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I am submitting herewith a thesis written by Charles W. Brown, Jr., entitled "The Location of Knoxville's New Wastewater Treatment Facility: A Case Study of the Decision-Making and Site Selection Processes and Citizen Involvement." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science in Planning.

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Thesis
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THE LOCATION OF KNOXVILLE'S NEW WASTEWATER TREATMENT FACILITY: A CASE STUDY OF THE DECISION-MAKING AND SITE SELECTION PROCESSES AND CITIZEN INVOLVEMENT

A Thesis

Presented for the

Master of Science in Planning

Degree

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ABSTRACT

This study examines the processes involved in selecting a site for Knoxville's proposed wastewater treatment facility. The processes examined were: (1) the decision-making process, (2) the site selection process, and (3) the citizen involvement which occurred in the planning and site selection processes for the wastewater treatment facility. The criteria used in site selection were also examined.

Two methods were employed to gather data for this thesis: (1) a literature review of texts and articles concerning the location of sewage treatment plants, citizen participation, and decision-making; and (2) a case study of the selection of the Cox Sky Ranch as the location for Knoxville's proposed wastewater treatment plant focusing on the three processes previously mentioned. A review of newspaper articles, transcripts of public hearings, the technical studies prepared for Knoxville, and interviews with the principal participants of the processes provided information for the case study.

Knoxville was cited for discharging inadequately treated sewage into Fort Loudoun Lake in late 1971 by the Tennessee Department of Public Health and the U.S. Environmental Protection Agency. To remedy the problems the city proposed to construct a wastewater treatment facility at the Cox Sky Ranch. This site was recommended by the city's engineers and was accepted by Mayor Kyle Testerman. Residents of the area fearing degradation of their neighborhood sought to have the site changed.

In examining this case study it was found that by selecting the Cox Sky Ranch as the location for the new sewage treatment plant, the city had selected a less than optimum location. The optimum location for a new facility, according to studies prepared by Rykman, Edgerly, Tomlinson, and Associates, was the Jo Anderson Farm owned by the University of Tennessee. The university was unwilling to sell the land to the city and the city was unable to obtain it through the use of eminent domain. It was also found that Mayor Kyle Testerman based his decision to select the Cox Sky Ranch on the technical recommendations of the engineers.

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CHAPTER I

INTRODUCTION

Knoxville's Situation

Many cities, including Knoxville, have been faced with the growing problem of disposing of their wastewater in a manner that causes the least harm to the environment. Knoxville's waste disposal problems have been increasing over the last few years. These problems are summarized below.

One of the city's wastewater disposal problems, and one of the most costly and difficult to solve, is the safe disposal of industrial wastes. Some industrial wastes can be difficult to treat or interfere with certain treatment processes. The Third Creek plant has been unable to meet current federal and state water quality criteria in recent years primarily because it has been unable to treat certain industrial wastes which possibly should have been treated by their producers. The problem of treating the industrial wastes was increased because the equipment used in its treatment was not used as efficiently as possible.

Knoxville's wastewater disposal problem is made more complex because it has a combined sanitary and storm sewage system in portions of the city. This type of system will cause the treatment plant to reach capacity more frequently, due to runoff after rain or snowfall. Once capacity is reached the overflow is discharged untreated into the receiving waters. Infiltration of water into sewer lines will also

cause a treatment plant to reach capacity quickly during rainy weather. Infiltration most frequently occurs in older sewer systems, however, there will be some infiltration regardless of the system's condition.

In order to solve problems related to the need to increase capacity and improve treatment processes many cities have decided to construct new, more advanced regional facilities. Knoxville's city officials were advised that a new facility would solve their sewage treatment problems and they initially decided to locate a regional wastewater treatment plant at Cox Sky Ranch in South Knox County. Because of U.S. Environmental Protection Agency requirements the plant's location was changed to the area adjacent to the Third Creek plant.

Knoxville's problems came to the attention of city officials in 1972 when the Tennessee Department of Public Health (TDPH) and the Environmental Protection Agency (EPA) informed Mayor Testerman that the city was in violation of established water quality standards. The city hired the engineering firm Rykman, Edgerly, Tomlinson, and Associates (R.E.T.A.) to assist in solving its wastewater treatment problems. R.E.T.A. proposed that a treatment facility be constructed which would help the city to meet the TDPH and EPA requirements. A study prepared by the University of Tennessee stated that the most cost effective location for the new plant would be the area adjacent to the existing Third Creek plant. The East Tennessee Development District recommended that a regional facility be located in South Knox County and indicated that the Anderson Farm would be an appropriate site.

After being pressured by TDPH and EPA Mayor Testerman and other city officials decided to construct a new facility at Cox Sky Ranch. According to studies prepared by R.E.T.A. this was the most cost effective location. The location of a treatment plant at this site was approved by city council in September 1973 and by the Metropolitan Planning Commission in December 1974.

News of plans to locate a sewage treatment plant at this site aroused residents of the nearby Topside Community and they sought to have the site for the proposed facility changed. Members of the community attended planning commission and city council meetings and public hearings. By becoming involved they caused city officials to reexamine the plans and alternatives for sewage treatment in Knoxville and Knox County.

Statement of the Problem

This thesis examines the processes involved in selecting a site for a sewage treatment plant. The three processes examined in this thesis are: (1) the decision-making process, (2) the site selection process, and (3) the citizen involvement in the planning and decision-making processes. In addition the criteria used in the site selection will be examined.

The decision-making process has been examined with respect to what agencies and individuals were involved and the roles they played in the final decision. In order to better understand the location of sewage treatment facilities, criteria used in site selection has been examined.

The citizen involvement in the various processes has been examined with respect to who has participated, and their location within the metropolitan region. Suggestions have been made as to how citizens can play a larger, more constructive role in planning and decision-making.

Methodology

Two methods were utilized in the research for this thesis: (1) a literature review of texts and articles concerning the location of sewage treatment plants, citizen participation, and decision-making; and (2) a case study of the selection of the Cox Sky Ranch as the site for the city's new wastewater treatment plant focusing on the three processes previously mentioned. Newspaper articles, transcripts of public hearings, the technical studies prepared for Knoxville, and interviews with principal participants of the processes provided information about the selection of the Cox Sky Ranch.

The interviews provided much information for the case study as well as providing insight into the decision-making process, and issues involved in the site selection. The interviewees were selected by the author's prior knowledge, achieved from newspaper articles and attending public hearings and other meetings, of who the principal participants were, by examining minutes of the city council, planning commission, and county commission meetings, and by recommendation from the participants themselves. Those who were interviewed included the organizers of the Topside Community Club's opposition, those in charge of preparing the wastewater facilities plan, and those who made the decision of which

site to select. Other individuals were interviewed to obtain specific information about events and aspects of wastewater treatment in Knoxville. A list of those interviewed can be found in the bibliography on pages 117-118. These interviews involved both a structured and unstructured type of interview guide. The structured portion was used to gain information concerning the roles of the participants in the controversy which developed as a result of the selection of Cox Sky Ranch as the site for the new sewage treatment plant. The unstructured portion was used to gain information concerning the issues and problems of the controversy.

To ascertain criteria that could be considered in locating wastewater treatment facilities, a review of literature, which included recent plans and technical studies prepared for Knoxville, was made. This was supplemented by interviews with planners and engineers.

Limits of the Thesis

This thesis will be limited to an examination of the decision-making and site selection processes and the citizen involvement of the controversy that developed from the selection of the Cox Sky Ranch as the site for a new regional wastewater treatment facility.

This thesis will not examine the decision to change the location of the proposed wastewater treatment facility from the Cox Sky Ranch. It will not be the purpose of this thesis to select the definitive set of criteria, nor determine if the definitive site was selected, but to discuss the criteria that were used to select a site for Knoxville and criteria that could be considered in any given situation.

Organization of the Thesis

A summary of Knoxville's wastewater treatment problems is presented in Chapter I as well as establishing the problem, methodology, and limits and organization of the thesis.

Chapter II presents background information concerning the sources and types of pollution, the historical aspects of water pollution control, Knoxville's wastewater treatment history, a detailed review of the treatment problems, and a review of events and issues involved in the selection of the Cox Sky Ranch as the site for a new sewage treatment plant.

The criteria that can be used for locating wastewater treatment facilities as well as those used for selecting a site for Knoxville's new facility will be discussed in Chapter III. The site selection process will also be discussed in this chapter.

Chapter IV discusses some general aspects of decision-making and citizen participation along with a discussion of these processes as part of the selection of the Cox Sky Ranch.

The summary and conclusion are presented in Chapter V.

CHAPTER II

BACKGROUND

Introduction

This chapter presents a discussion of the sources and types of water pollution which is intended to improve the understanding of Knoxville's sewage treatment problems and what will be required to solve them. A discussion of the historical aspects of water pollution control and Knoxville's wastewater treatment history and problems are also presented in this chapter. These discussions are presented to improve the understanding of how Knoxville's sewage treatment problems developed. The chapter concludes with a review of the events and issues involved in the selection of a site for the city's new wastewater treatment facility.

Sources and Types of Pollution

Most cities, in an attempt to reduce water pollution, have constructed or improved their wastewater treatment facilities. However, in order to improve water quality, and make plants operate more efficiently, it is necessary to have some knowledge of the types of pollutants being discharged and their sources. Generally, the impurities that enter waterways can be grouped into three categories:

(1) sewage from domestic use, (2) commercial and industrial wastes, and (3) drainage from farms, forests, and city lawns.[1]

Domestic Sewage

Domestic sewage is one of the major sources of water pollution and accounts for approximately one-third of the sewage generated within the United States. The average person in the U.S. uses approximately 50 gallons of water each day, most of which is used to carry wastes to treatment facilities. The amount of domestic sewage generated within a community is directly related to water consumption, and will vary according to climate, extent and availability of sewers, standard of living, and various other factors.[2]

Domestic sewage is typically composed of suspended solids derived from toilets, sinks, baths, laundries, garbage grinders, and water softeners.[3] Domestic sewage is the primary source of excessive nutrients, which stimulate plant growth creating blooms of plankton and algae, often causing undesirable odors and tastes.[4]

Most sewage treatment plants use a series of screening processes and settling tanks—primary treatment—to remove solid material from

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[1] Water - Useable or Polluted, (Washington, D.C.: U.S. Government Printing Office, 1970), p. 1.

[2] Sigurd Grava, Urban Planning Aspects of Water Pollution Control (New York: Columbia University Press, 1969), p. 32.

[3] Metcalf and Eddy, Inc., Wastewater Engineering (New York: McGraw-Hill Book Company, 1972), pp. 237-258.

[4] Charles H. Southwick, Ecology and the Quality of Our Environment (New York: Van Nostrand Reinhold Company, 1972), p. 8.

wastewater, and biological treatment to reduce organic wastes—secondary treatment. Tertiary treatment is required to remove nutrients from wastewater.[5] Tertiary treatment utilizes physical and chemical processes to further cleanse wastewater.

Commercial and Industrial Wastes

Of the three primary sources of pollution, more concern has been generated over commercial and industrial wastes. Commercial sewage flows are generally expressed in gallons per acre per day (gpad) and are based on the extent of existing development and by comparison with similar types of commercial establishments. Estimates of flow most often used for commercial areas are usually around 30,000 to 40,000 gpad but can vary from 4,500 to 160,000 gpad. The wastewater discharged by most commercial establishments is usually similar to domestic sewage in composition.[6]

Sewage flows from industrial districts will vary according to the industry type, size, and supervision. A typical design value for industrial areas is about 5,000 gallons per acre plus an additional 8 to 25 gallons per employee per day of domestic sewage. The composition of any industrial discharge generally depends on the type of industry, the specific processes employed, quality of supervision and control of emissions, and the size and organization of the industry. Industrial wastes can be grouped into the following categories:

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[5] Ibid.

[6] Sigurd Grava, pp. 40-41.

oil and grease, chemicals, toxic materials, radioactive substances, and thermal pollution.[7]

Petroleum products such as kerosene, lubricating and road oils are discharged into the sewage system from various sources including shops, garages, and from industries using them in their production processes. Oil and grease can be easily removed from sewage through the use of various types of pretreatment processes such as skimming, for removal of floating material; grease traps, preaeration, for grease separation; and flocculation, the formation of aggregates of finely divided material.[8]

Chemicals and toxic materials are another type of industrial waste and can enter the sewage system as by-products and overspill from production processes. Certain chemicals and heavy metals such as manganese, lead, mercury, arsenic, boron, etc., can become toxic in excessive quantities, killing fish and plant life.[9] Advanced treatment is required to remove chemicals, nutrients, and toxic wastes. Examples of such treatment are: chemical precipitation, adsorption, etc.[10]

Because of the addition of warm water from domestic and industrial sources, the temperature of wastewater is usually higher than that of

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[7]Ibid., pp. 41-42.

[8]Metcalf and Eddy, Inc., pp. 239, 444-446.

[9]Ibid., p. 260.

[10]Ibid., pp. 653-655.

the water supply. The temperature of water is very important because of its effects on aquatic life, chemical reactions, and the suitability of water for beneficial uses. It is necessary to realize that a sudden change in temperature of the receiving waters can result in a high rate of mortality of aquatic life. In addition, high temperatures can accelerate the growth of undesirable plants and sewage fungus.[11]

Radioactive substances enter the sewage system and receiving waters from the mining and use of radioactive ores. These substances can have long range adverse effects on all life forms depending on the element's half-life.[12]

Sewage from Drainage

The third major source of pollution is dissolved and suspended solids that come from drainage from farms, forests, and city lawns. Among the dissolved solids that pose pollution problems are pesticides, herbicides, and salt. These pollutants can enter a stream through excessive water runoff caused by poor farming methods and construction practices. Runoff from cultivated areas, even with good farming methods, is greatly increased over noncultivated areas. Soil loss, which varies according to the type of ground cover, can be as much as 99 tons per acre per year with corn or can be negligible in a forested area.[13]

The major source of suspended material from urban areas are sediment and street litter. Although some infiltration of storm water

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[11]Ibid., p. 676.

[12]Sigurd Grava, p. 42.

[13]Class Lecture, Dr. E. H. Hammond, Department of Geography, Land Surface Systems and Man, December 4, 1975.

into a sewer system will occur (usually through manhole covers and varying according to the number of openings and depth of water), this source of pollution is untreated unless a combined sanitary and storm sewer system is used.[14] Because this type of system increases flow a larger treatment facility will usually be required.

Measures of Pollution

Several standard tests and measures of water quality have been developed to determine the level of pollution at a particular location in a stream as well as to provide indicators of proper treatment control and operation. One of the most important and widely used is the Biochemical Oxygen Demand (BOD). BOD can be defined as the amount of oxygen that is required by any unit volume of sewage or polluted water to oxidize all organic material within the sample, thus restoring the water to normal conditions. Stated more simply, BOD indicates the amount of oxygen needed in the decomposition of wastes. The deficiency of oxygen is usually expressed in pounds of oxygen used up on incubation of a water sample for five days at 20° C. Any value of BOD above zero indicates pollution.[15]

The Chemical Oxygen Demand (COD) is another important test, and is used to measure the organic matter in industrial and municipal wastes that contain compounds toxic to biological life. The COD of a particular sample will generally be higher than the BOD because more compounds can

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[14] Metcalf and Eddy, p. 39.

[15] Sigurd Grava, pp. 37-38.

be chemically oxidized than can be biologically oxidized. There are many tests to determine levels of pollution in streams, of which BOD and COD are two of the more important. Other measures include: tests to determine the amount of solid matter in wastewater, measuring the level of dissolved oxygen (DO), and test to determine levels of various chemicals.[16]

Several of these tests are used by the city's Wastewater Control Division to determine the effectiveness of the treatment plants and the strength of the wastes entering the plant. Tests used by the city include: BOD, test for the level of suspended solids, tests to determine temperature levels, and measuring the level of dissolved oxygen.[17]

Historical Aspects of Water Pollution Control

The need to improve the quality of water because of man's abuse has long been recognized. The use of polluted water has been directly related to health problems. One of the most important factors responsible for improving the level of health has been the development of modern wastewater collection and treatment facilities. Sewer systems have been in use for a long period of time. Some of the first were in ancient Rome, where they were used primarily for removal of storm waters. Human wastes were excluded from most early sewer systems.

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[16]Metcalf and Eddy, p. 252.

[17]Obtained from records of the Wastewater Control Division, City of Knoxville, Tennessee.

The inclusion of human wastes in sewers did not became an acceptable practice until the 1800's.[18]

The city of Hamberg, Germany, was the first city to make improvements in the design of sewer systems. In the 1840's Hamberg constructed a new system taking into account topography and modern theories of the day concerning the flow of wastewater. Although the principles concerning the conveyance of wastewater have been known since their use in Hamberg, their application to the design of sewers has been evolutionary rather than by clear progressive steps. In other words it took over 100 years for the principles used in designing the Hamberg sewers to be accepted and used in other cities.[19]

Although wastewater collection dates back to early Rome, the treatment of sewage has been a comparatively recent development. The first facility for sewage treatment was developed in the late 1800's in England.[20] The first facility to be constructed in the United States, an intermittent sand filter, was built at Medford, Massachusetts, in 1887. The first trickling filter to be constructed in the U.S. was in 1901 at Madison, Wisconsin.[21]

Legislative Efforts to Improve Water Quality

Efforts to control water pollution in the United States date back to 1647 when the Massachusetts Colony passed regulations for the prevention

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[18] Metcalf and Eddy, p. 2.

[19] Ibid., p. 3.

[20] Ibid., p. 5.

[21] Leonard B. Dworsky, ed., Water and Air Pollution (New York: Chelsea House Publishers, 1971), p. 10.

of pollution of Boston Harbor as a public health measure. Other colonies instituted similar measures, such as the South Carolina statute forbidding pollution harmful to fish. Most early sanitation practices were usually limited to encouraging cleanliness and discouraging the depositing of undesirable matter in waterways used by the city's inhabitants. This tradition continued until the early 1900's when Congress passed legislation to prevent the depositing of impediments to navigation rather than controlling the discharge of pollution.[22]

One of the first acts passed by Congress controlling the discharge of wastes was in 1886 and was intended to prevent the discharge of refuse into New York Harbor. In 1899 the Rivers and Harbors Act applied these same provisions to all navigable waterways and is still in force today.[23] The Refuse Act passed the same year had similar provisions and provided criminal penalties, a fine between $500 and $2,500, for depositing refuse in navigable waterways. Unfortunately this and other similar acts were usually unenforced.[24]

Several members of Congress during this time were concerned about the relationship between pollution and health and several acts were introduced for its investigation, however, none were passed. Fortunately this attitude changed and Congress passed legislation, in 1912, enabling

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[22]Ibid., p. 7.

[23]Ibid., p. 21.

[24]The Refuse Act was enforced for a short time when it was "discovered" by Congressman Henry Reuss, of Wisconsin, while reviewing the Rivers and Harbors Act. Reuss successfully pressured the district attorneys in his home state to enforce the act in 1970. See Peter W. Schroth and Zygmunt Plater, Nature, Law and Society (Published by the Authors, 1975), pp. 3.02-3.09.

the Public Health Service to carry on investigations of the pollution of navigable waterways and the influence sanitation and sewerage has on contagious diseases.[25] No additional antiwater pollution legislation was passed (except for acts aimed at controlling oil pollution in coastal areas) until the 1948 Water Pollution Control Act.[26] This act set forth a national policy on controlling water pollution. It also directed the Public Health Service to develop programs for solution of water pollution problems in cooperation with interstate agencies and municipalities, and authorized federal grants to finance engineering studies, construction of abatement works, and for cleaning up industrial wastes. The act was amended several times, in 1956, 1961, 1965, and 1966, in order to redirect, reassert, and broaden the responsibility of the federal government in controlling water pollution.[27]

The most comprehensive legislation passed thus far is the Federal Water Pollution Control Act Amendments of 1972. This act set the goal of eliminating the discharge of pollutants into navigable waterways by 1985. To accomplish this goal the federal government has established specific water quality standards, given the Environmental Protection Agency the power to enforce the standards, and has encouraged the use of planning to help control sources of pollution in each state.[28] This legislation is already having an impact on cities with poor

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[25]Leonard W. Dworsky, p. 21.

[26]Ibid., pp. 26-27.

[27]Ibid., pp. 26-32.

[28]United States Congress, The Federal Water Pollution Control Act Amendments of 1972—Public Law 92-500, October 18, 1972.

wastewater treatment facilities. Most of those with antiquated facilities and those who cannot meet the standards of the act have been forced to improve and upgrade their sewage treatment plants. Knoxville is one of these cities.

Wastewater Treatment in Knoxville—Historical Perspective

Knoxville was the first of the four major cities in Tennessee to abate its stream pollution problem when it began to treat its sewage in the early 1950's. Up to this time the city had discharged its sewage into Fort Loudoun Lake through 32 outfall lines ranging in size from 8 to 60 inches in diameter. One of the primary reasons for becoming involved in sewage treatment was the decreased flow of the river caused by TVA's system of dams and reservoirs. The decreased flow caused discharged sewage to remain near the city for a longer period of time thus creating a problem.[29]

To provide technical assistance the city hired Greely and Hansen of Chicago as consulting engineers. The engineers made a study of existing conditions and submitted a report to the city council in 1945. In 1951 the voters of the city authorized an issue of $6 million in sewer revenue bonds to finance the proposed wastewater treatment plants.

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[29]Guy B. Arthur, "Knoxville's Third Creek Disposal Plant," Public Works 86, May 1955, p. 103.

Two plants were constructed in the project—the Loves Creek and Third Creek sewage treatment plants.[30]

The first wastewater treatment facility to be constructed in Knoxville was the Loves Creek sewage treatment plant. Serving the Loves Creek drainage area, construction began in the early 1950's and operation began in November 1954.[31] The Loves Creek drainage area is in the eastern portion of the city. It occupies an area of approximately 14 square miles and encompasses the Woods Creek drainage basin and includes parts of the Loves Creek and Williams Creek drainage basins.[32] One of the primary reasons for its construction was to prevent untreated sewage from entering the city's nearby water intake. Another reason was that it was more economical to serve this drainage area with a local facility than to pump the sewage to the Third Creek plant.

