GTUA

GREATER TEXOMA UTILITY AUTHORITY

TEXAS WATER DEVELOPMENT BOARD

REGIONAL WASTEWATER FACILITY STUDY FOR THE CITIES OF DENISON AND POTTSBORO

REPORT

July 2005

ALAN PLUMMER ASSOCIATES, INC.

ENVIRONMENTAL ENGINEERS - DESIGNERS - SCIENTISTS

in association with

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TABLE OF CONTENTS

	Page
List of Tables	ii
List of Figures	iii
Executive Summary	ES-1
Chapter I – Introduction	I-1
Background	I-1
Project Scope	I-2
Chapter II – Population and Flow Projections	II-1
Background	II-1
Chapter III – Preliminary Assessment of Site-Specific Permitting Issues	III-1
Evaluation of Discharge Locations	III-1
Little Mineral Creek Arm of Lake Texoma	III-1
Unnamed Tributary that Flows Through Hagerman National Wildlife Refuge	III-3
Scott Branch	III-4
Red River Below Lake Texoma	III-5
Other Considerations	III-5
Conclusions	III-6
Chapter IV – Economic Evaluation of Collection System Costs for Alternative Sites	IV-1
Evaluation Criteria	IV-1
Option 1: Preston Harbor Development Site	IV-2
Option 2: Regional Treatment Facilities at Existing Pottsboro Plant Site	IV-4
Option 3: Regional Facility (Northwest of Grayson County Airport)	IV-8
Option 4: Regional Treatment Facilities on Scott Branch	IV-11
Site Selection	IV-14
Chapter V – Treatment Process Evaluation	V-1
Existing Pottsboro WWTP	V-1
Proposed Regional Facility at the Northwest Grayson County Airport Site	V-9
Conventional, Mechanical Treatment System for the Regional Facility	V-9
Natural Treatment System for the Regional Facility	V-14
Remote Effluent Discharge and Reuse System Considerations	V-14
Summary	V-16
Chapter VI – Conclusion and Recommendations	VI-1

Appendix A - Natural Treatment Systems - General Discussion
Appendix B -TCEQ Meeting Minutes
Appendix C - USFWS Meeting Minutes

LIST OF TABLES

Table No.	Description	Page
ES-1	Summary of Projected Timing and Capital Costs	ES-5
II-1	Population Projections of Major Cities Including Grayson County	II-3
II-2	City of Pottsboro Populations and Flows	II-3
II-3	Drainage Basins and Projected Population	II-6
II-4	Drainage Basins and Projected Design Flows	II-6
II-5	Drainage Basins and Projected Peak Flows	II-7
IV-1	Opinion of Probable Collection Cost for Option 1	IV-6
IV-2	Opinion of Probable Collection Cost for Option 2	IV-10
IV-3	Opinion of Probable Collection Cost for Option 3	IV-11
IV-4	Opinion of Probable Collection Cost for Option 4	IV-13
IV-5	Cost Comparison and Ranking	IV-14
V-1	Opinion of Probable Project Cost	V-19
VI-1	Summary of Projected Timing and Capital Costs	VI-3

LIST OF FIGURES

Figure No.	Description	Page
ES-1	Regional System Facilities for Recommended Option	ES-2
ES-2	Summary of Projected Schedule	ES-6
I-1	Drainage Basins	I-3
II-1	Study Area and 2000 Census Blocks	II-2
II-2	Natural Drainage Basins	II-4
II-3	Historical Flows 1998-2003 (Freese and Nichols)	II-5
IV-1	Drainage Basins and Four Potential Sites	IV-3
IV-2	Sewage Collection System for Site 1 (Option 1)	IV-5
IV-3	Sewage Collection System for Existing Pottsboro WWTP Option 2)	IV-7
IV-4	Sewage Collection System for Northwest GCA Site (Option 3)	IV-9
IV-5	Sewage Collection System for Potential Site 3 (Option 4)	IV-12
V-1	Process Flow schematic for Existing Pottsboro WWTP	V-3
V-2	Site Layout for Existing Pottsboro WWTP	V-4
V-3	Process Flow schematic for 0.9 MGD Facility	V-6
V-4	Site Layout for 0.9 MGD Facility	V-7
V-5	Site Layout for 2.0 MGD Facility	V-8
V-6	Process Flow schematic for 2.0 MGD Facility	V-11
V-7	Process Flow Schematic for Conventional Treatment Plant for First Phase	V-12
V-8	Site Layout for Proposed Consolidated Regional WWTP	V-13
V-9	Process Flow Schematic for Natural Treatment Plant for First Phase	V-15
V-10	Treated Effluent Discharge Locations for Existing Pottsboro WWTP	V-17
V-11	Treated Effluent Discharge Locations for Northwest GCA Site	V-18

EXECUTIVE SUMMARY

The Cities of Denison and Pottsboro recognize the potential for significant commercial and residential development along the shore of Lake Texoma in areas generally west of the City of Denison. Residential growth in Pottsboro, the potential for commercial, residential, and industrial development in the area near the Grayson County Airport, and significant commercial and residential developments planned in the Little Mineral Creek area have suggested the need for planning for future wastewater services for these areas. The cities of Denison and Pottsboro jointly collaborated on this planning effort, with assistance and coordination provided by the Greater Texoma Utility Authority (GTUA), and with funding assistance provided by the Texas Water Development Board. The following is a synopsis of the conclusions of this evaluation.

1. Significant potential for development exists in the study area delineated in Figure ES-1. It is projected that, within the next 50-60 years, the entire study area could produce wastewater flows averaging approximately 7 MGD.

2. The study area encompasses a relatively large geographic area (possibly larger than Denison's current wastewater service area), but with a low initial population density. This fact, coupled with the fact that the study area drains into six different watersheds, will dictate a regional collection network that will be more expensive than would be expected in more densely populated areas.

3. It has been determined during the study period that the City of Pottsboro's existing wastewater treatment plant, while currently near capacity, can likely be permitted and expanded (in phases) to a future capacity of approximately 2.0 MGD. This site is believed to be the most economical and expeditious location for providing wastewater treatment services to the City of Pottsboro and to areas within the City of Denison's Certificate of Convenience and Necessity (CCN) lying within the peninsula to the east of the Little Mineral Arm of Lake Texoma. However, permit

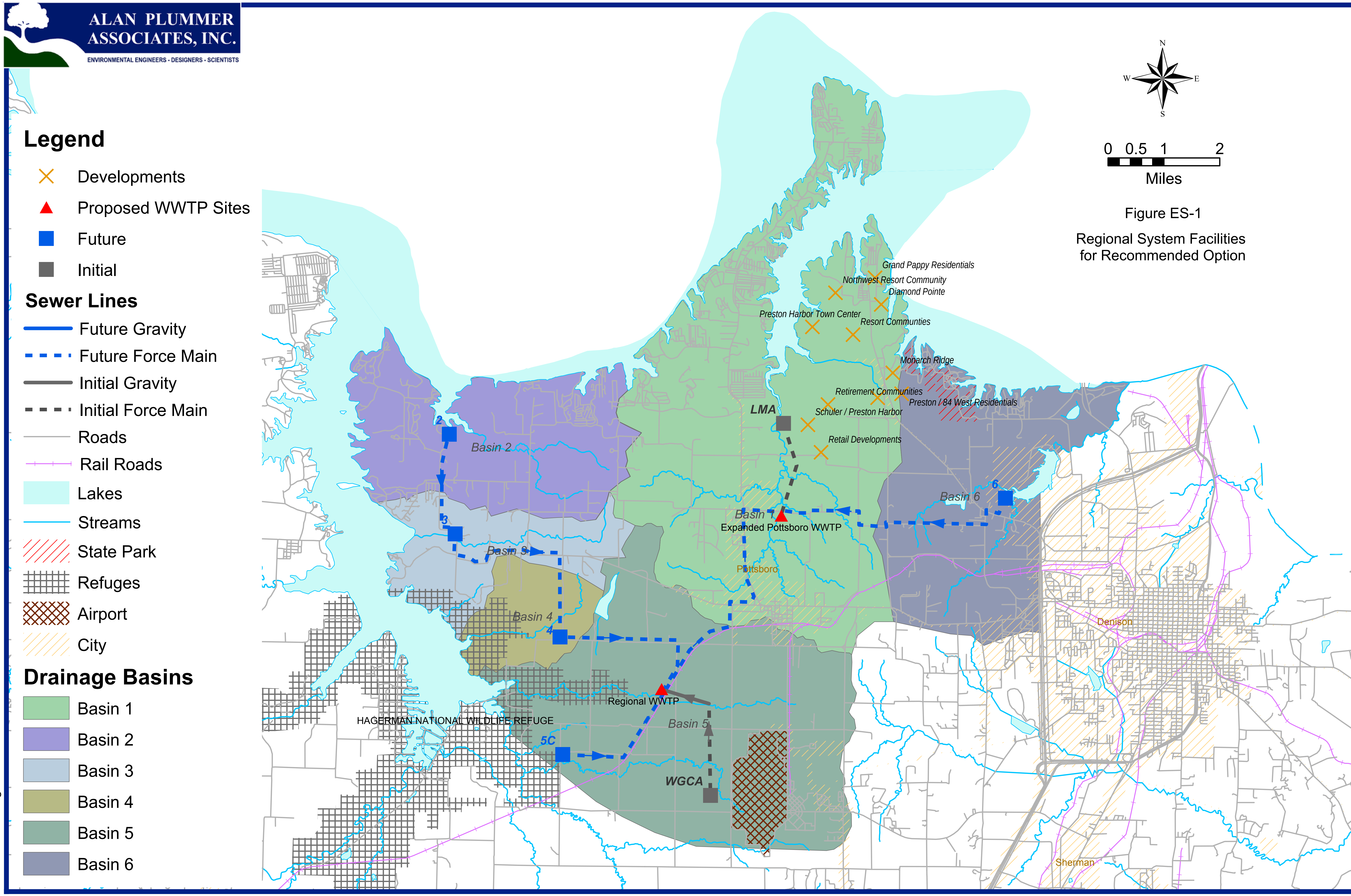

Figure ES-1

Regional System Facilities for Recommended Option

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limits and land availability suggest that this site may not be appropriate for growth beyond a 2 MGD capacity.

4. Consistent with planning conducted in 2000, it is recommended that actions be initiated for land acquisition and permitting for a future “regional” wastewater treatment plant to be located along the southwestern boundary of the study area, west of the Grayson County Airport. It is suggested that this treatment system be initially designed for 0.9 MGD, but that sufficient land be acquired to preserve options for future treatment capacity of up to 7 MGD. If permitting difficulties make it necessary, it is anticipated that effluent from the regional facility would ultimately be pumped northward for discharge into Scott Branch, or to other portions of the study area for reclamation.

5. It is envisioned that the expanded Pottsboro plant site, depending on rate of development and reclaimed water demands in the study area, would serve as a "water factory" providing high quality treated effluent to golf courses and other potential reclaimed water users in its immediate vicinity and northward. On a long-term basis, it is recommended that the cities preserve the option to either continue discharging from the Pottsboro plant, use the Pottsboro plant for water reclamation for the northern and eastern parts of the study area, or pursue abandonment with pumping to the proposed regional plant site west of the Grayson County Airport.

6. Areas north and west of the proposed plant site near the Grayson County Airport would eventually be served, as population growth dictates need, by a linked system of force mains and lift stations located in individual drainage basins (Basins 2,3, and 4). Similarly, Basin 6 (The area lying between Denison and the Little Mineral peninsula) would be linked to the regional system as growth and demands justify construction of pipeline facilities.

Our opinion of probable capital costs for "regional" components of the proposed wastewater system to be initially constructed (prior to 2010) is approximately $16 million, expressed in 2005 dollars. Many of these improvements will be phased in over an extended period of time. Table ES-1 lists a proposed schedule and cost associated with the major components anticipated to be needed within the initial years of operation. Future components can be constructed as dictated by growth and demand in the service area.

At the time of this report, institutional arrangements between the Cities of Denison and Pottsboro, and/or other potentially interested agencies have not been finalized. It is assumed that while the Pottsboro WWTP remains in service, it will continue to be owned and operated by the City of Pottsboro. Discussions to date regarding the future Regional WWTP preliminary identify the City of Denison as the owner and operator of the plant, with the City of Pottsboro being a contract customer. These arrangements should be finalized as soon as possible, prior to any discharge permit application, land purchase, etc. Some economics of scale benefiting both cities may be available through a coordinated or "regional" operation arrangement rather than having each City own and operate independent systems. Figure ES-2 shows a suggested table for implementation of improvements.

TABLE ES-1
GREATER TEXOMA UTILITY AUTHORITY
REGIONAL WASTEWATER FACILITIES FOR THE CITIES OF DENISON AND POTTSBORO

SUMMARY OF PROJECTED PROJECT COSTS

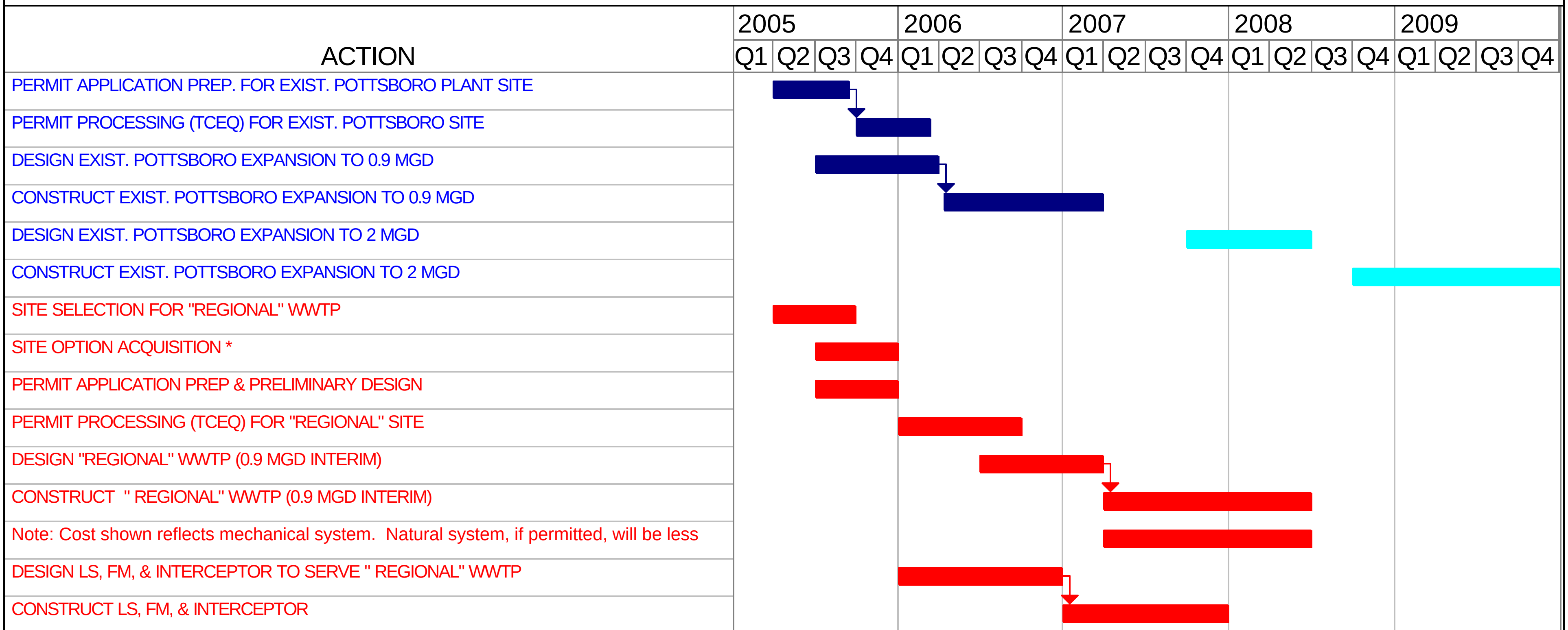
PRELIMINARY

ACTION	BUDGET (2005 $)
EXIST. POTTSBORO EXPANSION TO 0.9 MGD	$3,635,000
EXIST. POTTSBORO EXPANSION TO 2 MGD	$2,669,000
" REGIONAL" WWTP (0.9 MGD INTERIM)	$5,660,000
Note: Cost shown reflects mechanical system. Natural system, if permitted, will be less	
LS, FM, & INTERCEPTOR TO SERVE " REGIONAL" WWTP	$3,864,000
TOTAL OPINION OF PROBABLE COST	**$15,828,000**

Note: Costs presented above include 15% contingency, along with allowances for engineering, surveying, and land acquisition for major components. Costs associated with connection of the proposed Preston Harbor development to the Pottsboro treatment system are discussed in this report, but are not included in this table.

Prepared By Mark A. Perkins Texas PE 60329

FIGURE ES-2
GREATER TEXOMA UTILITY AUTHORITY
REGIONAL WASTEWATER FACILITIESFOR THE CITIES OF DENISON AND POTTSBORO
SUMMARY OF PROJECTED SCHEDULE
PRELIMINARY



Project: ES-2

CHAPTER I

INTRODUCTION

The Cities of Denison and Pottsboro, with coordination by the Greater Texoma Utility Authority and with funding assistance from the Texas Water Development Board, have entered into this study to identify wastewater collection and treatment facilities needed for areas lying generally west of Denison. The study area boundaries generally encompass the City of Pottsboro, the Grayson County Airport, and essentially all currently-unsewered land between Denison and the Big Mineral Arm of Lake Texoma. The City of Denison operates an aging wastewater treatment system at the Grayson County Airport; the City of Pottsboro operates a plant north of Pottsboro along Little Mineral Creek. Neither system is currently sized to handle long-term growth anticipated in the area. The cities desire a plan to provide wastewater service to the entire study area.

Background

Significant growth is expected within Grayson County over the coming years. Among the major drivers for this anticipated growth are a large private development along the east side of the Little Mineral Arm of Lake Texoma, expansion plans at the Tanglewood development, TxDOT's plans to extend S.H 289 further north, and commercial development planned along the western portion of the airport property. In turn, these drivers are anticipated to encourage further development at the Airport and other areas. Much of this anticipated development lies within the CCNs of the Cities of Denison and Pottsboro. Recognizing the need for wastewater facilities to accommodate this growth, the Cities of Denison and Pottsboro entered into this cooperative agreement to explore the possibility of forming a regional wastewater system to serve these areas of anticipated growth. A regional approach offers the possibility of distributing infrastructure costs over a larger rate base and consolidating certain operations. A major objective of this study is to define recommended components of a regional wastewater system, identify the costs for these components, and develop a preliminary implementation plan.

The Greater Texoma Utility Authority (GTUA) agreed to coordinate this the study for Denison and Pottsboro, and was responsible for coordinating Texas Water Development Board funding to assist with the study. Freese and Nichols, Inc. served as a sub consultant.

The area studied under this project (Figure I-1) comprises the northwest part of Grayson County including the Grayson County Airport and the surrounding area, the City of Pottsboro, a portion of Hagerman Wildlife Refugee, developments on the shores of Lake Texoma, and the northwestern part of the City of Denison.

