

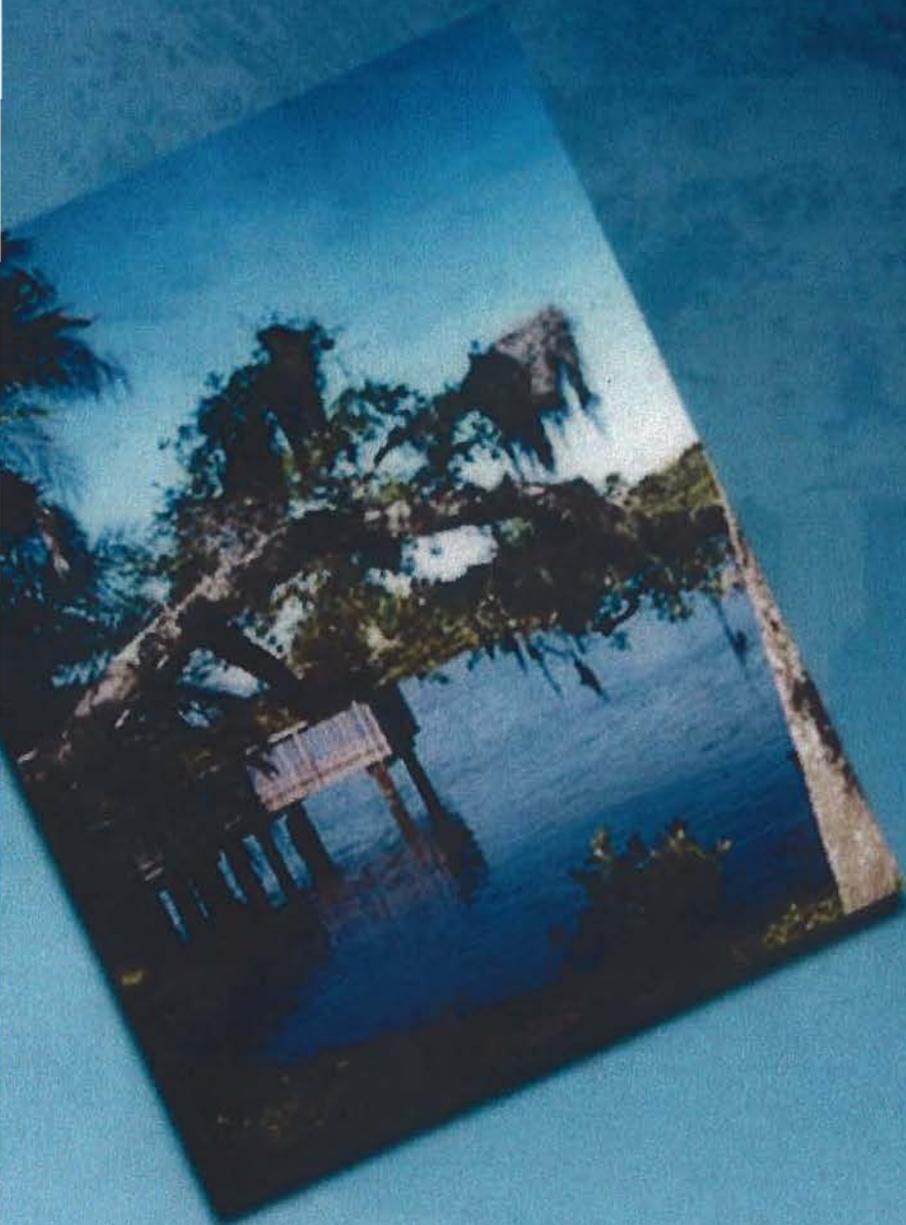
# Sarasota County

## Environmental Services Business Center



*Phillippi Creek  
Septic System Replacement Program  
Final Report  
Volume 1*

September 2000



**HAZEN AND SAWYER**  
Environmental Engineers & Scientists

**AYRES**  
ASSOCIATES



October 10, 2000

Mr. John Knowles, P.E.  
**SARASOTA COUNTY ENVIRONMENTAL SERVICES – UTILITIES**  
100 Cattlemen Road  
Sarasota, Florida 34232

**Phillippi Creek Septic System Replacement Program**  
**Executive Summary & Final Report**

Dear Mr. Knowles:

Hazen and Sawyer and Ayres Associates are pleased to submit our Final Report (2 volumes) and Executive Summary for the Phillippi Creek Septic System Replacement Program. This report completes the work performed under this project effort as defined in our scope of services with the exception of the onsite wastewater treatment system (OWTS) management task. This task effort will be extended and completed as part of the South County Wastewater Improvement Project where OWTS management will be evaluated County-wide.