The Loves Creek plant utilizes Imhoff tanks, sludge drying beds, and prechlorination. The flow at its completion was 0.5 million gallons per day (MGD) and was designed to handle 1.4 MGD. Trickling filters were added in 1963 which increased its effective capacity to approximately

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[30] J. W. Whisman, "Tennessee's First Major Sewage Treatment Plant," The American City 71, August 1956, p. 98.

[31] Guy B. Arthur, p. 104.

[32] Rykman, Edgerly, Tomlinson, and Associates, Knoxville, Knox County, 201 Facilities Plan Vol. 1 (Published by the Authors, 1975), pp. 9-10.

3.0 MGD.[33] It is presently receiving an average monthly flow of 1.9 MGD.[34]

The Third Creek sewage treatment plant, developed under the same program, went into operation in 1955. The site selected for its location is on the northern bank of the Tennessee River on property purchased from the University of Tennessee.[35] This facility serves the Third Creek drainage area which includes the following drainage basins: First Creek, Knob Creek, Williams Creek, and a portion of Loves Creek. The Third Creek drainage area encompasses approximately 64 square miles.[36]

The Third Creek plant, when first constructed, provided primary treatment utilizing sedimentation and digestion tanks, equipment for dewatering sludge with vacuum filters, and both prechlorination and postchlorination. At its completion flow was 24.2 MGD with a design basis of 35.7 MGD.[37] Secondary treatment was added in 1968. Present flow is approximately 33.0 MGD per month.[38]

The Fourth Creek sewage treatment plant was the third plant to be constructed by the city of Knoxville. This facility is located on

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[33]Ibid.

[34]Obtained from records of the Wastewater Control Division, City of Knoxville, Tennessee.

[35]Guy B. Arthur, p. 103.

[36]Knoxville, Knox County, 201 Facilities Plan, pp. 6-7.

[37]Guy B. Arthur, p. 404.

[38]Obtained from records of the Wastewater Control Division, City of Knoxville, Tennessee.

17 acres immediately behind Eastern State Psychiatric Hospital. At the time of the plant's construction, 1968, an agreement was made between the city and the hospital that if land was provided for the facility then wastewater generated by the hospital would be treated at a cost of $10,000 per year for thirty years.[39]

The plant serves the Fourth Creek drainage area which occupies approximately 43 square miles in the western portion of the city and part of the county. Four drainage basins are located in this area: Fourth Creek, Blue Grass Creek, Duncan Branch, and a portion of Third Creek.[40]

The treatment facilities at the plant include sedimentation, aeration, and chlorination. The plant is designed to treat an annual average flow of 7.7 MGD and a maximum of 15.2 MGD. The plant is currently treating an average of 5.6 MGD.[41]

Knoxville's Sewage Treatment Problems

When Knoxville began treating wastewater in the early 1950's it was considered a progressive step in controlling pollution on the Tennessee River. The construction of the first two sewage treatment plants received coverage in national engineering and public affairs

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[39] Interview with Jim Clark, Operator of the Third Creek Sewage Disposal Plant, June 20, 1976.

[40] Knoxville, Knox County, 201 Facilities Plan Vol. 1, pp. 7-9.

[41] Obtained from records of the Wastewater Control Division, City of Knoxville, Tennessee.

magazines. However, as Knoxville grew its ability to effectively treat its sewage decreased. The city's problems centered around the Third Creek plant which receives most of the wastewater flow. After being advised by the Tennessee Department of Public Health, in January 1971, that the Third Creek plant was inadequate, the city hired an engineering consultant, Dr. E. E. Baumann, to investigate the situation and determine what problems existed. (See Figure 1.)

Dr. Baumann issued two reports in 1971. These reports found that the Southern Extract Company, a paper mill located in the northwestern portion of the city, was one of the primary reasons for the Third Creek plant's ineffective operation. In these reports Dr. Baumann stated that wastes discharged from Southern Extract inhibit the growth of coliform organisms, which are useful in destroying organic matter in biological treatment processes; cause an increase in the BOD loading of the plant resulting in a decrease of approximately 20 percent in the efficiency of BOD removal; and cause an odor problem which results when the company discharges waste with a high sulfur content.[42] The Southern Extract plant closed recently which helped to lessen these problems.

Dr. Baumann's report also pointed out problems caused by improper operation of the Third Creek plant. The report stated that the plant was unable to effectively remove suspended solids in the sewage. This problem was caused by ineffective operation of the sludge thickeners.[43]

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[42]E. E. Baumann, Progress Report on the Study of Knoxville's Water Pollution Control Facilities—Third Creek Plant (Unpublished Report, December 1971), p. 23.

[43]Ibid., p. 37.

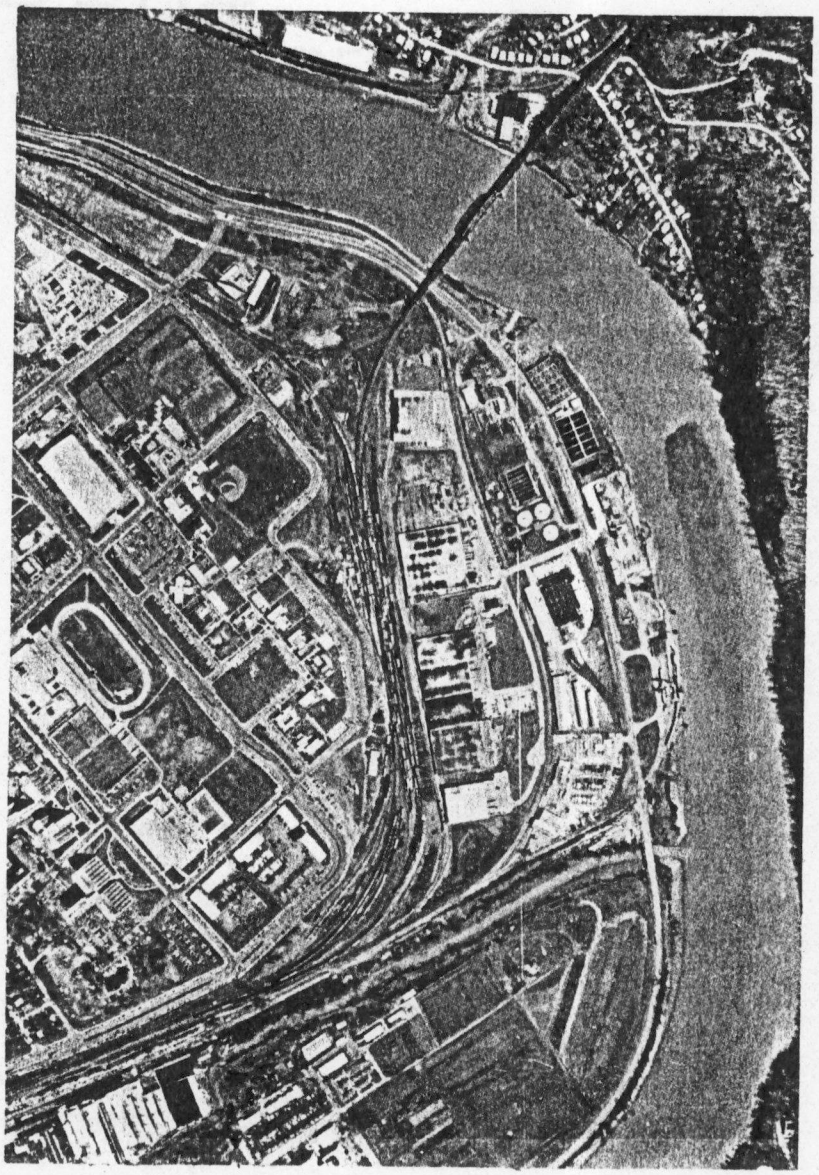


Figure 1. From the air the dark discharge from the Third Creek treatment plant can easily be seen. Photo from the Tennessee Professional Engineer 8 (November 1975), page 5.

An interview with Jim Clark, operator of the Third Creek plant revealed that this problem was caused primarily by overloading the sludge thickeners, both hydraulically and organically, and the mixing of incompatible wastes. It was pointed out in the interview that this problem has been relieved through modification of the plant operations although it has not been completely solved.[44] Other problems found by Dr. Baumann were: ineffective operation of the activated sludge units resulting in low BOD removal; and the inability of the aerators to supply the oxygen needed to maintain a satisfactory dissolved oxygen concentration.[45]

Before the last of Dr. Baumann's reports were issued the State Department of Public Health issued a Commissioner's Order citing Knoxville and the Third Creek treatment plant for violating established water quality standards. As a result of this order the city hired Ryckman, Edgerly, Tomlinson, and Associates in March 1972 to help solve its sewage treatment problems. Shortly after being hired R.E.T.A. issued an operations review, as required by the Commissioner's order. The purpose of this report was to determine problems and recommend plant improvements for their correction. The report concluded that the Third Creek plant cannot adequately treat the average dry weather flow of 29 MGD for three reasons: (1) the solids handling facilities are not adequately sized; (2) the oxygen demand characteristics of the raw sewage is significantly higher than normal domestic waste because of

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[44]Interview with Jim Clark, June 20, 1976.

[45]E. E. Baumann, p. 38.

industrial discharges into the system; and (3) the secondary treatment facilities are not adequately sized to treat 29 MGD.[46] In connection with the third reason, Jim Clark stated that the primary treatment facilities are overloaded and that the secondary treatment facilities, through a possible design error, can treat only 80 percent of the flow from the primary facilities. Present flow often approaches 31 MGD with the secondary treatment facilities capable of accepting only 25 MGD resulting in 6 MGD being bypassed.[47] The operations review also pointed out that the number and level of training of the operating and supervising personnel is not adequate for a facility of the type and size of the Third Creek plant.[48]

Recommendations made in this report include making appropriate additions and modifications; adopting and enforcing a more stringent ordinance regarding the rules and regulations for the sewage disposal system; and improving the staff at the facility.[49]

A problem also exists with a certain amount of flow being bypassed because of repairs or high flow. Because of an occasional breakdown of equipment at a treatment facility it is necessary that it be repaired or replaced. When this occurs it is necessary to bypass the wastewater

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[46]Rykman, Edgerly, Tomlinson, and Associates, Operations Review for the Third Creek Treatment Plant (Published by the Authors, 1973), p. 5.

[47]Interview with Jim Clark, June 20, 1976.

[48]R.E.T.A., Operations Review, p. 5.

[49]Ibid.

around the broken equipment or when necessary to let the flow bypass the plant completely. The Third Creek plant was shut down 319.0 hours in 1975 because of repairs, compared to 146.5 hours for the Fourth Creek plant.[50]

Knoxville's sewage treatment problem is made more complex because it has a combined storm and sanitary sewage system in a portion of the city. The combined system can be found in the older parts of the city, the downtown area, the immediate northern and eastern portions, and the western portion to the Bearden area. In this type of system, runoff and sanitary wastes are collected and flow to the treatment plant together. This causes the plant to reach capacity frequently, especially after rain or snowfall. Once capacity is reached the overflow is bypassed around the plant causing raw domestic and industrial wastes to be discharged into Fort Loudoun Lake without treatment. The Third Creek treatment plant had 1737.0 hours of bypass in 1975 due to high flow while the Fourth Creek plant had 680.5 hours.[51]

Another problem is the infiltration of water into sewer lines. This problem is caused by water seeping into the system through cracks and loosely fitting joints—often characteristic of older systems. This can also cause the treatment plant to reach capacity quickly during rainy weather or where there is a high water table. Generally there is some infiltration regardless of the condition of the system.

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[50]Obtained from records of the Wastewater Control Division, City of Knoxville, Tennessee.

[51]Ibid.

A Review of Events and Issues

The previous sections have provided some insight into the problems that caused Knoxville to consider constructing a new wastewater treatment facility, which created a controversy over where it should be located. In one sense it is the buildup of these problems that lead to the controversy. This section will present a synopsis of the major events that occurred throughout the controversy.

Knoxville's sewage treatment problems had been building up over a period of years and it was evident that current facilities could not meet existing demand. Recognizing this problem the Tennessee Department of Public Health (TDPH) advised the city that the Third Creek plant was inadequate to meet existing flows in January 1971. Later that month the state established specific effluent standards.[52] To assist the city in determining its problems and to suggest methods to remedy them, a consultant, Dr. E. E. Baumann, was hired. He issued two reports, one in October and another in December 1971, which outlined the specific problems of the Third Creek plant.

In November 1971, Knoxville submitted a grant application, under Public Law 84-660,[53] to the state for additional treatment facilities. The city was informed that funds for fiscal year 1972 were not available for the project.[54]

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[52]Letter from Jack E. Ravan, Regional Administrator, Region IV, Environmental Protection Agency, May 13, 1976.

[53]The Water Pollution Control Act Amendments of 1956.

[54]Letter from Jack E. Ravan, May 13, 1976.

The city's problems increased in December 1971 when Mayor Leonard Rogers received a Commissioner's Order from TDPH establishing certain criteria and conditions to be met in order to abate the stream pollution problems associated with the Third Creek plant. The order directed the city to submit an engineering report by June 3, 1972, and pointed out standards being violated by the Third Creek plant. The order stated in part that:

> The Third Creek plant frequently achieves a 5-day, 20° C BOD reduction of less than 50 percent, . . . industrial wastes received are inadequately treated, . . . wastewater currently being discharged is such that water quality standards can not be maintained in the receiving stream, . . . and the city has not complied with previous recommendations of the TDPH.[55] (See Commissioner's Order in Appendix A, page 123.)

In order to solve these problems the commissioner directed the city to upgrade, expand, and improve, the Third Creek treatment plant so that it is capable of meeting various water quality standards, retain an engineer to design these improvements by February 1, 1972, and submit an engineering report detailing how the plant will be improved by June 3, 1972.[56]

On January 1, 1972, Kyle Testerman, having been elected, was sworn in as mayor of Knoxville and was faced with having to comply with the Commissioner's Order. Testerman had been aware of the problems with the Third Creek plant prior to his inauguration through his work as a

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[55]Letter from S. Leary Jones, Director, Division of Water Quality Control, Tennessee Department of Public Health, to Leonard R. Rogers, Mayor of Knoxville, December 17, 1971.

[56]Ibid.

member of the Metropolitan Planning Commission and the city council. Mayors previous to Testerman had done little improve the treatment facilities leaving any problems that existed to be corrected by future administrations. A search was started for an engineering firm to assist in improving the plant. On March 10, 1972, a committee of six city councilmen voted to recommend the selection of Rykman, Edgerly, Tomlinson, and Associates of St. Louis to replace Greely and Hansen of Chicago, the present city engineers.[57] At the city council meeting held March 14, 1972, R.E.T.A. was hired.[58] Greely and Hansen had served the city since initiation of its sewage program in the early 1950's.

On June 30, 1972, the Department of Public Health issued an amendment to the Commissioner's Order. The amendment included a time schedule for providing the required facilities at the Third Creek plant. The order was amended after an engineering report was submitted recommending expansion of the 7.7 MGD Fourth Creek plant. This would require acquisition of property from Eastern State Psychiatric Hospital.[59] The city was required to meet the following schedule:

August 31, 1972—Complete operations review for secondary and primary plants
September 30, 1972—Submit and engineering design report for the primary plant

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[57]Moody Connell, "Sewerage Plant Consultant Picked," Knoxville Journal, March 11, 1972, p. 1.

[58]Minutes of Knoxville, Tennessee, City Council Meeting, March 14, 1972.

[59]Letter from Jack E. Ravan, May 13, 1976.

March 31, 1973—Submit plans and specifications for primary plant and design report for secondary plant
August 1, 1973—Initiate construction of primary plant
November 30, 1973—Submit plans and specifications for secondary plant
April 1, 1974—Initiate construction of secondary plant
December 31, 1974—Complete primary plant and place in operation
December 31, 1975—Complete secondary plant and place in operation[60]
(See amendment to Commissioner's Order in Appendix A, page 129.)

To compound Knoxville's problems the Environmental Protection Agency (EPA) cited the Third Creek facility for discharging inadequately treated sewage and violating federally approved water quality standards.[61] Issued in August 1972 this notification constituted a 180-Day Notice[62] in which time the violations were to be resolved or EPA would take formal enforcement actions. Pursuant to this notice a hearing was held in Knoxville in September 1972 in which a legally enforceable program was developed to achieve compliance with federal standards.[63] This program closely follows the timetable established by the TDPH.

An interim report prepared by R.E.T.A. was issued in March 1973. This report outlined three alternative solutions to meet current and projected flows for the Third and Fourth Creek treatment plants. These

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[60]Letter from V. Wayne McCoy, Monitoring and Enforcement Section, Division of Water Quality Control, Department of Public Health, to Kyle C. Testerman, Mayor of Knoxville, June 30, 1972.

[61]Letter from Jack E. Ravan, to Kyle C. Testerman, August 10, 1972.

[62]The 180-day notice is provided as an enforcement mechanism under the Water Pollution Control Act Amendment of 1956, Public Law 84-660.

[63]Letter from Jack E. Ravan, May 13, 1976.

alternatives were: (1) expand Third and Fourth Creek plants, (2) utilize existing facilities and divert excess flow to a new plant, and (3) abandon existing facilities and divert all flow to a new facility.[64]

Accepting alternative 1 as the best, Knoxville attempted to obtain a 45 acre tract for expanding the Fourth Creek plant from Eastern State Psychiatric Hospital in March 1973. The city's request for land was denied. The city attempted to purchase the land because the city was unable to obtain property owned by the state through the use of eminent domain. State officials said that because the loss of existing facilities would be too great, the city's request could not be approved.[65] The city had apparently met the requirements of the Commissioner's Order and the 180-day notice until this time.

As a result of being denied land for expanding the Fourth Creek plant Knoxville began to consider a regional facility in cooperation with Maryville and Alcoa. Maryville and Alcoa were in the final stages of plant design and had been given approval for construction of their own facility. S. B. Shields, mayor of Maryville, stated that because of the investment of time and money already made, cooperation with Knoxville would be impossible.[66]

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[64]Rykman, Edgerly, Tomlinson, and Associates, Alternative Wastewater Treatment Systems, (Published by the Authors, 1973), p. 16.

[65]"Regional Sewage Plant Considered," Knoxville Journal, April 10, 1973, p. 1.

[66]Moody Connell, "Region Sewage Plant Discussed for Knox," Knoxville Journal, May 12, 1973, p. 1.

In May 1973 Knoxville attempted to purchase 100 acres of the Jo Anderson Farm, owned by the University of Tennessee, for the city's new sewage treatment plant. Again the mayor attempted to purchase the farm because the city is unable to use eminent domain to obtain land owned by the state government. The Jo Anderson Farm had been recommended by R.E.T.A. as the best location. According to Dr. Edward Boling, president of the University, the farm was not sold to the city because the property had been sold to the university with the condition that it would always be an agricultural experiment farm. Dr. Boling felt this agreement could not be violated. Dr. Boling also stated that he felt that more benefit could be derived from the land with its present use. After learning that the university would not sell the Jo Anderson Farm Mayor Testerman threatened to not allow the university to use the city's wastewater treatment facilities. Dr. Boling ignored the mayor's threats, feeling that it would be impossible to separate the university's wastewater from that of the rest of the city.[67]

On June 6, 1973, the TDPH sent a letter to Mayor Testerman stating that the engineering design report due March 31 had not been submitted and was given 10 days to submit an acceptable proposal for compliance with the Commissioner's Order or the state would seek appropriate legal relief.[68] The city failed to meet this deadline and a hearing was held

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[67]Interview with Edward Boling, President of the University of Tennessee, July 16, 1976.

[68]Letter from Charles M. Cary, Staff Attorney, Division of Water Quality Control, Tennessee Department of Public Health, to Kyle C. Testerman, Mayor of Knoxville, June 6, 1973.

in Chancery Court in Nashville. In the hearing, held in July, Knoxville was given 90 days to pick a site for a new plant.[69]

Later in June, the state submitted Knoxville's grant application to EPA for fiscal year 1973 funds. The EPA did not approve the grant primarily because planning requirements had not been met. The application was returned to the state in December.[70]

About this same time Edward Boling offered the services of a professional staff of university personnel to work with the city's staff and consulting engineers in site investigations for the new wastewater treatment facility. Mayor Testerman accepted the university's offer on June 6, 1973, and requested that a team of experts be appointed to work with the director of wastewater control, the city's technical advisor, and consulting engineers. The mayor also requested that the group prepare a report concerning potential sites by June 15, 1973, for review by the engineers at that time. Dr. James Drinnon, Vice President for Administration, was selected to appoint a task force to devote the week of June 11-15 to conduct an intensive study to meet the mayor's deadlines.[71] A list of the task force members can be found in Appendix C, page 136.

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[69]Transcripts from Hearing, Chancery Court, Nashville, Tennessee, July 2, 1973.

[70]Letter from Jack E. Ravan, May 13, 1976.

[71]University of Tennessee Task Force, Report on Selected Wastewater Treatment Sites for Knoxville, Knox County, Tennessee (Unpublished report, 1973), p. 1.

Dr. Drinnon met with the task force and indicated that all potential sites should be investigated objectively from a technical standpoint. A report would then be prepared of its findings which could be used by the city in selecting a site for the proposed sewage treatment facility.[72]

In this study 13 potential sites were investigated. A comparison of these sites was made primarily from an economic point of view, but no effort was made to select the best site. According to this comparison the most cost effective location is the area adjacent to the Third Creek plant, with the Naval Station second, and Cox Sky Ranch third. Factors considered in the comparison included land cost, cost of site preparation, availability of utilities, capital plant and piping cost, relative pumping costs, land suitability, and environmental and aesthetic costs and benefits.[73]

In July 1973 the East Tennessee Development District (ETDD), in a letter to Mayor Testerman, made comments concerning their view of various sites for the proposed treatment facility. Their analysis indicated "only one really cost effective, long range solution to the wastewater problem"—acquisition of the Anderson Farm, presently owned by the University of Tennessee.[74]

A few days later Mayor Testerman, in a letter to Paul Traina, Director of EPA's Enforcement Division, stated that the Cox Sky Ranch had been selected as the site for the new sewage treatment plant.

