FINAL

ENVIRONMENTAL IMPACT STATEMENT

FOR

DISTRICT 47 REGIONAL WASTEWATER FACILITIES

CITY OF HOUSTON

WPC-TEX-1008

WATER DIVISION, REGION VI
NVIRONMENTAL PROTECTION AGENCY
DALLAS, TEXAS

MAY 1975

George J. Putnicki
APPROVED BY
for
REGIONAL ADMINISTRATOR
EPA, REGION VI
MAY 19, 1975

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1600 PATTERSON
DALLAS, TEXAS 75201

Re: ENVIRONMENTAL IMPACT
STATEMENT NUMBER 7415

TO ALL INTERESTED GOVERNMENT AGENCIES, AND PUBLIC GROUPS

IN ACCORDANCE WITH THE NATIONAL ENVIRONMENTAL POLICY ACT, WE ARE FORWARDING OUR FINAL ENVIRONMENTAL IMPACT STATEMENT TO THE PRESIDENT'S COUNCIL ON ENVIRONMENTAL QUALITY FOR THE 30-DAY REVIEW PERIOD. THE FINAL STATEMENT WAS MADE AVAILABLE TO THE COUNCIL AND THE PUBLIC ON JUNE 23, 1975.

THE FINAL STATEMENT HAS BEEN PREPARED TO FULLY CONSIDER THE SUGGESTIONS, CRITICISMS, AND COMMENTS RAISED THROUGH THE REVIEW PROCESS. WE APPRECIATE YOUR PARTICIPATION IN THE REVIEW PROCESS.

Thomas P. Harrison

For John C. White
Acting Regional Administrator

Enclosures

EPA 904/R-09/007

FINAL

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CONSTRUCTION OF WASTEWATER FACILITIES

CITY OF HOUSTON, TEXAS

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IMPACT STATEMENT NO. 7415

WATER DIVISION, REGION VI
ENVIRONMENTAL PROTECTION AGENCY
DALLAS, TEXAS

George J. Putnicki

APPROVED BY

for

REGIONAL ADMINISTRATOR
EPA, REGION VI
MAY 19, 1975

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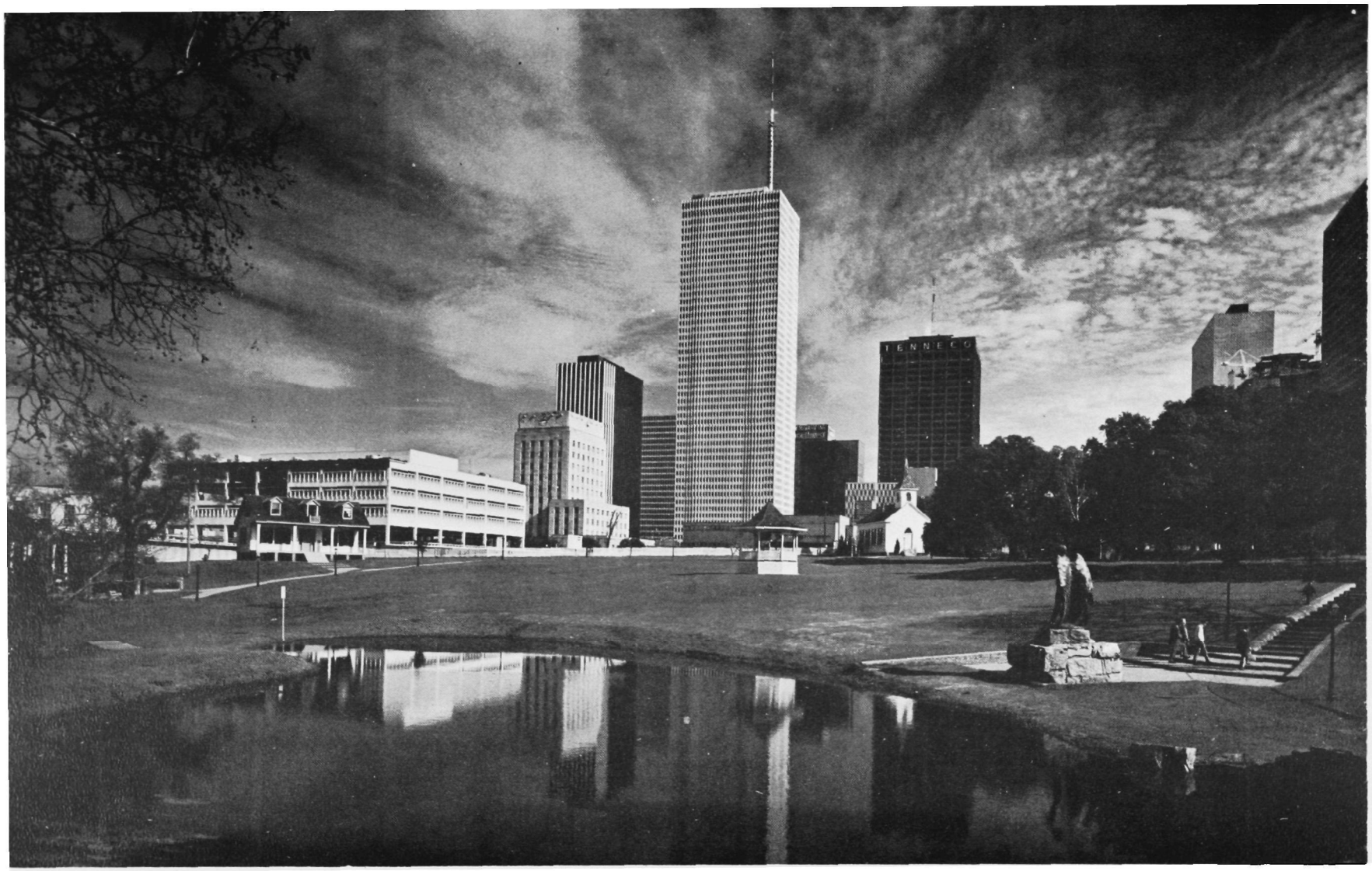
HOUSTON



SUMMARY

( ) Draft Impact Statement
(x) Final Impact Statement

Environmental Protection Agency
Region Vi, Office of Grants Coordination
Dallas, Texas

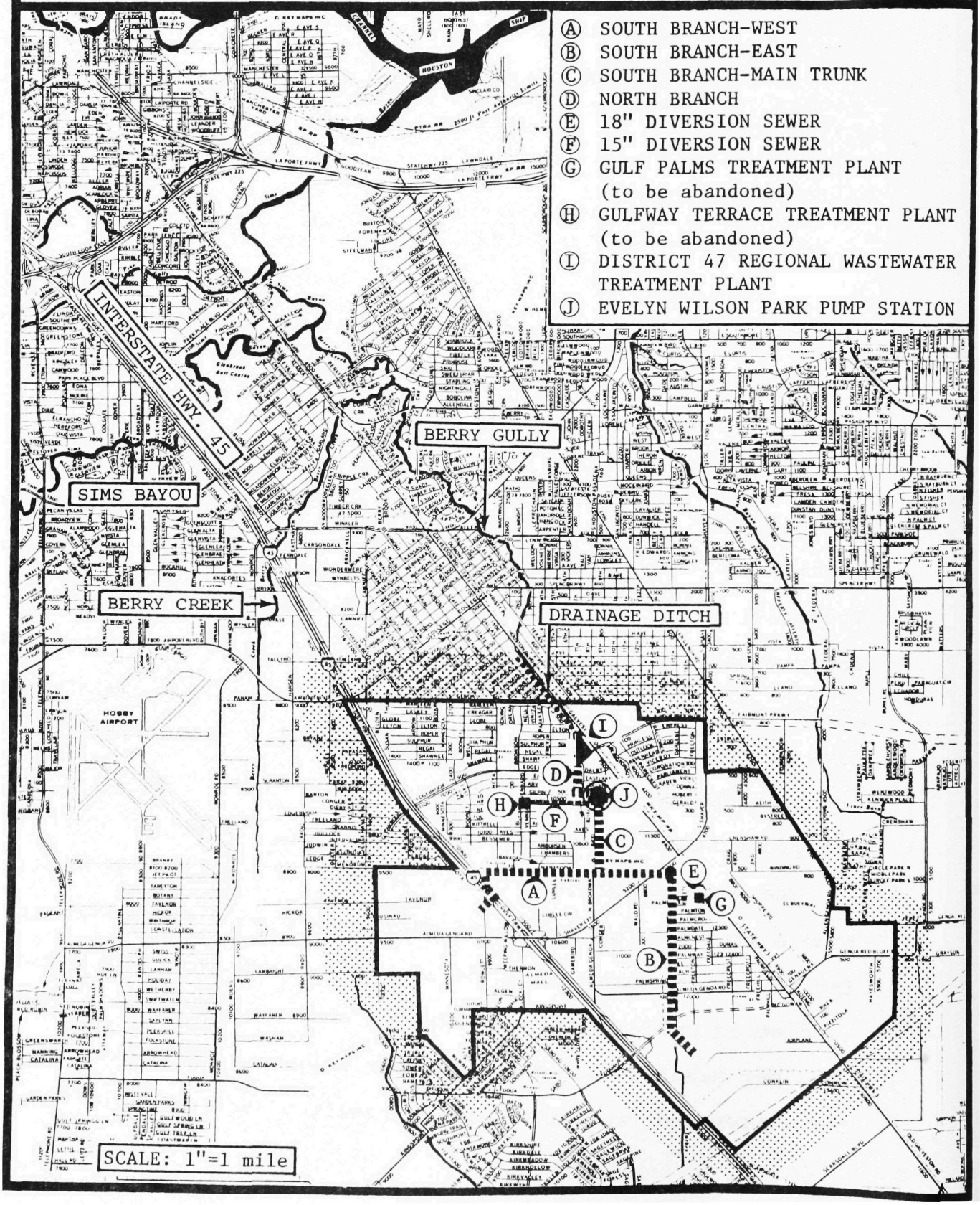
1. Name of Action
   Administrative Action (X)
   Legislative Action ( )

2. The proposed action involves Federal grant assistance as authorized by the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500).

The City of Houston has requested Federal funds in the amount of $3,296,082 to aid in its efforts to expand the wastewater collection and related facilities for the District 47 Regional Sewage Treatment Plant. The proposed facilities have been designed to carry wastewater currently treated by two small treatment plants in the service area and will be adequate to carry the wastewater flow projected for 1990. The service area is approximately six square miles in area and has a current population of 19,400. The projected service area population for 1990 is 42,200 persons.

The proposed project calls for the construction of a collection system of 25,430 feet of gravity and force main sewer varying in diameter from 15 to 54 inches, together with the construction of an underground pump station with a capacity of 12,000 gallons per minute. See Map A for the alignment configurations of these proposed facilities. As a result of the construction of

MAP A : PROPOSED PROJECT ELEMENTS



these facilities, the existing Gulf Palms and Gulf Terrace Plants will be abandoned as treatment plants. These two plants have a combined capacity of 0.48 mgd. The District 47 plant has a design capacity of 3 mgd but is currently processing only 1.66 mgd. It will be able to process the wastewater from the Gulf Palm and Gulf Terrace treatment plants and also handle the areas currently served by septic tanks within its service area.

The District 47 plant provides secondary biological treatment using the activated sludge treatment process. The aggregate influent of 3.0 mgd will receive secondary treatment followed by chlorine disinfection prior to discharge into the adjacent Harris County Flood Control District drainage ditch, which empties into Sims Bayou via Berry Gully approximately 4 miles northwest of the District 47 plant site.

Sludge from the plant site will be conveyed through an existing sludge transfer line to the Sims Bayou Multi-Regional Sludge Treatment Plant where it will be dewatered by vacuum-filtration, and the fertilizer produced will be chemically conditioned and marketed to a Florida-based citrus production firm.

The total cost of the project, including the local share, is estimated at $4,394,776.

3. SUMMARY OF ENVIRONMENTAL IMPACT AND ADVERSE ENVIRONMENTAL EFFECTS

The proposed facilities will improve the quality of public health in the project's service area and enhance water flow quality in the adjoining drainage ditch, Berry Gully, Sims Bayou and the Houston

Ship Channel. The impact of the project's implementation on the orderly physical development for this part of Houston will be beneficial.

The adverse effects which cannot be avoided are those normally associated with the existence and operation of wastewater facilities. The increased noise levels and occasional odors emanating from the pump and plant sites will be kept at a minimum by providing an improved treatment system and efficient plant operation.

Some degree of disruption of the environment and inconvenience to citizens is unavoidable during construction but can be reduced in severity by proper construction scheduling and techniques.

The construction of the proposed facilities should cause no short-term serious adverse effects on the natural and man-made environment; however, its long-term secondary impact on continuing urbanization of the service area and associated adverse ecological effects could be significant unless the City of Houston adopts and implements comprehensive land use policies to avoid such effects. The adverse effects in the immediate future will be insignificant compared to the beneficial effects the proposed project will generate to enhance the values of urban living for the people of Houston in general and the service area in particular.

4. ALTERNATIVES CONSIDERED

A number of alternatives including the "No-Action-Alternative" have been considered in the determination of facility locations and in the evaluation of systems design. Due consideration has been given to economic, social, technological and environmental factors.

These alternatives are summarized below:

A. Non-Structural Alternatives

These include policy regulations available to the City of Houston for collection, treatment and disposal of wastewater and pollution control, including enforcement of regulations governing pretreatment of wastewater generated by industrial plants in the city.

B. Structural Alternatives

These alternatives were explored and evaluated to determine:

1. Whether the service system should be centralized or decentralized;
2. Where the pump station should be located; and
3. Where the sewers should be routed.

C. Subsystems Alternatives

A variety of options were evaluated for each subsystem, including:

1. Collection system;
2. Treatment and disposal; and
3. Sludge handling and disposal.

5. LIST ALL FEDERAL, STATE AND LOCAL AGENCIES FROM WHICH COMMENTS ARE BEING SOUGHT

FEDERAL AGENCIES

U.S. Department of Agriculture
Environmental Planning and Management
U.S. Forest Service
Regional Office
1720 Peachtree Road, N.W.
Atlanta, Georgia 30309

Department of Agriculture
Dr. T. C. Byerly
Coordinator, Environmental Quality Activities
Office of the Secretary
Washington, D.C. 20250

Department of the Army (Corps of Engineers)
Col. William L. Barnes
Executive Director of Civil Works
Office of the Chief of Engineers
Washington, D.C. 20314

Department of Housing and Urban Development
Richard Brown
451 Seventh Street, S.W.
Room 7206
Washington, D.C. 20410

Department of Health, Education and Welfare
Robert D. Lanza
HEW North Building
Room 4062
Fourth and Independence, S.W.
Washington, D.C. 20201

Department of Health, Education and Welfare
1114 Commerce Street
Room 904
Dallas, Texas 75202

U.S. Department of the Interior
Assistant Secretary - Program Development and Budget
Attention: Office of Environmental Projects Review
Department of the Interior
Washington, D.C. 20240

U.S. Geological Survey
Water Resources Division
630 Federal Building
300 East Eighth Street
Austin, Texas 78701

Federal Highway Administration
Director Highway Programs Office
819 Taylor Street
Fort Worth, Texas 76102

Economic Development agency
702 Colorado
Austin, Texas 78701

District Engineer
Galveston District
U.S. Army Corps of Engineers
P. O. Box 1229
Galveston, Texas 77550

Department of Transportation
Assistant Secretary for Environment and Urban Studies
Washington, D.C. 20590

Department of Housing and Urban Development
819 Taylor Street
Fort Worth, Texas 76102

Department of Commerce
Attention: Dr. Sidney Galler
Deputy Assistant Secretary of Environmental Affairs
Washington, D.C. 20235

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Federal Building
144 First Avenue South
St. Petersburg, Florida 33701

Council on Environmental Quality
HQs - Environmental Protection Agency
722 Jackson Place, N.W.
Washington, D.C. 20506

Oil and Special Materials Division
Environmental Evaluation Branch
Attention: Alan Hill WH448
Environmental Protection Agency
Washington, D.C. 20460

Bern Wright WH447
Municipal Construction Division
Environmental Protection Agency
Washington, D.C. 20460

Office of Federal Activities
Environmental Protection Agency
Attention: Peter Cook
Washington, D.C. 20460

STATE AGENCIES

Office of the Governor
Division of Planning Coordination
Capitol Station
P. O. Box 12428
Austin, Texas 78711

Texas Air Control Board
820 East 53rd Street
Austin, Texas 78751

State Department of Health
1100 West 49th Street
Austin, Texas 78756

Texas Industrial Commission
Dierector, Research and Planning Division
814 Sam Houston State Office Building
Austin, Texas 78711

Texas Parks and Wildlife Department
John H. Reagan Building
Austin, Texas 78711

Texas Water Quality Board
P. O. Box 13246
Capitol Station
Austin, Texas 78711

Texas Highway Department
11th and Brazos
Austin, Texas 78711

Railroad Commission of Texas
910 Colorado
Austin, Texas 78701

Texas Water Rights Commission
722 Sam Houston Office Building
Austin, Texas 78701

Texas State Historical Survey Committee
P. O. Box 12276
Capitol Station
Austin, Texas 78711

Department of Agriculture
P. O. Drawer BB
Capitol Station
Austin, Texas 78711

General Land Office
Library and Archives Building
Austin, Texas 78701

Texas Animal Health Commission
1020 Sam Houston Office Building
Austin, Texas 78711

State Soil and Water Conservation Board
1018 First National Building
Temple, Texas 76501

Texas Tourist Development Agency
Room 500
John H. Reagan Building
Austin, Texas 78701

Texas Water Development Board
P. O. Box 13087
Capitol Station
Austin, Texas 78711

Association of Texas Soil and Water Conservation Districts
306 West 14th Street
Friona, Texas 79035

Texas Conservation Council, Inc.
730 East Friar Tuck Lane
Houston, Texas 77024

Bureau of Economic Geology
University of Texas
Box X
University Station
Austin, Texas 78712

Texas Council for Wildlife Protection
3132 Lovers Lane
Dallas, Texas 75225

Vice President of Academic Affairs
Texas A & M University
College Station, Texas 77843

Texas Forestry Association
P. O. Box 1488
Lufkin, Texas 75901

Texas Organization for Endangered Species
P. O. Box 648
Temple, Texas 76501

LOCAL AGENCIES AND INDIVIDUALS

City of Houston
City Hall
900 Brazos
Houston, Texas 77002

Turner, Collie and Braden, Inc.
3203 West Alabama
Houston, Texas 77002

John L. Spinks, Jr.
Southwest Regional Representative
National Audubon Society
P. O. Box 9585
Austin, Texas 78757

Houston League of Women Voters
614 Harold
Houston, Texas 77006

Binkley and Holmes, Inc.
Consulting Engineers
2010 North Loop West
Suite 220
Houston, Texas 77018

Dannenbaum Engineering
4543 Post Oak Place
Houston, Texas

Honorable John Tower
Honorable Lloyd Bentsen
U.S. Senate
Washington, D.C. 20510

Honorable William R. Archer
Honorable Bob Eckhardt
Honorable Barbara C. Jordan
Honorable Bob Casey
U.S. House of Representatives
Washington, D.C. 20515

Honorable Jim Wallace
Honorable Bob Gammage
Honorable Chet Brooks
Honorable Jack Ogg
Honorable A. R. Schwartz
Honorable Walter H. Mengden, Jr.
Texas State Senate
Austin, Texas

Honorable Ed R. Watson
Honorable Joe Allen
Honorable Ron Walters
Honorable Dr. Joseph F. Pentony
Honorable John H. Whitmire
Honorable Woody Denson
Honorable Larry A. Bick
Honorable Anthony Hall
Honorable Craig A. Washington
Honorable Ben T. Reyes
Honorable George LeLand
Honorable Senfronia Thompson

Honorable Kay Bailey
Honorable W. J. Blythe, Jr.
Honorable Sid Bowers
Honorable Milton E. Fox
Honorable Don Henderson
Honorable Raymond E. Green
Honorable Lindon Williams
Honorable Gene Jones
Honorable R. C. Nichols
Honorable Jim Clark
Honorable Ray Barnhart
Honorable Herman Lauhoff
Texas State House of Representatives
Austin, Texas

Dr. DeWitt Van Siclen
Department of Geology
University of Houston
Houston, Texas

Center for Community Planning and Design Services
Rice University
Houston, Texas

Houston Geologic Society
815 Walker
Houston, Texas 77002

6. The Draft Environmental Impact Statement was submitted to the Council on Environmental Quality in October, 1974. Submission of the Final Impact Statement has been scheduled for May, 1975.

CHAPTER 1: INTRODUCTION

A. STUDY BACKGROUND

B. EPA ROLES AND RESPONSIBILITIES (UNDER NEPA) AS THEY APPLY TO THE PROPOSED ACTION

C. PURPOSE AND SCOPE OF THIS REPORT

I. INTRODUCTION

A. STUDY BACKGROUND

This century has been a time of great expansion and growth. The United States experienced a population increase of 52 million during the last 20 years.

The Bureau of Census predicts that by the end of the century this nation will grow in population by another 60 to 75 million persons. The Bureau further predicts that most of this growth will occur in the nation's metropolitan areas. How to accommodate this population without adversely affecting the natural environment or without sacrificing the quality of urban living is a major issue facing all levels of government. The City of Houston shares this concern of environmental preservation and protection with the rest of the country. It is attempting to halt the current trends of water and air pollution and protect the ecological values within its jurisdiction while carrying out the obligations to the demand of urbanization within the limits of resources available to Houston.

One of Houston's critical problems is the collection and disposal of wastewater generated by its population. The existing sanitary system is inadequate in many parts of the city and represents a serious threat to public health in these areas. Houston has reached a critical level of air pollution. Water pollution has long been a problem for the Houston Ship Channel, fed by the bayous and other waterways that drain the Houston area. Effluent discharges from the city's numerous sewage treatment plants serve as the major

source of water flow in these streams during dry weather periods. Improved water flow and quality in these waterways can reduce the pollutants in the Houston Ship Channel. Construction of improved methods of wastewater collection and disposal could be a powerful stimulant for the channel's long-standing pollution problems, while at the same time it can eliminate or minimize a serious public health hazard. It is virtually inevitable that Houston will grow into a corporate city of over 2 million persons by the year 2000. Systematic planning and provision of the sanitary system is mandatory if Houston is to keep abreast of anticipated growth so that the problems normally associated with urbanization can be avoided.

To achieve the goal of a better environment in the future and to resolve some of its existing environmental problems, the City of Houston has adopted a regionalization plan for its wastewater treatment and related facilities. One part of this plan calls for the construction of a number of trunk sewers and related facilities designed to serve the population of a section in Southeast Houston. The objective of these improvements, and indeed the entire sewage treatment system of Houston, is to improve the public health and facilitate the overall improvement of water and environmental quality within the Houston Metropolitan Area. The proposal outlined in this report is intended to improve the quality of urban life and protect the environment for an approximately 6-square-mile area in the southeast section of the city, where a serious health problem exists at the present time and where quality growth has not occurred in the past as a result of the lack of sanitary facilities.

The resources currently available to the City of Houston are not

adequate to address the city's environmental problem in general, and to complete the specific task of providing the sanitary services for the District 47 community, in particular. Houston, therefore, is seeking assistance from the U.S. Environmental Protection Agency in fulfilling its commitment to improve the public health and the urban environment for this part of Houston.

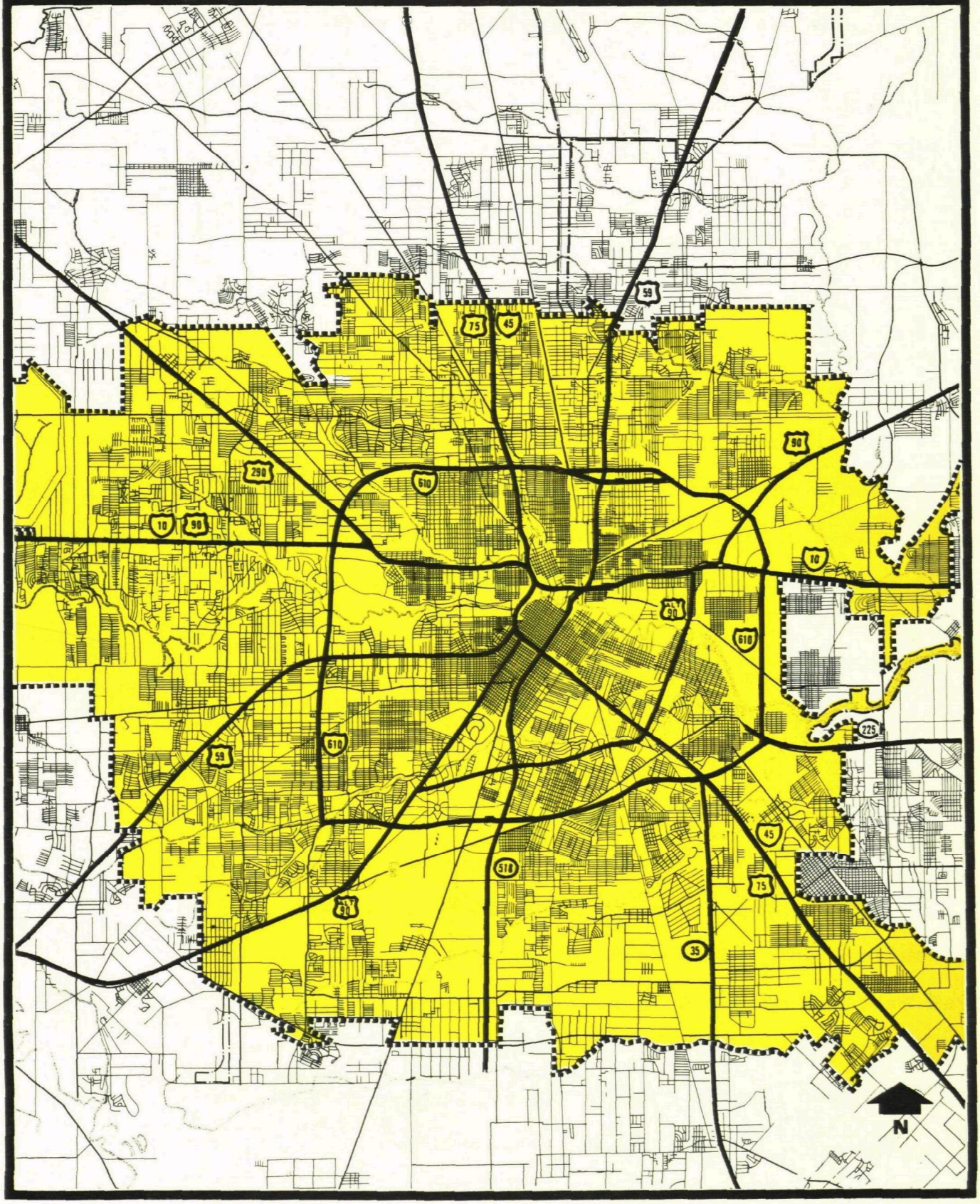
B. EPA ROLES AND RESPONSIBILITIES UNDER NATIONAL ENVIRONMENTAL POLICY ACT

Under Title II of the Federal Water Pollution Control Act, Amendment of 1972, Public Law 92-500, the Environmental Protection Agency is given authority to fund 75% of the cost for construction of sewage treatment facilities in order to comply with Section 301 of the Act.

Section 102(c) of the National Environmental Policy Act of 1969, Public Law 91-190, charges all agencies of the Federal Government, when funding a project, in part or in entirety, that will have a significant effect on the environment, to prepare a detailed statement taking into consideration:

1. The environmental impact of the proposed action;
2. Any adverse environmental effects which cannot be avoided should the proposal be implemented;
3. Alternatives to the proposed action;
4. The relationship between local short-term effects on man's environment and the maintenance and enhancement of long-term productivity; and
5. Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

HOUSTON, TEXAS



C. PURPOSE AND SCOPE OF THIS REPORT

This report is the Final Environmental Impact Statement, based on the environmental assessment submitted by the City of Houston attendant to the construction of approximately 5 miles of gravity and force main sanitary sewers varying from 15" to 54" in diameter and an underground pump station of 12,000 gpm capacity. This report evaluates the need for the proposed improvements from the standpoint of social and economic benefits and identifies the adverse and beneficial impacts of the proposed action on the man-made and natural environment and suggests how the adverse effects can be minimized. The preparation of this report has been guided by the policies and procedures outlined in Section 102(c) of the National Environmental Policy Act of 1969. Air pollution in Houston and subsidence problems of the project area are given a special evaluation in relation to the effects of the proposed project. Alternatives to the proposed action, including the "No-Action-Alternative," are evaluated in detail in light of their abilities to satisfy goals established for the proposed action.

CHAPTER II: THE CITYWIDE CONTEXT FOR THE PROPOSED ACTION

A. THE CITY OF HOUSTON, TEXAS

B. THE EXISTING CITYWIDE WASTEWATER TREATMENT SYSTEM

C. FUTURE DIRECTION: MOVE TOWARDS REGIONALIZATION OF TREATMENT FACILITIES

D. FACILITY PLANNING AREAS: BASIS FOR PROGRAMMING FUTURE IMPROVEMENTS

E. THE PROPOSED PROJECT: A STEP TOWARDS REGIONALIZATION

II. THE CITYWIDE CONTEXT FOR THE PROPOSED ACTION

A. THE CITY OF HOUSTON, TEXAS

The 1970 Census ranks Houston as the sixth largest American city with a population of 1,233,000 persons that occupy an area of 506 square miles. Sizable amounts of land are still vacant in Houston, which signals phenomenal growth in the future. In order for Houston to maintain its dominance as the industrial and commercial capital of the South and Southwest United States, it must face the challenge of developing and improving those facilities and services which are essential to assure a high-quality environment for all parts of the city. The provision of adequate sanitary facilities should be given a high priority and should have a minimum effect on the natural environment. Those public programs which will promote the existing quality of air, water and other natural features should be emphasized.

B. EXISTING WASTEWATER TREATMENT SYSTEM

The City of Houston, over the years, has built a sanitary system that currently consists of 42 wastewater treatment plants, 2 major sludge disposal plants, 179 pump stations and approximately 3600 miles of wastewater collection and conveyance lines. Much of the system was constructed by the city itself, and the remainder was acquired through purchase or annexation of water district sewer systems. The existing system processed an average volume of over 172 mgd of wastewater in 1973. During the same year, the city's

two major sludge disposal plants produced approximately 120 tons of dried soil conditioner/fertilizer per day.

The Houston treatment system is highly decentralized. On the average, one treatment plant serves about 30,000 persons, and there are a number of plants which have a capacity of less than 1 mgd. In comparison, one treatment plant has been planned to serve the entire city of Fort Worth and its suburban communities. The entire city of Dallas is served by only three treatment plants. Many plants in Houston are insufficient in capacity, and their treatment of wastewater does not meet modern water quality standards and exceed the permissible odor level associated with the sludge disposal plants. A more elaborate description of each plant is given in Table A-1 of Appendix A. The geographic location of existing plants is presented in Figure II-1.

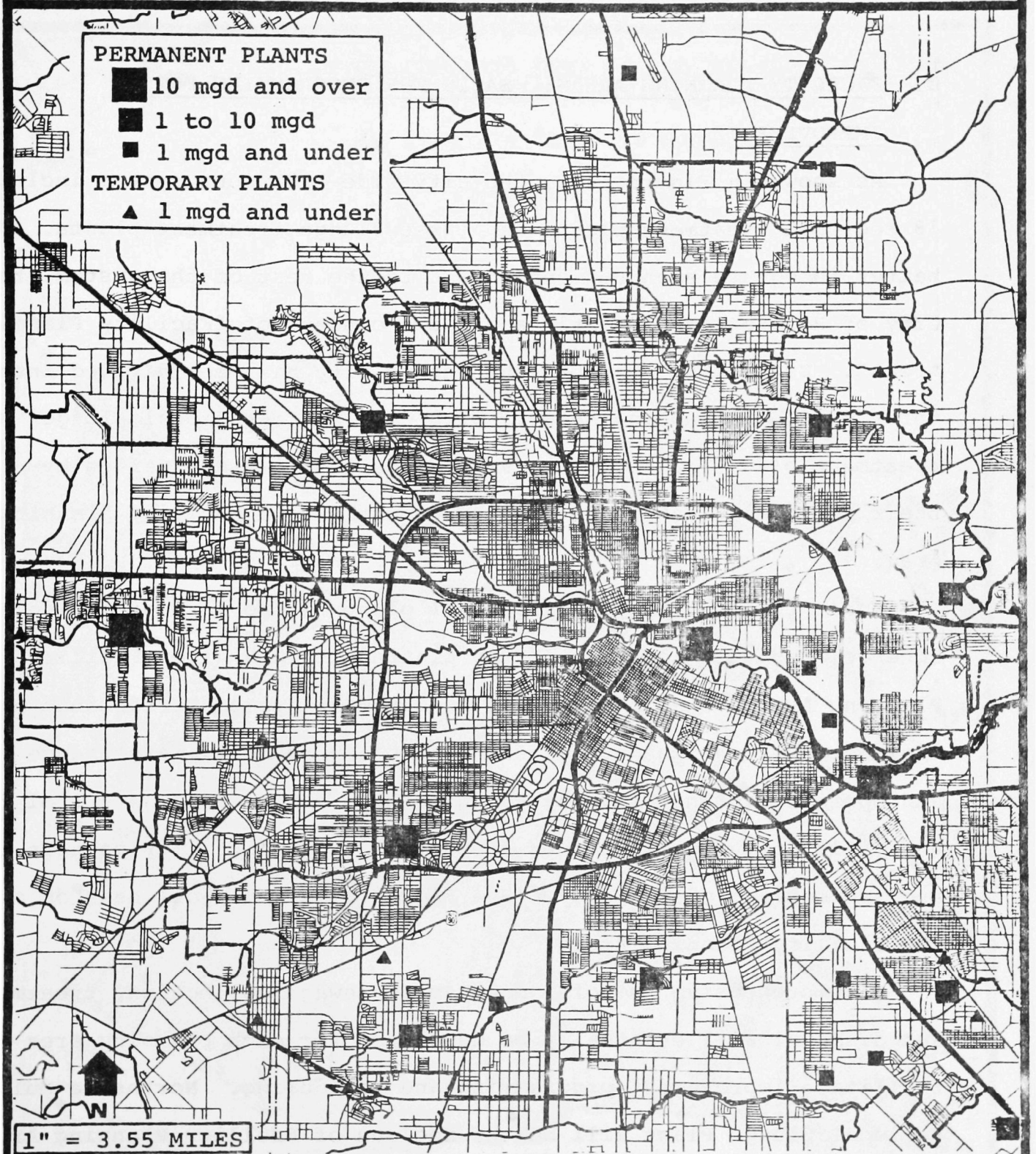
C. FUTURE DIRECTION: MOVE TOWARDS REGIONALIZATION

To address the existing problems discussed in the preceding section, the city has adopted a comprehensive policy of regionalization of its wastewater disposal system. The revised plan will provide for the diversion of sewage from the small plants to the regional plants for treatment and disposal, and includes three regional sludge treatment facilities designed to serve the need of the entire city through the year 1990. Figure II-2 shows the proposed regionalization plan.

The proposed city-wide system will have an aggregate capacity of over 300 mgd. A large part of the regional plan has been scheduled

FIGURE II-1

EXISTING TREATMENT SYSTEM FOR HOUSTON



Note: Some of the temporary plants do not appear on this map since they have recently been phased out or are in the process of being phased out.

for implementation through the city's next five-year Capital Improvement Program.

D. FACILITY PLANNING AREAS: BASIS FOR PROGRAMMING FUTURE IMPROVEMENTS

As shown in Figure II-2, the city-wide treatment system includes 18 regional treatment plants and three sludge treatment plants. To better integrate each regional plant to the rest of the system, the City of Houston has recently adopted a concept of "Facility Planning Areas". Using this concept, the entire city has been divided into three Facility Planning Areas. With each multi-regional sludge treatment plant as a nucleus, various communities are served by their regional plant which together constitute a Facility Planning Area.

Under this system, each regional plant can be more effectively interrelated with the rest of the plants within a given Facility Planning Area. The objective is to maximize system performance and minimize public expenditures for future improvement, maintenance and operation. The Facility Planning Area can be used as a tool to unify all individual projects as part of a total utility pattern for a given segment of the city. See Figure II-3 for a delineation of the Facility Planning Areas.

A comprehensive on-going program of sewage collection, treatment and disposal will eventually be developed for each planning area to facilitate improvement programming and scheduling. Northside Multi-Regional Sludge Plant will be the nucleus of Facility Planning Area I. Likewise, Sims Bayou and the Almeda-Sims Multi-Regional Sludge

FIGURE II-2

PROPOSED REGIONALIZATION PLAN FOR HOUSTON'S WASTEWATER TREATMENT SYSTEM

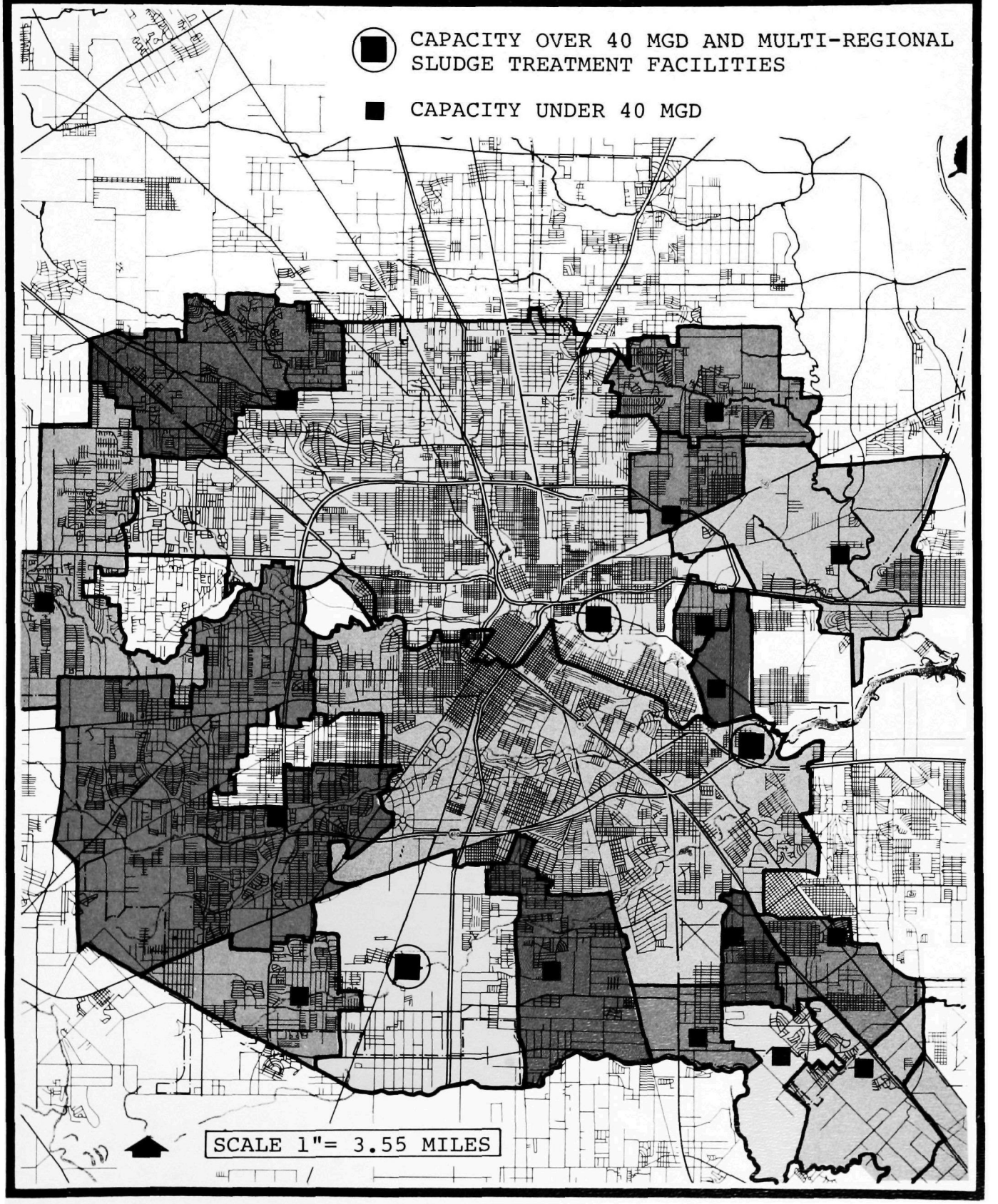
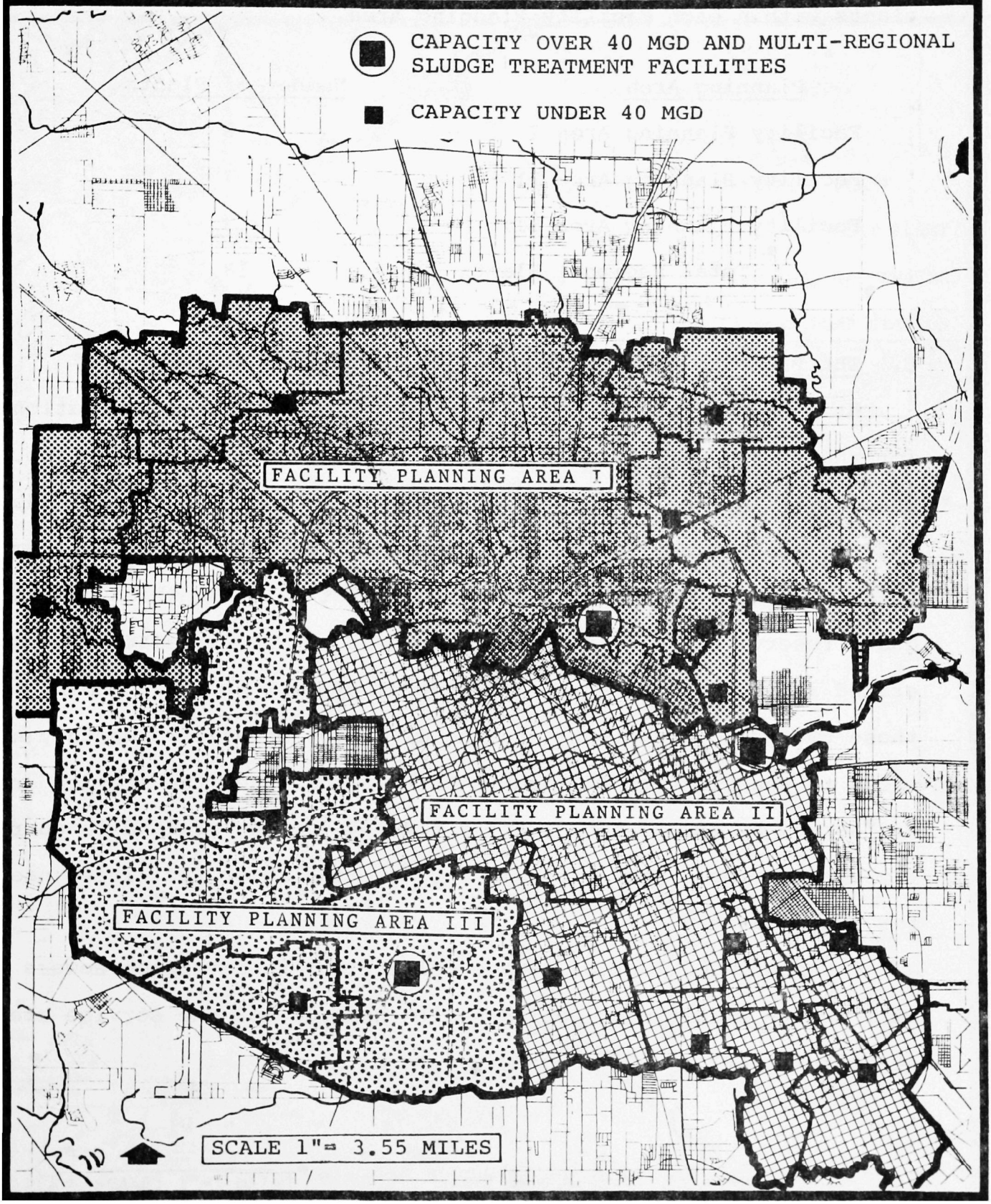


FIGURE II-3 PROPOSED FACILITY PLANNING AREAS FOR HOUSTONS WASTEWATER TREATMENT SYSTEM



Treatment Plants will be the functional centers of Facility Planning Areas II and III, respectively. Following is a breakdown of regional plants within each Facility Planning Area.