This Final Report consists of twelve sections which includes each technical memoranda that were prepared and submitted during the course of the project. Each of the individual technical memoranda received technical review from County staff and various agencies during the term of the project. These review comments have been incorporated into the Final Report. In addition to the Final Report, an Executive Summary has been prepared which provides a comprehensive overview of the wastewater practices improvement program for the Phillippi Creek service area.

Hazen and Sawyer and Ayres Associates appreciate the opportunity to have worked with Sarasota County and its staff on this important project. Should you require any additional information, please feel free to contact us.

Very truly yours,

**HAZEN AND SAWYER, P.C.**



Daniel G. Burden, Ph.D., P.E.  
Project Director

**AYRES ASSOCIATES**



Damann Anderson, P.E.  
Deputy Project Director

Enclosures

Boca:40075L048



# Phillippi Creek Septic System Replacement Program

## Final Report Volume 1

Prepared for:

**Sarasota County Government**  
**Environmental Services - Utilities**  
100 Cattlemen Road  
Sarasota, Florida 34232

September 2000

**HAZEN AND SAWYER**  
Environmental Engineers & Scientists

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**FINAL REPORT FOR THE  
PHILLIPPI CREEK SEPTIC SYSTEM REPLACEMENT PROGRAM**

**TABLE OF CONTENTS**

**VOLUME 1**

<u>T.M.</u>	<u>Title</u>
1	Technical Memorandum No. 1 – Documentation Review
2	Technical Memorandum No. 2 – Water Quality Problem Identification and Prioritization
3	Technical Memorandum No. 3 – Development of Geographic Information System Database
4	Technical Memorandum No. 4 – Preliminary Delineation of Service Areas
5	Technical Memorandum No. 5 – Population and Delineation
6	Technical Memorandum No. 6 – Assessment of Wastewater Land Application Systems in the Study Area

**VOLUME 2**

7	Technical Memorandum No. 7 – Evaluation of Onsite Wastewater Treatment and Wastewater Collection System Alternatives
8	Technical Memorandum No. 8 – Preliminary Design
9	Technical Memorandum No. 9 – Capital Improvement Plan
10	Technical Memorandum No. 10 – Preliminary Financial Plan
11	Technical Memorandum No. 11 – Alternative Institutional Framework Analysis
12	Technical Memorandum No. 12 - Funding Alternatives Screening Report

## Forward

This Final Report, consisting of two volumes, was prepared by Hazen and Sawyer and Ayres Associates under contract with Sarasota County Environmental Services – Utilities. This project and the preparation of this report was funded in part by a Section 104 Clean Water Act Program grant from the U.S. Environmental Protection Agency through a contract with the Stormwater/Nonpoint Source Management Section of the Florida Department of Environmental Protection.

This Final Report consists of twelve sections which includes each of the twelve technical memoranda that were prepared and submitted during the course of the project. Each of the individual technical memoranda received technical review from County staff and various agencies during the term of the project. These review comments have been incorporated into the Final Report. In addition to the Final Report, an Executive Summary has been prepared which provides project background information, describes the project purpose, and acknowledges those agencies and individuals that provided assistance and contributions during the project effort. The Executive Summary has been prepared and submitted to the County under separate cover.



# Technical Memorandum No. 3

## Development of Geographic Information System/Database

Prepared for:

**Phillippi Creek Septic System Replacement Program**  
**Sarasota County Government**  
**Environmental Services - Utilities**  
100 Cattlemen Road  
Sarasota, Florida 34232

November 1998

**HAZEN AND SAWYER**  
Environmental Engineers & Scientists

**AYRES**  
ASSOCIATES

## TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1 Introduction.....	1
2 Specifications.....	3
3 Sources of Data.....	4
4 Application Methodology.....	6
5 Limitations and Future Developments.....	9
6 Sample Maps.....	10

## LIST OF TABLES

Table 4-1	GIS Potential Applications for Evaluation and Determination of Onsite Water Treatment Systems (OWTS) and/or Sewering Required in the Phillippi Creek Study Area.....	6
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## LIST OF FIGURES