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[72]Ibid., pp. 2-3.

[73]Ibid., p. 4.

[74]Letter from John W. Anderson, Executive Director, East Tennessee Development District, to Kyle C. Testerman, Mayor of Knoxville, July 6, 1973.

(See Figure 2.) The selection of this site was based on recommendations from city engineers and R.E.T.A. In the same letter the mayor asked for a commitment that federal funds would still be made available to Knoxville even though prior deadlines had not been met. Assurances were made that other obligations with regard to the 180-day notice would be met.[75] In response to this request an extension of the 180-day notice was given to allow the city enough time to acquire the desired site. The 30-day extension gave the city until October 1, 1973, to purchase a treatment plant site and June 30, 1977, to have the new plant in operation.[76]

In early September 1973, with the deadline for acquisition nearing, the mayor urged city council members to approve the Cox Sky Ranch on an emergency basis saying it was "their only site."[77] The mayor went on to say that expansion of the Third Creek plant was a stopgap measure and the costs of purchasing the developed land would be prohibitive, making this alternative unacceptable. In a city council meeting held September 11, 1973, the selection of a site was postponed until a work session could be held to discuss the alternatives. A heated debate took place in the council meeting between Boone Dougherty, attorney for the

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[75]Letter from Kyle C. Testerman, Mayor of Knoxville, to Paul J. Traina, Director, Enforcement Division, Environmental Protection Agency, July 10, 1973.

[76]Letter from Paul J. Traina, Director, Enforcement Division, Environmental Protection Agency, to Kyle C. Testerman, Mayor of Knoxville, August 22, 1973.

[77]Moody Connell, "Mayor Urges Vote on Wastewater Site," Knoxville Journal, September 7, 1973, p. 1.

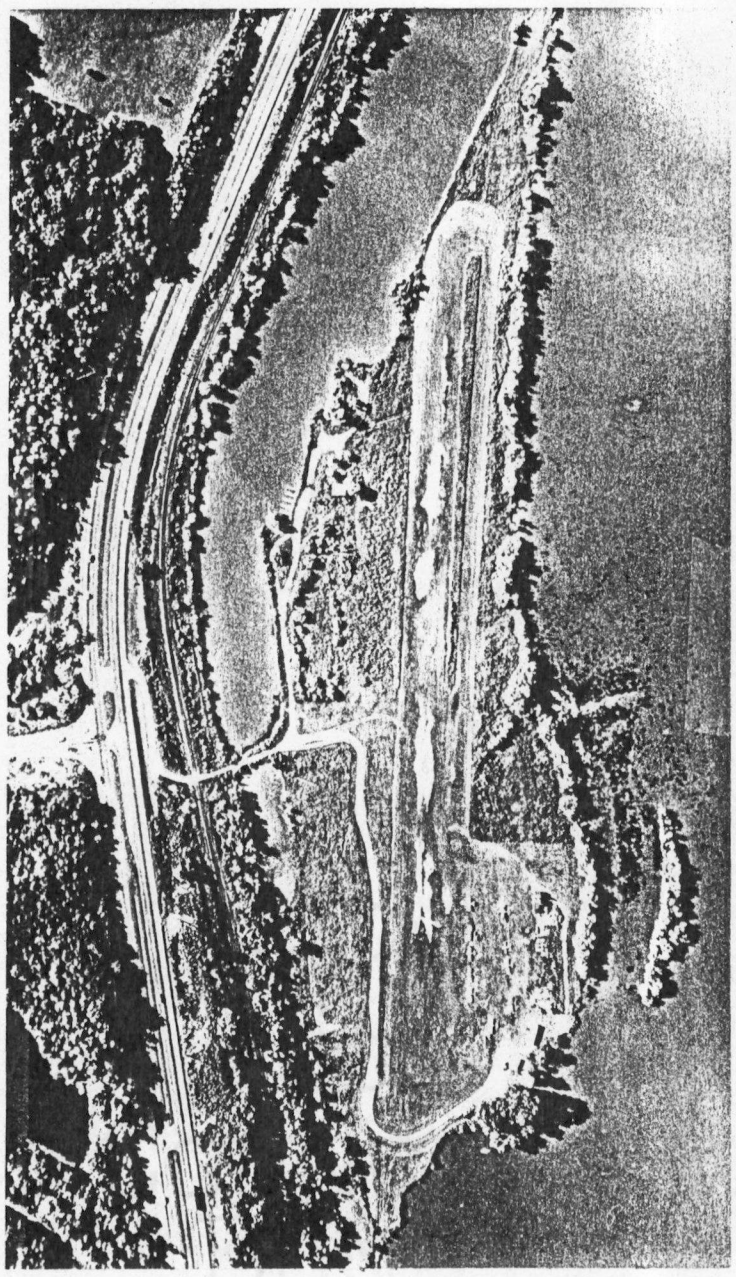


Figure 2. The Cox Sky Ranch.

Topside Community which is located near the Cox Sky Ranch, and Mayor Testerman. This debate resulted in Dougherty not being allowed to participate in any other discussions.[78]

Two days later the ETDD sent a letter to the mayor stating that the "Cox Sky Ranch site is a highly suitable location for ultimately implementing a significant regional wastewater system."[79] In a letter to Phillip Lynn, Director of Wastewater Control, the Tennessee Valley Authority stated that it had no objections to the proposed location, however, certain land rights must be acquired from TVA.[80]

At the council's work session, held on September 18, a review of alternatives was made, with R.E.T.A. strongly urging selection of the Cox Sky Ranch stating it was the number 1 site. The next day the council voted 6 to 1 to buy the Cox Sky Ranch. A motion was made to locate the plant on the Scottish Pike site failed to draw a second.[81]

Condemnation proceedings to obtain title to the Cox Sky Ranch began in September 1973. Dougherty, opposing the condemnation, stated that a city cannot condemn property outside its boundaries and that eminent domain laws made no mention that they could be used for acquiring land for a sewage treatment facility. He also contended that city

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[78]Minutes from Knoxville City Council Meeting, September 11, 1973.

[79]Letter from John W. Anderson, Executive Director, East Tennessee Development District, to Kyle C. Testerman, Mayor of Knoxville, September 13, 1973.

[80]Letter from the Tennessee Valley Authority to Phillip Lynn, Director, Wastewater Control, September 11, 1973.

[81]Minutes from Knoxville City Council Meeting, September 19, 1973.

council had acted capriciously and unreasonably in that the ordinance approving Cox Sky Ranch was passed on only one reading.[82]

Knoxville's problems continued to grow in early 1974 when the lessee of the Cox Sky Ranch, Richard Cox, refused to allow a continuation of topographical work. Phillip Lynn, Director of Wastewater Control, stated in a letter to the city's law director that "further delays, such as this, are intolerable if the court ordered construction schedule is to be met." He went on to say that immediate title and possession of the property is required if the city is to be able to comply with the imposed guidelines.[83]

Another attempt to thwart Knoxville's efforts came in February 1974 when legislation was introduced in the State House of Representatives by Representative Ben Atchley, which would give the Knox County Court approval authority over any sewage treatment plant planned for construction outside the city limits. Representative Atchley felt this bill was required in order to give the county a voice in locating wastewater treatment facilities. He pointed out that cities can now vote to locate plants outside their city limits without approval of local county governments.[84]

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[82]Charles Mason, "Sewage Plant Site Briefs Due November 26," Knoxville Journal, November 13, 1973, p. 1.

[83]Letter from Phillip Lynn, Director, Wastewater Control, to Louis Hofferbert, Law Director, City of Knoxville, February 12, 1974.

[84]Jim Bennett, "Knox Sewage Bill Falls 25 Votes Short," Knoxville Journal, March 19, 1974, p. 1.

The East Tennessee Development District urged members of the legislature to withdraw support for the bill pointing out that existing federal and state legislation requirements give ample protection to nearby residents of an area which may be unduly affected by such a facility.[85] The bill came up for a vote in March 1974 and failed to pass by 25 votes.[86]

Four days later court approval was given to the condemnation of the Cox Sky Ranch. The owners stated that they would cease contesting the condemnation and allow the city to take possession of the land. A jury trial was scheduled for April to determine the value of the property.[87]

Also in March, Knoxville filed a step one grant application with EPA for the planning stage of the 201 study. The lessee of the Cox Sky Ranch property, Richard Cox, tried to get an injunction against EPA to keep EPA from making a step one grant for the Knoxville planning area. On April 17, 1974, the U.S. District Court for the Eastern District of the Tennessee Northern Division dismissed the case because EPA had not yet made the grant. The preliminary injunctive relief sought by Mr. Cox was requested under the Uniform Relocation and Assistance Act. The grant

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[85]Letter from John W. Anderson, Executive Director, East Tennessee Development District, to Ben Atchley, State Representative, February 20, 1974.

[86]Jim Bennett.

[87]"City Free to Take Rest of Sky Ranch," Knoxville Journal, March 23, 1974.

was offered in June by EPA and accepted by Knoxville in July.[88]

In February 1975 a series of eight public hearings began in order to provide Knoxville and Knox County residents an opportunity to comment on proposals for future sewage collection and treatment. One public hearing was to be held for each of the eight utility districts in Knox County that provide sewage treatment. At the first of these meetings a number of South Knox County residents attending the meeting voiced their disapproval of the proposed plant being located at Cox Sky Ranch.[89]

In the same month, application was made to the Corps of Engineers for a permit to fill the area around the Cox Sky Ranch to make it large enough for a new facility. The fill will include approximately 1.25 million cubic yards of earth fill. This would increase the island's size from 30 acres to 100 acres.[90] Responding to this application the Department of the Interior recommended it be denied saying it would cause a loss of fish and wildlife in the area.[91]

The Knox County Commission, at a meeting in April 1975, began to voice their opinions about the location. John Beeler, Chairman of the Commission, charged that the proposed plant would destroy the I. C. King

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[88]Letter from Jack E. Ravan, May 13, 1976.

[89]Keith Bennett, "Sewage Plant Opposed," Knoxville Journal, February 18, 1975, p. 1.

[90]Public Notice by the Department of the Army, Corps of Engineers, Nashville District, February 10, 1975.

[91]Letter from Kenneth E. Black, Regional Director, Department of the Interior, to District Engineer, Corps of Engineers, Nashville District, April 7, 1975.

Park. The commission went on to approve a motion submitted by Boone Dougherty which said in part "this proposed sewage treatment plant will adversely affect the operation, use, and existence of the I. C. King Park for the citizens of Knox County." Dougherty also submitted a petition with 1,282 signatures of residents of the area opposed to the project.[92] In a meeting a few days later the Recreation Subcommittee of the County Court approved the resolution and urged study of alternative sites.[93]

In May 1975 the Department of Public Health directed city engineers to study a 155 acre site in South Knox County. The site included 53 acres of I. C. King Park, 15 acres of the Williams-Henson Home for Boys, and 87 acres owned by Alice Ghromley. A public hearing was held to discuss this alternative site. Those citizens attending the hearing voiced total opposition to the site and it was dropped from consideration.[94]

As opposition to the Cox Sky Ranch site grew, the Metropolitan Planning Commission in a meeting held in May 1975 decided to have its staff conduct a 60 day evaluation of eight possible sites.[95] This study resulted in the Cox Sky Ranch being rated as the best of the

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[92]Minutes of Knox County Commission Meeting, April 1, 1975.

[93]"County Against Plan," Knoxville Journal, April 4, 1975, p. 1; and Doug Morris, "County Votes Down AJ Purchase," Knoxville Journal, April 22, 1975, p. 1.

[94]Larry Aldridge, "Other Sites Eyed; May Expand Third Creek," Knoxville Journal, May 10, 1975, p. 1.

[95]Minutes from Knoxville, Knox County, Metropolitan Planning Commission Meeting, May 8, 1975.

eight sites examined. MPC approval of this site had been given in December 1974, and they rejected, 6 to 8, a motion to rescind their endorsement.[96]

Knoxville's 201 Wastewater Facilities Plan was issued in November 1975. The plan was designed to provide a tool that will eliminate haphazard construction of sewage facilities. A final public hearing for the 201 Facilities Plan was held November 25. About 250 persons, most from the South Knox County area, attended the meeting to attack various parts of the plan. About two weeks later the Knox County Commission declined to accept the county portion of the plan. The County Commission pointed out that it was not opposed to the plan but was opposed to the selection of the Cox Sky Ranch as the site for the new sewage treatment plant. Approval of the plan was denied until a complete plan was presented which stated where the new plant would be located, who it would serve, and what it would cost.[97]

In an attempt to obtain federal funds for construction of a sewage treatment plant at Cox Sky Ranch Mayor Testerman filed suit against EPA. The suit stated in part that "EPA has unlawfully and unreasonably delayed and impeded the city in its efforts to comply with the Commissioner's Order."[98]

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[96]Minutes from Knoxville, Knox County, Metropolitan Planning Commission Meeting, July 7, 1975.

[97]Minutes of Knox County Commission Meeting, December 2, 1975.

[98]Complaint filed by City of Knoxville, Kyle C. Testerman, Mayor, against Russell E. Train, Administrator of EPA, Jack E. Ravan, Region IV Director, and Leslie M. Buie, Director, Office of Audit, Region IV, EPA.

Randy Tyree defeated Kyle Testerman for mayor in the 1975 elections. Tyree was then faced with finding a solution to the city's sewage treatment problems. In an effort to reach a solution Mayor Tyree met with EPA and State Water Quality Control officials in January 1976. In a report of the meeting, Sam Waddell, EPA's representative, stated that the engineers had failed to convince him that the Cox Sky Ranch would be an effective solution to the problem. If the city still wanted to construct its new facility at Cox Sky Ranch then EPA may require an environmental impact statement. This would cause the city to miss deadlines for receiving a federal grant. Waddell went on to say that the expansion of the Third and Fourth Creek plants would probably be the most cost effective solution. As a result all parties agreed to work together in an effort to finalize the 201 Facilities Plan so that step II could be initiated.[99]

In February and May 1976 R.E.T.A. issued an addendum to the 201 plan which recommended the land adjacent to the Third Creek plant as the best location for a new facility.[100] Then on June 15, 1976, the Knox County Board of Commissioners approved a resolution accepting this as the location for the new plant.[101] The acceptance of the area

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[99]Report of meeting with the city of Knoxville, the Tennessee Department of Public Health, and the Environmental Protection Agency, January 15, 1976; letter from Jack E. Ravan, May 13, 1976.

[100]Rykman, Edgerly, Tomlinson, and Associates, Addendum to the Knoxville, Knox County 201 Facilities Plan, (Published by the Authors, 1976), p. 25.

[101]Minutes of Knox County Board of Commissioners meeting, June 15, 1976.

adjacent to the Third Creek plant as the site for the new facility silenced opposition to the Cox Sky Ranch site.

The Issues of Locating Knoxville's Wastewater Treatment Facility

The events presented in the previous section provide insight into what occurred throughout the controversy which developed over the selection of the Cox Sky Ranch as the location for Knoxville's sewage treatment plant. Throughout the controversy the Topside Community Club and others opposing the site brought up several issues important to them concerning the location of the wastewater treatment facility.

Generally there are two broad issues involved in improving the quality of water for man's use. These issues are: (1) what level of water quality is desired in the waterways, and (2) how can this level of water quality be achieved at the lowest cost.[102] These two issues are related to the city's decision to locate a sewage treatment plant at Cox Sky Ranch.

To determine the level of quality that should be maintained in a waterway it is necessary to know what purpose it will be used. For example, will the waterway be used extensively for recreational use, as a municipal water supply, or used in the production processes of industries. This issue was of great concern to the Topside residents. Because Fort Loudoun Lake is an important part of the Topside Community,

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[102] Allen V. Kneese and Blair T. Bower, Managing Water Quality: Economics, Technology, Instructions, (Washington, D.C.: Resources for the Future, 1968), pp. 4-6.

in that it makes the area more attractive as a residential community, the residents stated at the public hearings and other meetings that a sewage treatment plant at Cox Sky Ranch would greatly reduce the water quality in the immediate vicinity, thus reducing the area's attractiveness. The engineers pointed out that a new plant should improve the water quality since the plant would have to meet strict federal and state standards and because the Third Creek plant which adds pollution to the lake would no longer be in operation.

The next issue is how can the desired level of water quality be achieved at the lowest cost. As discussed in the next chapter the least costly method is the planning of wastewater systems on a regional basis. Generally the larger plants operate more efficiently than small randomly placed facilities. Of course this will vary according to local conditions. The system which minimizes total costs of piping and treatment is considered to be the optimal regional system. One of the major assertions of the Topside Community Club was that the location of a sewage treatment facility at Cox Sky Ranch was not the most cost effective solution to Knoxville's problem. The engineers pointed out that this site was the least costly alternative available to the city.

These were not the only issues of concern to the residents of the Topside Community. Other issues important to them were the selection of the proper location of the treatment plant and the appropriate size for the proposed plant. The location issue was also mentioned by R.E.T.A.

as being important in the controversy.[103] Testerman felt that there were no issues involved in the selection of the Cox Sky Ranch.[104] He stated that the site selection was based on factual information and that it should be clear that the Cox Sky Ranch is the best site. He went on to say that there were no issues raised by the Topside residents and others opposed to the site that were not answered by the technical information provided by the engineers.[105]

Summary

Knoxville began treating its wastewater in the early 1950's, and received national recognition for its efforts. However, as the city grew and state and federal water quality criteria became more stringent, Knoxville found itself unable to meet the new standards. Equipment at the Third Creek plant had become obsolete. To increase the problem the Third Creek plant received industrial wastes, primarily from the Southern Extract Company and Rohm and Haas, which it could not effectively treat. Because of its inability to effectively and efficiently treat its sewage Knoxville was cited by the Tennessee Department of Public Health and the Environmental Protection Agency, and was directed to upgrade its waste treatment facilities so that their discharges would meet the water quality criteria.

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[103] Interview with Dr. George Brower, Vice President, Rykman, Edgerly, Tomlinson, and Associates, April 6, 1976.

[104] Interview with Kyle C. Testerman, July 16, 1976.

[105] Ibid.

To assist in determining what problems existed the city hired Rykman, Edgerly, Tomlinson, and Associates, R.E.T.A. After a series of studies it was recommended that a new plant be constructed at the Cox Sky Ranch which is located in South Knox County. Accepting this recommendation Mayor Testerman informed EPA and TDPH of his decision. Members of the nearby Topside Community became aroused. Fearing that the plant would adversely affect their community they sought to have the site changed. Community members began to attend public hearings, city council and planning commission meetings to voice their disapproval of the site.

In 1975 Mayor Testerman lost his bid for reelection to Randy Tyree. After taking office Tyree met with representatives of TDPH and EPA. In this meeting Tyree was told that an environmental impact statement may be required if the Cox Sky Ranch site remained the city's primary location for the new sewage treatment plant. The EPA representative stated that expansion of the Third and Fourth Creek plants was the most cost effective solution to the problem. Because an EIS would take too much time, causing the city to miss deadlines for 201 grant application and upon the advice of R.E.T.A. Tyree selected the area adjacent to the Third Creek plant as the location for the new wastewater treatment facilities.

Issues brought up in the controversy included the loss of water quality in the area around the Cox Sky Ranch; the site was not the most cost effective location; the plant's size was not appropriate; and the Cox Sky Ranch was not the proper location.

While the events discussed in the above sections are not all the events that occurred in the Cox Sky Ranch controversy they are some of the most important and provide insight into the actions that were carried out by both parties in an effort to "win."

CHAPTER III

LOCATING WASTEWATER TREATMENT FACILITIES

Introduction

This chapter will present a discussion of the regionalization of wastewater treatment facilities which is intended to improve the understanding of why Knoxville initially chose to construct a regional facility. A discussion of criteria that can be used for locating a sewage treatment facility is also presented as well as the criteria used by Knoxville in their site selection process. Knoxville's three site selection processes are discussed to show what actually occurred in the selection of a site for a wastewater treatment facility.

Regionalization of Wastewater Treatment Facilities

In selecting a site for Knoxville's proposed sewage treatment plant a location was selected that would give it the ability to serve more than one hydrological unit. This made the plant a regional facility. The wastewater facilities plan was also a regional plan in that it was prepared for Knox County. The plan was prepared for the county to provide coordination among the utility districts for the construction of future facilities and to avoid duplication of effort.

With capital costs increasing, estimated to be approximately $15 billion in the early 1970's for municipal sewer systems throughout the U.S., there is a need to spend taxpayers' money more wisely and

to economize where possible. One way to economize is to carefully plan the size, location, and construction of the new facilities. Poor planning could result in a waste of time and money and result in a less than optimal system. If the sizes and locations of sewers and plants are poorly planned, costs to the individual taxpayer would be greater over a longer period of time.[1]

One method of planning sewer systems that has been generally accepted as inefficient is the construction of small, randomly placed plants. The inefficiencies of small localized plants have been quantified in terms of reliability and costs. Reliability of sewage treatment plants has been directly related to size.[2]

It has been pointed out that the main advantage of joint or regional sewage treatment facilities is that economies of scale are achieved.[3] The larger the plant, the more infrequent the operational difficulties. Larger plants experience fewer operational problems primarily because they are usually operated by better qualified personnel and better managers and the plant is large enough to neutralize any short term operational problems.[4]

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[1]Martin P. Wanielista and Christian S. Bauer, "Centralization of Waste Treatment Facilities," Journal of the Water Pollution Control Federation 44 (December 1972), pp. 2229-2238.

[2]Ibid.

[3]E. Downey Brill and Masahisa Nakamura, "Location and Size of Regional Wastewater Treatment Plants," Unpublished paper, p. 2.

[4]Wanielista and Bauer, p. 2229.

