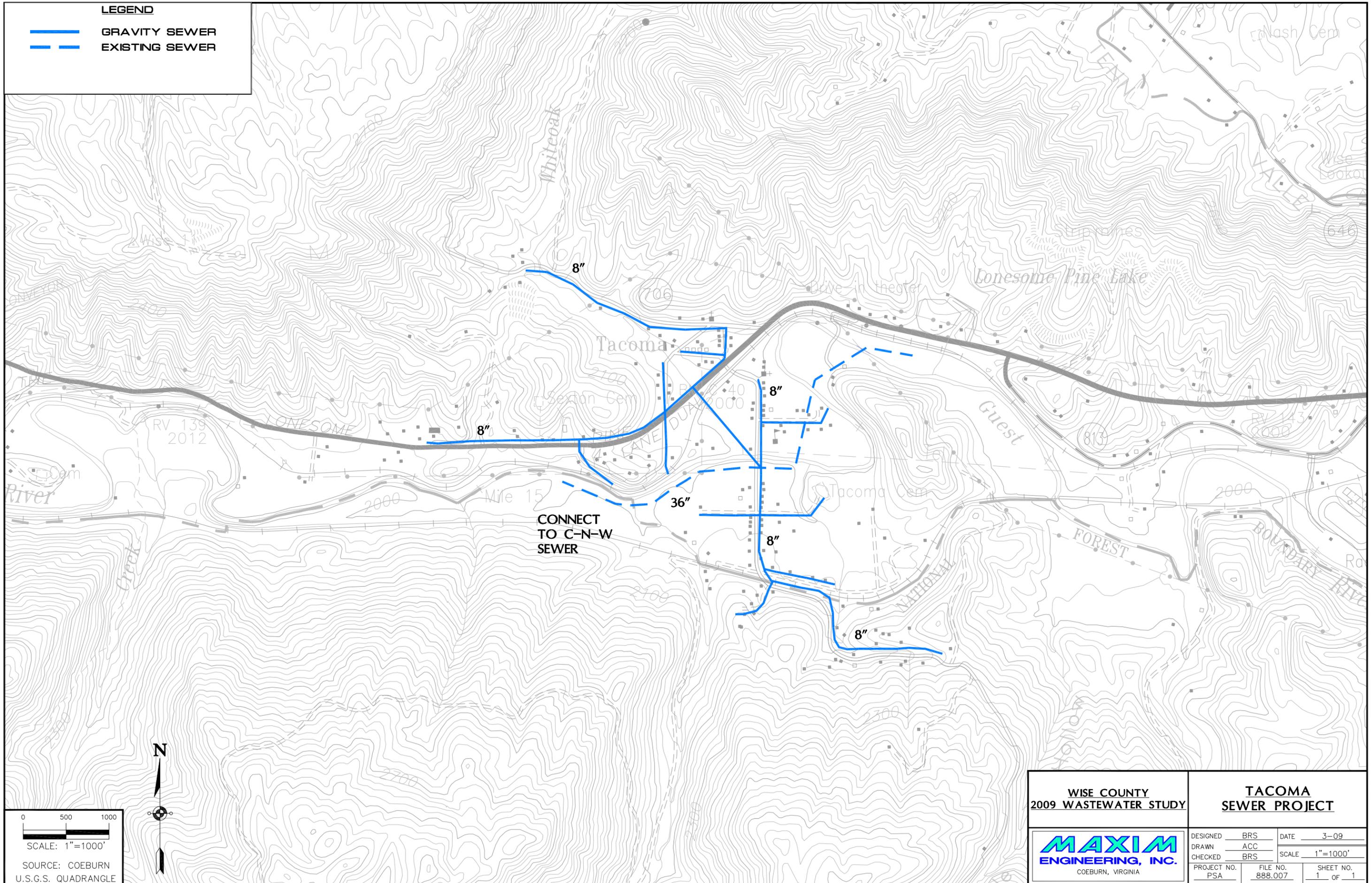
Basic Engineering	\$122,384
RPR	\$76,800
PER	\$20,000
Permits	\$20,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$31,788
Legal/Administration	\$31,788
Construction Contingency (10%)	<u>\$158,940</u>

Total Related Cost	<u>\$481,700</u>
---------------------------	-------------------------

TOTAL PROBABLE COST	\$2,071,100
----------------------------	--------------------

LEGEND

-  **GRAVITY SEWER**
-  **EXISTING SEWER**



SCALE: 1"=1000'
SOURCE: COEBURN
U.S.G.S. QUADRANGLE

WISE COUNTY 2009 WASTEWATER STUDY		TACOMA SEWER PROJECT	
DESIGNED	BRS	DATE	3-09
DRAWN	ACC	SCALE	1"=1000'
CHECKED	BRS		
PROJECT NO.	FILE NO.	SHEET NO.	
PSA	888.007	1 OF 1	



Banner Sewer Project

Project Service Area

The Banner area lies east of the Town of Coeburn along old U.S. Route 58, as shown in the Exhibit. The project area lies in the watershed of Little Tom's Creek, which is very flat-lying in places and contains large wetland areas.

Project Magnitude

There are 169 homes in this service area.

Required Facilities

The project includes approximately 20,000 linear feet of 8-inch gravity sewer and 8,400 linear feet of 4-inch service laterals. The project will connect to the Town of Coeburn sewage collection system and all wastewater generated in the project area will be conveyed to and treated at the existing Coeburn-Norton-Wise (CNW) Regional Wastewater Treatment Plant (WWTP). A flow of 300 gallons per day (GPD) per connection is estimated, for a total daily flow of 50,700 GPD.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the Town of Coeburn sewers to the CNW WWTP for treatment. Transmission and treatment considerations are addressed in a separate portion of the report.

Total Project Costs

The preliminary project cost is \$2,089,335, or \$12,363 per residential connection.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot of gravity sewer, an annual project O&M of \$2,000 is projected. The present worth of 30 years' annual O&M cost (calculated at 8%) is \$22,516.

Present Worth per Connection

The present worth per connection is \$12,496.16, based on the above costs for 169 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
BANNER SEWER PROJECT**

CONSTRUCTION COST:

20,000 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$900,000
8,450 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$211,250
50 EA. Standard Manholes @ \$2,500/EA.	\$125,000
30 EA. Waterproof Manholes @ \$3,000/EA.	\$90,000
400 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$84,000
400 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$70,000
200 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$35,000
200 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$30,000
169EA. Service Connections @ \$350/EA.	<u>\$59,150</u>

TOTAL CONSTRUCTION COST	\$1,604,400
--------------------------------	--------------------

RELATED COST:

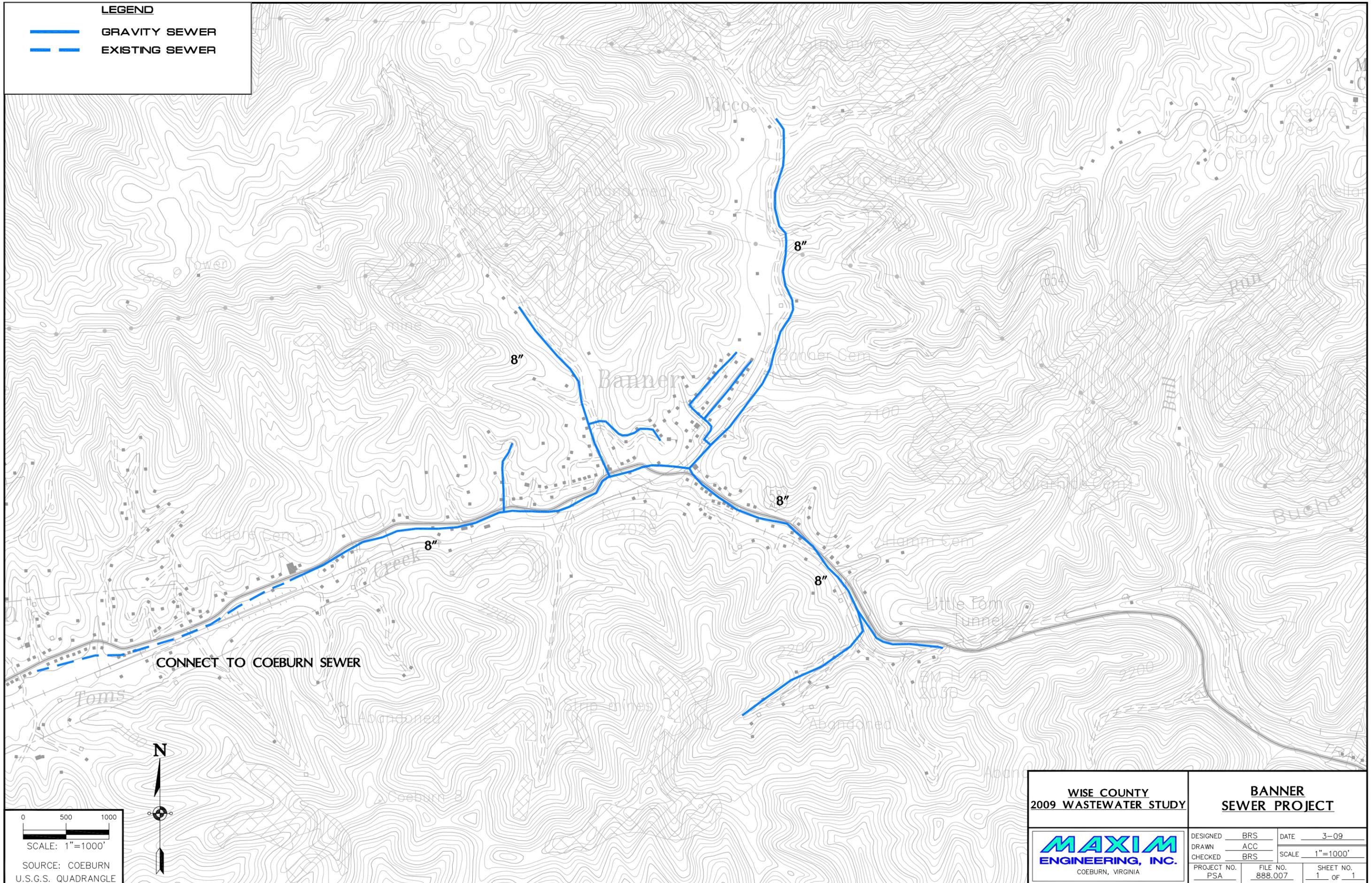
Basic Engineering	\$123,539
RPR	\$76,800
PER	\$20,000
Permits	\$20,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$32,088
Legal/Administration	\$32,088
Construction Contingency (10%)	<u>\$160,440</u>

Total Related Cost	<u>\$484,955</u>
---------------------------	-------------------------

TOTAL PROJECT COST	\$2,089,355
---------------------------	--------------------

LEGEND

-  GRAVITY SEWER
-  EXISTING SEWER



WISE COUNTY 2009 WASTEWATER STUDY		BANNER SEWER PROJECT	
DESIGNED	BRS	DATE	3-09
DRAWN	ACC	SCALE	1"=1000'
CHECKED	BRS		
PROJECT NO.	FILE NO.	SHEET NO.	
PSA	888.007	1 OF 1	



Cranesnest Sewer Project

Project Service Area

Cranes Nest lies north of the town of Coeburn, as shown in the Exhibit. The service area begins just north of the town limits near Dale Ridge Hollow and extends to the last residential dwelling along State Route 72. This service area is very flat at less than 0.5% grade.

Project Magnitude

There are 106 existing homes in this service area. This project would generate 21,200 gallons of wastewater per day, based upon an average of 200 gallons per day (GPD) per connection from the residences in this service area.

Required Facilities

A septic tank effluent pump (STEP) system is proposed for this community, with the pre-treated effluent pumped through the town of Coeburn's gravity sewer lines to the Coeburn-Norton-Wise (CNW) Regional Wastewater Treatment Facility. The project includes approximately 10,500 linear feet of 6", 4", and 2" force mains and 106 STEP systems to collect the wastewater from the existing homes.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the Town of Coeburn sewers to the CNW WWTP for treatment. Transmission and treatment considerations are addressed in a separate portion of the report.

Total Project Costs

The preliminary project cost is \$1,049,793, or \$9,904 per connection.

Annual Operations and Maintenance Cost

Allowing an annual cost of \$144 per STEP system, the operating and maintenance cost is \$15,264. The present worth of 30 years' annual O&M cost is \$171,839.

Present Worth per Connection

The present worth per connection is \$11,524.83, based on 106 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
CRANESNEST SEWER PROJECT**

Construction Cost

3,000 LF	6" Force Main	\$20	\$60,000
6,000 LF	4" Force Main	\$15	\$90,000
1,500 LF	2" Force Main	\$12	\$18,000
4 EA.	Stream Crossing	\$2,500	\$10,000
12 EA.	Road Crossing	\$2,500	\$30,000
106 EA.	Service Connection	\$250	\$26,500
106 EA.	STEP System	\$5,000	\$530,000
53 EA.	Pump & Fill Existing Septic Tank	\$500	\$26,500

Total Construction Cost \$791,000

Related Cost

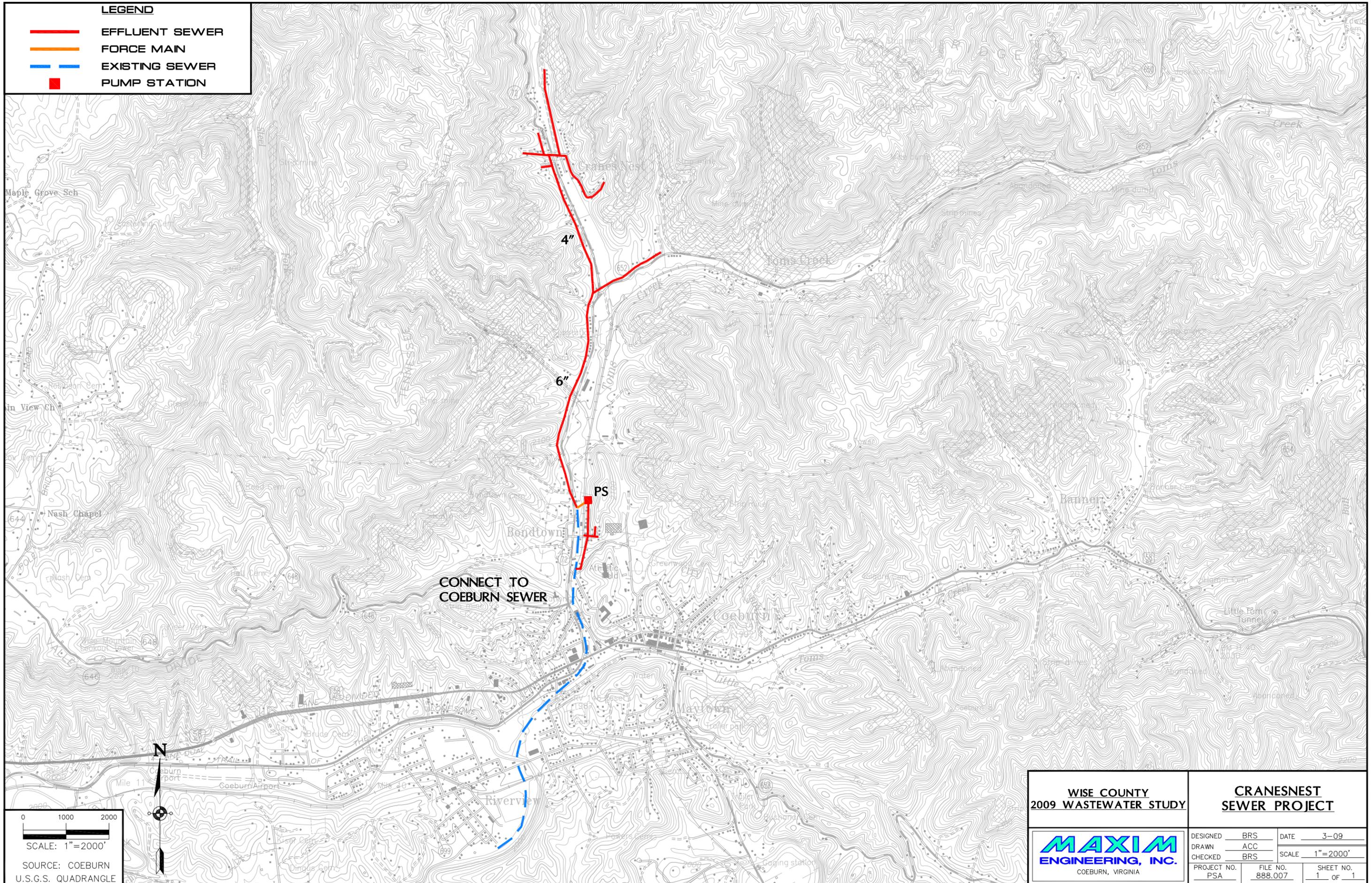
Basic Engineering	\$65,653
RPR	\$62,400
PER	\$10,000
Permits	\$10,000
Easements/Property Acquisition	\$15,820
Legal/Administration	\$15,820
Construction Contingency (10%)	\$79,100

Total Related Cost \$258,793

TOTAL PROJECT COST \$1,049,793

LEGEND

- EFFLUENT SEWER
- FORCE MAIN
- - - EXISTING SEWER
- PUMP STATION



0 1000 2000
 SCALE: 1"=2000'
 SOURCE: COEBURN
 U.S.G.S. QUADRANGLE



WISE COUNTY 2009 WASTEWATER STUDY		CRANESNEST SEWER PROJECT	
		DESIGNED BRS	DATE 3-09
		DRAWN ACC	SCALE 1"=2000'
		CHECKED BRS	
PROJECT NO. PSA	FILE NO. 888.007	SHEET NO. 1 OF 1	

ESSERVILLE SEWER PROJECT

Project Service Area

The Esserville service area lies along Route 757, and is a small area of the county tucked between the City of Norton and the Town of Wise, as shown in the Exhibit. After the Wal-Mart Shopping Center was developed, this area was recognized as a potential commercial area.

Project Magnitude

There are approximately 125 existing residential connections in this area. The existing flow from this project area is estimated at 37,500 GPD, based on 300 GPD per connection.

Required Facilities

The area would be served by installing approximately 12,000 linear feet of 8-inch gravity sewer line and connecting to the City of Norton's existing sewage collection system. All wastewater generated in the project area would flow to the Coeburn-Norton-Wise (CNW) Regional Wastewater Treatment Plant (WWTP).

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the City of Norton sewers to the CNW WWTP for treatment. Transmission and treatment considerations are addressed in a separate portion of the report.

Total Project Costs

The preliminary project cost is \$1,291,802, or \$10,334 per residential connection.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot of gravity sewer, an annual project O&M of \$1,200 is projected. The present worth of 30 years' annual O&M cost (calculated at 8%) is \$13,509.