Figure 6-1	Wastewater Treatment Plant Facilities.....	11
Figure 6-2	Selected Parcels and Roadways.....	12
Figure 6-3	High Water Table Soils.....	13
Figure 6-4	Unsewered Areas and County Owned Infrastructure.....	14

## APPENDICES

Appendix A	Principal Sources of Geographic Data
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## SECTION 1

# INTRODUCTION

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The geographic nature of the analytical requirements of the Septic Tank Replacement Project suggested the need for the development of a Geographic Information System (GIS). Upon review of project subsequent project tasks, the Hazen and Sawyer/Ayres project team developed a list of geographic data that would support the successful completion of those tasks and enhance the anticipated benefits of the project to the Utilities Department and Sarasota County. Utilities Department staff and other County personnel involved with planning, design, and construction of utility infrastructure may benefit from the methodology and/or product by which this GIS project has been developed and will be utilized.

This technical memorandum summarizes the results of Phase 1, Task 1.3 entitled Development of a Geographic Information System/Database. The objective of this task effort was to develop a GIS for the project effort through the integration of engineering, geophysical, hydrological, demographic, and feature data. Through the development of the geographic and attribute databases, the GIS will serve the project effort by supporting the analytical requirements of specific task efforts. Specifically, the focus of this task effort includes the following:

- Assembling the necessary information required to establish criteria for determining which parcels within the study area are potential candidates for alternative onsite technologies as defined in subsequent task efforts;
- Defining the layering and database requirements for the analytical needs of specific task efforts;
- Obtaining and preparing digital data resources from Sarasota County and other identified sources.
- Assembling the necessary information required to establish database files that will allow the estimation of unit cost information as defined in subsequent task efforts;
- Finalizing the analytical methodology using GIS with ArcView that allow future selection and prioritization of areas which may require sewerage; and
- Development of the required ArcView application necessary to support the analytical procedures for which the GIS is intended.

The geographic information system developed under this task has become a comprehensive tool that will provide many additional benefits to the County after the project's conclusion. This technical memorandum provides an accounting of the efforts of the project team and addresses the current status of the geographical information system. This technical memorandum

discusses the hardware, software, and geographic specifications of the project GIS (Section 2); summarizes the primary data sources which were utilized for the project GIS (Section 3); and presents an overview of the analyses for which the geographic data will be utilized (Section 4). A brief discussion on the limitations of the project GIS (Section 5) and mapping examples generated by the project GIS for various applications (Section 6) are also presented.

## SECTION 2

# SPECIFICATIONS

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All geographic data used in the project's GIS was manipulated using two software platforms: 1) ArcCad Version 14 by Environmental Systems Research Institute (ESRI) and 2) ArcView Version 3.1 by Environmental Systems Research Institute (ESRI). All work was done on a personal computer with Windows 98 as the operating system.

ArcCad was principally used to convert data which was obtained in either ESRI interchange format (.e00) or AutoCad drawing format (.dwg) and to reregister data which was not in the project's standard projection (see below). ArcCad stores geographic data concurrently in AutoCad drawing and ESRI coverage formats.

ArcView is the project's principal GIS platform for viewing and analyzing geographic data. This software is used for making spatial queries of external tabular data sets, for modifying the projections of non-standard data sets, for joining geographic data sets where similar data stored in section-sized blocks are regrouped into a data set covering the entire project area, and for creating and manipulating new geographic data. ArcView stores data as ESRI shape (.shp) files and can read data in a variety of vector and raster formats. All vector data that is expected to be used by the project team is converted to shape (.shp) format. All tabular data accessed by the GIS is converted to dBase (.dbf) format.

All geographic data must also be consistent with the following specifications:

Projection:	Florida State Plane
Zone:	West
Datum:	NAD83
Units:	U.S. Survey Feet
Distance:	Miles

## SECTION 3

# SOURCES OF DATA

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Data for the project GIS was obtained from several sources both within Sarasota County government as well as from outside sources. The Hazen and Sawyer project team has generated some geographic data used for the project effort.

Principal sources of data include:

- Sarasota County Management Information Services GIS Section
- Sarasota County Utilities Department
- Sarasota County Health Department
- Sarasota County Property Appraiser
- Florida Geographic Data Library

Appendix A provides a summary of the current array of GIS data that populates the project archive. There are currently 112 GIS coverages available for project use of which 54 are active and do not require further conversion or modification to be used for analytical or mapping purposes.