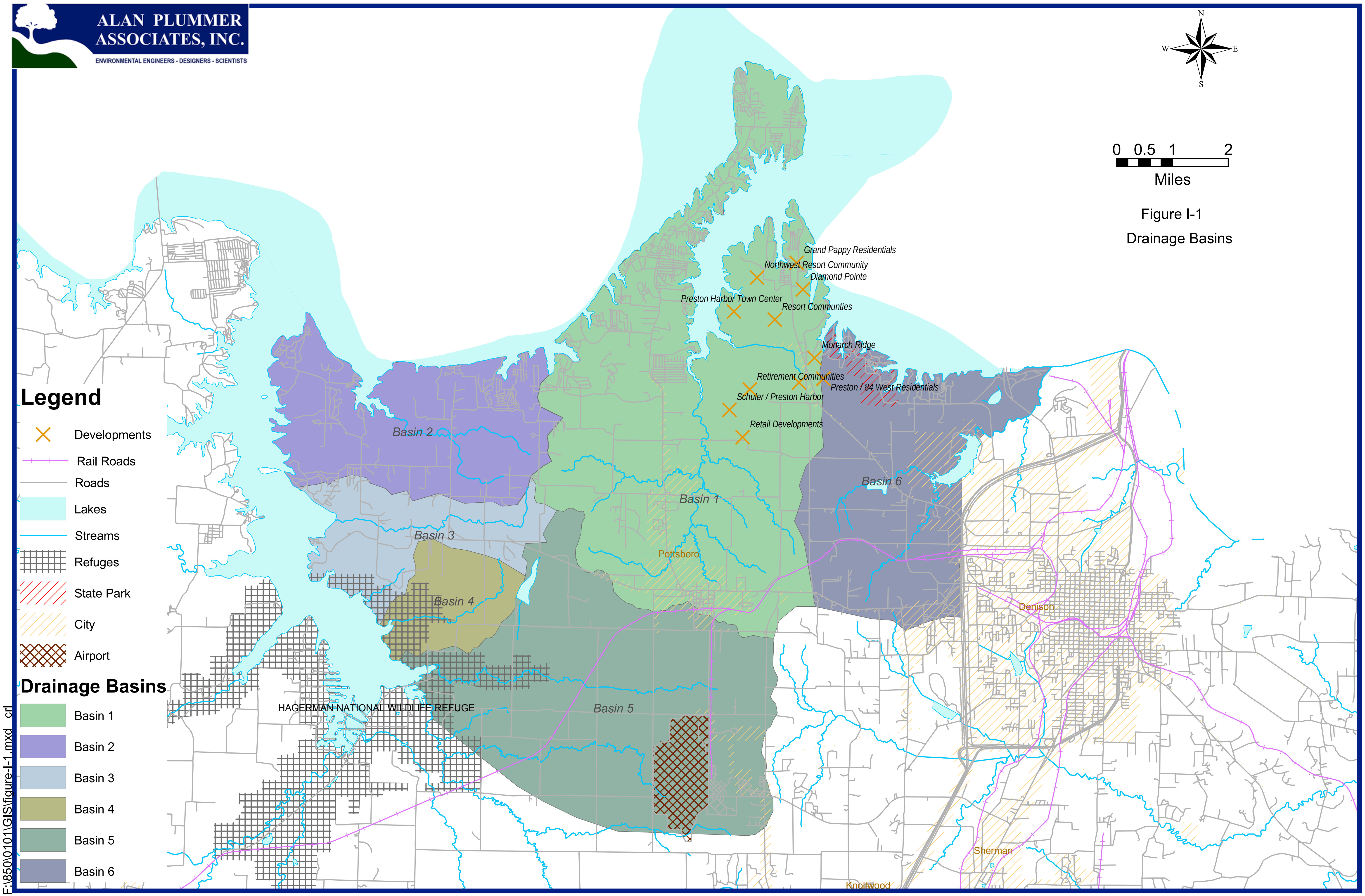
The current capacities of the existing Pottsboro Wastewater Treatment Plant (WWTP) and the Grayson County Airport WWTP are 0.35 million gallons per day (MGD) and 0.4 MGD, respectively. The combined capacity of both of the plants is inadequate to treat current flows from the entire study area, and the plants may not be in ideal locations to accommodate future growth. The existing developments at the Lake Texoma shores utilize individual septic tank systems for sewage disposal.

Several major issues have been considered in this evaluation. The major issues include potentially stringent permit limits at specific discharge locations, plus challenges associated with the fact that the study area naturally drains several different directions.

Project Scope

The scope of work includes of the following:

- Analysis of Existing Wastewater Systems:
    - Review Population and Flow Growth and
    - Delineate Sewershed in the study area.
- Master Planning and Flow Projections:
    - Estimating population and flow projections through the year 2060,
    - Identifying up to four locations for the potential regional wastewater treatment plant site for the study area, and
    - Studying selected sites from a feasibility perspective.



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- Wastewater Discharge Permit Assessment:
  - Anticipating future permit limits and
  - A Preliminary Assessment of Critical Issues that might make permitting difficult or impossible at selected locations.
- Wastewater Treatment Alternatives:
  - Selecting preliminary sites for potential regional wastewater treatment plant(s) and
  - Evaluating the feasibility of Natural and Conventional treatment processes.
- Detailed Alternative Analysis:
  - Planning treatment processes and
  - Recommending a suitable site and treatment process.

CHAPTER II

POPULATION AND FLOW PROJECTIONS

This chapter addresses the historical population information for Grayson County, the drainage basins comprising the study area, the population and flow projections for each drainage basin.

Background

The study area generally lies between the City of Denison and the Big Mineral arm of Lake Texoma, and includes the City of Pottsboro, the Grayson County Airport, the Tanglewood area, and currently-undeveloped land slated for significant residential development. Figure II-1 shows the boundaries of the study area and the year 2000 census blocks.

Using the spatial information available on the Environmental Systems Research Institute (ESRI) website, the study area is divided into the drainage basins according to their natural topography. This delineation helped to configure and classify the sewage lines, as gravity and force main, throughout the study area and identify the potential locations, if necessary, for wastewater treatment facilities.

Year 2000 census and population projections for Grayson County were obtained from the Texas Water Development Board (TWDB) website. The TWDB website also lists the population projections for Grayson County through the year 2060. The population projections in the study area are calculated by applying the growth coefficients used for the entire Grayson County.

Table II-1 shows the population projections of the major cities and Grayson County as a whole.

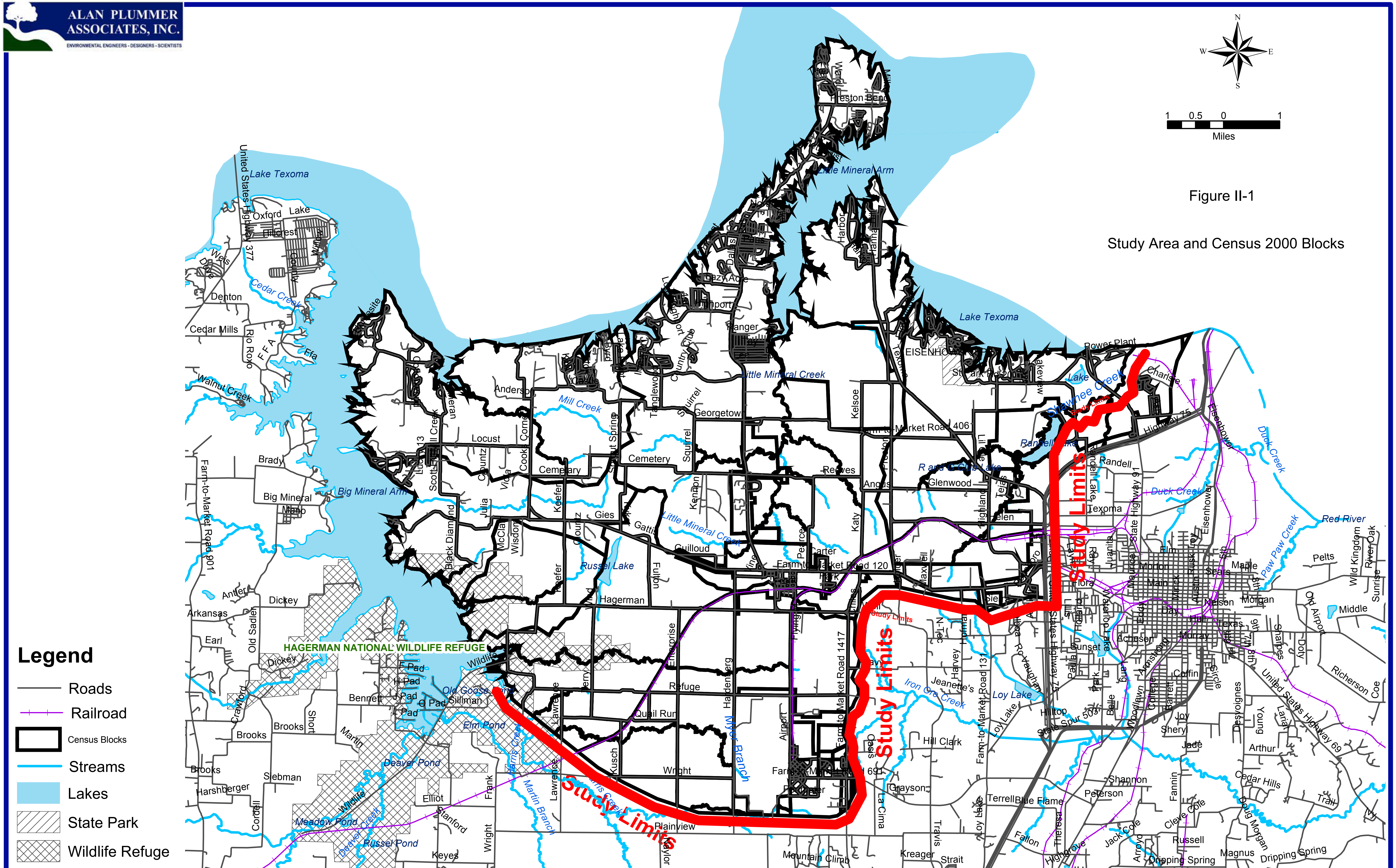

Figure II-1

Study Area and Census 2000 Blocks

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Table II-1
Population Projections of Major Cities
Including Grayson County

City/Year	Population						
	2000	2010	2020	2030	2040	2050	2060
Sherman	35,082	39,300	44,400	50,600	57,700	67,000	80,000
Denison	22,773	25,000	28,000	30,000	31,000	32,000	33,000
Pottsboro	1,579	3,000	5,000	7,000	9,000	11,000	12,000
Entire Grayson County	110,595	133,913	163,711	188,537	208,936	230,413	253,568

Figure II-2 shows the study area divided into the natural drainage basins with the year 2000 census blocks. The population within each drainage basin is calculated and potential growth for the drainage basins is calculated by applying the growth coefficients for the entire Grayson County as previously mentioned.

The existing City of Pottsboro Wastewater Treatment Plant (WWTP) has a rated capacity of 0.35 million gallons per day (MGD). Table II-2 shows population projections and expected average daily flows through the year 2060 for the City of Pottsboro.

Table II-2
City of Pottsboro Populations and Flows

City	Population Projections[1]						
	2000	2010	2020	2030	2040	2050	2060
Pottsboro	1,579	3,000	5,000	7,000	9,000	11,000	12,000
Flow Projections[2] (MGD) =	**0.21**	**0.41**	**0.68**	**0.95**	**1.22**	**1.49**	**1.62**

[1] TWDB population growth coefficients for Grayson County are applied to the drainage basins.
[2] Wastewater produced per capita = 135 gallons per day per capita.

The Pottsboro WWTP was expanded to 350,000 gallons per day (gpd) in 1999/2000. After the plant expansion was placed into service, the City of Pottsboro began a program to locate and repair sources of inflow and infiltration (I&I). Around the same time the plant was placed in service, an underground utility contractor horizontally bored into a sewer main, causing a major

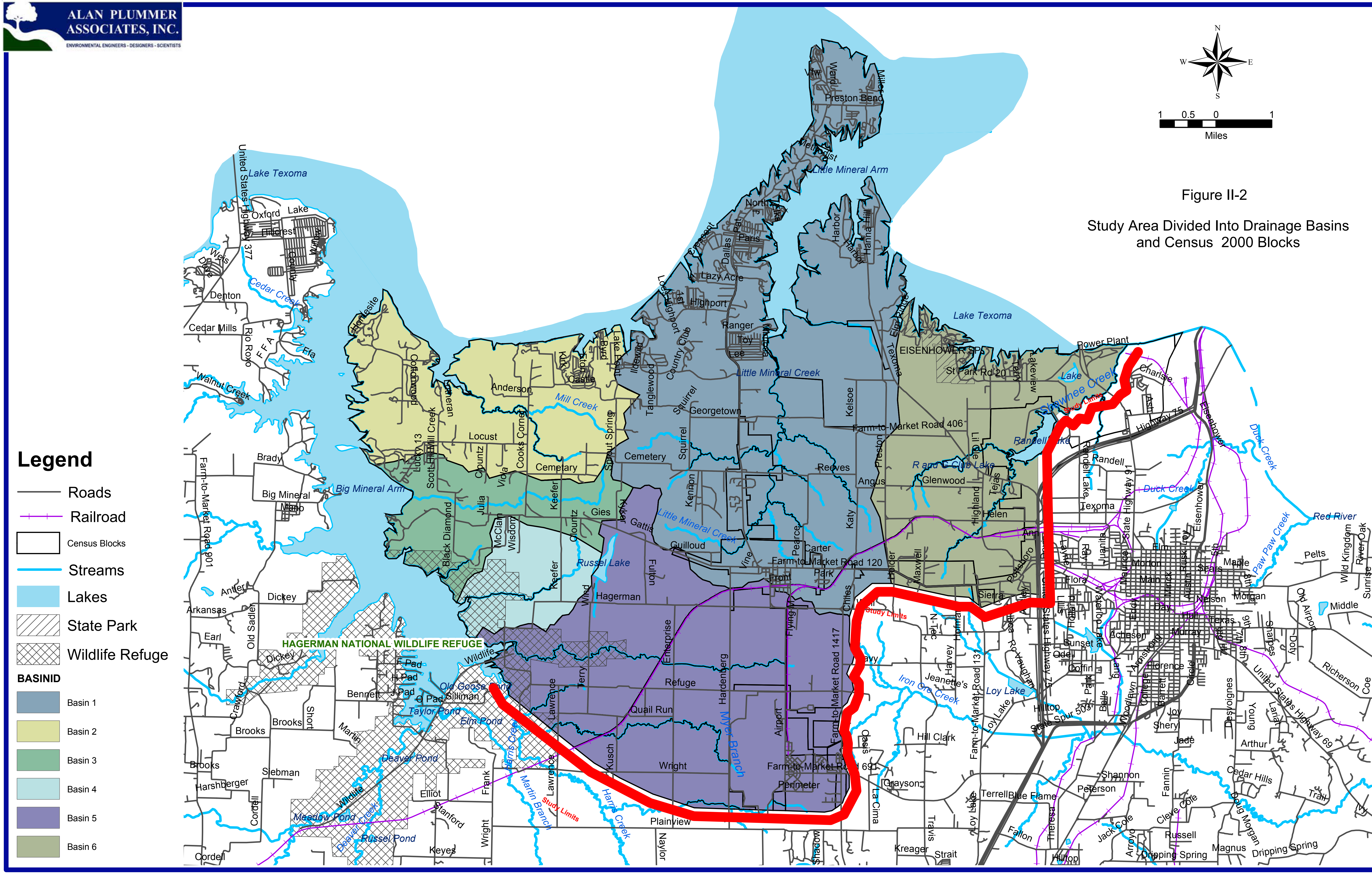
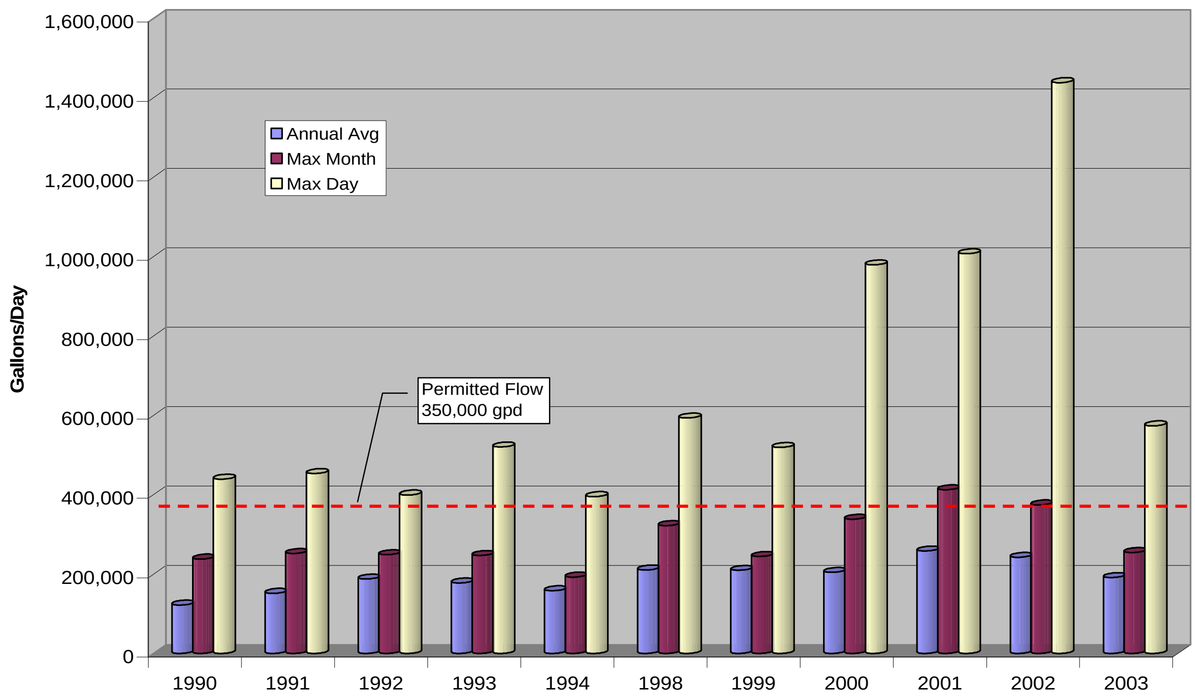


Figure II-2

Study Area Divided Into Drainage Basins and Census 2000 Blocks

F:\projects\8501\0101\GIS\figure-II-2.mxd ronl source of inflow. The damage was located and repaired in early 2003. The data clearly shows that repair of this major inflow source and other I&I elimination work has had a significant impact on the wet weather flows to the treatment plant. See Figure II-3.

Figure II-3
Historical Flows 1998-2003
City of Pottsboro Wastewater Treatment Plant



Discussion with the study participants regarding the study area and anticipated development is considered in calculating the projected flows. The projected population for each basin has been developed considering the anticipated private development plans in the study area. Projections for each basin are listed in Table II-3. Table II-4 shows the projected flows, which includes the flows from the anticipated development around the Grayson County Airport and the proposed Preston Harbor development, through the year 2060.

Due to lack of significant historical data, the peaking factor is assumed to be four per Texas Commission of Environmental Quality (TCEQ) standards, Chapter 317. The projected peak flows through the year 2060 are listed in Table II-5.

Table II-3
Grayson County Study Area
Basins and Projected Population

Basin ID	Population Projections[1]						
	2000	2010	2020	2030	2040	2050	2060
Basin 1	5,299	6,416	7,844	9,033	10,010	11,039	12,149
Basin 2	1,100	1,331	1,628	1,874	2,077	2,291	2,521
Basin 3	475	576	704	810	898	991	1,090
Basin 4	70	85	104	120	133	146	161
Basin 5	1,435	1,737	2,124	2,446	2,711	2,989	3,290
Basin 6	1,649	1,996	2,440	2,810	3,114	3,435	3,780
Tanglewood Development	0	1,000	2,000	2,000	2,000	2,000	2,000
Preston Harbor Development	0	2444	9926	9926	9926	9926	9926
Total Population =	10,028	18,031	36,695	38,946	40,795	42,743	44,842

[1] TWDB population growth coefficients for Grayson County are applied to the drainage basins.

Table II-4
Grayson County Study Area
Basins and Projected Design Flows

Basin ID	Design Flow Projections[1] (MGD)						
	2000	2010	2020	2030	2040	2050	2060
Basin 1[2]	0.72	1.20	2.40	2.56	2.69	2.83	2.98
Basin 2	0.15	0.18	0.22	0.25	0.28	0.31	0.34
Basin 3	0.06	0.08	0.10	0.11	0.12	0.13	0.15
Basin 4	0.01	0.01	0.01	0.02	0.02	0.02	0.02
Basin 5[3]	0.32	0.78	1.24	1.73	2.17	2.60	3.07
Basin 6	0.22	0.27	0.33	0.38	0.42	0.46	0.51
Total Flow =	1.48	2.52	4.29	5.05	5.70	6.36	7.07

[1] Flow Per Capita = 135 gallons per day

[2] Includes flow from Preston Harbor private development

[3] From APAI Grayson County Airport Master Plan Development Report October 2000.

Table II-5
Grayson County Study Area
Basins and Projected Peak Flows

Basin ID	Peak Flow Projections[1] (MGD)						
	2000	2010	2020	2030	2040	2050	2060
Basin 1[2]	2.86	4.78	9.60	10.24	10.77	11.32	11.92
Basin 2	0.59	0.72	0.88	1.01	1.12	1.24	1.36
Basin 3	0.26	0.31	0.38	0.44	0.49	0.53	0.59
Basin 4	0.04	0.05	0.06	0.06	0.07	0.08	0.09
Basin 5[3]	1.27	3.14	4.95	6.92	8.66	10.41	12.30
Basin 6	0.89	1.08	1.32	1.52	1.68	1.85	2.04
Total Flow =	5.91	10.08	17.18	20.19	22.79	25.44	28.29

[1] Peaking factor = 4.

[2] Includes flow from Preston Harbor private development

[3] From APAI Grayson County Airport Master Plan Development Report October 2000.