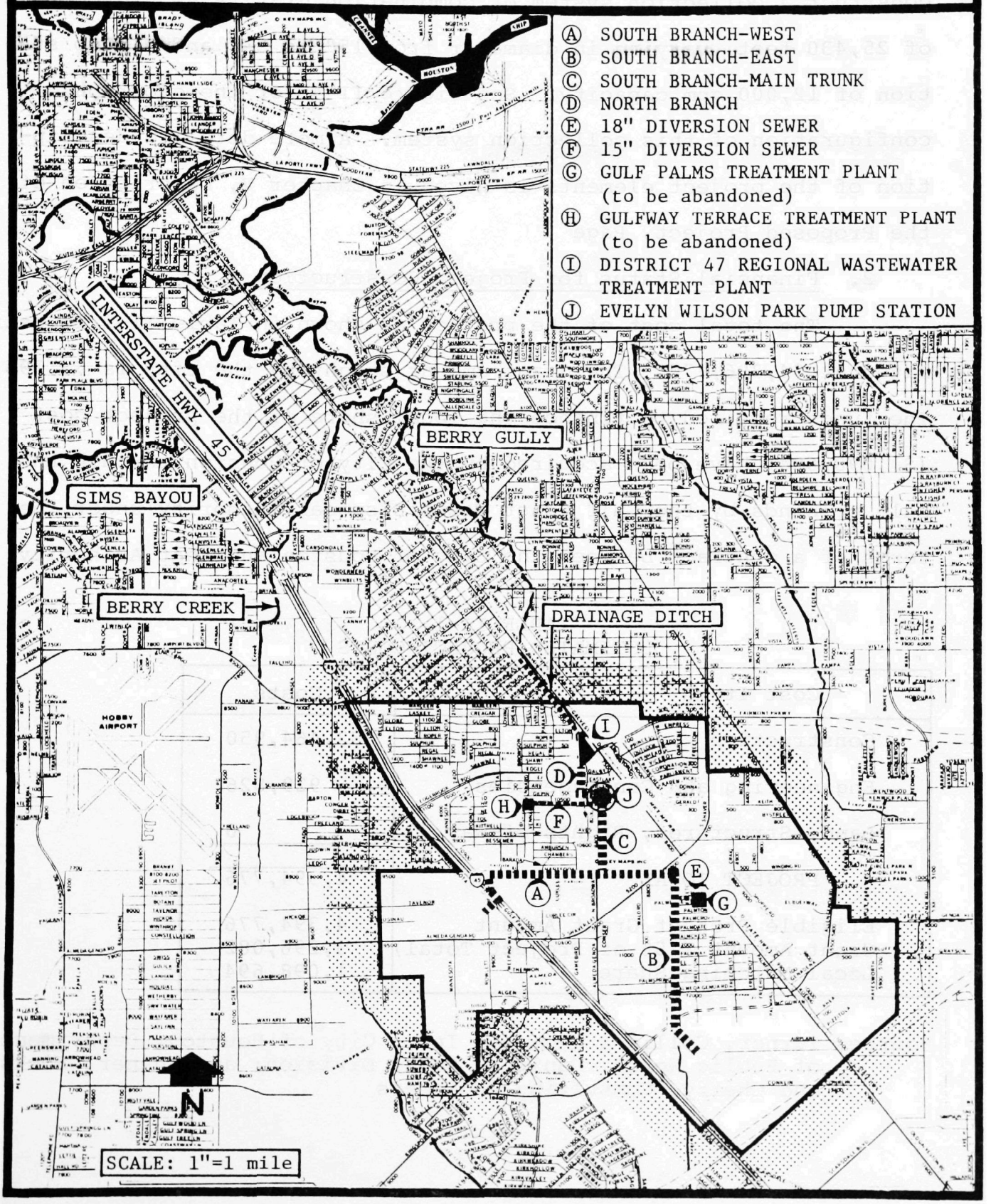
Planning Area	Number of Plants
Facility Planning Area I	8
Facility Planning Area II	7
Facility Planning Area III	3
Total Regional Plants	18

E. THE PROPOSED PROJECT (COLLECTION SYSTEM FOR DISTRICT 47)

At present, three different treatment plants are in operation for the service area of the District 47 Regional Treatment Plant. The Gulf Palms and Gulfway Terrace Plants are currently overloaded, and the present collection system does not permit wastewater from these plants to be diverted to the District 47 Plant which has adequate reserve capacity to allow treatment of all wastewater now generated in the service area. Current plans call for abandonment of these two temporary plants and the diversion of wastewater they now treat to the District 47 Plant. Further, parts of the service area are served by septic tanks, and a sizable amount of land is currently vacant since these areas do not have the sewer facilities needed for urbanization.

The continued lack of sewage collection and diversion sewers will create significant public health hazards for the service area of District 47.

FIGURE II-4
PROPOSED PROJECT ELEMENTS AND THE DISTRICT 47 SERVICE AREA



1. Proposed Response

To address these problems, the City of Houston proposes to construct a collection system of combination gravity and force main of 25,430 feet, varying in diameter from 15" to 54" and a pump station of 12,000 gpm capacity. See Figure II-4 for the geographic configuration of this collection system. A more detailed description of the project elements is given in Chapter V, Description of the Proposed Project, Page

2. Financial Status for Project Construction

The total cost of the project as shown in Table II-1 is estimated at $4,396,776. The grant amount sought by the city is $3,296,082. The funds required to finance the local share of the project cost ($1,098,694) have been acquired by the City of Houston through the sale of bonds by the Gulf Coast Waste Disposal Authority under the terms of a contract between the City of Houston and that Authority.

TABLE II-1
ESTIMATED PROJECT COSTS

Cost Items	Costs
Construction	$3,464,950
Engineering and Contingencies	929,826
Land, Structures, Rights-of-Way	0
PROJECT TOTAL	4,394,776
Eligible Project Grant Amount	4,394,776
Grant Amount (75% of Project Total)	3,296,082
Local Matching Share	1,098,694

Source: Turner, Collie & Braden, Inc.: City of Houston, Department of Public Works, Sanitary Sewer Division; and Shaner, Hicks and Cherry, Consulting Engineers

CHAPTER III: SOCIAL AND ENVIRONMENTAL SETTING

NATURAL ENVIRONMENT

A. SURFACE AND SUBSURFACE SETTING (TOPOGRAPHY, SOILS, GEOLOGY, PALEONTOLOGY, AND SURFACE AND UNDERGROUND WATER)

B. LAND-SURFACE SUBSIDENCE

C. CLIMATIC AND ATMOSPHERIC CONDITIONS (METEOROLOGY AND AIR QUALITY)

D. BIOLOGICAL ENVIRONMENT (BOTANICAL, ZOOLOGICAL AND WILDLIFE HABITATS)

MAN-MADE ENVIRONMENT

E. HISTORICAL AND CULTURAL ENVIRONMENT (ARCHAEOLOGY AND HISTORICAL ELEMENTS)

F. SOCIAL AND ECONOMIC ENVIRONMENT (POPULATION AND EMPLOYMENT)

G. LAND USE, TRANSPORTATION, AND RELATED ACTIVITIES (URBAN FUNCTIONS)

III. SOCIAL AND ENVIRONMENTAL SETTING

The social and environmental setting is discussed in two parts. The natural environment includes the physical features and any existing or potential changes resulting from urbanization. The man-made environment includes man's modifications of natural features in the development of living, working, moving and recreation facilities.

NATURAL ENVIRONMENT

A. SURFACE AND SUBSURFACE SETTING

1. Topography

The elevation of the Houston Metropolitan Area varies only 65 feet. The low point is approximately 25 feet for the east and southeast, and the high point is about 90 feet for the west and northwest sections of Houston. The topography of the service area is one of low relief with slopes of less than 1%. The elevation of the service area is between 35 feet and 45 feet from the mean sea level. A more elaborate discussion of the topographic features of Houston and the project area and their impact on the land use pattern and drainage system is included in Appendix B. Figure B-1 in that Appendix shows the topographic relief of the service area.

2. Soils and Geology

The service area consists of soils and substrata common to the Texas coastal uplands. The land is composed of finely grained

clays and mud soils including Beaumont soils series originating from overbanking of alluvial and deltaic streams of the Pleistocene period and Waller soils series originating from abandoned channels of the same period.

The Beaumont formation soils are composed mostly of clay, silt and sand. The clay is heavy, black and of the alluvial type. It has a low permeability which eliminates the use of septic tanks as a method of wastewater treatment.

A detailed analysis of soils and geology and their ramifications on future development of the service area is included in Appendix B of this report.

3. Paleontology

Studies attempting to uncover paleontological sites in the Houston area are limited. There are no known sites of paleontological value in the service area of the proposed project. In a conversation in June, 1974, Dr. DeWitt Van Siclen of the Department of Geology, University of Houston, and Dr. Charles Dodge of the Department of Geology, University of Texas at Arlington, reached the following conclusions on the difficulty of detecting paleontological sites without undertaking extensive excavation activity:

> The low relief of the area, humid climatic conditions and deep acid soil development would tend to destroy most fossil evidence at or near the surface. The rocks of the Beaumont Formation are deeply weathered and probably contained only limited fauna at the time of deposition. The nonmarine deltaic sediments of this unit would not be conducive to fossil accumulation or preservation.

Significant paleontological finds are, however, possible during excavation of a site below the depth of soil development. Any significant fossil, if detected, should be carefully extracted and preserved by trained paleontologists.

4. Hydrology

a. Subsurface Water

Three major aquifer systems have been listed by the Texas Water Development Board Study No. 178 (1974) in Harris County:

(i) The Chicot, which ranges in depth from 50 to 500 feet;
(ii) The Evangeline with depth from 500 to 1400 feet; and
(iii) The Jasper with depth from 1400 to 2800 feet.

These aquifers are located in the Lissie, Willis, Goliad and Lagard Formations in order of increasing depth.

The recharge area of these aquifers is to the north of Harris County. Water quality is good. Aquifers serve as the major source of water supply for the Houston area. Detailed data on the aquifer system for Harris County can be found in the TWDB Report 178, Volume I, II and III, which describes well logs for various wells and the records of wells and chemical analysis of well water. Figure C-1 in Appendix C is a contour map showing the depth to the base of the fresh to slightly saline water sands in the Harris County area. Figure C-2 in Appendix C is an Isopach (thickness) map for the fresh water sands in the same area. The water wells in Harris County are shown in Figure C-3 in the same Appendix.

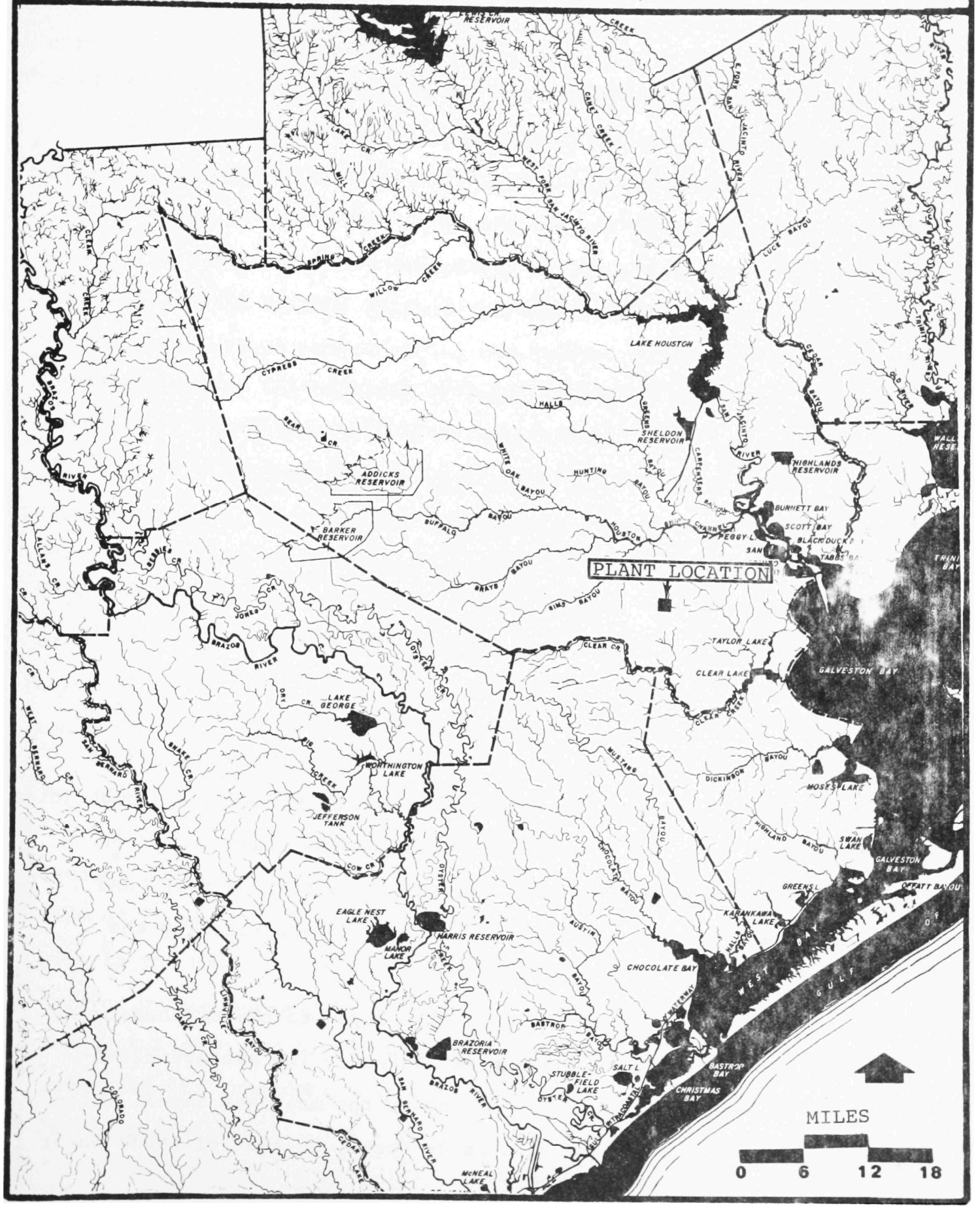
b. Surface Water

Figure III-1, taken from the 1972 Regional Atlas prepared by the Houston-Galveston Area Council, shows the major water courses and reservoirs in the Houston-Galveston Planning Region. The waterways which are directly or indirectly affected by the effluent from the District 47 Plant are:

(i) Harris County Flood Control District Drainage Ditch
(ii) Berry Gully
(iii) Sims Bayou, and
(iv) The Houston Ship Channel.

WATER COURSES AND RESERVOIRS

FIGURE III-1



A detailed description of each of these watercourses is given in Appendix C.

The two bodies of water to be most directly affected by the proposed District 47 Project are Berry Gully and Sims Bayou. Neither of these supply water to the residents of Houston. The proposed project will improve both the water flow quantity and quality in Berry Gully and Sims Bayou. Since Sims Bayou joins the Houston Ship Channel, the proposed project will also improve water quality in the Ship Channel.

Water flow and quality data collected at several points along Berry Gully and Sims Bayou are presented in Appendix C of this report. (See Figure C-5 in Appendix C for the exact location of these points.)

c. Flood Prone Areas

Flood data for the project site and its vicinity were not available from any agency in the Houston area normally responsible for collecting and maintaining data of this nature. Clear Creek, some three and one-half miles to the south of the project poses no flood threat. The 100 year flood level of this watercourse is at 50 geet from the mean sea level at the point where Hickory Slough joins Clear Creek. There is an east-west trending low ridge about one mile north of the creek that has elevations of over 55 feet, and this acts as a natural barrier to any flood waters reaching the project site or its service area.

Berry Gully drains into Sims Bayou to the northwest. Berry Gully's headwater elevation is 30 feet. The average elevation of the project area is 39 feet above the mean sea level. Elevation of the proposed pump site is 36 feet. Neither of these water

courses poses any flood threat to the project area. This is indicated in Figure III-2. Based on available data on the topography of the southeast Houston area, it appears that the existing District 47 Plant is not subject to 100-year floods, nor are the project elements proposed for improvement in the service area.

Hurricane flooding is a potential problem in any coastal zone, although it occurs infrequently in the Houston-Galveston area. The frequency of floods, however, may increase because of the continuing land-surface subsidence in the Houston area. As indicated by Figure III-3, the District 47 area, as a result of subsidence, has suffered an elevation loss of 3 to 4 feet. The continued use of underground water will aggravate this problem. The storm surge that accompanied Hurricane Carla flooded large areas of Harris County. Flood elevations of up to 15.3 feet above normal were recorded on Buffalo Bayou to the northwest of Galena Park. An appropriate land use policy by the City of Houston will be needed for areas which are subject to hurricane floods so that potential damages to life and properties can be eliminated or minimized.

B. LAND-SURFACE SUBSIDENCE IN HOUSTON

The continued use of underground water will have serious consequences for the environment of the Houston area. According to the City of Houston Public Works Department, 70% of all water consumption in the city is currently met by underground sources. Recent studies by the Bureau of Economic Geology at the University of Texas at Austin and by the United States Geological Survey indicate that the subsidence problems in the Houston-Galveston area are highly critical. The study reveals that more than 4,000 square

FIGURE III-2

AREAS SUBJECT TO 100 YEAR FLOOD

miles of area have subsided at least one foot and about 200 square miles in the Pasadena-LaPorte area have dropped more than five feet as a result of the pumping of underground water. (See Figure III-3). A more detailed description of this problem and its impact on the future land use is enclosed in Appendix D.

The City of Houston is keenly aware of the impact of the use of underground water on the uneven settlement of lands. It has abandoned the use of eastside wells because of the most critical subsidence problem in this part of the city, where industries rely heavily on the supply of underground water. Facilities for treating surface water are limited at the present time. Plans for new facilities to treat surface water are currently underway. Upon completion, these facilities will reverse the present ratio of underground and surface water usage.

SURFACE FAULTS AND LAND SUBSIDENCE

Surface faults are direct result of land subsidence caused by decline in aquifer pressure.

"The entire Texas Coastal Zone is traversed by surface faults. Many of these faults are presently inactive; others display actual displacement of the earth's surface.

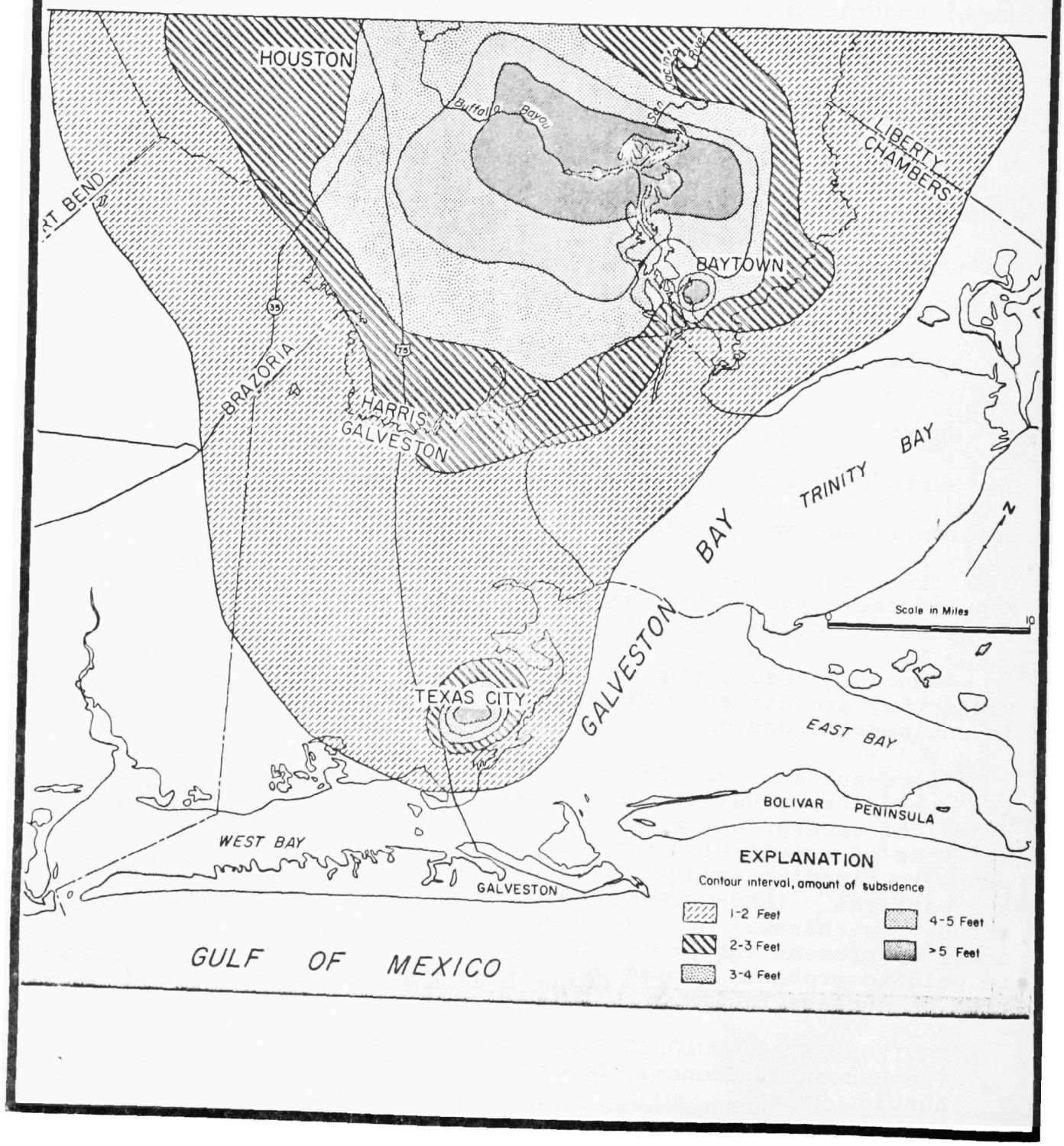
"None of these surface faults pose a threat to land use provided they are either recognized and avoided or properly considered in engineering design.

"Land-surface subsidence is prominent only in the greater Houston area. Principal effects of subsidence, created through withdrawal of underground water, are (1) activation of surface faults, (2) Loss of ground elevation in critical low-lying areas already prone to flooding, and (3) alteration of natural slope and drainage patterns. Land-surface subsidence, particularly in response to heavy withdrawal of underground water, is irreversible. Within areas of present and projected subsidence, special attention should be paid to problems caused by loss of ground elevation and activation of surface faults."

ENVIRONMENTAL GEOLOGIC ATLAS OF THE TEXAS COASTAL ZONE
The Bureau of Economic Geology, University of Texas at Austin, Page 87.

FIGURE III-3

LAND SURFACE SUBSIDENCE IN THE GREATER HOUSTON AREA (1964)



C. CLIMATIC AND ATMOSPHERIC CONDITIONS

1. Climate

The Houston climate is characterized by frequent precipitation. The annual average rainfall is about 50 inches. Table E-1 in Appendix E shows monthly precipitation from 1965 through 1973. Houston experiences high intensity showers during the spring and late summer. Temperatures range from a low of 32°F in winter to a high of 100°F in summer, the mean January temperature being 45°F and July being 93°F. Below freezing temperatures are rare, and snows are extremely infrequent.

Two principal wind regimes dominate the Houston area: persistent southeasterly winds from March through November and short-lived but strong northerly winds from December through February. Data on the climatic condition of Houston, including wind direction and hurricane tracks, are shown in Figure E-1 in Appendix E.

Hurricane flooding is a potential problem for any coastal zone; however, it occurs infrequently in the Houston-Galveston area.

2. Air Quality

Air pollution is one of the most serious problems affecting public health in Housotn. The problem results from solids, liquids and gases in the air in amounts that are injurious and detrimental to man and the environment. The major source of air pollution in Houston, as in other urban areas, is the automobile. Table III-1 indicates Houston's current level of air pollution. A graphic presentation of the data in Table III-1 is furnished in Figure E-2 in Appendix E.

TABLE III-1

LEVEL OF AIR POLLUTION BY TYPE OF POLLUTANTS
FOR HARRIS COUNTY, 1972

Pollutants	Air Contaminants Tons/Year	Harris County, 1972 Percent Distribution
Particulate Matter	69,300	4.20%
Carbon Monoxides (CO)	871,500	52.10%
Sulphur Dioxides (SO_2)	134,000	8.30%
Nitrogen Oxides (NO_2)	168,500	10.20%
Total Hydrocarbons	421,900	25.20%
TOTAL	1,665,200	100.00%

Houston leads the cities with air pollution problems in Texas. Over 50% of the total air contaminants in the city are the result of the carbon monoxide, the major source of which is the automobile. The current efforts by the City to attack the root of the problem are limited in their scope, though some improvements in air quality have been made since 1972. The current programs and their effect on air quality in Houston are discussed as follows:

Current Air Quality Programs for Houston

In 1967, Houston established an Air Pollution Control Program under the Department of Health to monitor sources of air pollution and control, regulate, and reduce pollutants. Since then, the Program has grown considerably and its scope has been expanded. Monitoring information is published annually and in 1974 the Program has started monthly reports. The City now has over 60 personnel working on pollution monitoring and control. The Program includes enforcement, engineering, technical

services, and meteorology. Data is compiled and stored by a computer telemetry system.

The number of monitoring stations has increased to 25, including the Houston Ship Channel Industrial District, where large concentrations of pollution sources exist. Two continuous monitoring mobile units have been assembled to sample Carbon Monoxide, Nitrogen Oxides, Sulfur Dioxides, and Total Oxidants on a continuing basis. Numerous surveys have been conducted for various parts of the city, particularly for industrial plants, to provide a basis for City Ordinances on incinerator permits and pollution control. In addition, stack sampling teams have been organized and trained to gather direct source data for industrial control and regulation. In 1973, the City has made over 1,100 inspections and 2,500 advisory visits. It has attended to 3,100 complaints, and 989 notices were served on 632 companies -- 431 corrections have been made. A total of 633 incinerator operating permits have been issued and 750 incinerators have been removed from service. See Table EE-3 in Appendix EE.

In the seven years the Air Pollution Control Program has been in operation, the City has made good progress in the monitoring, analysis, and control of industrial and small source pollutants. However, the Program has not been able to adequately address the problem of air pollution caused by the automobile, other than to monitor some of the pollutants generated by the auto. A more detailed description of the City's air pollution control programs and related data are presented in Appendix EE.

D. BIOLOGICAL ENVIRONMENT

A brief description of the biological environment of Houston in terms of plant and animal life is presented in Appendix F. Figure F-1 in Appendix F, taken from Proctor and Hall (1974), shows the distribution of various plant assemblages and typical vegetation of the Greater Houston Area. Common macro-biologic assemblages within the Texas coastal environment are shown in Figure F-2 of that Appendix. Data on major marine and wildlife habitats in the Houston region are shown in Figure F-3 through F-5 of the same Appendix.

1. Botanical

Vegetation in the service area of the proposed plant is fairly typical of the Gulf prairie and coastal plains. The service area is largely barren of major vegetation with the exception of scattered grasses and weeds and small amount of scrub trees. A more complete description of the botanical elements of the District 47 area is given in page F-8 of Appendix F.

2. Zoological

The presence of wildlife in the service area is not significant. Some wildlife -- small furbearing mammals and aquatic fauna -- are found in the area creeks and bayous. A variety of small birds has been sighted in the service area. A description of the zoological elements of the project area is attached in Appendix F (pages F-8 and F-9).

Available studies indicate no evidence of significant existence of any rare or endangered species within the project's service area. However, according to the Texas Department of Parks and Wildlife, there might be some endangered species in the Southeast Texas Region which include Attwater's prairie chicken, redwolf, poregrine falcon, Eskimo cuslew, bald eagle, ocelot, American alligator and Houston toad. Specific locations of these species are not known.

E. HISTORICAL, ARCHAEOLOGICAL AND CULTURAL ENVIRONMENT

1. Archaeological and Historical Elements

Two items listed in the National Register of Historic Places are the Cotton Exchange Building and the San Jacinto Battleground. Both are located outside the service area of the District 47 Plant. According to the Texas Historical Commission, most recent archaeological surveys were confined to one area of Houston. These surveys have recorded ten sites along the White Oak Bayou. This data, however, will not be available for public use until steps are taken to insure the preservation of these sites.

Areas south of the city were surveyed prior to construction of Army Corps of Engineers projects, and they were successful in locating large numbers of sites of archaeological importance. Prior to the construction of the proposed project, including the installation of trunk and diversion sewers, the proposed pump site and the pipeline easements and rights-of-way must be subjected to a thorough archaeological survey. If any site of archaeological value is discovered during the survey, it should be recorded and its significance appraised prior to its commitment to the project.

2. Cultural Elements

Houston is the cultural capital of the Southwest United States. It is the home of the Houston Astrodome and 14 Universities of higher learning. Varied cultural activities of Houston include its many libraries, museums, public arena, theatres, music groups, recreational and related facilities.

F. SOCIAL AND ECONOMIC ENVIRONMENT

The type and level of public facilities, including sewage treatment facilities, is a function of population and employment growth. The manner in which population and economic activities are geographically arranged on the space dictates the land use pattern of the city. This land use structure is key to the geographic configuration of the collection, treatment and disposal systems for wastewater. The future land use, therefore, must be considered before effective plans for public facilities can be developed and implemented.

1. Employment Trends and Projections for the Houston Area

Houston has been one of the fastest growing major cities in the United States. The expansion of Houston's manufacturing, petrochemical and chemical production, educational facilities, aerospace industry and medical research has contributed to this growth. Table III-2 shows the past, present and employment projection for the City of Houston, Harris County and the Houston-Galveston Planning Region.

These projections indicate the municipal facilities that must be planned to serve Houston as it grows. Growth in various parts of the city will depend upon the level and quality of public services provided to those areas. The city's proposal for the expansion of the wastewater collection facilities in the District 47 area is an indication that future development is inevitable for this part of Houston. The graphic illustration of Houston's employment base is shown as Figure G-1 in Appendix G.

TABLE III-2

HOUSTON'S EMPLOYMENT OUTLOOK: 1960 THROUGH 1990

	Employment				
	Number		Per Cent Change 1960-1970	Projections Through	
	1960	1970		1980	1990
City of Houston*	363,636	515,599	42%	667,000	1,000,000
Harris County**	470,452	711,749	51%	1,063,050	1,400,000
Houston-Galveston Region***	587,698	797,421	33%	1,186,591	1,575,600

*Employment projection for the City of Houston is based on the continuation of its 1970 share of Harris County total employment.
**Volume 2, "Houston-Harris County Population Projection", Table 5, Page 15, Texas Highway Department, 1967.
***Projections by University of Texas at Austin and Texas A & M University for Economic Base Studies and Projections of the HGAC Region, Page 9, "A Summary Projection, Land Use and Population," December, 1969.

2. Population Trends and Projections

In 1970, the service area of the District 47 Plant had a population of 19,400 persons. This is a gain of about 50% over the 1960 level. During the same period of time, the city itself grew 31% and Harris County grew 40%. Population growth rates and projections for the City of Houston, Harris County and the Gulf Coast Planning Region are shown in Table III-3. A more complete discussion of population growth and trends and their implications on the proposed project is presented in Appendix G.

G. LAND USE AND TRANSPORTATION

1. Existing and Projected Land Use

Figure G-5 in Appendix G shows the existing land use in the project area. Over half of the land in the service area is unde-

veloped and is available for urbanization. The predominant land use is single family dwellings. A portion of the population within the study area is using septic tanks and is not connected to the sanitary sewer system tributary to the District 47 Plant.

There is little industrial use in the service area at the present time; however, its proximity to the Hobby Airport may increase the prospect of industrial development in the future. Commercial development is scattered throughout the area primarily along the major thoroughfares. Planned commercial centers should develop as the retail market grows with population increases in the service area.

As the Houston area expands, the service area of the proposed project will be subject to increased urbanization. The development of commercial establishments and light industry will likely accompany the development of single-family dwellings and apartment housing associated with population increases. The projected land-use pattern for the District 47 area is shown in Figure G-6 in Appendix G. The 1990 city-wide development plan proposed by the City of Houston City Planning Commission is shown in Figure III-4.

2. Transportation

The service area's roads are for the most part surfaced for all weather use. The major north-south transportation arteries are Interstate Highway 45 and Galveston Road, which serve as the principal link between Houston Galveston. Major east-west thoroughfares include Edgebrook and South Shaver. Almeda-Genoa Road, another major street, passes through the southern half of the service area.

Figure G-7 in Appendix G shows the existing and proposed transportation network for the project area and surrounding vicini-

TABLE III-3

POPULATION TRENDS AND PROJECTIONS FOR THE PROJECT AREA, CITY OF HOUSTON, HARRIS COUNTY AND GULF-COAST PLANNING REGION - 1960 THROUGH 1990

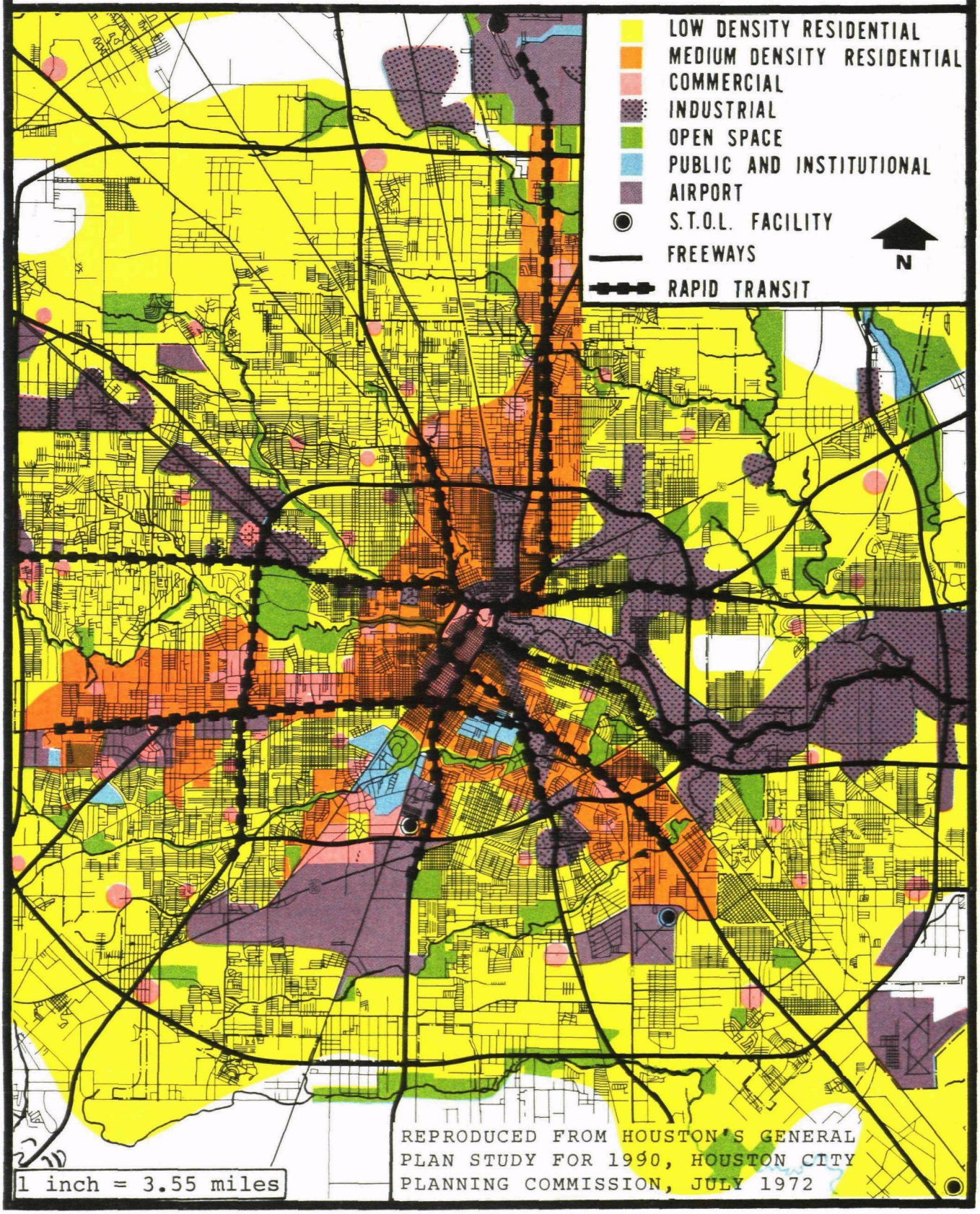
Area	Past and Present**				Future Projection*			
	1960	1970	Change 1960-70		1980	1990	Change 1970-90	
			Number	Percent			Number	Percent
Service Area of the Project	13,105	19,400	+6,295	48%	26,100	42,200	+22,800	+120%
City of Houston	938,219	1,232,802	+294,583	31.39%	1,600,000	2,300,00	+1,067,198	86.5%
Harris County	1,243,158	1,741,912	+498,754	40.11%	2,311,600	3,300,000	+1,588,088	89.4%
Gulf-Coast Planning Region (13 County)	1,698,748	2,305,196	+606,358	35.69%	3,293,500	5,157,100	+2,851,994	123.7%

*Projections by HGAC, "A Special Report on Population Projection, 1970-2020," November, 1972.

**1960 and 1970 Censuses of Population and Housing for the Houston, Texas, Standard Metropolitan Statistical Area.

FIGURE III-4

CITYWIDE DEVELOPMENT PLAN FOR HOUSTON



ties, including rapid transit corridors. The transit system will have a major impact on the northwestern sections of the service area. The transit corridor along the Interestate Highway 45 will have a dramatic impact on the predicted growth pattern of the service area. High density, concentrated development will take place around the transit stops. The energy crisis may cause rapid transit to develop much earlier than now seems likely. The actual 1990 population and employment will, in that event, far exceed the projections presented in this report. The need for an expanded system of wastewater treatment facilities will increase accordingly.