A comparison has been made of total treatment (operational) costs between two 5 MGD plants and one 10 MGD plant.[5] The total cost of treatment for two 5 MGD plants is $0.125/1000 gallons treated. This results in a total yearly cost for both plants of about $570,000. The total treatment cost using one 10 MGD plant would be approximately $0.103/1000 gallons treated or about $400,000 per year. It is obvious that the one 10 MGD plant would be less expensive to operate.

In planning the location of a new sewage treatment facility, it may be determined that because of certain conditions, topography for example, it would be necessary to utilize a system with two plants rather than one. In the case of topography, the cost of pumping wastewater to a centralized plant can be greater over a long period of time than the cost of constructing two separate plants. This helps to point out the need for a detailed analysis of the size and location of any type of new facilities. The combination of sewer lines and treatment plants which minimizes the total costs of pumping and treatment is considered to be the optimal regional system.[6]

The optimal regional system, however, may require the use of many small plants over the region. Many people have come to confuse a regional system with a centralized system. The primary reason for studying the problem on a regional basis is to determine the optimum solution for the entire region. Some regional studies

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[5] Ibid.

[6] Brill and Nakamura, p. 1.

have concluded that the optimum system included a centralized plant.[7]

In utilizing a regional approach to wastewater treatment, hydrological units are used to define the study area rather than municipal boundaries.[8] This is because upstream dischargers have a substantial impact on the water quality and treatment requirements of downstream users. In the regional approach, a discharger must select a solution to his problem which is not only the optimum solution for him but for the entire region.

Criteria for Locating Sewage Treatment Facilities

When a community is trying to locate a wastewater treatment plant, one of the primary sites usually considered is the lowest point within the service area. Locating the plant at this site enables the system to utilize gravity flow, thus reducing pumping costs. However, because this site may have unsuitable topography, be subject to flooding, or is already developed, other sites must be considered. The selection of the best possible site can be difficult—particularly when selecting from a large number of candidate sites or when locating a regional facility. The selection of a site is usually achieved by examining a series of criteria which, when applied to each site, will help the decision maker to eliminate those that are least desirable. A decision

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[7] Dennis W. Weeter and James G. Belardi, A Rational Approach to Decision-Making in the Regionalization of Wastewater Treatment Systems (Washington, D.C.: Department of the Interior, 1975), pp. 15-16.

[8] Ibid.

can then be made by selecting that site which most closely meets the established criteria.

Public facilities, such as a sewage treatment plant, play an important role in shaping development in the surrounding area. By locating a facility in a previously unserviced and undeveloped area economic pressure could cause the land to develop more quickly. It is important when locating public facilities to consider short and long range development goals and plans for the area in which the facility will be located and the area being served.

In selecting a site for a sewage treatment plant there are a number of standard criteria that can be used. These criteria can be grouped into four broad categories: (1) economic; (2) environmental; (3) physical; and (4) sociological. The criteria in this section were developed by reviewing texts and technical studies concerned with the location of sewage treatment plants and similar types of facilities.

Economic Criteria

The primary objective when constructing public projects is to achieve a given level of service for the lowest possible cost, or a maximum level of service at a given cost. The same is true for sewer systems. As stated earlier the optimal system is that system which provides the best mix between cost and service. There are several economic factors that can be considered when locating a sewage treatment plant. The capital cost factors that can be considered include: land

cost; cost of constructing the facility; flow diversion to the new plant; pumping cost; site preparation; and landscaping. Operating and maintenance costs can also be included in the economic factors.

When a large sewage treatment plant is located on a particular site it can have many important secondary effects. The secondary effects that can be considered include: changes in the value of surrounding property and structures; increased demand for sewer service once the plant is in operation; how the plant will affect the cost of providing service and its effects on the existing rate structure; and will the new facility cause an increase in growth in the previously unserviced area.

Environmental Criteria

The effects a new sewage treatment facility has on the environment are important to consider since these factors can determine its acceptability in the surrounding community. Environmental factors that can be considered include: odors that will be caused by the facility; changes in the visual attractiveness of the area; changes in the level of pollution in the receiving waters; the effects the facility will have on the aquatic plant and animal life; the effects on plant and animal habitats caused by the loss of land to the facility; and the increased levels of noise and air pollution caused by plant construction and operation.

Sociological Criteria

Sociological impacts, the third set of criteria, are important to consider since they can give an indication of the effects a

wastewater treatment facility can have on the residents of the area surrounding a proposed site. Social factors that can be considered include: the loss of any recreation facilities or recreation capabilities of the receiving waters caused by the plant; the loss of land based recreation facilities and capabilities; the number of residents and businesses that will be relocated; increased employment opportunities caused by plant construction and operation; improved public facilities—the provision of service to a previously unserviced area; a change in the spatial pattern and relationships of the city that would be caused by the selection of a particular site; changes in the current living conditions; changes in traffic patterns caused by plant construction; and conformance to the land use plan.

Physical Criteria

The physical characteristics of the sites under examination and the new plant itself can create limitations that are usually considered in selecting the best location. Physical characteristics that can be considered include: the size of the site; ability to serve previously unserviced areas; distance from existing facilities; the geological condition of the site; and the size of the facility to be constructed.

Other factors that can be considered and relate to the ability of a particular location being accepted as the best site include: political acceptability; community acceptability; and public agency acceptability. These factors can many times determine if a proposed plan can be implemented.

Criteria Used in Knoxville's Site Selection Process

Introduction

Knoxville had three separate site selection studies, each prepared by a different organization. Each organization used its own set of criteria. However, the criteria used by one organization were not totally different from those used by the others.

An indepth discussion of the studies is presented in this chapter. They are discussed here in the order of their completion.

Criteria Used by R.E.T.A.

The first, and probably the most important of these studies, was done by Rykman, Edgerly, Tomlinson, and Associates in 1973. The R.E.T.A. study used their criteria to select thirteen possible sites, which were then reduced to the most acceptable or desirable according to the criteria. The criteria used by R.E.T.A. in locating these sites were:

1. Location with respect to the Third Creek Treatment Plant. The farther away the site is, cost of pumping stations and force mains becomes much greater because of the high wastewater flow anticipated in this treatment basin.
2. Cost and availability of property.
3. Topography.
4. Size of available property.
5. Accessibility—defined as the ease of entrance and exit for vehicles during and after construction.
6. Relocation of businesses and families.
7. Other intangible factors such as nearness to high density areas, aesthetics, etc.[9]

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[9]Rykman, Edgerly, Tomlinson, and Associates, Alternate Waste Treatment Systems (Published by the Authors, 1973), p. 17.

An interview with Dr. George Brower of R.E.T.A. revealed other criteria and improved the understanding of the criteria mentioned above.[10] According to Dr. Brower the topography of the site should be relatively flat and downhill from the service area to aid flow. Accessibility is determined by the nearness of good highways and railroads. Accessibility and the site's attractiveness are greatly increased if barge access is available. Barge access can be used for transporting heavy equipment to a site during construction, and for disposing of sludge materials after the plant is in operation. One aspect of accessibility that can determine a site's acceptability is the ease of entrance to and exit from the site. The less traffic disruption that occurs the better.

Other criteria revealed in the interview include: the zoning of the site and its surrounding area, distance from the center of the service area, ease of diverting flow to the site, use of existing facilities, and social and environmental impacts that would occur if the plant is located at a particular site. Dr. Brower pointed out that an important consideration is the ability of the project to be implemented if a particular site is selected.

Criteria Used by the University Task Force

The second study completed was a report issued by a task force from the University of Tennessee in June 1973. The criteria used by

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[10] Interview with Dr. George Brower, Vice President, Rykman, Edgerly, Tomlinson, and Associates, Knoxville, Tennessee, April 6, 1976.

the task force were similar to those used by R.E.T.A. The criteria used by the university task force were:

1. The acreage of the site considered for acquisition, and the desirability of the site with respect to present needs and future demands for expansion.
2. Present ownership of the site.
3. The site's geographic location with respect to that part of South Knoxville and Knox County which is largely residential in nature and not presently served by the sewer system.
4. Estimates of the site's present value.
5. Costs of land preparation required before construction can begin.
6. The need to protect the site from flooding.
7. Accessibility for both plant construction and operation.
8. Installation costs.
9. The possibility of the site supporting plant expansion.
10. The amount of federal funds available for each site.
11. The need for extensive pumping of wastewater to the sites.

The U.T. study also attempted to determine the level of environmental impacts, although this was not one of their primary criteria.[11]

Criteria Used by the Metropolitan Planning Commission

The third study concerning site selection was completed by the Metropolitan Planning Commission (MPC) staff in July 1975. Criteria used were developed by MPC staff and were divided into four categories: (1) economic factors, (2) community impact, (3) feasibility, and (4) performance.

The economic factors considered in the study were: capital costs, which included: land costs, costs of the facility, cost of diverting

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[11]University of Tennessee Task Force, "Report of Selected Wastewater Treatment Sites for Knoxville, Knox County, Tennessee," June 1973, pp. 8-12.

flow to the new plant, and the costs of site preparation. Other economic factors considered in the evaluation were: annual capital amortization operation and maintenance costs; and present worth.[12]

Community impacts were considered because it is necessary to have an estimate of the disruptions that would occur in the surrounding neighborhoods if the facility is constructed at a particular location. The criteria considered in determining community impact, and their definitions, were:

1. Visual disruption—defined as the number of residential dwelling units within topographically defined viewing distance of a negatively altered site.
2. Water use effects—defined as the riverfront miles accessible to residential or public recreation activities to a downstream distance of one mile from the site's lower boundary.
3. Natural area disruption—defined as the number of acres of unconstructed land or river bottom developed.
4. Relocation--the number of dwelling units taken and $1,000 units of industrial or commercial properties displaced.
5. Traffic effects—defined as effects during construction and operation of the plant.
6. Noise increase—defined by assuming a maximum level of 100 decibels at 50 feet from any site boundary during construction.
7. Vehicular vistas—defined as projected average daily trips by 1990 through the viewing area of each state.[13]

The feasibility, or the difficulty of implementing the project at each site, was the purpose of the third set of criteria.[14] This category was divided into four sections:

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[12]Knoxville-Knox County Metropolitan Planning Commission, "Wastewater Treatment Plant Site Evaluation," (Unpublished report, July 1975), p. 11.

[13]Ibid., pp. 22-23.

[14]Ibid., p. 38.

1. Local government acceptability.
2. Citizen acceptability.
3. Site availability.
4. Physical suitability of the site—an assumption was made that the suitability of each site for plant construction was proportional to site preparation costs.

The final set of criteria, performance, was used in order to determine the ability of a plant to deliver effective, systematic performance over time. The performance category was divided into three sections:

1. Systematic operation—this was defined as the ability of a particular site to serve the existing Third and Fourth Creek drainage areas as well as serve South Knox County.
2. Expansion capacity—defined as the ability of a site to support expansion of the treatment plant.
3. Catastrophic effects—for the purpose of this evaluation it was determined that the effects of plant failure would be similar at each site.[15]

The criteria in the first section of this chapter were presented to provide a general conception of criteria that can be used in any given situation. These criteria can be compared with those in the second section which were actually used for selecting a location for a sewage treatment facility.

In comparing the criteria presented in the previous two sections it is easy to see that the criteria used in one study were not totally different from those used in the other studies. However, it is obvious that all possible criteria were not considered in any one of the studies. Neither study considered the impact a wastewater treatment facility can have in determining the future land uses of

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[15]Ibid., p. 41.

the area surrounding the plant's location. R.E.T.A.'s criteria were noticeably vague and lacked a discussion of social and environmental considerations. An indepth discussion of the criteria could have improved public understanding of how the site was selected.

The criteria used by the university task force were developed in a short period of time by people with different areas of specialization. The task force appeared to focus more on the various cost factors and other easily quantified criteria, and less on the social and environmental and those criteria which are difficult to quantify. The length of time the task force had to prepare the report can elucidate the emphasis on the easily quantified criteria.

The broadest set of criteria were used by the Metropolitan Planning Commission staff in preparing their report. They explicitly considered those criteria considered by R.E.T.A. implicitly. There was noticeably more depth in the social and environmental areas. An attempt was made to measure the impact of plant construction and operation on the social and environmental qualities of each site. Because this study was begin prepared for the MPC and public consumption it required an indepth explanation of the criteria so they would be more easily understood.

Knoxville's Site Selection Process

In March 1972 R.E.T.A. was hired to assist the city in solving its sewage treatment problems. As stated earlier the city's problems centered on the need to increase plant capacity, upgrade obsolete equipment, etc. Apparently Mayor Testerman's primary objective was to

arrive at a solution that would enable the Third Creek treatment plant to meet the criteria established by TDPH and EPA. R.E.T.A. assigned Dr. George Brower to work with the city in the formulation of alternative solutions, and once an alternative was selected, the development of plans.

R.E.T.A. prepared their first study in March 1973 in which they posed three alternatives which were considered to be possible solutions to the sewage treatment problems. The three alternatives were:

1. Expansion of existing facilities at Third and Fourth Creek plants. The Third Creek plant was to be expanded to 25 MGD with excess flow being diverted to an enlarged Fourth Creek plant.
2. Utilize existing facilities to its design capacity and divert excess flows from both treatment plants to a new site.
3. Abandon existing facilities and divert all flow to a new site.[16]

As stated earlier, alternative 1 was dropped from consideration because land could not be purchased for expanding existing facilities. Because alternatives 2 and 3 required locating a new plant, R.E.T.A. proceeded with their site selection process.

In the same report issued in March 1973 13 possible sites were identified and investigated. See map on page 62 (figure 3) and description of sites in Appendix B, page 133. The report went on to recommend the selection of the Jo Anderson Farm for the location of the new treatment facility.[17] The East Tennessee Development District

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[16] R.E.T.A., Alternative Waste Treatment Systems, p. 16.

[17] Ibid.

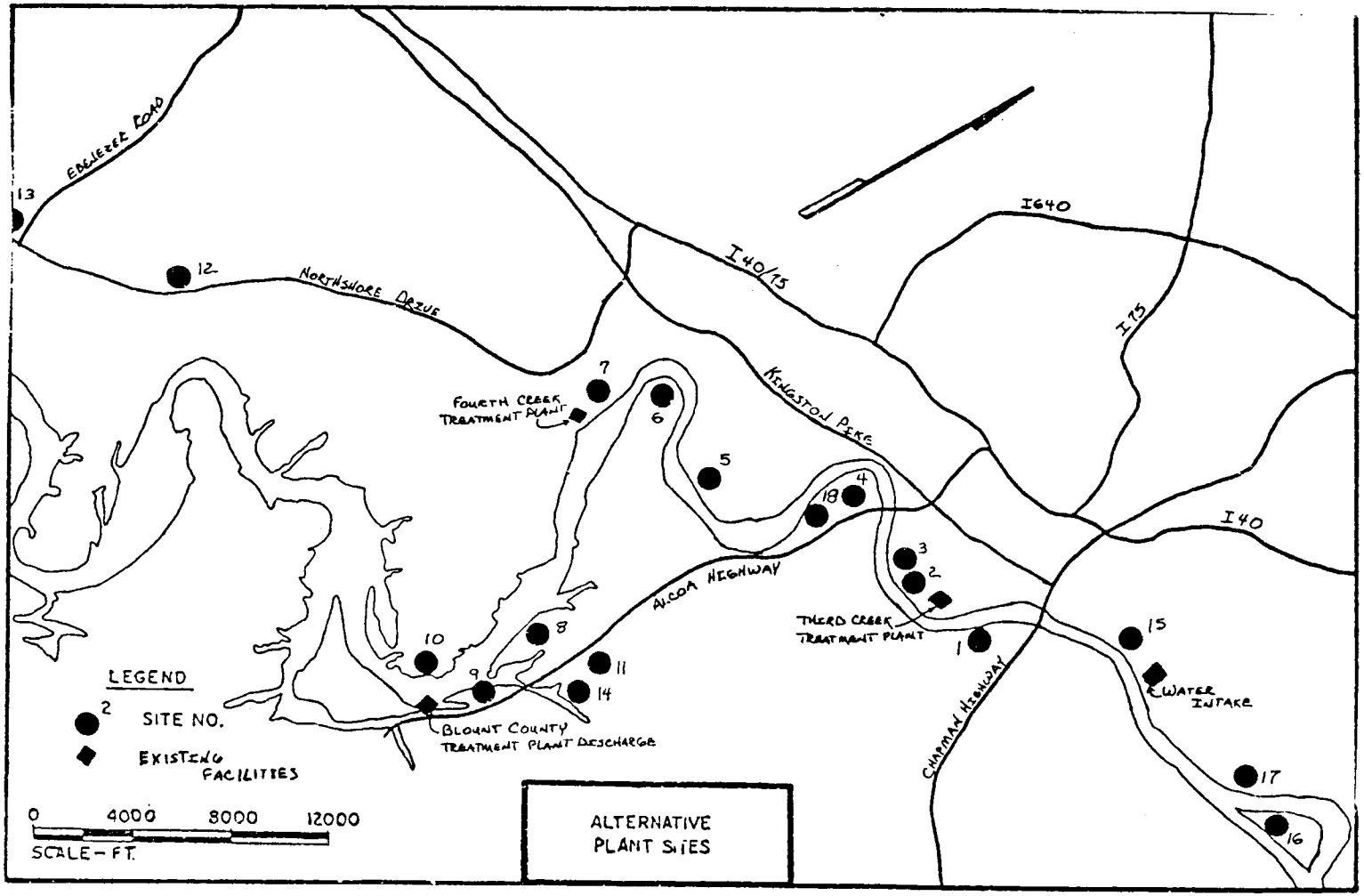


Figure 3. Alternative Plant sites.

From Knoxville-Knox County Metropolitan Planning Commission, "Wastewater Treatment Plant Site Evaluation," page 9.

supported this location in a letter to the mayor.[18] As stated earlier, Mayor Testerman was unable to purchase this site from the University of Tennessee who owned the land. Two other sites, the area adjacent to the Third Creek plant and expanding the Fourth Creek discharge point to the Tennessee River, were also recommended in the report but proved to be unacceptable. R.E.T.A. began to investigate the sites again to find an acceptable location.[19]

In June 1973, when R.E.T.A. was involved in their site selection process, President Edward Boling offered the services of a university task force to assist in finding a suitable site for the proposed facility. The mayor accepted the offer. A task force composed of U.T. faculty, planners, and administrative personnel issued a report on June 15.[20] (See list of task force members in Appendix C, page 136.)

In their investigation the task force eliminated several sites from consideration which had been previously eliminated by R.E.T.A. The sites eliminated were 1, 3, 4, 5, 7, 12, and 13. The task force then added four sites to their list for consideration making a total of 10 sites evaluated. (See description of additional sites in Appendix B, page 134.) According to the task force the best sites, based on the criteria previously presented, were sites 2—the land

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[18]Letter from John Anderson, Executive Director, East Tennessee Development District, to Kyle C. Testerman, Mayor of Knoxville, July 6, 1976.

[19]R.E.T.A., Alternative Waste Treatment Systems, p. 23.

[20]University of Tennessee Task Force, p. 1.

adjacent to the Third Creek plant, 14—the naval station, and 9—the Cox Sky Ranch.[21]

The task force also made a comparison of the environmental impacts that would occur if any 1 of the 10 sites were selected. Column 5 of Table A-2 in Appendix C, page 138, presents this comparison. Positive ratings indicate an overall positive impact, zero neither positive or negative impacts, and negative ratings an overall negative impact. The area adjacent to the Third Creek plant was determined to be the best site from an environmental standpoint. The Cox Sky Ranch and Dickinson Island were determined to be the third best.[22] The task force met with R.E.T.A. representatives after the report was completed to discuss their findings. R.E.T.A. agreed to use the findings of the study in their evaluation.

After the second investigation of the 13 sites R.E.T.A. issued the Preliminary Engineering Report in September 1973 which recommended the construction of a 60 MGD sewage treatment plant at Cox Sky Ranch site. Mayor Testerman accepted this recommendation and notified federal and state officials of his decision. The Cox Sky Ranch was selected as the best site for a number of reasons:

1. It was deemed to be the most cost effective.
2. It was accessible from highway, rail, and the river.
3. It was aesthetically suitable since it is relatively isolated and is far from densely populated areas.
4. It was capable of serving a large portion of the county.
5. It was adequate for expansion to meet long term needs.[23]

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[21] Ibid., p. 7.

[22] Ibid., pp. 12-14.

[23] Rykman, Edgerly, Tomlinson, and Associates, Preliminary Engineering Report (Published by the Authors, 1973), p. 5.

The Cox Sky Ranch site was accepted by both the Metropolitan Planning Commission and the city council. (See Figure 4.)

After continuing citizen protest over the selection of the Cox Sky Ranch, the Metropolitan Planning Commission requested that its staff conduct a third evaluation of the 13 sites. The evaluation was made in May and June 1975. The purpose of the study was to determine the suitability of the Cox Sky Ranch.[24] Richard Zenlinski of the MPC staff was charged with preparing the study.

Several sites were eliminated from consideration in the study and included: 4, 5, 6, 8, 12, 13, 14, 16, and 17. These sites had also been eliminated by R.E.T.A. and the task force. The MPC evaluation included sites 1, 2, 7, 9, 11, 15, 17, and 18, with 17 being included at the request of the citizens. The staff developed criteria, previously identified, and utilized the matrix approach in their evaluation. The criteria for the evaluation were divided into four categories: economic, community impact, feasibility, and performance.[25]

The economic matrix was developed with the goal to minimize capital and pumping costs. This means that the site available for the most federal aid would receive the lowest, or the best, rating. The ratings were determined by figuring the cost per point with the highest possible rating of 10 points. The highest rating was divided by the highest cost, or $46.3 million divided by 10 equals $4.6 million per point. The

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[24] Knoxville-Knox County Metropolitan Planning Commission, p. 4.

[25] Ibid., p. 12.