CHAPTER III

PRELIMINARY ASSESSMENT OF SITE-SPECIFIC PERMITTING ISSUES

During the course of the preliminary evaluation, four potential discharge locations have been identified, as described in Chapter 2. Each of these locations has been evaluated to determine the following:

- Is there a potential "fatal flaw" that could render the discharge location unacceptable for discharging effluent from a regional facility, based on permitting considerations?
- Are there, potentially, significant differences in the permit limits for discharges to the various locations?

To assist in making these determinations meetings were held with the Texas Commission on Environmental Quality (TCEQ) and U.S. Fish and Wildlife Service (USFWS). Minutes from the respective meetings are included in Appendix E and Appendix F. Following is a summary of the results of the evaluations.

EVALUATION OF DISCHARGE LOCATIONS

It has been determined that there may be significant differences in the ease with which a permit can be obtained and the possible stringency of permit limits at the four discharge locations. Following, potential permit concerns and possible permit limits are discussed for each location. The discharge locations are discussed in the order of increasing ability to obtain less stringent permit limits; i.e., the most unfavorable location is discussed first, and the most favorable location is discussed last.

Little Mineral Creek Arm of Lake Texoma

Several locations on the Little Mineral Creek, which discharges to the Little Mineral Creek arm of Lake Texoma, have been identified as potential discharge sites for a regional facility. The City of Pottsboro currently discharges treated effluent at one of the potential locations.

Depending on the ultimate flow anticipated at the regional facility, any of these potential locations could be problematic.

Recent water quality modeling performed by the TCEQ indicates that, for an effluent flow of 2.0 million gallons per day (MGD), an effluent set of 10 milligrams per liter (mg/L) for the 5-day Carbonaceous Biochemical Oxygen Demand ($CBOD_5$), 2 mg/L for ammonia- nitrogen ($NH\text{-}N_3$), and 6 mg/L for dissolved oxygen (DO) would be required. Consistent treatment of domestic wastewater to this level is generally achievable. However, as flows exceed 2.0 MGD, the limits for $CBOD_5$ and NH_3 quickly decrease to levels that are much more stringent. As flows approach 7 MGD, which may be a long-term requirement, $CBOD_5$ limits of approximately 5 mg/L and $NH\text{-}N_3$ limits below 2 mg/L would likely result. While currently available technology can achieve these treatment levels, it is more difficult to operate a treatment plant and consistently meet these limits.

There are other potential permitting issues associated with the Little Mineral Creek Arm. These issues are summarized as follows:

- Historically, the models used to predict the impacts of effluent discharges on receiving streams have been continually revised. As they have been revised, they have predicted a need for more stringent effluent quality limits. If this trend continues, effluent limits for even a 2.0 MGD discharge in this location could become very stringent.

- Due to the proximity of the discharge to Lake Texoma and the extent of recreational usage of the Little Mineral Creek Arm, nutrients are likely to be a concern in the future. The TCEQ is currently developing nutrient criteria for reservoirs. If nutrient limits were required for this permit, the potential Phosphorus permit limits could be between 0.5 mg/L and 1 mg/L. Although less likely, there could be a requirement to limit total nitrogen. A potential permit limit for total nitrogen is 10 mg/L

- The impacts of the discharge on bacteriological quality could be raised as a concern by the public, because of the amount of contact recreational use of the Little Mineral Creek Arm.

- Because the Little Mineral Creek Arm is popular for contact recreational uses, there is a significant probability that any proposal to increase the discharges to Little Mineral Creek will be protested by the public, and a public hearing will be required. A public hearing will increase the cost and the time required to obtain a permit, and can result in the imposition of unpredictable permit limits and conditions – or even a denial of the permit.

Due to uncertainties about future permit limits and requirements and the potential for public opposition, Little Mineral Creek and the Little Mineral Arm of Lake Texoma should be considered an unfavorable location for a proposed long-term discharge site for the regional facility.

Unnamed Tributary that Flows Through Hagerman National Wildlife Refuge

It may be possible to obtain a permit to discharge to the tributary to the Big Mineral Arm of Lake Texoma that flows through the Hagerman National Wildlife Refuge. There are currently two small discharges to this stream. However, the permit limits for a discharge to this stream may be relatively stringent, and there may be additional special requirements in the permit because of the presence of the refuge. Permit considerations associated with a discharge to this stream are as follows:

- The configuration of the cove where the tributary enters the lake is probably not as limiting as the configuration of the upper reach of the Little Mineral Arm. However, there is an area at the mouth of the tributary where a small cove is created by a weir constructed by the USFWS to improve duck habitat. Until there are cross-section measurements for this reach and a model is developed, it is not possible to confirm whether there are permit limits that will maintain the water quality standard for DO. It is possible that there are no permit limits that can be shown to maintain the existing standard. If so, it may not be possible to obtain a permit for a discharge to this stream. If limits are identified that achieve the water quality standard, it can be anticipated that they will be very stringent, perhaps at the following level:

$CBOD_5$ = 5 mg/L

NH_3-N = 1 mg/L

- Nutrients are not as likely to be a concern in the Big Mineral Arm as in the Little Mineral Arm because the primary uses of the Big Mineral Arm are fishing and bird habitat. Higher concentrations of algae are more acceptable for these uses than are generally acceptable for waters with significant contact recreational use. If any nutrient limitation is proposed, it would be for phosphorus, and it would not be expected to be more stringent than 1 mg/L.

- The USFWS is concerned that chlorination malfunctions or overdosages of chlorine could adversely affect fish and wildlife in the refuge. An ultraviolet (UV) disinfection system may be more appropriate than chlorination for a discharge at this location.

- The USFWS also is concerned that general plant malfunctions could release untreated or partially treated wastewater to the stream that would adversely impact the refuge. It may be necessary to address this concern by constructing a wetland between the treatment facility and the receiving stream to provide ongoing, natural backup treatment capability.

<u>Scott Branch</u>

Scott Branch also discharges to the Big Mineral Arm of Lake Texoma. The configuration of the cove receiving the flow from Scott Branch is the most favorable of any cove evaluated for this study. Possible permit limits for a discharge to Scott Branch are discussed below.

- Potential permit limits for $CBOD_5$ and NH_3-N cannot be precisely identified until site-specific data are obtained on the configuration of the cove, and a model is developed. However, the limits are expected to be in the following ranges:

  – $CBOD_5$ = 5 mg/L — 10 mg/L

  – NH_3-N = 1 mg/L — 3 mg/L

- This discharge location is the least likely to require nutrient limits due to both the configuration of the cove and the primary uses of the Big Mineral Arm of the lake.

Red River Below Lake Texoma

Based solely on permit considerations, this is the most favorable location for a discharge. Releases from Lake Texoma provide substantial base flow in the stream, which results in a stream with a large assimilative capacity. The seven-day average low flow with a recurrence interval of two years (the 7Q2 flow) in the Red River below Lake Texoma has been identified by TCEQ as 200 cubic feet per second (129 million gallons per day [MGD]).

The permit limit for a discharge to this reach of the river could be $CBOD_5$ = 20 mg/L. An NH_3-N limit may not be required, and there is no expectation that a phosphorus limit would be required.

If there are any potential problems associated with a discharge to the Red River, they would be of an economic or procedural nature. The configuration and flow variability of the Red River in this location may require special considerations when the outfall structure is designed.

The procedural issues will include determining how to coordinate with the State of Oklahoma. In this reach, the Oklahoma border is the southern bank of the Red River. Therefore, if the discharge is to the Red River, it would be a discharge to Oklahoma waters. At the present time, the States of Texas and Oklahoma have not resolved how to permit a facility that treats wastewater in Texas but discharges to Oklahoma waters. If this alternative were pursued, it would be desirable to evaluate discharging to Shawnee Creek, just upstream of the Red River confluence. An evaluation would be needed to determine a location that would be far enough upstream not to be subject to Oklahoma requirements, but not so far upstream that a requirement for rigorous permit limits would be triggered.

Other Considerations

Other considerations are the potential for a protest to the proposed permit and the potential impacts of inclusion on the List of Impaired Waters prepared by TCEQ pursuant to Section 303(d) of the Clean Water Act [303(d) List]. Each of these considerations is discussed briefly below.

Any time a new permit is proposed, there is a significant potential that there will be a protest from the public or from other government entities. When the plant site and discharge location are selected, land ownership adjacent to the plant site and below the discharge location should be determined. These landowners should be contacted and provided an opportunity to discuss the proposed project prior to the time they receive the mailed notice of the proposed permit or see the published notice in the newspaper. If there are concerns, it is better to resolve these concerns prior to issuing the notice of the proposed permit.

At the present time, the only one of the potential receiving waters that is on the 303(d) list is the Big Mineral Arm of Lake Texoma. The parameter of concern is bacteria. This type of listing typically does not affect permit limits or permit issuance because wastewater treatment plants provide disinfection. However, if a discharge location is selected such that the effluent ultimately flows to the Big Mineral Arm, the TCEQ 303(d) policies should be monitored periodically to verify they have not changed.

CONCLUSIONS

The two most preferable locations for effluent discharge from a regional facility are Scott Branch and the Red River below Lake Texoma. If a decision is made to discharge to the Red River, consideration should be given to locating the outfall on Shawnee Creek far enough upstream of the confluence of Shawnee Creek and the Red River such that the State of Oklahoma has no interest in the permit. A determination of how far upstream that would be has not been made.

A permit to discharge to the unnamed tributary that flows through the Hagerman National Wildlife Refuge is expected to have more stringent limits and more types of permit requirements than a permit to discharge to either Scott Branch or the Red River. Before a decision is made to pursue a request to discharge to this stream, additional study is needed to verify that permit limits can be identified for $CBOD_5$ and NH_3-N that will maintain compliance with the water quality standard for DO. It is possible that a permit cannot be obtained for this discharge location or that the permit limits will be very stringent.

The location considered to have the most limitations as a site for a long-term regional facility is Little Mineral Creek on the Little Mineral Arm of Lake Texoma. This is because of the configuration of the lake in this area, the extent of recreational development, and the types of recreational activities in that area. All of these factors can be expected to result in stringent permit limits, permit limits for more parameters, and a greater potential for protests when these are permit actions.

When a plant site and a discharge location are selected, adjacent and downstream landowners should be identified. They should be contacted prior to the time they receive a notice from TCEQ (or see the published notice in the newspaper) that a permit application has been filed. They should be given information on the project and provided an opportunity to identify their concerns. If possible, their concerns should be addressed before the notice is issued.

CHAPTER IV

ECONOMIC EVALUATION OF COLLECTION SYSTEM COSTS FOR ALTERNATIVE SITES

Four potential locations have been identified for potential regional wastewater treatment facilities. This chapter evaluates these four locations from an economic feasibility standpoint.

This evaluation presents unique technical challenges in that the study area is naturally drained by six or more natural watersheds, each going a different general direction. Furthermore, the relatively large geographic area encompassed, coupled with a low current population density, will make collection components more expensive than would be expected in more highly populated areas.

Evaluation Criteria

The following criteria were considered in selecting the preliminary locations for the consolidated regional WWTP location.

- Engineering Considerations
  - Gravity Flow/Force Main Requirements
  - Geology and Topography
- Zoning/Ownership of Adjacent Land
- Land Ownership/Availability
- Political and Regulatory Acceptance
  - Permitting Requirements
  - Local Land Use
- Environmental Issues
  - Wetlands
  - Wildlife Habitat
- Floodplain Designation
- Proximity to Potential Water Reclamation and Reuse Locations

Figure IV-1 shows the drainage basins and the four potential locations for the regional WWTP. These four locations are also compared to each other from a collection cost standpoint.
The following are assumptions made in planning the collection system components for the study area.

- Maximum Velocity thru a force main = 8 feet per second (fps)
- Minimum Velocity thru a force main = 2 fps
- Minimum Diameter for a force main = 6 inches
- Peaking Factor = 4
- C-Factor = 140

The opinion of probable collection cost only includes the major "regional" components of the collection system such as the pipes and lift stations, etc. The costs shown are based upon 2060 flow projections from the entire study area. In some cases, opportunities for phasing or "partial" implementation may be available.

Option 1: Preston Harbor Development Site

The proposed Preston Harbor site is located on property owned by a private developer who has communicated a plan for developing the property on the east side of the Little Mineral Arm of Lake Texoma. Historically, many developments around the lake have utilized septic systems to dispose of residential and commercial wastewater. The proposed development density will not likely support on-site disposal.

This site is considered desirable from an economic standpoint, as it can receive wastewater from half of drainage Basin No. 1 under gravity. The developer has preliminarily indicated that land could be made available for the potential treatment plant. Adjacent land is mostly reserved for residential housing and commercial development.

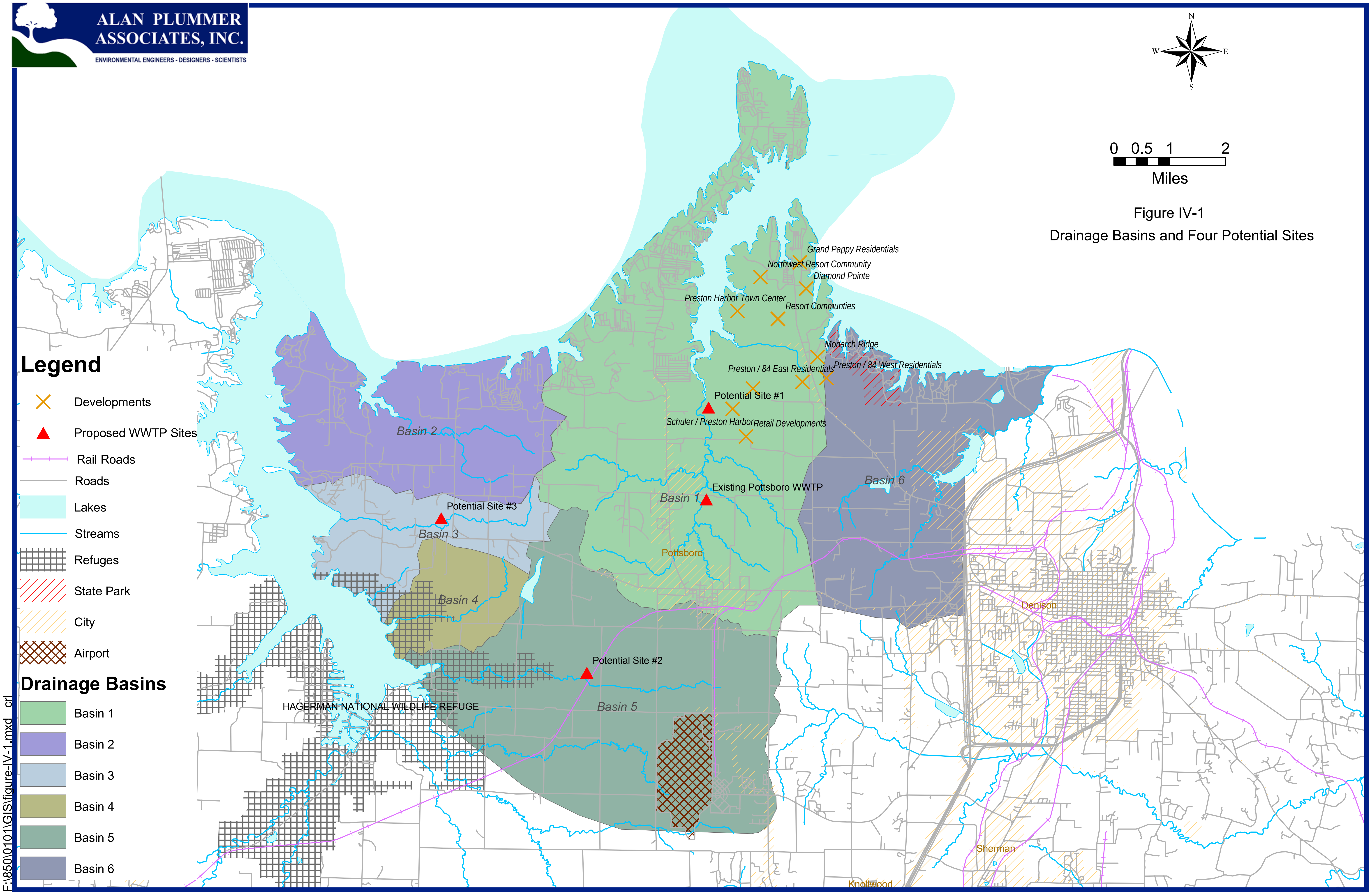

ALAN PLUMMER ASSOCIATES, INC.
ENVIRONMENTAL ENGINEERS - DESIGNERS - SCIENTISTS
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Figure IV-1
Drainage Basins and Four Potential Sites
Legend
Developments
Proposed WWTP Sites
Rail Roads
Roads
Lakes
Streams
Refuges
State Park
City
Airport
Drainage Basins
Basin 1
Basin 2
Basin 3
Basin 4
Basin 5
Basin 6
Grand Pappy Residentials
Northwest Resort Community
Diamond Pointe
Preston Harbor Town Center
Resort Communities
Monarch Ridge
Preston / 84 West Residentials
Preston / 84 East Residentials
Potential Site #1
Schuler / Preston Harbor
Retail Developments
Existing Pottsboro WWTP
Potential Site #3
Potential Site #2
Pottsboro
Denison
Sherman
Knollwood
HAGERMAN NATIONAL WILDLIFE REFUGE
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For this option, the collected raw wastewater from drainage Basin Nos. 2, 3, and 4 would be pumped to "Lift Station 5A" located in the drainage Basin No. 5 and then pumped to a high point to gravity flow collected sewage in to the existing Pottsboro WWTP. Raw wastewater from drainage Basin No. 6 is also collected at the existing Pottsboro WWTP and then, with wastewater collected from Basin Nos. 2, 3, 4, and 5, transported to Preston Harbor site under gravity. It is assumed that approximately 50 percent of the Basin No. 1 flow would be transported under gravity from the Pottsboro WWTP site to the Preston Harbor plant site, and the remaining 50 percent Basin No. 1 flow is connected directly to the Preston Harbor site.

Figure IV-2 shows the potential location of the regional wastewater treatment plant, lift stations required to collect sewage under gravity for each basin, and the force main routing from various lift stations to the WWTP. Table IV-1 shows the opinion of the probable construction cost for various lift stations and force main piping. It is anticipated that Lift Stations 5A and 5C would be constructed initially, and that Lift Stations 2, 3, 4, and 6 would be deferred until justified by development in individual watersheds.