3. Needs of the Service Area

An attractive living and working environment requires public services, i.e., water, sewer, solid-waste disposal, parks, streets, schools, public safety and so forth. The project area urgently needs an adequate collection system to carry the wastewater to the plant. The project will enable the city to provide a clean and safe environment for the citizens of the project area.

CHAPTER IV: ALTERNATIVES TO THE PROPOSED ACTION

A. MAJOR OBJECTIVES

B. CONSTRAINTS AND CONDITIONS

C. STRUCTURAL AND NON-STRUCTURAL ALTERNATIVES

D. COLLECTION SUBSYSTEM ALTERNATIVES

E. SUMMARY OF SUBSYSTEM ALTERNATIVES AND SELECTED SYSTEM

F. NO ACTION ALTERNATIVE

IV. ALTERNATIVES TO THE PROPOSED ACTION

This chapter identifies and evaluates the various alternatives to the proposed action and recommends the most feasible method to achieve the objectives defined for the project within social, economic, environmental and technological constraints and conditions.

A. MAJOR OBJECTIVES

The major objectives of the proposed action are:

1. Regionalization of wastewater treatment facilities in Houston.
2. Protecting public health and promoting community welfare and safety.
3. Satisfying increased wastewater facilities demands resulting from new growth and development in the service area.
4. Reduction of water pollution in receiving bodies of water, and maintenance and enhancement of water quality in these streams.
5. Compliance with State and Federal Environmental Quality standards and regulations.
6. Improving system performance related to sewage collection, treatment and disposal system for Houston.
7. Improving the environment by the use of wastewater system as a tool to promote quality land use.
8. Minimizing adverse impacts on the social and biological environment.

B. CONSTRAINTS AND CONDITIONS

1. Regulatory Constraints:

U. S. Environmental Protection Agency and Texas Water

Quality Board requirements, regulations and standards relating to collection of influent and discharge of effluent, including TWQB Waste Control Order No. 10495, must be satisfied.

a. Environmental Protection Agency Standards:

Under the National Pollutant Discharge Elimination System (NPDES), all point sources (including publicly owned treatment works) must obtain a permit for the discharge of wastewaters to the navigable waters of the United States. For publicly owned treatment works, the initial objective is secondary treatment, followed by the use of the most practicable advance technology available for treatment purposes.

The minimum level of effluent quality* attainable by secondary treatment as defined by EPA is as follows:

BOD_5 and Suspended Solids

The arithmetic mean of 30 consecutive days value not to exceed:	30 mg/l
The arithmetic mean of 7 consecutive days value not to exceed:	45 mg/l
The overall removal efficiency based on 30 consecutive days of influent and effluent monitoring not to be less than:	85%

Fecal Coliform Bacteria

The geometric mean in a period of 30 consecutive days shall not exceed:	200 per 100 ml
The geometric mean in a period of 7 consecutive days shall not exceed:	400 per 100 ml

*Federal Register, Appendix D, EPA Water Programs Secondary Treatment Information, August 17, 1973, Vol 38, No. 159, Washington, D. C.

pH

The effluent value for pH shall remain within the limits: 6.0 to 9.0

b. Texas Water Quality Board Standards:

The Board prescribes a treatment system capable of producing an effluent having the following quality:

Average monthly BOD_5*	20 mg/l or less
Average monthly TSS*	20 mg/l or less
Average daily TSS	25 mg/l or less
Individual sample BOD_5	30 mg/l or less
Individual sample TSS	30 mg/l or less
Residual chlorine after a contact time of 20 minutes at peak flow	1.0 mg/l or less

2. Economic and Financial Considerations:

The total cost of this project must lie within the financial capabilities of the governments involved. The collection and treatment facilities must be sufficient to meet the objectives of the proposed action and minimize improvement and subsequent operation and maintenance costs.

C. STRUCTURAL AND NON-STRUCTURAL ALTERNATIVES

1. Non-Structural Alternatives:

These include policy regulations available to the City of Houston for controlling growth in the city and for collection, treatment and disposal of municipal wastes.

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*Effluent quality standards are scheduled to become more restrictive in 1979, because of water quality problems in the Houston Ship Channel. Then, BOD_5 and TSS limits for the District 47 plant's effluent will be 10 and 15 mg/l, respectively.

a. Control of Growth:

The City of Houston does not have any zoning regulations or a comprehensive plan for guiding and controlling the growth of the city. It has, therefore, attempted to influence growth through such methods as:

- Use of its authority to approve subdivision plats.
- Issuing and enforcing building permits.
- Construction and extension of streets, sewer lines, water mains, drainage systems, and other public services.

The city will continue to exert some control over private development of the service area in this manner.

b. Control of Collection and Disposal of Wastewater:

The city's statutory regulations as defined in the Code of Ordinance imposes the following limits on the sanitary sewer system:

- Limitation of wastewater quantity discharged into the sanitary sewer system. This is controlled by sewer line connection permits and applies to all sewer users.
- Limitation of wastewater quality discharged into the sanitary sewer system by industrial users.
- Imposition of sanitary sewer rates charged as a function of quantity.
- Imposition of sanitary sewer rates charged as a function of quality.
- Prohibition of certain types of harmful discharges into the system by the industrial users.
- Restriction on excessive discharges caused by storm or overflow conditions into the system.

The City will use these regulations to keep growth and development of all parts of the city in balance with wastewater system capacities for those areas.

2. Structural Alternatives:

These include those alternatives to the proposed action which govern the wastewater collection, transport and disposal systems. The policies that guided the development of these alternatives are:

- Whether the service system should be centralized or decentralized.
- Where the pump station should be located.
- Where and how the trunk and diversion sewers should be routed.

a. Centralized vs. Decentralized Systems:

The policy of the Texas Water Quality Board is to require elimination of small plants and encourage centralization of facilities wherever possible, as well as to prohibit further construction of small plants.

The policy for regionalization of wastewater systems has been adopted to:

- Permit improved planning and coordination of wastewater collection and treatment activities.
- Facilitate application of new technology.
- Allow more efficient monitoring of effluent by regulatory agencies at the local, state and federal level.

- Economize construction and operating costs.

Policies pursued by the Gulf Coast Waste Disposal Authority, the Houston-Galveston Area Council and the City of Houston are in complete agreement with the regional approach to wastewater collection and treatment systems established by the Texas Water Quality Board.

b. Site Location Alternatives for Pump Stations

Pump sites should be sensitive to the constraints imposed by land availability and costs and the nature of surrounding development, both existing and proposed. Their locations should be sensitive also to the environmental constraints imposed by soil, geology, topography, drainage patterns, air quality and other ecological factors.

Where the collection of wastewater can be accomplished through use of gravity flow, accompanying pump stations are normally located in an area where the transport of waste to the treatment plant is not feasible through gravity sewers. Such locations can minimize the cost of conveyance by reducing the size of pipes and cost of excavation between the pump stations and the treatment plants. Since pump stations create noise and since in case of operational failures can be odorous, they should usually be located in areas where they can be built underground. Aesthetic consideration also calls for placing the pump stations underground.

An optimum location for the proposed pump station would be that which will minimize overall costs of the collection network for the District 47 area and which will cause minimum adverse

effects on the environment of the pump site vicinity.

Potentially, there are a number of sites in the project area which can serve as location for the pump station. However, land cost factor can be eliminated if the plant is located on a suitable site already owned by the city. That site is located on the northwest corner of the Evelyn Wilson Park, approximately 2000 feet south of the District 47 Plant outside any flood plain area and surrounded by open lands on three sides. For a description of the impact of this facility on the Evelyn Wilson Park, see Page 58, Chapter VI.

D. COLLECTION SUB-SYSTEM ALTERNATIVES:

In determing the optimum routing of the subsystem, the following objectives were considered:

- Minimize sewer length wherever possible.
- Wherever possible, utilize existing utility easements held by the City of Houston to avoid the expense of acquiring new right-of-ways.
- Provide adequate service projected for the area to be served.
- Utilize gravity sewer when permissible.
- Minimize inconvenience to the area residents during construction; and
- Maximize system conformity.

The proposed collection network in the District 47 area is intended to phase out the present Gulfway Terrace and the Gulf Palms Treatment Plants. It includes the construction of the District 47 Trunk and Diversion sewers which are designed to transport wastewater from the abandoned plants to the District 47

Regional Treatment Plant. See Figure V-2 in the next chapter for the location and alignment of the proposed project elements.

The two plants to be abandoned are currently operating far beyond their design capacities and cannot meet the effluent standard requirements. Accordingly, abandonment has been ordered by the Texas Water Quality Board. Expansion of these plants would not meet any of the objectives established for the proposed action. Also a sizable part of the project area to the south is currently served by septic tanks. The construction of new sewers will eliminate the operation of these septic tanks and allow the city to extend sewer service to the areas which are currently vacant and where prevention of septic tanks will only be possible if sanitary services are provided by the city.

In construction of the trunk sewer, the alternatives considered were whether to construct a gravity sewer or a force main or a combination. For evaluation purposes, the trunk sewer has been divided into two sections. The south section is south of the proposed pump station and intercepts two diversion sewers and several collection mains and laterals. The north section transports the collected wastewater from the pump station to District 47 Plant. Alternatives to each section are evaluated as follows:

1. South Section: The South section intercepts two existing diversion sewers and several existing collection mains and laterals. The latter are all gravity sewers. Therefore, the south section must be a gravity sewer.

   The route chosen for this section is the most feasible and practical alignment which meets all criteria defined in the preceding section governing trunk sewer routing.

The route will lie along existing city street rights-of-way or will go through dedicated easements. The chosen route offers least interference with existing underground utilities and is best coordinated with the transportation network of the general area. Considering all factors, the proposed interceptor route minimizes the conveyance distance between the areas to be served and the District 47 Plant.

2. North Section. The north section of the proposed Trunk Sewer is intended solely for transporting wastewater collected in the south section to the District 47 Plant. Since there are to be no lateral connections in this section, this section theoretically may be either a force main or a gravity sewer. However, because the District 47 Plant site elevation is higher than the point where the south section terminates, the north section has to be a force main.

The alternative chosen for the north section is, therefore, a force main, with a pump station at the northwest corner of Evelyn Wilson Park. Overall, the force main alternative is found to be more economical than a gravity sewer. The former offers less interference to existing underground utilities, since the pipe size is smaller and the excavations are shallower than those required for a gravity sewer.

E. SUMMARY OF SUBSYSTEM ALTERNATIVES AND SELECTED SYSTEM:

The chosen conveyance system will transport wastewater to the

District 47 Plant which consists of secondary treatment using the activated sludge process, followed by disinfection of the effluent through chlorination with hypochlorite, and discharge of the treated effluent into the HCFCD drainage ditch adjacent to the plant site. This effluent will subsequently flow into Berry Gully, Sims Bayou and to the Houston Ship Channel. The sludge will be processed off-site at the Sims Bayou Multi-Regional Sludge Disposal Plant by chemical conditioning (ferric chloride), dewatered by vacuum filtration, flash dried, and sold as a soil conditioner/fertilizer.

The chosen system has been judged to be most cost-effective for collecting wastewater for the District 47 Plant. Its construction will be consistent with the requirements and standards of the U. S. Environmental Protection Agency and Texas Water Quality Board. It best achieves the objectives defined for the proposed action earlier in this chapter.

One of the most important factors considered for selecting the proposed action is the efficient use of the underused treatment facility at the District 47 Plant. This plant is compatible with the existing treatment plants and facilities operated by the City of Houston. The city operates 16 other wastewater treatment plants using the activated sludge process including two multi-regional sludge disposal plants. These facilities utilize standardized equipment and machinery, minimizing the need for a large inventory of spare parts and equipment within the citywide system. Under the standardized system, the plants can be operated effectively by personnel familiar with the processes involved but not necessarily with a particular plant. The existing sludge disposal process produces a marketable product, reducing the overall system operation and maintenance costs.

F. NO-ACTION-ALTERNATIVE

In the absence of the proposed action, the existing Gulf Terrace and Gulf Palm Plants will have to remain in operation, continuing to produce substandard effluent quality; also, wastewater generated in the south section of District 47 area in excess of 0.48 mgd will have to be bypassed without treatment. Further, septic tanks currently in use in the area will continue to be operational. The following effects would be inevitable:

- Continuation of inadequate wastewater collection, treatment and disposal in the service area of the project;
- Continued intensification of water pollution in Berry Gully, Sims Bayou and the Houston Ship Channel as well as the HCFCD Drainage Ditch;
- Aggravation of public health hazards to residents of service area;
- Loss of opportunities for orderly development of the District 47 community and the City of Houston;
- Failure on the part of the City of Houston to fulfill the commitment it has made to the service area residents;
- Failure of the City of Houston to meet the environmental regulations imposed by the State and Federal Government; and
- Continuation of the present trends of land use development in the service area which will generate a secondary negative impact on public health and result in a polluted environment from the standpoint of air, water and other elements of the ecology. The entire community of Houston and perhaps the nation will have to pay for correcting that situation.

In brief, the "No-Action-Alternative" does not address any of the objectives outlined for the proposed action nor the goals and policies of the City of Houston, the Texas Water Quality Board and the U.S. Environmental Protection Agency. The only benefit the "No-Action-Alternative" offers is that it does not require the economic investment needed for the proposed project. On balance, however, the "No-Action-Alternative" cannot be considered as a solution to the problem of inadequate sanitary facility in this part of Houston.

CHAPTER V: DESCRIPTION OF PROPOSED ACTION

A. EXISTING TREATMENT FACILITIES IN THE DISTRICT 47 AREA

B. DESCRIPTION OF PROPOSED FACILITIES

C. RELATIONSHIP OF THIS ACTION WITH OTHER HOUSTON WASTEWATER FACILITIES SYSTEM STUDIES

D. STATUS OF PROJECT, APRIL 1974

V. DESCRIPTION OF THE PROPOSED ACTION

The proposed action will affect three existing plants in the District 47 Area. This chapter describes their capacity, treatment methods and influent and effluent quality.

A. EXISTING TREATMENT FACILITIES IN THE DISTRICT 47 AREA

These include District 47, Gulf Terrace and Gulf Palm Treatment Plants.

1. Existing Plant Capacities

The District 47 Plant was acquired by annexation in 1958 and was designed to treat an average daily flow of 3 mgd. The plant currently has an average flow of 1.66 mgd. Gulf Palms and Gulf Terrace Plants were both acquired in 1961, and at present treat an average daily flow of 0.20 mgd and 0.28 mgd, respectively. These two plants* will be abandoned upon the completion of the proposed facilities.

2. Existing Method of Treatment

The existing treatment plant of District 47 features secondary treatment by the contact stabilization mode of the activated sludge treatment process. Both Gulf Palms and Gulf Terrace Plants use a combination of primary and secondary treatment. The Primary treatment use Imhoff tanks and secondary treatment is accomplished through trickling filters. Sludge from the District 47 Plant is transported to the Sims Bayou Multi-regional

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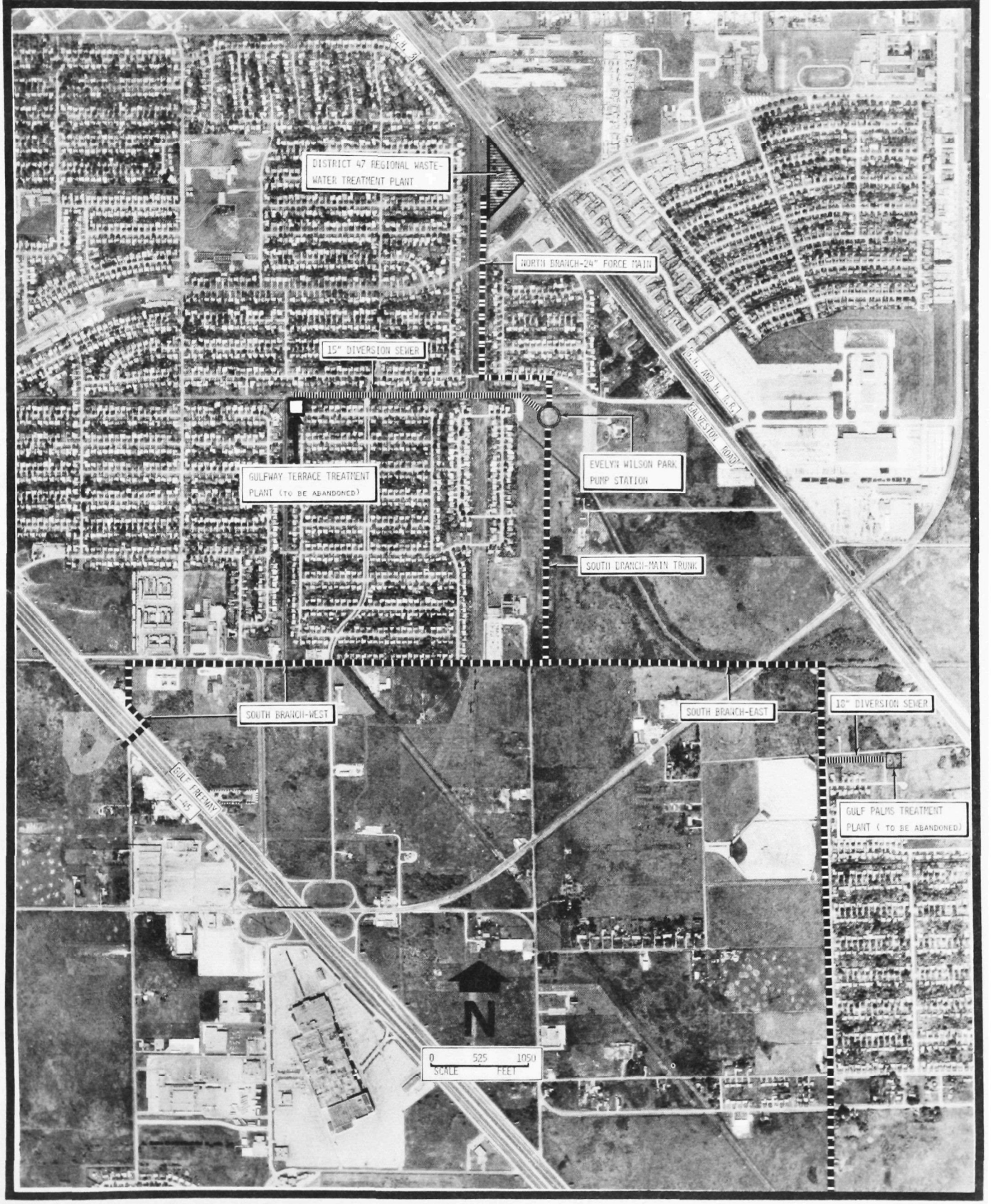
*The City has not yet finalized plans for ultimate use of these plants. Several options are available. One will be to return the unneeded land for private development. It is recommended that unused portions, after dismantling, be used for mini-parks for neighborhood children and community gardening by the adult population. Both sites are ideally situated for such activities.

FIGURE V-1

AERIAL MAP OF DISTRICT 47 PLANT SERVICE AREA



Sludge Treatment Plant. The digested sludge from the Gulf Terrace and Gulf Palm Plants are wasted in sludge drying beds. Dried sludge is then taken to a sanitary land fill for final disposal. A more elaborate description of the existing methods of treatment is included in Appendix H.

3. Existing Effluent Quality

Influent and effluent qualities and plant operating efficiencies are shown in Table V-1. As shown in Table V-1 current BOD_5 and TSS from both Gulf Palms and Gulf Terrace Plants do not meet the standards set forth by the TWQB or the EPA. On the other hand, effluent quality of District 47 is highly satisfactory, as reflected in its BOD_5 and TSS values of 6 and 8 respectively. It has an existing load of 1.66 mgd although its design capacity is 3 mgd. This plant can easily treat another 1.34 mgd. The combined capacities of Gulf Palms and Gulf Terrace Plants are only 0.48 mgd. Effluent quality, when the District 47 Plant is operated at its 3 mgd capacity after the construction of the proposed project elements, has been estimated at 8mg/l and 10mg/l for BOD_5 and TSS respectively. For further explanation, see footnote on page 47.

4. Future Plans for These Plants

There are no plans for making any changes to the District 47 Plant at this time. However, the City of Houston anticipates expansion of this plant to a 6 mgd facility by 1979. Under the present proposal, both the Gulf Palms and Gulf Terrace Plants are to be abandoned and the wasteload of these plants will be diverted to the District 47 Plant for treatment and disposal.

TABLE V-1

CURRENT WASTEWATER QUALITY PROFILE FOR TREATMENT PLANTS IN THE DISTRICT 47 AREA

	Parameters	Influent (mg/l)	Effluent (mg/l)	Removal (%)
District 47 Plant	Permitted BOD_5		20	---
	Permitted TSS		20	---
	Actual BOD_5	161	6	96*
	Actual TSS	158	8	95*
Gulf Palms Plant	Permitted BOD_5		20	---
	Permitted TSS		25	---
	Actual BOD_5	Data Not Available	25	---
	Actual TSS	Data Not Available	49	---
Gulf Terrace Plant	Permitted BOD_5		20	---
	Permitted TSS		20	---
	Actual BOD_5	Data Not Available	25	---
	Actual TSS	Data Not Available	39	---

Source: Texas Water Quality Board, Self Reporting Data

*As a result of increased wasteload for District 47 plant, these values are expected to slightly decline but would still meet the discharge criteria established by the TWQB and the EPA. Existing data on Fecal Coliform is not available. According to Binkley and Holmes, which has been engaged by the city to complete engineering design for the plant, Fecal Coliform Bacteria projected as the geometric mean in a period of 30 consecutive days will not exceed 200 per ml.

For calculating BOD_5 and TSS for District 47 plant, when it begins to process 3mgd wastewater the parameters in the following studies were used: For TSS, "Analysis of Excess Flow Treatment Costs at Plants not Receiving Transfer Sludge, 1974, Job No. 3074" by Binkley and Holmes, and for BOD_5, "Complete Mix Activated Sludge: Water Supply and Pollution Control" by John W. Clark, W. Weissman and M.H. Hammer, International Textbook Co., 1971, p. 529.

B. DESCRIPTION OF THE PROPOSED FACILITIES

The proposed project consists of three elements of waste-water collection:

(1) A trunk sewer system
(2) A pump station
(3) Two diversion sewers

All project elements are shown in Figure V-2.

1. The Trunk Sewer System:

The trunk sewer has two branches, the north and south branches. The south branch is south of the proposed pump station (See Figure V-2). All sewers in this subsystem are gravity-sewers. The north branch is north of the pump station and is intended to transport sewage from the pump station to the District 47 Plant. This section is a force main.

(a) South Branch:

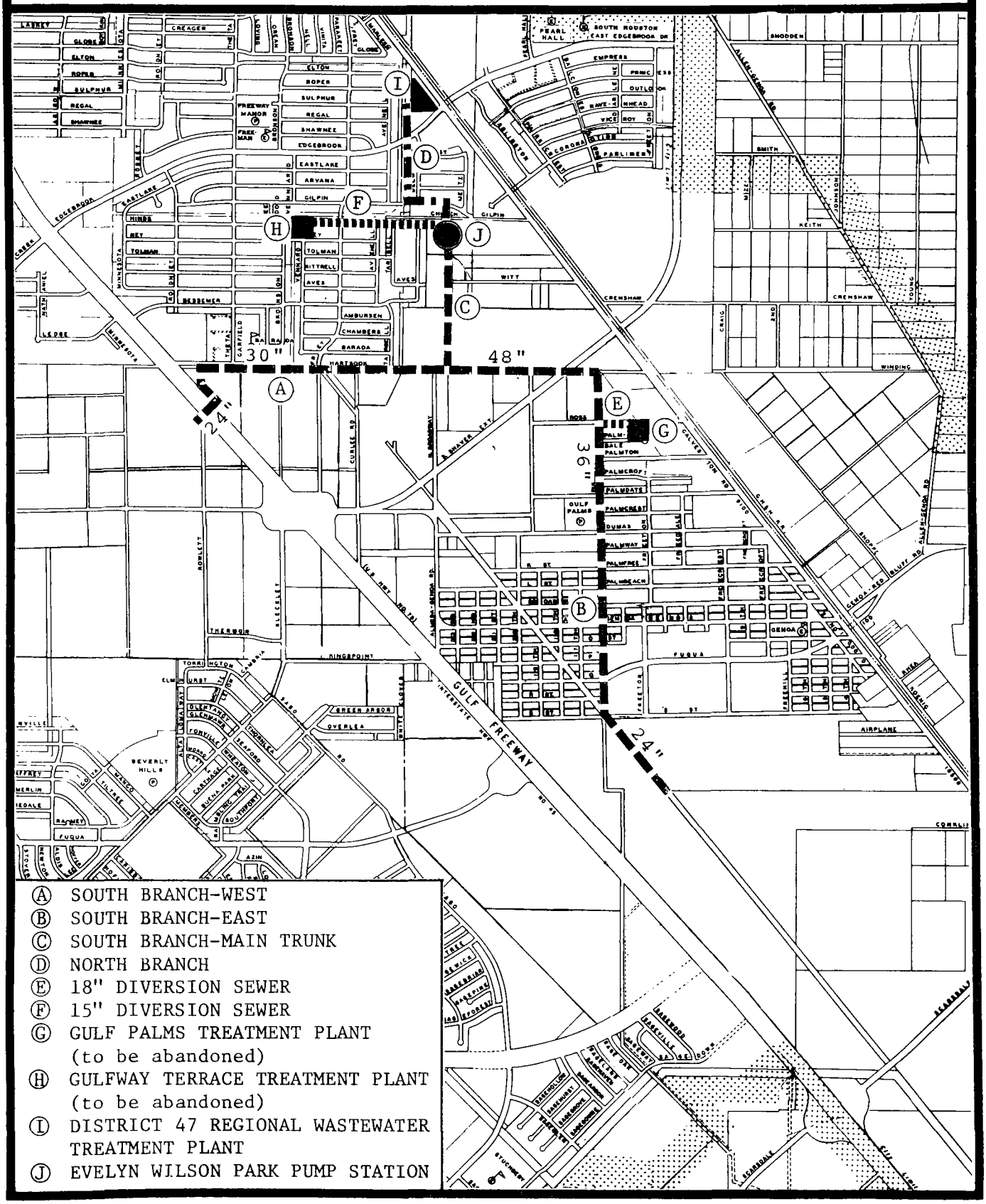
The south branch is proposed to have three sub-branches. These are:

(i) The South Branch East
(ii) The South Branch West
(iii) South Branch Main Trunk

(i) South Branch East:

This branch is proposed to begin at a point approximately 1,500 feet northwest of Conklin Road. From this point a 24-inch gravity sewer will run northwest a distance of approximately 2,080 feet to a manhole on Gulf Palms Street

FIGURE V-2: PROPOSED PROJECT ELEMENTS



between R and S Streets. From this point a 30-inch gravity sewer will run north along Gulf Palms Street a distance of 1,780 feet, at which point the sewer will be enlarged to a 36-inch line which will continue north on Gulf Palms Street a distance of 3,580 feet to Ross Street. From this point, the trunk sewer will continue north as a 42-inch line on Gulf Palms Street a distance of 900 feet to Hartsook Street, then west as a 48-inch line on Hartsook Street a distance of 2,800 feet.

(ii) South Branch West:

This branch of the trunk sewer will begin as a 24-inch line on the west right-of-way of the Gulf Freeway (I.H. 45) at Rowlett Street. From this point the line will cross under the Gulf Freeway to the east right-of-way of the Freeway and continue northwest along the Freeway for a distance of 380 feet, then north a distance of 380 feet to Hartsook Street. From this point, the sewer will continue as a 30-inch line east along Hartsook Street for a distance of 4,500 feet where it will join the south Branch East.

(iii) South Branch Main Trunk:

This trunk sewer begins at the confluence of South Branch East and South Branch West and continues as a 54-inch line north along an easement to the proposed pumping station located in the northwest corner of Evelyn Wilson Park.

(b) North Branch:

North Branch runs north from the pump station. It will transport wastewater a distance of 3,030 feet as a 24-inch force main along a Houston Light and Power Company easement

to the existing 3.0 mgd District 47 Regional Wastewater Treatment Plant. Tunneling will be employed where the trunk sewer crosses major streets.

(2) Evelyn Wilson Park Pump Station

The proposed pump station will be constructed underground except for the concrete roof slab and upper walls which will extend 12 to 18 inches above the ground surface. The pump equipment will all be located underground and will be sized for economical enlargement as the volume of wastewater entering the pump station increases. Initially, the pumps will have a maximum capacity of 12,000 gpm which is projected to serve the need for 1990. With changes in impeller size, these pumps could have a future maximum capacity of 22,500 gpm.

(3) Diversion Sewers

(a) Gulf Palms Diversion Sewer

Wastewater from the present Gulf Palms Plant will be diverted to the South Branch East of the Trunk Sewer and ultimately to the District 47 Plant via a 990-foot long, 18-inch gravity diversion sewer running from the plant westward along Ross Street to the intersection of Ross and Gulf Palms Streets. The route of this diversion sewer is shown in Figure V-2.

(b) Gulfway Terrace Diversion Sewer

Wastewater flows from the present Gulfway Terrace Plant will be diverted to the Trunk Sewer Pump Station at Evelyn Wilson Park and ultimately to the District 47 Plant via a 2,500-foot long, 15-inch gravity diversion sewer running from the plant eastward along Hinds and Old Church Streets to the pump station. See Figure V-2 for the route of this diversion sewer.

C. RELATIONSHIP OF THIS ACTION WITH OTHER HOUSTON WASTEWATER FACILITIES SYSTEM STUDIES

The construction of this collection-treatment-disposal system under the proposed action is consistent with the Master Plan for the city's sanitary sewer system and the city's wastewater management plant. These plans designate the District 47 Plant as one of the regional wastewater treatment plants for the city. The proposed action is part of a comprehensive program of phasing out small plants in the city by constructing diversion and collection sewer for transporting wastewater to the designated regional plants.

D. STATUS OF PROJECT, APRIL, 1974

1. Engineering Design Report

The report entitled "Engineering Design Report for Trunk Sewers, Main Sewers and Pumping Stations" for the District 47 Area was completed and submitted to the City of Houston in September, 1970, by Sheiner, Hicks and Cherry, Consulting Engineers. Detailed plans and specifications are in the final stages of preparation.

2. Funding of Project

Funding for the City of Houston's share of this project has been arranged by contract with the Gulf Coast Waste Disposal Authority which sold the required bonds in November, 1973.

3. Timing

Construction of the proposed project will begin in April, 1975, and is scheduled for completion in April, 1976.

CHAPTER VI: ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

A. SHORT-TERM IMPACT (CONSTRUCTION IMPACT)

B. LONG-TERM IMPACT OF THE PROPOSED ACTION

C. SECONDARY IMPACT OF THE PROPOSED ACTION

D. RELATIONSHIP BETWEEN THE PROJECT GROWTH AND TYPE OF GROWTH DESIRED BY THE AREA RESIDENTS

E. IMPACT OF THE PROPOSED ACTION ON THE ACHIEVEMENT OF LAND USE GOALS

VI. ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION:

This chapter deals with the impact of the proposed project on the natural and man-made environment within the immediate vicinity of the project sites and the service area. Impact is classified in three categories: short term, long term and secondary impact. Short term impact is same as construction impact. Its duration is short-lived and confined to the area where construction will take place. Long term impact includes areas beyond the project sites. Secondary impact will cause changes in the environment as a result of new social and economic activities for the service area and in some instances for the city as a whole.

A. SHORT TERM IMPACT (CONSTRUCTION IMPACT)

Construction activity associated with this project will consist of trenching and tunnelling for the trunk and diversion sewer installation and some excavation at the pump site.

1. Impact on Physiography (Soils, Geology, Vegetation, Water Courses):

a. Alterations to Land Forms, Streams, and Natural Drainage Patterns:

The construction of the project will cause no permanent alterations in land forms, soil condition, streams, or natural drainage patterns. Temporary alterations made in these features will be rectified immediately following construction activities.

b. Erosion Control Measures

Because of the flat character of the area where construction will occur, erosion should cause no problem. In those areas where erosion might occur, it will be controlled through

the use of temporary settling ponds and dikes. The construction sites will be graded , seeded and restored to their original state upon completion of work.

c. Dredging, Tunnelling and Trenching

Construction will not require dredging. Trenching and tunnelling will be required during installation of the trunk and diversion sewers. The proposed South Branch West of the Trunk Sewer will cross the Gulf Freeway (U. S. 75 or I-45) at Rowlett Street. It will therefore be necessary to obtain permits from the Texas Highway Department for necessary highway crossings. Construction of this sewer will be correlated with established Texas Highway Department policies affecting utility alignments and tunnelling.

d. Protection for Cover Vegetation, Trees and Disposal of Soil and Vegetation Spoil

Cover vegetation and trees will be protected, where possible, by means of fences and wooden slats. Only such growth will be removed from the right-of-way as is necessary for the construction of project elements. No clearance involving the use of herbicides, etc., is anticipated. Top soil removed during construction will be stockpiled and subsequently placed on stripped or fill areas. Excess soil will be deposited in the project site area. Vegetation spoil will be disposed of by burial.

e. Areas Affected by Blasting and Precautions

Due to the nature of the soils in the area, blasting will not be necessary.

2. Short-Term Social and Economic Impact of Project Construction

a. Property Acquisition, Relocation, and Project's Impact on Land Values for Adjoining Properties

All lands needed for the project are either the public rights-of-way or under public ownership. No additional lands are required for the project.

The proposed project will require no relocation.

All lands in the southern part of the service area are virtually vacant. Land values in this area should rise because of the availability of sewer service. The abandonment of Gulf Palms and Gulf Terrace Treatment will result in a beneficial impact on the surrounding properties. Since the sludge from District 47 Plant will be treated and disposed of off-site, its handling of additional sewage will have no adverse effect on the value of the surrounding area.

b. Construction Impact on Public Safety and Convenience

Whenever possible, construction activity will be isolated from the public except for line work across and along roads. The contractor will be required to furnish barricades, lights and flagmen to protect the public. Contract specifications will include provisions governing public safety during construction to insure public protection against construction hazards. Similarly, he will be required to provide all available safety measures to protect his employees.

City ordinances require the contractor to keep city streets clean and clear. Appropriate traffic control regulations

will be included in the contract specifications. The City Engineer's office will oversee the implementation of these regulations.

3. Construction Effect on Surrounding Environment

a. Dust Due to Construction and Control Measures

Dust control measures, where necessary, will consist of frequent sprinkling with water. Effect on the surrounding environment will be minimal.

b. Effects of Night Work

The contractor, as a rule, will be required to limit construction activity to daylight hours. Night work will be permitted only for special tasks to take advantage of conditions characteristic of such hours. In such cases, the use of flood lights will be restricted to the work site only. No harm to wildlife or serious disturbance to area residents is anticipated as a result of night work.

c. Areas Affected by Construction Noise and Precautions

The proposed pump station construction will take place on the corner of a city park. This site is sufficiently removed from residences so that construction noise will not be a problem. Some portions of the trunk and diversion sewer line work will be close to residences and some noise may be heard. This should, however, present no more than a temporary inconvenience to the nearby residences.

Construction of the proposed facility will require the use of machinery and equipment that will increase ambient noise and

produce high temporary noise levels. The type of equipment to be used will generate average noise levels ranging from 70 to 85 dBA. The contractor will be required to minimize the impact of equipment noise as much as possible. Special precautions required to minimize noise levels should be specified in the contract.

B. LONG-TERM IMPACT OF THE PROPOSED ACTION

1. Effect on Physiography

This has been more adequately covered in Impact on Ecology, Chapter VII, Page 75.

a. Project Relation to Flood Plains

The site for pump station and the District 47 Plant are outside the 100-year flood plains. See Figures III-2, Chapter III (Social and Environmental Setting), Section A, Surface and Sub-Surface Setting, Subsection 4, Hydrology, (d) Flood-Prone Areas, Page 18.

2. Impact on the Surrounding Environment

a. Relationship of the Project with Residences and Business and Prevailing Wind Patterns

The proposed pump station is situated some distance from existing activities in the surrounding area. Prevailing winds, for most of the year, originate from the south. Since there is no residential area to the immediate north of the pump site, little possibility exists of occasional odor problems

affecting the resident population in the surrounding area; however, the District 47 Plant is surrounded by built up areas. Its increased handling of wastewater will have some impact on the areas around it but the problem will be minor because sludge will be treated off site.

b. Incineration

Plans for the proposed project do not include any sludge incineration since sludge will be transported and processed into soil fertilizer at another plant.

c. Possible Odor Sources, Assessment of Potential Odor Problems and Their Effects

The selection of the project was carefully made to avoid odor sources and their effects as much as possible. Since the District 47 Plant utilizes the activated sludge process, odor emanating from the treatment site is minimal except on unusual occasions.

All project elements have been designed to minimize odors. The trunk and diversion sewer lines are completely enclosed. As such, the confined wastewater should present no odor problem, except on rare occasions when possible variations in flow may produce man-hole "breathing" near the pump station. The incidence of this is also minimized by placing the pump station underground. The operation of the pump will not adversely affect the recreation functions of the park area since it will located at a corner of the park away from the sport and recreation areas. Except in unusual cases, there will be no odors eminating from the pump site. Its placing underground will keep the noise level to a minimum. The overall adverse effect of the pump site on the park will be insignificant.

The District 47 Plant requires all influent to be pumped to prevent odors arising from raw sewage, pumps discharge the sewage below the surface of the liquid in the aeration tanks. The aeration tank

maintains aerobic conditions in all parts of the tank, thus reducing odor problems associated with the treatment process.

No odor problems should arise from the sludge at the plant site since sludge will be transported to Sims Bayou Multi-Regional Sludge Disposal Plant. In that plant, vacuum filters are completely enclosed and the air from that building is given ozone treatment prior to its release into the atmosphere. This virtually, eliminates odors in the surrounding area. Also, after-burners are utilized to combust the volatile gases released during flash-drying of the sludge prior to its conversion into soil conditioner/fertilizer. This process has been successfully used for the last 23 years by the City of Houston.

d. Potential Noise Levels and Protective Measures

Noise and vibration cannot be completely eliminated from the plant site and as such will to some extent inconvenience the plant employees. This is not considered a significant problem, however.

e. Ultimate Disposal Methods for Grit, Ash, and Sludge

Sludge generated by the District 47 Plant is and will continue to be processed into soil conditioner/fertilizer at the Sims Bayou Plant. The fertilizer will be sold wholesale to a market in Florida which consumes all fertilizer produced from all sludge disposal plants of the City of Houston.

3. Impact on Air Pollution

The effect on air pollution from the construction phase of the project will be temporary. The other source of air pollution includes the operation of the plant itself and possible odor sources from the treatment process. The effects of these have been discussed

in item 2.c in this section.

When the District 47 Plant approaches the 3 mgd load, its effect on the quality of ambient air will be very minor compared to other sources of air pollution in Houston. However, there will be some additional air pollution problems at the Sims Bayou Plant site as a result of the additional sludge transport from the District 47 Plant. It is estimated that only 0.21 tons/day of volatile gases will be incinerated by the afterburners in the sludge drying process at the Sims Bayou Plant as a result of the sludge transport.

A study* by the World Health Organization compared pollutants caused by the automobile with that of municipal incineration. The study reveals the following results for American cities:

Type of Pollutants	Contaminants in lbs/ton	
	Automobile Gasoline	Municipal Incineration
Particulate Matter	0.12	24.0
Carbon Monoxides (CO)	1000.00	Data Not Available
Sulphur Oxides (SO_2)	5.80	2.0
Nitrogen Oxides (NO_2)	9.00 - 18.00	2.0
Organic vapors including hydrocarbons	70.00 -140.00	1.20

Based on the above data, it is estimated that the quantities of air contaminants to be released from the after-burners as a result

*Air Pollution, World Health Organization, Columbia University Press 1961.

of sludge transport per day will be equivalent to the air contaminants generated from the combustion of approximately 30 gallons of automobile fuels per day. Considering contaminants from the ozone treatment for sludge drying, the net effect of the District 47 Plant on air pollution around the Sims Bayou Plant is estimated to be equivalent to the combustion of 54 gallons of automobile fuel per day. That level of air pollution is equivalent to the air pollution that is caused per day from the use of automobiles by 18 average families in Houston. The project's primary impact on air pollution is, therefore, very minor.

4. Impact on Water Quality

a. Effect on the Quality of Water in Drainage Ditch, Berry Gulley, Sims Bayou and the Houston Ship Channel:

The proposed action will comply with the effluent discharge requirements prescribed for the City of Houston by the state and federal agencies. The existing effluent from the plant contains the BOD_5 and TSS levels of 6 and 8 mg/l respectively. This effluent quality is not expected to be significantly affected by the addition of another 1.34 mgd of wastewater for treatment at the District 47 Plant.