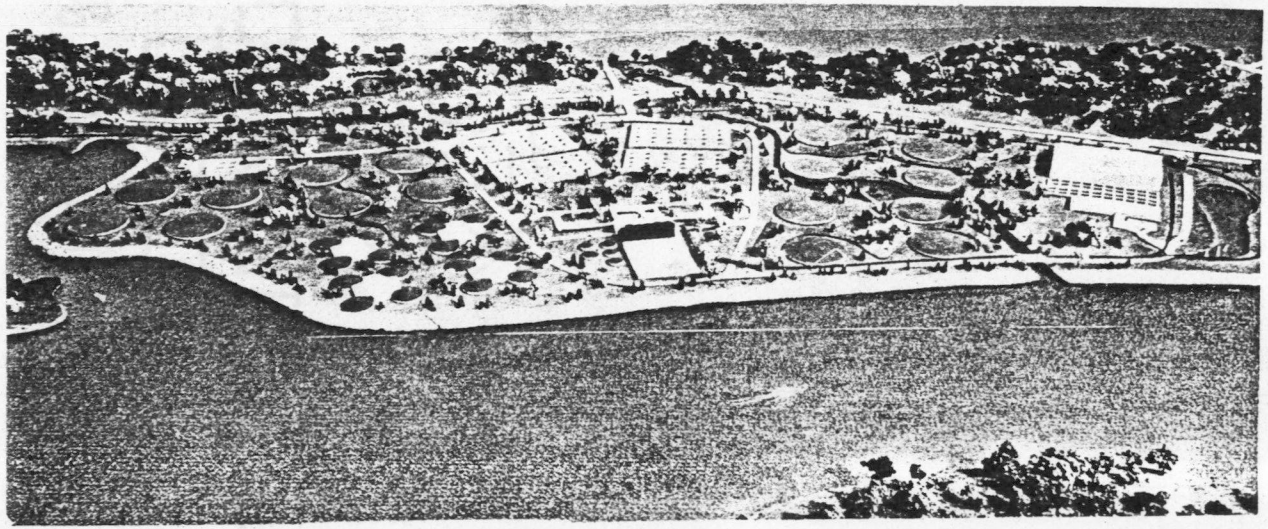


Figure 4. Model of the completed wastewater treatment plant at Cox Sky Ranch.

remaining ratings were found by dividing dollar costs of the remaining sites by 4.6 and subtracting from 10.[26] Tables 1 and 2 are presented on pages 68 and 69 as examples of those in the MPC study, the remainder of the tables are in Appendixes C and D, pages 137-146. Tables 1 and 2 present the economic data and matrix respectively.

As indicated in the economic data, table 1, the site eligible for the most federal aid is site 17 with $46.3 million, with site 7 receiving the least.

The economic data table indicates the following information:

1. Total capital cost.
2. The portion of the capital cost which is ineligible for federal aid, which in this case is each site's land cost.
3. The portion of the capital costs eligible for federal aid, or the capital cost minus land cost.
4. The amount of federal aid each site would receive, or column 3 times 0.75.
5. The local portion of the cost, computed by subtracting column 4 from column 3 and adding column 2.
6. Local amortization, which is column 5 at 7 percent for 20 years.
7. Pumping costs.
8. Total annual local cost, which is column 6 plus column 7.[27]

This table indicates that site 17 is eligible for the most federal aid and receives the lowest score in the matrix, table 2. Site 7 is eligible for the least amount of federal aid and receives the highest score of 3.5 in the matrix.

Community impact, the second set of criteria, was used to measure change in the physical or social environment caused by plant construction and operation at a particular site location. This factor is extremely

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[26] Ibid., p. 60.

[27] Ibid., p. 12.

TABLE 1

COST RESPONSIBILITY (IN $ MILLION)

SITE	SOURCE	TOTAL CAPITAL COSTS	INELIGIBLE FOR FEDERAL AID (LAND COST)	ELIGIBLE	FEDERAL PORTION	LOCAL PORTION	LOCAL PORTION 20 YEAR AMORTIZATION	PUMPING COSTS	TOTAL ANNUAL LOCAL COST (1978)
1	RETA	56.6	9.0	47.0	35.2	20.8	2.0	.23	2.2
2	RETA	50.6	7.4	43.2	32.4	18.2	1.7	.17	1.9
7	MPC	40.0	0.0	39.9	29.9	10.1	1.0	.13	1.1
9	RETA	46.0	0.0	45.9	34.4	11.6	1.1	.18	1.3
11	RETA-UT	49.3	2.6	46.7	35.0	14.3	1.3	.26	1.6
15	RETA-UT	61.7	2.6	59.1	44.3	17.4	1.6	.22	1.8
17	RETA-UT	62.1	0.4	61.7	46.3	15.8	1.5	.37	1.9
18	RETA-UT	42.9	1.5	41.4	31.0	11.9	1.1	.13	1.2

Table 8 in "Wastewater Treatment Plant Site Evaluation," Knoxville-Knox County Metropolitan Planning Commission, July 1975, page 20.

TABLE 2

ECONOMIC FACTORS MATRIX

PART I		ECONOMIC FACTORS MATRIX						
GOAL		MINIMIZE CAPITAL PUMPING COSTS						
OBJECTIVE		MINIMIZE CAPITAL COSTS		MINIMIZE PUMPING COSTS				
CRITERIA		TOTAL FEDERAL PORTION	ANNUAL LOCAL AMORTIZATION	1978 COSTS		COMPOSITE SUMMARY		
SITE \ WEIGHT		1	1	1		RAW TOTAL	WEIGHTED TOTAL	MEAN SCORE
1	DATA	35.2	2.0	0.23		6.2	6.2	2.1
	RATING	2.4	0	3.8				
2	DATA	32.4	1.7	0.17		9.9	9.9	3.3
	RATING	3.0	1.5	5.4				
7	DATA	29.9	1.0	0.13		15.0	15.0	5.0
	RATING	3.5	5.0	6.5				
9	DATA	34.4	1.1	0.18		12.2	12.2	4.1
	RATING	2.6	4.5	5.1				
11	DATA	35.0	1.3	0.26		8.9	8.9	3.0
	RATING	2.4	3.5	3.0				
15	DATA	44.3	1.6	0.22		6.5	6.5	2.2
	RATING	0.4	2.0	4.1				
17	DATA	46.3	1.5	0.37		2.5	2.5	0.8
	RATING	0	2.5	0				
18	DATA	31.0	1.1	0.13		14.3	14.3	4.8
	RATING	3.3	4.5	6.5				

Table 9 in Knoxville-Knox County Metropolitan Planning Commission, "Wastewater Treatment Plant Site Evaluation," July 1975, page 23.

difficult to measure objectively since individual value systems will cause the rating to vary. For the purpose of this matrix the treatment plant was classified as a light industrial land use. A comparison was then made between its potential impacts and the site's present land use utilizing the community impact criteria. For the purpose of this comparison weights were given to each of the criteria to indicate its importance. Visual disruption was given a weight of 2 to indicate the importance of aesthetics; construction impacts were given a weight of 0.5 because of their temporary nature; because of their uncertain effects vehicular vistas were also given a weight of 0.5; all other factors were given a weight of 1.[28] Tables A-3 and A-4 of Appendix D, pages 140-141, show the rating scale and matrix for this set of criteria.

In order to determine the difficulty of implementing the treatment plant at each site a feasibility index was developed. This index included local government acceptability, site availability, citizen acceptability, and physical site suitability. Site availability was given a weight of 5 to emphasize its importance with the other factors being given a weight of 1.[29] Tables A-5 and A-6 of Appendix D, pages 142-143, show the rating scale and matrix for this set of criteria.

A performance matrix was developed to measure the ability of a plant at each site to deliver effective, systematic performance over time. Included in this matrix were systematic operation which included

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[28] Ibid., pp. 22-23.

[29] Ibid., p. 38.

force main volume—the rating lessens as the volume increases, and south side service—if yes 10 points, no then 0 points; expansion capacity, sites were rated for their closeness to 100 acres, 100 acres being required for the proposed plant, with the rating increasing as acreage increases; catastrophic effects, each site was given a rating of 5. The ability of the site to serve the southern part of the county was given a weight of 0.5 and all other criteria a weight of 1.[30] Table A-7 of Appendix D, page 144, shows the matrix for the performance criteria.

The four matrices were then combined to form a decision matrix. This matrix, table A-8 of Appendix D, page 145, summarizes the mean scores received by each site for each of the four goals or sets of criteria. Each site was evaluated on the basis of its ability to satisfy each goal. The column at the far right indicates the number of scores for each site falling below the mean. The fewer the scores below the mean the better the site. Three sites had 1 score below the mean: site 1—the Scottish Pike area, site 2—the area adjacent to the Third Creek plant, and site 9—the Cox Sky Ranch. Each of these three sites fell below the mean for a different goal thus making it necessary to decide which goal is most important. The report reached the conclusion that if a large single wastewater treatment facility can be constructed on any of these sites, the best from a comprehensive community planning aspect is the Cox Sky Ranch. The report also noted that if a plant

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[30] Ibid., p. 41.

is built at Cox Sky Ranch officials should work with residents of the area to minimize negative community impact.[31]

In 1975 R.E.T.A. presented the completed 201 Facilities Plan which also made an investigation of possible treatment plant sites. Of the original 13 sites 3 were selected to be included in the evaluation. The 10 other sites had been eliminated for various reasons. Sites 4, 7, and 8 were eliminated because the land was not available for purchase; sites 3, 5, and 11 were not large enough; sites 6 and 10 contained highly developed residential areas; and sites 12 and 13 were too far from the Third Creek plant which would make flow diversion prohibitive. The 3 sites left for consideration were 1—the Scottish Pike area; 2—the land adjacent to the Third Creek treatment plant; and 9—the Cox Sky Ranch.[32] A detailed analysis was made of each site.

The investigation found site 1 to be the least desirable of the 3 because of socioeconomic considerations. Approximately 225 homes, 2 churches, and 10 businesses would have to be relocated along with 1 mile of roadway. The loss of homes and businesses could mean a loss of tax revenue to the city. Other disadvantages of this site include its high land costs and close proximity to downtown.[33]

Site 2 was made less desirable because of economic considerations. This site would require relocation of industries presently at this

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[31] Ibid., p. 43.

[32] Rykman, Edgerly, Tomlinson, and Associates, Knoxville-Knox County 201 Facilities Plan Vol. 4 (Published by the Authors, 1975), pp. 40-41.

[33] Ibid., p. 41.

location which could mean a loss of tax revenue. Another disadvantage is the site's limited land area. It has the advantages of being adjacent to the existing facilities and having good railroad, highway, and river access.[34]

Site 9 had the disadvantage of being too small for a regional waste treatment facility requiring 1,280,000 cubic yards of fill to bring the site up to 100 acres.[35] It was found to have the advantage of being far from heavily inhabited areas. No long range adverse environmental effects would result from a plant being located at Cox Sky Ranch.[36]

R.E.T.A. determined from this analysis that of these three sites the Cox Sky Ranch was the best.

In trying to select the best location for a wastewater treatment facility each of the three studies used different methods in their evaluation of the sites. R.E.T.A. appeared to use the most arbitrary method for evaluation in that they used no standard analysis technique. Instead they relied on their judgment and professional knowledge gained through years of experience in this type of work. This can be compared to some extent with the highway planning and location process as described by Altshuler.[37] In his book Altshuler presents a study of

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[34]Ibid.

[35]Rykman, Edgerly, Tomlinson, and Associates, Clean Water for Knoxville (Published by the Authors, 1974), p. 95.

[36]Ibid., p. xii.

[37]Alan A. Altshuler, The City Planning Process: A Political Analysis (Ithaca, New York: Cornell University Press, 1965), pp. 17-84.

the highway planning and location process as it occurred in Minneapolis-St. Paul. In selecting a location for a new highway the engineers maintained that their decision was based on technical engineering data and was not subject to question by nonengineers.

The University of Tennessee task force relied more heavily on an economic analysis of the sites. Costs for most of the criteria used in their study can be easily quantified and compared. Their study was completed in a period of one week which could have reduced the depth of the study.

The MPC study used the most objective analysis and extensive criteria in their evaluation of the sites. One problem with the matrix approach, and this applies to the MPC study, is that the weighting applied to the criteria are assigned arbitrarily. The MPC failed to clearly establish which site was the best with the decision matrix. Another objection to the MPC study is that it was undertaken after the Cox Sky Ranch site had been selected which gives the impression that the purpose of the study was to justify the site's selection.

CHAPTER IV

DECISION-MAKING AND CITIZEN INVOLVEMENT IN THE SITE SELECTION PROCESS

Introduction

This chapter is divided into two major sections. The first section will present a discussion of background information about decision-making. This section will be followed by a discussion of the decision-making process that actually occurred in selecting the Cox Sky Ranch as the location for a new wastewater treatment plant.

The second major section will present a discussion of background information about citizen participation. This section will be followed by a discussion of the citizen involvement that actually occurred in the decision-making and site selection processes.

Rational Decision-Making

Making decisions is defined as the selection of an alternative course of action with the purpose of achieving a goal. The goal can be one developed by the planning commission, city council, or a city official for a specific project. Decisions can be quite simple or involve highly technical and complicated processes. Governmental decisions often involve the selection of one course of action from many alternatives, each with its own advantages and disadvantages, and each capable of achieving the desired goal. When decisions must be made, decision makers naturally desire to choose the best alternative.

One technique that can be used in selecting an alternative is the rational approach or technical rationality. This approach will be discussed in this chapter because it is the approach that most closely corresponds to what occurred in the decision to select the Cox Sky Ranch.

Most decisions, particularly those made by governmental leaders, consist of a set of elements. These elements include:

1. A set of alternative actions from which the decision-maker makes his selection.
2. A set of conditions or states of nature which reflect the possible conditions in which the decision is to be made. The outcome of the decision depends on these conditions which frequently are not under the control of the decision-maker.
3. A set of outcomes which may result depending upon which alternative is selected and the environment existing at the time the decision is made.
4. A value or payoff to the decision-maker resulting from the outcome.
5. An assessment of the probability of each of the states of nature being the true one when the action is taken.[1]

Altshuler has pointed out that if an official wants his decisions to be considered authoritative on a wide range of subjects, his best strategy is to maintain that his decisions and policies have been made on a technical basis and that he is an interpreter of the technical process. In other words the official making the decision relies on the knowledge and opinions of experts. An expert can be defined as a person who is technically rational. Altshuler goes on to say that the expert's job is to measure the effects of action possibilities on variables, and

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[1] Melvin B. Cline, "Decision Theory," in J. Morley English, ed., Cost-Effectiveness; The Economic Evaluation of Engineered Systems (New York: John Wiley and Sons, 1968), pp. 45-46.

that his technical conclusions can do no more than provide a factual basis for nontechnical judgment.[2]

Dahl and Lindblom define a rational action as one which is correctly designed to maximize goal achievement. They also characterize a rational action as the most efficient action.[3] The basic steps of the rational decision-making process include: (1) the specification of the set of known possible actions; (2) the determination of all possible consequences of each action and their respective probabilities; (3) the evaluation of each possible consequence of each possible action; and (4) the selection of the best alternative.[4]

Since no alternative is excluded from analysis, the rational decision-making process has some rather obvious problems. These problems, as presented by Dahl and Lindblom, are:

1. The lack of information needed to make a rational decision.
2. The problem of communicating information about each alternative among those involved in the decision-making process.
3. The large number of variables that must be evaluated.
4. The complexity of the relationship among the variables.[5]

Richard Bolan has also pointed out some of the difficulties of the rational approach. He states that rational procedures bear little relation to the governing of cities: the local urban governments are

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[2]Alan A. Altshuler, The City Planning Process; A Political Analysis (Ithaca, N.Y.: Cornell University Press, 1965), pp. 334-335.

[3]Robert A. Dahl and Charles Lindblom, Politics, Economics and Welfare (New York: Harper and Brothers, 1953), pp. 38-39.

[4]Sidney Schoeffler, "Toward a General Definition of Rational Action," Kylos 7 (1954), p. 245.

[5]Dahl and Lindblom, p. 59.

so disorganized, fragmented, dispersed, and incompetent that no injection of rational planning and decision-making can survive in a political culture.[6] He goes on to say that:

> Seldom is information adequate; explicit specification of goals is often lacking; only a few alternative sets of means and ends can usually be considered; the ability to predict all possible consequences if highly restricted; meaningful evaluation for optimizing is difficult; and prior decisions often serve as constraints on the decision at hand. Thus rationality is an imperfect process.[7]

If the rational approach to decision-making has so many problems how can it be used effectively in making governmental decisions? Altshuler states that the only way is to narrow the criterion of rationality (the goals) until the number of variables affecting its achievement is reduced to one or very few, and they are susceptible to precise measurement.[8] Dahl and Lindblom present three processes which can aid decision makers in reducing the number and complexity of variables that exist in making a rational decision. These three processes are: the quantification of variables in comparable values, sampling, and delegation.[9]

Dahl and Lindblom point out that the strongest reason for not using the rational approach to decision-making is the problem of weighing the alternatives and deciding which is the most valuable. They go on to say that the number of variables can be reduced if the net value of each

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[6]Richard S. Bolan, "Community Decision Behavior: The Culture of Planning," The Journal of the American Institute of Planners (September 1969), p. 301.

[7]Ibid., p. 302.

[8]Altshuler, p. 336.

[9]Dahl and Lindblom, p. 65.

alternative can be quantified in comparable units. This would allow the alternatives to be ranked according to their net value.[10] This process can be related to the use of cost-benefit and cost effectiveness analyses. The cost benefit analysis involves the development of ratios, expressed as $\frac{\text{benefits to public}}{\text{costs to government}}$ or B/C=$/$, for each alternative. The alternative with the best ratio of benefits to costs is considered to be the optimum alternative.[11]

The cost effectiveness evaluation is similar to the cost benefit analysis, however, the C-E evaluation involves the minimization of costs to achieve a given level of benefits. The cost benefit analysis involves the maximization of benefits at a given cost.[12] The cost effectiveness evaluation is used most often when the benefits are difficult to measure or when the benefits that are measured cannot be reduced to a single dimension.[13]

The development of matrices is another approach that can be used to reduce the number and complexity of variables and make comparison of alternatives easier. A matrix is used to determine the ability of an alternative to achieve a desired goal. The goal's objectives should be

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[10] Dahl and Lindblom, p. 68.

[11] H. G. Thuesen, W. J. Fabrycky, and G. J. Thuesen, Engineering Economy (Englewood Cliffs, N.J.: Prentice-Hall, 1971), p. 224; Harley H. Hinrichs, "Government Decision Making and the Theory of Benefit-Cost Analysis: A Primer," in Harley H. Hinrichs and Graeme M. Taylor, Program Budgeting and Benefit-Cost Analysis (Pacific Palisades, Calif.: Goodyear Publishing Co., 1969), pp. 9-20.

[12] Ibid.

[13] J. Bridge and J. C. Dodds, Managerial Decision Making (London, England: Croom Helm Publishers, 1975), p. 292.

defined operationally rather than in abstract terms for the purpose of the matrix.[14] The Metropolitan Planning Commission (MPC) utilized the matrix approach in their study of alternative sites, and can serve as an example of goals and objectives used in a matrix.

In order to emphasize the importance of certain objectives, weights are assigned to each objective. Those objectives considered most important are assigned higher weights. Again the MPC study can serve as an example. The weights are then multiplied by the raw data obtained for a particular objective. Say for example that the objective is to reduce visual disruption, which is determined by the number of dwelling units within a certain distance of a negatively altered site. Visual disruption is given a weight of 2 to emphasize the importance of aesthetics.[15] The weight is then multiplied by the number of dwelling units which will experience visual disruption in each alternative. The alternative with the lowest number will be the best for this particular objective. This process is then repeated for each objective.

Sampling is another process given by Dahl and Lindblom for reducing the number of variables. Sampling involves the taking of a representative part, or specimen, of the whole. This sample is then used to prove the ability of an alternative to achieve the desired goal.[16]

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[14]Morris Hill, "A Goals-Achievement Matrix for Evaluating Alternative Plans," in Ira M. Robinson, Decision-Making in Urban Planning (Beverly Hills, Calif: Sage Publishers, 1974), p. 198.

[15]Knoxville-Knox County Metropolitan Planning Commission, "Wastewater Treatment Plant Site Evaluation," (Unpublished report, July 1975).

[16]Dahl and Lindblom, p. 69.

The third and final method for reducing the number of variables is delegation. This can be either delegation to leaders, experts, or machines. Delegation to leaders usually occurs in a situation in which nonleaders do not have the knowledge or power to make a decision. In some cases nonleaders may not want to assume the responsibility of making decisions on certain issues.[17]

Delegation to experts—those who have special skills or knowledge—can be an indispenible aid to decision makers. Leaders who may lack the knowledge required to make a decision in a specialized area will often request that experts with knowledge and experience in that area provide information so that a rational decision can be made.[18] This is essentially what occurred in Knoxville when city officials were required to solve the city's wastewater treatment problems.

Delegation to machines can in some cases greatly reduce the number of variables involved in alternative selection.[19] Models have been developed for use with computers which can determine how well the alternatives meet established criteria in a very small amount of time. Several models have been developed for use in locating sewage treatment plants.[20]

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[17] Dahl and Lindblom, pp. 71-72.

[18] Ibid., pp. 71-76.

[19] Ibid., pp. 76-78.

[20] See A. O. Converse, Optimum Number and Location of Treatment Plants," Journal of the Water Pollution Control Federation (44), August 1972, p. 1629; Martin P. Wanielista and Christian S. Bauer, "Centralization of Waste Treatment Facilities," Journal of the Water Pollution Control Federation (44), December 1972, p. 2229; John J. Jarvis, V. Ed Unger, and Ron L. Rardin, "Optimal Design of a Regional Water Quality Waste Management System: A Fixed Charge Network Flow Model," (Unpublished Paper).