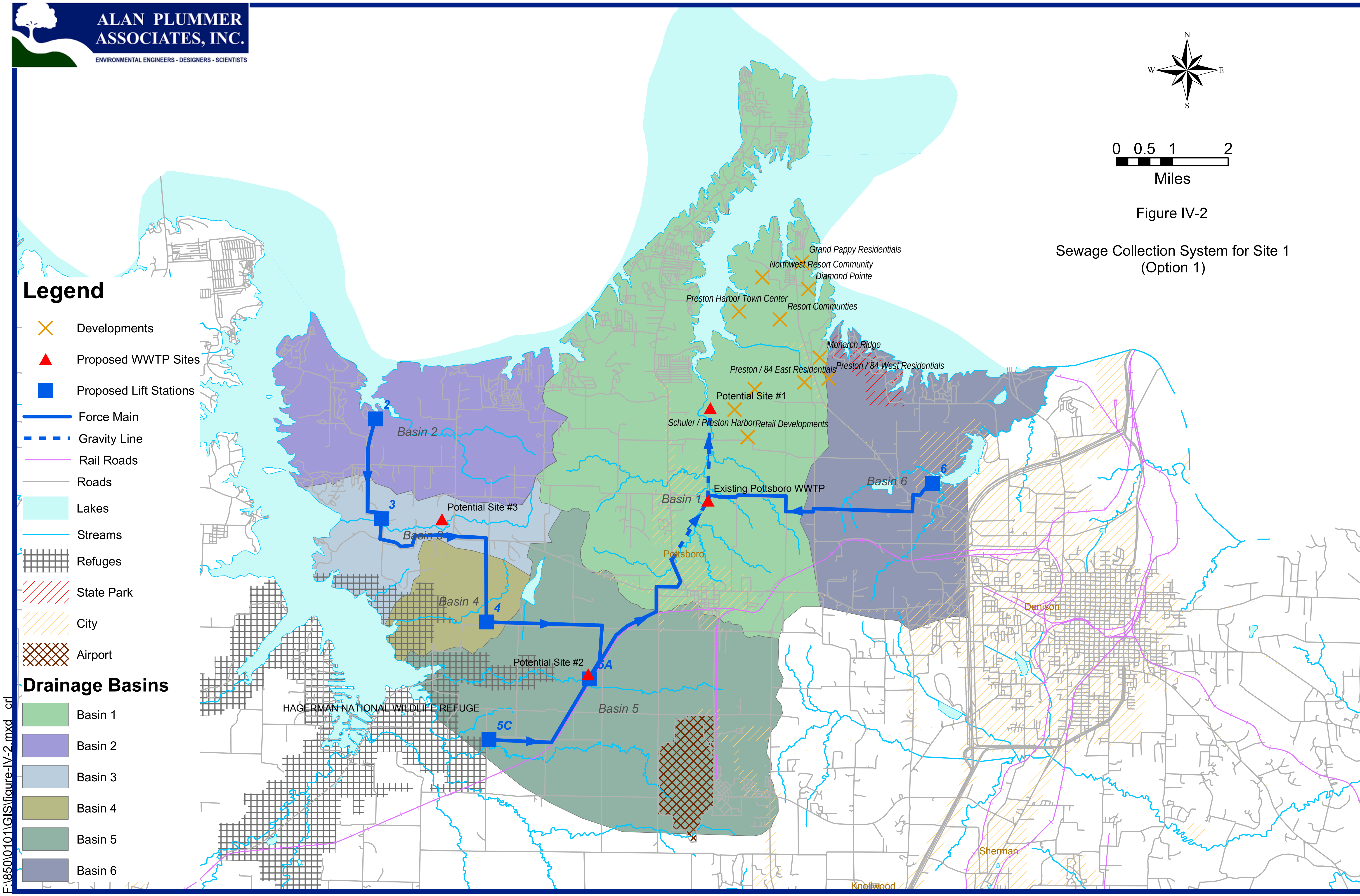
ALAN PLUMMER ASSOCIATES, INC.
ENVIRONMENTAL ENGINEERS - DESIGNERS - SCIENTISTS
Legend
Developments
Proposed WWTP Sites
Proposed Lift Stations
Force Main
Gravity Line
Rail Roads
Roads
Lakes
Streams
Refuges
State Park
City
Airport
Drainage Basins
Basin 1
Basin 2
Basin 3
Basin 4
Basin 5
Basin 6
0 0.5 1 2
Miles
Figure IV-2
Sewage Collection System for Site 1
(Option 1)
Grand Pappy Residentials
Northwest Resort Community
Diamond Pointe
Preston Harbor Town Center
Resort Communities
Monarch Ridge
Preston / 84 West Residentials
Preston / 84 East Residentials
Potential Site #1
Schuler / Preston Harbor
Retail Developments
Existing Pottsboro WWTP
Potential Site #3
Potential Site #2
HAGERMAN NATIONAL WILDLIFE REFUGE
Basin 1
Basin 2
Basin 3
Basin 4
Basin 5
Basin 6
2
3
4
5A
5C
6
Pottsboro
Denison
Sherman
Knollwood
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Table IV-1

Opinion of Probable Collection Cost for Option 1

Opinion of Construction Cost Option 1 (Regional Plant Near Proposed Preston Harbor Development)			
Item Description			**Cost 2005 $**
Lift Stations	Ultimate Capacity		
Lift Station 2*	1.4	MGD	499,000
Lift Station 3*	2.0	MGD	463,000
Lift Station 4*	2.0	MGD	484,000
Lift Station 5A	14.3	MGD	5,874,000
Lift Station 5C	8.6	MGD	3,350,000
Lift Station 6*	2.0	MGD	485,000
Pipelines			
Lift Station 2 to Lift Station 3 (8” Dia.)*	9,504	Feet	625,000
Lift Station 3 to Lift Station 4 (8” Dia.)*	23,760	Feet	1,563,000
Lift Station 4 to Lift Station 5A (8” Dia.)*	15,312	Feet	1,007,000
Lift Station 5A to Pottsboro WWTP (24” Dia.)	21,120	Feet	4,277,000
Lift Station.5C to Lift Station 5A (18” Dia.)	13,200	Feet	1,914,000
Lift Station 6 to WWTP (10” Dia.)*	29,568	Feet	2,451,000
Pottsboro to WWTP (30” Dia. gravity line)	9,504	Feet	1,758,000
Lift Station 5 to Pottsboro WWTP (24” Dia. gravity line)	7,392	Feet	1,220,000
Subtotal			**25,970,000**
Contingencies		15%	3,895,500
Total Construction Cost			**29,865,500**
Engineering and Surveying, Permitting, and Construction Administration		20%	5,973,100
Total Project Cost			**35,800,000**

* Timing to be deferred until needed for growth in individual watersheds.

Option 2: Regional Treatment Facilities at Existing Pottsboro Plant Site

The existing Pottsboro WWTP is located at the north side of the City of Pottsboro and approximately in the center of the study area. The Pottsboro WWTP currently utilizes a conventional treatment process that includes screenings, aeration, and secondary clarification to treat the influent wastewater flows. The plant receives wastewater from City of Pottsboro through an existing collection system.

Figure IV-3 shows the location of existing Pottsboro WWTP, lift stations required to collect flows under gravity for each basin, and the force main routing from various lift stations to the WWTP. On a long-term basis, the Pottsboro WWTP is assumed to be receiving approximately 30 percent of the flows under gravity and remaining flow would be pumped to the site.

The collected raw wastewater from drainage Basins 2, 3, and 6 would be pumped directly to the existing Pottsboro WWTP. The wastewater collected from Basin No. 4 and is pumped to Lift Station 5A. Flows from Basin Nos. 4 and 5 are pumped to a high point to achieve gravity flow to the existing Pottsboro WWTP. Approximately 30 percent of the Basin No. 2 flow is assumed to be gravity flow directly into the Pottsboro WWTP and the remaining 70 percent is pumped.

Table IV-2 shows the opinion of the probable construction cost for various lift stations and force main piping, which does not include the sewage collection system upgrades that might be needed inside Pottsboro.

As was proposed for the previous option, it is anticipated that collection facilities in Basins 2, 3, 4, and 6 would be deferred until necessitated by growth in the service area.

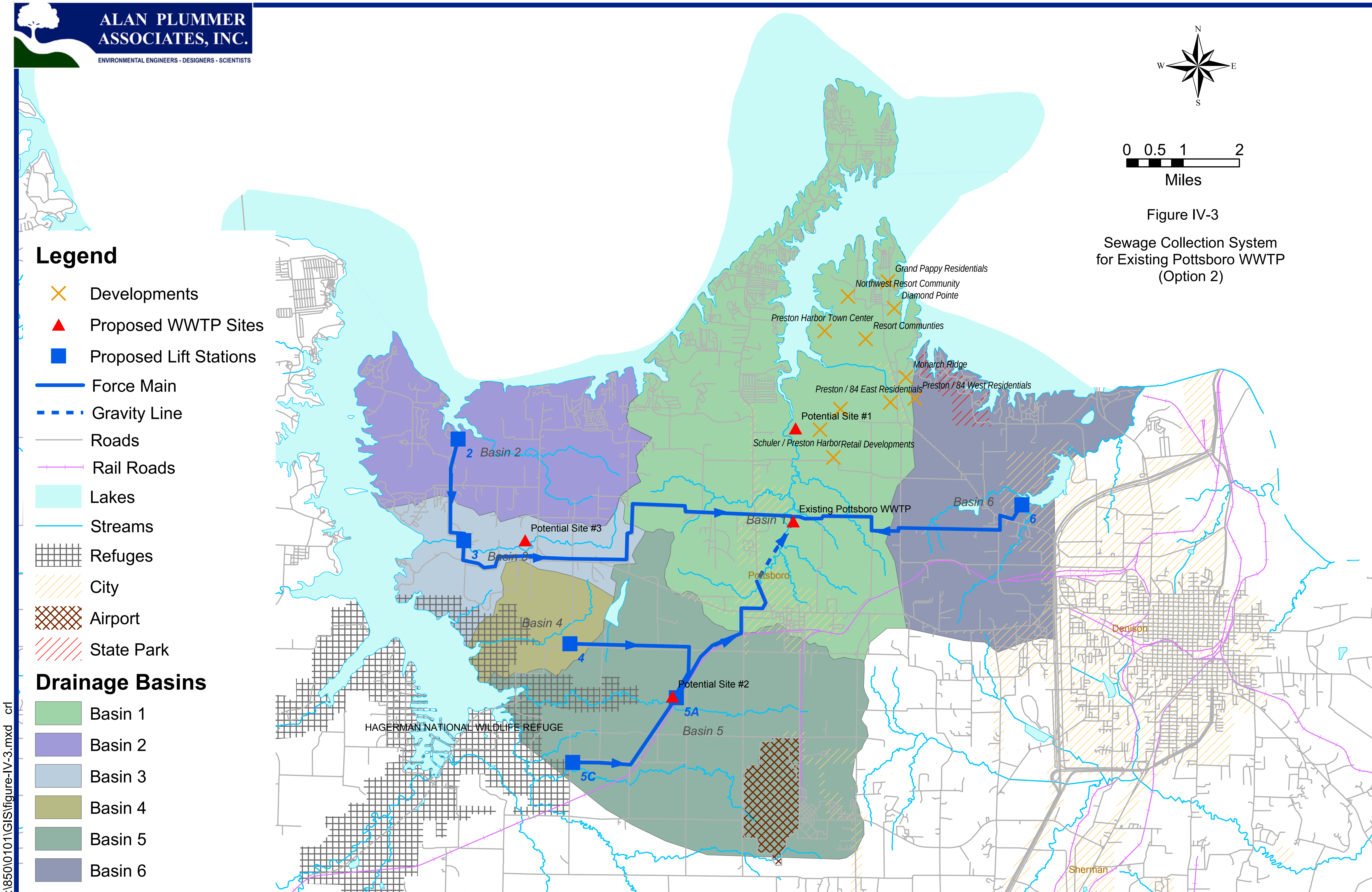

Figure IV-3

Sewage Collection System
for Existing Pottsboro WWTP
(Option 2)

Table IV-2
Opinion of Probable Collection Cost for Option 2

Opinion of Construction Cost Option 2 (Regional Plant at Existing Pottsboro Plant Site)			
Item Description			**Cost 2005 $**
Lift Stations	Ultimate Capacity		
Lift Station 2*	1.4	MGD	499,000
Lift Station 3*	2.0	MGD	463,000
Lift Station 4*	0.1	MGD	200,000
Lift Station 5A	12.4	MGD	5,096,000
Lift Station 5C	8.6	MGD	3,350,000
Lift Station 6*	2.0	MGD	485,000
Pipelines			
Lift Station 2 to Lift Station 3 (8" Dia.)*	9,504	Feet	625,000
Lift Station 3 to WWTP (8" Diameter.)*	39,072	Feet	2,570,000
Lift Station 4 to Lift Station 5 (4" Dia.)*	15,312	Feet	483,000
Lift Station 5A to WWTP (20" Dia.)	21,120	Feet	3,467,000
Lift Station 5C to Lift Station 5A (18" Dia.)	13,200	Feet	1,914,000
Lift Station 6 to WWTP (10" Dia.)*	29,568	Feet	2,451,000
Lift Station 5B to Pottsboro WWTP (21" Dia. Gravity Line)	7,392	Feet	1,146,000
Subtotal			**22,749,000**
Contingencies		15%	3,412,350
Total Construction Cost			**26,161.350**
Engineering and Surveying, Permitting, and Construction Administration		20%	5,232,270
Total Project Cost			**31,400,000**

* Timing to be deferred until needed for growth in individual watersheds.

Option 3: Regional Facility (Northwest of Grayson County Airport)

Potential "Site 2" is located on an unnamed tributary of the Big Mineral Arm of Lake Texoma and at the northwest side from the Grayson County Airport in the drainage Basin No. 5. The low level of existing development and close proximity from the anticipated residential and commercial development near the Grayson County Airport makes this site suitable for a potential regional wastewater treatment plant site.

Under this option, the collected raw wastewater from drainage Basin Nos. 2, 3, and 4 is pumped to the potential Site 2 located in the drainage basin No. 5. Raw wastewater from the drainage Basin No. 1 would be collected at the existing Pottsboro WWTP and pumped with collected sewage from the drainage Basin No. 6 to the Potential Site 2. Approximately 70 percent of the wastewater will be collected in Lift Station 5C (See Figure IV-4) and the remaining 30 percent will flow directly into the plant.

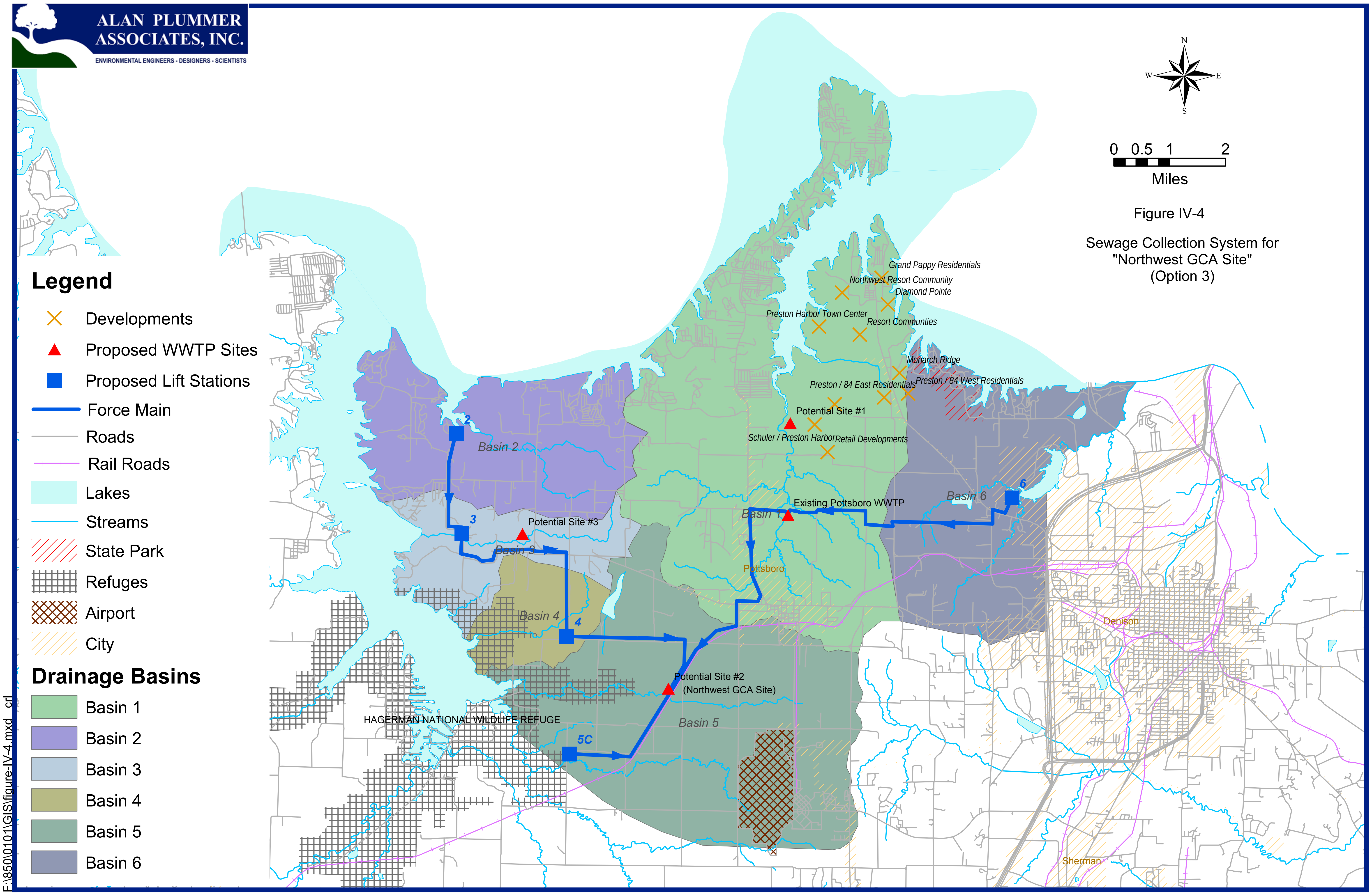

Figure IV-4

Sewage Collection System for "Northwest GCA Site" (Option 3)

Table IV-3 shows the opinion of the probable construction cost for various lift stations and force main piping, which does not include local sewage collection cost inside Pottsboro or in new subdivisions.

As was proposed for the previous option, it is anticipated that collection facilities in Basins 2, 3, 4, and 6 would be deferred until necessitated by growth in the service area.

Table IV-3
Opinion of Probable Collection Cost for Option 3

Opinion of Construction Cost Option 3 (Regional Plant Northwest of Grayson County Airport)			
Item Description			**Cost 2005 $**
Lift Stations	Ultimate Capacity		
Lift Station 2*	1.4	MGD	499,000
Lift Station 3*	2.0	MGD	463,000
Lift Station 4*	2.0	MGD	484,000
Lift Station 6*	2.0	MGD	485,000
Pottsboro WWTP	14.0	MGD	5,722,000
Lift Station 5C	8.6	MGD	3,350,000
Force Mains			
Lift Station 2 to Lift Station 3 (8” Dia.)*	9,504	Feet	625,000
Lift Station 3 to Lift Station 4 (8” Dia.)*	23,760	Feet	1,563,000
Lift Station 4 to WWTP (8” Dia.)*	15,312	Feet	1,007,000
Lift Station 6 to Pottsboro WWTP (10” Dia.)*	29,568	Feet	2,451,000
Pottsboro WWTP to Regional WWTP (24” Dia.)	30,624	Feet	6,201,000
Lift Station 5C to Regional WWTP (18” Dia.)	13,200	Feet	1,914,000
Subtotal			**24,764,000**
Contingencies		15%	3,714,600
Total Construction Cost			**28,478,600**
Engineering and Surveying, Permitting, and Construction Administration		20%	5,695,720
Total Project Cost			**34,200,000**

* Timing to be deferred until needed for growth in individual watersheds.

Option 4: Regional Treatment Facilities on Scott Branch

This potential site (Site 3) is located in drainage Basin No. 3 and on would be Scott Branch of the Big Mineral Arm of Lake Texoma. The collected wastewater from Basin No. 2 would be directly pumped to the potential plant site. Raw wastewater from Basins 4 and 5 would be collected and pumped to the site also. Raw wastewater in drainage Basin No. 1 would be collected at the existing Pottsboro WWTP and pumped with collected sewage from drainage Basin No. 6 to the regional plant site. Refer to Figure IV-5 for the routing of collection sewer lines.

Table IV-4 shows the probable construction cost for various lift stations and force main piping, which does not include the sewage collection and transportation cost inside drainage Basin No. 3.

As was proposed for the previous option, it is anticipated that collection facilities in Basins 2, 3, 4, and 6 would be deferred until necessitated by growth in the service area.