Present Worth per Connection

The present worth per connection is \$10,442.49, based on the above costs for 125 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
ESSERVILLE SEWER PROJECT**

CONSTRUCTION COST:

12,000 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$540,000
50 EA. Standard Manholes @ \$2,500/EA.	\$125,000
60 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$12,600
100 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$17,500
200 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$35,000
200 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$30,000
125EA. Service Connections @350/EA.	\$43,750
6,250 L.F 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	<u>\$156,250</u>

TOTAL CONSTRUCTION COST	\$960,100
--------------------------------	------------------

RELATED COST:

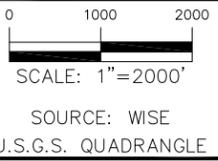
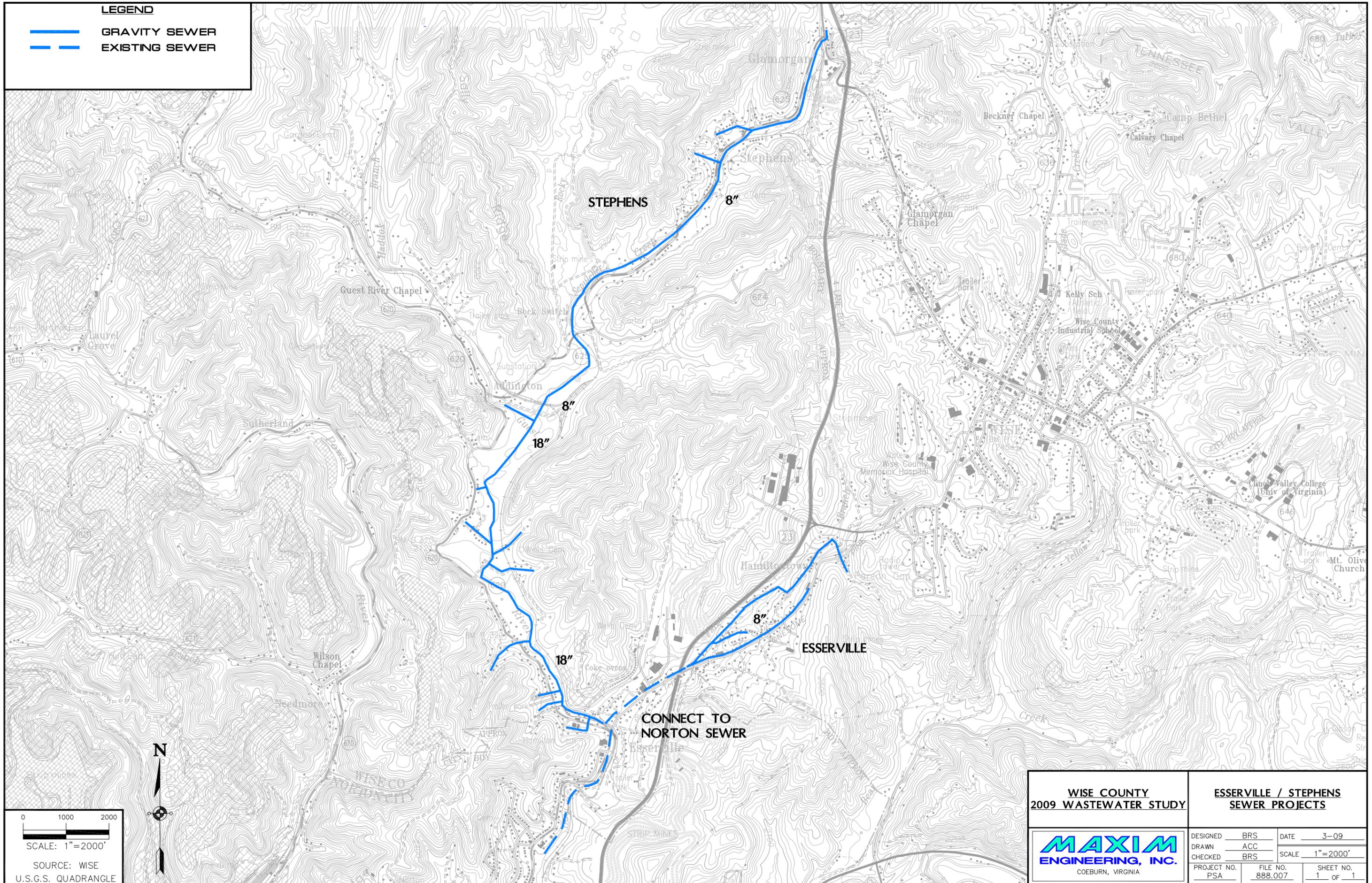
Basic Engineering	\$74,888
RPR	\$62,400
PER	\$20,000
Permits	\$20,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$19,202
Legal/Administration	\$19,202
Construction Contingency (10%)	<u>\$96,010</u>

Total Related Cost	<u>\$331,702</u>
---------------------------	-------------------------

TOTAL PROJECT COST	\$1,291,802
---------------------------	--------------------

LEGEND

-  **GRAVITY SEWER**
-  **EXISTING SEWER**



WISE COUNTY		ESSERVILLE / STEPHENS	
2009 WASTEWATER STUDY		SEWER PROJECTS	
		DESIGNED BRS	DATE 3-09
		DRAWN ACC	SCALE 1"=2000'
		CHECKED BRS	
PROJECT NO. PSA	FILE NO. 888.007	SHEET NO. 1 OF 1	

Stephens Sewer Project

Project Service Area

The Stephens area lies about 2-1/2 miles north of the Esserville section of the Norton, as shown in the Exhibit. Sepulcher Creek drains the Stephens area and has its confluence with Guest River near Rocky Fork. In the regional wastewater study, a decentralized was proposed for serving Stephens, but further study revealed that a 10,000-foot interceptor from Esserville to the mouth of Sepulcher Creek would be more beneficial since it more homes along the way, and later would serve the homes in the upper reaches of Guest River.

Project Magnitude

The sewer line extension would serve 290 homes from Esserville to Stephens.

Required Facilities

This project includes 9,800 feet of 18-inch sewer line (interceptor) and 37,350 feet of 8-inch gravity sewer. The existing connections would generate 87,000 gallons of wastewater per day, using the rate of 300 GPD per connection.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the City of Norton sewers to the Coeburn-Norton-Wise (CNW) Wastewater Treatment Plant for treatment. Transmission and treatment considerations are addressed in a separate portion of the report.

Total Project Costs

The preliminary project cost is \$4,603,447, or \$15,874 per residential connection.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot of gravity sewer, an annual O&M cost of \$4,715 is projected. The present worth of 30 years' annual O&M cost (calculated at 8%) is \$53,080.

Present Worth per Connection

The present worth per connection is \$16,056.99, based on the above costs for 290 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
STEPHENS SEWER PROJECT**

CONSTRUCTION COST:

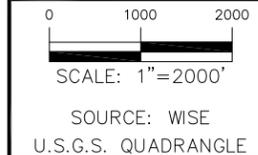
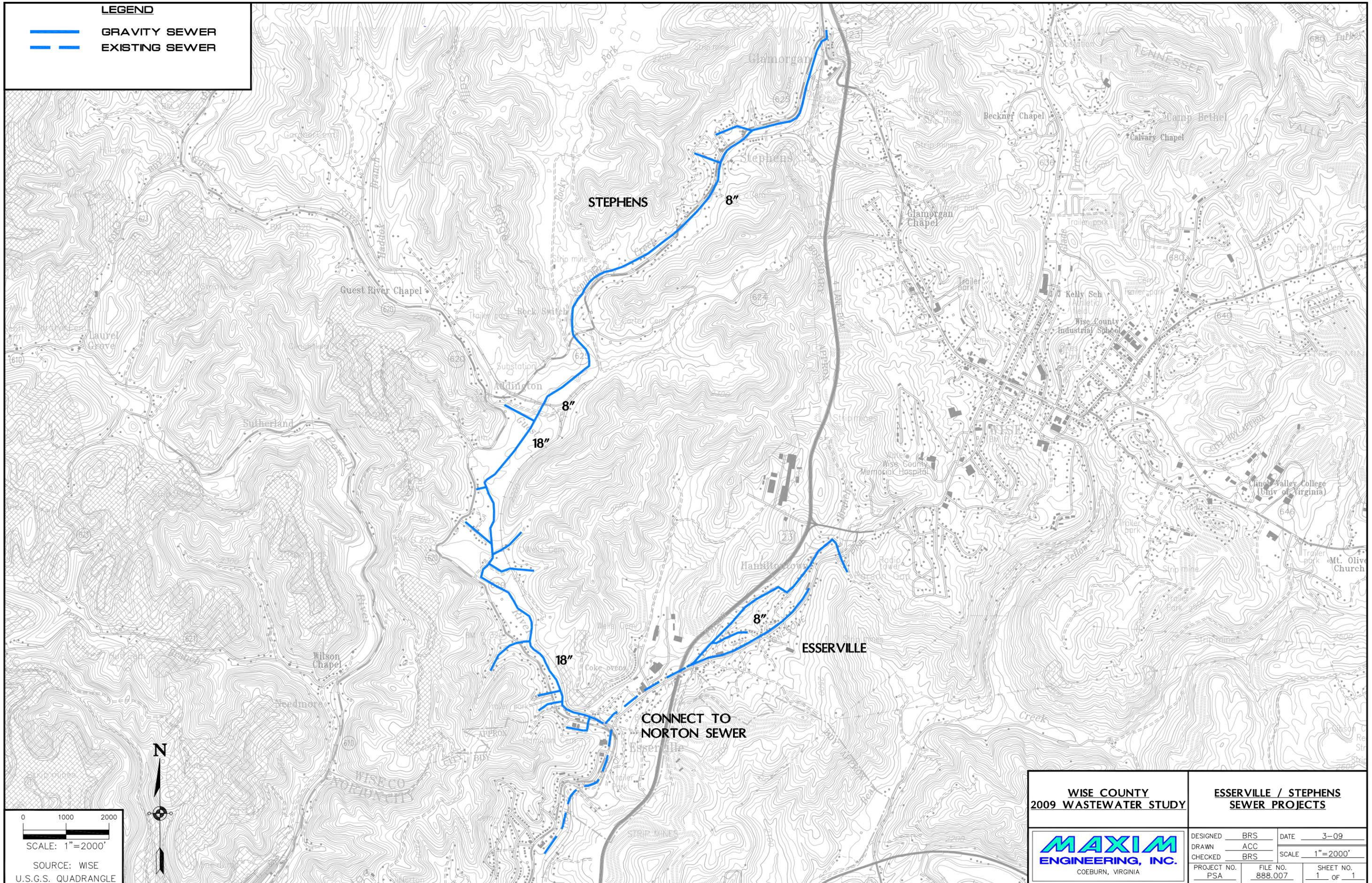
9,800 L.F. 18" Gravity Sewer Line @ \$75/L.F.	\$735,000
37,350 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$1,680,750
100 EA. Standard Manholes @ \$2,500/EA.	\$250,000
83 EA. Watertight Manholes @ \$3,000/EA.	\$249,000
150 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$31,500
450 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$78,750
630 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$110,250
120 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$18,000
180 L.F. 8-Inch Railroad Crossings @ \$250/L.F.	\$45,000
290EA. Service Connections @350/EA.	\$101,500
14,500 L.F 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	<u>\$362,500</u>
TOTAL CONSTRUCTION COST	\$3,662,250

RELATED COST:

Basic Engineering	\$263,682
RPR	\$124,800
PER	\$20,000
Permits	\$20,000
Easements/property acquisition	\$73,245
Legal/Administration	\$73,245
Construction Contingency (10%)	<u>\$366,225</u>
Related Subtotal	<u>\$941,197</u>
TOTALPROJECT COST	\$4,603,447

LEGEND

-  **GRAVITY SEWER**
-  **EXISTING SEWER**



WISE COUNTY		ESSERVILLE / STEPHENS	
2009 WASTEWATER STUDY		SEWER PROJECTS	
		DESIGNED <u>BRS</u>	DATE <u>3-09</u>
COEBURN, VIRGINIA		DRAWN <u>ACC</u>	SCALE <u>1"=2000'</u>
CHECKED <u>BRS</u>	PROJECT NO. <u>PSA</u>	FILE NO. <u>888.007</u>	SHEET NO. <u>1 OF 1</u>

Dorchester Sewer Project

Project Service Area

The Dorchester Project lies west of the City of Norton and includes the communities of Dorchester, Thackers Branch and Needmore, as shown in the Exhibit. This project area is in the Powell River watershed. Dorchester and Thackers Branch are located just outside the city limits and close to conventional sewer service where conventional sewer will be provided to 156 homes. Needmore is located about 1.5 miles upstream from Dorchester with only 20 homes between the communities. It is proposed that a septic tank effluent gravity (STEG) collection system with a pump station be utilized in Needmore. The effluent will be discharged into the Dorchester sewer line, and conveyed to the central sewer treatment plant. There are 122 homes in this alternative service area.

Required Facilities

Dorchester/Thackers Branch - A conventional gravity sewer system would consist of 24,560 feet of 8-inch sewer line. A flow of 300 gallons per day per connection has been estimated, for a total daily flow of 46,800 GPD.

Needmore - An effluent collection system would require 102 watertight septic tanks, 10,530 linear feet of 4-inch sewer line, 1 (one) 20,000 GPD pump station, and 8,700 linear feet of 4-inch force main. The twenty homes located between Needmore and Dorchester would require septic tank pump systems to pump into the force main line for conveyance to the plant. This system would have a flow of 24,400 gallons per day, based upon 200 GPD per connection. Effluent systems are more watertight than conventional sewers, due to the fact that they installed in drier conditions (not in the stream) and do not require manholes for access.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the City of Norton sewers to the Coeburn-Norton-Wise (CNW) Wastewater Treatment Plant for treatment. Transmission and treatment considerations are addressed in a separate portion of the report.

Total Project Costs

The preliminary cost for the Dorchester/Thackers Branch portion of the project is \$2,258,392, or \$14,477 per connection, while the Needmore effluent portion is \$1,135,679, or \$9,309. The total project cost is estimated at \$3,394,071, or an average cost per connection of \$12,209.

Annual Operations and Maintenance Cost

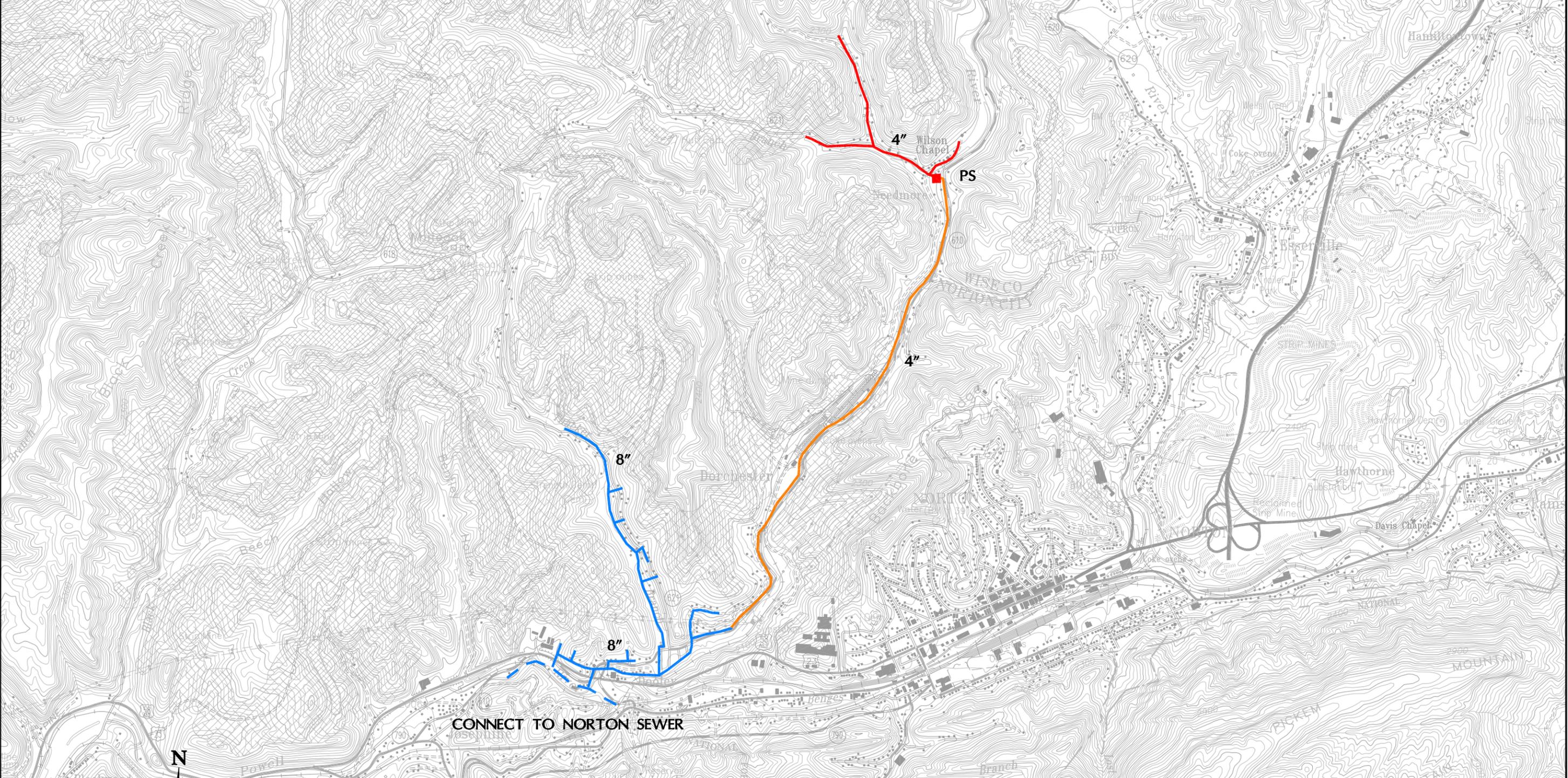
The annual operating costs for the Needmore system are calculated at STEG collection system at \$72 per connection, STEP collection system at \$144 per connection, pump station operations at \$5,000, for a total of \$22,568. The Dorchester section of conventional sewer line has an estimated maintenance cost of \$0.10/LF, or \$2,456. The annual total is \$25,024. The present worth of 30 years' O&M cost at 8% interest is \$281,715.

Present Worth per Connection

The present worth per connection is \$13,222.25, based on the 278 connections.

LEGEND

- GRAVITY SEWER
- EFFLUENT SEWER
- FORCE MAIN
- PUMP STATION



CONNECT TO NORTON SEWER

0 1000 2000
 SCALE: 1"=2000'
 SOURCE: NORTON
 U.S.G.S. QUADRANGLE



WISE COUNTY 2009 WASTEWATER STUDY		DORCHESTER SEWER PROJECT	
MAXIM ENGINEERING, INC. COEBURN, VIRGINIA		DESIGNED BRS	DATE 3-09
		DRAWN ACC	SCALE 1"=2000'
		CHECKED BRS	
PROJECT NO. PSA	FILE NO. 888.007	SHEET NO. 1 OF 1	

Wise County Sewer Projects in the Powell River Watershed

Six projects were identified within the Powell River Watershed of Wise County. For each project, a description is presented with probable project cost and an exhibit indicating the service area and major components for that project.

Project Name	Population	Flow (GPD)	Project Cost
• Irondale Sewer Project	510	62,000	\$4.74 million
• Crackers Neck Sewer Project	795	97,800	\$7.79 million
• Wildcat Sewer Project	295	36,300	\$3.47 million
• Powell Valley Sewer Project	468	57,600	\$7.67 million
• Roda/Osaka Sewer Project	91	27,300	\$2.56 million
• Dunbar Decentralized Sewer Project	<u>98</u>	<u>8,000</u>	<u>\$0.55 million</u>
TOTALS	2,388	289,000*	\$26.8 million

*Total flow to Big Stone Gap Regional WWTP is 281,000 GPD.

Additional potential project opportunities

Powell River WWTP Project

Others as identified

Irondale Sewer Project

Project Service Area

This service area includes the parts of Wise County located south of the Corporate Limits of the Town of Big Stone Gap along Route 844, 686 and 609, as shown in the Exhibit. The major system collection lines are located along these Routes. The area is served presently by individual septic tanks and drain fields. Some discharges of raw sewage have been noted.

Project Magnitude

Approximately 209 residential units are located in the proposed service area. Assuming each connection contributes 300 gallon/day, this project will generate approximately 62,000 gallon/day in wastewater flow. There is capacity for additional residences to be built in the service area, although population growth in Wise County has been projected to remain essentially constant through 2040.

Required Facilities

Approximately 29,400 linear feet (L.F.) of 8-inch gravity line, and 3,700 L.F. of 4-inch force main, in combination with two lift stations, will convey the wastewater from this service area into the Town of Big Stone Gap's collection system for transmission and subsequent treatment.

The first lift station will be located on Rte. 844 at the low point in the service area watershed. This lift station Pump Station Number 1 will convey flow from Rte. 844 through 3,700 L.F. of 4-inch force main to a point on Old Rte. 23 just below the Comfort Inn Hotel where Pump Station Number 2 will be located. The capacity of this lift station, 250 gpm, will serve approximately 200 residential connections. A peak factor of four is used to size the capacity.

The second lift station Pump Station Number 2 will collect the flow from Pump Station Number 1 and nine additional connections and will convey flow from the service area to an existing 8" gravity sewer located behind the Comfort Inn Hotel. This line carries flow to the main interceptor system transporting flow to the Town of Big Stone Gap Regional Treatment Plant. This Pump Station is also sized at 250 gpm.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the Town's lines into the Big Stone Gap Regional Wastewater Treatment Plant. Transmission and treatment considerations are addressed in a separate portion of the report.