Another type of decision-making is one in which the decision maker seeks the participation of knowledgeable or interested persons to assist in making the decision. When complex problems arise, decisions usually emerge from a series of meetings in which various officials jointly discuss the problem at hand. Frequently, when groups are allowed to participate in making decisions, the group's discussions and reports provide a basis for the decision. A decision made through the participation of groups tends to be a balanced decision that takes into account interactions of different viewpoints.

The participatory approach to decision-making is frequently used to make a choice among alternatives, to generate ideas, and to distribute information. However, it has the disadvantages of being time consuming and costly, and can lead to compromise and indecision.

Planning and Decision-Making

Planning, defined as a method of determining goals and selecting alternative means to achieve them, can be another aid to rational decision-making. Planning can aid the decision maker by making him aware of community goals. By being comprehensive in its approach planning can aid the decision maker by making him aware of a greater number of variables, and how the variables affect goal achievement, than he would otherwise be able to consider.[21]

Ideally, planning is a rational approach of selecting alternatives to reach desired goals. Rational planning is that which under given

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[21]Altshuler, p. 285.

conditions leads to the maximization of goal achievement.[22] John Dykman has stated that when planning is used by decision makers it is expected to make use of the rational-technical means of selecting alternatives. Planning is expected to aid rational decisions by covering the deficiencies of other decision mechanisms in dealing with the future and the extensive repercussions of limited goals. Dykman goes on to say that planning should be able to make rational decisions because of its access to superior information.[23]

The Decision-Making Process of Site Selection

The decision-making process to select a site for the proposed wastewater treatment facility began in early 1973. Rykman, Edgerly, Tomlinson, and Associates was hired to assist the city in solving its sewage treatment problems. Mayor Kyle Testerman was the central figure in deciding how the city should solve its problems and making the selection of a site for the new facility. The goal of the city, and Mayor Testerman, was to meet the water quality criteria established by TDPH and EPA. R.E.T.A. recommended that the best approach to meeting these criteria was to construct a new treatment plant. This advice was accepted and R.E.T.A. proceeded in the selection of the best site.

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[22]Martin Meyerson and Edward C. Banfield, Politics Planning and the Public Interest (New York: The Free Press of Glencoe, 1955), p. 314.

[23]John W. Dykman, "Planning and Decision Theory," Journal of the American Institute of Planners (November 1961), p. 336.

To meet the criteria R.E.T.A. first recommended, in March 1973, the expansion of the Third and Fourth Creek plants. In order to carry out this recommendation land would have to be purchased from the Eastern State Psychiatric Hospital since the Fourth Creek plant is surrounded by land under their ownership. Mayor Testerman was unable to obtain the land for expanding the Fourth Creek plant.

Because an agreement could not be reached on the hospital's property, R.E.T.A. began the process of selecting a site for the proposed facility. When their initial investigation was completed, the Jo Anderson Farm was recommended as the best site. The mayor was unable to obtain the Anderson Farm, which is owned by the University of Tennessee. The area adjacent to the Third Creek plant was the next best site according to R.E.T.A.'s investigation. After making a study of the possibility of obtaining this site and expanding the Third Creek plant, Testerman found that severe technical and legal conflicts would be involved. He also found that there was no way to expand the Third Creek plant so that it would meet 30 year state and federal water quality standards, and that time limitations imposed by the TDPH and EPA could not be complied with if this site was selected. This site was then dropped from consideration.[24]

Because the first sites were unacceptable, R.E.T.A. made a further investigation and recommended that the Cox Sky Ranch be selected as the site for the new wastewater treatment facility. Based on this

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[24]Interview with Kyle C. Testerman, July 13, 1976.

recommendation and a recommendation from Dr. John Gibbons who served on the University of Tennessee task force, Testerman selected the Cox Sky Ranch as the site for the proposed plant in July 1973. The Knoxville city council approved the site in September 1975 and the Metropolitan Planning Commission in December 1974.

Testerman lost the election for mayor in 1975 with Randy Tyree taking over the office. In a meeting with EPA and TDPH officials Tyree learned that the Knoxville-Knox County 201 plan did not substantially support the selection of the Cox Sky Ranch and that an environmental impact statement may be required if it remained the city's choice as the location for the plant. On the advice of R.E.T.A. and Sam Waddell of EPA Tyree decided to select the area adjacent to the Third Creek plant as the location for the new facility. In the same interview Testerman stated that he felt this decision was politically motivated and that this site is obviously not the best.[25]

In reviewing the events which took place leading up to the selection of the Cox Sky Ranch it is easy to see that even though eighteen sites were evaluated the mayor was limited in which sites could be selected. Outside factors not under the mayor's control played an important role in the decision. For example the city's inability to use eminent domain to obtain land owned by the state eliminated 2 of the best 3 sites.

As stated earlier the rational approach, or technical rationality, to decision-making appears to be that approach that most closely

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[25] Ibid.

corresponds to what occurred in the decision to select Cox Sky Ranch. Throughout the planning process for the wastewater system the mayor maintained, as Altshuler suggests, that the decision was based on a technical basis and that he was an interpreter of the technical process. The delegation to experts method of reducing the variables that must be considered in making a decision as described by Dahl and Lindblom also appears to have been used in the decision to select the Cox Sky Ranch.

The use of the technical rationality approach can create problems, particularly when the decision being made can have broad public interest. The use of this approach does not allow adequate citizen input when there is opposition to a decision. Problems can also be created when the public does not understand the technical process used to form a basis for a decision.

The studies used in making the decision of which site to select did not closely follow the rational approach. All alternatives to solving the problem were not considered. For example, no studies were prepared to determine the feasibility of forcing the industries presently overtaxing the Third Creek treatment plant to construct their own treatment facilities. There were no stated goals in the R.E.T.A. and U.T. studies. The MPC study was the only study which presented any goals and objectives. These goals, however, were developed by the MPC staff and were implied goals derived from the previous studies and the mayor's actions.

The criteria developed by R.E.T.A. and the task force did not correspond to the rational approach in that all criteria were not

considered in selecting a site. The criteria in their studies centered on the physical characteristics and cost factors of each site evaluated, while giving little consideration to the social and environmental factors. The MPC's criteria more closely followed the rational approach because they used the broadest range of criteria in their evaluation.

There were few key individuals involved in making the decision on the location for the new sewage treatment plant. Kyle Testerman is obviously one of these individuals since he made the decision to select that site. There were other individuals involved who limited Testerman's choice by their refusal to sell the city land in their control. These individuals are Edward Boling, the president of the University of Tennessee, and Governors Dunn and Blanton. Randy Tyree is another key individual since he made the decision to change the location of the proposed plant from Cox Sky Ranch to the area adjacent to the Third Creek plant.

While there were few individuals involved there were several agencies and organizations involved in the city's selection process. Two of the most important agencies of local government, the city council and planning commission, had a very large role in the decision-making process in that they supported the mayor in his selection of Cox Sky Ranch. The Knox County Commission and the Knox County Court are also important, however, they did not support Testerman in his site selection. One of the primary organizations is Rykman, Edgerly, Tomlinson, and Associates since they provided the technical expertise behind the decision. Two other organizations that provided technical information

was the University of Tennessee task force which made a study of the sites at the mayor's request and the Metropolitan Planning Commission staff whose study helped to substantiate the decision.

Two agencies that had an important impact on the city's sewage treatment problems were the Environmental Protection Agency and the Tennessee Department of Public Health. It was their requirements that caused the city to consider constructing a new facility, and EPA's recommendation which caused Tyree to change the location.

Several other agencies were involved indirectly through the A-95 review process, which allows government agencies to review proposed projects undertaken at the local level, and making recommendations directly to Mayor Testerman. One of these agencies is the East Tennessee Development District (ETDD). ETDD took an active role in the process in that they wrote letters to the mayor recommending sites and supported him in his selection of Cox Sky Ranch.

Other agencies that were involved in reviewing Knoxville's plans included: the United States Department of Interior, Tennessee Game and Fish Commission, Tennessee Wildlife Resources Agency, and the Tennessee Department of Transportation. The Department of Interior, Game and Fish Commission, and Wildlife Resources Agency wrote letters and testified at public hearings that the location of a sewage treatment plant at Cox Sky Ranch would damage the habitat of the wildlife in the area. The Department of Transportation wrote letters to the Topside Community Club stating that they would control access to the proposed site during construction of the treatment plant.

Citizen Participation in Planning and Decision-Making

Citizen interest in governmental affairs appears to be increasing with more people demanding a voice in the decisions which affect their lives and environment. The right of citizens to participate in the decisions which affect their lives is a central value of democracy.

Optimal participation of citizens in a planning and decision-making process can be defined as:

> The systematic process of mutual education and cooperation which provides an opportunity for those affected, to work together to create a plan which combines and reflects their values, knowledge, experience, and best judgment at the time in a democratic manner.[26]

In order for participation to take place as defined it must involve more than a single public hearing. It must be a planned process responsive to the needs of the public. In this type of process participation can provide an open forum in which planners, decision-makers, and citizens can inform each other, and improve their understanding of important issues and alternatives. In short, it is an educative process for all involved parties. Although mutual education is an important facet of participation, probably more important is the feeling of public involvement and the acceptance of responsibility by the public for the successful solution to community problems.[27]

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[26]Desmond M. Connor, "Public Participation," in David W. Hendricks, Evan C. Valchos, L. Scott Tucker, and Joseph C. Kellogg, eds., Environmental Design of Public Projects (Fort Collins, Colorado: Water Resources Publications, 1975), p. 577.

[27]Arnold W. Bolle, "Public Participation in Environmental Policy," Natural Resources Bulletin 11 (July 1971), p. 503.

Public participation, however, does not always take place in an atmosphere of mutual cooperation. Meyerson and Banfield have grouped into four categories the activities by which various groups or individuals may be involved to bring a settlement to issues of concern. The four categories are: cooperation, contention, accommodation, and dictation.[28]

In cooperation the parties involved engage in a cooperative search for that settlement which is implied in the goals or principles which they agree ought to be determinative. In this process of negotiation citizens can assist the decision makers in choosing the courses of action they feel will best serve the needs of the community. In a cooperative decision process the power of the parties does not affect the settlement of issues. The ability of the parties to reach a decision by cooperation largely depends upon the ability of the parties to communicate.

Contention has been used to describe the activity in which the participating parties mutually endeavor to make their goals prevail over those of the other parties by the exercise of power. Two forms of contention are struggle and bargaining. In a struggle each participant seeks to emerge supreme by dictating a settlement. In bargaining each participant seeks to emerge supreme but on terms which are only relatively favorable, or in other words a compromise is reached.

A contention usually occurs when the citizens had not been allowed to participate until the decisions have been made by governmental leaders

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[28]Meyerson and Banfield, pp. 304-312.

concerning the settlement of the issues at hand. This has been true of many types of public projects. In many situations the project will go forward quietly and will approach the point of irreversibility before those who oppose it can voice their opinions.[29] Altshuler has pointed out that those who voice their opinions are frequently interested in the direct results a project has on them. Those who have strong opinions about a particular project will form interest or pressure groups to advance their personal interest. These pressure groups then use their power to have decisions made in their favor.[30] Unfortunately there are times when it appears that a conscious effort has been made to minimize public awareness and participation. Under these conditions the planning and decision-making processes have regularly included angry confrontations, long petitions, protests, and heated public hearings.[31]

In accommodation a settlement is reached when one party freely chooses to make the goals of the other his own.

The fourth category, dictation, is used to describe a settlement which is reached when one party compels the other to accept a settlement on his terms. This can occur when the citizens are unaware that a decision has been made or have not had the opportunity to participate.

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[29]Peter W. Schroth and Zygmunt Plater, Nature, Law and Society (Published by the Authors, 1975), p. 7.04.

[30]Alan A. Altshuler, The City Planning Process; A Political Analysis (Ithaca, New York: Cornell University Presss, 1964), p. 317.

[31]Charles R. Ryan, Brian P. Nedwick, and Edward A. Beimborn, "An Evaluation of the Feasibility of Social Diagnostic Techniques in the Transportation Planning Process," Highway Research Record 410 (1972), p. 18.

It is generally agreed that cooperative participation is a desirable part of the planning and decision-making processes. However, the extent to which one participates, or is allowed to participate, is an important consideration in judging the impact citizens have on the processes. Sherry Arnstein has developed a ladder of participation which describes the levels at which participation can occur. These eight levels or rungs, beginning with the lowest level, are: (1) manipulation, (2) therapy, (3) informing, (4) consultation, (5) placation, (6) partnership, (7) delegated power, and (8) citizen control.[32] (See figure 5 on page 93.)

The two lowest levels, manipulation and therapy, are used to describe levels of nonparticipation which act as substitutes for genuine participation. Manipulation describes the process by which those in power use the citizens to rubber stamp their proposals and decisions. This type of participation is used for the purpose of educating the citizens and gaining their support.

Therapy describes the process in which the powerholders have assumed that powerlessness is synonymous with mental illness and subject the citizen involved in planning to clinical group therapy.

Informing, consultation, and placation form the next levels of participation which have been described as tokenism. Informing citizens usually takes the form of passing information to citizens concerning

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[32]Sherry Arnstein, "A Ladder of Citizen Participation," in Edgar S. Cahn and Barry A. Passett, eds., Citizen Participation: Effecting Community Change (New York: Praeger Publishers, 1971), pp. 69-91.

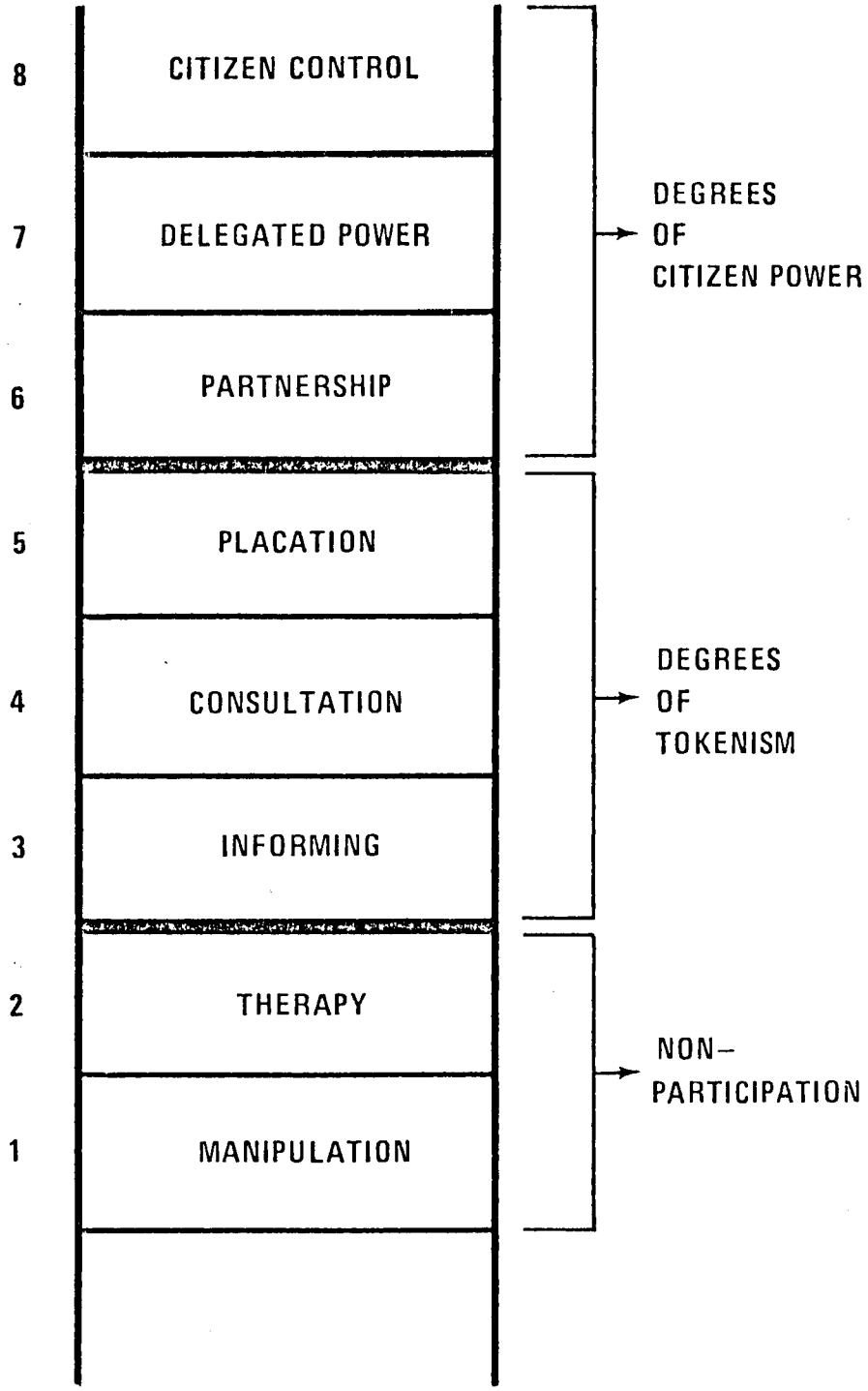


Figure 5. The eight rungs on the ladder of citizen participation.

Source: Sherry Arnstein, "Ladder of Citizen Participation," in Edgar S. Cahn and Barry A. Passett, eds., Citizen Participation: Effecting Community Change (New York: Praeger Publishers, 1971), pp. 69-91.

their rights, responsibilities, and options in the process. However, much of the flow of information is from the powerholders to the citizens who then have little opportunity to voice their opinions. It should be noted that this level could be the first step to legitimate participation.

Consultation describes the process by which the governmental officials seek the opinions of the citizens through questionnaires, interviews and public hearings. This does not assume that the citizens' concerns and ideas will be taken into consideration when making decisions.

The fifth level, placation, is the level at which citizens begin to have influence on the decision makers. Tokenism is still apparent, however. This level is usually achieved when a few citizens are selected to serve on various types of committees. Citizens usually remain in a minority and can be easily outvoted by those in power.

Partnership, delegated power, and citizen control form the upper levels and are described as degrees of citizen power. When a partnership exists the citizens can participate through negotiation with the government officials. Both the officials and the citizens agree to share the planning and decision-making responsibilities through policy boards and committees. Partnership can work most effectively when there is an organized power base in the community to which the citizen leaders are accountable.

Delegated power occurs when citizens achieve dominant decision-making authority over a particular plan or program. "At this level citizens hold the significant cards to assure accountability of the program to them. To resolve differences, powerholders need to start

the bargaining process rather than respond to pressure from the other end."[33]

Citizen control occurs when the people demand that degree of power which guarantees that participants or residents can govern a program and be in full charge of policy and managerial aspects. "A neighborhood corporation with no intermediaries between it and the source of funds is the model most often advocated to achieve this level."[34]

Meyerson and Banfield and Arnstein have presented ways in which participation can occur in the planning and decision-making process. None of the levels or categories occur in its pure form in the processes but will usually include a mixture of two or more levels and categories.

The categories developed by Meyerson and Banfield can be related to those developed by Arnstein. Meyerson and Banfield's categories of contention and dictation would occur at either the top or bottom of Arnstein's ladder. These two categories would occur at the bottom when citizens do not have the authority to force the decision-makers to consider their opinions. Conversely, contention and dictation would occur at the top where the citizens have the authority to force the governmental decision maker to accept their decision. Accommodation and cooperation can occur at any level but more easily at the middle levels where the decision maker does not have absolute decision power. Accommodation and cooperation can occur at the top or bottom, however, it would depend upon the desires of the powerholders concerning the

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[33]Ibid., p. 85.

[34]Ibid., p. 87.

issues at hand. These two categories also depend on the ability of the parties to communicate their desires so that accommodation and cooperation can occur.

Citizen Participation and the Role of the Topside Community Club in Knoxville's Wastewater System Plan

Citizen participation in the planning of wastewater treatment systems is a requirement of the Federal Water Pollution Control Act of 1972. In order to comply with the requirement public hearings were held for each political body (utility districts) in Knox County which provides a sewage treatment service. Eight public hearings were held with the primary purpose of obtaining citizen comments and reactions to various sections of the Knoxville-Knox County 201 Facilities Plan. These comments along with a record of each hearing were included in the plan. Copies of the plan were placed at several locations throughout the county for review by interested citizens. This was also a requirement of the Water Pollution Control Act.

A majority of the people commenting at the public hearings were residents of the Topside Community. The Topside Community is a small residential area located in South Knox County on the Blount-Knox County line. Portions of the community border on Fort Loudoun Lake which has helped to make this an attractive residential area. The community is composed of upper income level professionals, executives, and University of Tennessee professors. In the early 1950's the residents of the community formed the Topside Community Club for the purpose of

petitioning the Knox County and state governments for zoning in that area of the county. The club members desired to maintain the rural, residential character of the community. They were granted an estate zone as a result of their request. The community club continued to participate in local governmental affairs of interest to the community.

Members of the club had been aware, through newspapers and other news media, of the growing problem with the Third Creek sewage treatment plant in the early 1970's. When the community learned of the city's intent to locate a new sewage treatment plant at the nearby Cox Sky Ranch in 1973 its residents became noticeably upset. Fearing that construction of a wastewater treatment facility of the size proposed by the engineers (R.E.T.A.) would destroy the character of the community, the Topside Club sought to have the plant's location changed to another site.[35] Members of the community began to attend city council and planning commission meetings and public hearings that were held to discuss Knoxville's and Knox County's 201 plan to voice opposition to the plan and to the Cox Sky Ranch site. To assist the community club in its efforts and to provide legal representation W. P. Boone Dougherty, a local attorney, was hired. Dougherty's primary job was to fight the city's condemnation suit for the Cox Sky Ranch, provide legal representation at the various meetings, and to, in his own words, raise hell wherever he could.[36]

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[35]Interview with Ann Farmer, Secretary, Topside Community Club, July 6, 1976.

[36]Interview with W. P. Boone Dougherty, Attorney, August 6, 1976.