The low flow in the adjoining drainage ditch and Berry Gully is mostly the sewage effluent from the existing plants. The increased quantity of effluent to be discharged by the District 47 Plant should change the streams' condition from one of periodic low turbid flow to one of steady flow, eliminating the stagnation which causes odor problems. The water in Berry Gully at Forest Oaks Street during low flow period has a BOD value of 38 mg/l. The water quality at this location as a result of additional effluent discharge from the District 47 Plant is estimated at a BOD value of 20.2 mg/l or a BOD reduction of 48%. The capacity of the receiving bodies of water

is sufficient to absorb the new flow of 1.34 mgd without causing any floods in these streams.

Since Berry Gully is discharging into Sims Bayou, water flow and quality in Sims Bayous should improve. The proposed project should also contribute to the water quality of the Houston Ship Channel since Sims Bayou finally empties into that channel.

b. Effect on Municipal and Industrial Water Supplies and Ground Water

The water of HCFCD Drainage Ditch, Berry Gully or Sims Bayou is not utilized for water supplies purposes. The effluent disposal is expected not to have any adverse effect upon groundwater because of impermeable soil conditions. Surface water supplies start about 40 miles north of the project and therefore will not be affected.

5. Impact on the Biological Environment

a. Effects on Aquatic Life

Construction of the proposed project should have a beneficial effect on the aquatic biota in the receiving bodies of water by reducing pollutants in these streams. The dissolved oxygen in these streams will increase as a result of low BOD discharge. Also, the project will facilitate uniform water flow conditions even during low flow periods. This will eliminate stagnant pools which may cause odor problems. The adverse effects of the chlorine residual on aquatic life in the receiving streams will be only local. The free residual chlorine is short-lived in the natural water system.

b. Effect on Insect Populations and Insect Control Programs

The proposed project will have no detectable effect on the insect population of the service area. However, the mosquito

population of the receiving streams will be reduced as a result of the elimination of stagnation which causes odors and breeds mosquitos. This is a beneficial effect since these insects carry germs to affect public health.

c. Effect on Wildlife, Birdlife, and Plant Vegetations

Except for a minor disruption in and around the pump site, no effect or protracted disturbances of natural habitats will result from the proposed action. The clearing of vegetation will be temporary, and ground cover and trees will be restored to the land immediately following construction. Increased water flow and quality will have a positive impact on the growth of plants and vegetation along the receiving streams.

6. Impact on Parks and Recreational Potentials

a. Effects on Historic Sites, Recreations Uses or Natural Preserves

None of the project elements will affect any historic site, area, or preserves. In fact, depending on the goals and policies, the project could significantly enhance the parks and open space development in the city. Implementation of the regionalized wastewater system will improve the water quality not only in the receiving streams for the District 47 Plant but for other waterways in Houston as well. The cumulative effect of this policy can open up dramatic possibilities of parks and open space development in the flood plain areas of Houston. By pursuing an agressive flood plain development policy, the city can restrict private development in flood plains and use them for recreation and open space, and at the same time serve the cause of environmental conservation and beautification.

A great opportunity exists in the service area of the proposed project to develop linear parks and open space corridors along the drainage ditch and Berry Gully. Scattered parks and open space spots along Berry Gully can be connected to form linear open space systems. Pedestrian trails and bicycle paths could be created along the drainage ditch. The improved water flow and quality will aid in the achievement of recreation goals of the Houston Area.

b. Local Areas Designated for Use as Recreational Areas or Natural Preserves

None of the existing parks and recreation areas in the service area have been designated as Natural Preserves. The beneficial impact of the proposed project on recreational areas has been discussed in Item 6 (a) above.

7. Impact on Resources Conservation

a. Wastewater Re-Use

Although wastewater re-use by industries is possible, there is little or no market for such recycling at the present time. A relatively inexpensive supply of water is available in Houston. Projections indicate that available sources will be adequate to supply water through the year 2000. However, in view of the growing concern over Houston's emerging problem of subsidence as a result of continued pumping of underground water and serious environmental ramifications associated with this problem, every attention should be given to develop markets for wastewater re-use for commercial and industrial purposes so that the need for underground water can be reduced. The possibility of installing additional

treatment units in each wastewater treatment plant to produce improved effluent which could be recycled for non-domestic purposes should be explored.

b. Groundwater Recharge and Spray Irrigation

Though it may not be economically feasible to recharge aquifers with treated wastewater in the immediate future, special programs should be studied and if found possible, should be implemented to recharge aquifers with treated effluent. The heavy rainfall in Houston is not enough for groundwater recharge because of the generally unpermeable soil of the Houston area. There is no spray irrigation conducted in the service area at the present time. There is no agricultural activity in the area requiring spray irrigation.

8. Impact on Aesthetic Values

a. Interference with Natural Views of the Area

The proposed facilities will not interfere with or obstruct any natural views. The placing of pump station and proposed sewer lines underground will eliminate any possible interference with natural views.

b. Architectural Techniques and Landscaping

Care will be taken to blend the pump site with the surrounding park area. Trees and shrubs will be planted and fences erected where necessary in and around the site. Grass planting and other landscaping activities will be undertaken to esthetically make the site an integral part of the Evelyn Wilson Park. Some noise and vibration from pump operation will be unavoidable but its aesthetic intergation with the park and its corner location will more than offset adverse effect on the park. The recreational activities and continued use of the park by the surrounding area population will not be affected by the construction of the pump at this location.

C. SECONDARY IMPACTS OF THE PROPOSED ACTION

"Secondary Impact" does not imply effects of secondary (minor) significance, particularly for infra-structure projects. Such investments can stimulate other investments and changes in the area's pattern of social and economic activities. These effects are often more significant than the primary impact of a project. For instance, the effect of a proposed project on population, economic development and land use growth may be among the more significant secondary effects.

1. The Impact on Commercial, Residential, Industrial and Related Development

The addition of sewer service to an area is one of the key factors for land use growth. Other factors are land availability, transportation and so forth. Except for sewer service, the project area offers ample opportunities for development. The provision of sewer service in combination with other factors would probably cause most of the vacant land in the area to be urbanized within the next 20-year period.

Though the effect of the proposed project on the development of the service area cannot be completely quantified, the secondary net impact on the residential, industrial and related developments can be determined by making certain assumptions. A summary of the net numerical impact of the project on the area development activities is shown in Table VI-1.

TABLE VI-1

SECONDARY NET IMPACT OF THE PROPOSED ACTION DURING 1970 - 1990

Net Impact On:	Magnitude of Net Impact	
	Number	Acres
Population	22,000 persons	-
Employment	9,700	-
Residential Development	9,200 housing units	1,225
Industrial Development	-	195
Commercial Development	-	106
Parks and Recreation	5	230
Schools	5	135
TOTAL	-	1,881 acres

As Table VI-1 indicates, almost 1900 acres of land could be brought under urbanization to accommodate the social and economic activities within the service area as a secondary impact of the project elements.

The environmental implications associated with this urbanization are enormous. The ecology of the service area will be vulnerable to this impact, unless precautions are taken to insure that the natural characteristics, both physiographic and biological, are protected from adverse effects as development occurs. The formulation and implementation of a comprehensive land use policy

will be the key to avoid these adverse ramifications in the future.

a. Impact on Economic Development

The economic implications of the secondary growth are also expected to be substantial. Over 9,000 new jobs can be created as a result of the project and associated infra-structure improvements. The enormous real-estate investments anticipated as a result of the project could be a great opportunity for an area which has somewhat been by passed by Houston's growth in economic development. On the other hand, it could be a significant liability to the area if the quality of development is not assured by appropriate land use policies.

b. Impact on Other Urban Services

The city government of Houston cannot and should not emphasize one or two major city services and ignore others. To develop a desirable living pattern, other services and facilities must also be provided. For instance, the 1990 increase in population, employment and land use for the service area will create a solid waste disposal need of 42 tons per day. This service has also to be provided by the City. Likewise, transportation, open space, protection and related services will demand attention from the project area residents.

In the past, the development in the service of District 47 Plant has been characterized by uncoordinated public service facilities. The result has been a haphazard pattern of growth. This must be avoided in the future.

2. The Extent to Which the Proposed Action will serve the Unsewered Areas

Service will be provided to presently unserviced areas to comply with "reserve capacity" requirements of the Federal Water Pollution Control Act Amendments of 1972, Section 204 (a) (5). Sewer policy in Houston has been for developers to construct subsystems and deliver sanitary sewage to interceptor lines. In the event of failures by private developers to comply with this practice, the city has the authority to levy front foot assessment and hook-up charges sufficient to underwrite the costs of line installation. The construction of the project will sewer the part of the service area which is currently served by septic tanks.

D. RELATIONSHIP BETWEEN THE PROJECT'S EFFECT ON GROWTH AND TYPE OF GROWTH DESIRED BY THE AREA RESIDENTS

In the event, plans for future development are incompatible with the wishes and desires of the residents, a variety of administrative and judicial remedies are available to the citizens.

In 1973, the City of Houston Planning Department initiated a Citizen Participation Planning Program under which the city has been divided into a number of communities and neighborhoods for planning purposes. The program calls for active citizen involvement in the planning process. The program develops neighborhood plans by utilizing inputs from those who live, work, own property or do business in a neighborhood. It offers the residents of the various parts of the city an opportunity to voice their opinions on the type and intensity of growth they desire for their particular area.

Through this program, the citizens can prevent the type of growth which they do not want for their area. The effect of the proposed project on the type of growth therefore cannot be such as will be against the wishes of the area residents.

E. IMPACT OF THIS PROJECT ON THE ACHIEVEMENT OF LAND USE GOALS

Unlike most cities in Texas and across the country, the City of Houston does not have any zoning to control land use in the city. It has, therefore, attempted to influence growth through its authority to approve subdivision plats, issuing building permits and through the provision of transportation, sewer and water services, drainage systems, and so forth.

In view of the type of environment achieved through regulatory practices by the cities with established zoning, Houston appears to have done relatively well without any zoning regulations.

Absence of zoning has placed the City of Houston in a unique position to manage growth through "impact policies" which, if carefully applied, are a superior technique to quide and promote growth for large cities in the United States. From this standpoint, the proposed action is highly compatible with the current policy of the city in stimulating and guiding land use growth to the benefit of all people in Houston.

CHAPTER VII: ADVERSE IMPACTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

A. SUMMARY OF ADVERSE EFFECTS

B. SECONDARY ADVERSE IMPACT ON THE ENVIRONMENT

VII. ADVERSE IMPACTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED

The project is the outgrowth of a commitment made to the service area property owners and residents. It has been designed to minimize harm to the environment while collecting and treating wastewater in the most efficient and economical manner possible.

A. SUMMARY OF ADVERSE EFFECTS

Adverse impacts which cannot be avoided are:

- Occasional odor associated with pump station and manholes
- Minimal levels of pump and compressor engine noise.
- Construction noise.
- Some disruption of traffic flow during construction.
- Some air contaminants and particulate matter in the air due to construction activities.
- Some amount of thermal emissions into ambient air due to the plant operation.
- Some disruption of natural earth within the pump site and within public rights-of-way for installing sewer lines.
- Long term impact on environment and ecology (if present trends of land use are allowed to continue).

1. Disruption and Inconvenience During Construction

The construction of this project will cause temporary inconveniences to the users of some thoroughfares in the service area. This will include blocked driveways and sidewalks, reduced speeds in the construction area and soft shoulder surfaces

following installation of sewer lines. With careful planning and proper scheduling, the inconveniences associated with project construction will be kept to a minimum. All contracting documents, plans, and specifications will include provisions for minimizing construction impacts. Ground surfaces will be restored as quickly as possible after construction.

2. Noise

The construction process will require the use of machinery which will create a moderate, temporary noise nuisance. Proper equipment maintenance and noise reduction policies will be implemented.

3. Loss of Habitat

Loss of some habitats during project construction is possible. However, since the construction will occur on the corner of the city park, loss of habitat is expected to be minimal. No loss of habitat is expected as a result of sewer line installations.

4. Air Pollution

Construction activities will cause some temporary increases in particulate matter concentrations due to dust. Water sprinkling and minimizing equipment movements will keep this problem to a minimum. Hydrocarbons, carbon monoxide and other byproducts from fuel combustion of construction equipment will be emitted in the construction area but will not significantly affect air quality.

Within the pump site, some occasional odors will be unavoidable. Precautions will be taken to keep this problem to a minimum.

B. SECONDARY IMPACT ON THE ENVIRONMENT (Under Present Conditions)

While the project's short-term adverse effects on the environment will not be significant compared to the benefits, its long-term adverse impact on the quality of the environment could be severe unless appropriate policy actions are taken to avoid detrimental effects. There are many secondary benefits to be derived from the project. However, the adverse effects associated with the change in the level of environmental quality resulting from the expanding urbanization for the service area must be carefully evaluated before beginning construction. The City of Houston must consider these potentially adverse effects and develop necessary policies with regard to land use location and intensity to deter such effects on the service area of the project.

1. Secondary Impact on Air Pollution

An additional 22,000 persons are expected to live in the service area of the project by 1990. These additional people will generate a total of 67,000 trips per day, which will call for an extensive road building program to accomodate the travel need. See Appendix HH for a more elaborate analysis of this problem. The associated impact of this on air pollution will be considerable and certainly be much more significant than the level of air pollution caused by the primary impact of the project from the wastewater and sludge treatments. This problem will affect not the service area alone but other parts of the city as well. Unless the City of Houston adopts a stronger measure on air pollution than the ones currently operational, the secondary impact of the project construction could adversely affect the public health and environment of the area. Since the problem will be incremental, the City of Houston could implement a program

of public transportation under which the need for automobile travel could be incrementally reduced in the future.

2. Impact on Water Quality

On a short-term basis, the impact of the project on the water quality of the receiving waters will be beneficial. However, as vacant lands in the service area are urbanized, the water quality of the waterways will deteriorate. As the runoff increases in these water courses, with increased dust particles, grit and related spoils, the quality of water is expected to decline. Effects of this condition will be harmful to the aquatic life in these streams. Also, with expanded urbanization, drainage will become increasingly difficult, making many areas subject to potential floods that will cause damaging effects on life, property and the environment.

3. Impact of Subsidence on Underground Utility Lines

One of the major environmental problems currently facing the City of Houston is the continuing subsidence of the Houston area caused by the pumping of underground water for domestic and commercial supplies. This subsidence, with its serious consequences for the environment, will create a major problem for the underground utility lines. The city's expanding program for sewer extension should be carefully implemented so that the uneven settlement of lands will not cause sudden failures of the water, sewer or other utility lines. The breakdown of these systems would be a hazard to public health and the environment. A monitoring program should be instituted to identify areas where

the problem is serious now and where it may occur in the future. This effort should be supplemented by undertaking rehabilitation programs to correct breakdowns when they happen. All future utility lines should be carefully planned and aligned to avoid this problem.

4. Impact on Ecology

With the growth of the service area, some of the natural elements will inevitably be affected by the secondary impact of the proposed project. Man-made activities are likely to invade the natural environment. Soils, geology, sub-surface hydrology and vegetation all will be affected by the continuing growth of the service area.

The goal of peaceful coexistence between man and nature will not be an easy task to achieve. Unless new and innovative policy programs are designed and implemented to create such a balance, long-term consequences of the proposed project could be seriously adverse to the quality of air, water, land, life and the environment. The City of Houston must balance its goals of urbanization against the need of protecting the environment which took thousands of years to evolve into its present state.

CHAPTER VIII: IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION, SHOULD IT BE IMPLEMENTED

A. RESOURCES WHICH WILL BE IRRETRIEVABLY COMMITTED TO THE PROJECT

B. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED ACTION, SHOULD IT BE IMPLEMENTED

Certain irreversible and irretrievable commitments of resources will be required for the construction, operation and maintenance of the proposed project. Resources such as steel, concrete and fuels are essentially nonrenewable, but the benefits gained by their short-term depletion are expected to more than offset the costs of the project improvement.

A. RESOURCES WHICH WILL BE IRRETRIEVABLY COMMITTED TO THE PROJECT

1. Energy

Operation of the pump station in Evelyn Wilson Park will require approximately 1,963,000 kilowatt hours of electrical energy per year at peak capacity and the annual cost in Houston is estimated at $21,000. With operation at expected capacity, electrical energy requirements should be approximately 470,000 kilowatt hours per year, and the estimated cost is $5,000 per year. These estimates are based on historical energy requirements data available for plants of comparable size and equipment. The additional energy required for the District 47 Plant will be balanced by the energy regain from the abandoned plants.

2. Chemical

The proposed action does not require the utilization of any chemicals. The additional chemicals to be used for the District 47 Plant will be offset by the chemicals to be regained from the abandoned plants.

3. Manpower

Operation and maintenance of the pump station will require an approximately 0.25 man-years or nearly $2,500 per year.

4. Money

Funds committed to this action will be retrieved through customer service charges. However, the opportunity to commit the same funds to some alternative endeavor for the duration of the bonded indebtedness must be considered irretrievable. Compensation for this irretrievability is reflected in interest rendered. The estimated cost of this proposed action is approximately $4.4 million.

5. Land

During the lifetime of the sanitary sewer trunk and diversion lines, land designated for right-of-ways and easements will be in effect unavailable for other use. It is not anticipated that these sewers will be abandoned. However, should they be, the land may be returned to its former condition and made available for other use.

The sites of the abandoned wastewater treatment plants will be made available for other productive uses. They are ideally suited for neighborhood mini-parks. No additional land for right-of-way or easements is required for the proposed action.

B. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The improved sanitary system recommended for the District 47 Area, on balance, will enhance the environment by reducing water pollution and public health problems caused by existing septic tank systems and overloaded, inefficient treatment plants. Efficient and improved sewage treatment will increase long-term productivity by allowing more efficient use of land and related environmental resources in the service area.

The proposal does not and will not impose harmful net cumulative effect and long-term alterations on the environment of the service area or the surrounding community. Inconveniences will be primarily short-term and will be related to the initial construction of the proposed facilities. Long-term programs will be needed to maintain long-term environmental values and associated natural characteristics.

If the proposed improvements are not made, then the degradation of water quality and public health conditions will continue. The people of Houston could suffer the effects over an indefinite period of time. Construction of the project would, therefore, control water pollution and improve the health and environment in this part of Houston. This will be accomplished by providing adequate public services, including wastewater collection and treatment, while facilitating increased long-term productivity of land and the environment. Delay of the project construction may impose additional adverse social, economic and environmental impacts on the area residents.

CHAPTER IX: COMMENTS, PUBLIC PARTICIPATION AND INFORMATION DISSEMINATION

A. SUMMARY OF PUBLIC HEARING, 21 JUNE 1973, CONCERNING PROPOSED DISTRICT 47 WASTEWATER FACILITY

B. REVIEW OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

C. COMMENTS AND RESPONSES

IX. COMMENTS, PUBLIC PARTICIPATION AND INFORMATION DISSEMINATION

A. SUMMARY OF PUBLIC HEARING, 21 JUNE 1973, CONCERNING PROPOSED DISTRICT 47 WASTEWATER COLLECTION FACILITIES

Six Pollution Abatement Federal Grant Projects proposed by the City of Houston were discussed in a Public Hearing held in the Houston City Council Chamber -- 9:00 a.m., 21 June 1973, including Captial Improvements to the District 47 Trunk and Diversion Sewers and related elements.

Plans for these projects had already been prepared and applications sent to the Environmental Protection Agency requesting federal participation in the amount of 75% of costs for each of the six projects. The concensus of persons attending the public hearing favored implementation of each project. No objections or complaints were raised at the hearing against any of the proposals. All were judged worthy and necessary by residents of the affected service areas.

Several attendees expressed dismay at the slowness of project schedules for extension of sewer lines to the areas concerned. Some property owners objected to paying ad valorem taxes while receiving inadequate sanitary service. Questions were raised about the need for depending on federal funding when the city has already sold sanitary sewer bonds for extending sewer lines and making improvements to the treatment and disposal facilities.

B. REVIEW OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

The Draft Environmental Impact Statement for the proposed project was distributed in October, 1974, for comments and review by 25 agencies, 23 state agencies, and 46 local agencies and individuals. The comments received from these agencies are enclosed following this chapter. Comments made or questions raised are answered following this section.

A public hearing was held on the proposed project by the U.S. Environmental Protection Agency, Region VI, on January 6, 1974. The hearing took place in the Rice Hotel in downtown Houston. Regional Hearing Officer, Mr. Jim Collins, presided at the hearing. There was no opposition voiced against the project. A complete record of this hearing is provided in Appendix I.

C. COMMENTS AND RESPONSES

Of the agencies and individuals who responded to the Draft Environmental Impact Statement by returning formal responses, only five agencies made some minor comments which call for additional clarification. The rest of the agencies had no comments to offer and were in agreement with the Draft. The comments sent by the three agencies are discussed below. EPA's response to each comment is made separately.

1) U.S. DEPARTMENT OF THE ARMY
Galveston District Corps of Engineers
P.O. Box 1229
Galveston, Texas 77550

COMMENTS: The comments of the Corps of Engineers are suggested corrections in the terms and definitions on flood levels and corresponding changes suggested in tables and illustrations in the Final EIS. The Corps also suggested some minor adjustments in flood and climatologic data used in the Draft EIS.

RESPONSE: Adjustments have been made as suggested. Reference is made to pages 18, 19, C-7 of Appendix C and Table E-1 of Appendix E.

2) DR. DEWITT C. VAN SICLEN
Professor of Geology
University of Houston
Houston, Texas

COMMENTS: Dr. Van Siclen's comments focused on the geologic faults which characterize the service area of the District 47 Plant, like most of the Houston area, which should be considered specifically rather than in generalities.

RESPONSE: The discussion on the subsidence problem included in the Draft EIS was not a general one. Perhaps Dr. Van Siclen has not seen Appendix D and impact of subsidence on underground utility lines, page 74. This 16 page long appendix supported by a number of illustrations defining the subsidence problems adequately covers the subject. According to a geological study conducted by Mr. Martin Sheets, a local petroleum geologist, "Surface Fault Zones, Houston Area, Harris County," there is no major active geologic faults which will affect the proposed project elements. The District 47 plant site is not subject to any surface subsidence problems.

3) MR. EDMUND L. NICHOLS
Assistant Commissioner
Texas Department of Agriculture
Austin, Texas 78711

COMMENTS: The comments from the State Department of Agriculture are divided into three parts: (i) on a short term basis the project will be beneficial to the environment by reducing water pollution and improving public health through the elimination of septic tanks and relieving overloaded treatment plants, (ii) alternatives consideration lacked innovative approaches that require less water and make use of the solid waste products as energy sources, and (iii) additional studies should be made of Houston wastewater management plans with the specific goal of reducing per capita water to meet the fresh water demand for agriculture and other activities providing vital human supplies and services.

RESPONSE: No response is needed for comments under (i). Comments (ii) and (iii) are highly interrelated since the thrust of both comments leads essentially to the same issue which is how to minimize per capita water consumption in the Houston area.

As to the adequacy of alternative uses of solid wastes (sludge), the City of Houston has been converting sludge from treatment plants into soil conditioner/fertilizer for the last 23 years for sale to a Florida-based citrus production firm. This is considered a reasonably good resource conservation technique. The City is also producing hypochlorite solution from the wastewater sludge for some of the plants for effluent disinfection before its discharge into receiving waters. One example is the Northwest Treatment Plant. The District 47 is scheduled for expansion after 1977. Engineering plans including infiltration/inflow analysis studies are currently underway. According to Binkley and Holmes, Inc., the City's engineering consultant, hypochlorite solution will be generated on-site for the District

47 plant when it is expanded.

The EIS study team of the EPA concurs with Commissioner Nichols' comments that the City of Houston should explore methods to reduce water requirements for its domestic and commercial supplies for reasons beyond and above the ones cited here. One of Houston's critical environmental problems is the land surface subsidence directly caused by the pumping of underground water. The continuation of this method will further aggravate this problem. Reference is made to page 20, Subsidence Problems in Houston, and Appendix D which discusses this problem in considerable length. Also, see Impact of the Proposed Plant on Resources Conservation, Wastewater Reuse, pages 64-65.

4) DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Regional Office
1100 Commerce
Dallas, TX 75202

COMMENTS: HUD has no reservations about the carrying out of the proposed project. It believes that the project appears to be very desirable, and the implementation of this proposal and the larger system of which it is a part appears to be very much needed and quite beneficial. HUD, however, raises two questions which require further clarification. First, the status of the two small plants to be abandoned upon the completion of the project construction should be defined in more detail in the Final EIS since if left standing for a significant period of time, they might present attractive-nuisance-type hazards for neighborhood children. Second, though the expansion of District 47 plant is not a part of the proposed project, HUD feels that its impact on the residential development within 300' from the plant site should be given attention. FHA mortgage is not available for such housing. The City of Houston does not have any zoning. HUD therefore feels that the Final EIS should include recommendations, suggestions and possibilities as to how development might or should be guided or controlled by the City for areas likely to be affected by the District 47 plant and its operation.

RESPONSE: The HUD comments are well taken. The second comment which deals with one of the most fundamental issues of urban development in Houston bears heavily upon the quality of urban environment not only for this section of the city but for the entire city of Houston as well.

(i) In response to the first comment, reference is made to the 8-line footnote provided in page 44 of this report. The wastewater regionalization plan for Houston recommended the closing of these two plants and diverting wastewater to District 47 plant. These two plants are scheduled to have lift stations since these sites will continue to collect wastewater generated from their present service areas. The land area needed for the operation of the lift stations will be a portion of the total site areas. The remaining lands could be easily developed into neighborhood mini-parks and community gardening as recommended in page 44. It is anticipated that the plant structures currently used for wastewater treatment including sludge-drying beds, will be dismantled immediately following the construction of the proposed project elements. Such action will eliminate any attractive-nuisance-type hazard for the neighborhood children.

(ii) As to the second comment, the adjoining tract to the west of the District 47 plant is not vacant nor proposed for single family homes. The land that appears vacant in Figure G-5: Existing Land Use for District 47 Service Area, is the easement r.o.w. for the adjoining drainage ditch in which effluent from the plant is discharged. See page 45 which presents an aerial map of the area. The tract to the north across the railroad and

the Galveston Road is vacant and shown for multi-family development in Figure G-6, page G-8. Land use proposal shown in this figure was taken from the work of the Binkley & Holmes, Inc., City of Houston's consultant who conducted the Infiltration/ Inflow study for the District 47 and the Easthaven area. The City of Houston does not have any detailed land use plan for this area, though their City Planning Department is currently involved in a citizen participation oriented Neighborhood Planning Program for Houston, but it has not yet completed plans for this area.

The only development guide that is available for Houston area is the 1990 Citywide Development Plan for Houston prepared by the City Planning Commission. This plan is shown as Figure III-4 (page 30) in this report. This plan is highly generalized and only indicates the District 47 area to be a low density area. Within this general framework, many uses are possible, though the basic thrust of future development is projected to remain low density.

In absence of a specific land use plan for the District 47 area, Binkley & Holmes prepared its own land use plan which is by no means binding to the City nor to the property owners of the area. A land use plan for the area was needed by the Binkley & Holmes, Inc., for its determination of wasteload from the area. Considering the location it enjoys with respect to the Galveston Road which is a major thoroughfare, the subject tract may well develop as a commercial use instead of apartments. In any case,

though the existing and proposed land use activities around the plant are physically well buffered by the drainage ditch to the west, Galveston Road and the railroad to the north and northeast, and a collector street and ample setbacks to the south, the District 47 plant does have some adverse effect on the surrounding activities and this effect is likely to increase as the actual wasteload increases as a result of the proposed project. But these effects are those which are normally associated with the operation of a wastewater treatment plant. The primary problem is the odor but that is not expected to be significant since sludge will be treated off-site at Sims-Bayou Multi-Regional Sludge Treatment Plant.

On the broad question of adequate land use control for the affected area, it is strictly a local matter to be handled by the City of Houston. The private deed restriction method which is a substitute for zoning in Houston is effective in some cases. The Neighborhood Planning Program is expected to generate citizen awareness of the quality of their area when this area is undertaken for detail neighborhood planning. Some measures could be taken at that time with the aid of the area citizens (see pages 69-70).

The EPA study team concurs completely with HUD that development control and guidance are indeed needed not only for the District 47 area but for other parts of Houston as well since this is a citywide problem and has to be dealt with as a policy issue at the city level. Land use coordination is absolutely essential for Houston if it is to provide a viable, pleasant

and stimulating environment for its citizens. Though the EPA study team is not in a position to recommend land use control for Houston within the scope of an EIS study, nevertheless this report as well as other EIS reports for Houston are reflective of this concern. This policy theme has been resounded throughout this report. Reference is made to Section B, Chapter VII, page 73 through 75, for example.

5) U.S. DEPARTMENT OF AGRICULTURE
Soil Conservation Service
P.O. Box 648
Temple, TX 76501

COMMENT: The only comment made by this agency is a reference it made to its letter of December, 1974, in which it included current soils data for the Easthaven Regional Treatment Plant and indicated that the same data also apply to the District 47 area.

RESPONSE: Adjustments have been made as suggested. See pages B-8 through B-10, Appendix B.

COMMENTS RECEIVED ON DRAFT

ENVIRONMENTAL IMPACT STATEMENT

TEXAS FOREST SERVICE

File 5.7

College Station, Texas 77843
December 18, 1974

Mr. Arthur W. Busch
Regional Administrator
U. S. Environmental Protection Agency
Region VI
1600 Patterson
Dallas, Texas 75201

Dear Mr. Busch:

Your letter of December 12, 1974 together with a copy of the Draft EIS For District 47 Regional Wastewater Facilities, City of Houston has been received.

I have no constructive comments to offer other than in a generalized way.

a. Biota plant material should be protected in the project area during the construction phases and replaced where needed after the construction phases have been completed.

b. There was no evidence in the above cited document that the Houston-Galveston Area Council participated in any of the deliberations nor offered any inputs in the preparation of the document. Nor are they included on the list of Agencies for review...as they should.

Very truly yours,

Mason C. Cloud
Head, Forest Environment Dept.

MC/jc

RECEIVED
DEC 30 1974
6AAW

JOE RESWEBER
COUNTY ATTORNEY

B. R. KERR
FIRST ASSISTANT

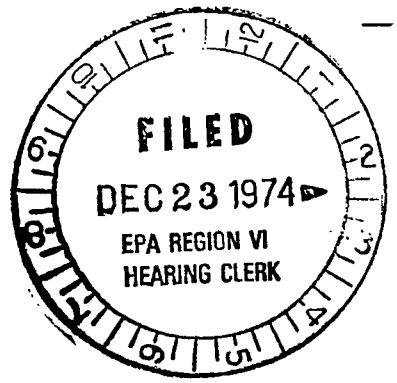
EDWARD J. LANDRY
SENIOR ASSISTANT

JERRY B. SCHANK
SENIOR ASSISTANT

OFFICE OF
COUNTY ATTORNEY
HARRIS COUNTY COURTHOUSE
HOUSTON, TEXAS 77002

December 19, 1974

IN REPLY REFER TO
C. A. FILE NO. 11,278



Mr. James L. Collins
Regional Hearing Officer
Region VI, Environmental
Protection Agency
1600 Patterson
Dallas, Texas 75201

Re: Draft EIS, District 47 Wastewater Facility

Dear Mr. Collins:

Thank you for the copy of the draft EIS on the captioned facility. I have reviewed it and find no fault with the proposal, and was especially gratified to see the conclusion that this new facility will reduce water pollution and public health problems, and will improve the flow characteristics through various drainage ditches or bayous.

My only adverse comment is that the data and statements made on pages 22 and 23 conflicts with other conclusions drawn by both EPA and local authorities. However, since the conclusion in the draft is that air quality must be considered in selecting the location of wastewater treatment projects, and since that has apparently been done and the selection location approved, there is no utility to pressing the point in this context. Otherwise, I am satisfied with the draft, and do not currently plan to attend the public hearing.

Thank you for your consideration.

Sincerely,

JOE RESWEBER
County Attorney

By JEFFREY B. GORDON
Assistant County Attorney

JR:JBG:bjw

Texas State Department of Health

JAMES E. PEAVY, M.D., M.P.H.
COMMISSIONER OF HEALTH

FRATIS L. DUFF, M.D., Dr. P.H.
DEPUTY COMMISSIONER

AUSTIN, TEXAS 78756

January 3, 1975

Mr. Arthur W. Busch, P.E.
Regional Administrator
Environmental Protection
Agency, Region VI
1600 Patterson, Suite 1100
Dallas, Texas 75201

RE: City of Houston, Texas
District 47 Regional
Wastewater Facilities
WPC-TEX-1008

Dear Mr. Busch:

Staff members have reviewed the Draft Environmental Impact Statement for the City of Houston's District 47 Regional Wastewater Facilities. The proposed installation will eliminate two small overloaded plants and is designed to treat the waste generated by the projected service area population for 1990, which is estimated to be 42,000 persons.

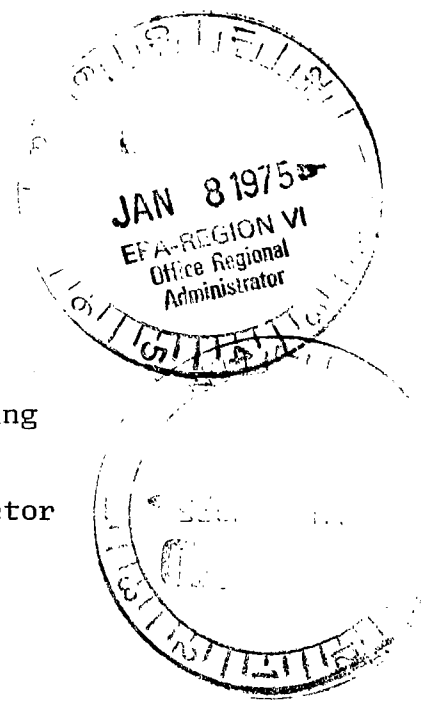
From the standpoint of public health, the project appears to be generally beneficial. Therefore, this Department offers no objection to the Draft Impact Statement as prepared.

Sincerely,

G. R. Herzik, Jr., P.E.
Deputy Commissioner
Environmental and Consumer
Health Protection

DMC/dec

ccs: Office of the Governor
ATTN: Wayne Brown, Division of Planning Coordination
Program Planning and Evaluation
ATTN: A. M. Donnell, Jr., M.D., Director
Region VIII
Texas Water Quality Board



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION SIX
FORT WORTH, TEXAS 76102

819 Taylor Street

January 2, 1975

IN REPLY REFER TO
06-00.8

Mr. Arthur W. Busch
Regional Administrator
Environmental Protection Agency
1600 Patterson
Dallas, Texas 75201

Dear Mr. Busch:

We have reviewed your draft environmental impact statement for construction of District 47 Regional Wastewater Facilities at Houston, Texas. We have no comments to make on the statement.

Sincerely yours,

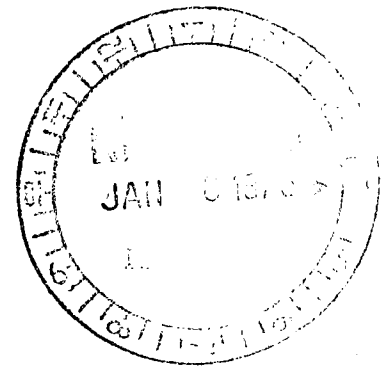
For J. W. White
Regional Administrator

W. A. QUEBEDEAUX, JR., PH.D.
DIRECTOR

HARRIS COUNTY POLLUTION CONTROL DEPARTMENT
107 NORTH MUNGER • BOX 6031
PHONE (713) 228-8311, EXT. 681
PASADENA, TEXAS 77502 6

83

December 30, 1974



Mr. James L. Collins
Regional Hearing Officer
Environmental Protection Agency
1600 Patterson Street Suite 1100
Dallas, Texas 75201

Dear Mr. Collins:

Submitted herewith are the results of samples taken by our office at three of the existing treatment plants in the area of the proposed District 47 Wastewater Treatment Facility. We trust this data may be of value to you in evaluating the historical data of the area and give some guidance to future planning. The attached data represents the results for the past three years. Data is probably available from our office for earlier dates of needed.

Sincerely yours,

C. E. Miller
Assistant Director-Engineering
Harris County Pollution Control Dept.

sg

Copy to Greg Edwards 1/7/75

GULF PALMS SEWAGE TREATMENT PLANT

T.W.Q.B. Waste Control Order No. 10495

Date	BOD	TSS
11/13/74	62	38
10/10/74	46	26
9/03/74	31	42
8/01/74	60	48
6/18/74	55	34
5/09/74	53	38
4/09/74	--	86
2/26/74	135	38
1/31/74	73	78
1974 average	64	48
11/27/73	217	16
10/04/73	102	28
9/12/73	88	22
8/29/73	131	16
7/31/73	81	31
6/26/73	57	39
5/24/73	102	18
4/10/73	167	14
2/01/73	59	22
1973 average	112	23
11/21/72	27	7
11/07/72	28	38
10/11/72	71	34
9/19/72	48	66
8/16/72	53	40
7/18/72	53	42
6/14/72	67	0
5/16/72	61	56
2/29/72	12	12
2/03/72	49	48
1/13/72	36	40
1972 average	46	35

GULFWAY TERRACE SEWAGE TREATMENT PLANT

T.W.Q.B. Waste Control Order No. 10495

Date	BOD	TSS
11/13/74	111	48
10/10/74	48	48
9/03/74	14	16
8/01/74	30	38
6/18/74	56	108
5/09/74	14	34
4/09/74	--	34
2/26/74	130	22
1/31/74	43	34
1974 average	56	42
11/27/73	71	20
10/04/73	83	28
9/12/73	30	19
8/29/73	23	22
7/31/73	73	48
6/26/73	32	32
5/24/73	136	32
4/10/73	24	17
2/01/73	35	38
1973 average	56	26
11/21/72	18	0
11/07/72	31	48
10/11/72	26	26
9/19/72	132	36
8/16/72	81	112
7/18/72	39	31
6/14/72	50	44
5/16/72	54	60
2/29/72	21	128
2/03/72	51	12
1/13/72	47	44
1972 average	50	49

FREEWAY MANOR S.T.P. WC&ID #47

T.W.Q.B. Waste Control Order No. 10495

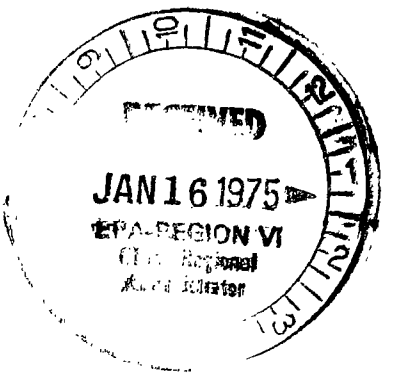
Date	BOD	TSS
11/13/74	5	8
10/10/74	3	2
9/03/74	4	1
8/01/74	2	10
6/18/74	4	7
5/09/74	4	6
4/09/74	--	6
2/26/74	6	5
1/31/74	4	0
1974 average	4	5
11/27/73	16	0
10/04/73	9	1
9/12/73	6	2
8/29/73	6	1
7/31/73	13	3
6/26/73	3	7
5/24/73	13	1
4/10/73	11	1
2/11/73	2	4
1973 average	9	2
11/21/72	3	--
11/07/72	7	14
10/11/72	7	10
9/19/72	7	8
8/16/72	4	7
7/18/72	1	10
6/14/72	9	8
5/16/72	11	44
2/29/72	6	28
2/03/72	10	8
1/13/72	10	12
1972 average	7	15

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77550

SWGED-E

14 January 1975

Mr. Arthur Busch
Regional Administrator
Region VI, Environmental
Protection Agency
1600 Patterson, Suite 1100
Dallas, Texas 75201



Dear Mr. Busch:

This is in response to your letter dated 12 December 1974, transmitting for our review and comments a draft environmental statement for the City of Houston's District 47 Regional Wastewater Treatment Facilities.

It is expected that the Corps of Engineers will resume flood control studies for Sims Bayou in the fall of 1975. Such studies will consider the effects of the wastewater discharges during flood stages, and flood control improvements will be designed accordingly.

Specific comments are as follows:

a. Page 18 - C. Flood Prone Areas - Third sentence should be changed to "The 100-year flood level of this watercourse is 50 feet mean sea level at ..." or "The Intermediate Regional Flood (100-year) level ..."

b. Page 19A - Incorrect title on Figure III-2. The title should be "AREAS SUBJECT TO 100 YEAR FLOOD".

c. Page C-7 - Second paragraph should be revised "...indicates a mean daily discharge (October 1971 - September 1972) of 76.2 cfs ranging from 18 cfs to 2390 cfs for individual days."

d. Table E-1 requires corrections as indicated on attached marked up copy. Data should be taken from same station and referenced.