The Sarasota County Management Information Services GIS Section provided a number of geographic data sets. These data were delivered to Hazen and Sawyer in two formats associated with the GIS software manufacturer ESRI: shape files and ESRI interchange files (.e00). ".e00" files are ESRI's universal data interchange between all of its GIS application platforms. Once imported into a new GIS, they are converted into standard ESRI coverages where data is organized into a series of directories and specialized files.

Data delivered as .e00 files included road centerlines, city boundaries, parcels as both lines and polygons, surface water as both lines and polygons, precincts, section boundaries, subdivisions, and rights of way. These data (from 580 separate interchange files) were imported into coverage format then similar data from individual sections were joined to create a project-wide data set. The results were then stored in shape (.shp) format.

Parcel data was deemed unusable because the associated attribute data did not contain a parcel ID (PID) number for each parcel feature that was consistent with the Sarasota County Property Appraiser PID. Therefore, the parcel data could not be used to query either the property appraisal database or the Sarasota County Health Department permit database. Sarasota County MIS staff were able to identify an alternative source of parcel data whose attribute tables included a usable property ID number. At the same time, MIS staff also provided several countywide data sets including: canals, centerline roads, coastline, lakes, and surface water. MIS staff also provided USGS digital orthophoto quarter quadrangles for the entire project area.

The **Sarasota County Utilities Department** provided geographic data associated with County owned potable water and sewer transmission infrastructure. These data were delivered as AutoCad drawing files by individual section. GIS coverage data were created from the drawing files for each section within the project area, then joined into a single data set and stored in shape format. The Utilities Department also provided wastewater franchise boundary data as an unprojected (without a real-world coordinate system) drawing file. This drawing was shifted and scaled to match another project area data set with a Florida State plane (west) projection, then stored as a shape file. Additionally, the Utilities Department provided unsewered boundary data from a previous consultant's project effort. These data were provided as AutoCAD closed polylines registered in Florida State plane and were converted to shape format.

The **Sarasota County Property Appraiser** office provided its mass appraisal database CD that contains descriptive, measurement and value information for every parcel within Sarasota County. Each parcel record contains a unique parcel identification number which will be used for linking individual parcel records with parcel features in the project GIS.

The **Sarasota County Health Department** provided a copy of its well and septic tank permit database that includes detailed data for every affected property as provided by installers. Septic system information from this database will be linked to individual parcel features in the project GIS. The database's native parcel identification number (PID) field, however, was in a format that lacked hyphen separators. As these hyphens are present in both the property appraiser database and the GIS parcel coverage, the PID field required parsing and subsequent addition of the hyphens to be accessible for analytical purposes.

The **Florida Geographic Data Library (FGDL)** is a statewide clearinghouse for public entity generated geographic data located at the University of Florida in Gainesville. The FGDL distributes geographic data as individual county data sets on CD-ROM. Of the 80 coverages supplied, 13 were processed into the project GIS system. As all data distributed by FGDL are in an Albers Equal Area projection, any coverage used by the project must be projected to Florida State Plane (West). FGDL provides very precise metadata for each coverage so that the results of the projection process are quite satisfactory. Project staff have processed the following coverages from the FGDL: coastline, county boundary, general soils, hydrography 1:24,000, land use, rivers, roads, sewage treatment plants, specific soils, state roads, 5 foot topography, U.S. roads, and water treatment facilities.

**Hazen and Sawyer** generated some geographic coverages not available from other sources. These include 1) a project boundary, which was used to limit the extent of future geographic queries, 2) sewage treatment plant locations, 3) a database that summarizes wastewater treatment plant permit data obtained from the Florida Department of Environmental Protection (FDEP), and 4) proposed service area boundaries.

## SECTION 4 APPLICATION METHODOLOGY

The developed GIS will provide the project team with the capability of integrating engineering, hydrological, demographic and other feature data for the purpose of defining service areas, evaluating and routing collection systems, and evaluating cost scenarios for various alternative system designs. This section of the memorandum presents the specific applications and evaluations which we anticipate using the GIS for and the expected data sources required for each application/evaluation. Presently, a total of seven applications are tentatively planned for this purpose. These applications and their required GIS data sources are summarized in Table 4-1. A brief discussion of the defined applications and the methods envision for using GIS information is presented in the following paragraphs.