At the first of the eight public hearings, held in July 1974 to allow public input into the 201 planning process, comments were made concerning the suitability of the Cox Sky Ranch as the site for the city's new wastewater treatment plant. Approximately sixteen citizens gave comments voicing their disapproval of the 201 plan and the Cox Sky Ranch site. The comments made by the citizens concerning the Cox Sky Ranch site have been summarized by R.E.T.A. Their reasons for opposing the site were:

1. Many doubt that the proposed plant will be more efficient in operation than existing plants.
2. Many claim that adequate studies have not been conducted to thoroughly evaluate alternative sites.
3. Several citizens stated that detailed information concerning site selection had not been made public.
4. Opinions were voiced that plant construction at the Cox Sky Ranch would create many adverse environmental impacts.
5. Several citizens felt that Knox County residents have had no voice in site selection.[37]

At a public hearing held February 17, 1975, for the purpose of reviewing wastewater treatment alternatives for Knoxville, residents of the Topside Community continued to voice opposition to the Cox Sky Ranch site. Several citizens from this community questioned the validity of the site selection process and whether a regional sewage treatment plant is the most cost effective solution to the city's problems.[38]

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[37] Rykman, Edgerly, Tomlinson, and Associates, Knoxville-Knox County 201 Facilities Plan, Vol. 6, (Published by the Authors, 1975, p.7.

[38] Ibid.

On November 25, 1975, a final public hearing was held for the discussion of the completed 201 plan. Approximately 250 persons, most from the Topside Community, attended the meeting. Several of these citizens presented papers, each critizing the plan and the selection of the Cox Sky Ranch. Most of the papers presented expressed concern about possible adverse effects of plant construction at this site.

The primary tactic of the Topside Community Club in opposing the plant's location was to get the facts on what was occurring in the 201 planning process. This involved getting information from agencies and individuals involved in the planning process. Club members sought answers to unanswered and unasked questions concerning the 201 plan for Knoxville-Knox County. In gathering information club members contacted approximately 25 to 30 individuals, agencies, and organizations involved in 201 planning for Knox County. The Freedom of Information Act provided the club with access to correspondence between the city and the various agencies which provided an excellent source of information about what was taking place.[39]

The club's main opposition to the Cox Sky Ranch was centered in six major areas. Firstly, that locating a sewage treatment plant of the proposed 60 MGD size at the Cox Sky Ranch was not economically sound. The club thought that there was no one best site in the group evaluated, and that a number of small plants would best serve the city. Secondly, that the plant would have adverse environmental effects on the nearby

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[39]Interview with Ann Farmer, Secretary, Topside Community Club, July 6, 1976.

I. C. King Park. Third, that an industrial type land use would be located in an area zoned agricultural. Fourth, that severe traffic hazards would be created during construction because of the large amount of earth fill that would have to be brought in to make the site large enough to support the sewage treatment plant. Fifth, that there would be a loss of aesthetics in the area. Sixth, that a sewage treatment plant constructed at the Cox Sky Ranch would be a waste of valuable environmental assets.[40] These points of opposition were presented at city council, county commission, and planning commission meetings and the three public hearings held to discuss the wastewater system plan and the location of the new treatment facility.

These three public hearings constituted the only official input citizens had into the Knoxville portion of the 201 plan. The site selection process was completed before citizen comments were taken, thus they had little input into the process. A majority of the citizens making comments at these hearings reside in the Topside Community, and were the only persons having any significant input into the process. It is easy to reach the conclusion that this is a typical case in which citizens did not have an opportunity to participate until key decisions had been made. The citizens obviously had little impact on the wastewater facilities plan since it was issued with the Cox Sky Ranch recommended as the best site for the sewage treatment plant.

Citizen participation can play a larger role in planning and decision-making but more than public hearings are required. For

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[40] Ibid.

participation to play a larger role the powerholders involved in the processes must desire that it play a larger role. The decision maker must seek out the opinions of individuals both opposed or in favor of a particular project. These opinions should then be considered in making the decision. It is also necessary for citizens to be aware of decisions affecting them and seek out the opportunities to participate. The decision maker should let the citizens be aware of what decisions are being made. This could be done through press releases or by broadcasting council and planning commission meetings. The responsibility to participate, to make their opinions known rests most heavily on the citizens and it is up to them to take advantage of the opportunities that exist. It is the decision maker's responsibility to provide the opportunity for the citizens to participate.

The participation that occurred in planning and locating Knoxville's wastewater treatment can be analyzed according to the levels and categories developed by Meyerson and Banfield and Arnstein. As stated earlier the levels and categories rarely occur in their pure form. Participation is more typically composed of more than one level or category as the participation process is carried out.

At the beginning of the planning and decision-making processes for the city's wastewater system plan the participation fell into Meyerson and Banfield's dictation category. Dictation occurs when one party compels the other to accept a settlement on his terms. Testerman had used his power as decision maker to compel the citizens to accept the Cox Sky Ranch as the location for the new sewage treatment plant. In

a meeting with the Topside Community Club shortly after the site had been selected, Mayor Testerman told club members that the Cox Sky Ranch had been selected as the site for the plant and that it would be best for all concerned to accept the decision.[41]

After the participation process began and the Topside residents began voicing their opinions, the involvement falls into the contention category. A contention occurs when one party desires to have their goals prevail over those of the other party. Struggle and bargaining are two forms of contention. As the wastewater system planning process continued the residents of Topside sought to have their interest prevail over the overall public interest. The club members attended meetings in force, wrote letters to influential citizens and politicians, and exerted their political muscle in an effort to have the site changed. Throughout the planning process Testerman stood firm refusing to change his decision. Testerman felt that his decision was backed by the technical recommendations of R.E.T.A. and was not subject to question. Of the two forms of contention the participation in the wastewater system planning process is clearly a struggle. Neither Testerman nor the Topside residents was willing to bargain on where the new sewage treatment facility should or should not be located.

The levels of participation as described by Arnstein vary throughout the planning process in a way that is similar to the Meyerson and Banfield categories. At the beginning of the process the citizens were at the

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[41] Ibid.

lower rungs of the ladder at the manipulation level. Mayor Testerman sought to have the citizens approve his selection of Cox Sky Ranch. The Topside residents were unwilling to blindly accept this site for the plant's location. As the planning process continued the participation moved up the ladder to the consultation level. At this level the city officials sought out the opinions of the citizens through public hearings. The citizens still had little impact on the plan or Testerman's decision. At the end of the planning process the Topside residents felt that they had moved up to the level of delegated power.[42] While their opinions played a significant role in getting the site changed they were not the only reason the area adjacent to the Third Creek plant was selected by Mayor Tyree.

Role of the Residents of the Surrounding Region

The residents of the area surrounding the Cox Sky Ranch played a significantly smaller role than the Topside residents. Participants other than the Topside residents were from the Singleton-Louisville area of Blount County and the Lyons Bend area of Knox County. Residents of these two areas who participated joined the Topside Community Club in their effort to have the plant located at another site. The lack of participation on the part of the residents of the surrounding region can be attributed to apathy, a lack of understanding of how the sewage treatment plant will affect them, and a lack of knowledge that the project was in progress. The lack of participation can also be

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[42]Ibid.

attributed to the acceptability of the site. It is possible that a large number of citizens agreed that the Cox Sky Ranch was the best site for the treatment facility.

Role and Effects of Participation in the Controversy

". . . decisions that are made in the ignorance of the values of the population affected by the decisions will frequently have unexpected results."[43]

Participation in any type of public project is an important part of planning for its construction and operation. Through participation, theoretically, it is possible to learn what problems exist and what the public's opinion is of that particular project. However, those that usually participate are people who oppose the project because they feel it will affect them adversely. This can occur when the citizens affected by the project have been unaware of its planning or the city's intentions for the project. The opposing citizens then organize, either formally or informally, to form a pressure group to have the project altered or cancelled.

Altshuler has stated that pressure group members, and the Topside Community Club can be included as a pressure group, are typically interested in the direct and immediate consequences to themselves, not the overall public interest. He goes on to say that these groups

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[43]Robin M. Williams, Jr., quoted in Roy Burke and James P. Heaney, Collective Decision-Making in Water Resource Planning (Lexington, Mass: Lexington Books, 1975), p. 1.

depend for the survival on issues which encourage their members and on at least occasional success in confrontations on issues important to them. "A rigorous public opinion in turn cannot survive without vigorous interest groups, whose leaders articulate the issues, command attention in the mass media, and assure supporters in dissent they are not alone."[44]

As stated earlier, participation in the planning of wastewater systems is a requirement of federal law. The purpose of public participation is to provide citizen input into the final plan. This does not necessarily mean that the citizens participating will have a significant impact on the plan. The participation in Knoxville's 201 plan provided an opportunity for those opposing the plan and more specifically the Cox Sky Ranch site to voice their opinions. Those citizens who commented in favor of the plan received less news coverage, were fewer in number, and thus had less impact on the community and the plan. Some of those who commented in favor of the plan were planners, engineers, etc., who had a better understanding of the processes involved in locating a wastewater treatment plant.

The effects of citizen involvement on Knoxville's wastewater facilities plan are easily seen. The pressure exerted by the Topside Community Club caused the city council, planning commission, and county commission to reexamine the sites and to question the selection of the Cox Sky Ranch. Through their efforts to have the Cox Sky Ranch site dropped from consideration the Topside Club brought media attention

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[44] Altshuler, p. 317.

to focus on their actions. The participation also had the effect of lengthening the planning process possibly causing deadlines set by TDPH and EPA to be missed.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The problems with Knoxville's wastewater treatment system did not happen overnight. Rather they were caused by a buildup of problems over a period of years. Mayors previous to Testerman made little effort to correct the problems leaving them for future administrations to worry about. When Testerman became mayor he was forced by EPA and TDPH to remedy the situation. Testerman had been aware of the problems prior to his election through his work on the Metropolitan Planning Commission and city council. Testerman made an effort to correct the problems.

Relying on the advice of R.E.T.A. Testerman selected the Cox Sky Ranch as the site for a new wastewater treatment facility. This decision by Testerman follows the delegation to experts method of reducing the number of variables a decision maker must consider in the rational or technical rationality approach to decision-making described by Dahl and Lindblom.

The construction of a new facility is one way to solve the city's sewage treatment problems. Much of the equipment at the Third Creek plant has become obsolete and is not efficient enough to meet present standards.

In evaluating the sites R.E.T.A. relied heavily on past experience, which can be a plausible method, to develop their criteria and select the best site. However, it is difficult for those who lack the experience of the R.E.T.A. staff to understand why or how a particular site is selected with this method. In their analysis of the sites R.E.T.A. left too much for public speculation. In reading the studies one is unsure whether all the sites were evaluated in depth. Their studies should have presented a more indepth discussion of how all the sites were evaluated. The other studies prepared by the task force and MPC did little to improve the public's understanding.

The University of Tennessee study was prepared over a period of one week and focused mainly on economic factors and other easily quantified criteria to evaluate the sites. The length of time the task force had to prepare this study can explain the emphasis on easily quantified criteria and could have reduced the depth of the study. The Metropolitan Planning Commission study was prepared at the request of the planning commissioners after the site was selected. This study used the broadest set of criteria and most objective analysis of the three studies prepared. The MPC study gives the impression that its purpose was to justify the selection of the Cox Sky Ranch.

Because the final plan prepared by R.E.T.A. was also completed after the site for the new facility was selected it too gives the impression that the purpose of the plan was to justify the selection of the Cox Sky Ranch.

Citizens had little or no opportunity to participate in the decision-making process. Participation of any consequence came after

the decision to select Cox Sky Ranch had been made. At his first meeting with the Topside residents to explain his decision, Testerman stated that the Cox Sky Ranch was the best site and it would be best for all concerned to accept it. By trying to force the site on the residents they were less willing to accept it. This gave the Topside residents something to unite behind, to fight for. The wastewater system planning process then became a conflict between Testerman and the residents. According to Boone Dougherty, the Topside Club's attorney, had Testerman explained why the Cox Sky Ranch was selected the residents might have been more willing to accept it.[1]

A positive aspect of the Knoxville-Knox County plan is that it was prepared on a regional basis, i.e., it included more than one hydrological unit. R.E.T.A. acted as coordinator for the plan with the individual utility districts preparing their own plans which were included in the final document.

Conclusions

As previously stated, Knoxville's sewage treatment problems developed over a period of years. Part of the city's problem was its inability or unwillingness to recognize that these problems existed and its indifference toward correcting them. A continuous program of upgrading the sewage treatment facilities would have helped to avoid some of the problems as well as improving their ability to meet the standards established by TDPH and EPA. This reasoning could

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[1] Interview with W. P. Boone Dougherty, August 6, 1976.

be applied to other types of public facilities as well. Because Knoxville allowed the problems to accumulate over a period of years, the city found itself in the position of having to construct a new treatment facility.

Locating a large public facility, such as a sewage treatment plant, is often a difficult task in any situation. When selecting the location of a facility it is important to have a stated goal which the city hopes to attain through the construction of the facility on a particular site. It is equally important to consider a broad range of criteria in site selection, particularly the effect the facility will have on the spatial pattern and relationships of the city. The criteria should include social and environmental considerations as well as physical and economic factors. The method of site selection should be as easily understood by the citizens and as objective as possible. The matrix approach as used by MPC is one example of an objective approach. The subjective approach used by R.E.T.A. is more difficult to understand in that one is unsure of which criteria are given greater consideration, and can make citizens suspicious of the selection process.

As previously stated the rational theory of decision-making appears to closely follow what occurred in Mayor Testerman's selection of the Cox Sky Ranch. The use of this approach to select a site created many problems for Testerman and caused delays in the construction of the sewage treatment facility. One problem with the rational approach, as used in the selection of the Cox Sky Ranch, is that while

allowing time for the examination of alternatives, it does not give the citizens ample opportunity to voice their opinions until the decision is made.

Public participation should be an integral part of the decision-making process. A participatory approach to decision-making would tend to produce a more acceptable decision by providing for the exchange of ideas and information. Although most citizens may choose not to participate access to the decision-making process should be available. Because the citizens did not have an adequate opportunity to influence Testerman's decision caused the Topside residents to take a more active role in trying to change the proposed location of the sewage treatment plant.

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APPENDIXES

APPENDIX A

STATE OF TENNESSEE
DEPARTMENT OF PUBLIC HEALTH
NASHVILLE 37219

December 17, 1971

CERTIFIED MAIL

Honorable Leonard R. Rogers
Mayor, City of Knoxville
City Hall
Knoxville, Tennessee 37902

Re: Third Creek Sewage Treatment Plant

Dear Mayor Rogers:

Enclosed is an Order which has been issued and signed by Dr. Eugene W. Fowinkle, Commissioner, Tennessee Department of Public Health. The Order establishes certain criteria and conditions to be met at the City's Third Creek Sewage Treatment Plant. Said criteria and conditions are established and must be met in order to abate the stream pollution problems associated with the wastewater being discharged and to insure that applicable water quality standards in the receiving stream are met. The Order further directs the City of Knoxville to retain the services of a consulting engineer and direct said engineer to prepare an engineering report detailing by what means and by when the City will comply with the criteria and conditions established in the Order. The Order directs the City of Knoxville to submit the engineering report to the Tennessee Department of Public Health on or prior to June 3, 1972.

Please be advised that this action by the Commissioner, Tennessee Department of Public Health, is taken pursuant to Section Eight (8), Chapter 164, Public Acts of 1971 as amended by Chapter 336. Be further advised that this Order shall become final and not subject to review unless you request by written petition a hearing before the Tennessee Water Quality Control Board; however, such petition must be made no later than thirty (30) days after receipt of this Order.

Very truly yours,

S. Leary Jones, Director
Division of Water Quality Control

SLJ/VMW/jw

Enclosure

PUBLIC HEALTH DEPARTMENT OF THE STATE OF TENNESSEE

IN THE MATTER OF

DIVISION OF WATER QUALITY CONTROL
DAVIDSON COUNTY

THE CITY OF KNOXVILLE
KNOX COUNTY, TENNESSEE

COMPLAINT

Comes now the Commissioner of Department of Public Health, State of Tennessee, Eugene W. Fowinkle, M.D., or his duly authorized representative, S. Leary Jones, Director, Division of Water Quality Control, and states that:

I

The City of Knoxville, Knox County, Tennessee, owns and maintains a domestic wastewater treatment facility known as the Third Creek Sewage Treatment Plant. Domestic wastewater, after passing through said sewage treatment plant, is discharged to the Tennessee River at mile approximately 646.3.

II

The Third Creek Sewage Treatment Plant frequently achieves a 5-day, 20°C biochemical oxygen demand reduction of less than fifty (50) percent and the 5-day, 20°C biochemical oxygen demand concentration in the wastewater being discharged from the Third Creek Sewage Treatment Plant is frequently in excess of 150 mg/l.

III

The Third Creek Sewage Treatment Plant receives industrial wastewaters that are not readily amenable to being adequately treated

by the treatment facilities at the Third Creek Sewage Treatment Plant. Said industrial wastewaters are inadequately treated by the Third Creek Sewage Treatment Plant and, in no insignificant degree, cause disruption of the treatment process to the extent that the normal, domestic wastewater is adequately treated. The most significant and deleterious industrial wastewater being received at the Third Creek Sewage Treatment Plant is the industrial wastewater from the Southern Extract Company.

IV

The wastewater currently being discharged from the Third Creek Sewage Treatment Plant is such that applicable water quality standards cannot be maintained in the receiving stream. The existing treatment facilities do not provide nor closely approach a secondary degree of treatment.

V

Recommendations that the City of Knoxville upgrade and improve the treatment capabilities of the Third Creek Sewage Treatment Plant have been made by the Tennessee Departmnnt of Public Health. Also, time schedules for providing such improved treatment facilities have been established by the Tennessee Department of Public Health.

VI

The City of Knoxville has not complied with previous recommendations of the Tennessee Department of Public Health. The time schedules previously established by the Tennessee Department of Public Health for providing improved wastewater treatment capabilities at the Third Creek Sewage Treatment Plant have not been met by the City of Knoxville.

THEREFORE, pursuant to the authority granted me as Commissioner of Public Health, or to my duly authorized representative, in Section Eight (8a) of Chapter 164 as amended by Chapter 386, Public Acts of 1971, I order the City of Knoxville, Knox County, Tennessee, to take the following action:

I

The treatment capabilities of the Third Creek Sewage Treatment Plant must be upgraded, expanded and improved such that said sewage treatment plant is capable, at all times, of treating wastewater influent to the sewage treatment plant to the extent that the effluent from the sewage treatment plant complies with an meets the following specific criteria:

(a) The volume of settleable solids in the wastewater discharge must not exceed 0.5 ml/l as determined by the standard Imhoff cone test;

(b) The wastewater discharge must contain no distinctly visible floating scum, grease and oil or other floating matter;

(c) Following the approved chlorine contact period, the wastewater discharge must have a chlorine residual concentration of at last 0.5 mg/l;

(d) The daily average five (5) day, 20°C biochemical oxygen demand concentration in the wastewater discharge must not exceed 30 mg/l;

(e) The instantaneous maximum five (5) day, 20°C biochemical oxygen demand concentration in the wastewater discharge must not exceed 40 mg/l;

(f) The total five (5) day, 20°C biochemical oxygen demand of the wastewater discharge must not exceed 7,500 pounds/day;

(g) The daily average suspended solids concentration in the wastewater discharge must not exceed 30 mg/l;

(h) The instantaneous maximum suspended solids concentration in the wastewater discharge must not exceed 40 mg/l;

(i) The total suspended solids in the wastewater discharge must not exceed 7,500 pounds/day;

(j) There shall be no color due to the wastewater discharge that will cause substantial visible contrast with the natural appearance of or interfere with any legitimate use of the receiving stream; and,

(k) The effluent from the Third Creek Sewage Treatment Plant must be so discharged to achieve maximum diffusion in the diffusing stream.

II

On or prior to February 1, 1972, the City of Knoxville must retain an engineer or engineers and direct said engineer or engineers to proceed to design treatment additions and improvements capable of treating wastewater such that the previously detailed criteria are met.

III

On or prior to June 3, 1972, the City of Knoxville must submit to the Tennessee Department of Public Health an engineering report detailing how the City intends to improve the Third Creek Sewage Treatment Plant such that the previously detailed criteria are met. Said engineering

report must take into consideration the problems associated with the industrial wastewater entering the Third Creek Sewage Treatment Plant and provisions for alleviating the problems associated with the industrial wastewaters must be developed. The engineering report must also develop a reasonable time schedule for accomplishing the necessary treatment additions and/or alterations required to meet the criteria previously detailed.

Issued in the office of the Tennessee Water Quality Control Division, Tennessee Department of Public Health, Nashville, Tennessee, on this the sixteenth day of December, 1971.

Eugene W. Fowinkle, M.D., Commissioner
Tennessee Department of Public Health

S. Leary Jones, Director
Division of Water Quality Control

June 30, 1972

CERTIFIED MAIL

Honorable Kyle C. Testerman
Mayor, City of Knoxville
City Hall
Knoxville, Tennessee 37902

Re: Third Creek Sewage Treatment Plant

Dear Mayor Testerman:

Enclosed is an Amendment to Commissioner's Order of December 16, 1971, which has been issued and signed by Dr. Eugene W. Fowinkle, Commissioner, Tennessee Department of Public Health. As detailed in the enclosed Amendment, the Commissioner's Order issued to the City of Knoxville has been amended to include a time schedule for providing needed facilities at the Third Creek Sewage Treatment Plant such that said treatment plant will be capable of meeting the effluent criteria previously established by the Tennessee Department of Public Health. The schedule established in the enclosed Amendment corresponds to the schedule proposed in the Engineering Progress Report submitted to the Tennessee Department of Public Health on June 1, 1972.

Please be advised that this action by the Commissioner, Tennessee Department of Public Health, is taken pursuant to Section 70-331, Tennessee Code Annotated. Be further advised that this Amendment to the Commissioner's Order of December 16, 1971, shall become final unless you request by written petition a hearing before the Tennessee Water Quality Control Board; however, such petition must be made no later than thirty (30) days after receipt of this Amendment.