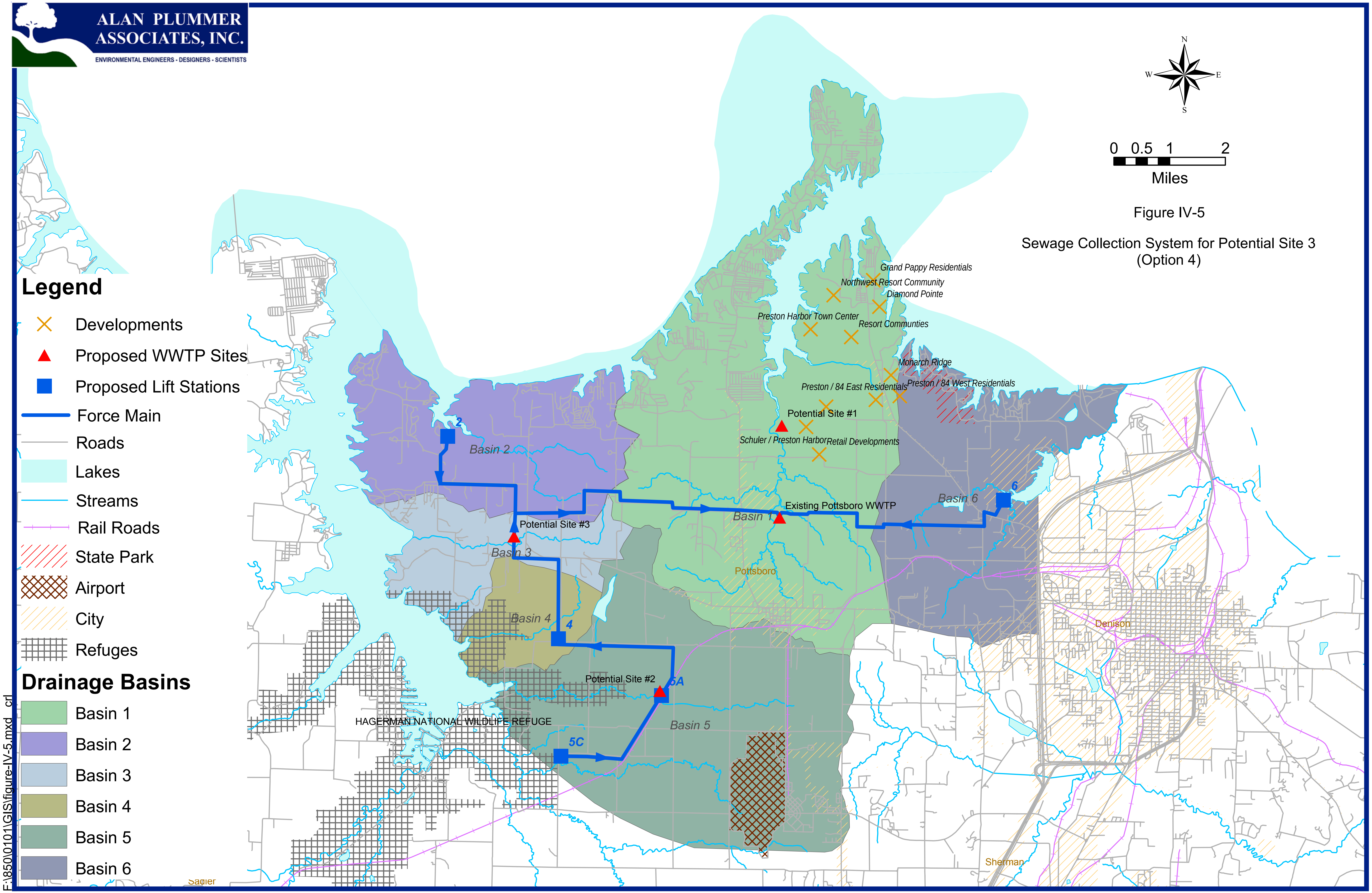

Figure IV-5

Sewage Collection System for Potential Site 3 (Option 4)

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Table IV-4

Opinion of Probable Collection Cost for Option 4

Opinion of Construction Cost Option 4 (Regional Plant in Scott Branch Area)			
Item Description			**Cost 2005 $**
Lift Stations	Ultimate Capacity		
Lift Station 2*	1.4	MGD	499,000
Lift Station 5C	8.6	MGD	3,350,000
Lift Station 5A	12.3	MGD	5,060,000
Lift Station 4	12.4	MGD	5,096,000
Lift Station 6*	2.0	MGD	485,000
Pottsboro WWTP	14.0	MGD	5,722,000
Force Mains			
Lift Station 2 to WWTP (8" Dia.)*	19,536	Feet	1,285,000
Lift Station 5C to Lift Station 5A (18" Dia.)	13,200	Feet	1,914,000
Lift Station 5A to Lift Station 4 (24" Dia.)	15,312	Feet	3,101,000
Lift Station 4 to WWTP (24" Dia.)	15,840	Feet	3,208,000
Lift Station 6 to Pottsboro WWTP (10" Dia.)*	29,568	Feet	2,451,000
Pottsboro WWTP to Regional WWTP (24" Dia.)	34,320	Feet	6,950,000
Subtotal			**39,121,000**
Contingencies		15%	5,868,150
Total Construction Cost			**44,989,150**
Engineering and Surveying, Permitting, and Construction Administration		20%	8,977,830
Total Project Cost			**54,000,000**

* Timing to be deferred until needed for growth in individual watersheds.

Site Selection

The above-mentioned four sites are evaluated and ranked on the "collection" cost basis in the Table IV-5. From the collection standpoint, Option 2, the existing wastewater treatment plant at Pottsboro, is the most feasible option. However, only Option 4 is significantly more expensive. Therefore, due to the higher collection system cost of Option 4, and the discharge permitting concerns involving Option 1 (as discussed in Chapter III), those options will not be considered further. Since Options 2 and 3 are very similar in collection system cost, both will be evaluated for potential regional treatment processes.

Table IV-5
Cost Comparison and Ranking

Potential Sites	Total Collection Cost of Raw Wastewater to the Plant (Full-Development Scenario)	Rank
Option 1 - "Preston Harbor" Site	$35,800,000	3
Option 2 - Existing Pottsboro WWTP Site	$31,400,000	1
Option 3 - "Northwest GCA" Site	$34,200,000	2
Option 4 - "Scott Branch" Site	$54,000,000	4

The opinion of probable collection cost only includes the major "regional" components of the collection system, and does not include "local" components. Additionally, Options 2 thru 4 do not include a pump station and force main tying the Preston Harbor development into the regional system. The costs shown are for the flows projected through the year 2060 covering the entire study area, and are expressed in 2005 dollars.

CHAPTER V

TREATMENT PROCESS EVALUATION

This chapter presents the proposed treatment options for both expansion of the existing Pottsboro wastewater treatment plant and construction of a new regional treatment plant near the Grayson County Airport. This chapter addresses the facility needs for the plants under the proposed construction and expansion scenarios.

At the Pottsboro plant, the initial expansion would be to 0.9 MGD with a later expansion to 2 MGD. The initial regional plant at the Grayson Airport site would be at a capacity of about 0.9 MGD with expansions to 2 MGD, 4 MGD, 6 MGD, and 7 MGD. This expansion schedule is based on current trends in the service area. It could be modified based on future growth patterns and development.

For treatment plants that range in size from less than 1 MGD to as much as 7 MGD, there are typically a number of options regarding the selection of treatment processes and the phasing of expansions. The treatment processes appropriate for a plant less than one MGD may not be the most appropriate for the later expansions. The decision regarding the type of process is a function of land availability, effluent limits, expansion timing, and operations training and involvement. Both conventional mechanical and natural treatment systems are considered.

EXISTING POTTSBORO WWTP

The existing Pottsboro WWTP is permitted to discharge 0.35 MGD with permit limits of 10/15/3 and 4 mg/l dissolved oxygen (DO). An influent lift station pumps all flow from the collection system to the treatment plant. The treatment plant consists of the following unit processes:

- Coarse bar screen (manually cleaned)
- Two Orbal™ treatment units with internal clarifiers, operating in the extended aeration mode
- One 35’ diameter, 10’ SWD external clarifier
- Chlorine contact tank

- Effluent flow measurement (Parshall Flume)
- Sludge drying box (trailer mounted) and sludge drying beds for sludge dewatering

Figure V-1 presents the process flow diagram and Figure V-2 presents the site plan for the existing treatment plant.

It appears the plant could be expanded up to 2 MGD within the bounds of the existing property and making beneficial use of the existing facilities. Expansion of the plant beyond 2 MGD would likely require acquisition of additional land and large scale demolition and replacement of existing unit processes. It is not likely that the Pottsboro plant would be expanded beyond 2 MGD unless development and permitting of an alternative site for the regional system is not possible.

It is anticipated that the initial expansion of the Pottsboro plant would be up to 0.9 MGD. The rationale for the smaller incremental expansion is to meet the short-term needs of Pottsboro and the proposed high density residential and resort development in Basin 1 during the time period while a regional system is planned, designed, permitted and constructed. After a regional system is developed, it is likely the Pottsboro plant would remain in operation to produce reclaimed water for irrigation of nearby existing and proposed golf courses.

Water quality modeling of the Little Mineral Creek recently completed by TCEQ suggests that Pottsboro's WWTP can be expanded up to 1 MGD under the same discharge permit limits as the existing plant (10/15/3 and 4 mg/l DO). If the plant is expanded to 2 MGD, the permit limits may be slightly more stringent for ammonia nitrogen (2 mg/l) and DO (6 mg/l).

Expansion of the plant to 0.9 MGD would involve addition of new headworks facilities (fine screen and grit removal), first stage aeration tank, conversion of the existing Orbal™ units from extended aeration to conventional activated sludge operating mode, conversion of the existing internal clarifiers to additional aeration tank volume, a new 50' diameter clarifier, return sludge

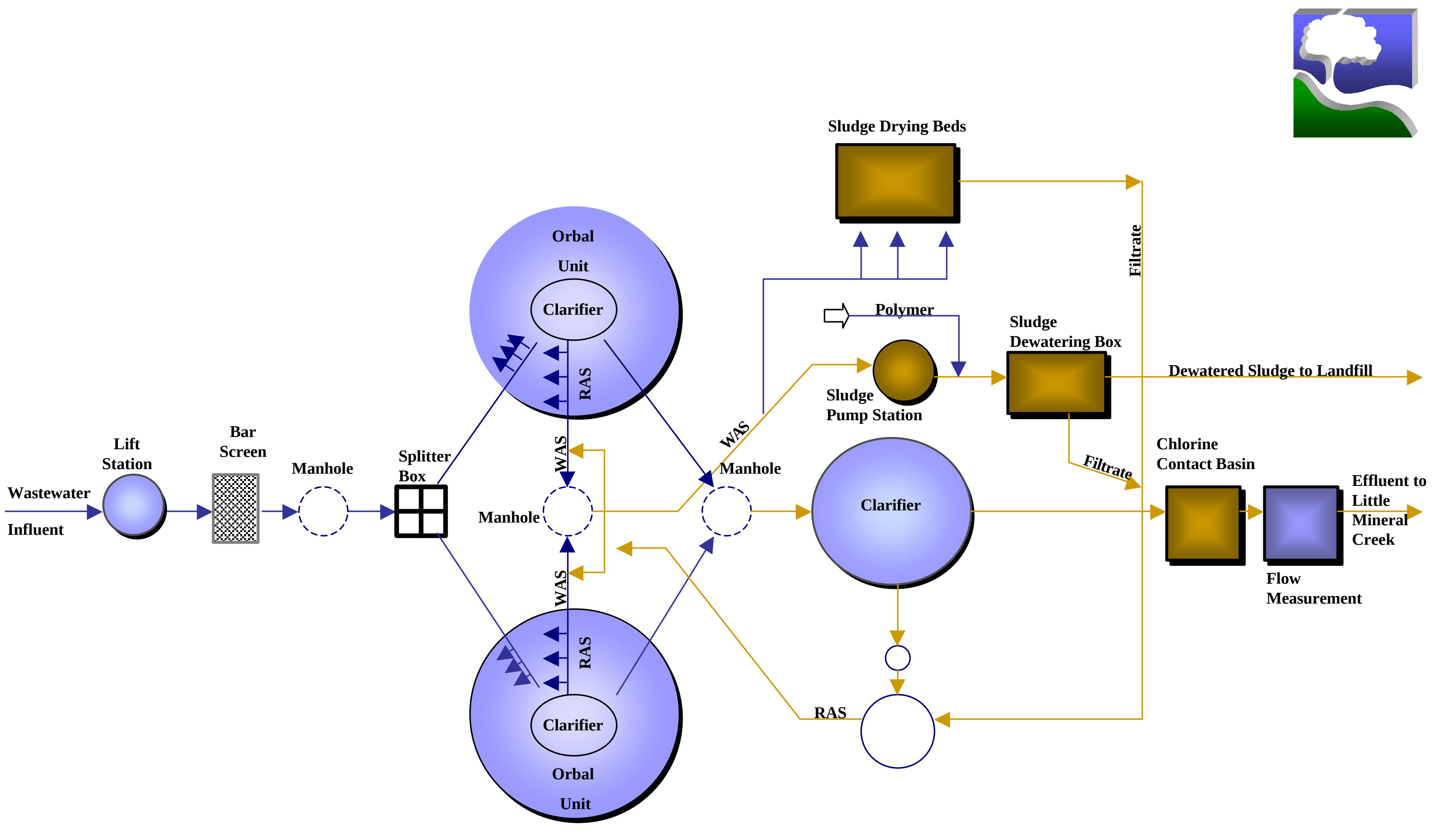

Figure V-1
Process Flow Schematic

For Existing Pottsboro WWTP
For 10/15/03 Permit Limits

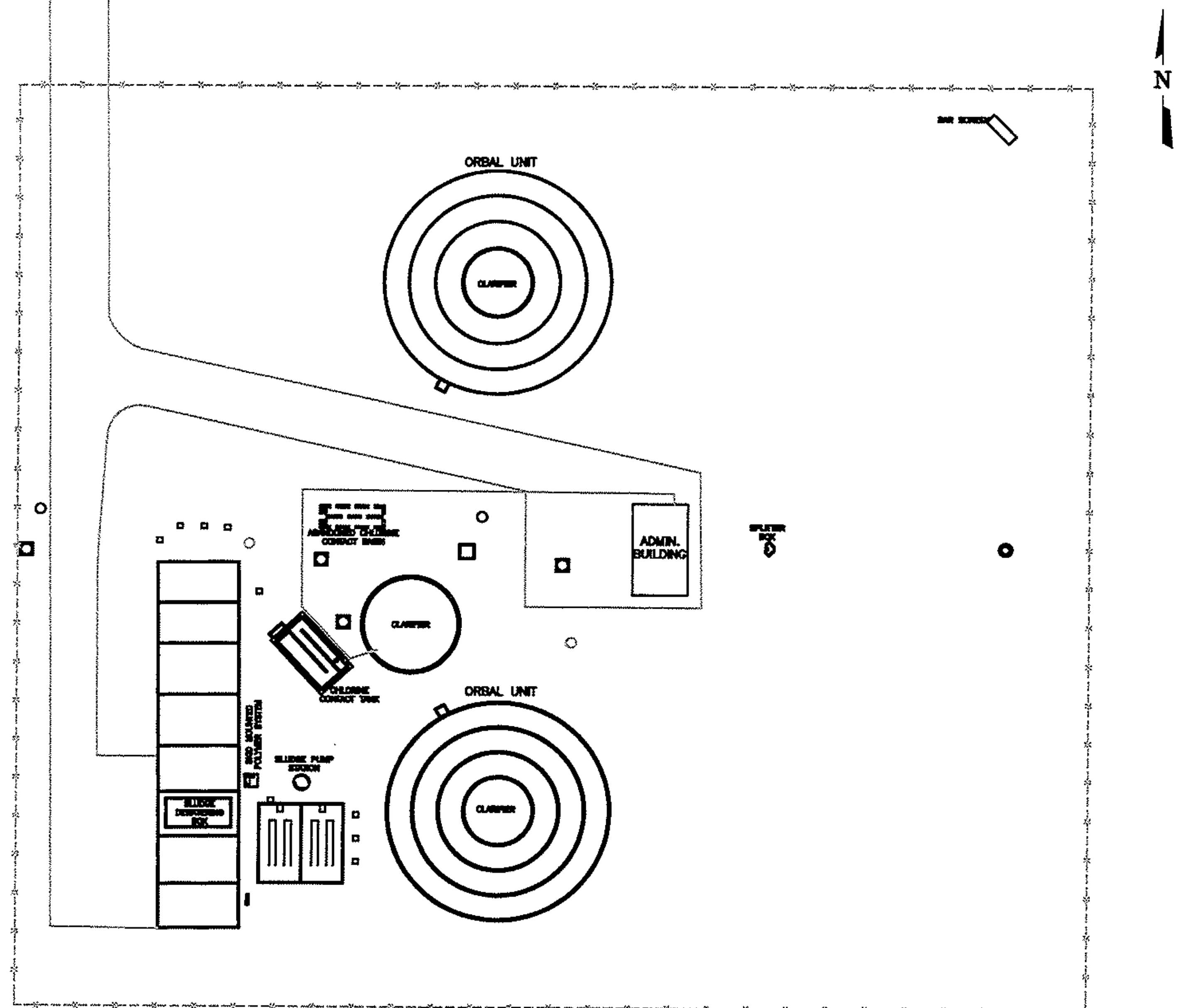

Figure V-2
Site Layout
Existing Pottsboro WWTP

Freese and Nichols

(RAS) pump station, new UV disinfection system, conversion of the existing chlorine contact tank to aerated sludge storage, and miscellaneous site, yard piping, electrical and instrumentation work. If there are opportunities to reuse a portion of the plant effluent for irrigation of the nearby golf courses, then effluent filtration would be required. For the purposes of this evaluation, it is assumed that effluent reuse will be possible, and filters are therefore included in the estimated project costs. Sludge handling would continue to be accomplished using the trailer-mounted sludge dewatering boxes and disposal at the landfill. Figures V-3 and V-4 present process flow diagram and site plan for the initial expansion up to 0.9 MGD.

If the proposed resort and residential development requires additional capacity prior to the time when a new regional facility can be brought on line, the Pottsboro plant can be expanded to 2 MGD with additional first stage aeration tanks, and a second final clarifier. At that time, the existing 35’ diameter clarifier could be converted to aerated sludge storage. Figure V-5 presents the site plan for the next expansion up to 2.0 MGD.

Preliminary opinion of probable project costs for expansion of Pottsboro’s WWTP to 0.9 MGD are $2,910,000 construction and $3,492,000 total project. For the additional expansion to 2.0 MGD the preliminary opinion of probable project costs are $2,224,000 construction and $2,669,000 total project.

If for some reason the proposed expansion of the Pottsboro WWTP resulted in a more stringent set of discharge limits (5/5/2/1), it would be necessary to provide additional first stage aeration tank volume and chemical addition for precipitation of phosphorous. Under the more stringent discharge limits, the estimated project cost for the expansion of the Pottsboro WWTP from 0.35 MGD to 0.9 MGD is approximately $4.4 million and the estimated project cost for the expansion to 2.0 MGD is approximately $3.4 million. It is not recommended that expansion of the Pottsboro plant beyond 2 MGD be considered.

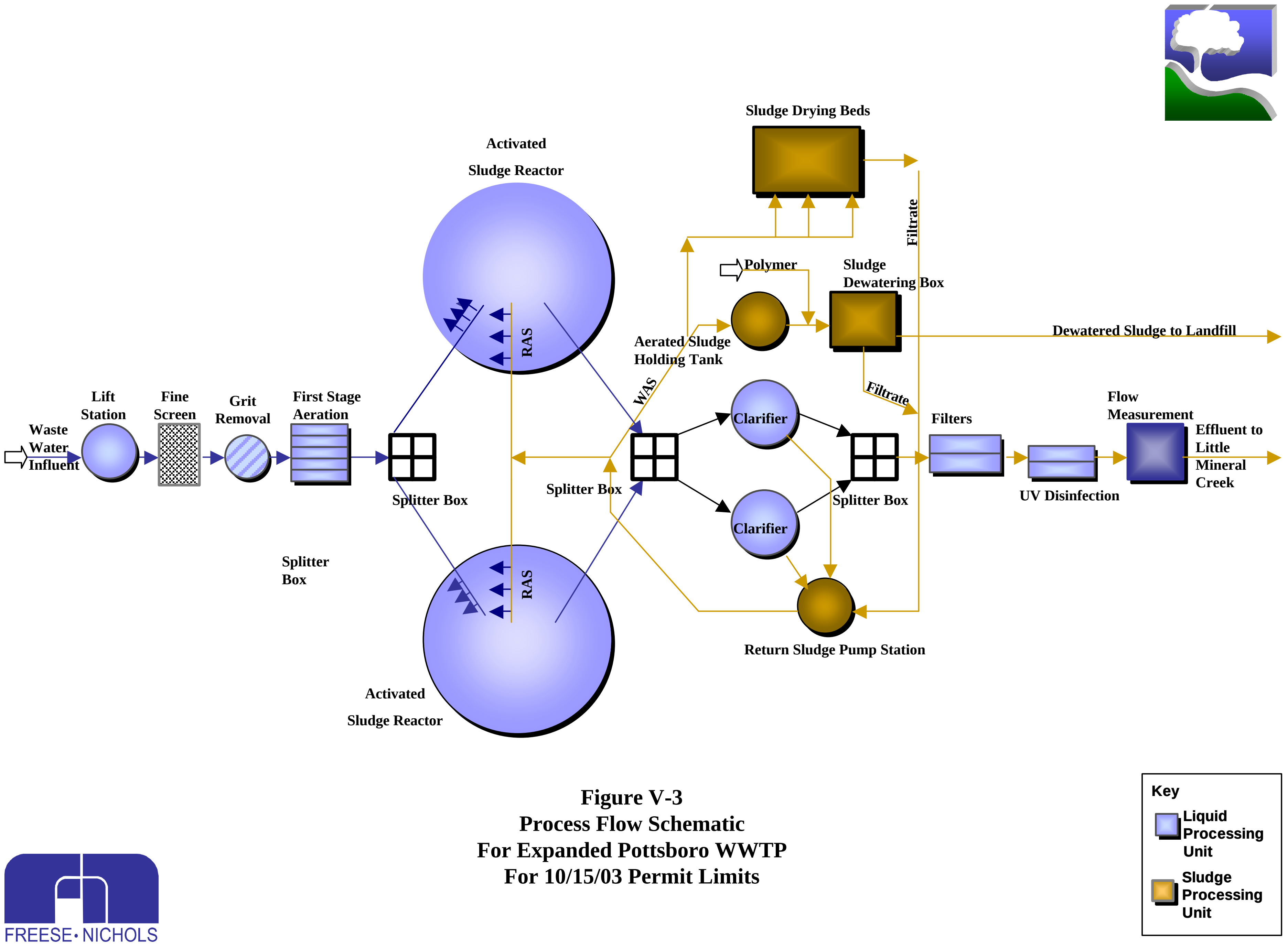

Figure V-3
Process Flow Schematic
For Expanded Pottsboro WWTP
For 10/15/03 Permit Limits