Constructability Assessment

The amount of rock in the project area appears to be typical of Wise County. There appears to be adequate construction space for installation of the lines. In portions of the project area, the gravity lines will follow topographic contours, rather than roadway. Where appropriate, location of the gravity lines should accommodate sewage discharge plumbing from existing residences.

Phasing of Project Construction

It does not appear that phasing of service to the Irondale community would be feasible.

Total Projected Projects Cost

The projected construction cost of \$3,681,360 includes ten percent construction contingency. With related costs of \$1,057,790 the total projected project cost is \$4,739,150. This projection is based on estimated construction costs in spring 2009. Calculation of costs is based on costs in 2009 dollars. Anticipating costs for project construction for any specific future date requires incorporation of unit price changes of the costs between 2009 and the future date. The total project cost does not include any ancillary costs to upgrade existing transmission line or expand treatment capacity at the Big Stone Gap Regional Wastewater Plant in order to accommodate the flow from this project. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$13,310 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$157,990.

Present Worth per Connection

The present worth per connection is \$23,431.29, based on the above costs for 209 connections.

**PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
IRONDALE SEWER PROJECT**

CONSTRUCTION COST:

29,400 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$1,323,000
3,700 L.F. 4" Force Main @ \$25/L.F.	\$92,500
15,900 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$397,500
2,250 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$393,750
138 EA. Standard Manholes @ \$2,500/EA.	\$345,000
9 EA. Waterproof Manholes @ \$3,000/EA.	\$27,000
4 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$12,000
209 EA. Service Wyes @ \$90/EA.	\$18,810
300 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$63,000
200 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$35,000
240 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$42,000
120 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$18,000
24 EA. 8-Inch Boring Attempts @ \$500/EA.	\$12,000
9 EA. 4-Inch Boring Attempts @ \$200/EA.	\$1,800
10,000 Tons Miscellaneous Aggregate @ \$15/Ton	\$150,000
1,000 C.Y. Miscellaneous Concrete @ \$150/C.Y.	\$150,000
2 EA. Lift Station @ \$300,000/EA.	\$600,000

TOTAL CONSTRUCTION COST	\$3,681,360
--------------------------------	--------------------

RELATED COST:

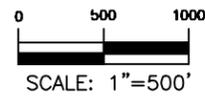
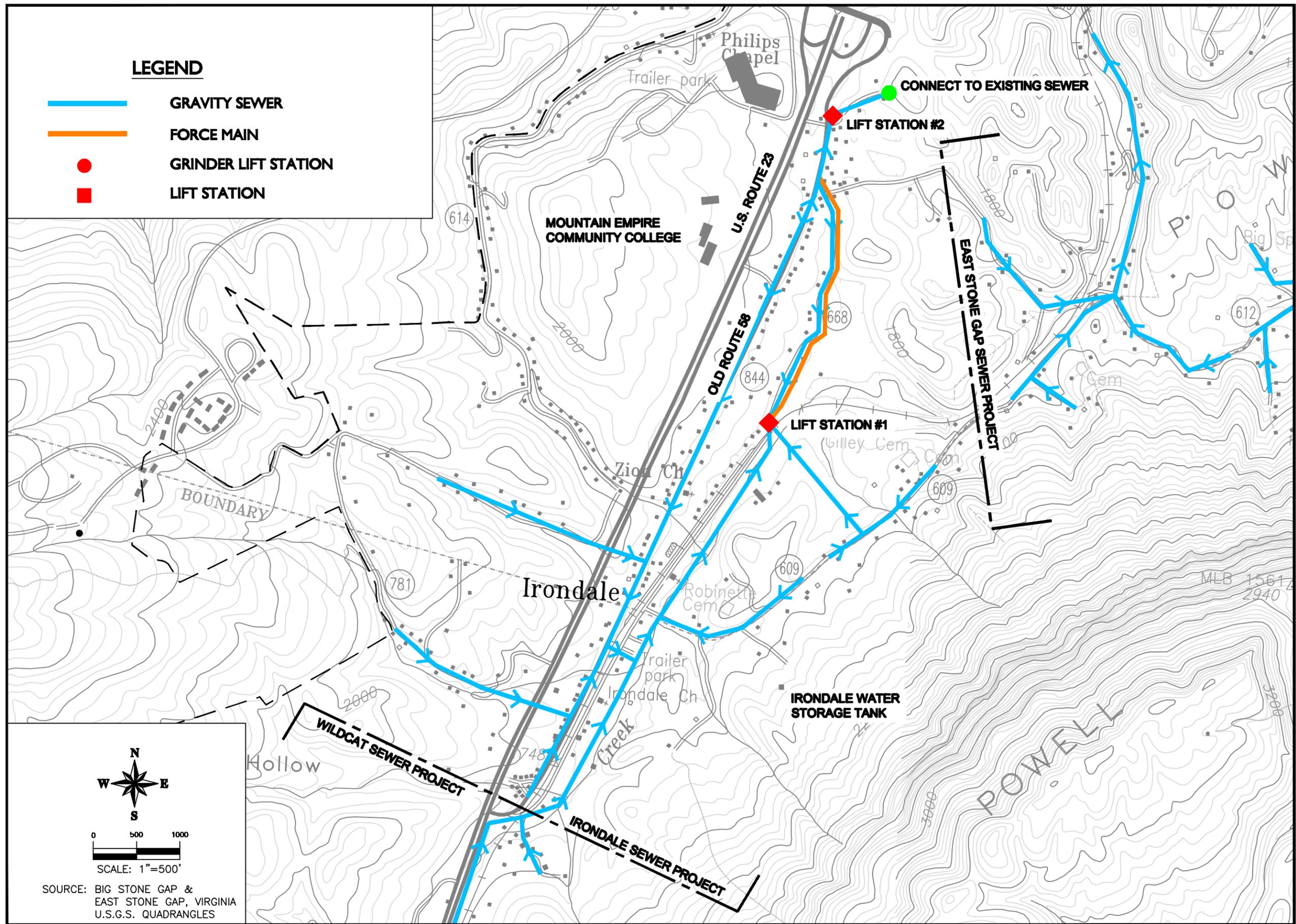
Basic Engineering	\$353,400
RPR	\$104,000
PER	\$10,000
Permits	\$20,000
Surveying/ Geotechnical	\$20,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$73,627
Legal/Administration	\$73,627
Wetlands and Waters Delineation (If Required)	\$15,000
Construction Contingency (10%)	\$368,136

Related Subtotal	\$1,057,790
-------------------------	--------------------

TOTAL PROBABLE PROJECT COST	\$4,739,150
------------------------------------	--------------------

LEGEND

-  GRAVITY SEWER
-  FORCE MAIN
-  GRINDER LIFT STATION
-  LIFT STATION



SCALE: 1"=500'

SOURCE: BIG STONE GAP & EAST STONE GAP, VIRGINIA U.S.G.S. QUADRANGLES

**WISE COUNTY
SEWER STUDY**

IRONDALE SEWER PROJECT

PROJECT NO.

NO.	REVISION DATE
1	
2	
3	

BY: **MLB** SHEET
 CHECKED BY: **BRL** **EXHIBIT**

Crackers Neck Sewer Project

Project Service Area

This service area includes the parts of Wise County located east of the Corporate Limits of the Town of Big Stone Gap and the East Stone Gap Community. Development occurs along Routes 609, 616 and 612 as shown in the Exhibit. The major system collection lines are located along these Routes. The area is served presently by individual septic tanks and drain fields.

Project Magnitude

Approximately 326 residential units are located in the proposed service area. Assuming each connection contributes 300 gallons per day (GPD), this project will generate approximately 97,800 GPD in wastewater flow.

There is capacity for additional residences to be built in the service area, although population growth in Wise County has been projected to remain essentially constant through 2040.

Required Facilities

Approximately 59,100 linear feet (L.F.) of 8-inch gravity line, and 4350 L.F. of 4-inch force main, in combination with one lift stations, will convey the wastewater from this service area into the Town of Big Stone Gap's collection system for transmission and subsequent treatment.

Connections along Route 609 will be served by gravity to the existing sewer system in East Stone Gap. The lift station for the other portion of the service area will be located at the intersection of Routes 612 and Route 616 at the low point in the service area watershed. This lift station will convey flow from Rte. 616 and 612 through 4,350 L.F. of 4-inch force main to a point in the eastern portion of East Stone Gap where it will be connected to the existing sewer system. The capacity of this lift station, 350 gpm, will serve approximately 265 residential connections. A peak factor of four is used to size the capacity.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the Town's lines into the Big Stone Gap Regional Wastewater Treatment Plant. Transmission and treatment considerations are addressed in a separate portion of the report.

Constructability Assessment

The amount of rock in the project area appears to be typical of Wise County. Narrow road rights of way and the location of streams will push most of the line onto private property therefore a significant number of easements will be required. Where appropriate, location of the gravity lines should accommodate sewage discharge plumbing from existing residences.

Phasing of Project Construction

Since the portion of the service area along Route 609 is separate from the remaining portions of the system, it would be possible to construct the two parts of the Project independent of each other. This will especially be true if the public need is greater in one area.

Total Projected Projects Cost

The projected construction cost of \$6,087,240 includes ten percent construction contingency. With related costs of \$1,707,314 the total projected project cost is \$7,794,554. This projection is based on estimated construction costs in spring 2009. Calculation of costs is based on costs in 2009 dollars. Anticipating costs for project construction for any specific future date requires incorporation of unit price changes of the costs between 2009 and the future date. The total project cost does not include any ancillary costs to upgrade existing transmission line or expand treatment capacity at the Big Stone Gap Regional Wastewater Plant in order to accommodate the flow from this project. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$11,345 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$134,438.

Present Worth per Connection

The present worth per connection is \$24,322.06, based on the above costs for 326 connections.

**PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
CRACKERS NECK SEWER PROJECT**

CONSTRUCTION COST:

59,100 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$2,659,500
4,350 L.F. 4" Force Main @ \$25/L.F.	\$108,750
18,000 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$450,000
4,250 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$743,750
270 EA. Standard Manholes @ \$2,500/EA.	\$675,000
25 EA. Waterproof Manholes @ \$3,000/EA.	\$75,000
6 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$18,000
326 EA. Service Wyes @ \$90/EA.	\$29,340
1,200 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$252,000
600 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$105,000
240 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$42,000
160 L.F. 8-Inch Railroad Crossing @ \$250/L.F.	\$40,000
240 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$36,000
45 EA. 8-Inch Boring Attempts @ \$500/EA.	\$22,500
27 EA. 4-Inch Boring Attempts @ \$200/EA.	\$5,400
15,000 Tons Miscellaneous Aggregate @ \$15/Ton	\$225,000
2,000 C.Y. Miscellaneous Concrete @ \$150/C.Y.	\$300,000
1 EA. Lift Station @ \$300,000/EA.	\$300,000

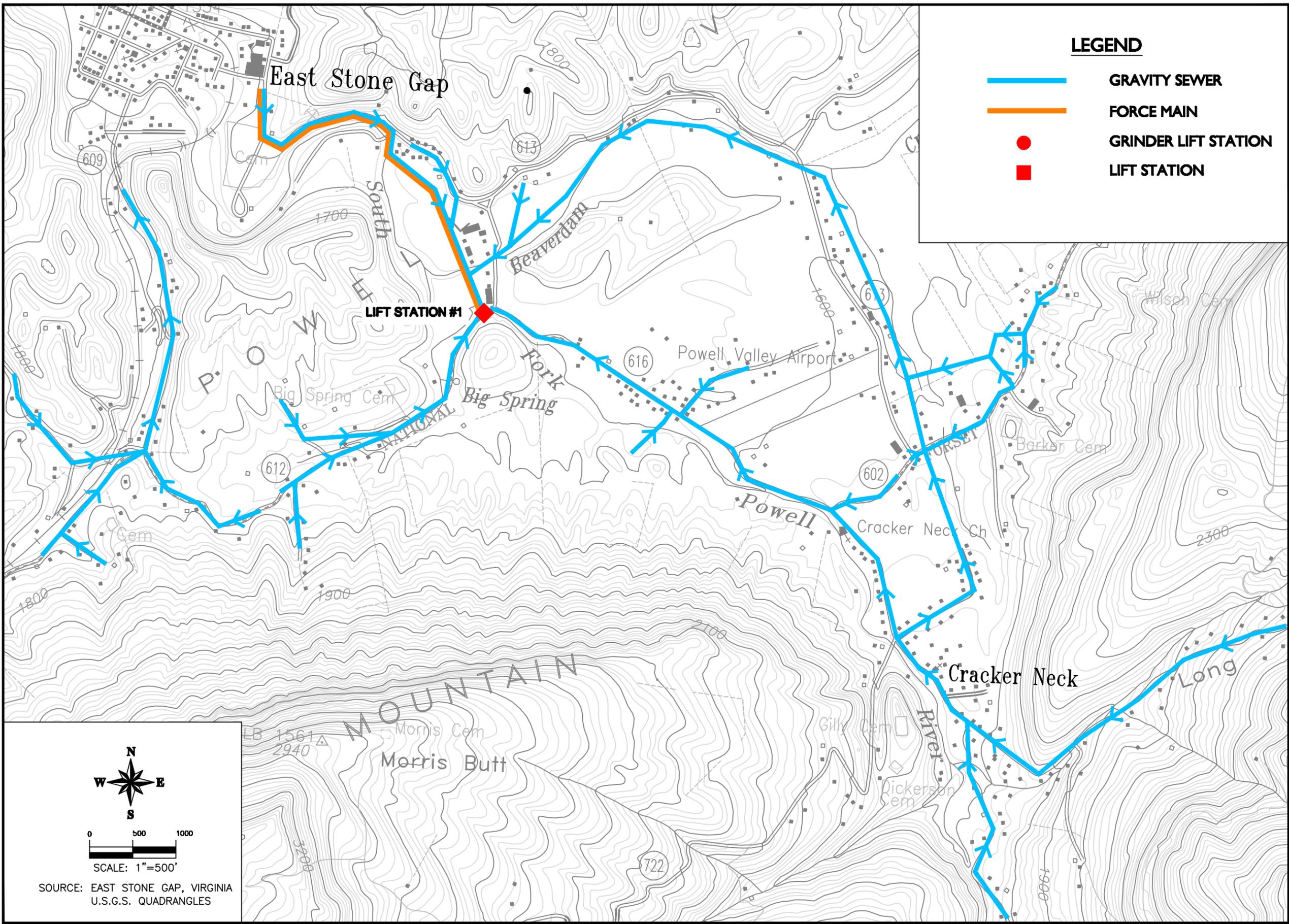
TOTAL CONSTRUCTION COST	\$6,087,240
--------------------------------	--------------------

RELATED COST:

Basic Engineering	\$562,100
RPR	\$208,000
PER	\$10,000
Permits	\$20,000
Surveying/Geotechnical	\$20,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$121,745
Legal/Administration	\$121,745
Wetlands and Waters Delineation (If Required)	\$15,000
Construction Contingency (10%)	\$608,724

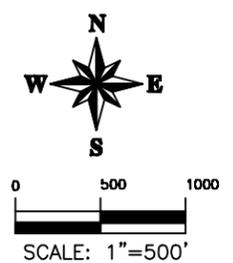
Related Subtotal	<u>\$1,707,314</u>
-------------------------	---------------------------

TOTAL PROBABLE PROJECT COST	\$7,794,554
------------------------------------	--------------------



LEGEND

- GRAVITY SEWER
- FORCE MAIN
- GRINDER LIFT STATION
- LIFT STATION



SOURCE: EAST STONE GAP, VIRGINIA
U.S.G.S. QUADRANGLES

THE LANE GROUP
 316 EAST FIFTH ST. SOUTH - BIG STONE GAP, VA 24219
 P. 703.635.3771 F. 703.635.3888
 WWW.THELANEGROUP.COM
 BIG STONE GAP, VA • CHILHOWIE, VA • HITCHCOCK, VA • MT. CARMEL, TN

**WISE COUNTY
SEWER STUDY**

**EAST STONE GAP
SEWER PROJECT**

PROJECT NO.	
NO.	REVISION DATE
1	
2	
3	
DESIGNED BY	SHEET
MLB	EXHIBIT
CHECKED BY	
BRL	
DATE	
5-7-09	
THE LANE GROUP INC. © 2009	

Wildcat Sewer Project

Project Service Area

This service area includes the parts of Wise County located southwest of the Corporate Limits of the Town of Big Stone Gap and the Irondale Community. Development occurs along Routes 23 and several roads (Sunset Village, Oreton Road, Fisher Road, and Williams Road) intersecting with Route 23 as shown in the Exhibit. The major system collection lines are located along these Routes. The area is served presently by individual septic tanks and drain fields. Since the Irondale community lies between Wildcat and the Town of Big Stone Gap, it would be necessary to construct the Irondale System either before or during construction of the Wildcat system.

Project Magnitude

Approximately 121 residential units are located in the proposed service area. Assuming each connection contributes 300 gallons per day (GPD), this project will generate approximately 36,300 GPD in wastewater flow.

Population density is sparse and land remains for additional residences to be built in the service area, although population growth in Wise County has been projected to remain essentially constant through 2040.

Required Facilities

Approximately 19,000 linear feet (L.F.) of 8-inch gravity line, and 3,750 L.F. of 4-inch force main, in combination with one large lift stations and two small grinder pump stations, will convey the wastewater from this service area into the Irondale system and then to the Town of Big Stone Gap's collection system for transmission and subsequent treatment.

One small grinder pump station will be needed near the Lee County Line for about six residential connections and a second grinder pump will be needed for three connections on Fisher road. The main lift station for the other portion of the service area will be located at the intersection of Route 23 and Oreton Road. This lift station will convey flow from about half of the service area to a high point near Sunrise Village where it will discharge to the gravity line which will transport the flow to the Irondale System. The capacity of this lift station, 50 gpm, will serve approximately 50 residential connections. A peak factor of four is used to size the capacity.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the Town's lines into the Big Stone Gap Regional Wastewater Treatment Plant. Transmission and treatment considerations are addressed in a separate portion of the report.

Constructability Assessment

No unusual construction challenges are evident within this service area. Rock in the project area appears to be typical of Wise County. Narrow road rights of way will push most of the line onto private property therefore a significant number of easements will be required. The Town of Big Stone Gap provides water service to this portion of the County. Care will be needed to locate sewer lines at appropriate distances from the water lines.

Phasing of Project Construction

Since the Irondale community lies between Wildcat and the Town of Big Stone Gap, it would be necessary to construct the Irondale System either before or during construction of the Wildcat system.

Total Projected Projects Cost

The projected construction cost of the system is \$2,605,140. With related costs of \$866,720, including ten percent construction contingency, the total projected project cost is \$3,471,860. This projection is based on estimated construction costs in spring 2009. Calculation of costs is based on costs in 2009 dollars. Anticipating costs for project construction for any specific future date requires incorporation of unit price changes of the costs between 2009 and the future date. The total project cost does not include any ancillary costs to upgrade existing transmission line or expand treatment capacity at the Big Stone Gap Regional Wastewater Plant in order to accommodate the flow from this project. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$17,275 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$204,708.75.

Present Worth per Connection

The present worth per connection is \$30,384.87, based on the above costs for 121 connections.

**PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
WILDCAT SEWER PROJECT**

CONSTRUCTION COST:

19,000 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$855,000
3,750 L.F. 4" Force Main @ \$25/L.F.	\$93,750
5,000 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$125,000
2,100 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$367,500
69 EA. Standard Manholes @ \$2,500/EA.	\$172,500
30 EA. Waterproof Manholes @ \$3,000/EA.	\$90,000
2 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$6,000
121 EA. Service Wyes @ \$90/EA.	\$10,890
800 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$168,000
360 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$63,000
240 L.F. 8-Inch Railroad Crossings @ \$250/L.F.	\$60,000
27 EA. 8-Inch Boring Attempts @ \$500/EA.	\$13,500
8,000 Tons Miscellaneous Aggregate @ \$15/Ton	\$120,000
400 C.Y. Miscellaneous Concrete @\$150/C.Y.	\$60,000
1 EA. Lift Station @ \$200,000/EA.	\$200,000
2 EA. Grinder Lift Station @ \$100,000/EA.	\$200,000

TOTAL CONSTRUCTION COST	\$2,605,140
--------------------------------	--------------------

RELATED COST:

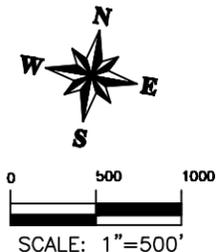
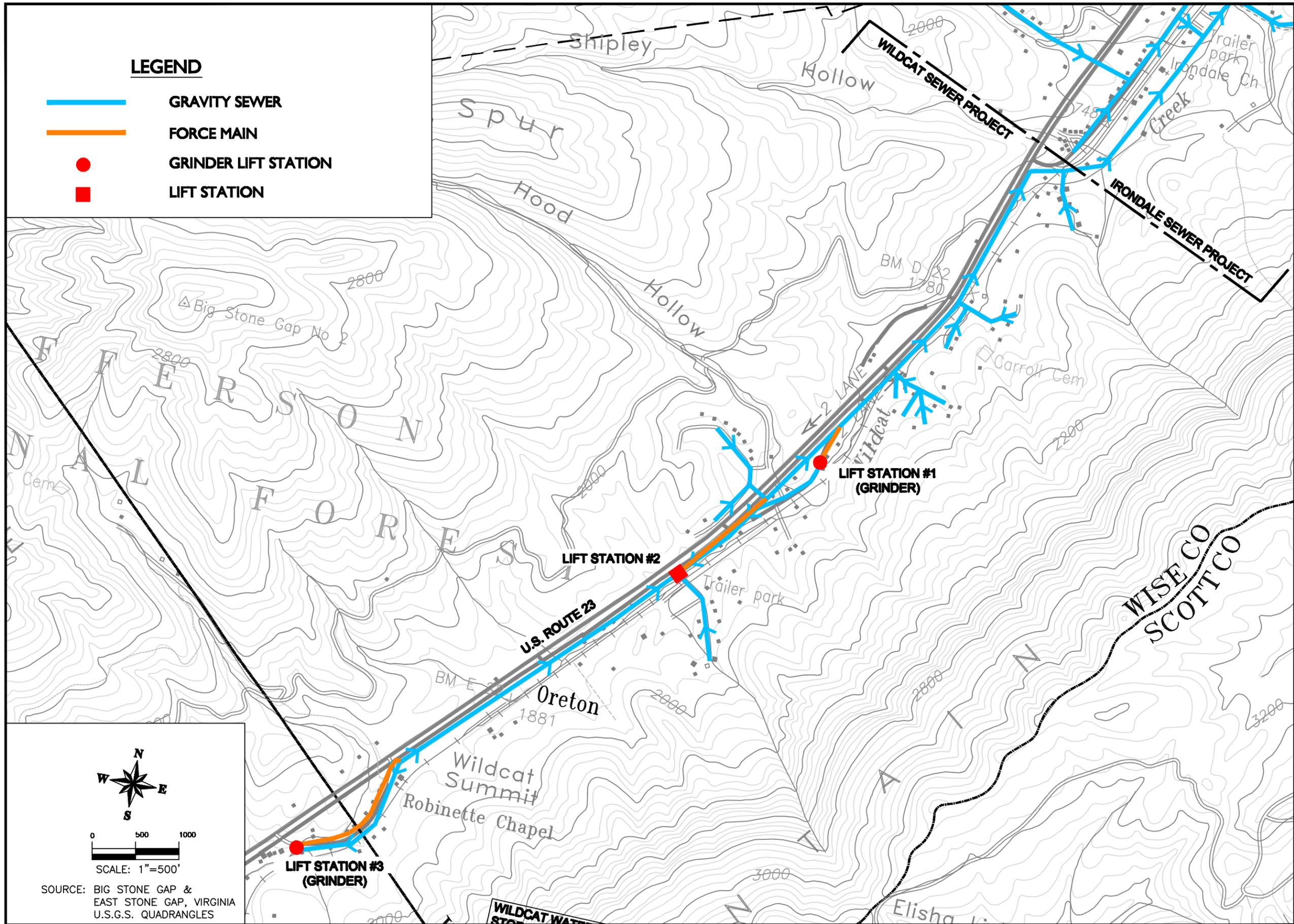
Basic Engineering	\$298,000
RPR	\$104,000
PER	\$10,000
Permits	\$20,000
Surveying/Geotechnical Engineering	\$25,000
Environmental Assessment	\$30,000
Easements/property acquisition	\$52,103
Legal/Administration	\$52,103
Wetlands and Waters Delineation (If Required)	\$15,000
Construction Contingency (10%)	\$260,514

Related Subtotal	\$866,720
-------------------------	------------------

TOTAL PROBABLE PROJECT COST	\$3,471,860
------------------------------------	--------------------

LEGEND

-  GRAVITY SEWER
-  FORCE MAIN
-  GRINDER LIFT STATION
-  LIFT STATION



SOURCE: BIG STONE GAP & EAST STONE GAP, VIRGINIA U.S.G.S. QUADRANGLES

THE LANE GROUP
 310 EAST FIFTH ST. SOUTH • BIG STONE GAP, VA 24310
 P: 270.582.4771 F: 270.582.3888
 WWW.THELANEGROUP.COM
 BIG STONE GAP, VA • CHILHOWNE, VA • WYTHEVILLE, VA • WILSON, VA

WISE COUNTY SEWER STUDY

WILDCAT SEWER PROJECT

PROJECT NO.

NO.	REVISION DATE
1	
2	
3	

DESIGNED BY: M.L.B.
 CHECKED BY: B.R.L.

DATE: 6-7-00
 SHEET: EXHIBIT
 THE LANE GROUP INC. © 2000

Powell Valley Sewer Project

Project Service Area

This service area (See Exhibits) includes the parts of Wise County located south of Route 23 between Big Stone Gap and the City of Norton. Development occurs along Routes 610 (Valley Road), 612 (Back Valley Road) and 602 (Egan Road). The Town of Big Stone Gap provides water service to this area. A majority of the area water lines are sufficient to provide fire protection. Lonesome Pine Country Club is located in the service area. The area is relatively flat and with the interchange at Route 23 and 610, this area represents a potential location for commercial and industrial development if wastewater service was made available. The area is served presently by individual septic tanks and drain fields.

Project Magnitude

Approximately 192 residential units are located in the proposed service area. Assuming each connection contributes 300 gallons per day (GPD), this project will generate approximately 57,600 GPD in wastewater flow.

As stated above, this service area would be potentially attractive for commercial and industrial growth and land is available for additional residences to be built in the service area. Population growth in Wise County has been projected to remain essentially constant through 2040, however this area may represent an exception. A majority of the proposed system serving the Powell Valley Area will be gravity sewer and must be a minimum of 8" in diameter. The force main will be 4" in diameter to handle peak flows. These line sizes will allow significant growth to be served should the growth occur.

Required Facilities

Approximately 54,410 linear feet (L.F.) of 8-inch gravity line, and 3,000 L.F. of 4-inch force main, in combination with one lift stations and two small grinder lift stations, will convey the wastewater from this service area into the Town of Big Stone Gap's collection system for transmission and subsequent treatment.

The lift station for the service area is located at the intersection of Valley Road and Egan Road at a low point in the service area. This lift station will convey flow through 3,000 L.F. of 4-inch force main to a point where gravity flow will carry the wastewater to the existing sewer system. The capacity of this lift station, 65 gpm, will serve approximately 80 residential connections. A peak factor of four is used to size the capacity. Two small grinder stations will serve small areas of the service area on Egan Road.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the Town's lines into the Big Stone Gap Regional Wastewater Treatment Plant. Transmission and treatment considerations are addressed in a separate portion of the report.

Constructability Assessment

There are no unusual construction challenges associated with the Project. Care will need to be taken to locate sewer line away from potable water line on road right-of-way. This fact and the location of streams will push most of the line onto private property therefore a significant number of easements will be required. Where appropriate, location of the gravity lines should accommodate sewage discharge plumbing from existing residences.

Phasing of Project Construction

The Egan Road section of the Project could be constructed as a phase 2 project if financial considerations or customer need issues make this necessary. No other phasing opportunities appear to exist.

Total Projected Projects Cost

The projected construction cost of the system is \$5,977,630. With related costs of \$1,694,168, including ten percent construction contingency, the total projected project cost is \$7,671,798. This projection is based on estimated construction costs in spring 2009. Calculation of costs is based on costs in 2009 dollars. Anticipating costs for project construction for any specific future date requires incorporation of unit price changes of the costs between 2009 and the future date. The total project cost does not include any ancillary costs to upgrade existing transmission line or expand treatment capacity at the Big Stone Gap Regional Wastewater Plant in order to accommodate the flow from this project. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$20,741 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$240,673.50.

Present Worth per Connection

The present worth per connection is \$41,210.78, based on the above costs for 192 connections.

**PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
POWELL VALLEY SEWER PROJECT**

CONSTRUCTION COST:

54,410 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$2,448,450
3,000 L.F. 4" Force Main @ \$25/L.F.	\$75,000
2,500 L.F. 2" Force Main @ \$20/L.F.	\$50,000
16,200 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$405,000
3,000 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$525,000
225 EA. Standard Manholes @ \$2,500/EA.	\$562,500
25 EA. Waterproof Manholes @ \$3,000/EA.	\$75,000
6 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$18,000
192 EA. Service Wyes @ \$90/EA.	\$17,280
1,400 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$294,000
600 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$105,000
480 L.F. 8-Inch Stream Crossings @ \$175/L.F.	\$84,000
240 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$36,000
54 EA. 8-Inch Boring Attempts @ \$500/EA.	\$27,000
27 EA. 4-Inch Boring Attempts @ \$200/EA.	\$5,400
20,000 Tons Miscellaneous Aggregate @ \$15/Ton	\$300,000
3,000 C.Y. Miscellaneous Concrete @ \$150/C.Y.	\$450,000
1 EA. Lift Station @ \$300,000/EA.	\$300,000
2 EA. Grinder Lift Station @ \$100,000/EA.	\$200,000

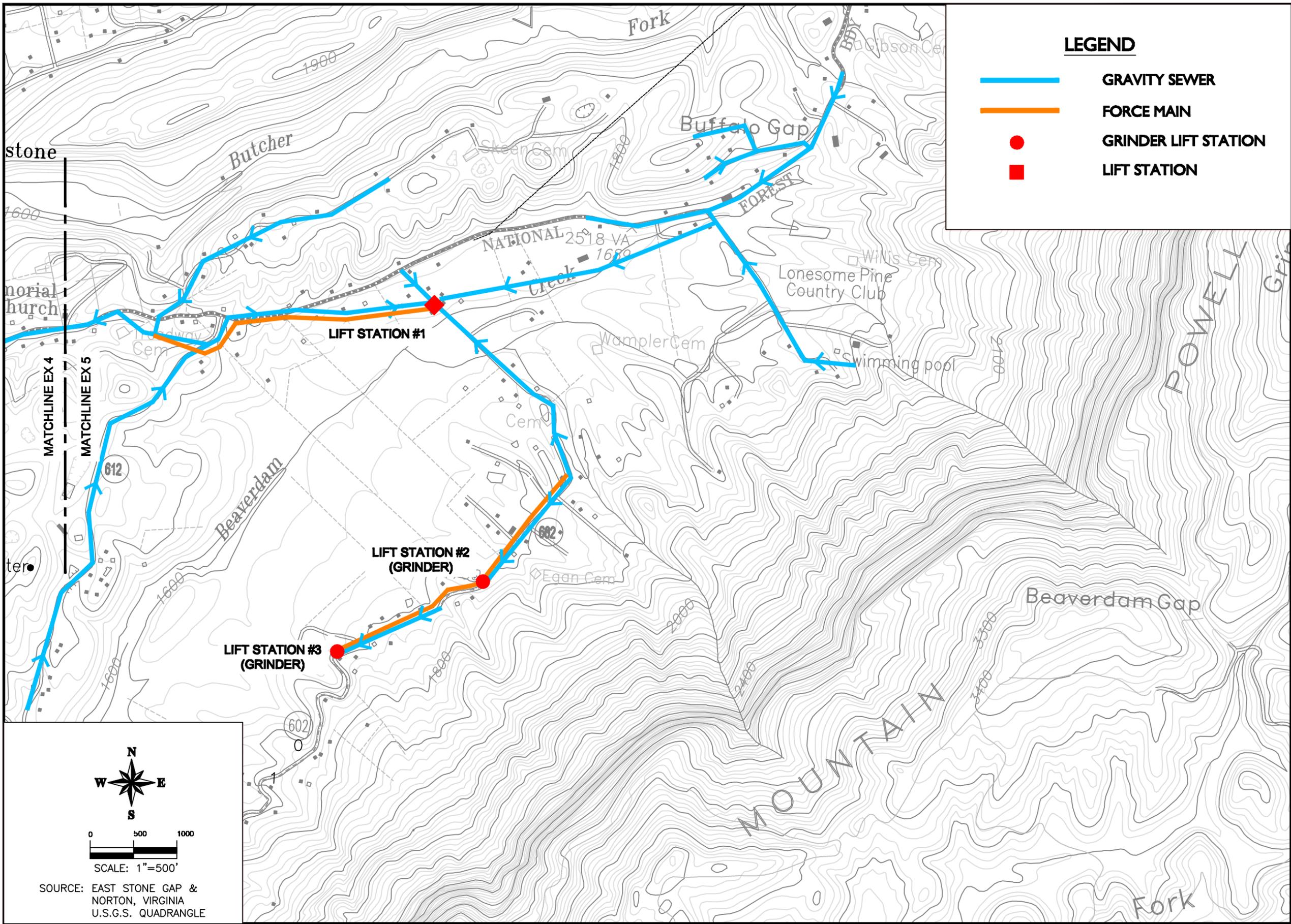
TOTAL CONSTRUCTION COST	\$5,977,630
--------------------------------	--------------------

RELATED COST:

Basic Engineering	\$554,300
RPR	\$208,000
PER	\$10,000
Permits	\$20,000
Surveying/Geotechnical	\$30,000
Environmental Assessment	\$20,000
Easements/property acquisition	\$119,553
Legal/Administration	\$119,553
Wetlands and Waters Delineation (If Required)	\$15,000
Construction Contingency (10%)	\$597,763

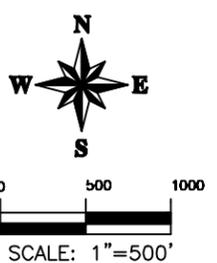
Related Subtotal	<u>\$1,694,168</u>
------------------	--------------------

TOTAL PROBABLE PROJECT COST	\$7,671,798
------------------------------------	--------------------



LEGEND

- GRAVITY SEWER
- FORCE MAIN
- GRINDER LIFT STATION
- LIFT STATION



SOURCE: EAST STONE GAP & NORTON, VIRGINIA U.S.G.S. QUADRANGLE

THE LANE GROUP
 316 EAST FIFTH ST. SOUTH - BIG STONE GAP, VA 24210
 P.O. BOX 1001 - FREDERICKSBURG, VA 22401
 WWW.THELANEGROUP.COM
 BIG STONE GAP, VA • CHILHOWIE, VA • WITHERSILLE, VA • MT. CARMEL, TN

**WISE COUNTY
SEWER STUDY**

**POWELL VALLEY
SEWER PROJECT**

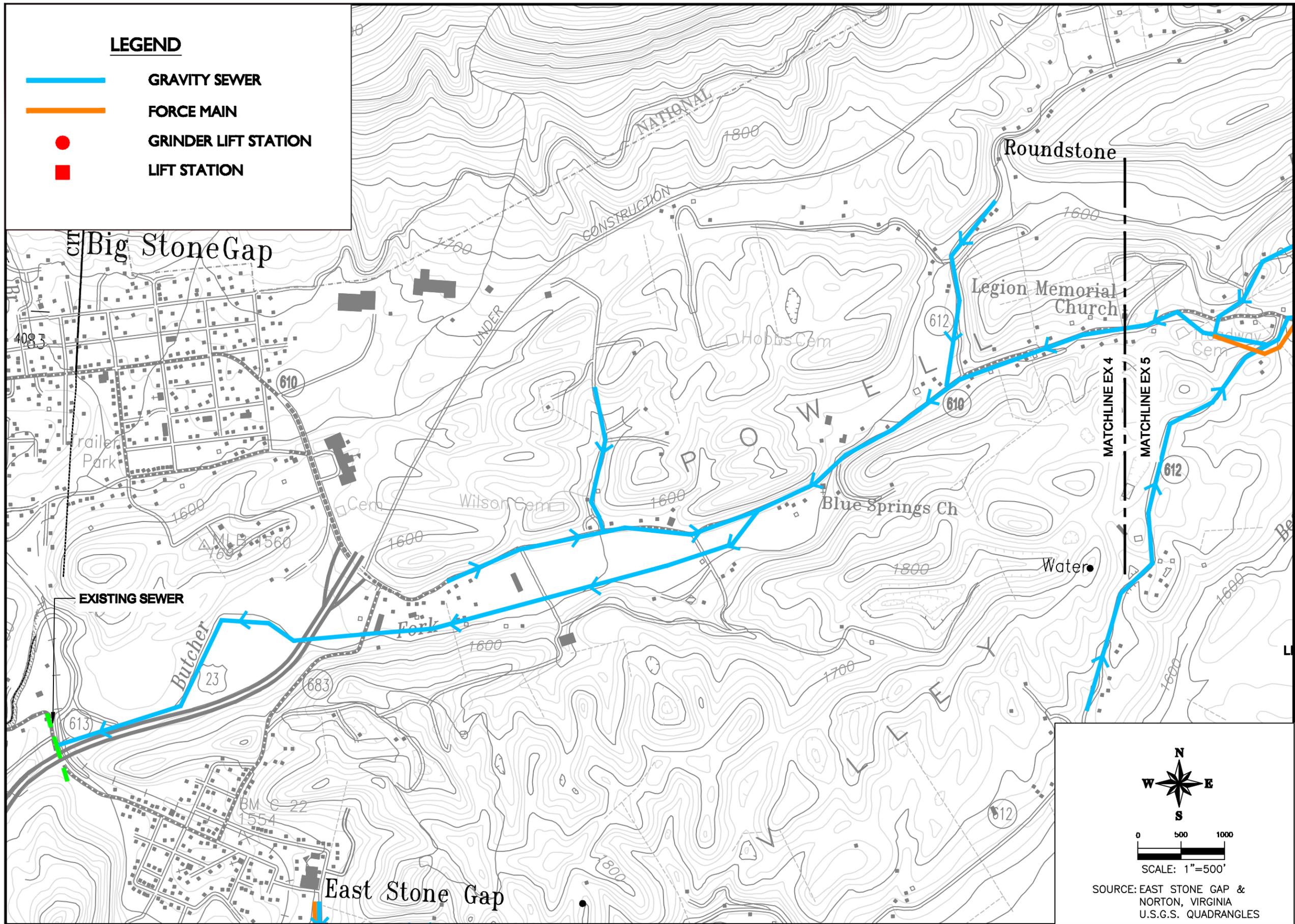
PROJECT NO.

NO.	REVISION DATE
1	
2	
3	

DESIGNED BY: MLB
 CHECKED BY: BRL
 DATE: 6-7-09
EXHIBIT
 SHEET

LEGEND

-  GRAVITY SEWER
-  FORCE MAIN
-  GRINDER LIFT STATION
-  LIFT STATION



PROJECT NO.

NO.	REVISION DATE
1	
2	
3	

DESIGNED BY
MLB

CHECKED BY
BRL

DATE
5-7-09

SHEET
EXHIBIT

Roda/Osaka Sewer Project

Project Service Area

This service area includes the parts of Wise County located north of the Town of Appalachia. The Communities of Roda and Osaka are located along Route 685 (See Exhibit) and are served water by the Town of Appalachia. These two communities are also located west of the Stonega Community. All three communities have expressed a desire for central sewer service since space and geological considerations make it difficult to construct operable subsurface sewage treatment facilities. While some of the residents have operable septic tanks and drain fields, many discharge directly to surface waters.

Project Magnitude

Approximately 91 residential units are located in the proposed service area. Assuming each connection contributes 300 gallons per day (GPD), this project will generate approximately 27,300 GPD in wastewater flow.

This particular area of the County has very little capacity for additional residences to be built in the service area.

Required Facilities

Approximately 15,695 linear feet (L.F.) of 8-inch gravity line, and 1,455 L.F. of 2-inch force main, in combination with two grinder lift stations, will convey the wastewater from this service area to a proposed force main from the Stonega Community to the Town of Appalachia's sewer collection system and then to the Town of Big Stone Gap Regional Wastewater Treatment Plant for subsequent treatment.