**Table 4-1  
GIS Potential Applications for Evaluation and Determination of Onsite Water Treatment Systems (OWTS) and/or Sewering Required in the Phillippi Creek Study Area**

Application	Data Requirements
1. Service Area Delineation	County boundaries & coastline, City limits, general soils, hydrography, major rivers, roads, canals, lakes, parcels, surface waters, USGS digital orthophotos, WWTP database, unsewered areas, County-owned wastewater collection lines.
2. Population Projections	WWTP database, City limits, County boundaries and coastline hydrography, parcel and parcel records, SCPA data, USGS digital orthophotos
3. OWTS Alternatives	Soils, hydrography, parcels, roads, canals, lakes, surface waters, Sarasota County Property Appraiser data, Sarasota County Health Dept. database
4. Capital Improvements	County boundaries & coastline, City limits, general soils, hydrography, major rivers, roads, canals, lakes, parcels, surface waters, section boundaries, subdivisions, rights of way, County-owned water distribution lines, County-owned wastewater collection lines, USGS digital orthophotos, WWTPs, unsewered areas
5. Alternative Analysis	Aerial photos, County boundaries & coastline, City limits, general soils, hydrography, major rivers, roads, canals, lakes, parcels, surface waters, section boundaries, subdivisions, rights of way, topography, County-owned water distribution lines, County-owned wastewater collection lines, USGS digital orthophotos, WWTPs, unsewered areas,
6. OWTS Management Program	County boundaries & coastline, City limits, soils, hydrography, topography, parcels, roads, canals, lakes, surface waters, Sarasota County Property Appraiser data, Sarasota County Health Dept. database

**Service Areas.** Delineation of service areas within the North County area is a necessary step prior to establishing population and wastewater flow projections, identifying areas for Onsite Wastewater Treatment Systems (OWTS), and identifying collection alternatives available. Using GIS information in conjunction with this task effort will allow the delineation and overlap of various information sources that will assist in establishing criteria for the defined service areas. For example, GIS information relative to parcel data, wastewater treatment plant locations, wastewater treatment plant capacity and attribute data, existing infrastructure and other potential attribute information will be used for establishing criteria necessary to delineate the required service areas. An example of how GIS information can be utilized for the establishment of service area boundaries is presented in Section 6.

**Population Projections.** Population projections for the defined service areas will be required for the purpose of establishing flow projections for those areas which require sewerage. Estimated population data and projected flow information will be entered into the GIS as attribute information relative to individual parcel, parcels, defined areas, or some other defined method. Population and flow data will then be utilized for the purpose of defining capacity requirements within defined service areas. Refinement of service area boundaries may be necessary based on plant capacity requirements. The use of parcel information for the purpose of estimating population data is illustrated in Section 6. In this case, spatial analysis of parcel oriented data, coupled with property appraiser information, can be used for estimating population projections and establishing flow projections within a given service area boundary.

**OWTS Alternatives.** The evaluation of onsite wastewater treatment system (OWTS) alternatives will be performed based on the use of field-collected data as well as selected sources of GIS information. GIS data fields such as the Soil Construction Service (SCS) soil types, hydrography, surface water locations and groundwater elevations will be used for the purpose of defining parcel areas which are suitable for the use of OWTS alternatives. Figure B-3 illustrates an example of using the SCS soil and hydrography data fields for the purpose of evaluating OWTS alternatives. In this example, an additional data field was created for each soil polygon based on the approximate distance between the seasonal high water table elevation and topography of the area. Soil types were then grouped accordingly based on seasonal high water table elevation (see examples in Section 6).

**Capital Improvements.** Prioritization of capital improvements can be assisted with the use of selected components of developed GIS information. For example, a specific improvement project within a defined service area would require the delineation of the number of parcels, defining the capacity requirements, determining collection requirements, and defining transmission needs. Parcel information, roadways, digital orthophotos, and existing infrastructure information when combined with the GIS can be used to assist in the determination of necessary capital improvements required for specified projects. Section 6 presents an example of the sewerage and unsewered areas overlaid with County-owned infrastructure. Within a specified service area, this information coupled with wastewater

treatment plant facility data and other GIS data, can be used for the purpose of identifying alternatives for collection and transmission.