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[PLU04307]N:\WW\MP-ALL-PL-SITE01.DWG LAYOUT: Layout1
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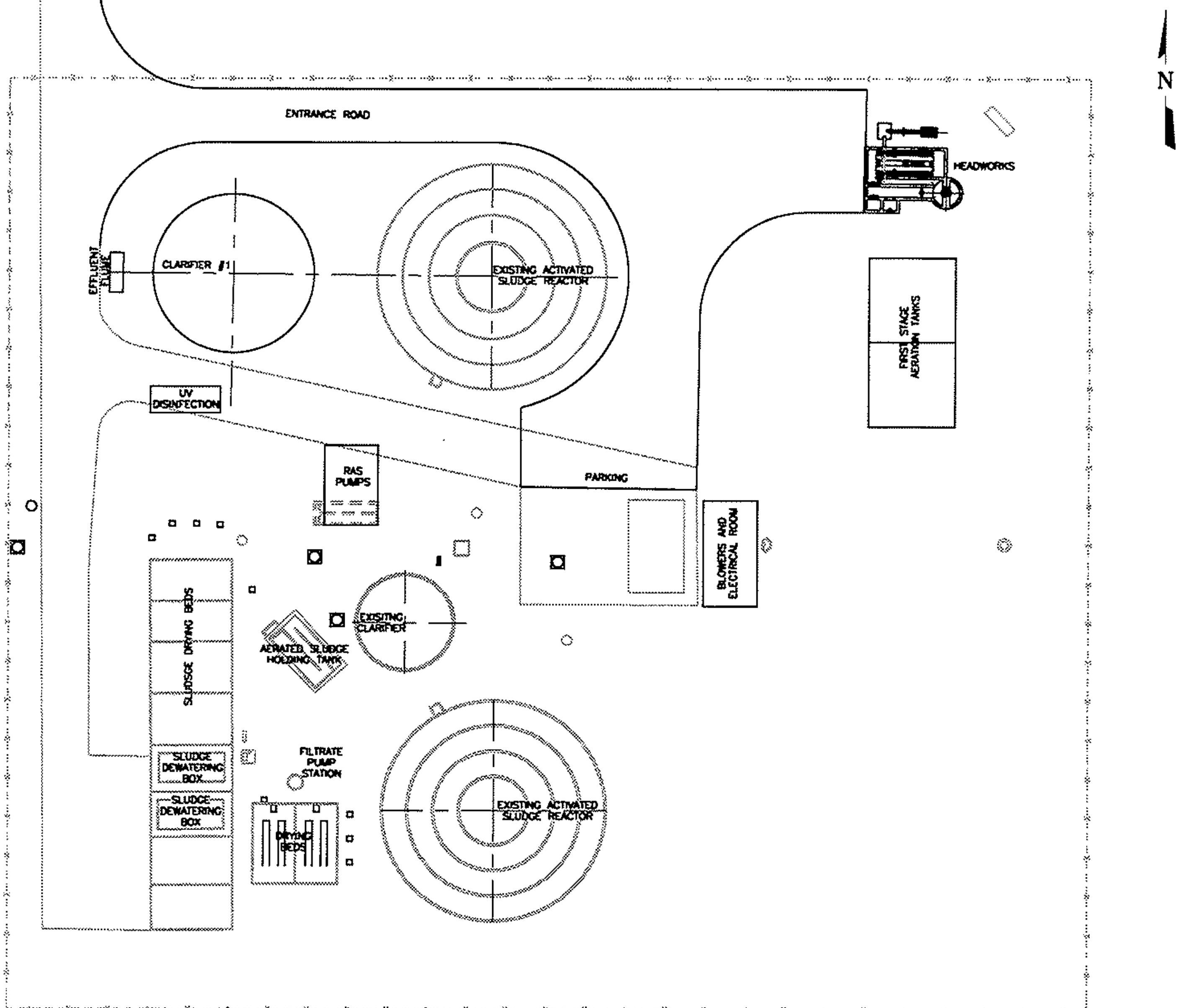

Figure V-4
Site Layout
Pottsboro WWTP - 0.9 MGD

Freese and Nichols

PROPOSED REGIONAL FACILITY AT THE NORTHWEST GRAYSON COUNTY AIRPORT SITE

Based on the evaluation of potential permit conditions provided in Chapter III and the site selection evaluation presented in Chapter IV, it is recommended that the regional treatment facility be located at a site on the northwest side of the Grayson County Airport. The treated effluent is assumed to be either discharged into Scott Branch or transported to potential reuse customers, unless a 10/15/3 local discharge permit can be obtained. The effluent limits for the first phases of the proposed plant are anticipated to be 10/15/7 or possibly 10/15/3 depending on whether the proposed plant receives the same effluent limits as the existing Denison plant located at the airport. It is expected that future expansions may receive permit limits as low as 5 mg/L CBOD, 5 mg/L TSS, 1 mg/L ammonia-nitrogen, and 0.5 mg/L phosphorus (5/5/1/0.5). The TCEQ has indicated that limits for total nitrogen are unlikely within the near future.

Two alternative types of treatment were considered for the regional facility – conventional mechanical and a natural treatment system. Mechanical treatment facilities can be appropriate for either of the anticipated effluent sets. The natural system is considered only for the less stringent effluent set of 10/15/7 or 3. The facilities and planning level costs for each of these alternatives are presented below.

Conventional, Mechanical Treatment System for the Regional Facility

The process train for the first phase of the regional facility would include preliminary and secondary biological treatment with UV disinfection and solids dewatering and disposal in a landfill for a plant capacity of 0.9 MGD. Based on initial evaluation of the growth potential in the area, it might be possible to cost- and process-efficiently construct a 0.5 MGD facility. However, the evaluation presented in this section addresses the 0.9 MGD plant.

A new headworks facility would include a mechanically cleaned fine screen and vortex grit removal sized for a design capacity up to 2 MGD. The secondary biological treatment would be designed as an extended aeration process for the first phase with the option to convert to a conventional activated sludge/single stage nitrification (AS/SSN) system in the future.

Converting from an extended aeration plant in the future to a conventional AS/SSN would provide additional secondary treatment capacity without expansion of the aeration basin. The extended aeration basin would be followed by a secondary clarifier. While filters are not required to meet the anticipated permit limits in the initial phases of the regional plant, turbidity limits for reuse projects require low effluent solids. For this reason, effluent filters are included in the proposed plant. The filters will be automatic backwash, sand media filters or cloth media disk filters. A UV disinfection system will be used to disinfect. The waste activated sludge will be dewatered in trailer-mounted sludge dewatering boxes or a small belt press and disposed of at the sanitary landfill with the solids collected from the headworks (i.e., screenings from the fine screen and the grit). The plant layout is designed in order to have sufficient space to add a primary clarifier in the future and for the further expansion of the existing treatment units for higher treatment capacity. The planning level cost estimate for a 0.9 MGD conventional plant meeting effluent limits of 10/15/7 or 3 is $4,651,000 and $5,600,000 total project cost.

To meet the anticipated future stringent permit limits (i.e. 5/5/1/0.5) at 0.9 MGD, additional treatment processes are required. To reduce total phosphorus concentration to permitted levels, aluminum sulfate (alum) solution would be fed to the raw wastewater prior to the secondary clarifier. A chemical feed system with chemical storage for a design capacity up to 2 MGD would be provided. Figures V-6 and V-7 show the process schematic for the initial phase of the regional facility with and without phosphorus removal.

The first expansion of the regional plant would be to a capacity of 2 MGD. For this expansion for a 10/15/3 effluent set, the extended aeration process would be converted to an AS/SSN system to provide additional biological treatment capacity without expanding the aeration basins. Additional final clarifier capacity would be added and the UV and filter systems expanded. To provide phosphorus removal for a 5/5/1/0.5 effluent set, additional chemical would be required, but the initial chemical feed system would have been sized for a design capacity of up to 2 MGD. Solids handling in the initial phase would be sized to accommodate the first expansion. Refer to Figure V-8 for the site layout for the proposed consolidated regional WWTP.

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[PLU04307]H:\W -PL-SITE02.DWG LAYOUT: Layout1
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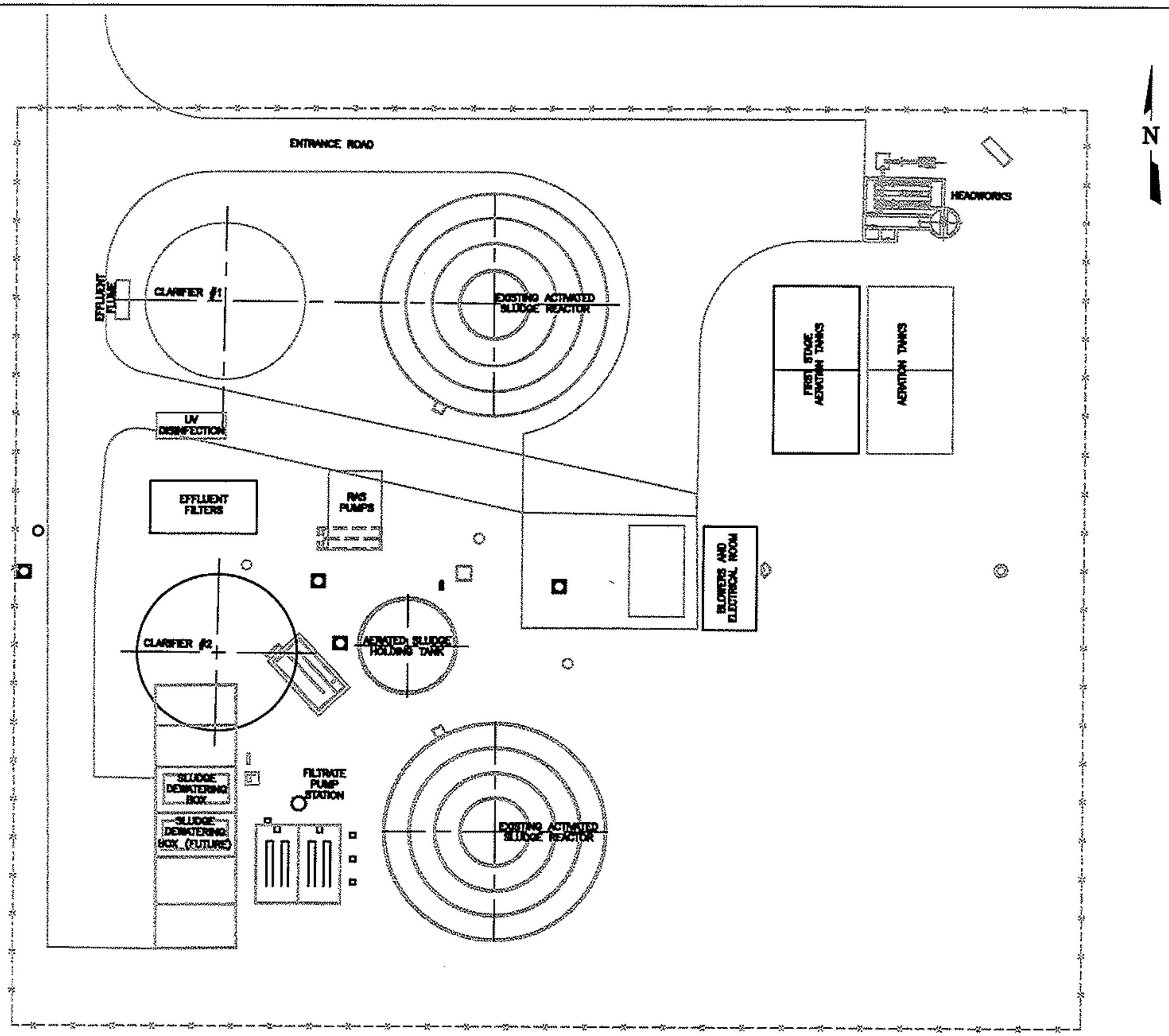


Figure V-5
Site Layout
Pottsboro WWTP - 2.0 MGD

Freese and Nichols

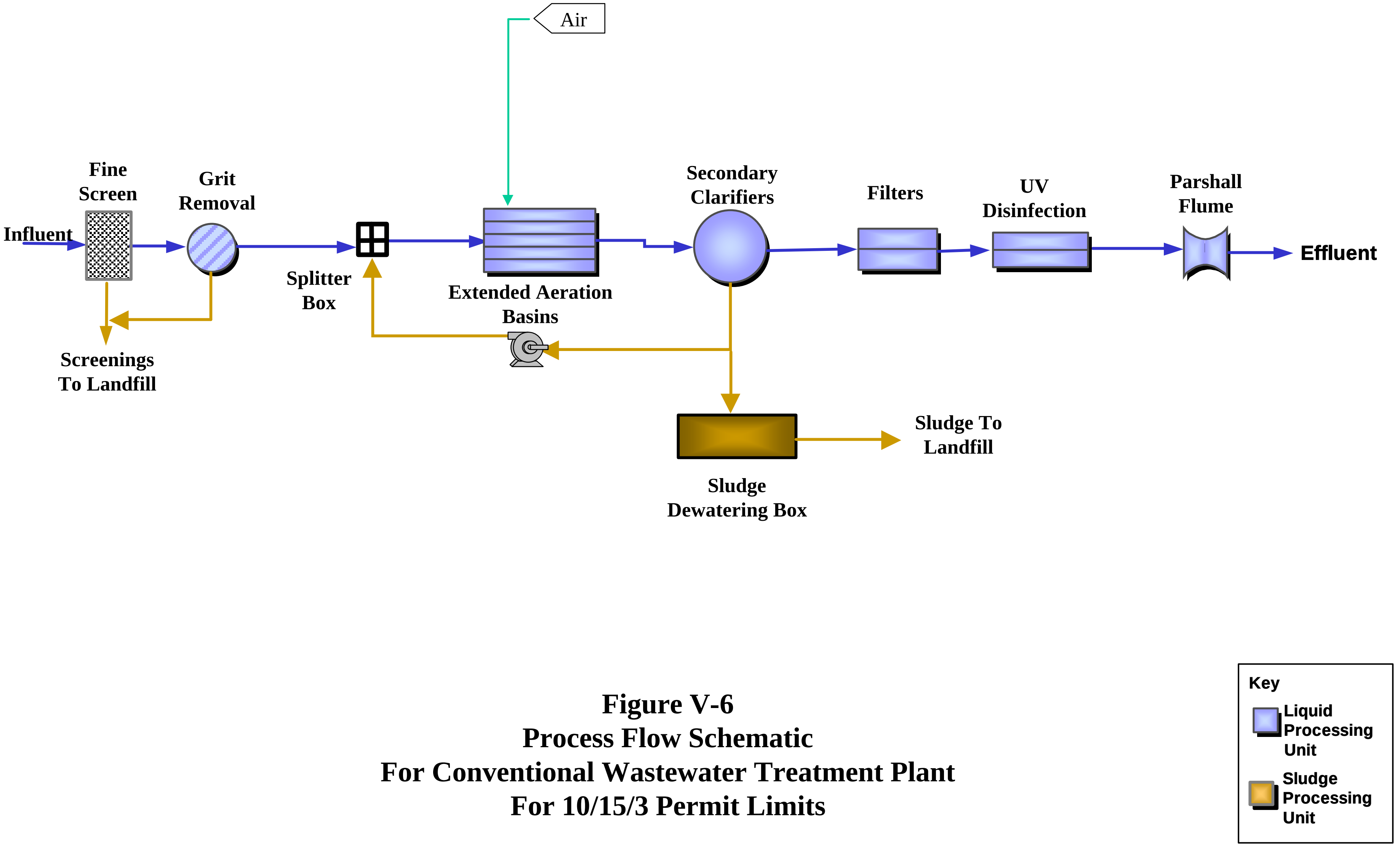


Figure V-6
Process Flow Schematic
For Conventional Wastewater Treatment Plant
For 10/15/3 Permit Limits

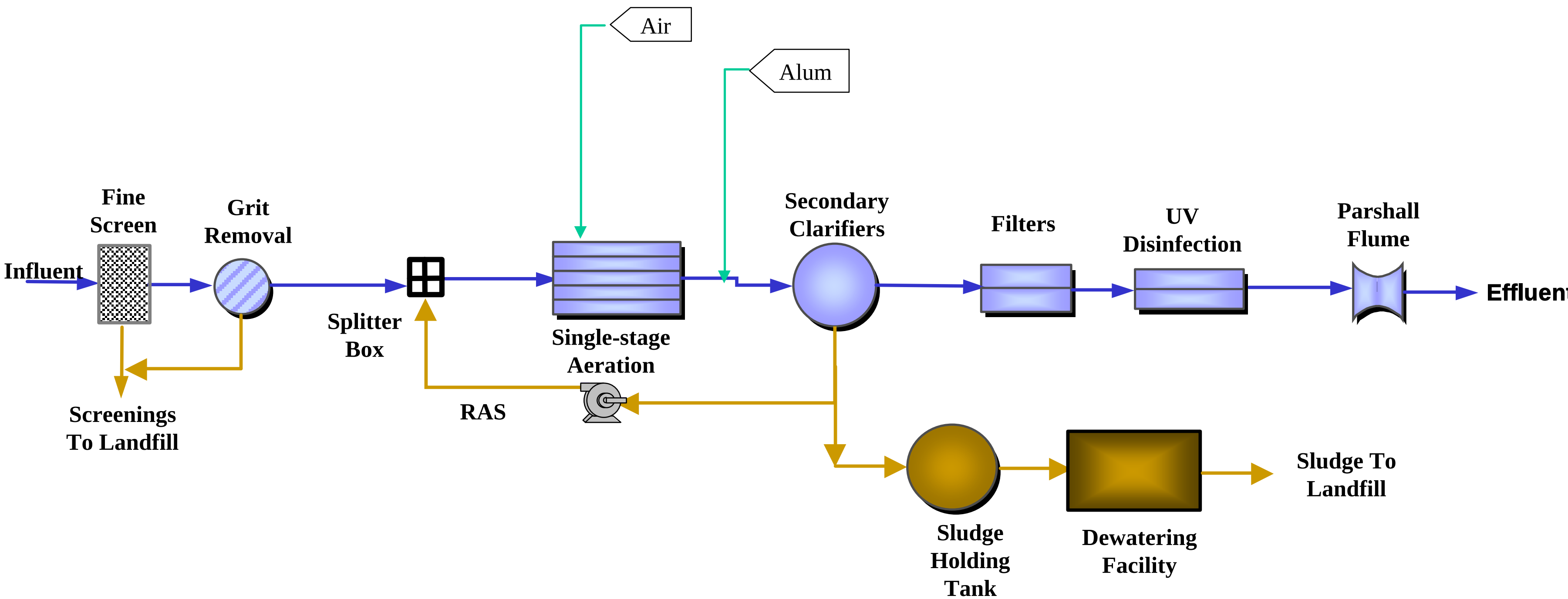
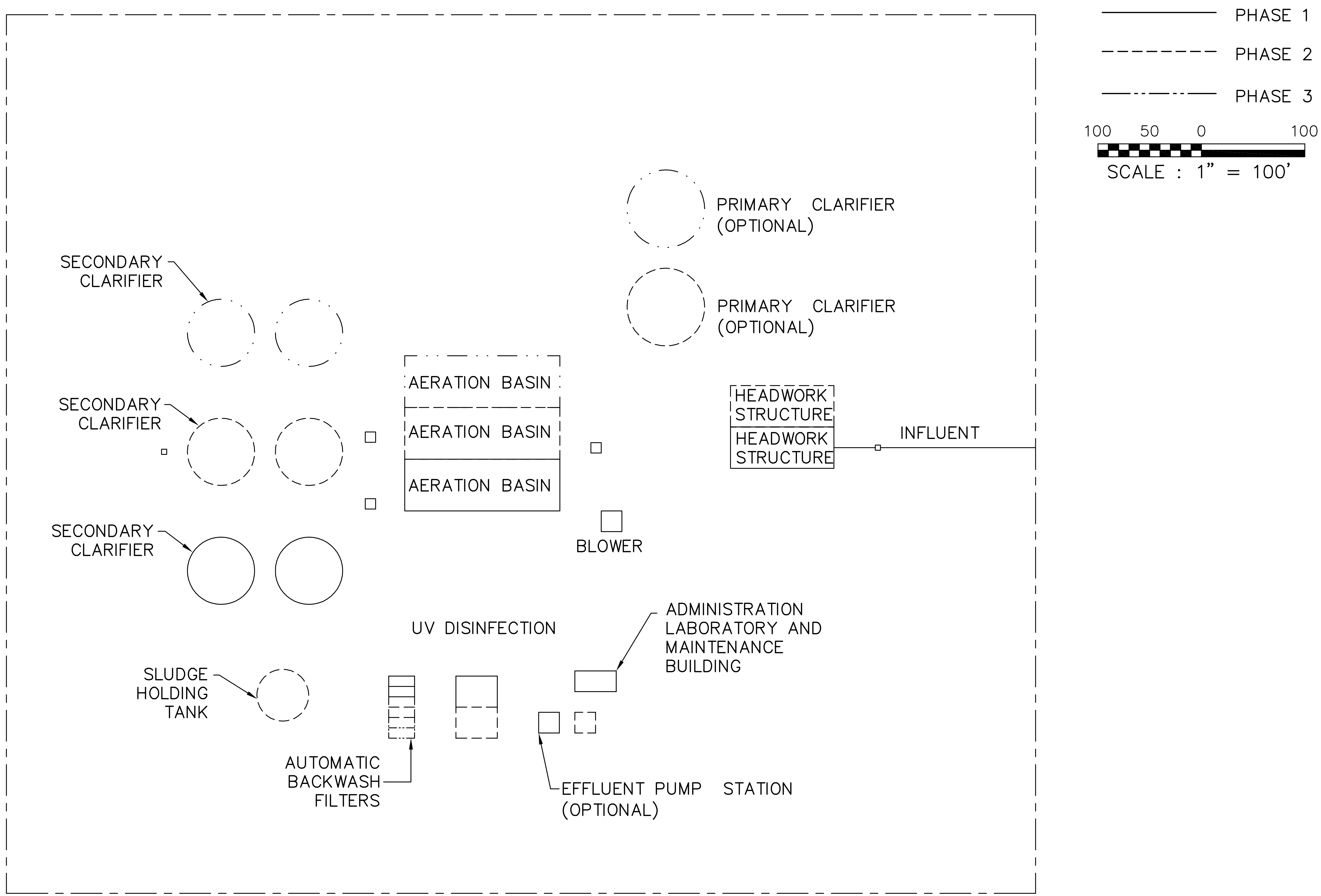