Sincerely yours,

Martin W. Teague

1 Incl
As stated

MARTIN W. TEAGUE
LIEUTENANT COLONEL, CE
DEPUTY DISTRICT ENGINEER

TABLE E-1

MONTHLY PRECIPITATION (MEASURED IN INCHES)
CITY OF HOUSTON 1965-1973

Month	Location ? [a] 1965	Houston WB Airport 1966	Houston WB Airport 1967	Houston WB Airport 1968	Houston FAA Airport 1969	✓ 1970	✓ 1971	Houston WSO AP 1972	Houston WSO AP 1973
January	1.87	4.46	~~2.14~~ 2.41	8.02	2.74	1.93	0.36	3.30	5.00
February	3.27	7.75	~~2.47~~ 2.17	1.99	5.31	2.52	2.11	1.20	3.40
March	0.81	2.20	1.83	2.92	3.18	5.08	1.21	8.52	~~3.18~~ 3.68
April	0.95	7.98	4.42	3.02	3.34	2.21	2.14	~~1.85~~ 2.85	7.15
May	6.53	11.21	2.54	13.24	4.73	14.39	3.41	6.99	4.22
June	3.05	4.42	0.17	11.18	Houston Intcont AP 1.51	0.26	2.42	3.02	13.46
July	1.57	1.45	7.77	6.49	3.89	2.28	1.42	2.76	~~6.66~~ 6.77
August	2.29	7.11	1.60	2.90	2.67	2.03	6.95	3.90	3.73
September	~~3.46~~ 3.56	4.01	4.84	3.87	6.08	6.22	5.17	6.23	9.38
October	3.09	5.45	3.18	3.91	3.30	9.09	3.49	3.34	9.31
November	4.82	1.56	0.50	2.71	2.13	1.54	1.82	6.49	1.59
December	6.15	1.53	5.02	~~1.99~~ 1.19	4.38	0.64	7.33	2.20	2.47
TOTAL YEAR	37.97	59.13	36.45	61.44	43.26	48.19	~~36.83~~ 37.83	50.80	70.16

Average 1965-1973: 49.4~~8~~ 5 Inches [1]

SOURCE: United States Department of Interior, Weather Bureau

UNIVERSITY OF HOUSTON
CULLEN BOULEVARD
HOUSTON, TEXAS 77004

GEOLOGY DEPARTMENT

December 20, 1974

Mr. James L. Collins
Regional Hearing Officer
Environmental Protection Agency
1600 Patterson Street, Suite 1100
Dallas, Texas 75201

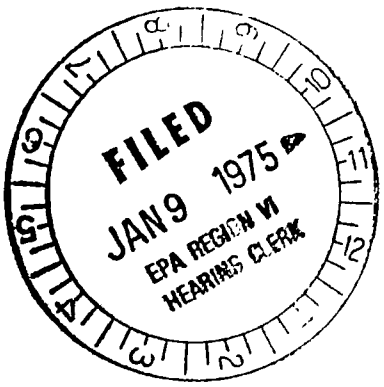
Dear Mr. Collins:

The City of Houston's proposed District 47 Regional Wastewater Facilities are located in an area crossed by several active geologic faults. These should be considered specifically in planning the construction, rather than in the generalities of a quoted source as has been done on page 20 of the Draft Environmental Impact Statement.

Very truly yours,

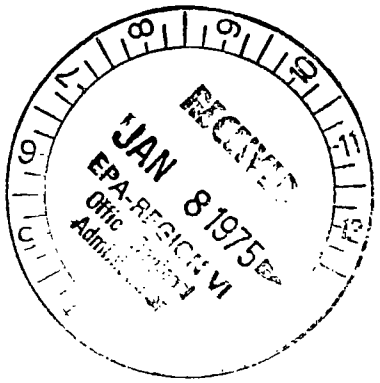
DeWitt C. Van Siclen
Professor of Geology

DWCVS:ae



EDMUND L. NICHOLS
Assistant Commissioner

January 2, 1975



Mr. Arthur W. Busch
Regional Administrator
U. S. Environmental Protection Agency
1600 Patterson
Dallas, Texas 75201

Dear Mr. Busch:

This is in response to your letter of December 12, 1974, soliciting comments on the Draft Environmental Impact Statement for District 47 Regional Wastewater Facilities, City of Houston, WPC-TEX-1008.

We have reviewed this statement and agree that the sanitary system recommended will at least for the short term enhance the environment by reducing water pollution and diminish the probability of health problems arising from overloaded treatment plants and septic plants.

We are concerned, however, that very few alternatives were considered and evaluated. Furthermore, little ingenuity or creative thought was displayed in selecting alternatives for evaluation. Innovative approaches that require less water and make use of the solid waste products as fuels were not considered.

This lack of consideration of concepts and techniques with reduced water requirements compounds a situation in Houston that is already bad. Specifically this Draft EIS indicates that about 1.3 million residents now require 172 million gallons per day for an average of about 140 gallons per day per person. This is slightly above the per capita water requirement of other cities of comparable size. The projected population growth and water use figures reflect an anticipated per capita increase in the water requirement.

Clearly at some time this trend must be reversed or at least stopped. This need is almost certain to be accentuated by growing demands for fresh water in agriculture and other industries providing vital human supplies and services.

This line of reasoning leads us to suggest that additional studies be made of the Houston wastewater management plans with the specific goal of finding methods of reducing the per capita water requirement.

We appreciate the opportunity to review the plan for this important project.

Sincerely,

Edmund L. Nichols

ELN:am

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
REGIONAL OFFICE
1100 COMMERCE STREET
DALLAS, TEXAS 75202

January 22, 1975

REGION VI

IN REPLY REFER TO:

6ME

Mr. Arthur W. Busch
Regional Administrator
United States Environmental Protection Agency
Region VI
1600 Patterson
Dallas, Texas 75201

JAN 30 1975

Dear Mr. Busch:

The Draft Environmental Impact Statement for proposed improvements to the City of Houston's District 47 Wastewater Treatment Facilities (WPC-Tex-1008) has been reviewed by environmental impact assessment personnel in the Department of Housing and Urban Development's Dallas Area and Regional Offices. The Department's review comments on the subject Statement follow:

1. Cross Reference to Incoming Inquiry

   The proposed action is to expand the wastewater collection and related facilities for the City of Houston's District 47 Regional Sewage Treatment Plant. More specifically, it is to construct diversion sewers from two small treatment plants and a trunk sewer system including a pump station which will feed all sewage generated within the District into the District Plant and make possible the closing of the two small plants.

2. HUD Comment on the Statement.

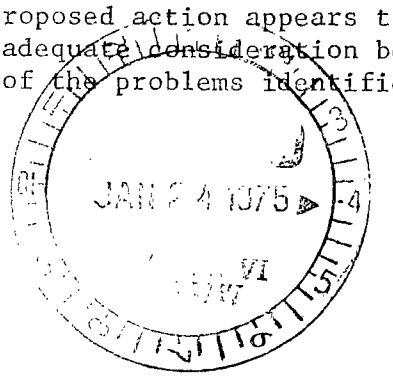
   a. Although the Statement indicates that the two abandoned wastewater treatment plant sites will be made available for other productive uses, possibly for neighborhood mini-parks, it is not clear whether these facilities will be demolished immediately following their being closed down. If left standing for any significant period, it would appear that they might possibly have adverse environmental impacts in terms of visual aesthetics and as attractive-nuisance-type hazards for neighborhood children. It is therefore felt that the Statement should go into more detail regarding the disposition of these facilities.

   b. Figure G-6 (Projected Land Use Pattern for District 47 Service Area) on page G-8 of Appendix G indicates that a presently

vacant tract adjoining the District Plant site to the west is expected to be built up with single family residences and that a larger vacant tract across State Highway 3 and the railroad to the north of the plant site is expected to be developed for multi-family residential use. Although the action currently under consideration does not involve any physical changes to the plant but rather will only increase its treatment load (but still only to a level substantially below its design capacity), the Statement indicates that the plant will be doubled in capacity by 1979. Accordingly, we question whether areas near the plant which are now vacant are suitable or desirable for future residential use, and we are concerned that the City of Houston is apparently not in a position to exercise any effective controls over development in these areas to assure that it is of a type that is compatible with a nearby sewage treatment plant. Accordingly, we feel that the Statement should devote more attention to recommendations, possibilities, and suggestions as to how development might or should be guided or controlled by the City of Houston in nearby areas likely to be adversely affected by the plant and its operations. In this connection, we might point out that the Department of Housing and Urban Development's Houston Insuring Office does not provide Federal Housing Administration mortgage insurance for homes within three hundred feet of the sites of future wastewater treatment plants. Within areas near existing plants, the decision as to whether such insurance should be approved for a particular residential property is made on the basis of an investigation and determination of the extent to which the property is expected to be subjected to the undesirable environmental effects of the plant. Such determination is made on the basis of field visits, knowledge of the area and of problems created by the plant over a period of time, talks with people already in the area and other knowledgeable people, etc. However, HUD's withholding of FHA mortgage insurance in areas adversely impacted by sewage treatment plants is not an adequate substitute for effective local land use controls because in the absence of local controls such areas can still be developed for residential purposes with convential financing.

3. HUD Reservations about the Proposal

HUD has no reservations about the carrying out of this proposal. The proposed action appears to be very desirable. Our concern is that adequate consideration be given to the recognition and alleviation of the problems identified in Item 2 above which might be



expected or could result from the implementation of this proposal and the larger system of which it is a part even though overall both this project and the system as a whole appear to be very much needed and quite beneficial.

Sincerely,

for Travis Wm. Miller
Environmental Clearance Officer

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

P. O. Box 648
Temple, Texas 76501

January 24, 1975

Mr. Arthur W. Busch
Regional Administrator
United States Environmental
Protection Agency
Region VI
1600 Patterson
Dallas, Texas 75201

Dear Mr. Busch:

We have reviewed the draft environmental statement for the City of Houston's District 47 Regional Wastewater Treatment Facilities, WPC-TEX-1008.

Generally the statement adequately describes the environmental impact of the proposed project and contains measures to minimize adverse effects.

On December 19, 1974, we included soils data in our comments on the Easthaven Regional Treatment Plant. You may wish to refer to that letter since the same data on soils will apply to this project area.

We appreciate the opportunity to review this draft and make appropriate comments.

Sincerely,

Edward E. Thomas
State Conservationist

The University of Texas at Arlington
Arlington, Texas 76019

Planning Research and Design Center
Department of Architecture

April 16, 1975

Mr. George J. Putnicki
Deputy Regional Administrator
U. S. Environmental Protection Agency, Region VI
1600 Patterson Street
Dallas, Texas 75201

Sub: Archaeological Survey and Related Studies for Draft and Final EIS Reports on WPC-TEX-1009-1074-1060, WPC-TEX-1020, WPC-TEX-1047 and WPC-TEX-1008

Dear Mr. Putnicki:

I am writing this letter to offer additional clarification on archaeological, historical and cultural studies included in the City of Houston's Almeda-Sims, Northwest, Easthaven, and District 47 Regional Wastewater Treatment Facilities. The following table provides the reference of these elements in the Draft and Final EIS documents for all four projects in Houston.

TEXT REFERENCE OF ARCHAEOLOGICAL AND RELATED ELEMENTS IN THE DRAFT AND FINAL EIS REPORTS FOR HOUSTON PROJECTS

Project Name	Draft/Final	Date	Reference to EIS Reports on Archaeological, Historical and Cultural Elements
Almeda-Sims WPX-TEX-1009	Draft EIS	June 1974	Section I, Subsection 4b, p.27, 28; Section IV, Subsection 2w, p. 92; Appendix H, p. H-1 through H-5
	Final EIS	Oct. 1974	Section I, Subsection 4b, p. 27, 28; Section IV, Subsection 2w, p. 92; Appendix H, p. H-1 through H-5
Northwest WPC-TEX-1020	Draft EIS	Sept. 1974	Chapter III, Section D, Subsection 2, p. 48, 49; Chapter VI, Section A, Subsection 2u, p. 110, 111; Appendix H, p. H-1 through H-5
	Final EIS	Jan. 1975	Chapter III, Section D, Subsection 2, p. 48, 49; Chapter VI, Section A, Subsection 2u, p. 110, 111; Appendix H, p. H-1 through H-5
Easthaven WPC-TEX-1047	Draft EIS	Sept.	Chapter III, Section D, Subsection 2 and 3, p. 39, 40; Chapter VI, Section B, Subsection 6a, p. 89, 90; Appendix G, p. G-1 through G-5
	Final EIS	Feb. 1975	*
District 47	Draft EIS	Oct. 1974	Chapter III, Section E, Subsection 1 and 2, p. 25; Chapter VI, Section B, Subsection 6a, p. 63, 64
	Final EIS	March 1975	*

* Camera-ready copies of Final EIS Reports for Easthaven and District 47 have been submitted to Greg Edwards, Project Officer, in February and March 1975, respectively. We do not have copies of the Final EIS on these two projects in our office to provide an accurate reference.

The UTA study team started the EIS preparation for the Houston projects by evaluating the environmental assessments submitted by the City of Houston which engaged the consulting services of Turner, Collie and Braden, Inc. We verified the archaeological data furnished by the TCB and found that the Houston area had only two sites which are in the National Register of Historic Places: The Cotton Exchange Building in downtown Houston and the San Jacinto Battlefield located northwest of Houston. Both these sites were outside the service areas of all four projects.

We however, did not stop there. To get additional information, we contacted the Texas Historical Commission in Austin. We visited their office in early June, 1974 and gave them a map of the Houston metropolitan area showing the service areas of all four projects and requested data on properties of historical and Archaeological significance in addition to the two items listed in the National Register. A few days later, they responded to our request by sending a letter (a copy of which is attached for your information) expressing their appreciation of our efforts to consult with them in the early stages of the EIS preparation and mentioning that the Corps of Engineers located ten sites of archaeological significance along the White Oak Bayou. It was our sole intent to exhaust all possible sources to get an accurate picture of archaeological and historical sites in Houston and as such we contacted the Historical Commission in advance of Draft EIS preparation for any of the Houston Projects.

Next we contacted the Corps of Engineers District Office in Galveston in an attempt to get a map of White Oak Bayou showing the location of the ten sites along this Bayou so that we could include this information in the Draft and Final EIS Reports. Unfortunately, we were informed by Mr. Ernie Wittig of the Ecology Section of the Corps of Engineers of the Galveston District Office that the Corps of Engineers had been asked by the Texas Archaeological Survey to not make the location of these sites public until steps are taken to insure the preservation of all these sites. A statement to this effect has been made in all Draft and Final EIS reports. The archaeological and historical sections of these documents were thus prepared by fully utilizing the available inputs from both the Texas Historical Commission and the Corps of Engineers office in Galveston.

We wholeheartedly concur and still concur with the substance of Mr. Brigg's letter with regard to a thorough archaeological survey of all plant sites and the proposed pipeline easements and right of ways. With regard to the Department of the Interior's suggestion of including the results of an archaeological survey in the Final EIS reports, I think the statement on "Prior to the construction of the treatment plants and the sewer lines" has been subject to varying interpretations. The Department of the Interior went a step further in their review of the Almeda-Sims and Northwest Draft EIS reports. They suggested that a survey should be made prior to the publication of the Final EIS. We do not agree with this suggestion. What was meant in the Draft EIS was that the survey

should be made by the City of Houston immediately prior to or during the construction phase of the project development. There is a significant difference between carrying out an archaeological survey before the completion of a Final EIS and the actual construction of a grant project in terms of time and costs for a project development.

There are several reasons why we did not recommend earlier, nor do we recommend now, any archaeological survey before the Final EIS. First and foremost, from our study of the Executive Order No. 11593 and the Historical Preservation Act of 1966, we did not find that an archaeological field Survey is required before the preparation of a Final EIS Report. Secondly, there is no archaeological site recorded in the National Register within any of the project sites, easements, right of ways or the service areas. Third, a reconnaissance survey which is mostly done through a walk and search technique, is, in our opinion, not meaningful since the possibility of detecting any sites through such techniques is slim and do not always justify the costs involved. In our opinion, real findings are possible through actual excavation and construction. That is why we recommended the archaeological surveys during the construction phase. As you already know, the construction crew is probably the best source of finding archaeological and paleontological sites underground. We also recommended that a trained paleontologist should be employed during the construction phase. Please see the sections on Paleontology in the Draft and Final EIS documents.

In brief, we believe the statements on the archaeological and historical elements presented in all EIS Reports for the Houston projects are complete and sufficient. We have gone beyond the requirements of typical EIS documents by including a separate section on cultural elements in Houston supported by an Appendix on Historical, Archaeological and Cultural Elements in each EIS report.

The project's impact on the existing historic and archaeological sites are neither adverse nor beneficial since they are all outside the project areas. All four statements meet the requirements of the Executive Order No. 11593 and the National Historic Reservation Act of 1966. All statements reflect both the spirit and the letter of

the policy objectives of the historic National Environmental Policy Act of 1969. It was our pleasure to be involved in these projects and we look forward to a mutually rewarding outcome again in the future. In the meantime, if you have any questions or need additional clarification on any of the elements of the EIS projects in Houston, please let me know.

Sincerely,

Khan M. Husain, Director
UTA Planning Research and Design Center and
Associate Professor, Department of Architecture

KMH/prg

Copy to: Greg Edwards
Project Officer
Houston EIS Projects

Enclosure

Texas Historical Commission
Box 12276, Capitol Station
Austin, Texas 78711
Truett Latimer
Executive Director

June 11, 1974

Mr. Khan M. Husain, Director
UTA/Planning Research and Design Center
Department of Architecture
The University of Texas at Arlington
Arlington, Texas 76019

Dear Mr. Husain:

In response to your request of 4 June, 1974, we have examined the enclosed map and find that archeological surveys have been confined to one area. Archeological surveys have recorded ten sites along White Oak Bayou. Areas south of the metropolitan area have been surveyed prior to construction of Army Corps of Engineers projects and have been successful in locating large numbers of sites. For this reason, we are recommending that the area of any proposed wastewater treatment facilities as well as any necessary pipelines, easements for machinery, etc. related to the proposed installation be subjected to an archeological survey prior to their construction. Sites recognized during the survey may be recorded and their significance appraised prior to their commitment to the project. Sites which fulfill National Register criteria can then be nominated to the National Register of Historic Places.

Thank you for the opportunity to examine the map of your project area and for consulting with the Texas Historical Commission at this early stage of planning. If we may be of further assistance, please advise.

Sincerely,

Alton K. Briggs
Archeologist

AKB:pc

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BIBLIOGRAPHY

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TEXT REFERENCE:

CHAPTER II: THE CITY WIDE CONTEXT FOR THE PROPOSED ACTION

APPENDIX A: HOUSTON'S EXISTING TREATMENT SYSTEM: EXISTING CAPACITY, INFLUENT AND EFFLUENT QUALITY

TABLE A-1

INFLUENT AND EFFLUENT QUALITY OF HOUSTON'S EXISTING TREATMENT PLANTS

Sewage Treatment Plant	Suspended Solids mg/l		5-Day BOD mg/l		Residual Chlorine mg/l Effluent	Treated Flow Yearly Average mgd	Dry Weather Flow* mgd
	Raw	Effluent	Raw	Effluent			
Northside	385	141	304	79	0.7	89.69	100.5
Sims Bayou	243	61	181	23	0.6	39.64	43.3
Almeda Sims	232	27	118	9	1.3	0.819	0.42
Chadwick Manor		24		6	2.0	0.040	(E)
Chocolate Bayou	156	100	124	36	1.2	3.305	2.67
Clinton Park	134	80	145	35	1.9	0.754	0.31
CIWA	-	-	-	-	-	-	-
Eastex Oaks		49		24	2.0	0.183	0.16
Easthaven	197	48	175	25	1.3	0.476	0.25
Fontaine Place		45		39	1.9	0.275	(E)
FWSD 17	211	35	136	15	1.9	0.7	(E)
FWSD 23	118	45	99	12	1.4	2.154	1.48
FWSD 34	107	18	166	13	1.7	0.631	0.62
Gulf Meadows	133	8	113	3	2.1	0.999	0.75
Gulf Palms		49		25	1.3	0.283	0.23
Gulfway Terrace		39		25	1.3	0.231	0.14
Homestead	194	55	96	16	1.7	1.435	1.13
Intercontinental Airport	446	42	267	23	1.6	0.311	
Longwoods		25		17	1.7	0.075	(E)
Mayfair Park	161	38	148	15	1.7	0.39	0.18
Northeast	188	18	122	7	2.0	1.567	0.87
Northwest	407	24	136	7	1.5	6.135	
Red Gulley		34		9	2.0	0.367	0.13

TABLE A-1
(Con't)

Sewage Treatment Plant	Suspended Solids mg/l		5-Day BOD mg/l		Residual Chlorine mg/l Effluent	Treated Flow Yearly Average mgd	Dry Weather Flow* mgd
	Raw	Effluent	Raw	Effluent			
Sagemont	227	8	166	4	4.1	1.548	1.60
Sherwood Forest	-	-	-	-	-	-	-
Southeast	121	53	41	10	2.5	0.134	0.19
Southwest	188	8	147	4	1.7	25.37	20.9
Turkey Creek		81		20	1.6	0.263	0.14
WCID 20		116		52	2.0	0.244	0.097
WCID 32	169	77	146	26	2.0	0.880	0.69
WCID 34		38		25	1.8	0.300	(E)
WCID 39		49		43	1.9	0.500	(E)
WCID 42		78		55	1.9	0.645	0.33
WCID 44-1		85		52	1.4	0.444	
WCID 44-3		48		35	1.4	0.606	0.91
WCID 47	158	8	161	6	1.5	1.660	
WCID 51	125	14	136	8	1.3	2.441	(E)1.65
WCID 53	250	64	222	58	2.1	0.449	
WCID 62	140	41	155	35	2.3	0.196	
WCID 73		34		7	2.1	0.254	1.05
WCID 81	213	66	209	20	2.1	0.240	
WCID 82		26		4	5.0	0.034	
WCID 95		51		16	1.6	0.372	0.40
West District	171	53	170	19	1.3	11.4	11.0
Chatwood		66		78	1.5	0.250	(E) 3 mo
Forest West		55		16	1.6	0.235	(E) 8 mo
Lake Forest		36		18	2.2	0.180	(E) 3 mo

TEXT REFERENCE:

CHAPTER III: SOCIAL AND ENVIRONMENTAL SETTING

APPENDIX B: NATURAL ENVIRONMENT (SURFACE AND SUBSURFACE SETTING)

A. TOPOGRAPHY

B. SOILS AND GEOLOGY

A. TOPOGRAPHY

Houston and its environs have been built on a gently sloping part of the Texas Coastal Plain. The elevation of the area varies only 65 feet having a low of 25 feet above the mean sea level in the east and southeast to a high of about 90 feet in the northwestern part of the city. The broad prairie presents an undulating pattern of long and gentle swells and depressions, ascending from the southern part of the city to Spring Creek near the northern part of the city. In the past, the gentle slope allowed easy drainage of the undeveloped prairie land, but with the rapid urbanization of Houston over the last several decades, drainage has become more and more difficult since much of the open land has been covered by man-made structures. The problem will further intensify unless appropriate land use policies are implemented to halt the problem. Houston has no extreme topographic features such as mountains or valleys. Its topographic pattern played a major role in shaping a highly decentralized and an expensive system of wastewater collection, treatment and disposal activities.

The Service Area of the Proposed Project:

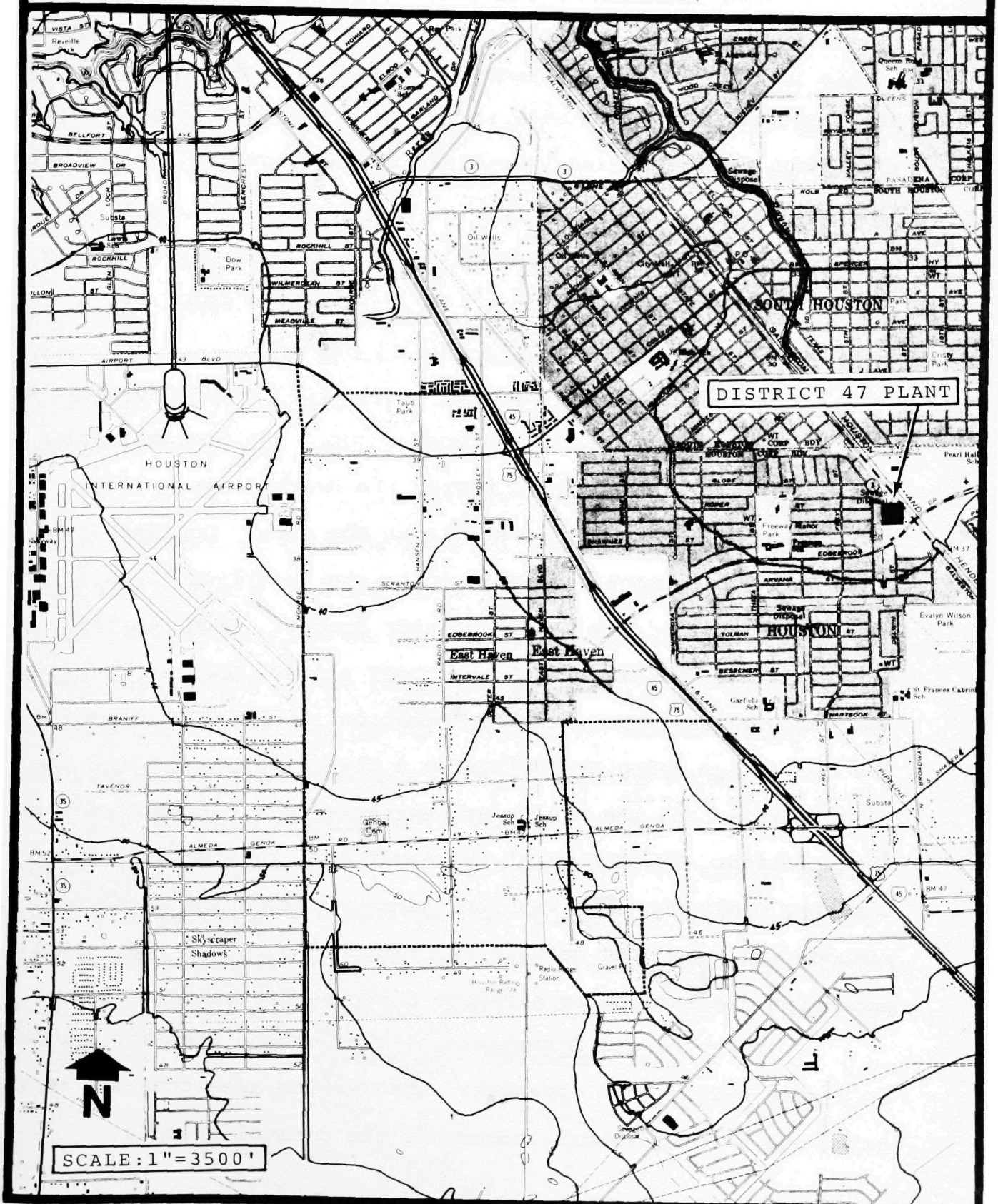
The service area of the proposed project lies in the Texas Coastal Prairie, which extends westward along the Gulf Coast, reaching inland 30 to 60 miles. The topography of the service area is one of very low relief with slopes in the area being generally less than 1%. The elevation for the service

area is between 35 feet to 45 feet above the mean sea level. The topographic maps included as Figure B-1 in this Appendix show the topographic relief of the area. Like the rest of the city, the low relief and slope make runoff and internal drainage difficult and expensive for the service area.

The topographic features of the service area will have a significant impact on the distribution and intensity of future land use development. Since more than half of the service area is still available for urban development, the city can avoid the mistakes which characterized the past land use pattern. Residential, commercial and industrial developments are necessary to life, but land use policies can prevent continued low density development. Subject to soils and geological constraints, efforts should be made to concentrate land use in specific locations, permitting as much land as possible to remain open. This would ease the drainage of the area during periods of heavy rainfall and reduce costs for utilities and drainage projects. A very important byproduct of such policies will be the preservation of the ecological values associated with the natural environment. Such a policy if adopted, would maximize the development of open space with a minimum of public funds.

FIGURE B-1

TOPOGRAPHY OF DISTRICT 47 VICINITY



B. SOILS AND GEOLOGY

1. Geology

Houston Area

Sand, gravel, silt and clay deposited along inland waterways or built up as deltaic, shoreline or lagoonal deposits along the coast are the dominant geologic features of the Houston area. The subsurface is mineral rich, containing sulphur, petroleum, gas and salt deposits. In addition, the surface deposits provide gypsum, limestone from shells, sand, gravel and brick clays.

Service Area of District 47 Plant

Most of the service area of the Project is underlain by geologic formations in the Beaumont Group. The Geologic Atlas of Texas, Houston Sheet (1968), mapped the Beaumont as a single formation and made no attempt to subdivide the unit. Doering (1935) described the Beaumont as overlapping the underlying Lissie Formation (Motgomery of the G.A.T. Houston Sheet). Then, in 1956, he subdivided the Beaumont into the older (lower) Oberlin Formation and the younger (upper) Eunice Formation. Doering interpreted the Oberlin as being predominantly a clay unit overlapping the older Lissie, and the Eunice as representing a period of deltaic progradation. The Eunice of the Study area is somewhat sandier than the older Oberlin, with the sands representing elongate, sinuous and abandoned deltaic distributory channels that usually appear on the surface as elongate distributory meander ridges.

The geologic formations of the Houston area are included as Figure B-2 in this appendix. The service area consists of geologic and soils substrata common to the coastal uplands.

Soils

There are two detailed soil maps available for Harris County. The oldest of these was prepared by the U. S. Department of Agriculture in 1922. The Soil Conservation Service of the U. S. Department of Agriculture is now completing a new soil map for Harris County. A portion of this map, taken from the aerial photos used to delineate the various soil series, is included as Figure B-3 in this appendix. It covers the service area and shows the various soil types that are found in the project area. A brief summary of the characteristics of these soil types and their consideration as determinants of urban land use and man-made activities are presented following this section.

The types of soil that predominate in the service area of the District 47 have low permeability, which virtually eliminates septic tanks as a method of wastewater effluent. Yet, parts of the service area are servicedby septic tanks. The continued use of this system over a prolonged period of time will have an extremely adverse effect on the environment unless action is taken to remedy the situation in the immediate future.

From the standpoint of strength of soils to sustain man-made activity loads for active land usedevelopments, the soils that dominate the service area have characteristics that will restrict heavy construction, road building and other intense structural construction unless proper stabilization and engineering precautions are taken before such construction.

FIGURE B-2: GEOLOGICAL FORMATIONS FOR THE HOUSTON AREA

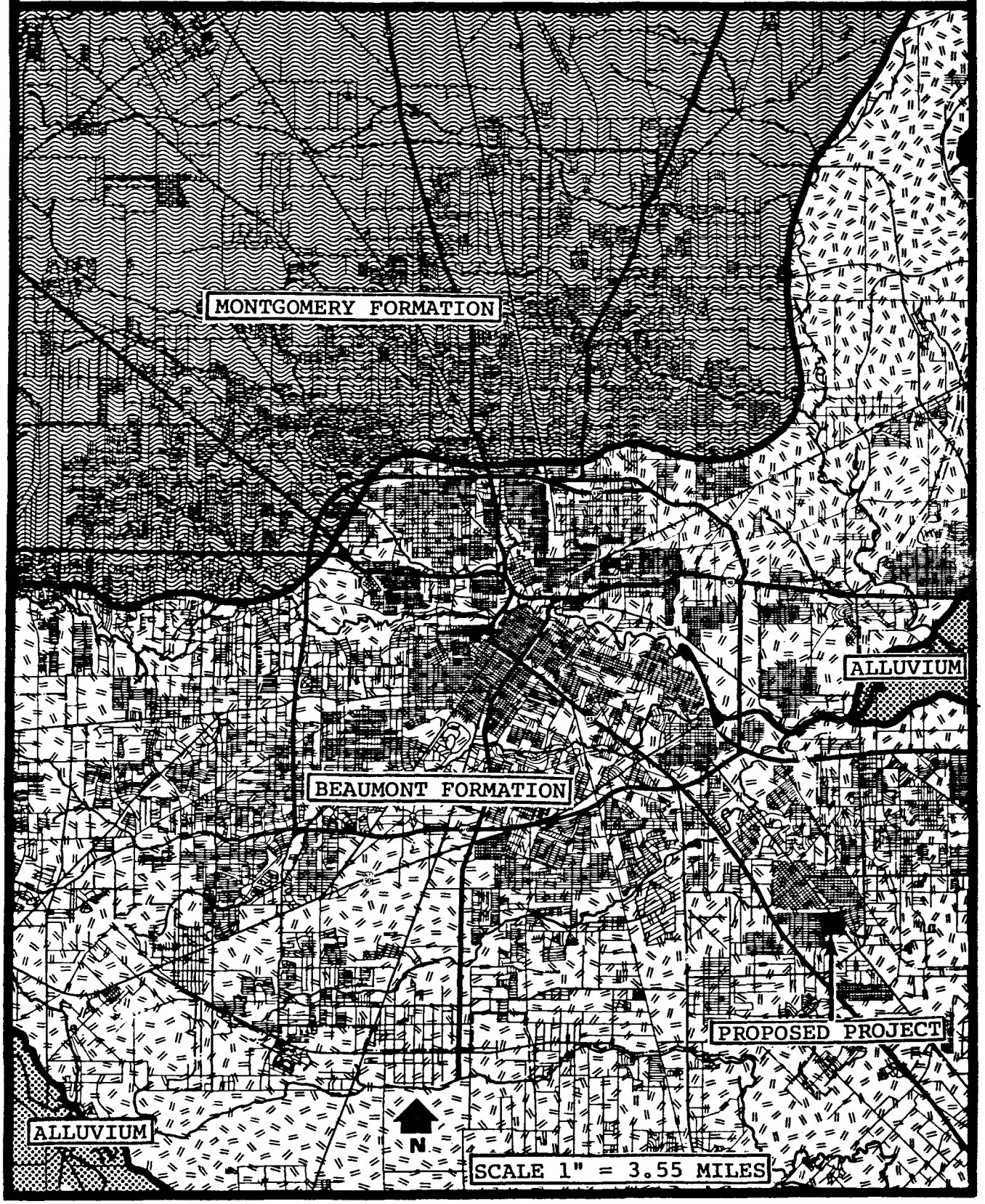
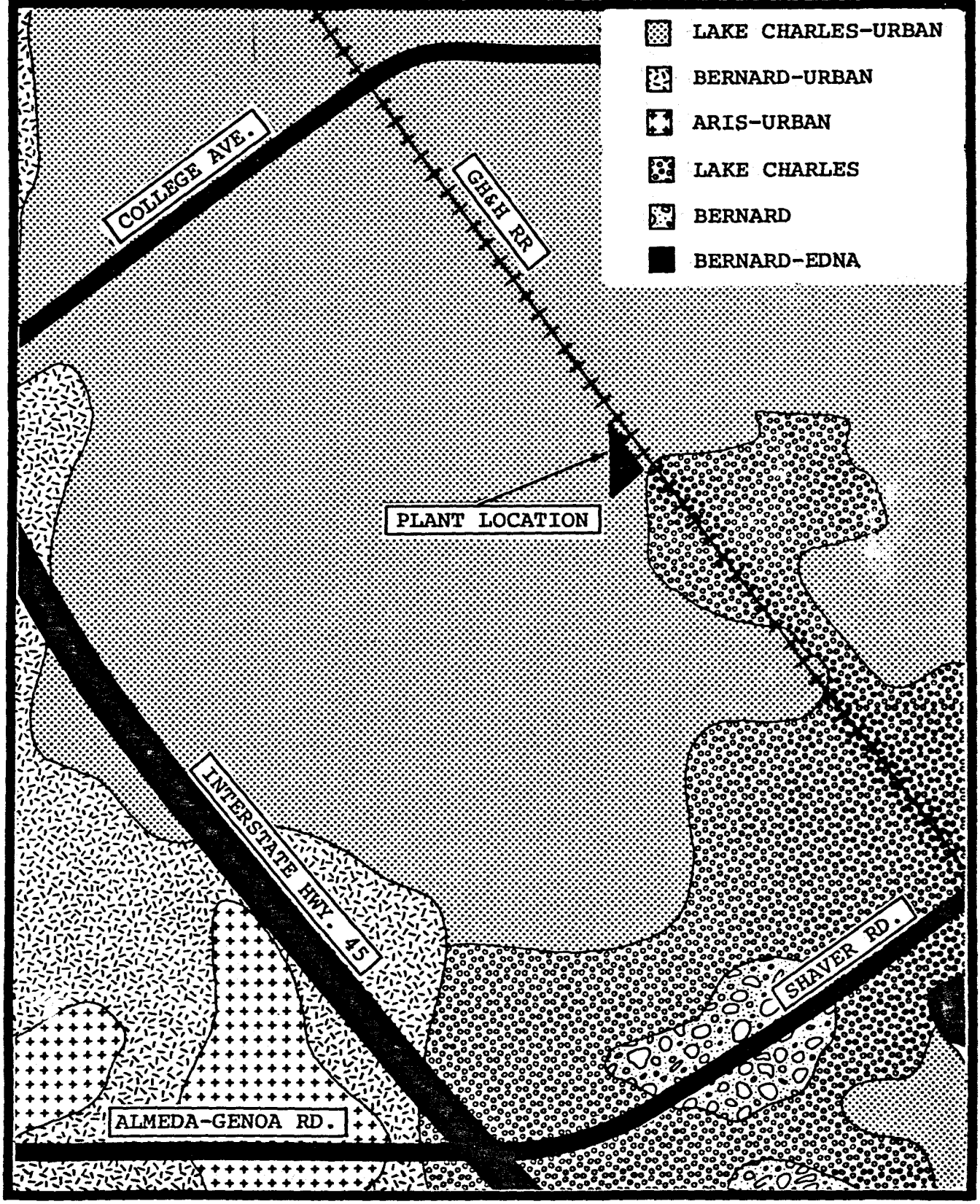


FIGURE B-3

DETAILED SOILS MAP FOR THE SERVICE AREA AND VICINITY



CHARACTERISTICS OF SOIL SERIES IN SOUTHEAST HARRIS COUNTY

There are 48 different mapping units in Harris County. They are mostly clay, sandy loam, and loam textures. Clay textures predominate in the area south of Buffalo Bayou, where the soil is dark, clayey, and compact. On the margins of the prairie, especially where there are small clusters of pine trees, the soil tends to be loamy, grayish or yellowish, and acidic, with compact clayey subsoils. In the bottomlands bordering streams, creeks, and bayous, deep grayish, loamy alluvial soils occur. They tend to be poorly drained and are saturated during periods of heavy rainfall.

In the service area of the proposed project, the Beaumont formation soils predominate. They are composed mostly of clay, silt, and sand. They support scattered grasses, weeds, and small amounts of timber. The clay is heavy, black and alluvial type, having low permeability, which virtually eliminates septic tanks as a method of wastewater treatment since the soil cannot satisfactorily absorb wastewater effluent. Their fine-grained texture and the high plastic montmorillonitic clay contents make for high water holding capacity, plasticity, shrink-swell potential, and compressibility. These characteristics represent restrictions to heavy construction, road building, and other intense structural construction unless proper stabilization and adequate engineering precautions are taken before such construction.

Following is a brief description of the types of soils which can be found in the service area and general vicinity of the proposed sewage treatment plant.

The Addicks (Ad-Au) Soil Series occurs in limited areas to the south and west of the Houston Domed Stadium. Soil depth ranges more than 78 inches for the "B23t" horizon. The Addicks is a poorly drained upland soil with slopes of generally less than 1% and moderate permeability. Soil pH ranges from 6.1 to 8.4, with a high corrosivity to uncoated steel and a low corrosivity to concrete. The various soil zones have a plasticity index that ranges from 5 to 27, with a low to moderate shrink-swell potential.

The Aris (Ap-Ar-As) Soil Series occurs extensively in the service area. Soil depths range over 78 inches. The Aris soils are poorly drained and have a very slow permeability. The PI ranges from non-plastic to 36, and the shrink-swell potential is low to high. Soil pH ranges from 5.1 to 7.3, and the soils have a high corrosivity to uncoated steel and a moderate corrosivity to concrete.

Each soil series may be shown on the soil map in several mapping units. An example of this would be the Bernard soil series. The Bernard (Bd) is the clay loam phase. The Bernard-Edna complex is shown on the map as Be, in which the Edna series is a large component of the delineated areas. The Bernard-Urban land complex is shown as Bg, in which there is considerable disturbance of soil due to urban development.

Urban land (Ur) has been completely covered or modified by urban development.

The Bernard (Bd-Be-Bg) Soil Series is extensively developed in the service area and over much of the south central Harris County. Bernard

soils are more than 90 inches thick. They have a plasticity index range of 12 to 45, with moderate to high shrink-swell potential. Soil pH ranges from 6.1 to 8.4 and varies with depth; corrosivity is high to uncoated steel and low to concrete. The Bernard is a somewhat poorly drained, very slowly permeable upland soil, with slopes of usually less than 1%.