The system will consist of gravity line except for two small areas consisting of five connections each. These two areas will be served with grinder pump stations and short sections of force main.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the Town of Appalachia sewer collection system lines to the Appalachia main sewer lift station. The lift station delivers flow through a six inch force main to the Town of Big Stone Gap Regional Wastewater Treatment Plant. Transmission and treatment considerations are addressed in a separate portion of the report.

Constructability Assessment

The major constructability challenge associated with this service area is the lack of space for construction. Roads are very narrow and are bordered with the stream on one side and the railroad track on the other. The Town of Appalachia water lines are also located in the road right-of-way. The amount of rock in the project area appears to be typical of Wise County.

Where appropriate, location of the gravity lines should accommodate sewage discharge plumbing from existing residences.

Phasing of Project Construction

If the sewer system serving this area is constructed prior to construction of the Stonega System, an additional 5,625 linear feet (L.F.) of force main will be required. The project will be more feasible if constructed in conjunction with, or after the Stonega system is constructed.

Total Projected Projects Cost

The projected construction cost for this service area is \$1,975,190. With related costs of \$586,427, including ten percent construction contingency, the total projected project cost is \$2,561,617. This projection is based on estimated construction costs in spring 2009. Calculation of costs is based on costs in 2009 dollars. Anticipating costs for project construction for any specific future date requires incorporation of unit price changes of the costs between 2009 and the future date. The total project cost does not include any ancillary costs to upgrade the existing Town of Appalachia transmission line or expand treatment capacity at the Big Stone Gap Regional Wastewater Plant in order to accommodate the flow from this project. The ancillary costs are addressed in a subsequent portion of this report.

Annual Operations and Maintenance Cost

Allowing an annual operating cost of \$0.10/foot for gravity lines and force mains, and \$5,000 per lift station per year, annual project O&M of \$11,716 is projected. This does not include annual depreciation on the collection system or lift stations. The present worth of 30 years' annual O&M cost (calculated at 8% interest) is \$138,834.60.

Present Worth per Connection

The present worth per connection is \$29,675.29, based on the above costs for 91 connections.

**PRELIMINARY STATEMENT OF PROBABLE PROJECT COST
FOR THE
RODA/OSAKA SEWER PROJECT**

CONSTRUCTION COST:

15,700 L.F. 8" Gravity Sewer Line @ \$45/L.F.	\$706,500
1,460 L.F. 2" Force Main @ \$20/L.F.	\$29,200
3,000 L.F. 4" Service Lateral (including Plugs & Cleanouts) @ \$25/L.F.	\$75,000
1,000 L.F. 4" Service Lateral Road and Stream Crossings @ \$175/L.F.	\$175,000
22 EA. Standard Manholes @ \$2,500/EA.	\$55,000
30 EA. Waterproof Manholes @ \$3,000/EA.	\$90,000
2 EA. Air Release & Vacuum Valve @ \$3,000/EA.	\$6,000
91 EA. Service Wyes @ \$90/EA.	\$8,190
800 L.F. 8-Inch Bored Road Crossings @ \$210/L.F.	\$168,000
400 L.F. 4-Inch Bored Road Crossings @ \$175/L.F.	\$70,000
200 L.F. 8-Inch Railroad Crossings @ \$250/L.F.	\$50,000
240 L.F. 4-Inch Stream Crossings @ \$150/L.F.	\$36,000
9 EA. 8-Inch Boring Attempts @ \$500/EA.	\$4,500
9 EA. 4-Inch Boring Attempts @ \$200/EA.	\$1,800
10,000 Tons Miscellaneous Aggregate @ \$15/Ton	\$150,000
1,000 C.Y. Miscellaneous Concrete @\$150/C.Y.	\$150,000
2 EA. Grinder Lift Station @ \$100,000/EA.	\$200,000

TOTAL CONSTRUCTION COST	\$1,975,190
--------------------------------	--------------------

RELATED COST:

Basic Engineering	\$167,900
RPR	\$72,000
PER	\$10,000
Permits	\$20,000
Surveying/Geotechnical	\$20,000
Environmental Assessment	\$5,000
Easements/property acquisition	\$39,504
Legal/Administration	\$39,504
Wetlands and Waters Delineation (If Required)	\$15,000
Construction Contingency (10%)	\$197,519

Related Subtotal	<u>\$586,427</u>
-------------------------	-------------------------

TOTAL PROBABLE PROJECT COST	\$2,561,617
------------------------------------	--------------------

Dunbar Decentralized Sewer Project

Project Service Area

The Dunbar Community is an abandoned coal camp located 5 miles north of State Route 58A, and about halfway between Norton and Appalachia, as shown on the Exhibit. This community is very remote, as evidenced by the fact that it recently received a decentralized water treatment plant, which is owned and managed by the Wise County Public Service Authority.

Project Magnitude

There are 40 existing homes in this project area, which would generate about 8,000 gallons of wastewater per day, based upon an average of 200 GPD per connection.

Required Facilities

The project includes 6,750 linear feet of 4-inch effluent gravity sewer line to collect the pre-treated wastewater for the existing homes.

Wastewater Treatment

The wastewater originating in this project area would be treated using an AdvanTex Treatment System, capable of treating 10,000 gallons per day. Due to soil limitations, a discharging system would probably be required.

Constructability Assessment

Since this project area does not lie in an environmental sensitive area, an environment assessment is not needed and construction should be fairly easy to perform.

Total Project Costs

The preliminary project cost is \$553,840, or \$13,846 per residential connection.

Annual Operations and Maintenance Cost

The annual operating costs are calculated at treatment system at \$150.00 per connection, collection system at \$72.00 per connection, and system discharge permit at \$1,080.00 per year for a total of \$9,960.00. The present worth of 30 years' O&M cost at 8% interest is \$112,128.

Present Worth per Connection

The present worth per connection is \$16,649.20, based on the 40 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
DUNBAR DECENTRALIZED SEWER PROJECT**

Construction Cost

6,750 LF	4" Gravity	\$15	\$101,250
6 EA.	Isolation Station	\$2,000	\$12,000
3 EA.	Branch Connection	\$250	\$750
3 EA.	Terminal Cleanout	\$250	\$750
2 EA.	Stream Crossing	\$2,500	\$5,000
5 EA.	Road Crossing	\$2,500	\$12,500
40 EA.	Service Connection	\$250	\$10,000
35 EA.	STEG System	\$3,000	\$105,000
5 EA.	STEP System	\$5,000	\$25,000
10,000 Gal.	Treatment System	\$10	\$100,000
10,000 Gal.	UV Disinfection System	\$2	\$20,000
20 EA.	Pump & Fill Existing Septic Tank	\$500	\$10,000

Total Construction Cost **\$402,250**

Related Cost

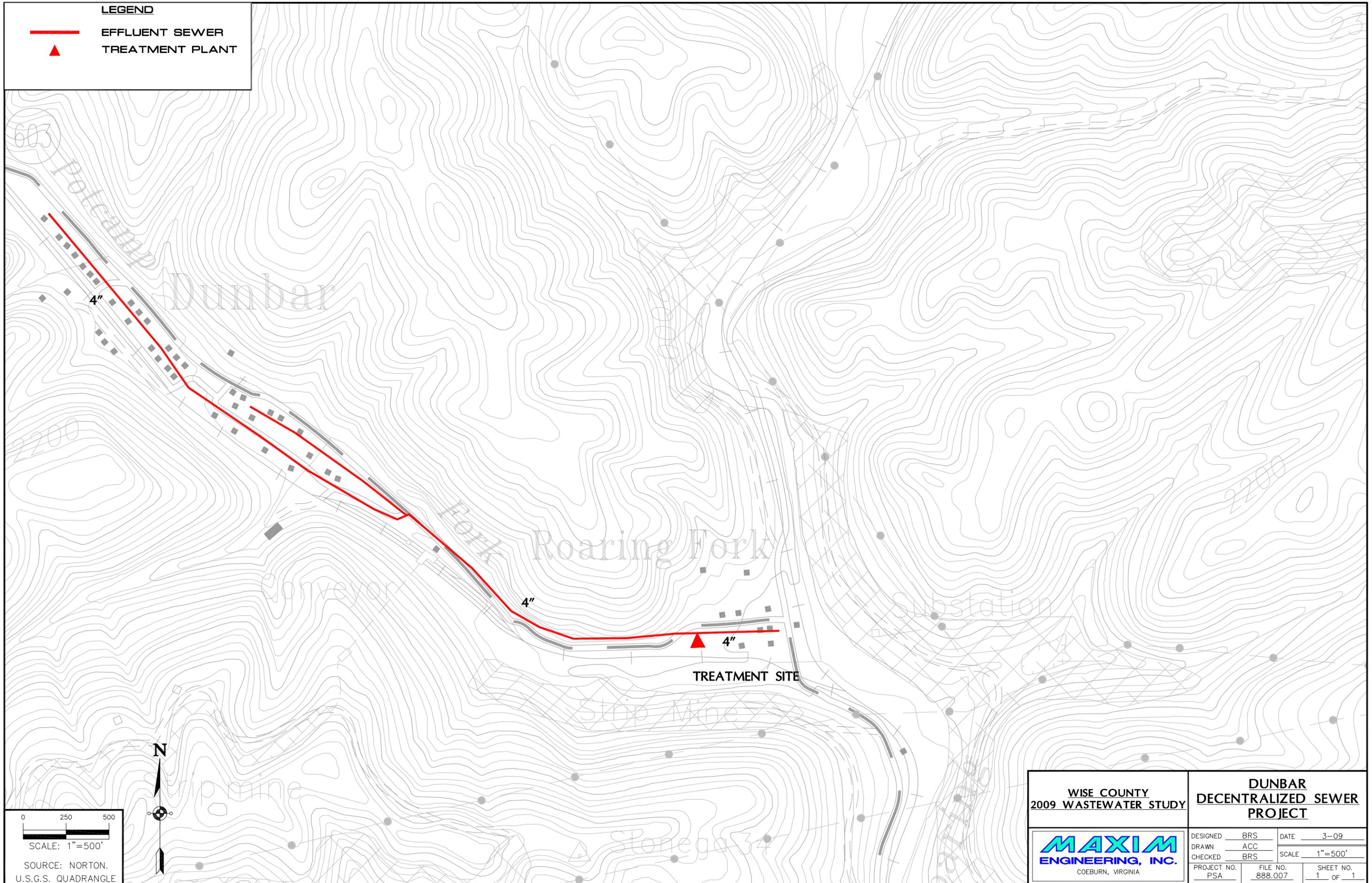
Basic Engineering	\$37,007
RPR	\$31,200
PER	\$5,000
Permits/Environmental Assessment	\$10,000
Easements/Property Acquisition	\$8,045
Legal/Administration	\$20,113
Construction Contingency (10%)	\$40,225

Total Related Cost **\$151,590**

TOTAL PROJECT COST **\$553,840**

LEGEND

-  EFFLUENT SEWER
-  TREATMENT PLANT



WISE COUNTY 2009 WASTEWATER STUDY		DUNBAR DECENTRALIZED SEWER PROJECT	
DESIGNED	BRS	DATE	3-09
DRAWN	ACC	SCALE	1"=500'
CHECKED	BRS	PROJECT NO.	PSA
		FILE NO.	888.007
		SHEET NO.	1 OF 1



Wise County Sewer Projects in the Pound River Watershed

Five projects were identified within the Pound River Watershed of Wise County. For each project, a description is presented with probable project cost and an exhibit indicating the service area and major components for that project.

Project Name	Population	Flow (GPD)	Project Cost
• Bold Camp Sewer Project – Phase II	520	42,600	\$2.36 million
• Indian Creek Sewer Project	327	40,200	\$3.24 million
• Indian Creek Effluent Sewer Project	549	45,000	\$2.50 million
• South Fork Sewer Project	676	55,400	\$3.45 million
• North Fork Sewer Project	<u>400</u>	<u>32,800</u>	<u>\$2.35 million</u>
TOTALS	2,472	216,000	\$13.9 million

Additional potential project opportunities

Mill Creek Sewer Project

Others as identified

Bold Camp Sewer Project - Phase II

Project Service Area

The Bold Camp - Phase 2 Project includes the Dotson Fork (Middle Fork) of Bold Camp Creek and Meade Fork, as shown on the Exhibit. The preliminary engineering report for this project was approved by the Virginia Department of Environmental Quality (DEQ) in 2006.

Project Magnitude

There are 175 existing homes on Dotson Fork and 38 homes on Meade Fork, for a total of 213 homes which would benefit from this project.

Required Facilities

The project includes 9,500 linear feet of 6-inch effluent sewer and 51,300 linear feet of 4-inch effluent sewer to collect the wastewater from 213 total homes. The pre-treated wastewater from this project would be drained through the existing 10-inch gravity sewer to the Pound sewage plant for further treatment. This project would generate 42,600 gallons of wastewater per day, based upon an average of 200 GPD per connection.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the Town of Pound sewers to the Pound WWTP for treatment. Transmission and treatment considerations are addressed in a separate portion of the report.

Total Project Costs

The preliminary project cost is \$2,530,837, or \$11,882 per residential connection.

Annual Operations and Maintenance Cost

The annual operating costs are calculated at STEG collection system at \$72 per connection, STEP collection system at \$144 per connection, for a total of \$18,072. The present worth of 30 years' O&M cost at 8% interest is \$203,451.

Present Worth per Connection

The present worth per connection is \$12,837.03, based on the 213 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
BOLD CAMP SEWER PROJECT - PHASE II**

Construction Cost

9,500 LF	6" Gravity	\$20	\$190,000
51,300 LF	4" Gravity	\$15	\$769,500
10 EA.	Isolation Station	\$2,000	\$20,000
16 EA.	Branch Connection	\$250	\$4,000
13 EA.	Terminal Cleanout	\$250	\$3,250
38 EA.	Stream Crossing	\$2,500	\$95,000
56 EA.	Road Crossing	\$2,500	\$140,000
213 EA.	Service Connection	\$250	\$53,250
175 EA.	STEG System	\$3,000	\$525,000
38 EA.	STEP System	\$5,000	\$190,000
106 EA.	Pump & Fill Existing Septic Tank	\$500	\$53,000

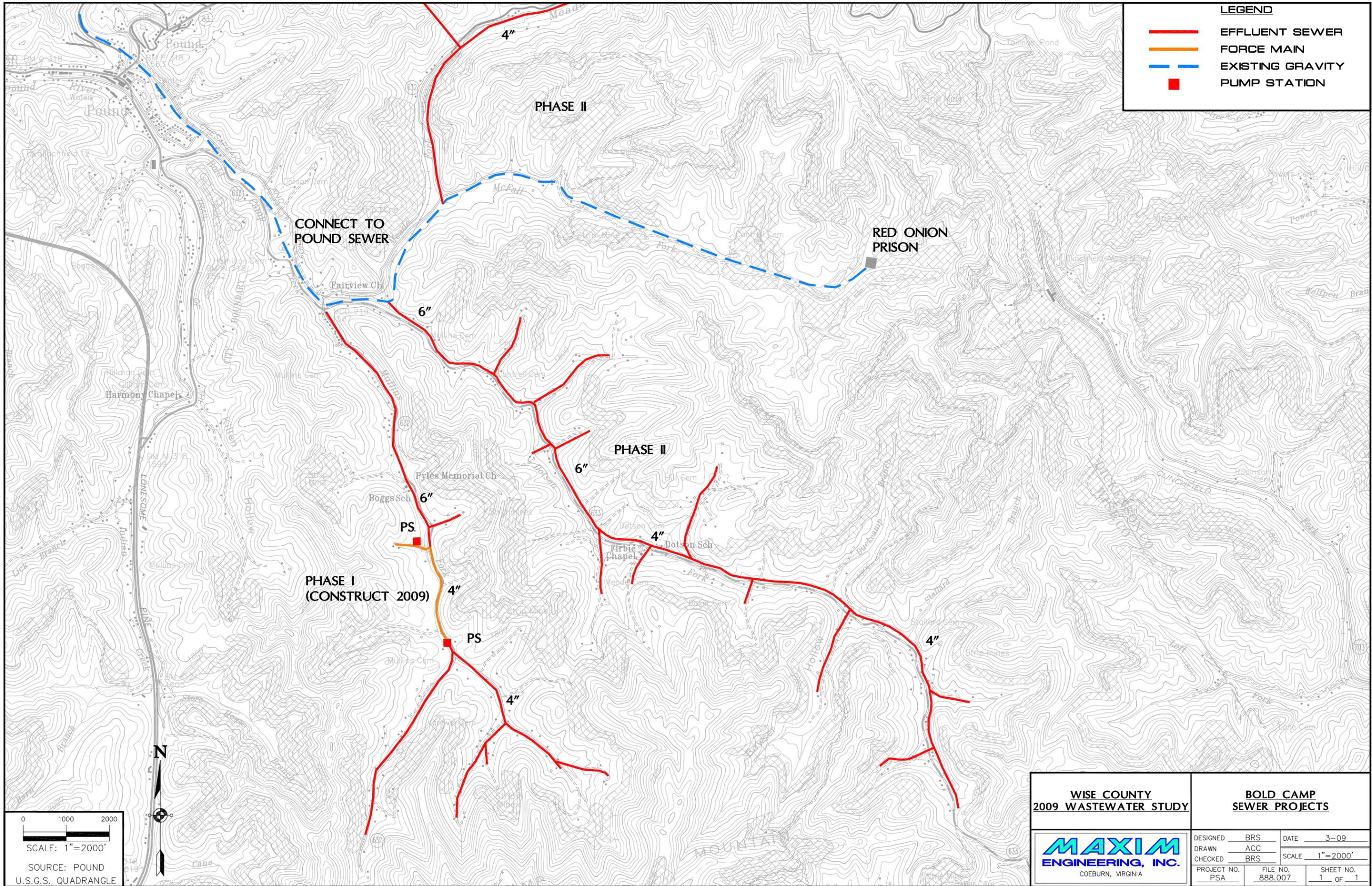
Total Construction Cost \$2,043,000

Related Cost

Basic Engineering	\$155,677
RPR	\$0
PER	\$10,000
Permits	\$20,000
Environmental Assessment	\$20,000
Easements/Property Acquisition	\$40,860
Legal/Administration	\$37,000
Construction Contingency (10%)	\$204,300

Total Related Cost \$487,837

TOTAL PROJECT COST \$2,530,837



Indian Creek Sewer Project

Project Background

The Indian Creek service area extends north from the top of Indian Mountain to the Pound Junction (intersection of U.S. 23 and Business 23), and includes the hollows on either side (see Exhibit). Initially, a hybrid system was considered using conventional gravity sewers along U.S. 23 to serve potential commercial businesses and effluent sewers in the hollows to serve the residences there. However, a closer examination of the project area revealed that the stream gradient for Pound Junction to the foot of Indian Mountain is only 0.25%. A 12-inch sewer would be required in this relatively flat five-mile section of the sewer line, and there is not volume of wastewater to scour the pipeline. Therefore, the system design was changed to a combination STEP/STEG system, which is described below.

Project Service Area/Required Facilities

U.S. 23 Corridor - A STEP (Septic Tank Effluent Pump) system is proposed in this flatter section of the project. A STEP system requires a watertight tank and pump at each wastewater source. The tank provides a quiet environment where the solids can settle to the bottom, while the liquid portion (called effluent) is pumped through a pipeline to the treatment plant. This portion of the project would require 25,000 feet of 8-inch force main, 7,880 feet of 6-inch force main, and 6,700 feet of 4-inch force main, and 134 tanks and pumps.

Hollows - The hollows are much steeper than the valley floor. Septic tanks are installed at each home for settling out the solids. Since the residences are generally located higher in elevation than the treatment plant and conveying sewers, the effluent flows by gravity to the treatment plant, thus pumps are not required. These systems are called STEG (septic tank effluent gravity) systems. The hollows can be served by installing approximately 3,200 feet of 6-inch gravity sewers, 61,700 feet of 4-inch gravity sewer, and 225 tanks. This project would generate 71,800 gallons of wastewater per day, based upon an average of 200 GPD per connection.

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be conveyed through the Town of Pound sewers to the Pound Wastewater Treatment Plant for treatment. Transmission and treatment considerations are addressed in a separate portion of the report.

Total Project Costs

The preliminary cost for this project is \$5,372,262, or \$14,965 per residential connection.