Figure V-7
Conventional Wastewater Treatment Plant
Process Flow Schematic
For 10/15/3 Permit Limits

Key
Liquid Processing Unit
Sludge Processing Unit

FIGURE V 8: SITE LAYOUT FOR PROPOSED CONSOLIDATED REGIONAL WWTP



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The opinion of probable cost for a conventional activated-sludge wastewater treatment plant with the capacity of treating approximately 2.0 MGD and for the land required for future expansions to ultimate capacity is $9,000,000 to meet a 10/15/3 permit with local discharge. To accommodate conventional treatment units processing the year 2060 projected flows of 7.0 MGD require approximately 20 acres of land. An addition of chemical system to feed alum for phosphorus removal and the operational change in the conventional activated-sludge process can achieve the discharge permit levels of 5/5/1/0.5. To meet this more stringent permit, the opinion of probable cost for a conventional activated-sludge wastewater treatment plant with the capacity of treating approximately 2.0 MGD is $9,100,000 with the land required for future expansions to ultimate capacity, assuming a local discharge.

Natural Treatment System for the Regional Facility

For the initial phases of the regional facility – treatment capacities of 0.9 and 2.0 MGD, a natural treatment system alternative to the conventional mechanical plant could be appropriate. The natural treatment system would include a headworks structure with screens and grit removal, an integrated facultative pond (IFP), and constructed wetlands to meet the first phase 10/15/3 permit levels. Figure V-9 shows the process flow schematic for the natural treatment system plant for the first phases.

The opinion of probable cost for a natural treatment system plant with the capacity of treating approximately 0.9 MGD at 10/15/3 discharge permit levels and the land required is $2,346,000 for construction, and $2,800,000 total project cost. The natural system would not be recommended for expansions beyond 2.0 MGD because the effluent set anticipated for higher flows is 5/5/1/0.5, and a natural system would not consistently meet those limits.

REMOTE EFFLUENT DISCHARGE AND REUSE SYSTEM CONSIDERATIONS

As discussed in the Chapter 3, treated effluent may be discharged, to avoid very stringent discharge permit limits, at Scott Branch or to be reused at Preston Harbor and/or Tanglewood development. The cost of transporting treated effluent to these discharge locations from both the

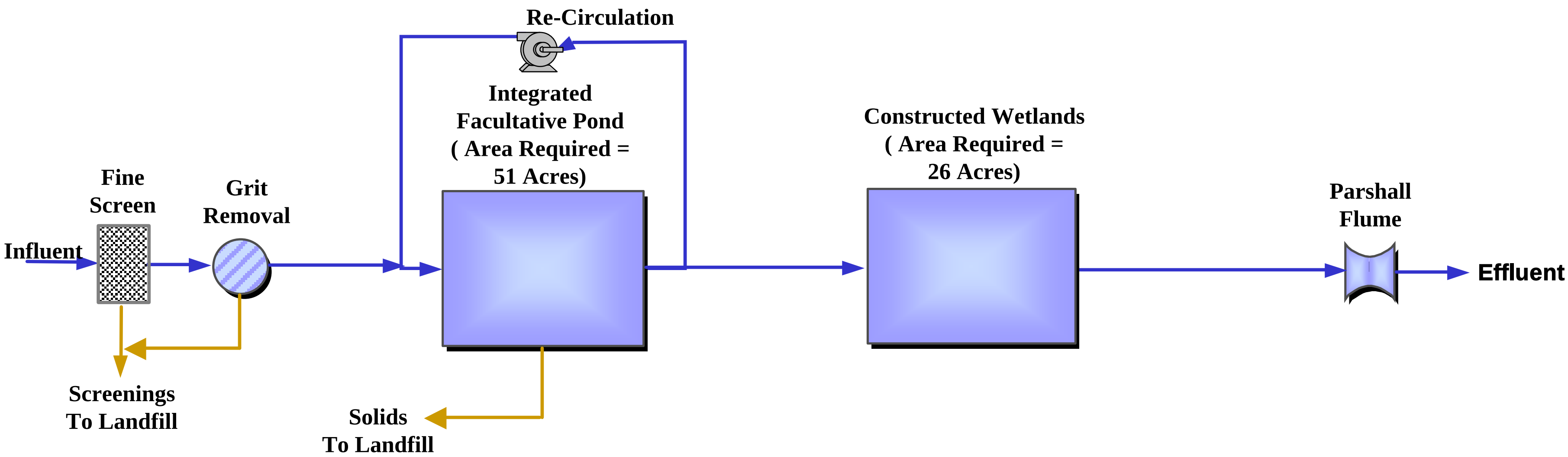
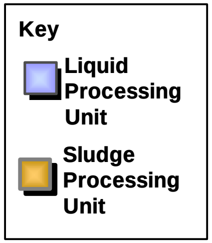


Figure V-9
Process Flow Schematic
For Natural Wastewater Treatment Plant
For 10/15/3 Permit Limits



Pottsboro and Northwest Grayson County Airport locations are estimated with the following assumptions.

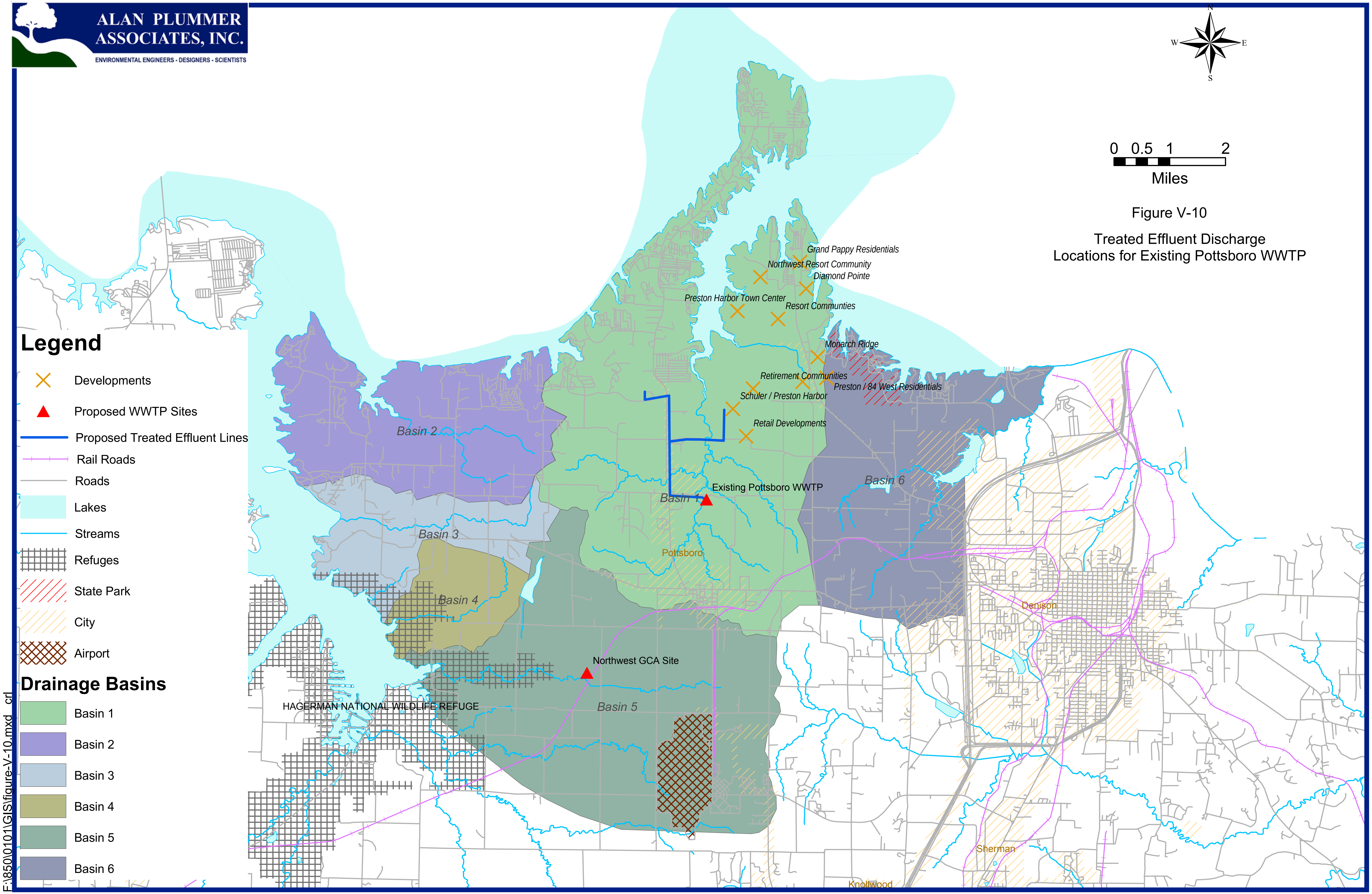
- Maximum Velocity thru a force main = 8 feet per second (fps)
- Minimum Velocity thru a force main = 2 fps
- C-Factor = 140

The anticipated locations for a reuse system from the Pottsboro WWTP site, and discharging treated effluent remotely from the Northwest Grayson County Airport WWTP site are shown in Figures V-10 and V-11, respectively. The construction cost associated with reusing treated effluent for Option 2 is $2,344,000. Total project costs are $2,800,000, based upon reusing up to 2 MGD of average plant flow. The construction cost discharging effluent remotely from the Northwest Grayson County Airport WWTP site is estimated as $17,220,000. Total project costs are $20,700,000, based upon discharging 20 MGD of effluent (5 MGD average flow).

SUMMARY

The recommended phasing of treatment capacity for the system is to expand the existing Pottsboro plant to 0.9 MGD and then 2.0 MGD to provide treatment capacity to the existing service area while a regional facility is sited and constructed. After construction of the regional facility, it is recommended that the cities preserve the option to either continue discharging from the Pottsboro plant, use the Pottsboro plant for water reclamation for the northern and eastern parts of the study area, or pursue abandonment with pumping to the proposed plant site west of the Grayson County Airport.

It is recommended that the regional facility be located at a site northwest of the Grayson County Airport. An initial phase at the regional plant would provide a treatment capacity of 0.9 MGD. The initial phase could consist of a conventional extended aeration plant or, alternatively, include a headworks facility followed by a natural treatment system consisting of an integrated facultative lagoon followed by a constructed wetland. The natural system could provide treatment up to 2.0 MGD for an effluent set of 10/15/3. Expansions beyond 2.0 MGD would



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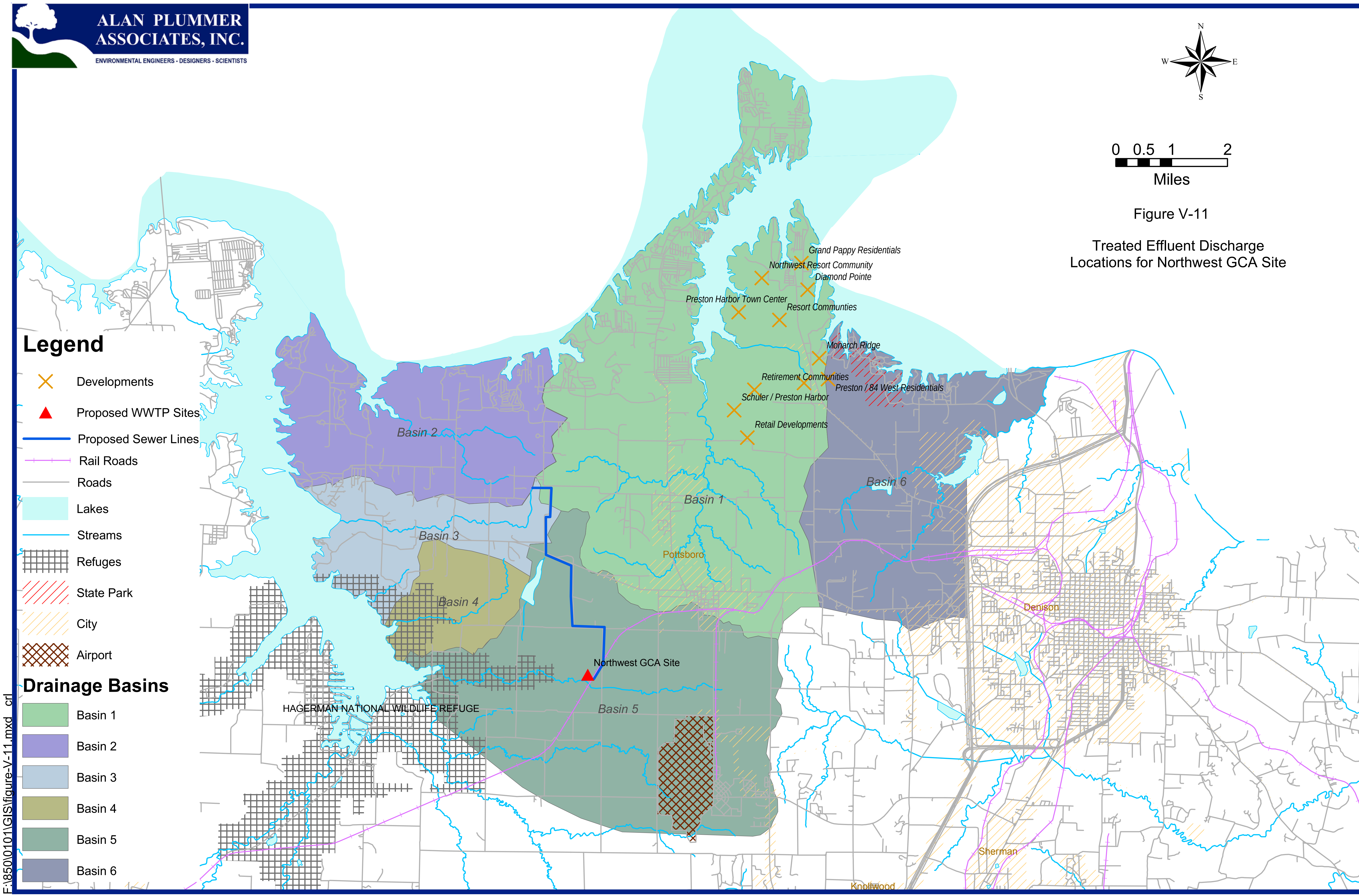
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Figure V-11
Treated Effluent Discharge
Locations for Northwest GCA Site
Legend
Developments
Proposed WWTP Sites
Proposed Sewer Lines
Rail Roads
Roads
Lakes
Streams
Refuges
State Park
City
Airport
Drainage Basins
Basin 1
Basin 2
Basin 3
Basin 4
Basin 5
Basin 6
Grand Pappy Residentials
Northwest Resort Community
Diamond Pointe
Preston Harbor Town Center
Resort Communities
Monarch Ridge
Retirement Communities
Preston / 84 West Residentials
Schuler / Preston Harbor
Retail Developments
Basin 2
Basin 3
Basin 4
Basin 1
Basin 6
Basin 5
Pottsboro
Denison
Sherman
Knollwood
Northwest GCA Site
HAGERMAN NATIONAL WILDLIFE REFUGE
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most likely involve stringent effluent limits of 5/5/1/0/5 and require a conventional AS/SSN plant with chemical phosphorus removal. Table V-1 summarizes the capital collection cost, natural as well as conventional treatment cost, and the treated effluent discharge cost for both the alternatives.

Table V-1

Opinion of Probable Project Cost Summary

	Existing Pottsboro WWTP	NW Grayson Co. Airport RWWTP
Regional WW Collection System	$31,400,000	$34,200.000
Conventional Treatment System		
0.9 MGD		
10/15/3 Effluent Set	$3,492,000	$5,600,000
5/5/1/0.5 Effluent Set	$4,400,000	$5,650,000
2.0 MGD		
10/15/3 Effluent Set	$2,669,000	$3,400,000
5/5/1/0.5 Effluent Set	$3,400,000	$3,450,000
Natural Treatment System		
0.9 MGD		
10/15/3 Effluent Set	N/A	$2,800,000
Reuse System		
2.0 MGD	$2,800,000	N/A
Remote Effluent Discharge		
5.0 MGD	N/A	$20,700,000

CHAPTER VI

CONCLUSION AND RECOMMENDATIONS

From both permitting and siting standpoints, the potential plant locations west of the Grayson County Airport and at the existing Pottsboro plant appear most feasible.

Modeling conducted by TCEQ during the course of this study suggests that the City of Pottsboro's plant can be expanded, in phases, to a 2 MGD capacity before experiencing significantly more stringent permit limits. This capacity is also the plant's approximate "buildout" capacity with respect to land availability.

In order to expedite the addition of treatment capacity to better serve Pottsboro's growth and to accommodate growth in the proposed Preston Harbor development, it is recommended that the study participants pursue expansion of the Pottsboro plant as a first and interim step.

Consistent with planning conducted in 2000 (Grayson County Airport Wastewater Treatment Plant Master Plan Development for Collection and Treatment Facilities, October 2000), it is recommended that concurrent actions be initiated for land acquisition and permitting for a future "regional" wastewater treatment plant to be located near the southwestern boundary of the study area, west of the Grayson county Airport. It is suggested that this treatment system be initially designed for 0.9 MGD, but that sufficient land be acquired to preserve options for future treatment of up to 7 MGD. Permitting procedures have changed since the 2000 study was conducted; it is anticipated that ammonia limits for this site will be more restrictive than at the current Denison GCA plant, and that a "natural" system may thus not be appropriate. Actual permit limits will determine whether a natural (wetland) system can provide economic benefits during initial years of operation. It is expected that a mechanical system will be more appropriate in any case as the plant size exceeds 2 MGD.

If permitting difficulties make it necessary, it is anticipated that effluent from the regional facility would ultimately be pumped northward for discharge into Scott Branch, or to other portions of the study area for reclamation.