The Gessner (Ge-Gs) Soil Series has a limited extent in the service area, being restricted to the south central Harris County area near its common corner with Fort Bend and Brazoria Counties. This soil extends to depths greater than 84 inches. It is poorly drained, with slopes that rarely exceed 1% and moderate permeability. The plasticity index ranges from 4 to 20; thus, the shrink-swell potential is low. The soil has a pH ranging from 6.1 to 8.4, with depth; corrosivity is high to uncoated steel and low to concrete.

The Lake Charles (LuA-Lu) Soil Series covers a major part of both the service area and of south central Harris County. It occurs in depths greater than 100 inches and is somewhat poorly drained, very slowly permeable, upland soil with slopes of mainly less than 1%.

As will be noted from these brief soils descriptions, almost all of the service area is covered by deep soils with high shrink-swell potentials and moderate to high plasticity indices. Of all potential land uses, from the point of view of a sanitary facility or community development, only a sewage lagoon rates slight in the problem classification. Septic tank absorption fields, sanitary landfills and cover, shallow excavations, dwellings with or without basements, small commercial buildings and local streets and roads are all rated as severe on the soils survey interpretations range.

TEXT REFERENCE:

CHAPTER III: SOCIAL AND ENVIRONMENTAL SETTING (NATURAL ENVIRONMENT)

APPENDIX C: SURFACE AND SUBSURFACE WATER FLOW AND QUALITY DATA FOR HARRIS COUNTY AND SOUTHEAST HOUSTON

A. AQUIFER SYSTEMS FOR HARRIS COUNTY (FIGURES C-1, C-2 AND C-3)

B. DESCRIPTION OF RECEIVING STREAMS AND BODIES OF WATER

C. STREAM FLOW AND WATER QUALITY DATA FOR BERRY GULLEY AND SIMS BAYOU

FIGURE C-1

BASE OF THE FRESH TO SLIGHTLY SALINE WATER SANDS IN SUBREGION II OF THE GULF COAST REGION

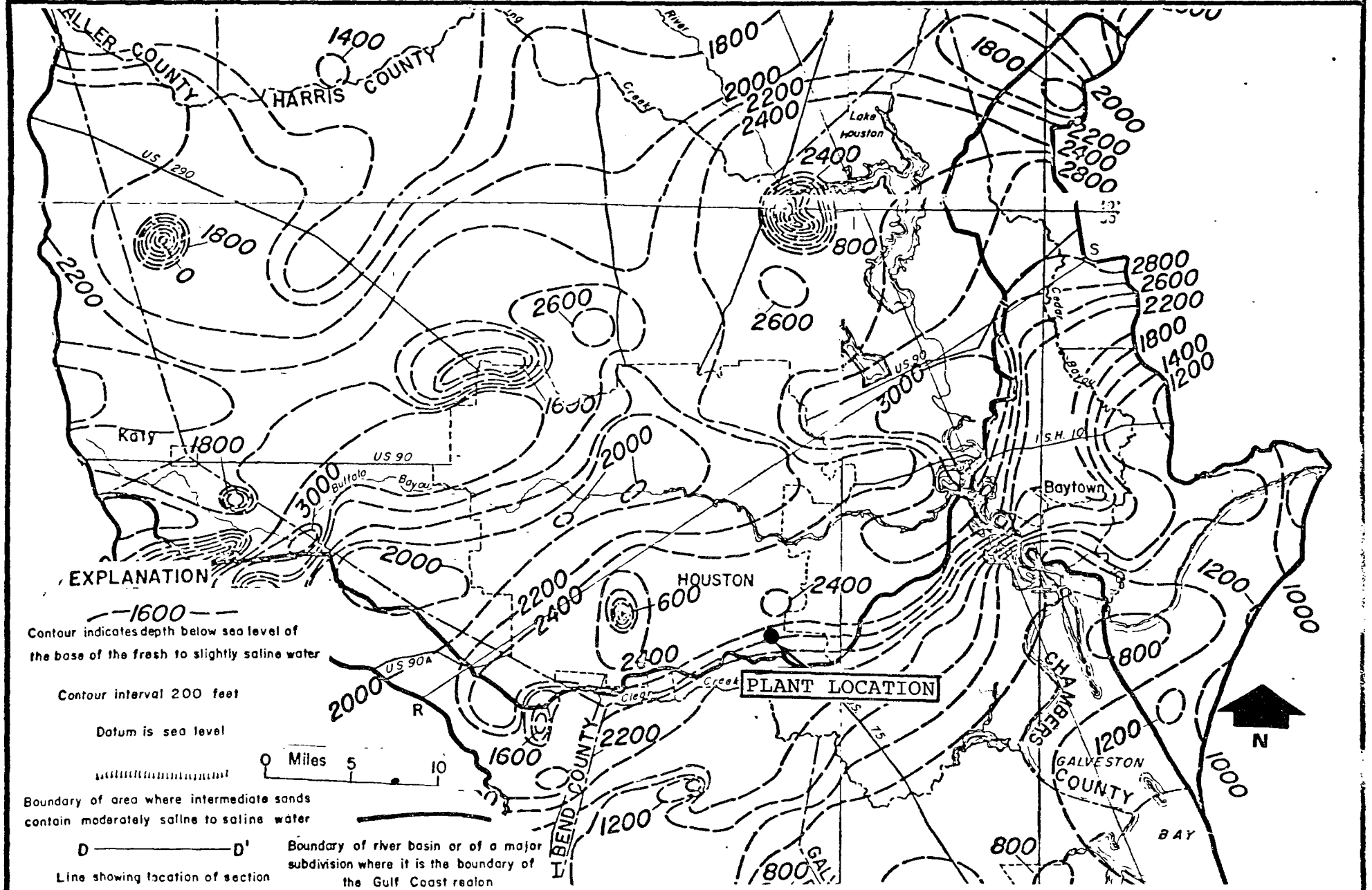


FIGURE C-2

ISOPACHOUS MAP OF THE FRESH TO SLIGHTLY SALINE WATER SANDS IN SUBREGION II OF THE GULF COAST REGION

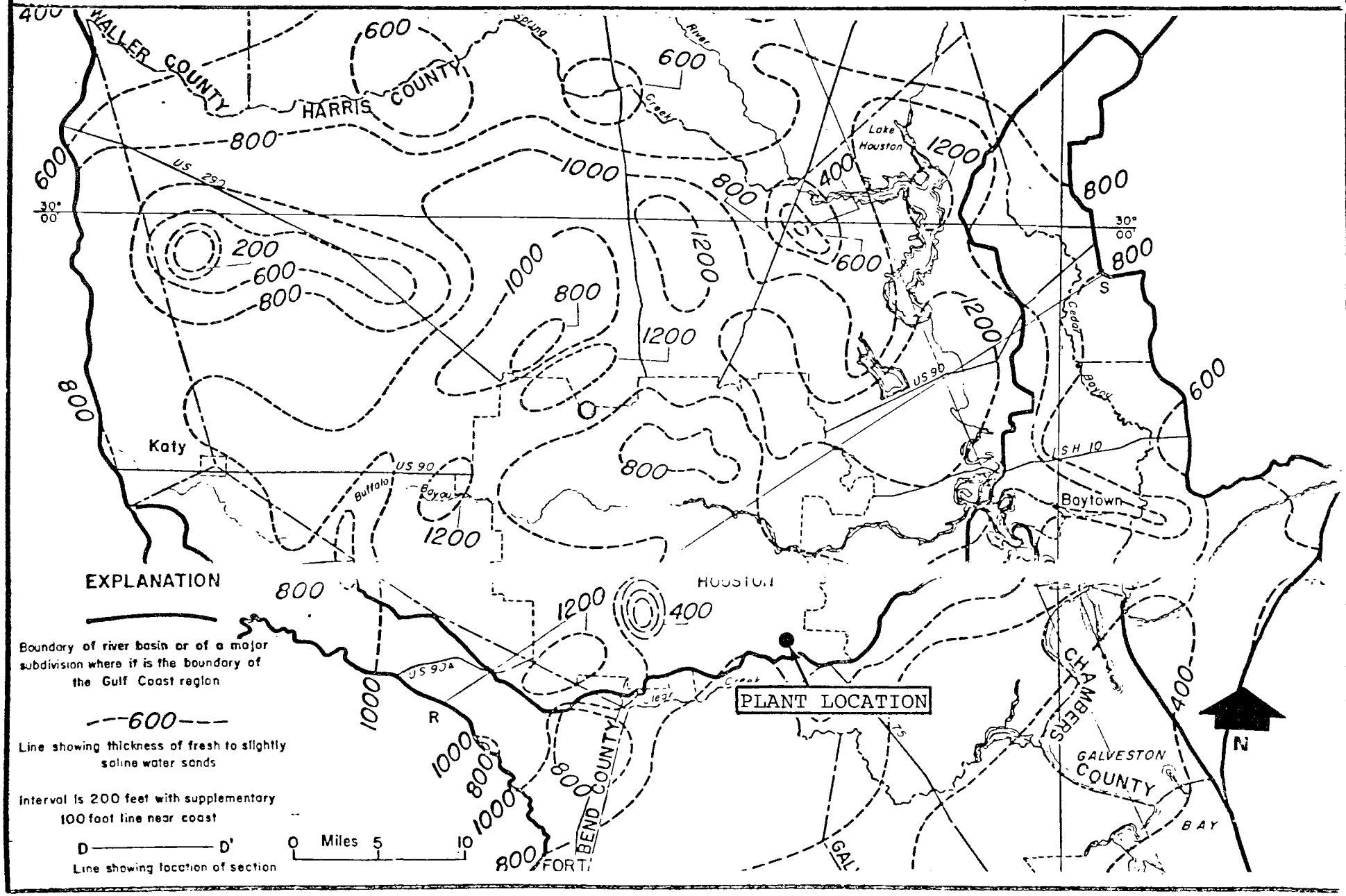
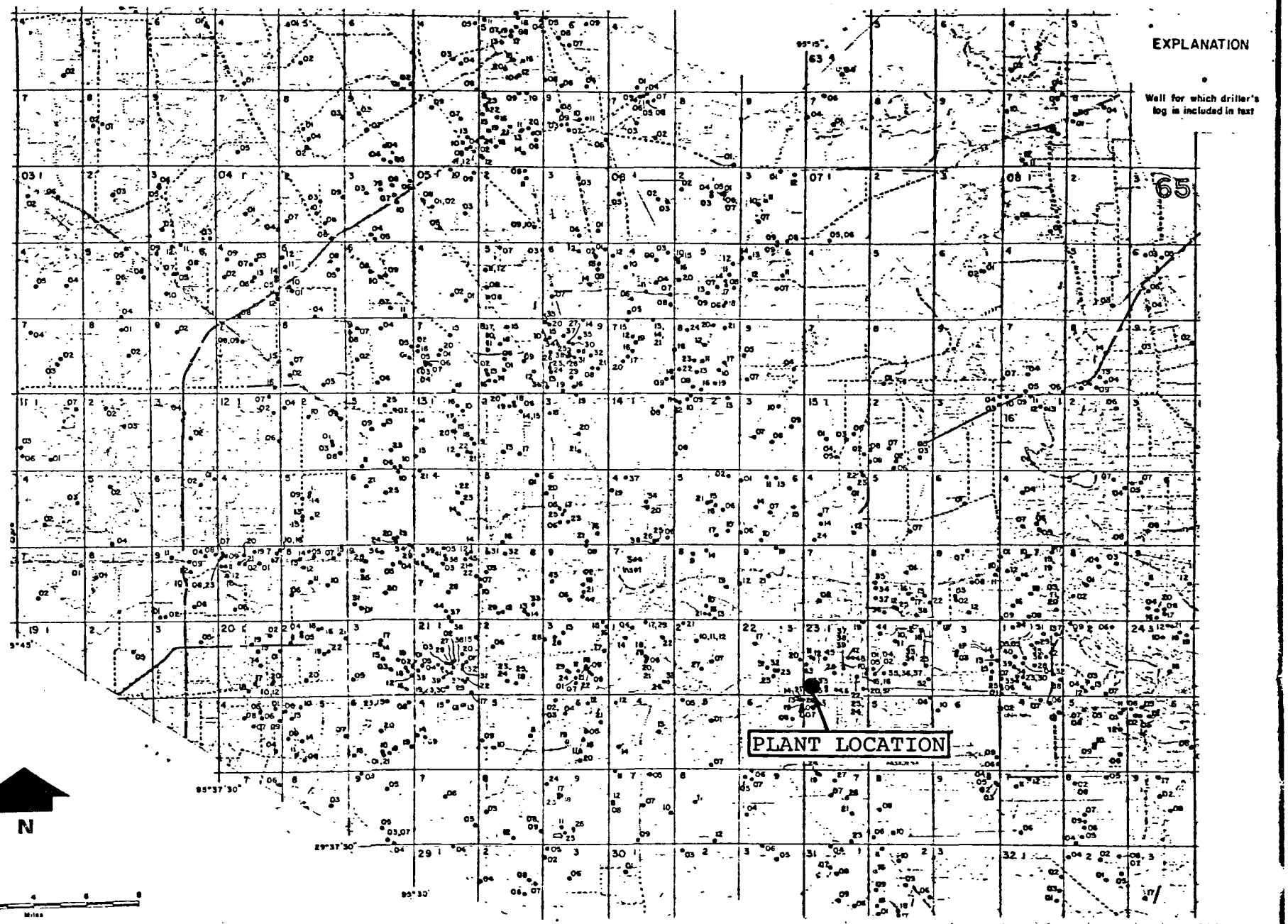


FIGURE C-3
LOCATION OF WELLS IN HOUSTON AND VICINITY



B. DESCRIPTION OF RECEIVING STREAMS AND BODIES OF WATER

1. Harris County Flood Control District (HCFCD) Drainage Ditch

The receiving stream for treated effluent from the District 47 Wastewater Treatment Plant is the HCFCD drainage ditch which empties into Berry Gulley approximately three quarters of a mile northwest from the plant.

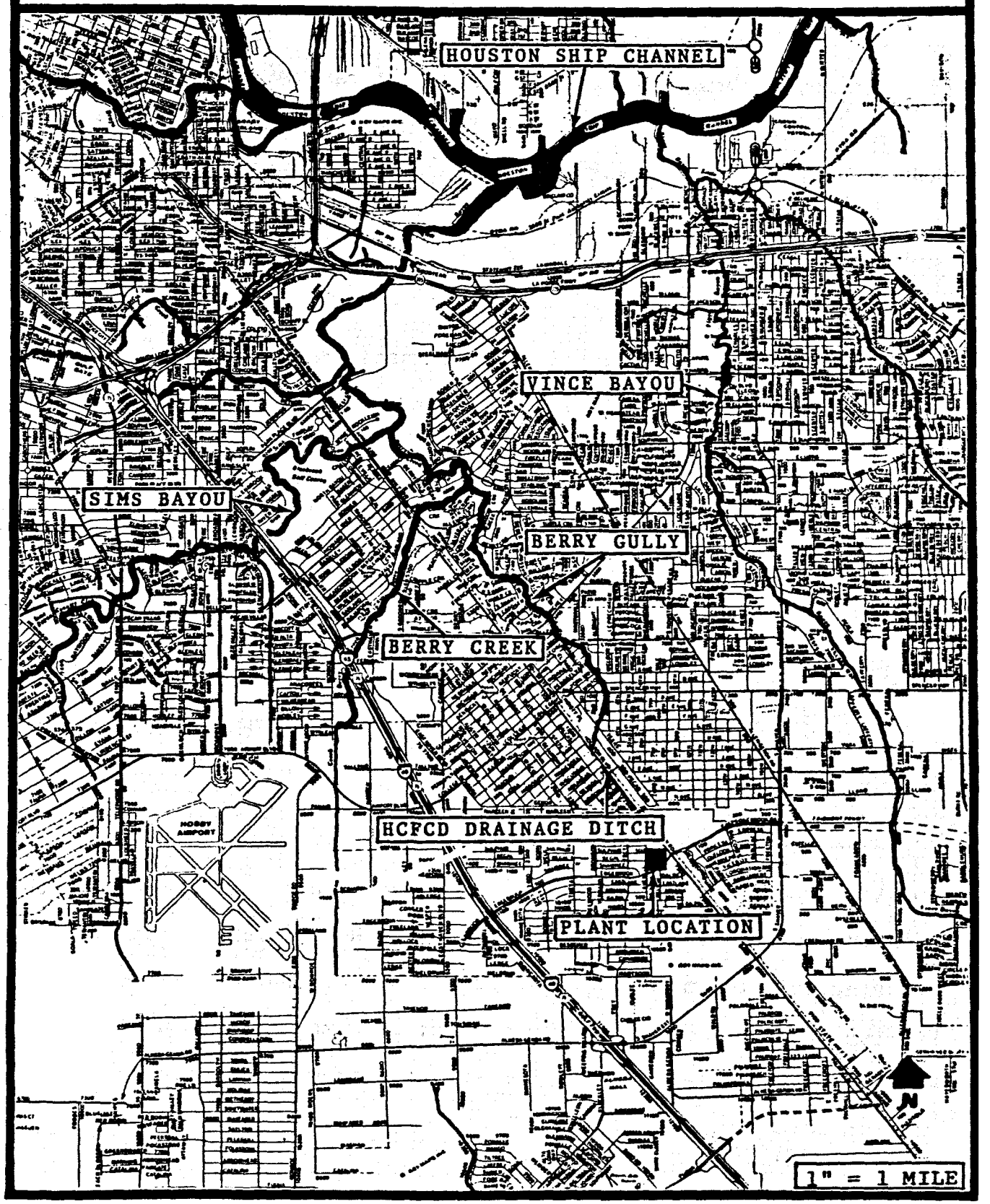
2. Berry Gulley

Berry Gulley extends northwest through predominantly residential and commercial areas, emptying into Sims Bayou at a point near the latter's intersection with the Galveston Road approximately 3.15 miles northwest from the plant. There is little natural flow through the ditch or the Berry Gulley which instead serve as repositories for street runoff and effluent from treatment plants.

3. Sims Bayou

Sims Bayou is located north of the District 47 service area. It originates at the junction of Willow Water Hole Bayou and a drainage ditch near the boundary separating Harris and Fort Bend Counties. An irrigation canal associated with nearby rice farms and several drainage ditches intersect the bayou as it passes through the Southern part of Houston before emptying into the Houston Ship Channel nearly two and one-half miles below the point where Brays Bayou enters the Houston Ship Channel.

FIGURE C-4: RECEIVING BODIES OF WATER



Sims Bayou has been widened and cleared as part of Harris County flood control activities, but it has not been lined with concrete or other materials. The bayou passes through such parks as Sims Bayou, Law, Reveille, Charlton and Charles H. Milby. Sims Bayou has little natural flow and serves mainly as a repository for storm water runoff and wastewater treatment plant effluent flows.

4. Houston Ship Channel

The uppermost portion of the Houston Ship Channel is a nearly 25-mile section of Buffalo Bayou widened and dredged to accommodate ocean-going vessels, capped by a turning basin three and one-half miles east of Downtown Houston. Extensive industrial uses are found on both sides of the channel from the turning basin eastward to Galveston Bay. As a result of Houston's rapid industrial growth over the past three decades, water quality has been deteriorating in the Houston Ship Channel. Actions by both the public and private sectors should be implemented to rectify this condition and improve the quality for the Houston Ship Channel.

The regionalization plan for the city, as stated earlier, calls for the expansion and modernization of a number of treatment plants over the next several years. The City of Houston should take full advantage of the opportunity presented by the implementation of the regional system to address the problem of water pollution of the Houston Ship Channel. Since the effluent from all treatment

plants are discharged to the area water courses, mostly emptying into the Ship Channel, improving their water quality with the aid of refined treatment systems will reduce the pollutants in the Channel and even stimulate the water quality of the Galveston Bay. The objective of the city's wastewater management program should therefore be to improve and enhance the overall water quality of the entire Houston area. The proposed project should be considered a step in that direction.

C. WATER FLOW AND QUALITY FOR SIMS BAYOU AND BERRY BAYOU

Water discharge data for the HCFCD Ditch and Berry Creek is not available; however, data is available (Table C-1) for Berry Bayou at its intersection with Forest Oaks Street.

Discharge data for Sims Bayou measured at State Highway No. 35, which lies northwest of the service area (Table C-2) indicates a mean daily discharge (October 1971 - September 1972) of 76.2 cfs ranging from 18 cfs to 3,930 cfs for individual days. The proposed action is expected to increase the water discharge of Berry Gulley (Bayou), thereby increasing water flow in Sims Bayou.

Measurements available for Berry Bayou are shown in Table C-3, with BOD_5 ranging from 5.4 mg/l to 38.0 mg/l. Comparable data for Sims Bayou at State Highway No. 35 is presented in Table C-4, indicating a BOD_5 range of 4.1 mg/l to 23.0 mg/l. Implementation of the proposed project should improve the quality of water in Berry Gulley and Sims Bayou by lowering their BOD_5 levels. See page 61, last paragraph, Impact on Water Quality.

FIGURE C-5

LOCATION OF WATER FLOW AND QUALITY DATA

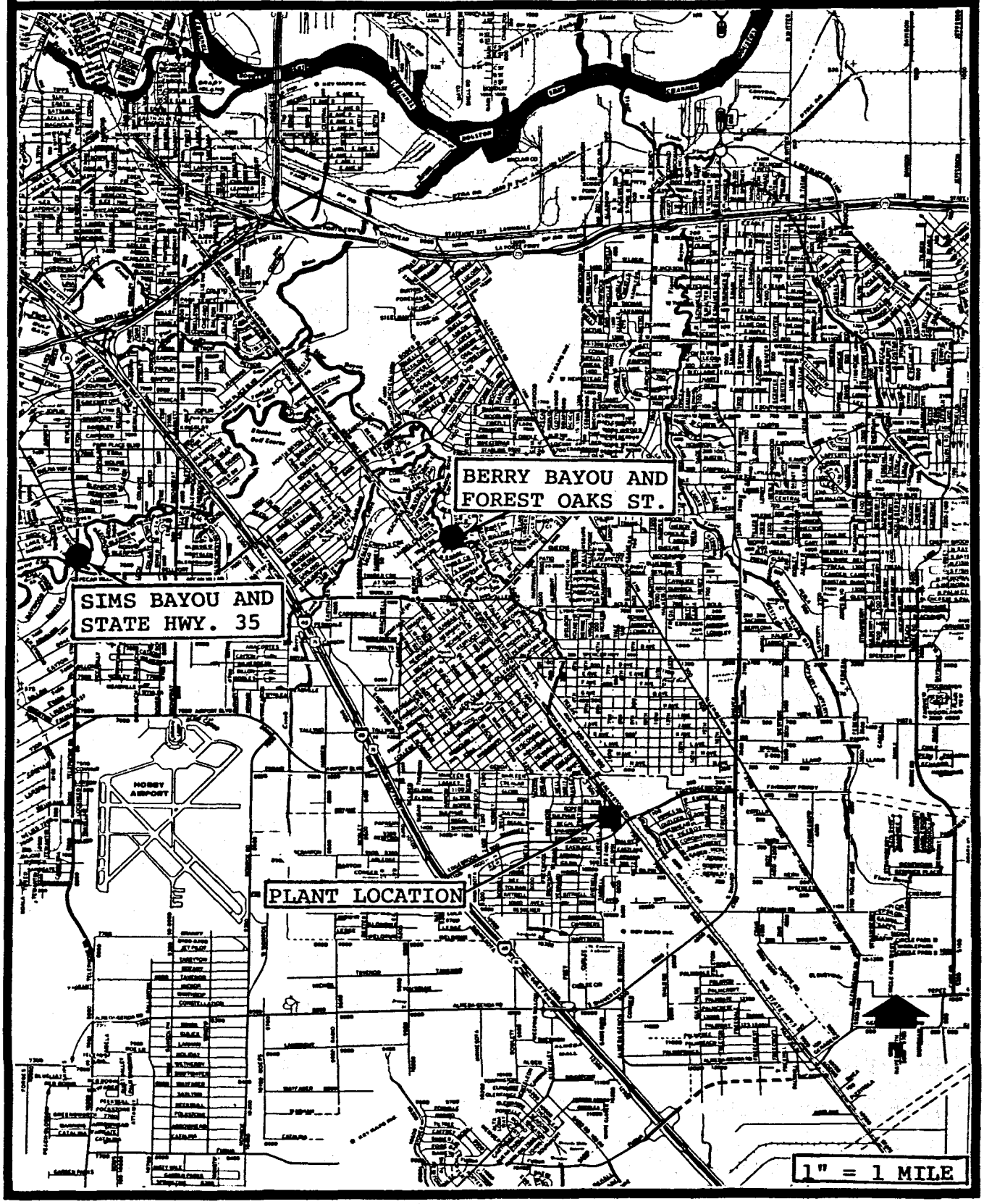


TABLE C-1

Water Discharge Data: Berry Bayou at Forest Oaks Street

SAN JACINTO RIVER BASIN

08075650 Berry Bayou at Forest Oaks Street, Houston, Tex.

LOCATION.--Lat 29°40'35", long 95°14'37", Harris County, near left bank at downstream side of Forest Oaks Street Bridge in southeast Houston, 0.8 mile upstream from auxiliary gage at mouth of Berry Creek, and 1.7 miles upstream from Sims Bayou.

DRAINAGE AREA.--11.1 sq mi.

PERIOD OF RECORD.--April 1964 to current year (gage heights only for some periods).

GAGE.--Water-stage recorder. Datum of gage is at mean sea level, datum of 1929, adjustment of 1959; unadjusted for land-surface subsidence. Auxiliary water-stage recorder 0.8 mile downstream at same datum. June 25, 1964, to Jan. 11, 1965, auxiliary nonrecording gage 0.8 mile downstream at same datum.

EXTREMES.--Current year: Maximum discharge, 1,530 cfs Apr. 27; maximum elevation, 13.45 ft Apr. 27; minimum discharge not determined. Period of record: Maximum discharge, 3,110 cfs May 10, 1968; maximum elevation, 17.59 ft Feb. 21, 1969 (backwater from Sims Bayou); minimum discharge not determined.

REMARKS.--Records fair. Discharge during storm periods computed using fall as a factor. Flow affected by tides and backwater from Berry Creek and Sims Bayou. Discharge estimated for periods of indefinite stage-fall-discharge relationship following runoff periods. No diversions above station. Low flow sustained by sewage effluent from south Houston and Houston suburbs. Recording rain gage located at station.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1971 TO SEPTEMBER 1972

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	-	-	-	-	-	-	-	-	-	-		-
2	-	-	123	-	-	-	-	97	-	-		-
3	-	-	33	-	-	-	-	20	-	-		-
4	30	-	-	-	-	-	-	-	-	29		-
5	80	-	750	9.2	-	-	-	-	-	13		-
6	20	-	300	-	-	-	-	-	-	-		-
7	-	-	38	-	-	-	-	85	-	-		-
8	-	-	-	-	-	-	-	20	-	-		-
9	-	-	-	-	-	-	-	-	-	-		-
10	-	-	-	-	-	-	-	33	91	-		-
11	-	-	-	-	100	-	-	334	66	-		-
12	-	-	68	-	30	-	-	603	-	-		-
13	-	-	31	-	10	-	-	83	-	-		-
14	-	-	12	-	-	-	-	15	-	-		-
15	-	-	-	-	-	-	-	-	-	-		-
16	-	-	-	-	-	-	-	-	227	-		-
17	-	-	-	-	-	-	-	-	48	-		-
18	-	99	-	-	-	-	-	-	-	-		-
19	-	19	-	-	-	-	-	-	-	-		-
20	-	-	-	-	-	80	-	-	-	-		-
21	-	-	-	-	-	70	-	-	-	-		-
22	-	-	-	-	-	10	-	-	-	-		-
23	-	-	-	-	-	-	-	-	-	-		-
24	-	-	-	-	-	-	-	-	-	-		81
25	-	-	-	-	-	-	-	-	-	-		62
26	-	-	-	-	-	-		-	-	-		-
27	-	-	-	-	-	-	330	-	-	-		-
28	-	-	-	-	-	-	77	-	-	-		67
29	-	-	-	46	-	-	-	-	-	-		35
30	-	-	-	332	-------			-	-	-		135
31	-	-------	-	50	-------	-	-------	-	-------	-		-------
MAX	80	99	750	332	100	80	330	603	227	29	-	135
(††)	3.13	2.18	5.81	3.15	1.43	1.11	4.18	6.85	4.43	3.48	2.37	6.47

CAL YR 1971 MAX 750 †† 33.04
WTR YR 1972 MAX 750 †† 44.59

PEAK DISCHARGE (BASE, 800 CFS)

DATE	TIME	ELEV.	DISCHARGE	DATE	TIME	ELEV.	DISCHARGE
12-5	1600	13.00	about 1,480	4-27	1730	a13.45	1,530
				5-12	0800	13.08	1,500

†† Weighted-mean rainfall, in inches, based on two rain gages.
a Peak elevation did not occur at same time as peak discharge.

SOURCE: Water Resources Data for Texas, Part 1: Surface Water Records, 1972, United States Department of the Interior, Geological Survey, p.266.

TABLE C-2

Water Discharge Data: Sims Bayou at State Highway 35

SAN JACINTO RIVER BASIN

08075500 Sims Bayou at Houston, Tex.

LOCATION.--Lat 29°40'27", long 95°17'21", Harris County, on left bank at downstream side of bridge on State Highway 35 in southeast section of Houston and 7.0 miles upstream from mouth.

DRAINAGE AREA.--64.0 sq mi.

PERIOD OF RECORD.--October 1952 to current year.

GAGE.--Water-stage recorder. Datum of gage is 0.61 ft below mean sea level, datum of 1929, adjustment of 1957; unadjusted for land-surface subsidence.

AVERAGE DISCHARGE.--20 years, 62.3 cfs (45,140 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 3,930 cfs May 12 (gage height, 23.38 ft); minimum daily, 18 cfs Nov. 15, Aug. 18, 19, 30, 31.
Period of record: Maximum discharge, 8,800 cfs May 21, 1970 (gage height, 30.22 ft); minimum daily, 0.9 cfs Aug. 7, 1955.

REMARKS.--Records fair. Low flow is largely sustained by sewage effluent from Houston suburbs and industrial wastes.

REVISIONS (WATER YEARS).--WSP 1922: 1960.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1971 TO SEPTEMBER 1972

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	26	22	37	158	51	22	21	24	24	24	21
2	22	25	258	47	80	30	21	250	28	21	21	24
3	24	24	146	26	47	27	21	100	35	20	23	23
4	77	23	44	45	31	25	22	40	23	41	24	26
5	88	23	1,450	33	26	24	21	25	21	47	21	24
6	47	24	1,270	31	46	24	21	20	20	23	20	33
7	38	24	397	25	39	26	21	250	21	20	19	33
8	29	23	146	23	28	26	21	100	21	21	20	29
9	24	25	129	24	27	28	21	43	20	22	19	25
10	24	24	108	23	28	29	22	211	641	44	27	23
11	24	22	55	23	754	28	22	1,530	534	42	25	25
12	23	20	157	23	612	27	21	2,390	104	22	23	32
13	23	19	105	23	217	25	21	1,090	49	29	21	27
14	22	19	52	22	85	25	22	313	35	43	30	40
15	21	18	88	21	61	65	21	140	28	40	44	37
16	30	19	52	21	47	265	20	59	467	21	22	29
17	64	19	48	22	37	70	19	51	239	25	19	20
18	50	122	36	31	33	36	20	37	56	26	18	19
19	30	38	32	165	30	26	19	32	34	72	18	19
20	58	21	29	136	29	37	20	30	26	45	38	19
21	56	19	27	39	29	172	33	27	24	67	93	21
22	29	20	24	31	33	66	43	27	24	52	25	21
23	24	24	23	28	33	39	20	26	25	32	74	38
24	22	32	23	26	30	32	20	25	24	21	66	150
25	22	24	22	22	28	28	20	25	23	21	51	170
26	26	21	21	21	29	26	19	26	22	19	41	237
27	24	21	21	23	28	25	406	24	23	21	33	224
28	25	22	24	25	29	26	282	23	22	34	22	103
29	25	22	23	27	51	27	41	24	23	34	21	54
30	24	22	23	722	------	27	25	22	22	43	18	369
31	25	------	23	403	------	27	------	24	------	62	18	------
TOTAL	1,042	845	4,878	2,168	2,677	1,303	1,207	7,005	2,658	1,054	938	1,915
MEAN	33.6	28.2	157	69.9	93.0	44.8	43.2	226	88.6	34.0	30.3	63.8
MAX	88	122	1,450	722	754	265	406	2,390	641	72	93	369
MIN	21	18	21	21	26	24	19	20	20	19	18	19
AC-FT	2,070	1,680	9,680	4,300	5,310	2,760	2,570	13,990	5,270	2,090	1,860	3,800

CAL YR 1971 TOTAL 17,740 MEAN 48.6 MAX 1,450 MIN 15 AC-FT 35,190
WTR YR 1972 TOTAL 27,386 MEAN 75.2 MAX 2,390 MIN 18 AC-FT 55,310

PEAK DISCHARGE (BASE, 1,600 CFS).--Dec. 5 (1800) 2,840 cfs (21.38 ft); May 12 (1600) 3,930 cfs (23.38 ft).

SOURCE: Water Resources Data for Texas. Part 1: Surface Water Records, 1972. United States Department of the Interior, Geological Survey, p. 265.

TABLE C-3

Water Quality Data: Berry Bayou at Forest Oaks Street

SAN JACINTO RIVER BASIN

08075650 BERRY BAYOU AT FOREST OAKS STREET, HOUSTON, TEX.

LOCATION.--Lat 29°40'35", long 95°14'37", Harris County, at gaging station at Forest Oaks Street bridge in southeast Houston, 0.8 mile upstream from auxiliary gage at mouth of Berry Creek, and 1.7 miles upstream from Sims Bayou.

DRAINAGE AREA.--11.1 sq mi.

PERIOD OF RECORD.--Chemical and biochemical analyses: October 1968 to September 1972.
Pesticide analyses: October 1968 to September 1972.

REMARKS.--See Part 1 of this report for remarks on diversions and return flows.

WATER QUALITY DATA, WATER YEAR OCTOBER 1971 TO SEPTEMBER 1972

DATE	TIME	DIS-CHARGE (CFS)	DIS-SOLVED SILICA (SIO2) (MG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	DIS-SOLVED SODIUM PLUS POTAS-SIUM (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	DIS-SOLVED SULFATE (SO4) (MG/L)	DIS-SOLVED CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	ORGANIC NITRO-GEN (N) (MG/L)
OCT.												
27...	0930	4.3	26	55	9.5	290	386	0	67	320	1.6	.57
NOV.												
22...	1105	6.0	15	34	12	330	338	0	39	400	1.7	.27
DEC.												
14...	0950	14	17	28	34	270	242	0	56	380	1.0	.38
JAN.												
24...	1200	7.4	15	42	18	400	454	0	41	470	1.8	.80
FEB.												
22...	1030	6.6	12	20	26	130	266	0	42	140	.7	.59
MAR.												
12...	0930	3.5	14	34	11	230	348	0	34	250	1.0	.73
27...	1320	72	10	66	26	720	222	0	30	1200	.6	.90
APR.												
04...	1350	20	13	53	15	190	202	0	37	280	.5	.47
11...	0900	264	9.3	24	4.6	29	88	0	15	37	.2	.35
MAY												
9...	1215	4.3	15	26	9.0	250	306	0	28	260	1.5	.39
16...	1000	4.6	15	37	18	490	292	0	33	690	1.4	.31
23...	1015	5.2	14	28	13	330	288	0	30	420	1.1	.47
JUN.												
11...	1220	7.2	--	--	--	--	--	--	--	--	--	.41

DATE	TOTAL NITRITE (N) (MG/L)	AMMONIA NITRO-GEN (N) (MG/L)	TOTAL NITRATE (N) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	TOTAL NON-FILT-RABLE RESIDUE (MG/L)	VOL. NON-SETTLE-ABLE RESIDUE (MG/L)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	SODIUM AD-SORP-TION RATIO	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)
OCT.												
27...	.66	8.1	.2	5.3	969	--	--	180	0	9.5	1780	7.4
NOV.												
22...	.47	10	.2	3.8	1020	19	--	130	0	13	1910	7.7
DEC.												
14...	1.0	1.8	.3	1.7	918	--	--	210	12	8.1	1720	7.5
JAN.												
24...	.46	12	.1	8.0	1220	44	--	180	0	13	2230	7.8
FEB.												
22...	.40	5.5	.2	3.6	511	92	--	160	0	4.6	967	7.2
MAR.												
12...	.090	12	.03	8.0	761	27	--	130	0	8.8	1430	7.1
27...	.14	6.5	.2	3.8	2140	256	--	270	90	19	3760	7.4
APR.												
04...	.50	2.2	.5	1.1	696	--	--	200	30	5.8	1230	7.2
11...	.043	.34	.5	.44	165	--	--	79	7	1.4	312	7.0
MAY												
9...	.76	3.5	.1	5.0	753	7	--	100	0	11	1360	7.5
16...	.29	6.5	.05	6.0	1440	--	--	170	0	16	2540	7.9
23...	.40	6.6	.2	3.0	991	--	--	120	0	13	1740	7.3
JUN.												
11...	....	7.0	.2	5.0	--	46	14	--	--	--	1260	--

TABLE C-4

Water Quality Data: Sims Bayou at State Highway 35

SAN JACINTO RIVER BASIN

08075500 SIMS BAYOU AT HOUSTON, TEX.

LOCATION.--Lat 29°40'27", long 95°17'21", Harris County, at gaging station at bridge on State Highway 35 in southeast section of Houston, and 7.0 miles upstream from mouth.

DRAINAGE AREA.--64.0 sq mi.

PERIOD OF RECORD.--Chemical and biochemical analyses: October 1968 to September 1972. Pesticide analyses: October 1968 to September 1972.

REMARKS.--See Part 1 of this report for remarks on diversions and return flows.

WATER QUALITY DATA, WATER YEAR OCTOBER 1971 TO SEPTEMBER 1972

DATE	TIME	DIS-CHARGE (CFS)	DIS-SOLVED SILICA (SIO2) (MG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	DIS-SOLVED SODIUM PLUS POTAS-SIUM (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	DIS-SOLVED SULFATE (SO4) (MG/L)	DIS-SOLVED CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	ORGANIC NITRO-GEN (N) (MG/L)
OCT.												
19...	1130	28	24	53	12	260	238	0	42	370	.3	.51
NOV.												
17...	0830	19	19	63	13	320	222	0	63	500	.6	.10
DEC.												
02...	1700	360	5.3	48	8.3	240	120	0	37	390	.4	.47
08...	1110	110	12	30	7.1	110	102	0	28	160	.2	.33
27...	1200	18	19	57	23	250	316	0	65	350	.7	.37
JAN.												
11...	1155	20	19	55	18	220	361	0	36	280	.6	.50
31...	1010	340	7.8	24	9.3	57	94	0	26	82	.2	.40
MAR.												
22...	0910	48	12	42	9.0	200	160	0	230	150	.3	.45
APR.												
05...	0920	21	15	72	20	500	333	0	460	440	.8	.40
27...	1415	88	7.4	25	8.6	81	130	0	24	110	.2	.30
MAY												
02...	1130	165	7.7	26	8.0	69	110	0	33	92	.2	.44
23...	1025	22	6.0	55	17	140	280	0	48	170	.5	.43
JULY												
25...	1145	20	16	54	13	160	214	0	42	240	.5	.40
AUG.												
09...	1110	19	18	51	12	140	255	0	50	180	.5	.38
14...	0900	20	19	41	16	190	278	0	45	240	.6	.70
29...	0845	18	19	47	17	170	298	0	55	200	.5	1.1
SEP.												
11...	1015	26	--	--	--	--	--	--	--	--	--	.53

DATE	TOTAL NITRITE (N) (MG/L)	AMMONIA NITRO-GEN (N) (MG/L)	TOTAL NITRATE (N) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	TOTAL NON-FILT-RABLE RESIDUE (MG/L)	VOL. NON-SETTLE-ABLE RESIDUE (MG/L)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	SODIUM AD-SORP-TION RATIO	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)
OCT.												
19...	.020	6.5	.00	2.8	884	--	--	180	0	8.4	1680	6.9
NOV.												
17...	.017	13	.00	4.8	1100	--	--	210	29	9.5	2130	7.2
DEC.												
02...	.021	2.0	.8	3.5	798	632	--	150	56	8.5	1520	7.2
08...	.66	.79	1.2	1.0	406	--	--	100	20	4.7	766	7.0
27...	.10	9.5	.00	4.0	936	--	--	240	0	7.2	1760	7.5
JAN.												
11...	.061	10	.02	5.9	814	22	--	210	0	6.5	1540	7.5
31...	.000	.88	1.3	.35	259	--	--	98	21	2.5	476	7.3
MAR.												
22...	.10	3.4	.3	2.2	732	292	--	140	11	7.3	1290	7.0
APR.												
05...	.014	9.5	.00	6.0	1690	12	--	260	0	13	2780	7.2
27...	.045	3.0	.3	2.2	324	90	--	98	0	3.6	638	7.2
MAY												
02...	.016	2.2	.5	1.8	295	464	--	98	8	3.0	566	6.9
23...	.10	7.0	.07	3.2	584	--	--	210	0	4.1	1060	7.4
JULY												
25...	.090	7.5	.04	4.4	639	--	--	190	10	5.0	1230	7.2
AUG.												
09...	.040	9.5	.02	3.5	583	--	--	180	0	4.5	1070	7.3
14...	.035	10	.07	4.8	707	--	--	170	0	6.4	1240	7.0
29...	.11	7.0	.00	3.2	660	--	--	190	0	5.4	1250	7.2
SEP.												
11...	.032	6.5	.01	6.0	--	9	8	--	--	--	1270	7.2

TEXT REFERENCE:

CHAPTER III: SOCIAL AND ENVIRONMENTAL SETTING (SURFACE AND SUBSURFACE SETTING)

APPENDIX D: LAND-SURFACE SUBSIDENCE IN THE HOUSTON-GALVESTON AREA

BY:
R. K. GABRYSCH AND C. W. BONNET
U. S. GEOLOGICAL SURVEY, OPEN-FILE REPORT

PREPARED BY THE U. S. GEOLOGICAL SURVEY IN COOPERATION WITH THE TEXAS WATER DEVELOPMENT BOARD AND THE CITIES OF HOUSTON AND GALVESTON, 1974.