Annual Operations and Maintenance Cost

Allowing an annual cost of \$72 for STEG systems, 144 per STEP system, the total operating and maintenance cost is \$39,528. The present worth of 30 years' annual O&M cost is \$444,998.

Present Worth per Connection

The present worth per connection is \$16,204.07, based on 359 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
INDIAN CREEK SEWER PROJECT**

Construction Cost

25,000 LF	8" Force Main	\$25	\$625,000
7,880 LF	6" Force Main	\$20	\$157,600
6,700 LF	4" Force Main	\$15	\$100,500
10 EA.	Air Release Valves	\$2,000	\$20,000
25 EA.	6" Stream Crossing	\$8,000	\$200,000
25 EA.	6" Road Crossing	\$8,000	\$200,000
134 EA.	Service Connection	\$250	\$33,500
134 EA.	STEP System	\$5,000	\$670,000
67 EA.	Pump & Fill Existing Septic Tank	\$500	\$33,500
	STEP Collection Along US 23		<u>\$2,040,100</u>

3,200 LF	6" Gravity	\$20	\$64,000
61,700 LF	4" Gravity	\$15	\$925,500
10 EA.	Isolation Stations	\$2,000	\$20,000
25 EA.	Branch Connections	\$250	\$6,250
25 EA.	Terminal Cleanouts	\$250	\$6,250
50 EA.	Stream Crossing	\$2,500	\$125,000
60 EA.	Road Crossing	\$2,500	\$150,000
225 EA.	Service Connection	\$250	\$56,250
169 EA.	STEG System	\$3,000	\$507,000
56 EA.	STEP System	\$5,000	\$280,000
113 EA.	Pump & Fill Existing Septic Tank	\$500	\$56,500
	Gravity Collection In Hollows		<u>\$2,196,750</u>

Total Construction Cost \$4,236,850

Related Cost

Basic Engineering	\$305,053
RPR	\$187,200
PER	\$10,000
Permits	\$20,000
Environmental Assessment	\$20,000
Easements/Property Acquisition	\$84,737
Legal/Administration	\$84,737
Construction Contingency (10%)	<u>\$423,685</u>

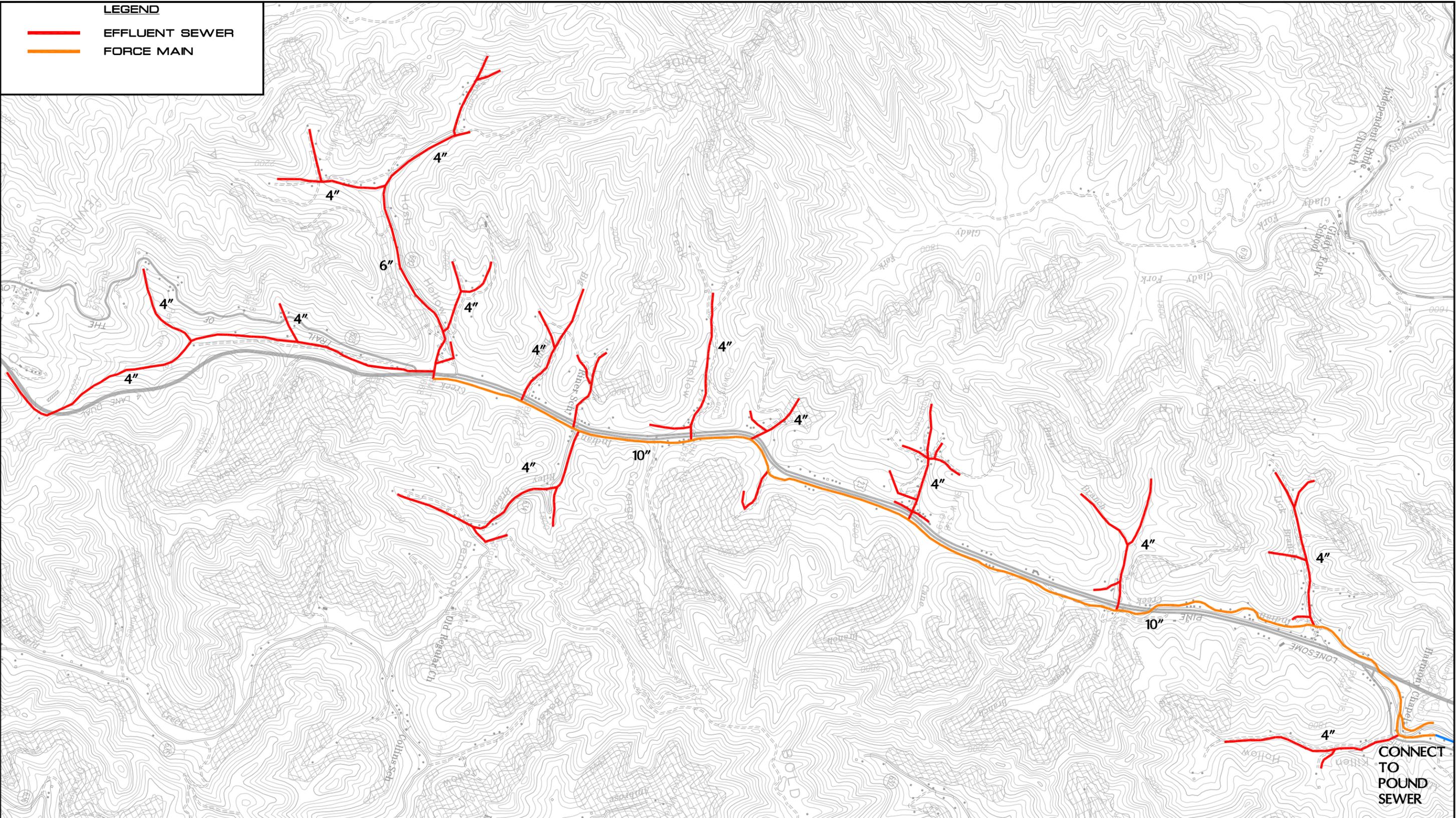
Total Related Cost \$1,135,412

TOTAL PROJECT COST \$5,372,262

LEGEND

 EFFLUENT SEWER

 FORCE MAIN



0 1000 2000

SCALE: 1"=2000'

SOURCE: POUND
U.S.G.S. QUADRANGLE



WISE COUNTY 2009 WASTEWATER STUDY		INDIAN CREEK SEWER PROJECT	
DESIGNED	BRS	DATE	3-09
DRAWN	ACC	CHECKED	BRS
SCALE		1"=2000'	
PROJECT NO.	FILE NO.	SHEET NO.	
PSA	888.007	1 OF 1	

MAXIM ENGINEERING, INC.
COEBURN, VIRGINIA

South Fork Sewer Project

Project Service Area

The South Fork of the Pound River service area extends from the junction of SR 671 and U.S. 23 near Pound for a distance of 5-1/2 miles, as shown on the Exhibit. The valley is generally narrow and the surrounding mountains are very high and steep. The stream meanders across the narrow valley floor. This geologic description is presented in order to explain the reason conventional gravity sewers are expensive. In the 5-1/2 mile long service area, the stream gradient averages only 0.75%. When the relief is low, larger, more expensive sewer lines are required. For this reason, effluent sewers (sometimes called small diameter sewers) have been proposed for this area. Due to the size of the service area, South Fork has been divided into two phases. Phase 1 extends to the Dewey Junction, and Phase 2 covers the upper limits of the service area.

Project Magnitude/Required Facilities

Phase 1 - The portion of the project area would be served by installing almost 25,000 linear feet of 8-inch and 6-inch effluent sewer and 16,760 linear feet of 4-inch effluent sewer to collect the wastewater from 107 homes. This phase of the project would generate 21,400 gallons of pre-treated wastewater per day.

Phase 2 - This upper portion of the project area has 170 existing homes, and would require 8,400 linear feet of 6-inch effluent sewer, and 31,450 linear feet of 4-inch sewer. This phase of the project would generate 34,000 gallons of pre-treated wastewater per day.

Wastewater Conveyance and Treatment

The wastewater would discharge into the town of Pound's existing sewer line which terminates just west of U.S. 23, and treatment would be provided by Pound's Wastewater Treatment Plant.

Constructability Assessment

The homes situated close to the creek would require pumps to allow discharge into the sewer line, while homes at higher elevations would use gravity discharge. Construction should not be hampered by environmental issues.

Total Project Costs

The preliminary cost for Phase 1 is \$1,910,328, or \$17,854 per residential connection; while Phase 2 is estimated to cost \$1,946,824, or \$11,452 per connection.

Annual Operations and Maintenance Cost

Phase 1 - Based on \$72 for each STEG system, \$144 for each STEP system, the annual system cost is \$9,648, and the present worth of 30 years' annual O&M cost at 8% is \$108,615. Phase 2 - Using the same unit costs, the annual system cost is \$15,408, and the present worth of 30 years' annual O&M cost is \$173,460.

Present Worth per Connection

The present worth of Phase 1 is \$18,868.63 per connection, while the present worth of Phase 2 is \$12,472.26.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
SOUTH FORK SEWER PROJECT - PHASE I**

Construction Cost

24,600 LF	8" Gravity	\$25	\$615,000
600 LF	6" Gravity	\$20	\$12,000
16,760 LF	4" Gravity	\$15	\$251,400
27 EA.	Isolation Station	\$2,000	\$54,000
8 EA.	Branch Connection	\$250	\$2,000
11 EA.	Terminal Cleanout	\$250	\$2,750
23 EA.	Stream Crossing	\$2,500	\$57,500
20 EA.	Road Crossing	\$2,500	\$50,000
107 EA.	Service Connection	\$250	\$26,750
80 EA.	STEG System	\$3,000	\$240,000
27 EA.	STEP System	\$5,000	\$135,000
54 EA.	Pump & Fill Existing Septic Tank	\$500	\$27,000

Total Construction Cost \$1,473,400

Related Cost

Basic Engineering	\$113,452
RPR	\$67,200
PER	\$10,000
Permits	\$20,000
Environmental Assessment	\$20,000
Easements/Property Acquisition	\$29,468
Legal/Administration	\$29,468
Construction Contingency (10%)	<u>\$147,340</u>

Total Related Cost \$436,928

TOTAL PROJECT COST \$1,910,328

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
SOUTH FORK SEWER PROJECT - PHASE II**

Construction Cost

8,400 LF	6" Gravity	\$20	\$168,000
31,450 LF	4" Gravity	\$15	\$471,750
9 EA.	Isolation Station	\$2,000	\$18,000
16 EA.	Branch Connection	\$250	\$4,000
13 EA.	Terminal Cleanout	\$250	\$3,250
22 EA.	Stream Crossing	\$2,500	\$55,000
37 EA.	Road Crossing	\$2,500	\$92,500
170 EA.	Service Connection	\$250	\$42,500
126 EA.	STEG System	\$3,000	\$378,000
44 EA.	STEP System	\$5,000	\$220,000
85 EA.	Pump & Fill Existing Septic Tank	\$500	\$42,500

Total Construction Cost **\$1,495,500**

Related Cost

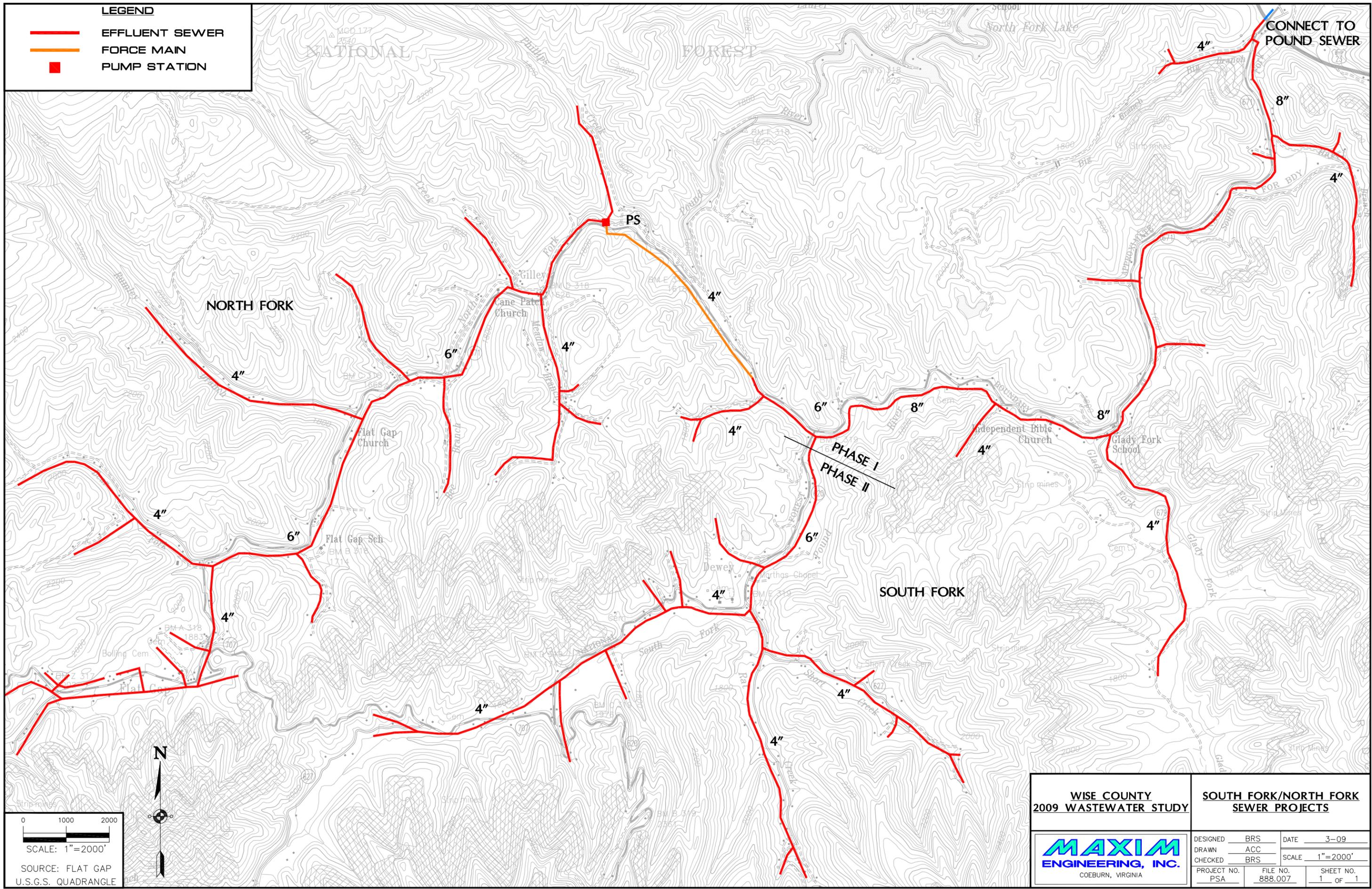
Basic Engineering	\$115,154
RPR	\$76,800
PER	\$10,000
Permits	\$20,000
Environmental Assessment	\$20,000
Easements/Property Acquisition	\$29,910
Legal/Administration	\$29,910
Construction Contingency (10%)	\$149,550

Total Related Cost **\$451,324**

TOTAL PROJECT COST **\$1,946,824**

LEGEND

- EFFLUENT SEWER
- FORCE MAIN
- PUMP STATION



0 1000 2000
 SCALE: 1"=2000'
 SOURCE: FLAT GAP
 U.S.G.S. QUADRANGLE



WISE COUNTY		SOUTH FORK/NORTH FORK	
2009 WASTEWATER STUDY		SEWER PROJECTS	
MAXIM		DESIGNED	BRS
ENGINEERING, INC.		DRAWN	ACC
COEBURN, VIRGINIA		CHECKED	BRS
PROJECT NO.	FILE NO.	DATE	3-09
PSA	888.007	SCALE	1"=2000'
		SHEET NO.	1 OF 1

North Fork Sewer Project

Project Service Area

The North Fork of the Pound River service area extends from the gap in the ridge above the Dewey Junction (intersection of highways SR 671 and SR 620) through the community of Flat Gap almost to the Kentucky state line, as shown in the Exhibit. This service area drains into North Fork Lake, which is the water supply for the town of Pound. The valley floor is more narrow than in South Fork. The stream gradient for the initial 2.5 miles is 1.25%, or about twice as steep as South Fork.

Project Magnitude

There are 164 existing homes, or potential connections in this service area. This project would generate 32,800 gallons of pre-treated wastewater per day, based upon an average of 200 GPD per connection.

Required Facilities/Treatment

The project area is served by installing almost 14,000 linear feet of 6-inch effluent sewer, 48,040 linear feet of 4-inch effluent sewer, and 6,000 linear feet of 4-inch force main. The wastewater from this project would be pumped into the South Fork sewer line, and treated at the Pound Wastewater Treatment Plant (WWTP).

Wastewater Conveyance and Treatment

The wastewater originating in this collection system will be pumped into the South Fork - Phase I sewer line for conveyance to the Town of Pound WWTP for treatment. Transmission and treatment considerations are addressed in a separate portion of the report.

Total Project Costs

The preliminary project cost is \$2,646,826, or \$16,139 per residential connection.

Annual O&M Cost

Allowing \$72 per connection for STEG, \$144 per connection for STEP, and a pump station operating cost of \$5,000 yields a total annual cost of \$19,832. The present worth of 30 years' annual O&M cost is \$223,265.

Present Worth per Connection

The present worth per connection is \$17,500.56, based on 164 connections.