Very truly yours,

V. Wayne McCoy, Chief
Monitoring and Enforcement Section
Division of Water Quality Control

VWM/jw
Enclosure

CC: Knox County Health Department
CC: Division of Sanitary Engineering
CC: Ryckman, Edgerley, Tomlinson and Associates, Inc.
CC: Division of Water Quality Control
Knoxville, Tennessee
CC: Mr. C. Ron Culberson

PUBLIC HEALTH DEPARTMENT OF THE STATE OF TENNESSEE

IN THE MATTER

DIVISION OF WATER QUALITY CONTROL
DAVIDSON COUNTY, TENNESSEE

THE CITY OF KNOXVILLE
KNOX COUNTY, TENNESSEE

AMENDMENT TO COMMISSIONER'S ORDER OF
DECEMBER 16, 1971

Comes now the Commissioner of the Department of Public Health, State of Tennessee, Eugene W. Fowinkle, M.D., and states that:

I

On December 16, 1971, the City of Knoxville was ordered by the Commissioner, Tennessee Department of Public Health, to provide improved wastewater treatment capabilities at the City's Third Creek Sewage Treatment Plant such that the criteria as detailed in said Commissioner's Order of December 16, 1971, could be met and maintained.

II

The Commissioner's Order of December 16, 1971, required the City of Knoxville to submit to the Tennessee Department of Public Health an engineering report detailing how the City of Knoxville plans to improve the Third Creek Sewage Treatment Plant such that the effluent criteria detailed in said Order of December 16, 1971, can be met and maintained. Said Order of December 16, 1971, also directed that said engineering report develop a reasonable time schedule for accomplishing the necessary treatment additions to and/or alterations of the Third Creek Sewage Treatment Plant as required to meet the criteria detailed in the Order of December 16, 1971.

III

In compliance with the Order of December 16, 1971, the City of Knoxville submitted the required engineering report and schedule of correction.

THEREFORE, pursuant to the authority granted me as Commissioner, Tennessee Department of Public Health, or to my duly authorized representative, in Section 70-331, Tennessee Code Annotated, I hereby AMEND my Order of December 16, 1971. In addition to the action ordered in my Order of December 16, 1971, I hereby order the City of Knoxville, Knox County, Tennessee, to take the following action in relation to the City's Third Creek Sewage Treatment Plant as outlined in the City's Report of May 31, 1972.

I

On or prior to August 31, 1972, complete Phase I (primary plant) and Phase II (secondary plant) plant operation review.

II

On or prior to September 30, 1972, complete the Engineering Design Report for Phase I (primary plant) and submit said report to the Tennessee Department of Public Health.

III

On or prior to March 31, 1973, complete the Plans and Specifications for Phase I (primary plant) and submit said plans and specifications to the Tennessee Department of Public Health and on or prior to March 31, 1973, complete the Engineering Design Report for Phase II (secondary plant) and submit said report to the Tennessee Department of Public Health.

IV

On or prior to August 1, 1973, initiate construction of Phase I (primary plant).

V

On or prior to November 30, 1973, complete the Plans and Specifications for Phase II (secondary plant) and submit said plans and specifications to the Tennessee Department of Public Health.

VI

On or prior to April 1, 1974, initiate construction of Phase II (secondary plant).

VII

On or prior to December 31, 1974, complete construction of Phase I (primary plant) and place same into effective operation.

This Amendment is hereby incorporated into the body of the Commissioner's Order of December 16, 1971, as though it had appeared originally therein.

Issued in the office of the Tennessee Water Quality Control Division, Tennessee Department of Public Health, Nashville, Tennessee, on this the 30th day of June, 1972.

Eugene W. Fowinkle, M.D., Commissioner
Tennessee Department of Public Health

S. Leary Jones, Director
Division of Water Quality Control

APPENDIX B

LIST OF SITES EVALUATED BY RYKMAN, EDGERLY, TOMLINSON, AND ASSOCIATES, THE UNIVERSITY OF TENNESSEE TASK FORCE, AND THE METROPOLITAN PLANNING COMMISSION

1. An 80 acre site adjacent to and including Knoxville Sand and Gravel Company on the south side of the river across from the Third Creek Treatment Plant.

2. Approximately 48 acres adjacent to the Third Creek Treatment Plant.

3. The 29 acre portion of the Institute of Agriculture Campus west of Third Creek.

4. A 100 acre portion of the U.T. Cherokee Farm at the south end of the Karnes Bridge.

5. The Sequoyah Park containing 54 acres.

6. The Peter Blow Bend area, containing 85 acres.

7. The Eastern State Hospital site, containing approximately 50 acres.

8. The western half of the U.T. Plant Sciences (Jo Anderson) Farm, containing approximately 100 acres.

9. The Cox Sky Ranch site, with a filled size of approximately 85 acres.

10. The southern tip of Lyons Bend, containing approximately 89 acres.

11. The Power Equipment Company property south of Maloney Road and east of Alcoa Highway, containing approximately 70 acres.

12. A site containing approximately 100 acres along Northshore Drive approximately six miles west of the Third Creek Treatment Plant.

13. An 80 acre site between Northshore Drive and the Tennessee River approximately seven miles west of the Third Creek Treatment Plant.

14. A site containing approximately 100 acres three miles south of the Third Creek Treatment Plant between Alcoa Highway and Maryville Pike.

ADDITIONAL SITES CONSIDERED BY THE UNIVERSITY TASK FORCE

15. The "Brickyard," a site 2.5 miles east of the Third Creek Treatment Plant on the north side of the river, containing 50 acres.

16. "Dickenson Island," a site 3 miles east of the Third Creek Plant, presently used as an airport and containing 150 acres.

17. The "State Farm," a site 4.5 miles east of the Third Creek Plant, formerly used for agricultural production for Eastern State Hospital, and containing approximately 120 acres.

18. The "Naval Station," a site 3 miles west of the Third Creek Plant, containing approximately 60 acres.

APPENDIX C

MEMBERS OF THE UNIVERSITY OF TENNESSEE
TASK FORCE

Henry Morse, Chairman
William A. Drewry
John H. Gibbons
David Hake
Frank Kirk
C. T. Nunley
Friedrich Schmidt-Bleek
William C. Seaton
Bruce A. Tschantz

TABLE A-1

SOCIOECONOMIC COMPARISON OF SELECTED POTENTIAL WASTEWATER TREATMENT SITES, KNOXVILLE-KNOX COUNTY, TENNESSEE

1	2	3	4*	5	6	7†	8†	9†	10†	11†	12	13†	14	15†	16†	17†	18†	19†	20†	21†	22†	23†	24†	25†
SITE NUMBER	IDENTIFICATION	AREA (ACRES)	PRESENT OWNER	EXPANSION POSSIBILITY	SOUTH SIDE SERVICE	LAND VALUE	LAND PREP.	DIKING	ROAD	RAIL	NAVIG.	SUBTOTAL 7+12	MGD NEEDED	PLANT COST	PIPING FROM 3RD CREEK	PIPING FROM 4TH CREEK	PIPING OUT	SUBTOTAL 15+18	COLS. 10+12 & 19, (1975 $)	ENGR. & ADMIN. (1975 $)	CONTINGENCY (1975 $)	LEGAL FEES (1975 $)	INELIGIBLE COSTS	TOTAL CAP. COSTS IN 1975 $
2	3RD CREEK	60	3,7	YES	NO	7	0.5	0	<0.1	<0.1	YES	7.5	44 (+13)	16	0	0	0	16.0	19.2	1.9	2.9	0.4	7.5	31.9
	BLOW FARM	85	6	NO	MAR-GINAL	4.5	<0.1	0	0.7	NO	YES	5.2	57	18	7.9	0.5	0	26.4	32.5	3.3	4.9	0.6	4.5	45.8
8	PLANT SCI. FARM	100	2	YES	YES	6.5	1.5	0.2	0.2	0.5	YES	8.9	57	18	6.8	1.3	0	26.1	32.2	3.2	4.8	0.6	7.2	48.0
9	COX ISLAND	30+ 40	4	YES	YES	0.1	1.5	0.1	<0.1	0.2	YES	1.9	57	19.5	7.1	1.5	0	28.1	34.3	3.4	5.1	0.7	1.7	45.2
10	LYONS BEND	30+ 40	5	YES	YES	0.4	1.5	0.1	0.7	NO	YES	2.7	57	19.5	9.0	1.5	0	30.0	36.8	3.7	5.5	0.7	2.0	48.7
11	POWER EQUIP.	60	4,6	NO	YES	2.0	0.7	0	0.1	0.1	NO	2.9	57	18	6.8	1.5	2.3	28.6	34.6	3.5	5.2	0.7	2.7	46.7
14	NAVAL STATION	60	1,2	YES	MAR-GINAL	1.2	<0.1	0.1	<0.1	NO	YES	1.3	57	18	2.6	1.7	0	22.3	26.8	2.7	4.0	0.5	1.3	35.3
15	BRICK-YARD	50	4	NO	NO	2.0	0.5	0	<0.1	0.1	YES	2.6	44 (+13)	23.4	3.8	0	3.8	31.0	37.3	3.7	5.6	0.7	2.5	49.8
16	DICKIN. ISLAND	3	3	NO	NO	4.0	<0.1	0	0.2	NO	YES	4.3	44 (+13)	23.4	6.5	0	6.5	36.4	43.9	4.4	6.6	0.9	4.1	59.9
17	STATE FARM	300	1	YES	NO	0.3	0.1	0	0.4	<0.1	YES	0.7	44 (+13)	23.4	6.5	0	6.5	36.4	44.2	4.4	6.6	0.9	0.3	56.4

*1 = FEDERAL AND STATE GOVT.
2 = U.T.
3 = CITY OF KNOXVILLE

*4 = FEW INDIV. OWNERS, COMMERCIAL
5 = SINGLE OWNER, AGRICULTURAL
6 = MULTIPLE OWNER, RESIDENTIAL
7 = MULTIPLE OWNER, COMMERCIAL

† = IN MILLIONS OF $

Table 1 in University of Tennessee Task Force, "Report on Selected Wastewater Treatment Sites for Knoxville, Knox County, Tennessee, page 8.

TABLE A-2

SUMMARY OF SOCIOECONOMIC COMPARISON OF SELECTED POTENTIAL WASTEWATER TREATMENT SITES, KNOXVILLE-KNOX COUNTY, TENNESSEE

1	2	3†	4†	5	6	7	8	9†
Site #	Identification	Total Capital Costs in 1975	City's Share of Total Capital Costs	Relative Environmental Desirability	Rating in Total $	Rating in City $	Rating in Env. Impact	Operational Costs for Pumping
2	3rd Creek	31.9	13.6	+5	1	3	1	0
6	Blow Farm	45.8	14.8	-5	4	8	10	0.17
8	Plant Sci. Farm	48.0	17.4	-3	6	9	6	0.15
9	Cox Island	45.2	12.6	0	3	2	3	0.16
10	Lyons Bd.	48.7	13.7	-4	7	4	8	0.18
11	Power Equip.	46.7	13.7	-1	5	4	5	0.20
14	Naval Sta.	35.3	9.8	-4	2	1	8	0.10
15	Brickyard	49.8	14.3	+3	8	6	2	0.13
16	Dickins. Island	59.9	18.1	0	10	10	3	0.20
17	State Farm	56.4	14.3	-3	9	6	6	0.24

† = In Millions of Dollars. See text for explanations.

APPENDIX D

TABLE A-3

RATING SCALE—TRAFFIC AND NOISE

Scale	1 Traffic Effects	2 Noise Effects	Scale
	will improve vehicular flow on a major road	will substantially lower ambient noise levels for large numbers of residents	
	will improve vehicular flow on a minor road	lowers ambient noise levels for a moderate number of residents	
	will have no significant effect on vehicular flow	will have no significant effect on ambient noise levels	
	will impede vehicular flow on a minor road	raises ambient noise levels for a moderate number of residents	
	will impede vehicular flow on a major road	will substantially raise ambient noise level	

Table 10 in Knoxville-Knox County Metropolitan Planning Commission, "Wastewater Treatment Plant Site Evaluation," page 35.

TABLE A-4

COMMUNITY IMPACT—VISUAL DISRUPTION, WATER USE EFFECTS, LAND DISRUPTION, RELOCATION, AND TRAFFIC EFFECTS

PART II		COMMUNITY IMPACT						
GOAL		MINIMIZE NEGATIVE COMMUNITY IMPACT						
OBJECTIVE		VISUAL DISRUPTION	WATER USE EFFECTS	LAND DISRUPTION	RELOCATION		TRAFFIC EFFECTS	
CRITERIA		NUMBER OF DWELLING UNITS	LAKE FRONT MILES	ACRES ALTERED	D.U.'S TAKEN		CONSTRUCTION	OPERATION
SITE \ WEIGHT		2	1	1	1	1	0.5	1
1	DATA	30	0	0	225	3802	--	---
	RAW	7	10	10	0	2.9	1	7
	WEIGHTED	14	10	10	0	2.9	0.5	7
2	DATA	0	0.25	0	0	5348	--	--
	RAW	10	8.7	10	10	0	0	5
	WEIGHTED	20	8.7	10	10	0	0	5
7	DATA	60	2.0	0	0	0	--	--
	RAW	4	1.1	10	10	10	3	5
	WEIGHTED	8	1.1	10	10	10	1.5	5
9	DATA	25	2.0	40	0	0	--	--
	RAW	7.5	1.1	6	10	10	0	5
	WEIGHTED	15	1.1	6	10	10	0	5
11	DATA		2.0	40	8	620	--	--
	RAW	0	1.1	6	10	8.8	1	5
	WEIGHTED	0	1.1	6	10	8.8	0.5	5
15	DATA	0	0	0	0	2295	--	--
	RAW	10	10	10	10	5.3	3	5
	WEIGHTED	20	10	10	10	5.3	1.5	5
17	DATA	30	0	100	0	0	--	--
	RAW	7	10	0	10	10	3	7
	WEIGHTED	14	10	0	10	10	1.5	7
18	DATA		2.25	60	0	0	--	--
	RAW		0	5	10	10	1	5
	WEIGHTED		0	5	10	10	0.5	5

Table 11 in Knoxville, Knox County Metropolitan Planning Commission, "Wastewater Treatment Plant Site Evaluation," July 1975, page 36.

TABLE A-5

COMMUNITY IMPACT—NOISE INCREASE, TRAFFIC VISTAS, AND COMPOSITE SUMMARY

PART II		COMMUNITY IMPACT, CONTINUED						
GOAL		MINIMIZE NEGATIVE COMMUNITY IMPACT						
OBJECTIVE		NOISE INCREASE		TRAFFIC VISTAS		COMPOSITE SUMMARY		
CRITERIA		CONSTRUCTION	OPERATION	ADT				
SITE \ WEIGHT		0.5	1	0.5		RAW	WEIGHTED	MEAN SCORE
1	DATA	--	--	0		57.4	56.9	6.0
	RAW	5	5	10				
	WEIGHTED	2.5	5	5				
2	DATA	--	--	0		63.9	66.4	7.0
	RAW	5	5	10				
	WEIGHTED	2.5	5	5				
7	DATA	--	--	MINIMAL		58.1	55.6	5.8
	RAW	0	5	10				
	WEIGHTED	0	5	5				
9	DATA	--	--	43,000		49.0	54.3	5.7
	RAW	3	5	1.4				
	WEIGHTED	1.5	5	0.7				
11	DATA	--	--	33,000		41.3	38.6	4.1
	RAW	1	5	3.4				
	WEIGHTED	0.5	5	1.7				
15	DATA	--	--	0		73.3	74.3	7.8
	RAW	5	5	10				
	WEIGHTED	2.5	5	5				
17	DATA	--	--	MINIMAL		67.0	65.0	6.8
	RAW	5	5	10				
	WEIGHTED	2.5	5	5				
18	DATA	--	--	50,000		42.0	44.5	4.7
	RAW	2	5	0				
	WEIGHTED	1	5	0				

TABLE A-6

RATING SCALE—FEASIBILITY

Scale	1 local government acceptability	2 citizen acceptability	3 site availability	Scale
	Desired by all local agencies	Desired by an overwhelming majority of citizens	site is clearly available	
10				
			site will probably be available	
9				
8				
	supported by some local agencies	supported by some local groups	site is available with extensive mitigation needs	
7				
6				
	agency ambivalence, mixed reactions, or indecision	citizen ambivalence	availability is undetermined	
5				
4				
	opposed by some local agencies	opposed by some local groups	prior experience indicates acquisition difficulty	
3				
2				
			site will probably be unavailable	
1				
	opposed by all local agencies	opposed by overwhelming majority of citizens	site is clearly unavailable	

Table 12 in Knoxville-Knox County Metropolitan Planning Commission, "Wastewater Treatment Plant Site Evaluation," July 1975, page 39.

TABLE A-7

FEASIBILITY

PART III		FEASIBILITY						
GOAL		MAXIMIZE PUBLIC-PRIVATE-PHYSICAL FEASIBILITY						
OBJECTIVE		SITE AVAILABILITY	CITIZEN ACCEPTABILITY	GOVERNMENT ACCEPTABILITY	PHYSICAL SITE SUITABILITY	COMPOSITE SUMMARY		
CRITERIA		SCALE	SCALE	SCALE	SITE PREPARATION COST			
SITE \ WEIGHT		5	1	1	1	RAW	WEIGHTED	MEAN SCORE
1	DATA	--	--	--	5.8	20.7	56.7	7.1
	RAW	9	6.5	5.2	0			
	WEIGHTED	45						
2	DATA	--	--	--	4.9	23.6	59.6	7.4
	RAW	9	7.5	5.5	1.6			
	WEIGHTED	45						
7	DATA	--	--	--	1.5	20.1	20.1	2.5
	RAW	0	6.2	6.5	7.4			
	WEIGHTED	0						
9	DATA	--	--	--	4.2	19.0	47.0	5.9
	RAW	7	4.0	5.2	2.8			
	WEIGHTED	35						
11	DATA	--	--	--	2.0	23.8	59.8	7.5
	RAW	9	3.7	4.5	6.6			
	WEIGHTED	45						
15	DATA	--	--	--	2.5	24.6	60.6	7.6
	RAW	9	5.7	4.2	5.7			
	WEIGHTED	45						
17	DATA	--	--	--	1.5	21.4	33.4	4.2
	RAW	3	6.0	5.0	7.4			
	WEIGHTED	15						
18	DATA	--	--	--	1.5	17.1	21.4	2.7
	RAW	7	4.2	4.5	7.4			
	WEIGHTED	5						

Table 13 in Knoxville-Knox County Metropolitan Planning Commission, "Wastewater Treatment Plant Site Evaluation," July 1975, page 40.

TABLE A-8

PERFORMANCE

PART IV		PERFORMANCE						
GOAL		MAXIMIZE SYSTEMATIC OPERATION						
OBJECTIVE		SYSTEMATIC EFFICIENCY		EXPANSION CAPACITY	CATASTROPHIC EFFECTS	COMPOSITE SUMMARY		
CRITERIA		FORCE MAIN VOLUME	SOUTH SIDE SERVICE	ACRES				
WEIGHT / SITE		1	0.5	1	1	RAW	WEIGHTED	MEAN SCORE
1	DATA	151.4	No	801	--	19.6	19.6	5.6
	RAW	8.6	0	6.0	5			
	WEIGHTED		0					
2	DATA	112.7	No	60	--	15.9	15.9	4.5
	RAW	8.9	0	2.0	5			
	WEIGHTED		0					
7	DATA	368.0	Yes	70	--	25.4	20.4	5.8
	RAW	6.4	10	4.0	5			
	WEIGHTED		5					
9	DATA	369.5	Yes	85	--	28.4	23.4	6.7
	RAW	6.4	10	7.0	5			
	WEIGHTED		5					
11	DATA	369.5	Yes	70	--	25.4	20.4	5.8
	RAW	6.4	10	4.0	5			
	WEIGHTED		5					
15	DATA	693.2	No	50	--	8.2	8.2	2.3
	RAW	3.2	0	0	5			
	WEIGHTED		0					
17	DATA	1022.1	No	120	--	15.0	15.0	4.3
	RAW	0	0	10	5			
	WEIGHTED		0					
18	DATA	304.8		60	--	19.0	16.5	4.7
	RAW	7.0	5	2.0	5			
	WEIGHTED		2.5					

Table 14 in Knoxville-Knox County Metropolitan Planning Commission, "Wastewater Treatment Plant Site Evaluation," July 1975, page 42.

TABLE A-9

DECISION MATRIX

PART V	DECISION MATRIX				
SITE	ECONOMIC SCORE	COMMUNITY IMPACT SCORE	FEASIBILITY SCORE	PERFORMANCE SCORES	SCORES BELOW MEAN
1 - SCOTTISH PIKE	2.1*	6.0	7.1	5.6	1
2 - THIRD CREEK	3.3	7.0	7.4	4.5*	1
7 - FOURTH CREEK	5.0	5.8*	2.5*	5.8	2
9 - COX SKY RANCH	4.1	5.7*	5.9	6.7	1
11 - POWER EQUIPMENT	3.0*	4.1*	7.5	5.8	2
15 - BRICKYARD	2.2*	7.8	7.6	2.3*	2
17 - STATE FARM	0.8*	6.8	4.2*	4.3*	3
18 - NAVAL STATION	4.8	4.7*	2.7*	4.7*	3
MEAN GOAL SCORE	3.2	6.0	5.6	5.0	

*Denotes score below mean.

Table 15 in Knoxville-Knox County Metropolitan Planning Commission, "Wastewater Treatment Plant Site Evaluation," July 1975, page 44.

VITA

Charles William Brown, Jr., was born in Lebanon, Tennessee, on July 27, 1950. He attended public school in that city graduating from Lebanon High School in 1968. He received a Bachelor of Science degree with a major in urban planning in 1972 from Middle Tennessee State University, and was subsequently employed by the Tennessee State Planning Office. He entered the University of Tennessee Graduate School of Planning in 1974, and received the Master of Science in Planning degree in December 1976.