LAND-SURFACE SUBSIDENCE IN THE HOUSTON-GALVESTON REGION, TEXAS

By

R. K. Gabrysch and C. W. Bonnet
U.S. Geological Survey

ABSTRACT

The pumping of large amounts of ground water in the Houston-Galveston region, Texas, has resulted in water-level declines of as much as 200 feet (61 metres) in wells completed in the Chicot aquifer and as much as 325 feet (99 metres) in wells completed in the Evangeline aquifer during 1943-73. The maximum annual rates of decline for 1943-73 were 6.7 feet (2.0 metres) in the Chicot aquifer and 10.8 feet (3.3 metres) in the Evangeline aquifer. During 1964-73, the maximum rates were 10 feet (3.0 metres) in the Chicot and 17.8 feet (5.4 metres) in the Evangeline. The declines in artesian pressures have resulted in pronounced regional subsidence of the land surface.

The center of subsidence is at Pasadena, where as much as 7.5 feet (2.3 metres) of subsidence occurred between 1943 and 1973. More than 1.0 foot (0.3 metre) of subsidence occurred at Pasadena between 1906 and 1943. The maximum amount of subsidence during 1964-73 was about 3.5 feet (1.1 metres).

In the southern part of Harris County, about 55 percent of the subsidence is a result of compaction in the Chicot aquifer. The area in which subsidence is 1 foot (0.3 metre) or more has increased from about 350 square miles (906 square kilometres) in 1954 to about 2,500 square miles (6,475 square kilometres) in 1973.

Estimates of subsidence are based on the amount of water-level decline, the thickness of the clay, and the compressibility of the clay. At Seabrook, it is estimated that for each 1 foot (0.3 metre) of average water-level decline, 1 foot (0.3 metre) of clay would compact 0.000031 foot (0.00094 centimetre). At Seabrook, for 1 foot (0.3 metre) of water-level decline, 0.0248 foot (0.756 centimetre) of subsidence would occur.

Planned use of surface water instead of ground water will probably result in some recovery of artesian pressures. If pressure recovery occurs the rate of subsidence should decrease substantially in the more critical areas.

INTRODUCTION

Land-surface subsidence has become critical in parts of the Houston-Galveston region of Texas. Some low-lying areas along Galveston Bay are subject to inundation by normal tides, and an even larger part of the region may be subject to catastrophic flooding by hurricane tides. The Houston-Galveston region, as described in this report, includes all of Harris and Galveston Counties and parts of Brazoria, Fort Bend, Waller, Montgomery, Liberty, and Chambers Counties. Figure 1 shows the principal areas of ground-water withdrawals in the region and the average rate of pumping in 1972.

Several reports have described land-surface subsidence as a result of compaction of fine-grained material in the subsurface (Winslow and Doyel, 1954; Winslow and Wood, 1959; and Gabrysch, 1969). The compaction is caused by loading due to pressure declines associated with the removal of subsurface fluids, principally water, oil, and gas. These reports and other reports listed in the references describe the geologic and hydrologic conditions resulting in land-surface subsidence. A generalized cross section of the hydrologic system is shown on figure 2. The Chicot and Evangeline aquifers furnish all of the ground water pumped in the Houston-Galveston region.

For those readers interested in using the metric system, metric equivalents of English units of measurements are given in parentheses. The English units used in this report may be converted to metric units by the following conversion factors:

From		Multiply by	To obtain	
Unit	Abbreviation		Unit	Abbreviation
acre	-	0.004047	square kilometre	km^2
foot	ft	0.3048	metre	m
		30.48	centimetre	cm
million gallons per day	mgd	0.04381	cubic metre per second	m^3/s
square mile	mi^2	1.609	square kilometre	km^2

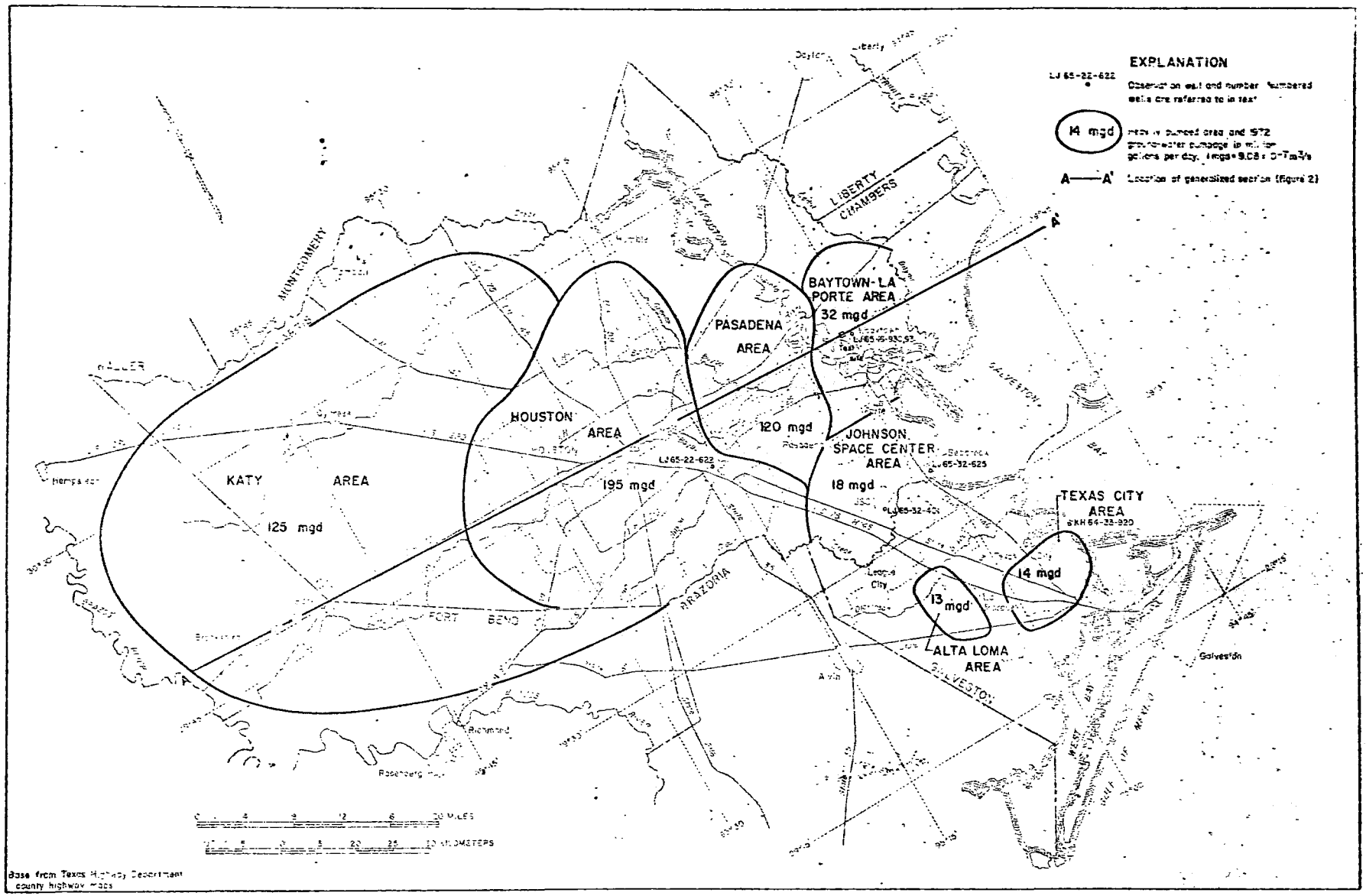


FIGURE 1.-Locations of principal areas of ground-water withdrawals and average rates of pumping in 1972

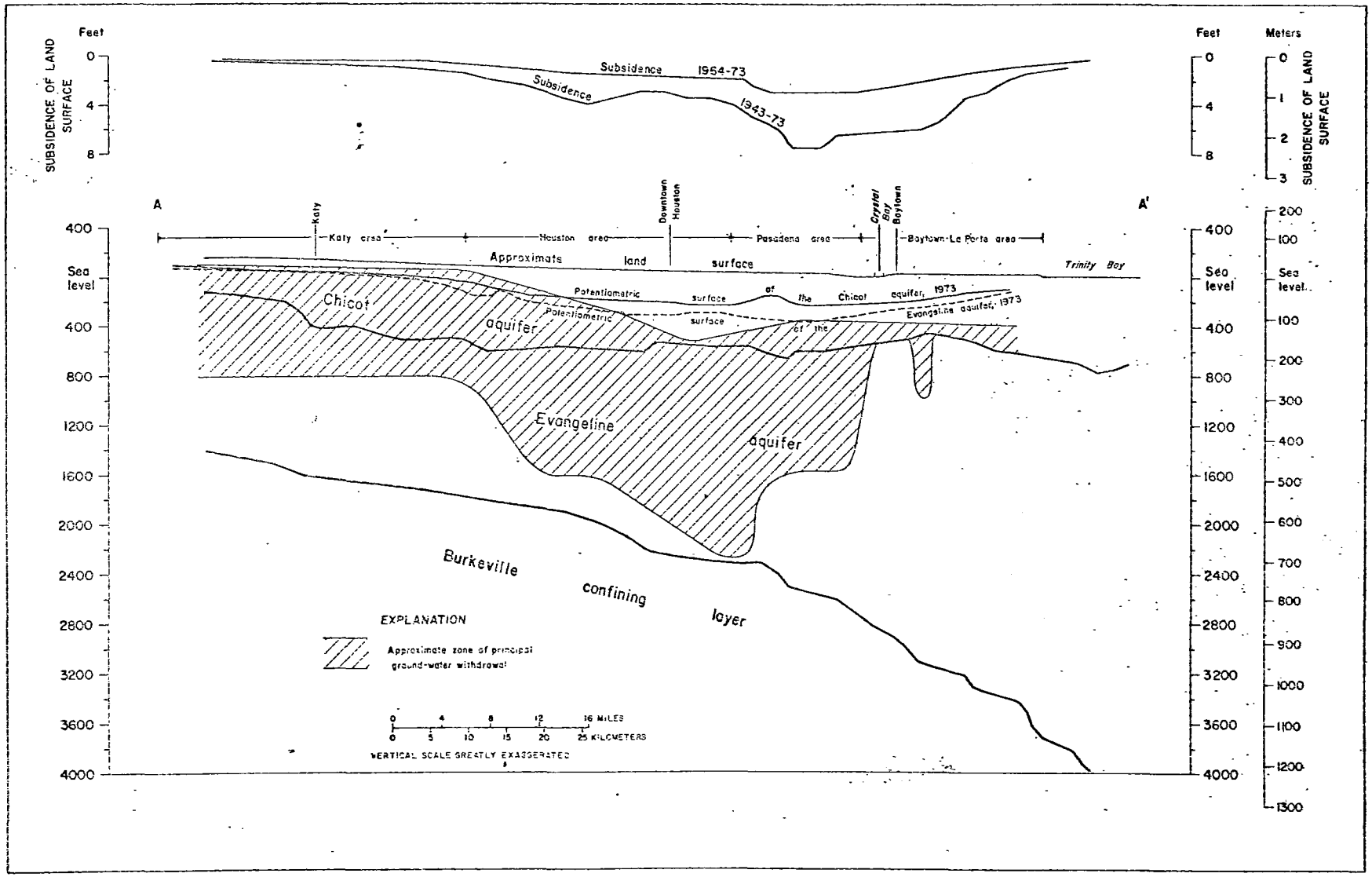


FIGURE 2.-Generalized hydrologic section in the Houston-Galveston region

DEVELOPMENT OF GROUND WATER IN THE HOUSTON-GALVESTON REGION

Houston Area

In 1887, when the city of Houston purchased a private water-supply company, the demand for water for municipal supply was 1 to 2 mgd (0.04 to 0.09 m^3/s). The demand grew steadily, and in 1972, the Houston Water Department used 164 mgd (7.2 m^3/s) of ground water and about 58 mgd (2.5 m^3/s) of treated surface water.

In 1973, the water department increased the use of surface water to 63 mgd (2.8 m^3/s) and decreased the use of ground water to 156 mgd (6.8 m^3/s). Prior to 1954, at which time the ground-water supply was supplemented by surface water from Lake Houston, the total public supply was obtained from the ground-water reservoirs. Public supply is the largest use of ground water in the Houston area; in 1972, only 11 mgd (0.5 m^3/s) of a total of 195 mgd (8.5 m^3/s) pumped in the Houston area was used for purposes other than public supply.

Pasadena Area

Pumping of ground water for industrial use in the Pasadena area began near the end of World War I and grew steadily until 1936, when annual pumpage was about 15 mgd (0.5 m^3/s). In 1937, the construction of a paper mill increased the pumping rate to 30 mgd (1.3 m^3/s). Production increased rapidly during and following World War II.

Surface water from Lake Sheldon and the San Jacinto River was brought into the area in 1942, but the amount of surface water used was less than 20 mgd (0.9 m^3/s) until Lake Houston was completed in 1954. In 1953, 87 mgd (3.8 m^3/s) of ground water was used in the area. In 1972, 120 mgd (5.3 m^3/s) of ground water and 82 mgd (3.6 m^3/s) of surface water was used. In 1972, about 104 mgd (4.6 m^3/s) of ground water was pumped for industrial use.

Texas City Area

Ground-water pumping in the Texas City area increased from less than 2 mgd (0.09 m^3/s) in 1930 to about 12 mgd (0.5 m^3/s) in 1940, then increased to about 24 mgd (1.1 m^3/s) in 1944 and 1945. Withdrawals decreased slightly at the end of World War II, then decreased rapidly after 1948 when surface water from the Brazos River was brought into the area. Ground-water withdrawals averaged about 10 mgd (0.4 m^3/s) from 1950 to 1960, then gradually increased to 14 mgd (0.6 m^3/s) in 1972. About 53 percent of the water pumped in 1972 was for industrial use.

DECLINES IN WATER LEVELS

As a result of large amounts of water having been pumped from the ground, the pressure in the artesian aquifers has declined. This decline in pressure, reflected by lower water levels in wells, is the principal cause of regional land-surface subsidence. Figures 3 and 4 show the declines in water levels for 1964-73 and 1943-73 in wells tapping the Chicot aquifer, and figures 5 and 6 show the declines in water levels for the same periods in wells tapping the Evangeline aquifer. These periods correspond to periods of releveling of lines of bench marks by the National Geodetic Survey.

In the Pasadena and Baytown-LaPorte areas, where ground-water withdrawals are heavily concentrated, the decline of water levels in wells completed in the Chicot aquifer was about 200 feet (61 metres) during 1943-73. The maximum average rate of decline during 1943-73 was about 6.7 feet (2.0 metres) per year. During 1964-73, the center of the area of maximum decline shifted eastward into the Baytown-LaPorte area, where as much as 90 feet (27 metres) of water-level decline occurred. The maximum average rate of decline for the Chicot aquifer during 1964-73 was 10 feet (3.0 metres) per year.

Water levels in wells completed in the Evangeline aquifer declined as much as 160 feet (48.8 metres) between 1964 and 1973, and as much as 325 feet (99 metres) between 1943 and 1973. The maximum average rate of decline during 1964-73 was about 17.8 feet (5.4 metres) per year; the maximum average rate during 1943-73 was about 10.8 feet (3.3 metres) per year.

The maps showing water-level declines in the Evangeline aquifer were constructed from water-level measurements in multiscreened wells. The maps showing water-level declines in the Chicot aquifer are based on measurements in multiscreened wells in the northwest half of the region and on measurements in wells completed in the basal sand of the Chicot aquifer in the southeast half of the region.

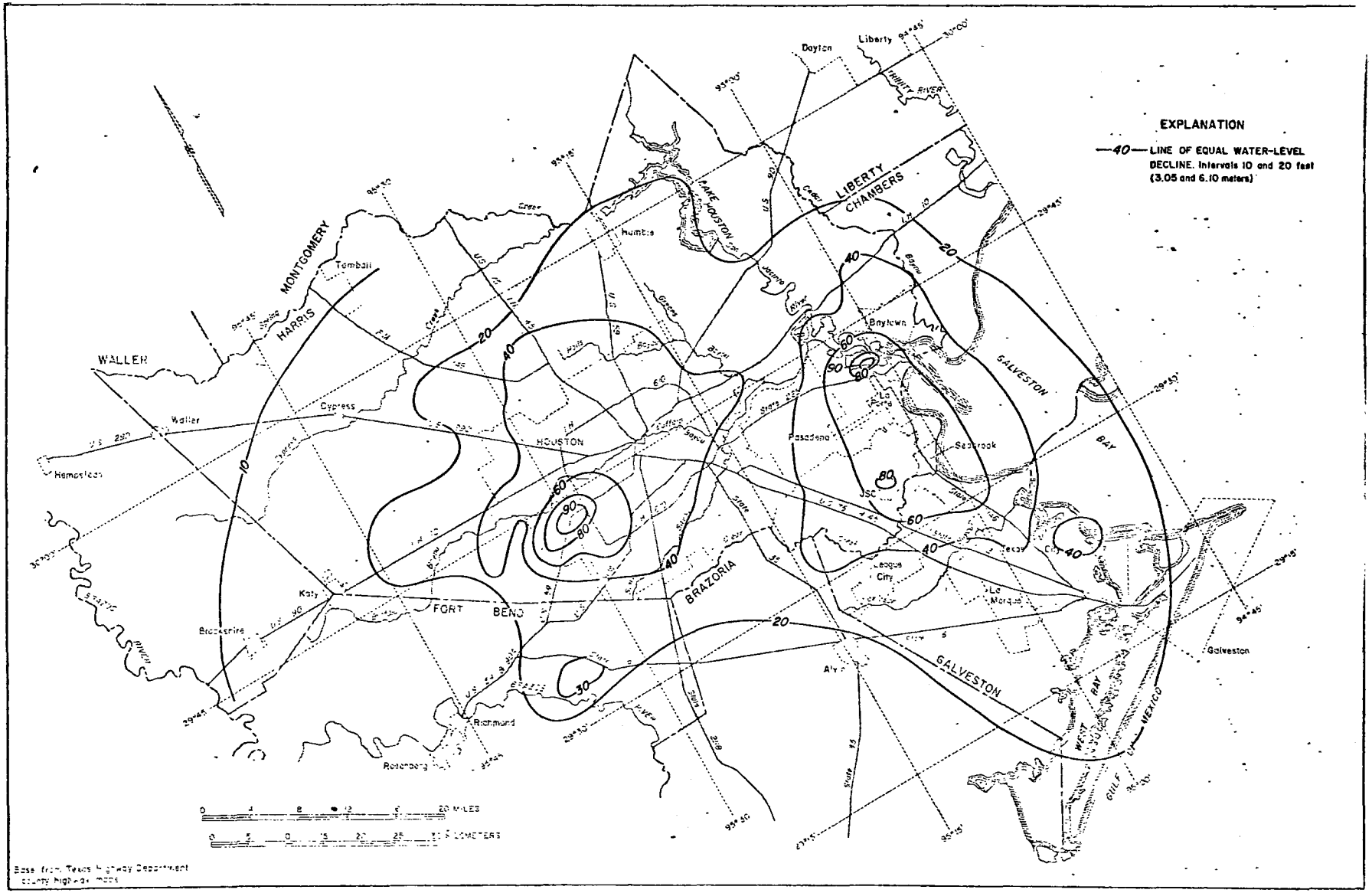


FIGURE 3.-Approximate declines of water levels in wells completed in the Chicot aquifer, 1964-73

FIGURE 4.-Approximate declines of water levels in wells completed in the Chicot aquifer, 1943-73

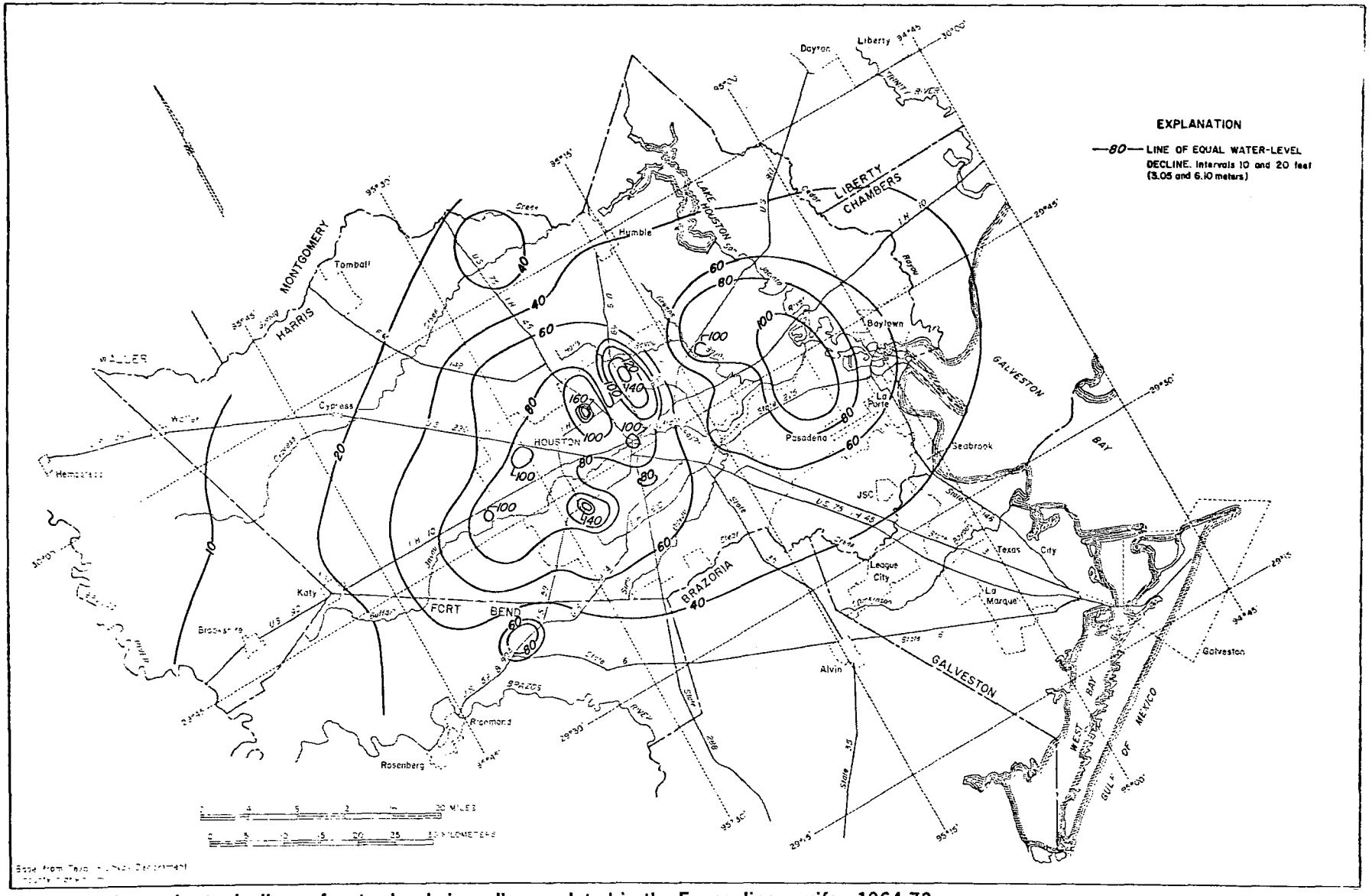


FIGURE 5.-Approximate declines of water levels in wells completed in the Evangeline aquifer, 1964-73

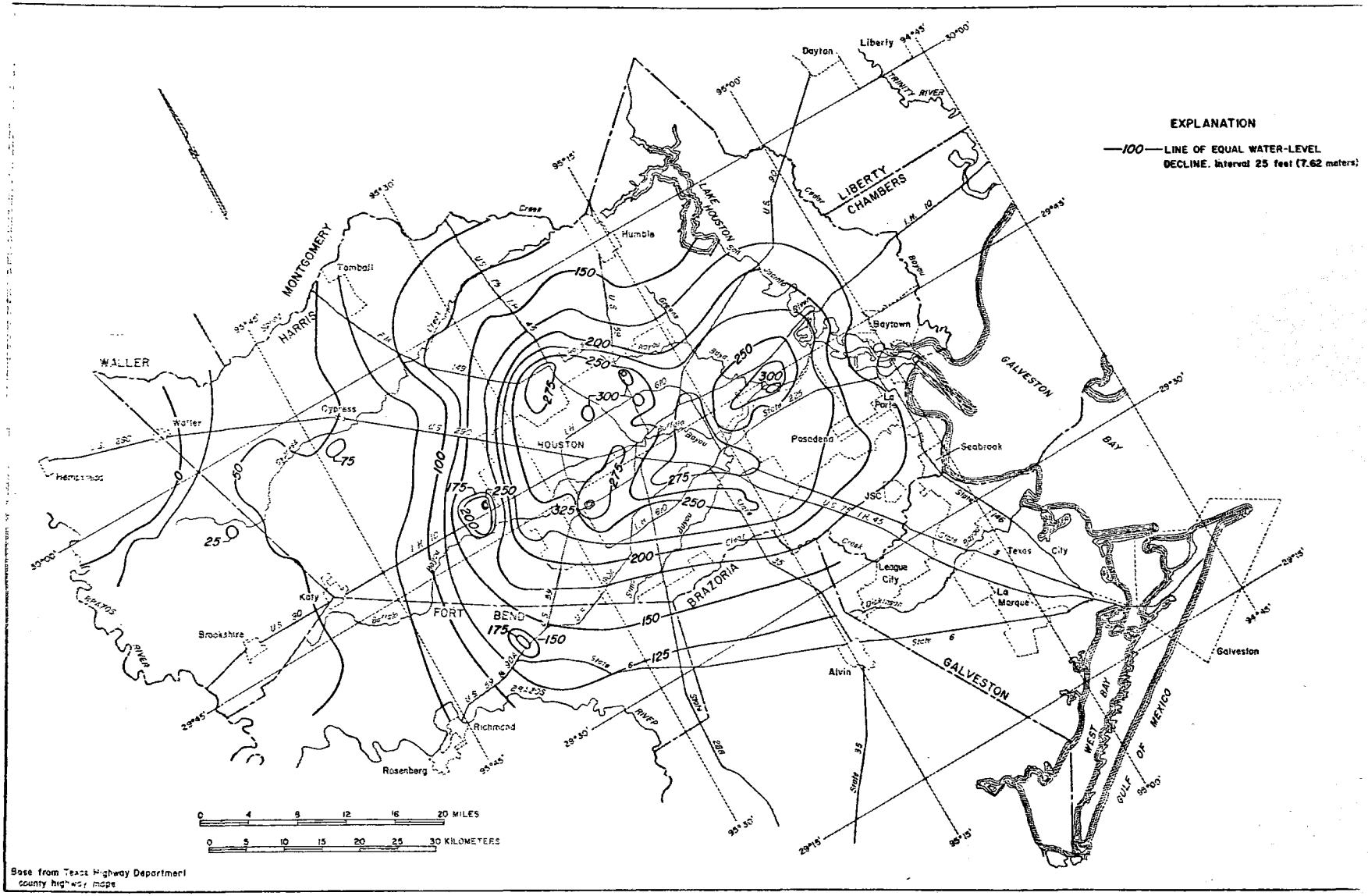


FIGURE 6.-Approximate declines of water levels in wells completed in the Evangeline aquifer, 1943-73

The water-level declines shown on the map are composite average declines in artesian pressure. Not every sand at a particular location exhibits the same amount of pressure decline; therefore, not every clay layer has the same amount of loading. Figure 7 shows the potentiometric profile and depth to water in wells completed at different depths at Baytown. The water level for the depth interval 390-500 feet (119-152 metres) was used in determination of the declines shown on figures 3 and 4.

COMPACTION AND LAND-SURFACE SUBSIDENCE

The withdrawal of water from an artesian aquifer results in an immediate decrease in hydraulic pressure. With a reduction in pressure, an additional load, equal to the reduction in pressure, is transferred to the skeleton of the aquifer. The pressure difference between the sands and clays causes water to move from the clays to the sands, and this in turn results in compaction of the clays. Because the clays are mostly inelastic, most of the compaction is permanent. Less than 10 percent rebound can be expected from a total recovery of artesian pressure.

Figures 8 and 9 show the amount of subsidence in the Houston-Galveston region for 1964-73 and 1943-73. These maps were constructed from data obtained from the National Geodetic Survey leveling program, supplemented by data from local industries. Some subsidence occurred before 1943, but the amount is difficult to determine. Winslow and Doyel (1954, p. 18) stated:

"The United States Coast and Geodetic Survey has established extensive nets of first- and second-order level lines covering most of the region. The first leveling in the region was the first-order line from Smithville to Galveston, which was run in 1905 and 1906. The next was in 1918 when a first-order line was run from Sinton, Texas, to New Orleans, Louisiana. During that period between 1932 and 1936 several other first- and second-order lines were run and the two original lines were releveled.

"In 1942 and 1943 a large number of second-order lines were established in the region and most of the old lines were releveled. At this time subsidence in the Houston area was noted from the results of leveling, although the actual amount of subsidence was not determined because of changes in datum."

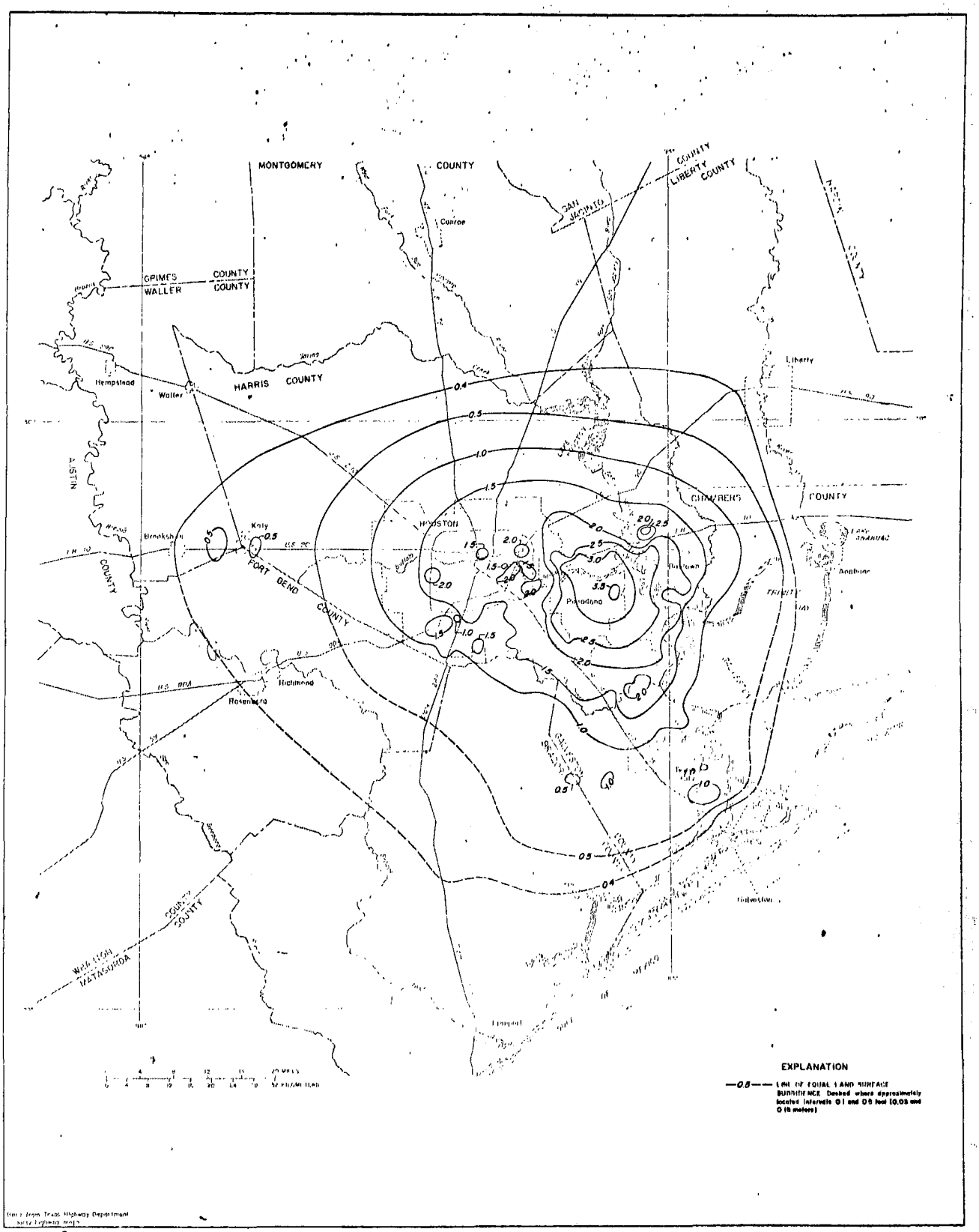


FIGURE 7.-Subsidence of the land surface, 1964-73

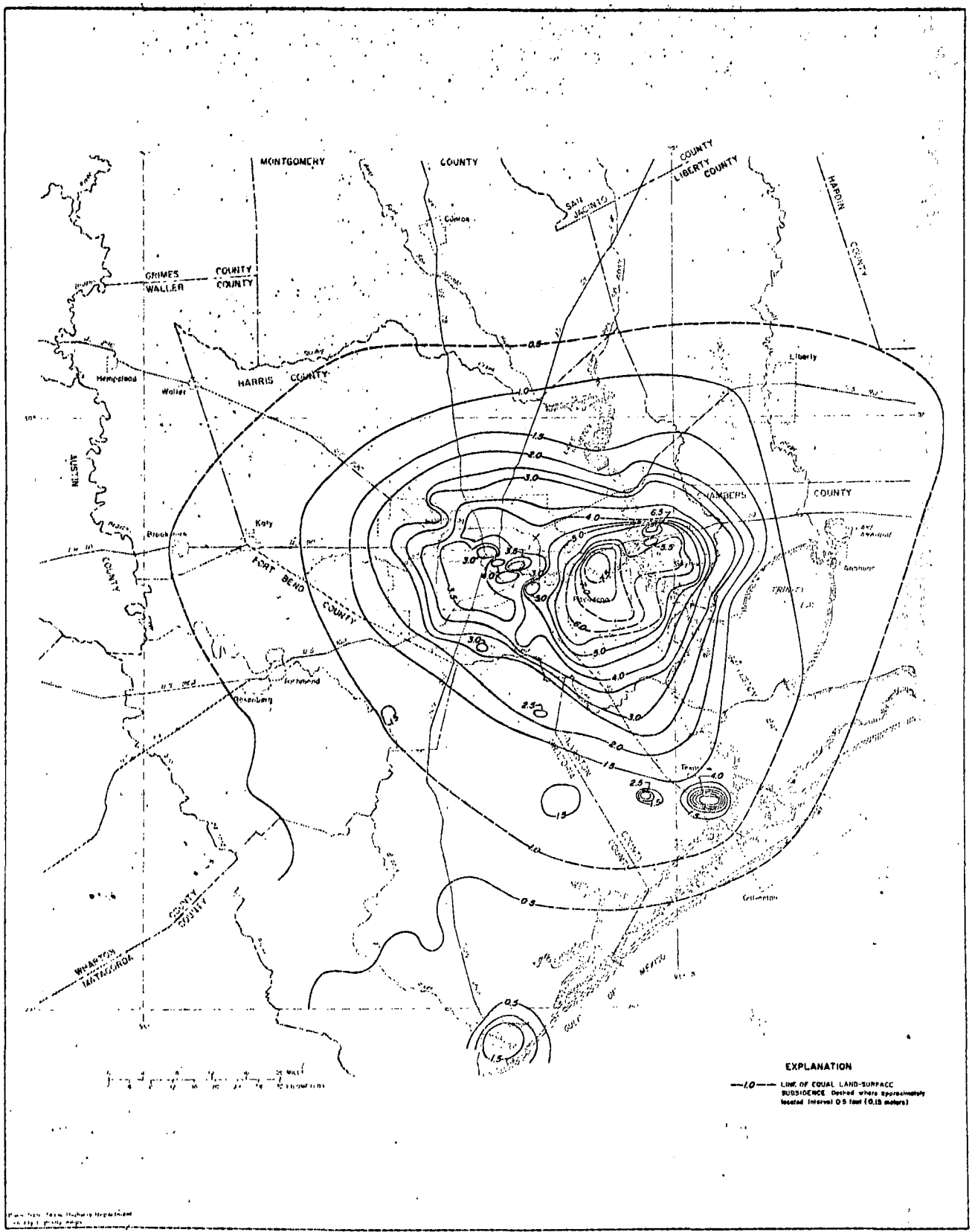


FIGURE 8.-Subsidence of the land surface, 1943-73

An approximation of the amount and extent of the subsidence that occurred between 1906 and 1943 is shown on figure 10. The maximum amount of subsidence shown on figure 10 occurred in the Goose Creek oil field. Pratt and Johnson (1926) concluded that the withdrawal of oil and gas from the Goose Creek field had caused 3.25 feet (1.0 metre) of subsidence between 1918 and 1925. Data to determine subsidence since 1925 are not available. Pratt and Johnson observed that subsidence was restricted to the area of production.

Land-surface subsidence resulting from the pumping of ground water first occurred in the Texas City area, where minor discrepancies in altitude data were noticed between 1938 and 1940 (American Oil Company, 1958). Before subsidence was definitely known, the search for an outside source of water was begun. After recognition of the subsidence problem, efforts were made to obtain water for industrial use from outside the area, and the delivery of surface water from the Brazos River began in 1948. Ground-water pumping for all uses decreased from about 24 mgd (1.1 m^3/s) in 1948 to about 10 mgd (0.4 m^3/s) in 1952.

The decrease in ground-water withdrawals resulted in partial recovery of artesian pressures in the aquifers and in a greatly decreased rate of subsidence. Only about 0.2 foot (6.1 centimetres) of subsidence occurred at Texas City in each of the two 5-year periods 1954-59 and 1959-64. The indicated rate of subsidence during those two periods was about 0.04 foot (1.2 centimetres) per year compared to a reported rate of as much as 0.366 foot (11.2 centimetres) per year between 1940 and 1952.

Since 1964, a gradual increase in ground-water pumping in the Texas City area and the effects of pumping outside the area have caused water levels to decline to below their 1948 levels. An accelerated rate of land-surface subsidence is now occurring. Figure 8 shows that about 1.0 foot (0.3 metre) of subsidence occurred between 1964 and 1973, which is a rate of about 0.11 foot (3.4 centimetres) per year.

The center of the largest subsidence "bowl" in the region is in the vicinity of the Houston Ship Cahnnel at Pasadena. As much as 7.5 feet (2.3 metres) of subsidence occurred between 1943 and 1973 (fig. 9). The water-level declines due to pumping before 1937 and between 1937 and 1943 caused subsidence in excess of 1.0 foot (0.3 metre) between 1906 and 1943. The maximum amount of subsidence between 1964 and 1973 was about 3.5 feet (1.1 metres); the average maximum rate of subsidence was about 0.4 foot (12.2 centimetres) per year.

The area of active subsidence is expanding. Between 1943 and 1954, about 350 square miles (906 square kilometres) had subsided 1 foot (0.3 metre) or more; by 1964, 1,350 square miles (3,497 square kilometres) had subsided 1 foot (0.3 metre) or more. By 1973, 2,500 square miles (6,476 square kilometres) had subsided 1 foot (0.3 metre) or more. About 4,700 square miles (12,173 square kilometres) subsided 0.5 foot (0.15 metre) or more between 1943 and 1973.