It is envisioned that the expanded Pottsboro plant site, depending on rate of development and reclaimed water demands in the study area, would serve as a "water factory" providing high quality treated effluent to golf courses and other potential reclaimed water users in its immediate vicinity and northward. On a long-term basis, it is recommended that the cities preserve the option to either continue discharging from the Pottsboro plant, use the Pottsboro plant for water reclamation for the northern and eastern parts of the study area, or pursue abandonment with pumping to the proposed plant site west of the Grayson County Airport.

Areas north and west of the proposed plant site near the Grayson County Airport would eventually be served, as population growth dictates need, by a linked system of force mains and lift stations located in individual drainage basins (Basins 2,3, and 4). Similarly, Basin 6 (The area lying between Denison and the Little Mineral peninsula) would be linked to the regional system as growth and demands justify construction of pipeline facilities.

Our opinion of probable capital costs for "regional" components of the proposed wastewater system to be initially (prior to 2010) is approximately $16 million, expressed in 2005 dollars. Many of these improvements will be phased in over an extended period of time. Table VI-1 lists a proposed schedule and cost associated with the major components anticipated to be needed within the initial years of operation. Future components can be constructed as dictated by growth and demand in the service area.

Opportunities for cooperative institutional arrangements should be discussed between the two cities, as such arrangements may afford both cities' economies of scale and other benefits not necessarily available through operation of independent systems.

TABLE VI-1
GREATER TEXOMA UTILITY AUTHORITY
REGIONAL WASTEWATER FACILITIES FOR THE CITIES OF DENISON AND POTTSBORO

SUMMARY OF PROJECTED TIMING AND CAPITAL COSTS

PRELIMINARY

ACTION	BUDGET	ANTICIPATED SCHEDULE (QUARTERS)																		
	(2005 $)	2005			2006				2007				2008				2009			
PERMIT APPLICATION PREP. FOR EXIST. POTTSBORO PLANT SITE	$25,000	■	■																	
PERMIT PROCESSING (TCEQ) FOR EXIST. POTTSBORO SITE				■	■															
DESIGN EXIST. POTTSBORO EXPANSION TO 0.9 MGD	$700,000		■	■	■															
CONSTRUCT EXIST. POTTSBORO EXPANSION TO 0.9 MGD	$2,910,000					■	■	■	■											
DESIGN EXIST. POTTSBORO EXPANSION TO 2 MGD	$445,000											■	■	■						
CONSTRUCT EXIST. POTTSBORO EXPANSION TO 2 MGD	$2,224,000															■	■	■	■	■
SITE SELECTION FOR "REGIONAL" WWTP	$20,000	■	■																	
SITE OPTION ACQUISITION *			■	■																
PERMIT APPLICATION PREP & PRELIMINARY DESIGN	$60,000		■	■																
PERMIT PROCESSING (TCEQ) FOR "REGIONAL" SITE					■	■	■													
DESIGN "REGIONAL" WWTP (0.9 MGD INTERIM)	$930,000						■	■	■											
CONSTRUCT " REGIONAL" WWTP (0.9 MGD INTERIM)	$4,650,000									■	■	■	■	■						
Note: Cost shown reflects mechanical system. Natural system, if permitted, will be less										■	■	■	■	■						
DESIGN LS, FM, & INTERCEPTOR TO SERVE " REGIONAL" WWTP	$644,000				■	■	■	■												
CONSTRUCT LS, FM, & INTERCEPTOR	$3,220,000								■	■	■	■								
TOTAL OPINION OF PROBABLE COST	**$15,828,000**																			

Note: Costs presented above include 15% contingency, along with allowances for land acquisition for all components.

Prepared By Mark A. Perkins Texas PE 60329

Appendix

APPENDIX A

Natural Treatment Systems - General Discussion

Integrated Facultative Ponds

An Integrated Facultative Pond (IFP) is a combination of an anaerobic pond and a facultative pond and is used as the initial stage of treatment. Unlike the conventional facultative ponds that have flat bottoms, an IFP has a pit in the bottom. Essentially, this pit is an anaerobic pond, surrounded by a berm or other barrier, within the middle of a facultative pond. The isolation of the anaerobic pit isolates the anaerobic activity from wind-induced mixing such as can occur from seasonal thermal inversions or just strong wind storms, thereby avoiding unintentional mixing of the pit's contents with the rest of the pond so that potential release of odors is minimized. The Chapter 271 Section 210 of Texas Commission on Environmental Quality (TCEQ) "Design Criteria For Sewerage System" details out the design criteria for an IFP. With a minimum of a 21-day hydraulic retention time, 80 percent of influent BOD_5 removal efficiency can be assumed through an IFP. The pit is designed so that the upflow velocity is slow enough to remove helminth ova and parasitic cysts and the IFP can also provide removal of 50-70 percent of the total nitrogen from the wastewater.

Proper design of the IFP will provide the following:

- A pond system that produces minimal sludge, provided trash and grit removal are used;
- The requirement for less area and volume of storage than the conventional three-stage aerated lagoon system; and
- The minimization of periodic odors that occur from most conventional three-stage lagoon systems due to thermal inversion or wind induced mixing.

The facultative pond should be approximately 10 feet deep with the pit being approximately 10 feet deeper. The larger, facultative portion of the pond is sized according to the volume of the pit. Generally, the facultative portion is 10 to 20 times the size of the pit with the larger ratio needed for ponds in more northern latitudes.

Stabilization Ponds

Stabilization ponds are typically designed as secondary treatment units following facultative ponds to provide additional treatment for suspended and dissolved organic matter in wastewater. A minimum of two ponds is needed, typically having a length to width ratio of 2.5 or 3:1 and a depth of 2 to 5 feet. Designed with a normal operating depth of 2 feet and planted with specific emergent wetland plant species, these ponds can be operated as deep marsh cells having superior polishing treatment than deeper open water ponds. With sufficient freeboard included in the design of the perimeter berms to allow temporary increases in water depth to approximately 4 feet, they can provide temporary storage of storm flow pulses to assist in managing inflows to the final polishing constructed wetland cells. Having multiple ponds enables one or more to be taken out of service without compromising treatment. The maximum organic loading rate according to the TCEQ is 35 pounds of BOD_5 per day. Recirculation from the effluent of the final pond to the beginning of the stabilization ponds helps to maintain an aerobic environment in the stabilization ponds.

Constructed Wetland

According to Title 30 of the Texas Administrative Code Chapter 317, Appendix G, constructed wetlands are "man-made complexes of saturated substrates, emergent and submergent vegetation, animal life, and water that simulates natural wetlands." In this context, wetlands are used to treat domestic wastewater. This system will utilize the free water surface variety of wetland. Free water surface (FWS) wetlands have been engineered for water quality treatment in the United States since the early 1970s and the accumulated design information and operational performance data for these FWS treatment wetlands have been summarized and assessed to provide improved design and operational practice guidance. Wetland aquatic plants, through their canopy, biomass, and rhizosphere, create an environment that supports a wide range of physical, chemical, and microbial processes. These processes separately and in combination remove total suspended solids (TSS), reduce the influent biochemical oxygen demand (BOD), transform nitrogen forms, provide storage for metals, cycle phosphorus, and attenuate organisms of public health significance. The biogeochemical cycling of macro and micronutrients within the wetland is the framework for the treatment capacity of a wetland system. This treatment capacity is driven by natural solar radiation; kinetic wind energy; the chemical-free energy of rainwater, surface water, and groundwater; and storage of potential energy in biomass and soils, rather than the nonrenewable, fossil-fuel energies used in conventional wastewater treatment systems. However, FWS treatment wetlands are much more land-intensive wastewater treatment systems.

Aquatic macrophytes play an important role in the treatment processes functioning within FWS constructed wetlands. The plants, unique to the wetland environment, control the pollutant removal processes and act as sources and sinks of certain dissolved and particulate water quality constituents (Gearheart, et al., 1999). Wetland plants intercept the solar radiation from the sun reducing algal growth within the water column, which can add carbon back to the system. The shading of the water surface also moderates the temperature of the water column, buffering the water from the changes in the ambient temperature.

Well-developed stands of vegetation also reduce the natural reaeration process by controlling the micrometeorology within the wetland and limiting wind induced turbulent mixing. Lower rates of oxygen transfer, combined with low algal concentrations and the dissolved oxygen consumed within the water column to satisfy BOD, usually results in low dissolved oxygen concentrations in FWS constructed wetlands. Low dissolved oxygen concentrations are mitigated somewhat by the contribution of oxygen to the water column by the wetland plants. The mixture of oxic and anoxic zones found within the wetland system facilitates the degradation and transformation of various pollutants including organic compounds and nitrogen.

Open water zones are frequently incorporated into FWS constructed wetland designs to provide reaeration zones as well as to aid in flow distribution. Submergent plants including coontail (*Ceratophyllum dermersum*), pondweed (*Potomogeton spp.*), and water celery (*Vallisneria americana*) thrive in these open water zones. These plants contribute dissolved oxygen directly to the water column while affording a physical substrate for attached microorganisms. Floating aquatic macrophytes, however, are subject to being moved by the wind over the surface of the open water zones and can be windrowed amongst and against emergent vegetation or a berm, resulting in an accumulated biomass that can produce odors during decay.

Open water zones mixed with emergent vegetation areas promote reoxgenation of the water column through atmospheric reaeration as well as algal and submerged vegetation photosynthesis. They also provide habitat and feeding areas for waterfowl, and in addition, allow for the predation of mosquito larvae by fish and other predators. Open water areas also provide increased BOD reduction and nitrification of wastewater because of the increase in oxygen levels. Recommended open water to emergent vegetation requirements range from 0 to 30 percent for treatment wetlands and 40 percent and greater for enhancement wetlands (Gearheart, et al. 1999)

Net carbon production in emergent wetlands tends to be high because of the great primary production of plant carbon. High production of plant carbon and the resistance of plant carbon to degradation combined with a low organic carbon decomposition rate in the oxygen deficient water column provides a litter layer within the water column. Many of the biochemical transformations that occur in treatment wetlands are mediated by a variety of microbial species residing on solid surfaces such as those provided by the plant litter, as well as the living plant leaves, stems, and roots. Examples of these processes include the decomposition of organic matter, periphyton fixation, nitrification-denitrification, and sulfate reduction. In turn, these processes are directly responsible for the water quality improvement potential of treatment wetlands.

Wetland vegetation also has an effect on the hydraulic characteristics of the wetland, which directly influences water quality constituent removal processes. Wetland vegetation can:

- increase water losses through plant transpiration;
- decrease evaporation water losses by shading water surfaces and cooling water temperatures;
- create friction on the flowing water and, thereby, creating headloss and flocculation of colloids;

- provide wind blocks, thus promoting quiescent water conditions and protection for floating plants such as duckweed;
- provide complex water column flow pathways; and
- occupy a portion of the water column, thus decreasing detention time.

It is the vegetation, specifically the emergent and submergent vegetation, that gives a FWS constructed wetland its capability to treat wastewater effectively in a passive manner. FWS constructed wetlands are unique in that they grow their own physical substrate for periphytic microorganisms resulting in capture of incoming solar energy while minimizing the effects of solar radiation to the water column. Without the aquatic macrophytes, the same physical conditions would result in an oxidation pond producing a large amount of total suspended solids (algae) in the effluent. A diversity of vegetative species is recommended to provide both a robust treatment facility and a high quality habitat.

The k-C* model presented in Kadlec and Knight (1996) was used to determine the area required for a constructed wetland based on the influent concentrations and the effluent goals. Usually TN removal is used as the basis for sizing the constructed wetland where ammonia criteria are included in a discharge permit as it is a more limiting factor than BOD and requires more area for reduction. For this reason, wetland systems are typically very economical (given proper topography, soil characteristics, and land costs) with higher ammonia limits (7 and above), but become larger, more expensive, and somewhat more risky if ammonia limits as low as 3 are required by permit.

APPENDIX B

MEMORANDUM

Meeting Date: August 31, 2004

Memo Date: September 3, 2004

To: Distribution
File (850-0101)

From: Preston Dillard

Subject: Denison/Pottsboro Regional Wastewater System Study
Initial TCEQ Meeting Minutes

On August 31, 2004, a meeting with the Texas Commission on Environmental Quality (TCEQ) on the above reference project was held. The following individuals were in attendance:

Name	Representing
Jim Davenport	TCEQ, Water Quality Standards
Jim Michalk	TCEQ, DO Modeling
Firoj Vahora	TCEQ, Municipal Permits
David Howerton	City of Denison
Preston Dillard	APAI
Peggy Glass	APAI
Mark Perkins	APAI
Pann Sribhen	PSA Engineering

The meeting began with introductions and Peggy Glass reviewing the purpose of the meeting, which was to determine any "fatal flaws" that TCEQ might be aware of for the possible WWTP sites under consideration. David Howerton provided a description of the project, and Pann Sribhen described the Preston Harbor development.

It was clarified to the TCEQ that the flow rates shown on the meeting agenda were not intended to be plant phases.

Each WWTP site was discussed in turn, with TCEQ being asked for input on ease and/or parameters of permitting for each. Comments are recorded below.

<u>Little Mineral Creek into Little Mineral Arm (Site1 and Existing Pottsboro WWTP)</u>

It was thought that due to the apparent lake cove that the creek flows into and the backwater conditions into the creek that dissolved oxygen would probably be limiting on the amount of discharge possible. The Pottsboro WWTP discharge was last modeled by the TCEQ in 1992.

<u>Unnamed Tributary into Big Mineral Arm (Site 2)</u>

The USGS quad map seems to indicate a wide outlet into the lake at this creek; however aerial map that Jim Michalk had indicated possible backwater conditions, meaning that dissolved oxygen may also be limited here.

Scott Branch into Big Mineral Arm (Site 3)

According to information present at the meeting, this site appeared to be the most favorable (least limited by dissolved oxygen).

Other Comments

Firoj Vahora reminded the team to be sure to meet buffer zone requirements.

The only other permitted discharger in the area (besides the Pottsboro WWTP and Denison's Grayson Co. Airport WWTP) is a small plant serving a mobile home park, into the unnamed tributary to Big Mineral Arm.

E Coli is now accepted as the primary criterion.

Proposing UV as the disinfection unit process may cause additional concern, since it is an alternative process; however positive operational experience and data from the UV unit at Denison's Paw Paw WWTP should alleviate that.

David Howerton explained that his preference would be to pump treated effluent as opposed to raw sewage, to accomplish the necessary pumping for this regional system. The favored approach for this regional system may be to have more than one WWTP site, but to discharge all the effluent into Scott Branch. TCEQ cautioned that there are some unresolved issues with regard to combining multiple WWTP discharges into one permit. The issues include concern over pinpointing which WWTP is at fault when permit violations occur, how to satisfy property owner notifications, and how to apply fees appropriately.

Mr. Howerton informed the TCEQ that the plan is for the City of Denison to own and operate the regional WWTP. TCEQ stated that having the owner and operator as the same entity makes it easier to permit.

Peggy Glass inquired as to what role the State of Oklahoma would play in the permitting process. There is no set protocol at this time, but it was thought that TCEQ would probably notify Oklahoma about the permit application. This is something that TCEQ will take care of however; no responsibility about this for the applicant.

Jim Davenport pointed out that nutrients maybe applicable to this permit as a discharge requirement, particularly phosphorus. There is some correlation to dissolved oxygen requirements.

It was discussed about how more definite information about permit ease and conditions could be obtained. Peggy Glass inquired if geometry taken from a USGS map, or a lower level aerial would be helpful. Jim Michalk replied that this info would not be enough to provide any more detail. However, if transcepts were surveyed along the coves and creeks, geometry developed from those would provide sufficient accuracy to allow a more detailed opinion.

Jim Davenport inquired about TDS expected in the waste stream, and that could be of issue. David Howerton explained that Denison obtains their raw water from Randell Lake with augmentation from Lake Texoma, but that TDS is low.

It was pointed out that industries (present and/or future) around the Airport or elsewhere in the service area might force a bio-monitoring requirement in the permit; even if the permitted flow rate is less than 1 mgd (the normal cut off for biomonitoring requirements).

Jim Davenport is to check for Lake Texoma on the 2004 303 watch list, but doesn't think this will be of issue.

It was discussed that piping the effluent discharge out into the lake would be better for regard to dissolved oxygen conditions, but that cost and possible USACE objections may make that infeasible.

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APPENDIX C

MEMORANDUM

Date: October 8, 2004

To: File 850-0101

From: Preston Dillard

Subject: Denison/Pottsboro Regional Wastewater System Study
USFWS Meeting Minutes

On September 28, 2004, a meeting with the United States Fish and Wildlife Service (USFWS) on the above reference project was held. The following individuals were in attendance:

Name	Representing
Rick Cantu	USFWS, Refuge Operations Specialist, Hagerman NWR
Craig Giggleman	USFWS, Contaminants Specialist, Arlington, Texas Field Office
Jerry Chapman	GTUA
David Howerton	City of Denison
Preston Dillard	APAI
Peggy Glass	APAI
Mark Perkins	APAI

The meeting began with introductions and Preston Dillard reviewing the purpose of the meeting, which was to determine any “fatal flaws” that USFWS might be aware of for the possible WWTP sites under consideration. An overview of the project was provided, and a description of the 4 potential sites given.

Probably only one of the sites currently under consideration would have any direct implications for the Hagerman National Wildlife Refuge. This is the site located west of the Grayson County Airport, along an unnamed tributary to the Big Mineral Arm of Lake Texoma. Effluent from a future WWTP here would eventually flow through the Refuge property.

Mr. Giggleman expressed his concerns about that particular location as follows:

- Over chlorination

- Treatment bypass
- Hydraulic capacity of unnamed tributary to carry additional flow

Mr. Giggleman has observed over chlorination occurring at other WWTPs. The scenario perhaps is where the chlorinator was left running longer than planned. His concern is that over chlorinated effluent released to the tributary might cause fish kills in the Refuge or other environmental problems. It was discussed that City of Denison, who will be the operator of this proposed WWTP, has Ultraviolet (UV) disinfection at the City's Paw Paw WWTP. UV will be considered as the disinfection process for this proposed WWTP.

Similarly, Mr. Giggleman has observed situations at other WWTPs where high flow or other non-normal situations has led to discharges that were not treated appropriately, which again could lead to fish kills or other problems. He understands that this is not supposed to happen, but can and does. It was agreed that no "guarantees" could be offered by anyone about any WWTP that effluent would always meet permit requirements. However, this study could consider installing a constructed wetland after the treatment system. The wetland would provide back-up treatment and an additional buffer if there were a malfunction at the treatment plant. Additionally, Mr. Howerton pointed out that the City of Denison has an excellent track record in the operation of their WWTPs.

Regarding creek capacity, it was discussed that the ability to carry the wastewater flow can be confirmed, but that most likely the storm flow the creek carries already would be greater than the amount of wastewater flow being considered.

Mr. Giggleman also expressed that a potential Refuge advantage would be the additional water flowing in the creek. Mr. Cantu commented that the creek is currently an intermittent stream.

It was pointed out that the study was considering the possibility of treating wastewater at this site, but discharging some or the entire effluent elsewhere, possibly as reuse water. Additionally, Mr. Howerton observed that the creek has been receiving discharge from the City of Denison's Grayson County Airport WWTP since the plant was constructed as part of the old Perrin Air Force Base during World War II. The City plans on routing that flow to the new regional WWTP eventually.

Regarding any possible need of the USFWS for reuse water, Mr. Giggleman mentioned that some planning had been conducted to create some wetlands along the creek.

The USFWS has in place a hydraulic control structure located at a low water crossing across the creek, at or near the mouth as it empties into the lake. The structure is used to enhance duck habitat. The control structure utilizes stop logs to raise and lower the creek water surface. Range of control was thought to be only a few feet. Mr. Cantu was not aware of any elevation data on the structure. Mr. Cantu explained that generally the control structure is used to lower the water surface in the summer, and raise it in the winter. The additional wastewater effluent flow into the creek may mean that the control structure would need modification to still function as intended.

Mr. Chapmen mentioned that elevation 617 feet was no longer the conservation pool elevation in Lake Texoma. The lake is operated so that a “target” elevation of 619 – 620 is reached during the summer. Lake elevation can be high enough to back water up into the creek.

USFWS needs to discuss further internally how much flow they would want to receive.

Distribution:

Jerry Chapman, Greater Texoma Utility Authority
Kendall King, Freese & Nichols, Fort Worth, Texas
Mayor, Steve Atkins, City of Pottsboro, Texas
David Howerton, City of Denison, Texas
Pann Sribhen, PSA Engineering, Dallas, Texas
Mark Perkins, APAI, Fort Worth, Texas
Shrirang Golhar, APAI, Fort Worth, Texas
Peggy Glass, APAI, Austin, Texas
Janet Sims, APAI, Austin, Texas

PCD/gh