**PRELIMINARY STATEMENT OF PROBABLE COST
FOR THE
NORTH FORK SEWER PROJECT**

Construction Cost

14,000 LF	6" Gravity	\$20	\$280,000
48,040 LF	4" Gravity	\$15	\$720,600
6,000 LF	4" Force Main	\$15	\$90,000
14 EA.	Isolation Station	\$2,000	\$28,000
20 EA.	Branch Connection	\$250	\$5,000
18 EA.	Terminal Cleanout	\$250	\$4,500
32 EA.	Stream Crossing	\$2,500	\$80,000
33 EA.	Road Crossing	\$2,500	\$82,500
164 EA.	Service Connection	\$250	\$41,000
122 EA.	STEG System	\$3,000	\$366,000
42 EA.	STEP System	\$5,000	\$210,000
82 EA.	Pump & Fill Existing Septic Tank	\$500	\$41,000
36,000 Gal.	Pump Station	\$3	\$108,000

Total Construction Cost \$2,056,600

Related Cost

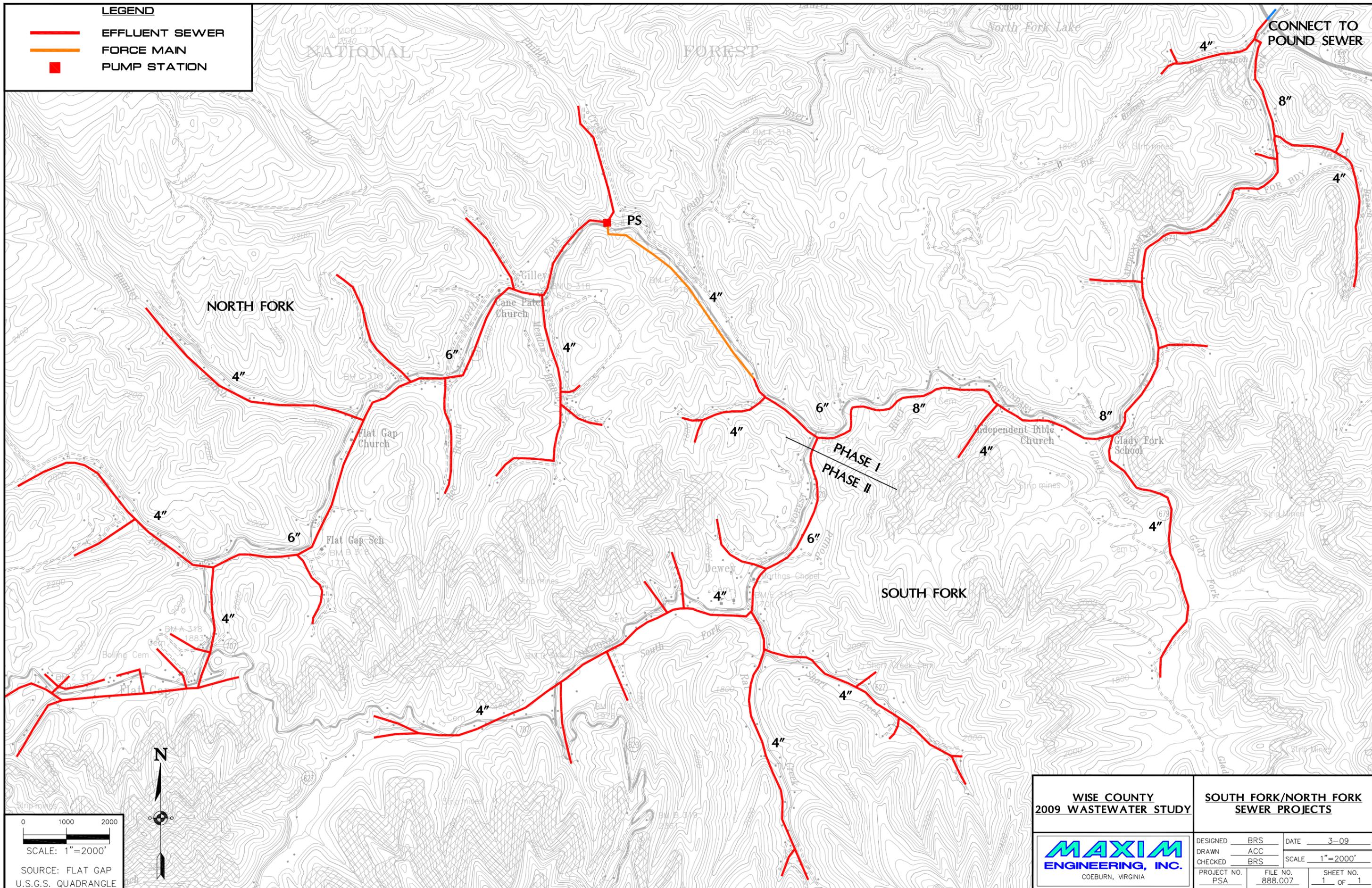
Basic Engineering	\$156,302
RPR	\$96,000
PER	\$10,000
Permits	\$20,000
Environmental Assessment	\$20,000
Easements/Property Acquisition	\$41,132
Legal/Administration	\$41,132
Construction Contingency (10%)	\$205,660

Total Related Cost \$590,226

TOTAL PROJECT COST \$2,646,826

LEGEND

- EFFLUENT SEWER
- FORCE MAIN
- PUMP STATION



0 1000 2000
 SCALE: 1"=2000'
 SOURCE: FLAT GAP
 U.S.G.S. QUADRANGLE



WISE COUNTY		SOUTH FORK/NORTH FORK	
2009 WASTEWATER STUDY		SEWER PROJECTS	
DESIGNED	BRS	DATE	3-09
DRAWN	ACC	SCALE	1"=2000'
CHECKED	BRS	PROJECT NO.	PSA
		FILE NO.	888.007
		SHEET NO.	1 OF 1



IV. DESCRIPTION OF TRANSMISSION AND TREATMENT CAPACITY NEEDS

Introduction

The centralized collection system projects identified in this study will convey wastewater to existing treatment facilities. In addition to the costs projected to build the new collection systems, the impact of increased flow through existing facilities must be evaluated to determine any related costs to accommodate the increased flow.

The three major wastewater treatment plants in the County are the CNW WWTP, the Big Stone Gap Regional WWTP, and the Pound WWTP. These serve the Guest River Watershed, the Powell River Watershed, and the Pound River Watershed, respectively, and will receive and treat wastewater from the collection system projects described in this study (excluding decentralized projects). Information is also presented on a proposed facility, the Powell River Wastewater Treatment Plant, which could potentially impact both the Guest and Powell River Watersheds.

The assessment of existing facilities that follows is organized to present an evaluation of capacity within each watershed. Common among facilities in all three watersheds is that current baseline wastewater flow to each treatment facility utilizes about half of capacity in the facility. The baseline flow is the average flow during periods of the year when precipitation is low. This baseline flow correlates with the volume of drinking water delivered to wastewater customers. During periods of precipitation, flow through existing facilities may greatly exceed baseline flow, due to inflow and infiltration (I&I) of stormwater or groundwater into the collection system lines and manholes.

Inflow occurs when stormwater enters the collection system through a direct connection, such as from foundation drains, downspouts, sump pumps, and streams. Infiltration occurs when groundwater enters the collection system through cracks or leaks in lines or manholes. I&I can be reduced by reducing opportunities for inflow, and by replacing older lines that have deteriorated, been damaged, or were installed improperly. Addressing I&I is the most cost-effective approach to providing sufficient transmission and treatment capacity for the collection system projects in Wise County. This is emphasized in the following sections that examine the transmission and treatment capacity for each of the three watersheds.

Guest River Watershed Transmission and Treatment

Description of the CNW Wastewater Treatment Plant

The Coeburn-Norton-Wise (CNW) Wastewater Treatment Plant (WWTP) is owned by the CNW Regional Waste Water Treatment Authority. The Authority was created to provide wastewater treatment for the Towns of Coeburn and Wise; the City of Norton and the portions of Wise County in this watershed. The WWTP was constructed in 1990 and has a permitted capacity of 4.0 MGD. The facility consists of a head-works building which houses the pre-treatment equipment (screening and grit removal) and the raw sewage pumps; a three train oxidation ditch using mechanical “brush” aerators; two circular secondary clarifiers; and a rectangular baffled chlorine contact tank. After disinfection the effluent is de-chlorinated prior to discharge into the Guest River. Waste sludge is treated in two circular aerated digesters. After treatment, sludge is dewatered through a belt press, stored in a covered sludge storage facility and disposed of by land application.

Description of Major Transmission Routes

The interceptor system for the Regional facility was constructed in conjunction with the Regional WWTP and connected the existing wastewater treatment facilities serving the two Towns and the City with the Regional WWTP. A 24-inch gravity interceptor delivers flow from the location of the Wise treatment lagoon along Bear Creek to a point adjacent to the Guest River. A 30-inch gravity line conveys flow from the City of Norton, connecting to the City’s line near the Ramsey Community, to a point of intersection with the 24-inch line from Wise. At this point, a 30-inch gravity line generally follows the Guest River to a point near the Tacoma Community where the line increases to 36-inch in diameter. The 36-inch line continues to its connection with the Town of Coeburn’s system near the previous location of the Coeburn Lagoon. From this point a 36-inch gravity line carries flow to the Regional WWTP head-works building. The Riverview Community is connected to the interceptor downstream from the Coeburn Connection through six different points. There are no lift stations.

Assessment of Capacity

During dry weather, the flows through the interceptor and to the plant average from 1.5 to about 2.0 MGD and are well within the flow limit of 4.0 MGD. The average flow to the WWTP during 2008 was 2.72 MGD. This is presented in Figure 1.

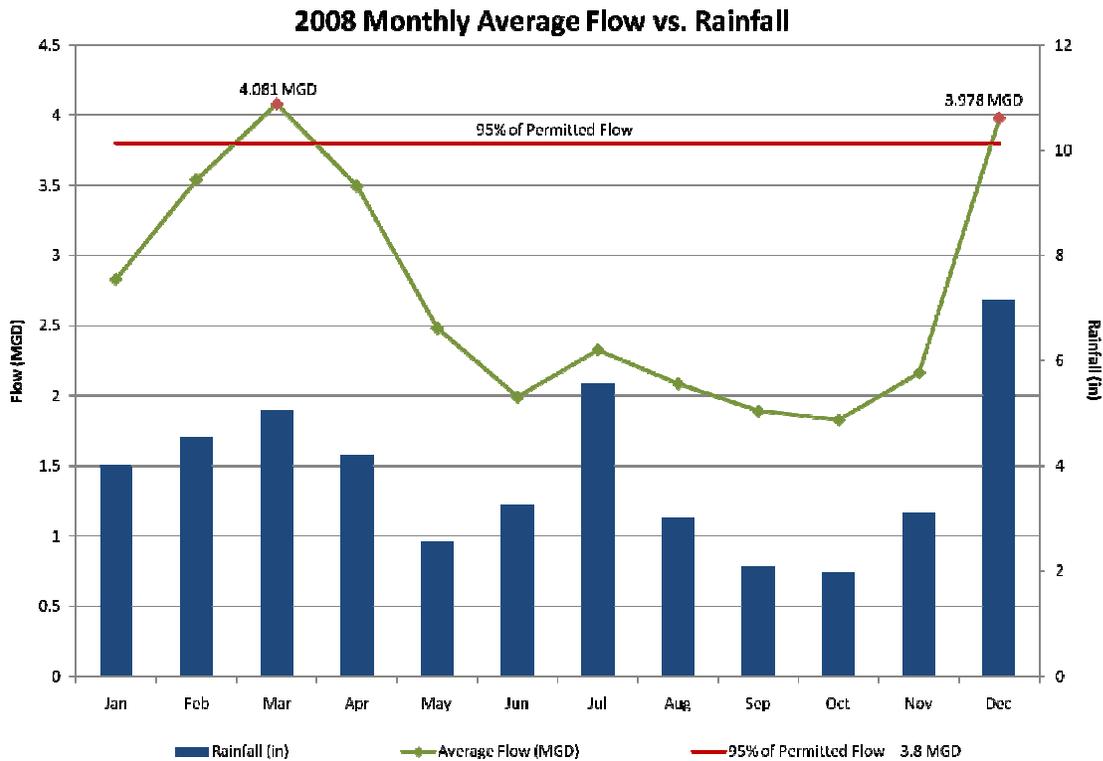


Figure 1: Monthly Average Flows for 2008

However, when significant rainfall occurs, both the interceptor and the WWTP operate near capacity. Flows during 2008 exceeded the “95% permitted flow” limit for two months. Three consecutive months over this limit will result in a violation of effluent limits and action by regulatory agencies.

Assuming that some part of each section of the CNW Interceptor, i.e. 24-inch, 30-inch and 36-inch, is constructed on minimum grade, Table I shows the full pipe carrying capacity of each section.

Table I
Full Pipe Carrying Capacity

Pipe Size	Minimum Slope (ft/100ft)	Full Pipe Capacity
24-inch	.080	4,200,000 GPD
30-inch	.058	6,500,000 GPD
36-inch	.046	9,200,000 GPD

The data in Table I indicates that the plant capacity of 4.0 MGD will be exceeded long before the interceptor capacity is reached and that the “critical link in the chain” is the collection systems of the two Towns, the City and the County. Capacity for additional wastewater flow at the treatment plant may be increased by several means. The simplest method to increase capacity is to reduce inflow and infiltration (I&I). Although the simplest method, I/I reduction is not always the most practical or least expensive.

The CNW Waste Water Treatment Authority has authorized a study of capacity, currently in preparation. I&I is considered in that study. Other methods currently being studied for the CNW WWTP include:

- Flow Blending or Anticipated Bypass
- Equalization
- Capacity Expansion by Process Replication
- Capacity Expansion by Process Modification
- Plant Capacity Re-Rating

Potential Improvement Projects For The Existing Treatment Facility

The existing CNW WWTP is well maintained and continues to operate well within discharge limits for Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS). Other than minor repair to some buildings and units, i.e., roof repair, pump replacement, there are no plant improvements noted as a result of this study. CNW staff and consultants are currently reviewing the potential for future effluent limits for nutrient removal such as Phosphorus and Nitrogen. Any improvements resulting from future effluent limits are not impacted by the addition of flows to the plant and are therefore not considered pertinent to this Study.

Capacity Available for Identified Collection System Projects

The flows which may be added to the CNW Plant from sewer expansion areas included in this study are broken into two parts. Projects which would flow by force main directly to the plant include:

1. South Coeburn at an estimated flow of 45,600 GPD
2. Sheffield Acres at an estimated flow of 53,700GPD
3. Timberville Area at an estimated flow of 16,500 GPD
4. Crab Orchard Area at an estimated flow of 35,100 GPD
5. Dry Fork at an estimated flow of 14,400 GPD

Projects which would enter the Treatment Plant through other interceptor lines are:

1. Coeburn Mountain through the Town of Wise-135,000 GPD
2. Banner through the Town of Coeburn-50,700 GPD
3. Cranesnest through the Town of Coeburn-21,200 GPD
4. Esserville through the City of Norton-37,500 GPD
5. Dorchester including Thackers Branch-71,200 GPD
6. Tacoma through a tie to the existing CNW interceptor-43,200 GPD
7. Riverview through a tie to the existing CNW interceptor-18,900 GPD
8. Hoot Owl Hollow through the City of Norton-7,500 GPD

The total wastewater flow projected from all proposed sewer line extensions is estimated at 550,500 GPD. Total Flow to be added through a direct connection to the Plant is 165,300 GPD. Flow entering the Plant through CNW 36-inch Interceptor equals 62,100 GPD. Flow proposed to enter through the Town of Wise system and the 24-inch CNW interceptor is estimated at 135,000 GPD. The estimated flow to be added through the City of Norton and the 30-inch interceptor is 104,800 GPD and the flow expected to arrive at the plant through the Town of Coeburn system and the 36-inch interceptor equals 71,900 GPD. Based upon the minimum flow carrying capacity shown in Table I, no improvements or expansion would be required to the CNW interceptor system.

A review of Figure I indicates that the addition of 0.55 MGD to the Plant Flow by the addition of all proposed line extensions would have caused the plant to exceed limits for three consecutive months. Based upon this analysis, the plant does not have capacity to handle the flows without expansion. Adding the proposed additional flows to the dry weather flow of the plant would indicate that significant capacity would remain after the addition. From this analysis it would appear that the collective reduction of I&I in the amount of approximately 500,000 GPD would allow the addition of the proposed new connections leaving some capacity for growth.

Powell River Watershed Transmission and Treatment

Description of the Big Stone Gap Regional Wastewater Treatment Plant

The Big Stone Gap Regional Wastewater Treatment Plant (WWTP) is owned by the Town of Big Stone Gap. The WWTP was constructed in the 1960s, expanded and upgraded in the mid-1990s, and currently has a permitted capacity of 2.0 MGD. By contractual agreement, the Town of Appalachia is allocated 20% or a 0.4 MGD portion of the Plant. The facility consists of a 2,000,000 gallon equalization basin, a head-works building which houses the pre-treatment equipment (screening and grit removal) and the raw sewage pumps; a three train oxidation ditch using mechanical “brush” aerators; two circular secondary clarifiers; an ultraviolet disinfection chamber and a cascade aeration unit. After disinfection the effluent is discharged into the Powell River. Waste sludge is treated in two aerated digesters. After treatment sludge is dewatered through either a belt press or on gravity sludge drying beds and disposed of by land application. An expansion of the facility is currently under construction and will result in a capacity of 4.0 MGD. This expansion is expected to be completed by April of 2010. The expanded plant will utilize the same treatment process currently being used by the 2.0 MGD Plant. The equalization basin is being converted to an aeration tank.

Description of Major Transmission Routes

Flow from the Town of Appalachia is pumped directly to the WWTP through a six-inch force main. The 10-inch main interceptor, which collects and conveys flow to the plant, was built when the plant was constructed. The gravity line terminates at the Aviation Road Lift Station which is being upgraded and expanded with the WWTP project. None of the other lift stations in the system would be affected by additional flows from the areas addressed in this study.

Assessment of Capacity

During dry weather, the flows through the interceptor and to the plant average from 1.2 to about 1.6 MGD and are well within the flow limit of 2.0 MGD. However when significant rainfall occurs both the interceptor and the treatment plant exceed permitted capacity. As a result, the Town of Big Stone Gap and the Department of Environmental Quality (DEQ) have entered into a consent order which directed the expansion of the plant and significant infiltration and inflow (I&I) reduction. In addition to the plant expansion, the Town has

contracted a sewer line replacement project and was recently awarded \$1,836,000 for additional I&I work. This work is expected to be under construction by September 2009.

Potential Improvement Projects For The Existing Treatment Facility

After completion of the current work, the plant should have the capacity to treat additional wastewater and is expected to have the necessary treatment units to meet effluent limits to a design flow of 4.0 MGD.

Capacity Available for Identified Collection System Projects

The flows which may be added to the Big Stone Gap Regional Wastewater Plant from sewer expansion areas included in this study are shown below:

1. Wildcat Community at an estimated flow of 36,300 GPD
2. Irondale Community at an estimated flow of 62,000GPD
3. Crackers Neck Community at an estimated flow of 97,800 GPD
4. Powell Valley Community at an estimated flow of 57,600 GPD
5. Roda/Osaka Community at an estimated flow of 27,300 GPD

The total wastewater flow projected from all proposed sewer line extensions is estimated at 281,000 GPD. Projected flow through direct connection to the WWTP is 27,300 GPD. Projected flow through the main interceptor is 258,700 GPD. If I&I removal efforts currently being implemented by the Town are successful and if the collective reduction of I&I in the amount of approximately 281,000 GPD is accomplished the existing interceptor should handle the proposed additions.

After expansion of the WWTP, the addition of 0.281 MGD due to proposed collection system projects is not expected to cause the plant to exceed discharge limits as long as I&I removal efforts are completed and continued maintenance is a priority for the Town.

Based on this analysis, it would appear that the collective reduction of I&I in the amount of approximately 281,000 GPD would allow the addition of the proposed new connections to the plant flow leaving significant capacity for additional growth.

Pound River Watershed Transmission and Treatment

Description of the Pound Wastewater Treatment Plant

The Pound WWTP is owned by the Town of Pound and operated by Veolia Water, Incorporated. The WWTP's capacity was increased to its currently permitted level, 0.5 MGD, in 1997. A Virginia Class II Licensed Operator is required. The WWTP is a secondary treatment plant. Major components of the WWTP include preliminary treatment unit operations of mechanical screening and grit removal, secondary treatment unit operations of extended-aeration activated sludge with gravity clarification, and chemical disinfection of the treated liquid product prior to discharge into the Pound River. Waste solids ("sludge") from the treatment process are stabilized through aerobic digestion and dewatered using a belt filter press. The flow to the WWTP averages 0.33 MGD. Red Onion Correctional Center contributes the largest volume from a single customer at 0.09 MGD.

Description of Major Transmission Routes

The existing collection system consists of gravity collection lines of various sizes (8-, 10-, 14-, and 20-inch diameters) and two lift stations with associated force mains. The Pound Lift Station is located south of the WWTP and pumps most of the collected wastewater to the WWTP. The Almira Lift Station pumps flow collected from approximately 50 residences north of the WWTP, 10,000 gallons per day. Portions of the collection system are 8-inch lines installed during the 1970s when the WWTP was initially constructed.

The Pound WWTP current receives an average flow of 0.33 MGD during months with greater precipitation (January through April). This is approximately two-thirds of the 0.5 MGD permitted capacity of the WWTP. An estimated 0.1 MGD of this average flow is believed to result from to excessive inflow and infiltration. The average concentrations of organics and solids in the wastewater are 166 mg/l and 111 mg/l, respectively. Both of these values are more than one-third more dilute than conventional wastewater (250 mg/l) and support the estimate that one-third of the average flow is attributable to excessive I&I. An aggressive program to eliminate inflow through manhole lids is planned to begin during the third quarter of 2009. The operator will conduct this program. If successful, this program is expected to remove at least eighty percent of the excessive I&I, reducing the average flow to 0.25 MGD.

The Pound WWTP achieves its permit requirements as a 0.5 MGD facility. The WWTP's performance may indicate that the existing facility's effective treatment capacity is greater than the permitted capacity of 0.5 MGD. In order to quantify the amount of potential existing treatment capacity that exceeds the permitted capacity and demonstrate this to the Department of Environmental Quality, a detailed assessment report of WWTP capacity would be required. This report would also identify the order and magnitude in which specific unit operations of the WWTP limit capacity. It is more cost-effective to prepare a report that successfully demonstrates the WWTP has greater capacity than its permitted capacity than to physically construct additional capacity.

Assessment of Capacity

The existing collection system will receive flow from all projects identified in the Pound River watershed. The Bold Camp Sewer Project - Phase II will discharge into the existing 10-inch interceptor that conveys flow from Red Onion Correctional Center. The two Indian Creek projects (conventional and effluent sewer) will discharge into an 8-inch interceptor along Indian Creek Road. The North Fork sewer project and both phases of the South Fork sewer project will discharge into the 8-inch interceptor along South Fork Road. The Wise County IDA funded an extension of this line to an industrial site at the intersection of U.S. Route 23 and South Fork Road. The collection system capacity appears to be sufficient to handle the flow from the proposed projects. Regular maintenance and funding for replacement of older collection lines should be pursued in order to support reduction in system I&I and maintain the system in good working condition.