**Alternative Analysis.** Alternatives for treatment and collection within defined service areas may be analyzed using data sources established for the developed GIS. Potential alternative analysis may include the use of centralized, clustered and decentralized approaches. Data requirements may include existing infrastructure such as County-owned collection systems, force mains, and pump stations; existing wastewater treatment plant facilities; roadways; parcel data; and other data sources that may pertain to the analysis.

**OWTS Management Program.** This task effort is directed toward assisting the County with the development of a management program that can be utilized for the purpose of tracking construction, operation, maintenance and repair, and performance of onsite wastewater treatment systems within the unsewered areas. A potential application of the developed GIS involves the geocoding of available parcel information with the County Health Department's permit database. By linking the two databases, the County Health Department would be able to use the information (parcel data, soils data, etc.) for the purpose of permitting parcels which require the use of an OWTS. Additionally, this information could be utilized for logging repair information where failures occur and using this information for analyses of areas where repairs and/or failures are frequently occurring.

**SECTION 5****LIMITATIONS AND FUTURE DEVELOPMENTS**

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As a result of this task effort, various limitations of the project GIS need to be recognized. These limitations, typically associated with data unavailability, are discussed in the following paragraphs and should be addressed during the course of the project for the subsequent task efforts, which utilize the GIS.

**Utility Infrastructure.** The geographic data associated with the potable water and sewer transmission infrastructure are only available for those facilities which are County owned and which have been transformed into computer aided drawing (CAD) format. GIS coverage data on non-County owned (private and/or franchise) water and wastewater infrastructure and facilities are not available.

**Topographic Information.** Topographic coverage data for the study area are limited primarily to 5-foot contours. A limited amount of 2-foot topographic contour information is available in GIS coverage format.

**Unsewered Areas.** The accuracy of a small percentage of the polygons associated with the unsewered boundary data received from the County Utilities Department is questionable in a few localized areas. For example, some parcels may, or may not, be included within the boundaries of the unsewered areas.

The GIS approach for this project was chosen due to disparate data types and the need for near real-time tracking. Further analytical capability may be realized with new ArcView modules as they become available.

## SECTION 6

# SAMPLE MAPS

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Examples of maps generated by the project geographic information system are included with in this section. As previously discussed, maps generated by the project geographic information system have been included as specific examples that may be utilized in the analysis of subsequent task efforts.

Maps presented for this purpose include:

- Service Area Delineation Map (Figure 6-1)
- Selected Parcels & Roadways (Figure 6-2)
- High Water Table Soils (Figure 6-3)
- Unsewered Areas and County Infrastructure (Figure 6-4)