Potential Improvement Projects for the Existing Treatment Facility

Several potential improvements for the Pound WWTP that may accommodate improved treatment and increased capacity include ultraviolet disinfection, flow equalization, and additional clarification. Within five years, the regulatory agency is expected to encourage installation of ultraviolet disinfection technology to replace the chlorination disinfection process currently used. An approximate cost for this is \$150,000. Increased flow due to precipitation events could be attenuated in a flow equalization basin at the WWTP. An equalization basin could be sited in the parking lot of the WWTP. This location is adjacent to the preliminary

treatment operations portion of the WWTP and would minimize site piping. An approximate cost to design and install this basin is \$200,000, dependent upon geotechnical conditions. There is available space at the WWTP to site a third clarifier if needed to increase capacity, at an approximate cost of \$175,000.

Capacity Available for Identified Collection System Projects

In Chapter III of this report, five collection system projects were identified that, when completed, would deliver a total flow of 216,000 GPD (0.252 MGD) to the Pound WWTP for treatment. An additional 36,000 GPD flow is anticipated from the Bold Camp Sewer Project - Phase I, which has not been constructed. This increases expected flow to 252,000 GPD. The average flow per project is 36,000 GPD, with flows ranging from 21,400 GPD (South Fork Effluent Sewer Project – Phase I) to 45,000 GPD (Indian Creek Effluent Sewer Project). Preparation of plans to expand plant capacity is required by the regulatory agency, Virginia Department of Environmental Quality, when average daily flow exceeds ninety-five percent of the capacity for three consecutive months. This action level is 0.475 MGD for the Pound WWTP. Therefore, without any modification of treatment capacity or reduction in I&I from the current 0.33 MGD, three of the five projects could be installed without modification to the existing facilities.

If eighty percent of excessive I&I is removed through the I&I reduction program proposed to initiate in 2009, four of the five collection system projects identified in the Pound River Watershed could be installed without modification. Even with the additional flow from these projects, the total flow to the WWTP would remain below the action level of 0.475 MGD. Flow from the fifth project would increase the flow to the WWTP slightly more than the permitted capacity. Prior to construction of that project, the capacity of the WWTP would be increased to accommodate the flow. Addition volume in the wet well of the Pound Lift Station could be installed to attenuate surges due to I&I from rain events.

Several actions are recommended to address wastewater needs in the Pound River Watershed of the County. Wise County should prioritize the proposed sewer projects in the Pound River watershed and proceed to secure funding, design, and construction. The operator of the Pound facilities should pursue the I&I reduction program scheduled for 2009. A detailed capacity assessment of the Pound WWTP should be completed and, if supported by the report,

a request made to DEQ to increase the capacity of the WWTP above its current 0.5 MGD. A detailed evaluation of older existing collection lines in the system should be completed, including a cost-benefit analysis for replacing selected lines. This would be followed by a prioritized listing and schedule for replacing selected lines.

Powell River Wastewater Treatment Plant Project

Description

The Powell River WWTP is a new proposed plant that has been identified by Wise County as a possible project that would be worth pursuing. The plant would be located in the upper portion of the Powell River watershed in the Blackwood community just west of the City of Norton. It would provide several benefits toward meeting the wastewater needs of Wise County, including the following:

- A Wise County wastewater treatment facility for the county's Blackwood Industrial Park and for the county landfill, plus county residents in the upper Powell River watershed area, including the communities of Dorchester, Thackers Branch, and Needmore (proposed Dorchester Sewer Project). The wastewater from these areas would be collected by gravity and treated at the new plant, rather than pumping it to the CNW Wastewater Treatment Plant, which would preserve both current and future capacity in the CNW plant.
- The new plant could receive wastewater from the proposed Hoot Owl Hollow Sewer Project, as well as the Josephine Sewer Project that is currently under design, again preserving future capacity in the CNW plant.
- Wastewater collected by the existing City of Norton sewer system in the western end of the city (that which originates in the Powell River watershed) could be treated at the new plant. This would eliminate the need for pumping, and further take a portion of the wastewater load off the CNW plant, thus preserving current capacity.
- If wastewater flow to the CNW plant continues to increase due to county growth and/or infiltration/inflow from existing systems, and a major plant expansion is the only solution, a new Powell River WWTP provides another option for Wise County. A pumping system located on the Guest River could pump wastewater collected from the proposed Esserville/Stephens Sewer Projects a short distance over into the Powell River watershed, for transmission and treatment there instead of at the CNW plant. Other service areas in the Guest River watershed could benefit as well from such a pumping

arrangement.

- A couple of other benefits with a new treatment plant in the upper Powell are:
 - 1) The possibility of reuse of the plant effluent (with proper treatment) at the Mullican Lumber flooring plant in the Blackwood Industrial Park; and
 - 2) An increase in the stream flow of the Powell River from the plant's discharge. This would help the downstream towns of Appalachia and Big Stone Gap during drought emergencies, if they had to pump from the river to supplement their water supplies like they have had to do in the past. The existing inter-basin transfer of wastewater from the Powell watershed to the Guest watershed precludes this benefit.

Required Facilities

Preliminary sizing of the new plant indicates a design capacity of 0.5 million gallons per day (MGD) would be required. Approximately 17,000 linear feet (L.F.) of 12-inch gravity sewer line would be needed from the end of the proposed Dorchester Sewer Project downstream to a possible plant site in the Blackwood area. Treatment limits have not been determined for the new plant, but initial contact with the Virginia Department of Environmental Quality indicates advanced treatment would be required, particularly to meet ammonia limits. Very preliminary design work has been based on using a submerged membrane bioreactor (MBR) system as the treatment process.

Total Project Cost

A preliminary project cost for the 18,000 L.F. of 12" gravity interceptor sewer along the Powell River to the plant is \$2,000,000, and the 0.5 MGD treatment plant is estimated at \$4,000,000, for a total project cost of \$6,000,000 for the Powell River WWTP.

V. WASTEWATER SYSTEM MANAGEMENT ALTERNATIVES

Introduction

There are many important aspects associated with addressing the wastewater needs of Wise County. In addition to extending sewer service into areas of Wise County that are currently unserved, the existing collection and treatment facilities in the County must be maintained and operated. As a comprehensive wastewater plan for Wise County is developed, the approach taken to operate and manage wastewater facilities in Wise County is an important component. Wastewater collection and treatment operations need to be self-sustaining to the greatest extent possible. The management approach selected should optimize the allocation of available resources.

From a countywide perspective, among the many alternatives for managing wastewater operations, two basic alternatives were considered for the management of Wise County wastewater operations: the “Current Ownership” approach and the “Watershed Authority” approach. Several hybrid approaches that are variations of these two basic approaches are presented. The benefits and challenges associated with each alternative are described in this chapter, together with an overall assessment.

Alternative I. Current Ownership

The Current Ownership approach centers on the fact that existing facilities are owned, managed, and operated by (or for) existing political subdivisions in Wise County. As noted in the preceding chapter, there is a single major wastewater treatment facility in each of the three watersheds in the County. Those three wastewater treatment plants (WWTPs) will receive wastewater from the centralized sewer projects identified in this Amendment.

The CNW WWTP, with 4.0 MGD capacity, is owned by the Town of Coeburn, the City of Norton, the Town of Wise, and Wise County, and is operated by the CNW Waste Water Authority. This WWTP receives flow originating in the Guest River Watershed. Individual customer accounts are maintained by the respective locality (Towns of Coeburn or Wise, City of Norton, or Wise County).

The Big Stone Gap WWTP, with 4.0 MGD capacity, is owned and operated by the Town of Big Stone Gap and receives flow originating in the Powell River Watershed. Individual customer accounts are maintained by the Town of Big Stone Gap or the Town of Appalachia, respectively.

The Pound WWTP, with 0.5 MGD capacity, is owned by the Town of Pound and operated by Veolia Water, Inc., for the Town. The Pound WWTP receives flow originating in the Pound River Watershed, and all retail customers are customers of the Town. All customer accounts are maintained by the Town of Pound.

The Current Ownership management approach would continue existing management of existing facilities, with new collection systems, which are located outside of Town or City boundaries, owned and operated by the County or its designee, which could be the PSA, the owner of existing adjacent facilities, or a separate entity. Because wastewater received in new sewer collection systems will be conveyed through and treated by existing facilities, a key aspect of the Current Ownership approach is the importance to revisit existing inter-municipal agreements that address conveyance and treatment cost allocation, and to develop new inter-municipal agreements that address conveyance and treatment cost allocation in situations for which agreements do not exist.

There are several benefits from the Current Ownership approach. Funding agencies are strongly supportive of cooperative and inter-jurisdictional systems that utilize a regional solution to serve their stakeholders. Another benefit is that the existing knowledge base and experience base possessed by current management and operations personnel are of great value and would be difficult to replace in a change of management. The physical requirements to connect a new collection system to the existing facilities are known and easily implemented. If sufficient treatment and transmission capacity exist in available facilities, plans can be approved rapidly and with minimal effort. Addition of a new collection system would decrease fixed costs of the existing facilities.

In addition to the benefits noted above, there are challenges associated with the Current Ownership approach. One challenge is that the various stakeholders will not necessarily share common objectives on system priorities and expenditures. The current ownership of the

existing facilities may not have any interest to accommodate growth outside of its current service area. The driving force to implement corrective maintenance may be insufficient to achieve improvements needed to accommodate additional wastewater flow.

In the case of non-residential flow, there can be an inability or reluctance to enforce the pretreatment standards of the WWTP receiving the wastewater. The result is greater operational costs and potential issues of regulatory compliance that fall on the treatment works permit holder, but not necessarily the collection system operator.

Alternative 2. Watershed Authority

The manner that the Watershed Authority approach addresses the challenges associated with the Current Ownership approach is by consolidating ownership and operations of existing transmission and treatment facilities within each watershed to a newly created wastewater authority for that watershed. This would result in three separate wastewater authorities in Wise County.

The potential benefit resulting from establishing a separate wastewater authority within each watershed could have significant value. Most notably, this approach provides a framework to serve all the identified wastewater needs in a watershed. This will enable consistent progress on achieving Wise County's wastewater objectives as funding and other constraints allow. Support for prioritized wastewater projects by the stakeholders of other, subsequent projects can be sustained because a management approach is established to accommodate those subsequent projects.

The Watershed Authority approach also delivers a unified, integrated wastewater system that can be aligned with County's efforts to allocate resources for economic development and infrastructure support. This avoids the difficulty that results when the goals of an existing service provider differ from the goals of other political subdivisions.

The economies of scale achievable by a Watershed Authority can result in improved performance and cost reductions. Another financial benefit is that the Watershed Authority would function as an enterprise fund. Utility service would be funded by rates and fees that cover actual cost of operation. This may lead to rate increases initially, but full cost accounting,

including funding of depreciation, results in operations that are self-sustaining and viable over the long-term.

The major challenge to implementing the Watershed Authority approach is the difficulty in obtaining the concurrence and participation of the ownership of the existing facilities. Owners of the existing wastewater facilities may be reluctant to cede control over growth that is inherent in providing wastewater services. Additionally, employees of the current wastewater systems in Wise County often maintain additional duties outside of their wastewater work. A concern over disrupting these employees or losing their contributions toward other public works functions could dissuade the current owners from participating in a Watershed Authorities approach.

Current owners may have funded operations through a combination of user rates and general funding of the locality, rather than as an enterprise fund. This resulted in the locality having established equity through taxes rather than user fees (and justifies use of different rates for residents inside and outside of the locality).

One additional challenge is the role of inertia in modifying management approach. Until sufficient benefits and motivations develop to drive a change in management approach, the Current Ownership approach will continue.

Hybrid Management Alternatives

Hybrid management alternatives are similar to either of the two basic management approaches described above, with specific modifications as noted below. From the many hybrid alternatives, this Amendment has considered four particular hybrid management approaches. The hybrid approaches described in this section are Single Authority approach, Decentralized Systems Authority approach, Private Operations approach, and Public Service Authority Operations approach.

The Single Authority hybrid approach differs from the Watershed Authorities approach by having a single authority ownership of the facilities in the three watersheds in the County, rather than three separate authorities. A Single Authority approach could be more streamlined and less bureaucratic than the Watershed Authorities approach. This would enable consistency

of purpose throughout Wise County, as well as more rapid responsiveness to Wise County initiatives.

Another benefit is opportunity for efficient use of resources through sharing specialized equipment throughout Wise County, rather than three separate authorities owning and maintaining redundant equipment, such as vacuum trucks, sewer jets, emergency pumps, portable generators, and visual line inspection equipment. A Single Authority would have greater resources to address emergencies and operational needs.

A challenge with implementing this approach is that establishment of a single authority will require more effort than establishing separate authorities in the separate watersheds. The concept of a Watershed Authority may be embraced more strongly in a particular watershed. Current owners of transmission and treatment facilities in a specific one of the three watersheds may be more receptive to working with a wastewater authority that serves their area than an authority whose responsibilities are Countywide.

The Decentralized Systems Authority approach addresses the need to operate and manage existing and proposed decentralized wastewater systems in the County. Due to their small size and geographical disbursement, decentralized systems often lack sufficient operational resources or are relegated to a low priority when included under the direction of a larger agency. A Decentralized Systems Authority would focus exclusively on decentralized systems and could develop operational expertise and strengths. This approach could be combined with the Private Operations approach described below to provide.

Private Operations approach is a hybrid approach to operations that can be utilized in conjunction with various management formats. In this hybrid approach, the operations of the wastewater facilities are conducted by a private contractor, rather than the owner. This approach can be further modified by management to include only selected portions of operations.

The most beneficial aspect of this hybrid approach is the potential for more cost-effective operations. Another benefit is maintaining operational competence and required regulatory compliance for licensed operators. This can be a challenge for a smaller facility if a licensed operator becomes disabled or leaves for another position.

One challenge for the public utility is to explicitly identify the expectations and performance standards in its contract with a private operations contractor. This includes provisions to implement a remedy if the contract is not fulfilled.

The Pound WWTP is operated currently by a contracted private operations firm, and the Town of Coeburn is initiating having a private contractor operate its public works functions.

A fourth hybrid management approach is the **Public Service Authority Operations approach**. The Wise County PSA operates an extensive drinking water treatment and distribution system. PSA personnel have extensive operational experience and resources, which could provide the framework for operations under various management approaches, such as a Decentralized System Authority or Single Authority. Because the PSA already is chartered and established, its management umbrella could accommodate the responsibilities for a wastewater authority.

One challenge is an assessment whether the present relationship between the PSA and other wastewater service providers in Wise County strengthens or inhibits the achievability of implementing any selected management approach. A related challenge is whether Wise County officials perceive that modifications to the PSA would be required to implement a countywide wastewater management approach, and if so, how readily those modifications could be implemented.

VI. CONCLUSIONS

Conclusions and Recommendations

The 2009 Wise County Wastewater Study developed the Wise County projects identified in the 2005 Southwest Virginia Regional Wastewater Study. Collection system projects are described, the ability of existing infrastructure to convey and treat the wastewater is analyzed, and alternatives for wastewater management in Wise County are reviewed. Conclusions for each of these three aspects are presented in this section, followed by specific recommendations.

Collection System Projects

This Study describes twenty-five potential wastewater collection system projects in Wise County that had been identified in the 2005 Southwest Virginia Regional Wastewater Study. In the aggregate, it is projected that 9,929 residents could be served through these projects, at a total projected cost of \$76,600,000. Thirteen projects are located in the Guest River watershed of Wise County, six projects in the Powell River watershed, five in the Pound River watershed, and one project is in the Clinch River watershed but could be treated by facilities in the Guest River watershed.

At the time of the preparation of this Study, the Town of St. Paul was developing a wastewater planning study that would address additional projects in the Clinch River watershed area of Wise County. Because wastewater collected in that watershed would be treated in the Town's facilities, potential projects in that portion of Wise County were not included in this report. However, information from the Town's study can supplement this Study as needed.

In addition, potential wastewater collection projects not described in the 2005 Study have been noted. These include the Rockbar Sewer Project, Birchfield Heights Sewer Project, Mill Creek Sewer Project, and the Powell River WWTP Project. As needs throughout Wise County are identified, additional projects to address those needs should be developed and integrated with the information contained in this report.

The collection system projects should be constructed as funding permits. Several proposed projects are required to be completed in order to serve additional projects, and this will impact the sequence in which selected projects are completed.

Transmission and Treatment Capacity Needs

Existing wastewater interceptors (main transmission lines) that will transfer wastewater from the new collection systems to the existing regional wastewater treatment plant (WWTP) in each watershed have sufficient capacity to convey new flow as well as existing wastewater if inflow and infiltration (I&I) of stormwater and groundwater is not excessive. The Town of Big Stone Gap has received grant funds to continue its I&I reduction, the City of Norton has received funding to replace a portion of its main interceptor, and the Town of Pound is initiating an I&I reduction project.

As long as I&I is not excessive, the CNW WWTP and the Big Stone Gap Regional WWTP have sufficient capacity to treat wastewater from the identified projects in the Guest River watershed and the Powell River watershed, respectively. The CNW WWTP needs to reduce excessive I&I by 0.5 MGD, and the Big Stone Gap Regional WWTP needs to reduce excessive I&I by 0.28 MGD. Reduction of 0.08 MGD excessive I&I at the Pound WWTP in the Pound River watershed would provide capacity for four of the five collection system projects identified for that watershed. Sufficient capacity for the fifth system may be available in the existing treatment facilities. An assessment documenting that available capacity in the Pound WWTP exceeds the permitted capacity, or a greater reduction in excessive I&I could provide treatment capacity necessary for the fifth collection project in that watershed.

Management Alternatives

Achieving wastewater service in areas in Wise County that are currently unserved by public facilities is complex. Much of Wise County lies in the headwaters areas of three separate watersheds. Current wastewater service is provided by the Towns of Appalachia, Big Stone Gap, Coeburn, Pound, and Wise, the City of Norton, the Wise County PSA, and the CNW Waste Water Authority. In addition, the Town of St. Paul provides wastewater service in the portion of Wise County adjacent to the Town, located in the Clinch River watershed.

Most areas in need of wastewater service will connect to existing facilities for transmission and treatment of wastewater. Because existing facilities are owned and operated by the providers listed above, continuing the existing management of existing facilities would facilitate pursuit of several collection system projects to secure funding. Inter-municipal agreements should be developed as needed, and existing inter-municipal agreements reviewed and modified appropriately. In the long-term, by developing a wastewater authority for each watershed, Wise County would accommodate effective implementation of all projects, provide for service areas and economic development outside of municipality boundaries, and establish true-cost wastewater service funded by rate payers, rather than subsidized by general funds of the localities. The watershed authority approach will provide economies of scale resulting in more efficient operations.

Regional cooperation is the critical aspect to securing funding for wastewater projects in Wise County. Regional management of wastewater systems will enhance funding opportunities.

Specific recommendations are presented:

- Utilize regional cooperation to address the unmet wastewater needs of Wise County. Regional systems will receive funding more readily than individual systems. The County is encouraged to form a Wise County Regional Wastewater Task Force that includes a representative from Wise County, the Towns of Appalachia, Big Stone Gap, Coeburn, Pound, St. Paul, and Wise, the City of Norton, the Wise County PSA, the CNW Waste Water Authority, and the LENOWISCO Planning District Commission. The Task Force should meet regularly, either monthly or quarterly, as needed to share information, coordinate funding, and develop necessary regional cooperation.
- Pursue all avenues of project funding to the greatest degree possible. Because selection criteria differ among funding agencies and programs, evaluate the level of resident support for projects prior to their submission for funding.
- Commit resources toward removal of excessive I&I from existing systems. Install flow measurement equipment at each point where wastewater is transferred from one collection system to another system to identify excessive I&I. Where practical, include

funding needed to address excessive existing I&I as part of requests to fund proposed collection systems.

- Proceed with current management of existing systems. Review and modify existing inter-municipal agreements as appropriate and develop new agreements as needed. Over time, implement management of wastewater activities in each watershed through a separate authority. This will require the coordination between Wise County and the existing ownership of facilities. Establishment of a separate wastewater authority would not be expected to occur simultaneously in all three watersheds.