Figure 6-2. Selected Parcels and Roadways

0 0.5 1 Miles

**HAZEN AND SAWYER**  
Environmental Engineers & Scientists

**AVRES**  
ASSOCIATES



Note: For Illustrative Purposes Only



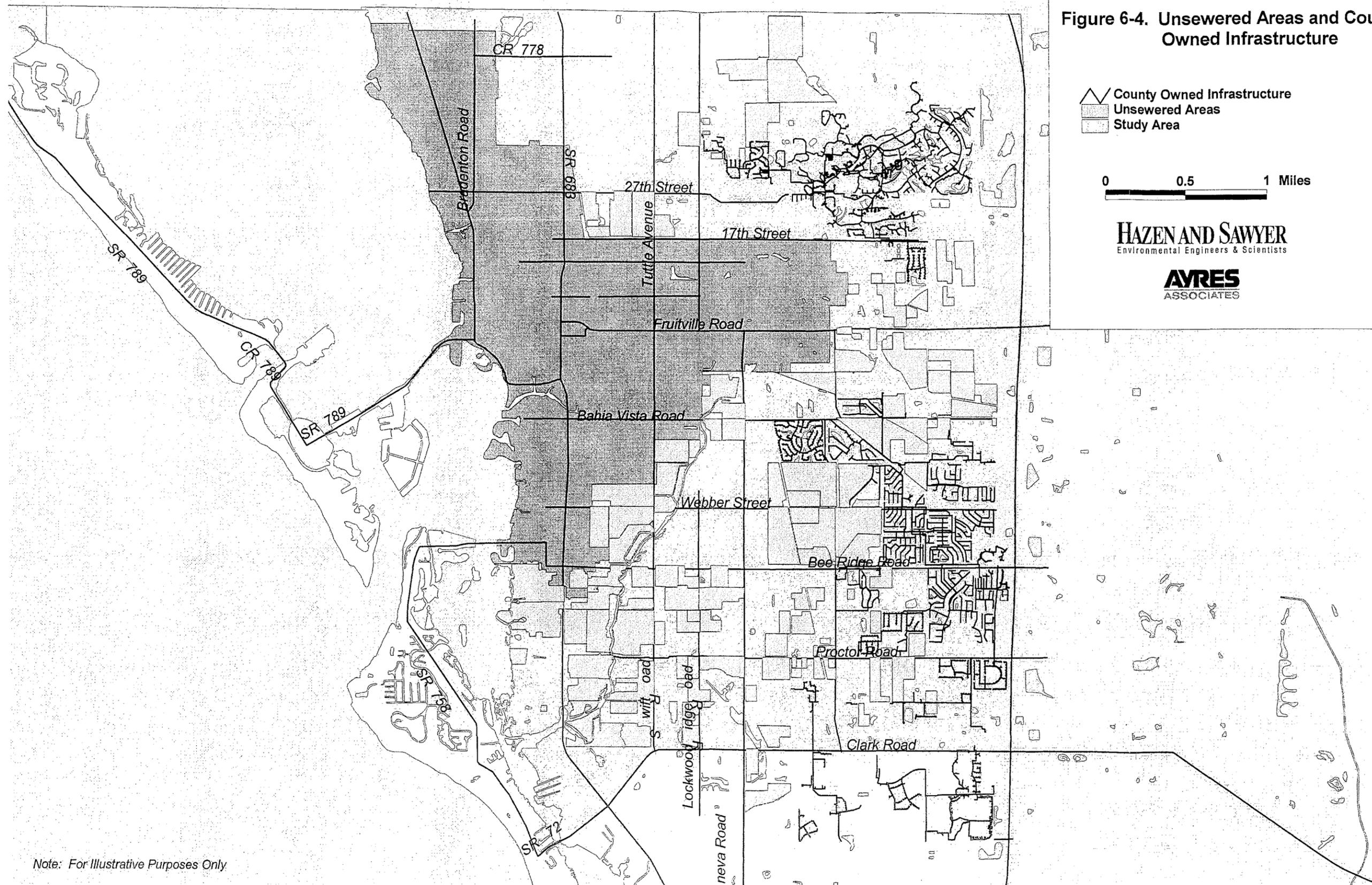
Figure 6-4. Unsewered Areas and County Owned Infrastructure

-  County Owned Infrastructure
-  Unsewered Areas
-  Study Area

0 0.5 1 Miles

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Environmental Engineers & Scientists

**AVRES**  
ASSOCIATES



Note: For Illustrative Purposes Only.



**TECHNICAL MEMORANDUM NO. 3**  
**APPENDIX A**

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## APPENDIX A

### Principal Sources Of Geographic Data

Data Item	Source	Initial Format	Current Format	Transformation Required
Average Daily Traffic - FDOT	FGDL	Shape/Albers		
Archaeological and Historical Data	FGDL	Shape/Albers		
Basins	FGDL	Shape/Albers	Shape/State Plane	Projection
Bathymetry	FGDL	Shape/Albers		
City and County Seat Locations	FGDL	Shape/Albers		
Conservation and Recreation Lands 1997	FGDL	Shape/Albers		
County Boundary	FGDL	Shape/Albers	Shape/State Plane	Projection
Coastline	FGDL	Shape/Albers	Shape/State Plane	Projection
Digital Elevation Models - USGS	FGDL	Shape/Albers		
Digital Elevation Models - WMD	FGDL	Shape/Albers		
Aerial Photos Center Points - FDOT	FGDL	Shape/Albers		
Aerial Photos - DOT Photo Date: 11 / 92	FGDL	Shape/Albers		
Ecological Regions	FGDL	Shape/Albers		
Ecosystem Management Areas	FGDL	Shape/Albers		
Federal Aviation Administration Obstructions	FGDL	Shape/Albers		
Flood Insurance Rate Maps	FGDL	Shape/Albers		
Florida Intrastate Highway System	FGDL	Shape/Albers	Shape/State Plane	Projection
Florida County Boundaries	FGDL	Shape/Albers		
FNAI Species Occurrence 1997	FGDL	Shape/Albers		
Florida County Boundaries and Coastline	FGDL	Shape/Albers	Shape/State Plane	Projection
FNAI Conservation Areas Zone A	FGDL	Shape/Albers		
FNAI Conservation Areas Zone B	FGDL	Shape/Albers		
FNAI Conservation Areas Zone C	FGDL	Shape/Albers		
Florida National Scenic Trail Planning Area	FGDL	Shape/Albers		
Habitat and Landcover	FGDL	Shape/Albers	Shape/State Plane	Projection
Biodiversity Hot Spots	FGDL	Shape/Albers		
Strategic Habitat Conservation Areas	FGDL	Shape/Albers		
Priority Wetland Habitats	FGDL	Shape/Albers		
General Soils - STATSGO	FGDL	Shape/Albers	Shape/State Plane	Projection
Hazardous Material Sites 1997	FGDL	Shape/Albers		
Historic Hurricane Paths	FGDL	Shape/Albers		
Hospital Locations	FGDL	Shape/Albers		
Hydrography, 1:100,000 - line	FGDL	Shape/Albers		
Hydrography, 1:100,000 - polygon	FGDL	Shape/Albers	Shape/State Plane	Projection
Hydrography, 1:24,000 - lines	FGDL	Shape/Albers		
Hydrography, 1:24,000 - polygons	FGDL	Shape/Albers	Shape/State Plane	Projection
Landfill and Recycling Centers	FGDL	Shape/Albers		
Landsat Index	FGDL	Shape/Albers		
Land Use Level II 1989-90	FGDL	Shape/Albers	Shape/State Plane	Projection
Major Prison Facilities	FGDL	Shape/Albers		
Major Rivers - lines	FGDL	Shape/Albers	Shape/State Plane	Projection
Major Rivers - polygons	FGDL	Shape/Albers	Shape/State Plane	Projection
MSS Satellite Images 1970s	FGDL	Shape/Albers		
MSS Satellite Images 1980s	FGDL	Shape/Albers		
MSS Satellite Images 1990s	FGDL	Shape/Albers		
National Oceanic and	FGDL	Shape/Albers		
Atmospheric Administration Obstacles	FGDL	Shape/Albers		
Public Land Survey System	FGDL	Shape/Albers		
Points of Interest	FGDL	Shape/Albers		

Data Item	Source	Initial Format	Current Format	Transformation Required
Parcels - Lines	SCMIS	.E00 by Section	Shape by Project Area	Import Coverage/ Join to Shape
Parcels - Polygons	SCMIS	.E00 by Section	Shape by Project Area	Import Coverage/ Join to Shape
Surface Water - Lines	SCMIS	.E00 by Section	Shape by Project Area	Import Coverage/ Join to Shape
Surface Water - Polygons	SCMIS	.E00 by Section	Shape by Project Area	Import Coverage/ Join to Shape
Precincts	SCMIS	.E00 by Section	Coverage	Import Coverage
Section Boundaries	SCMIS	.E00 by Section	Coverage	Import Coverage
Subdivisions	SCMIS	.E00 by Section	Coverage	Import Coverage
Rights of Way	SCMIS	.E00 by Section	Shape by Project Area	Import Coverage/ Join to Shape
* Note: Conversion of this group of 10 data items was done for each section, or 580 conversions.				
County Owned Water Distribution Lines	SCUD	.dwg by Section	Shape by Project Area	Drawing to Coverage/ Join to Shape
County Owned Wastewater Collection Lines	SCUD	.dwg by Section	Shape by Project Area	Drawing to Coverage/ Join to Shape
* Note: Conversion of this group of 2 data items was done for each section, or 216 conversions.				
Wastewater Franchise Boundaries	SCUD	.dwg / No Projection	Shape/ State Plane	Project to State Plane to Coverage to Shape
Unsewered Areas	SCUD	.dwg	Shape	Drawing to Coverage to Shape
Wastewater Treatment Plants	H&S		Shape	Developed
Wastewater Treatment Plant DEP Attributes	H&S		.dbf	Developed
Sarasota County Property Appraiser Data	SCPA	.csv	.dbf	Join to Parcel Shape
Sarasota County Health Dept. Data	SCHD	.dbf	.dbf	Modify Property ID to match key field.