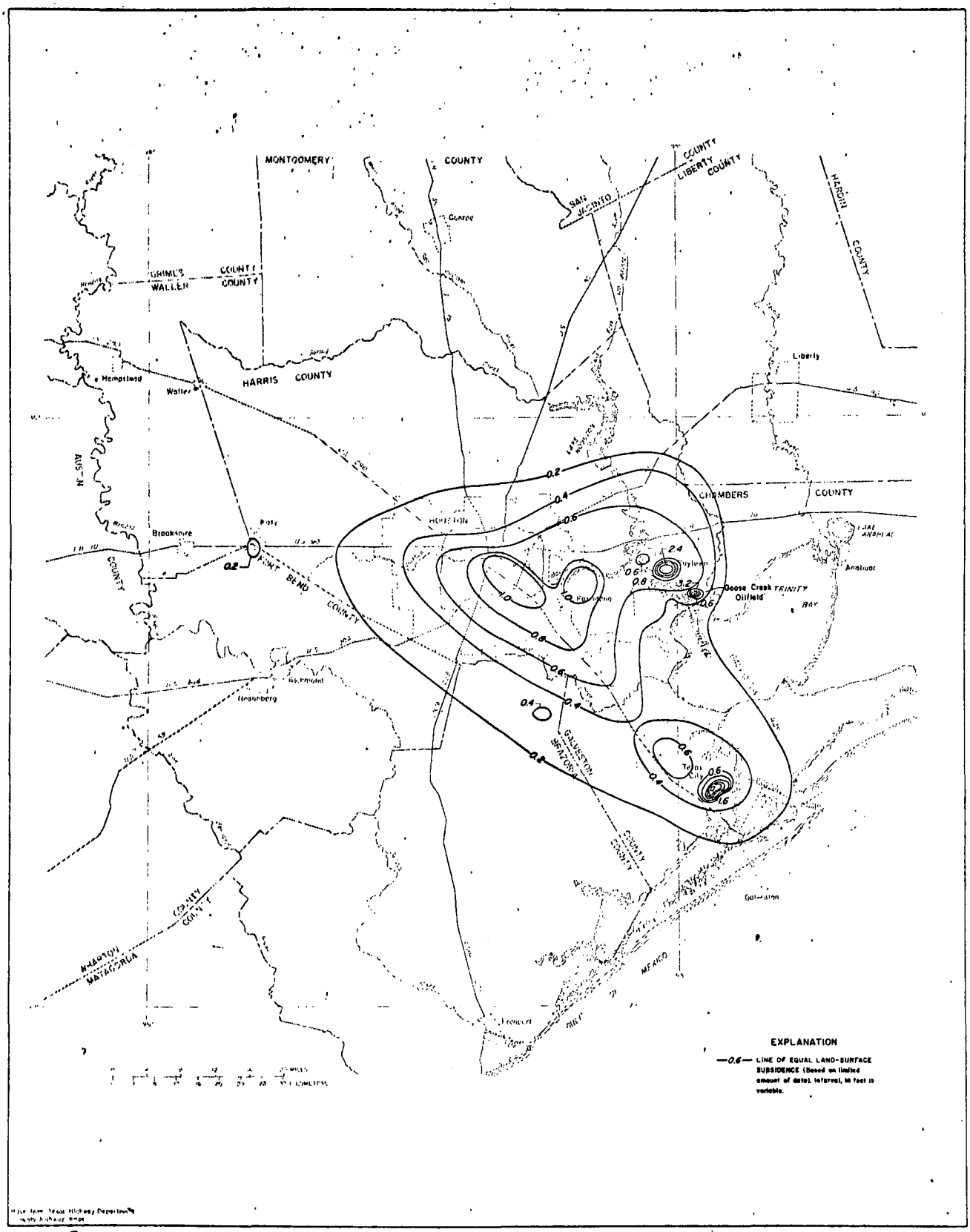


FIGURE 9.–Approximate subsidence of the land surface, 1906-43

Except at low altitudes near the waterfront, subsidence is not generally recognized because it is regional in nature. The changes in altitudes are not abrupt, and subsidence has not caused widespread structural damage.

Under the several ground-water investigation programs in the Houston-Galveston region, borehole extensometers (compaction recorders) have been installed to monitor compaction. To date (1974), seven such monitors have been installed at five sites, and two additional monitors at two other sites are planned. The first monitor was installed on the east side of Houston in 1958 in an abandoned well. The well failed in 1962 and the monitor was destroyed. The second monitor was installed in 1962 at the Johnson Space Center and has been maintained since then. The compaction monitored at this site and the subsidence are shown on figure 11. Five monitors were installed in 1973 at four sites: east of Houston; west of Baytown; at Seabrook; and at Texas City. The compaction recorded at these sites is shown on figure 12.

At the Johnson Space Center in southern Harris County, the land surface subsided about 2.12 feet (0.65 metre) between 1964 and 1973 (fig. 11). Compaction of the material between the land surface and a depth of 750 feet (229 metres) was measured as 1.17 feet (0.357 metre) during the same period. Therefore, 55 percent of the subsidence resulted from compaction of the upper 750 feet (229 metres) of material. The monitor at this site is recording all compaction in the Chicot aquifer.

Figure 12b shows the amount of compaction measured at two depth intervals at Baytown. The upper curve shows that 0.038 foot (1.16 centimetres) of compaction, from land surface to a depth of 431 feet (131 metres), occurred from July 24, 1973, until April 5, 1974. The lower curve shows that 0.088 foot (2.68 centimetres) of compaction, from land surface to a depth of 1,475 feet (450 metres), occurred during the same period. The estimated rate of subsidence at the site during 1964-73 was 0.19 foot (5.79 centimetres) per year.

On the basis of this short period of record (8½ months) at Baytown, about 28 percent of the subsidence is due to compaction between the land surface and a depth of 431 feet (131 metres), 37 percent is due to compaction from 431 to 1,475 feet (131 to 450 metres), and 35 percent is due to compaction below 1,475 feet (450 metres).

Detailed analysis of subsidence, artesian-pressure declines, total clay-bed thickness, individual clay-bed thickness, clay properties, and pressure profiles at sites at Baytown, Texas City, and Seabrook indicates the following:

1. The change in pressure in both sand and clay layers varies from one depth to another; measurement of a single well does not necessarily define the changes in pressure in the entire aquifer.

TEXT REFERENCE:

CHAPTER III: SOCIAL AND ENVIRONMENTAL SETTING

APPENDIX E: CLIMATIC AND ATMOSPHERIC CONDITIONS

1. CLIMATE
2. AIR QUALITY

TABLE E-1

MONTHLY PRECIPITATION (MEASURED IN INCHES)
CITY OF HOUSTON 1965-1973

Month	Houston WB Airport 1965	Houston WB Airport 1966	Houston WB Airport 1967	Houston FAA Airport 1968	1969	1970	1971	Houston WSO AP 1972	Houston WSO AP 1973
January	1.87	4.46	2.41	8.02	2.74	1.93	0.36	3.30	5.00
February	3.27	7.75	2.17	1.99	5.31	2.52	2.11	1.20	3.40
March	0.81	2.20	1.83	2.92	3.18	5.08	1.21	8.52	3.68
April	0.95	7.98	4.42	3.02	3.34	2.21	2.14	2.85	7.15
May	6.53	11.21	2.54	13.24	4.73	14.39	3.41	6.99	4.22
June	3.06	4.42	0.17	11.18	1.51*	0.26	2.42	3.02	13.46
July	1.57	1.45	7.77	6.49	3.89*	2.28	1.42	2.76	6.77
August	2.29	7.11	1.60	2.90	2.67*	2.03	6.95	3.90	3.73
September	3.56	4.01	4.84	3.87	6.08*	6.22	5.17	6.23	9.38
October	3.09	5.45	3.18	3.91	3.30*	9.09	3.49	3.34	9.31
November	4.82	1.56	0.50	2.71	2.13*	1.54	1.82	6.49	1.59
December	6.15	1.53	5.02	1.19	4.38*	0.64	7.33	2.20	2.47
TOTAL YEAR	37.97	59.13	36.45	61.44	43.26*	48.19	37.83	50.80	70.16

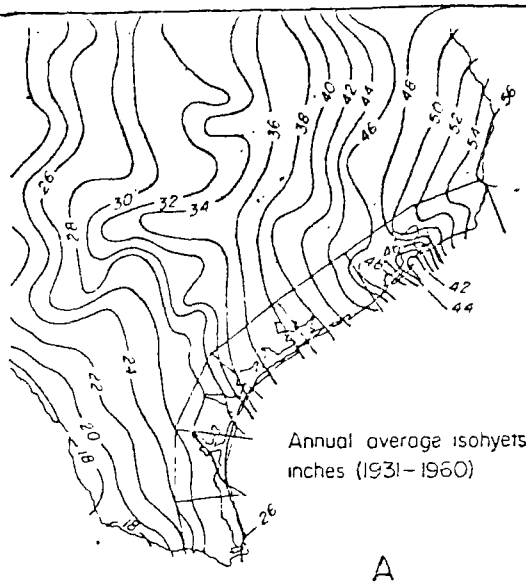
Average 1965-1973: 49.50 Inches

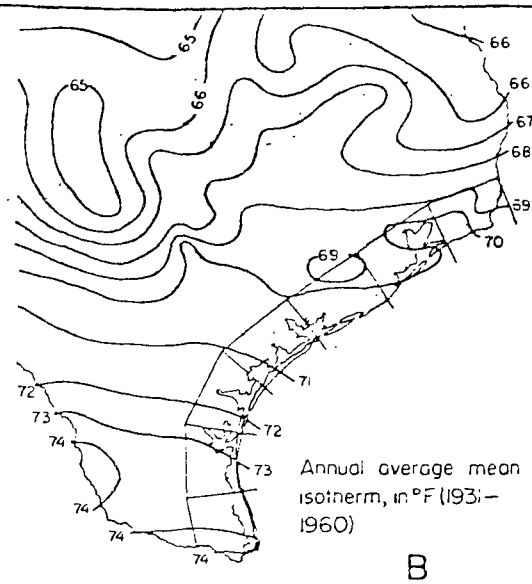
* At Houston Incont. Airport

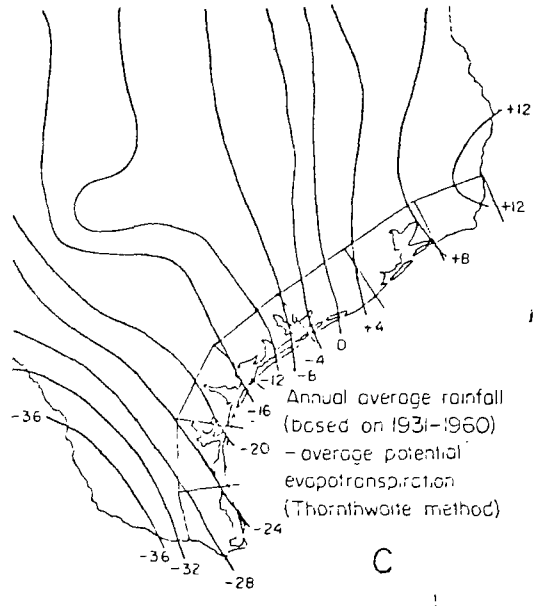
SOURCE: United States Department of Interior, Weather Bureau

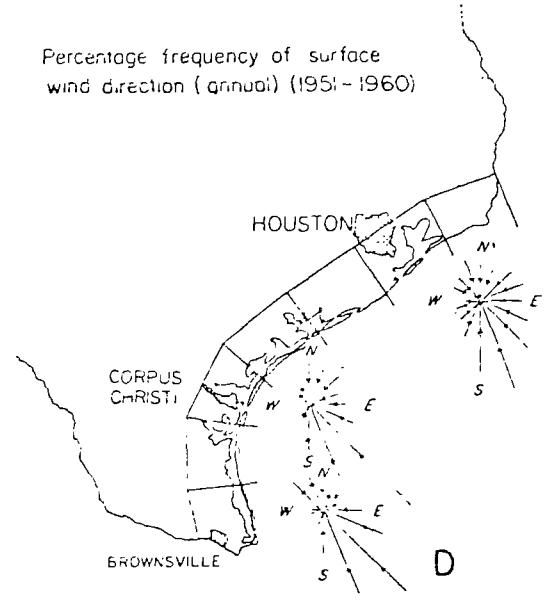
CLIMATE CONDITIONS

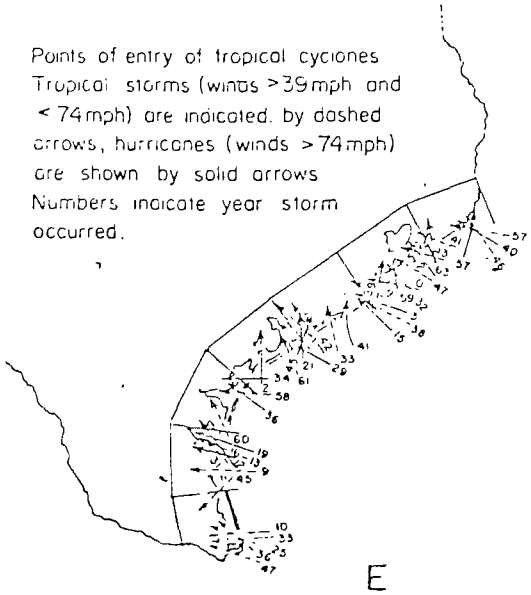
FIGURE E-1

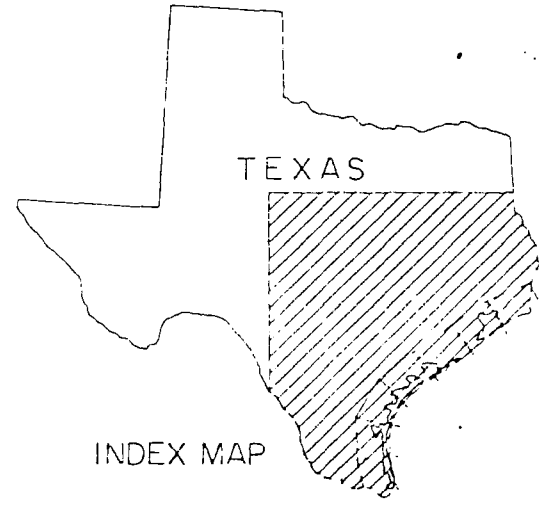






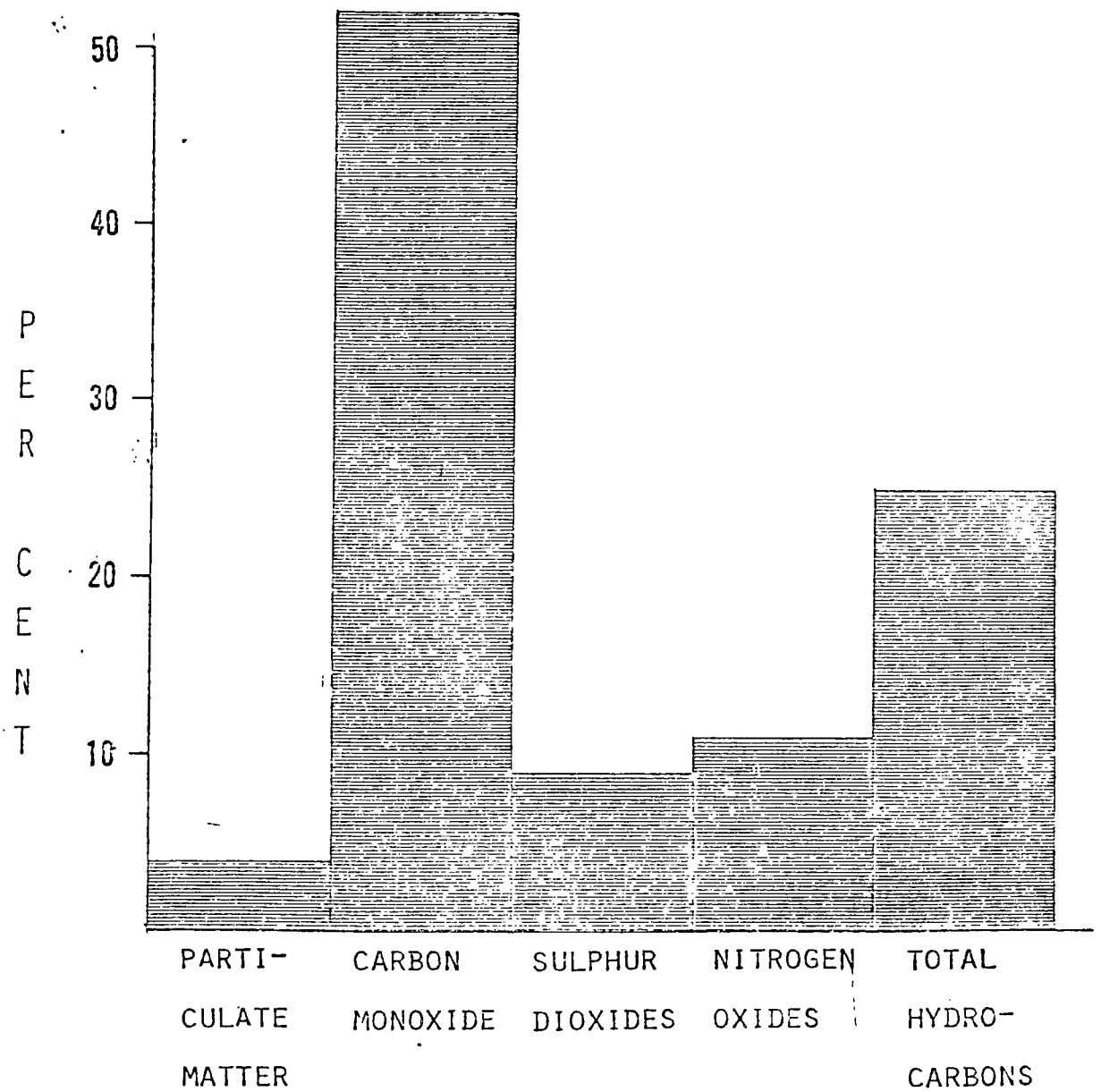






Regional climatic data, Texas Coastal Zone. A, Average annual precipitation (after J. T. Carr, 1967). B, Average annual temperature (after J. T. Carr, 1967). C, Precipitation deficiency (after Orton, 1969a). D, Frequency of surface wind direction (after Orton, 1964). E, Hurricane tracks across Texas coastline (after Hayes, 1967).

FIGURE E-2: SOURCES AND LEVEL OF AIR POLLUTION IN HARRIS COUNTY, 1972



TEXT REFERENCE:

CHAPTER III: SOCIAL AND ENVIRONMENTAL SETTING
(NATURAL ENVIRONMENT: CLIMATIC AND ATMOSPHERIC CONDITIONS)

APPENDIX EE: AIR POLLUTION CONTROL PROGRAM FOR THE HOUSTON AREA

1. GEOGRAPHIC VARIATION OF AIR POLLUTION IN HOUSTON
2. COMPARISON OF HOUSTON'S AIR QUALITY AGAINST NATIONAL AND STATE AMBIENT AIR QUALITY STANDARDS
3. THE CURRENT PROGRAM OF THE CITY OF THE CITY IN COMBATTING AIR POLLUTION PROBLEMS FOR HOUSTON

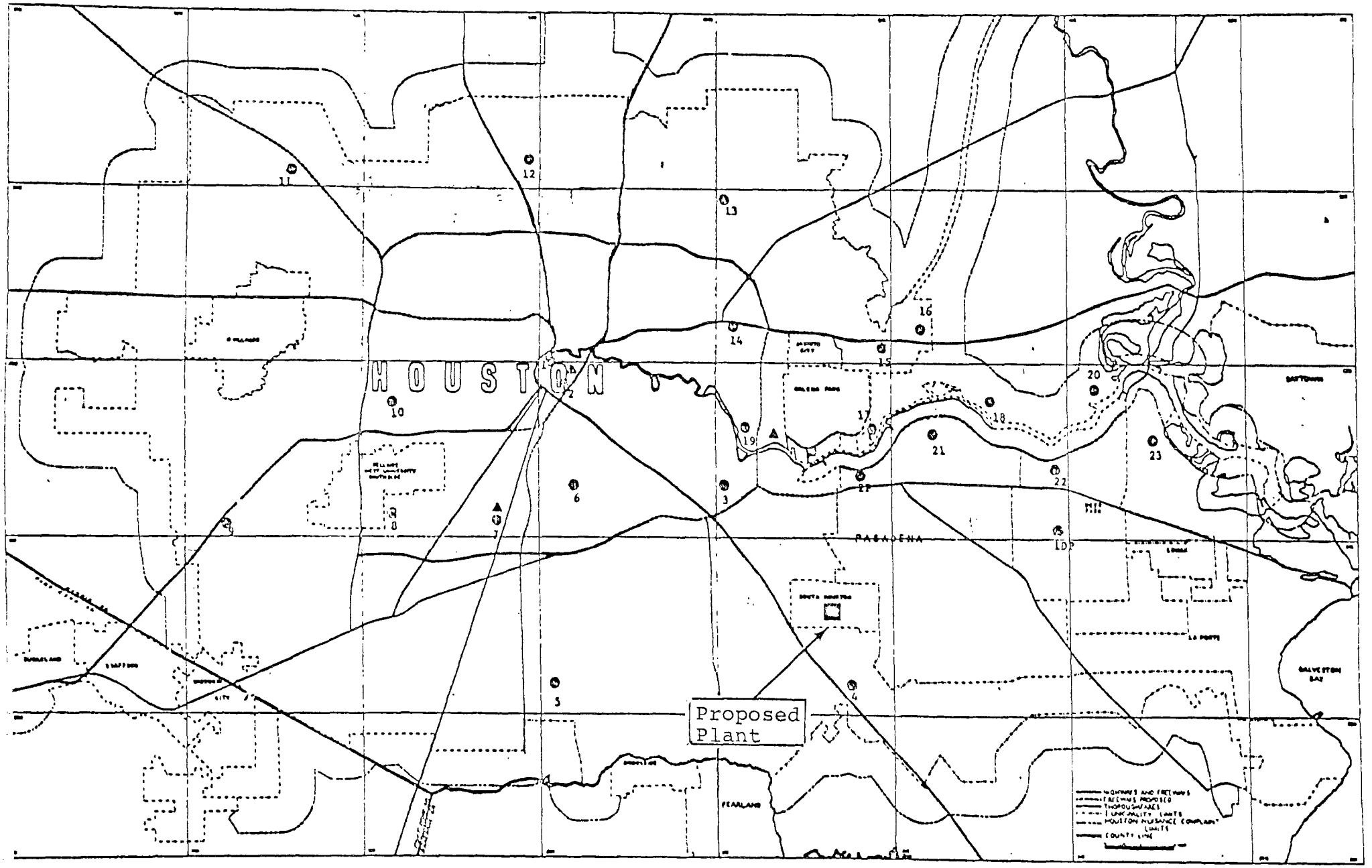
The Houston Air Pollution Control Program began in 1967 under the City's Department of Health. The purposes of the program was to monitor sources of air pollution and to control regulate, and reduce these pollutants. The City assumed the responsibility of monitoring and enforcing the State and Federal Standards on air pollution. Their activities include the determination of where the standards are being violated and issuing citations to make improvements in the general air quality of Houston.

1. Geographic Variation of Air Pollution in Houston

Currently, the Houston area has 25 monitoring stations including the Houston Ship Channel Industrial District, where large concentrations of pollution sources exist. These monitoring stations are shown in Figure EE-1. In addition, two continuous monitoring mobile units have been put into operation to sample Carbon Monoxide, Nitrogen Oxides, Sulphur Dioxides, and Total Oxidants on a continuing basis. Of the 25 monitoring stations, none is located within the District 47 Plant's service area or within 2 miles from the location of the plant.

Table EE-1 summarizes geographic mean data on suspended particulates (in micrograms per cubic meter) for the three month period of January to March, 1972 and 1973. Similar data on other pollutants are not available. Data in Table EE-1 indicates the

FIGURE EE-1: AMBIENT AIR MONITORING NETWORK



relative pollutant concentrations of suspended particulates at 25 locations. The pollution concentration in 1972 ranged from 146 mg/mt^3 for location 21 (Pasadena area, Houston Ship Channel) to 53 mg/mt^3 for location 8 in the vicinity of the Houston Astrodome. The pollution curve for 1973 ranged in Houston from 274 for location 18 (again the Ship Channel area) to 40 for location 23. The nearest monitoring station location is approximately 3 miles south of the proposed plant site. This station recorded a geometric mean (particulate matters) of 59 mg/mt^3 during January through March 1972. The recorded figure was 47 during the comparable period in 1973.

The City Air Pollution Control Program in cooperation with the University of Texas Health Science Center in Houston has prepared some computer maps showing the concentration of pollutants of suspended particulates, Sulphur Dioxides and Nitrogen Oxides and their geographic distribution. Figures EE-2 and EE-3 show the heaviest concentration of industrial pollutants over the Ship Channel Industrial District, downtown Houston and other industrial areas. Figure EE-4 shows the heaviest concentration of Nitrogen Oxides in the downtown area. The Ship Channel area is high also, but so is much of the City. This concentration and distribution pattern is largely caused by the automobile.

2. Comparison of Houston's Air Quality Against National and State Ambient Air Quality Standards:

The Ambient Air Network established and monitored by

TABLE EE-1

SUSPENDED PARTICULATE COMPARISONS

Geometric means [$\mu g/m^3$]: January through March

Site Location		1972	1973	% Change
Deer Park	1	66	74	+12.1
Pasadena	2	115	99	-13.9
Houston	2	91	102	+12.1
	3	76	97	+27.6
	4	59	47	-20.3
	5	69	68	- 1.4
	6	67	71	+ 5.9
	7	79	60	-24.1
	8	53	46	-13.2
	9	77	63	-18.2
	10	59	54	- 8.5
	11	66	59	-10.6
	12	62	57	- 8.1
	13	64	62	- 3.1
	14	87	93	+ 6.9
	15	80	78	- 2.5
	16	98	72	-26.5
	17	86	63	-26.7
	18	--	274	-
	19	99	123	+24.2
	20	64	55	-14.1
	21	146	79	-45.9
	22	57	66	+15.8
	23	54	40	-25.9

FIGURE EE-2: SUSPENDED PARTICULATE MATTER ANNUAL GEOMETRIC MEAN

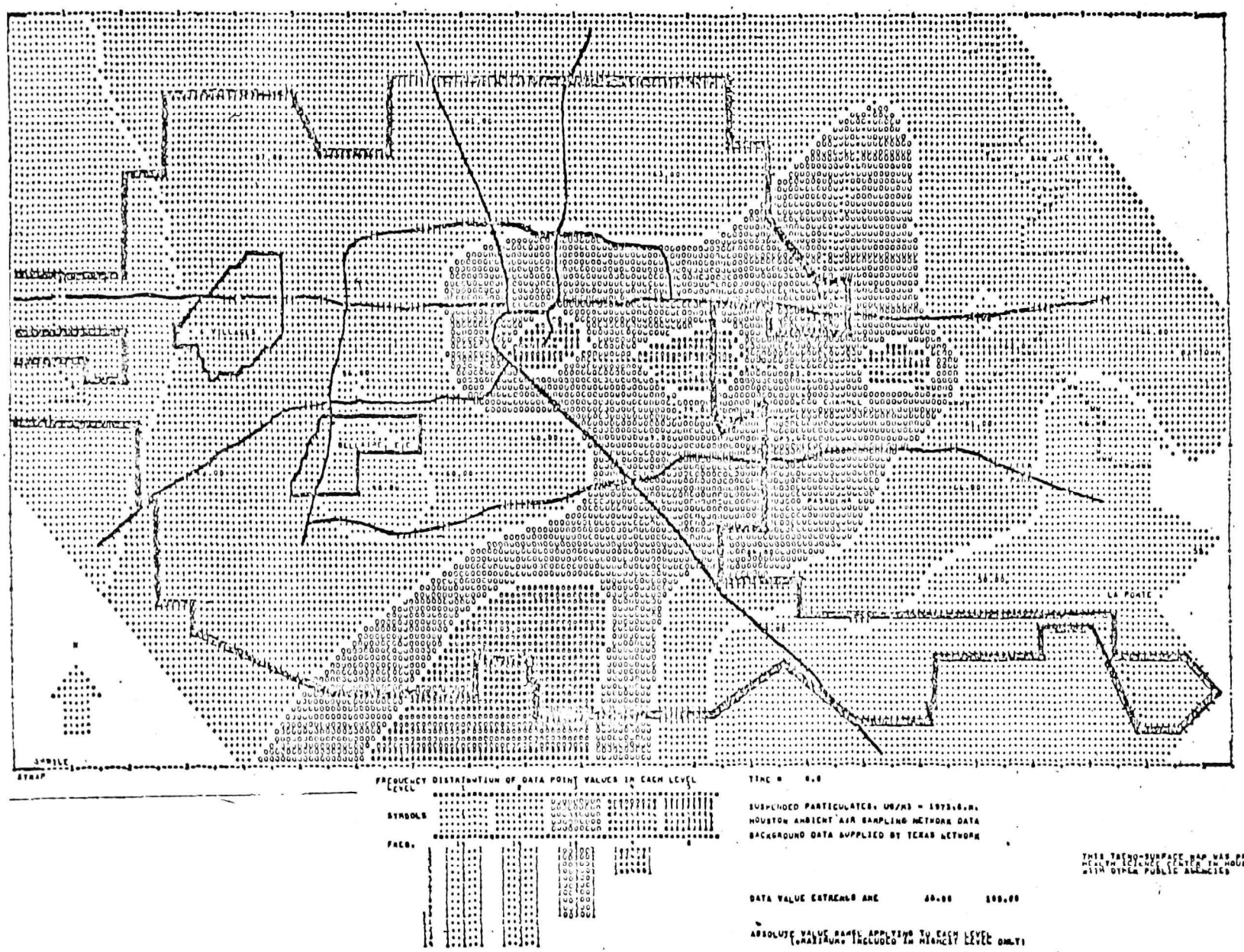


FIGURE EE-3: SULFUR DIOXIDE ANNUAL ARITHMETIC MEAN

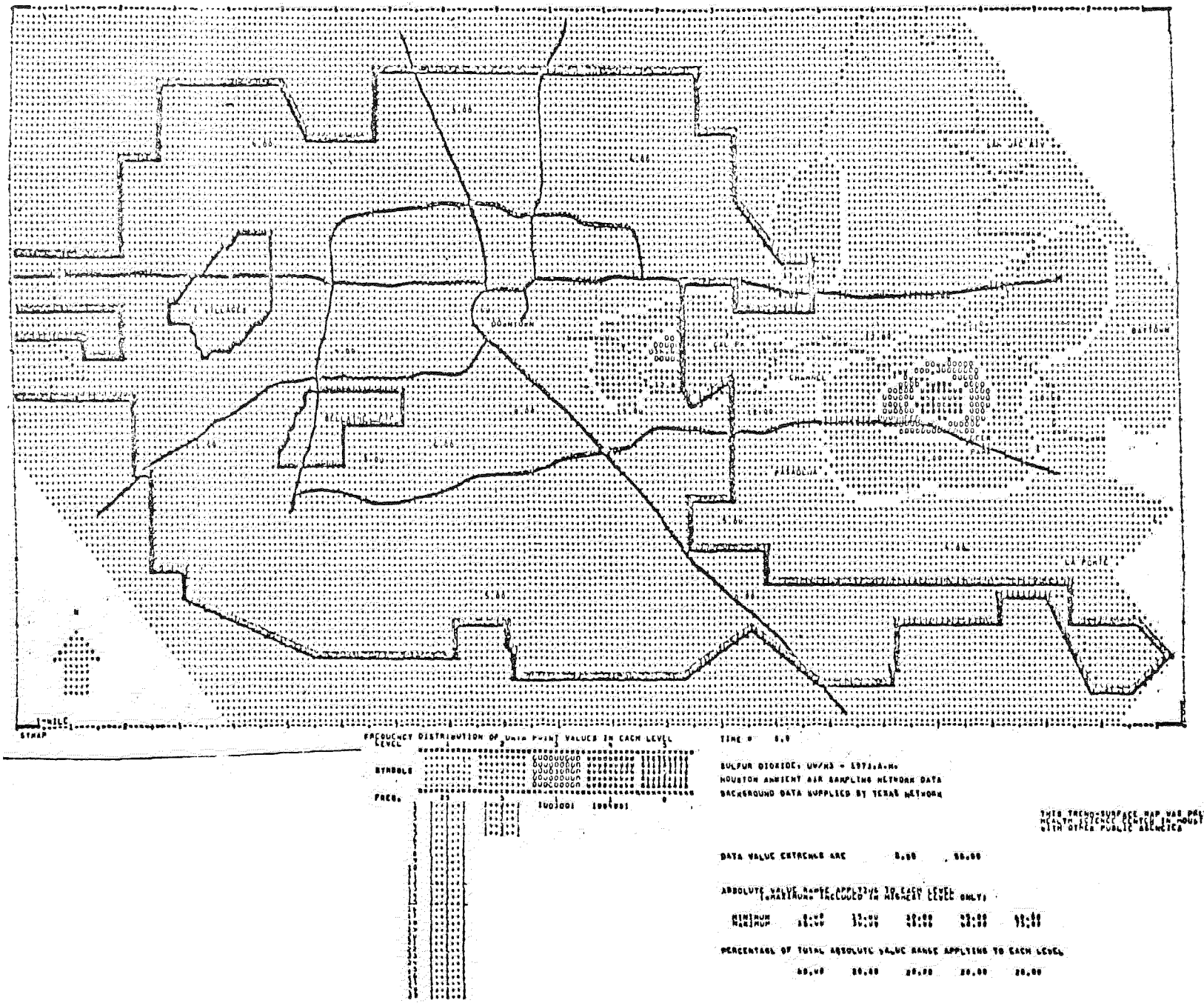


FIGURE EE-4: NITROGEN DIOXIDE ANNUAL ARITHMETIC MEAN

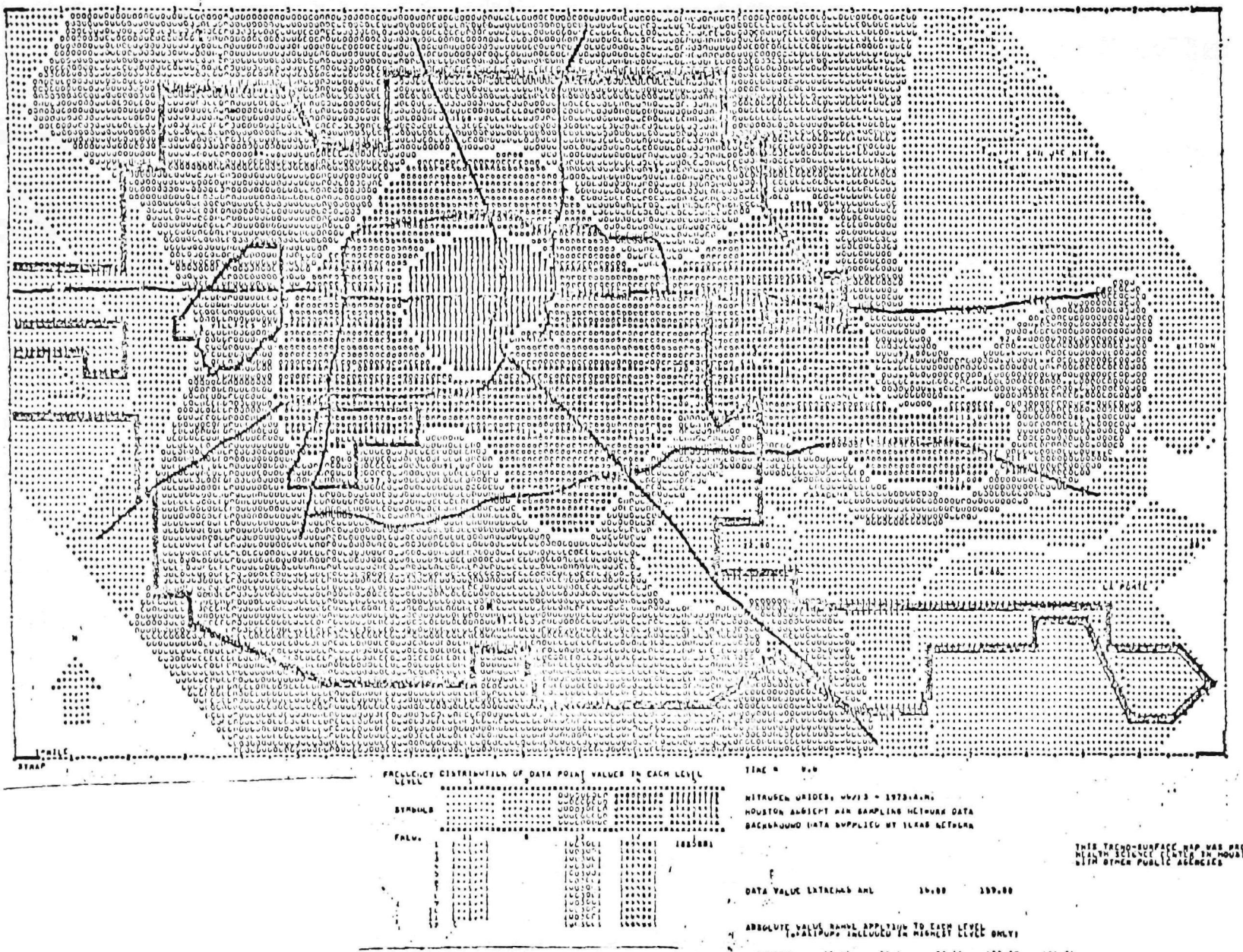
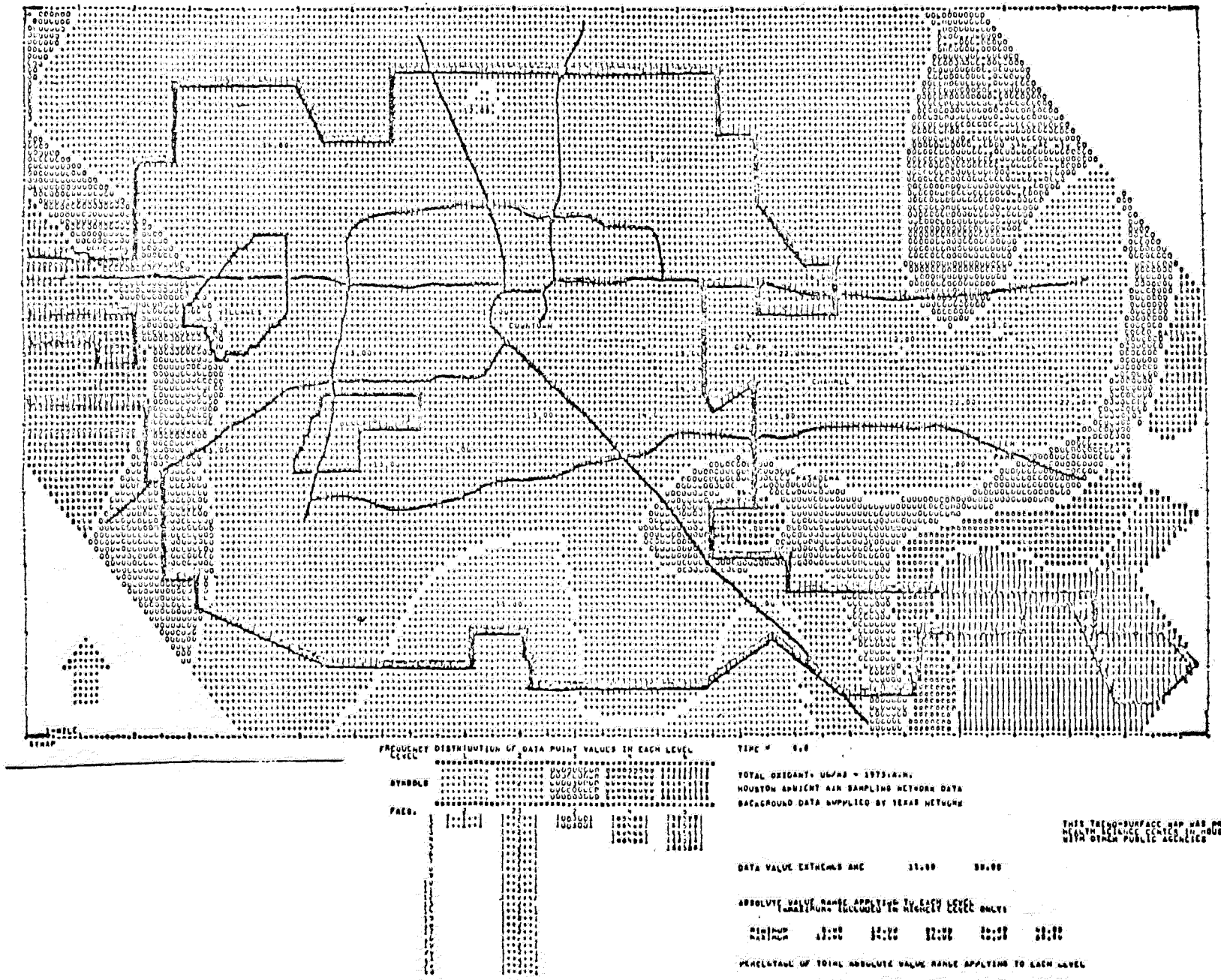


FIGURE EE-5: TOTAL OXIDANTS ANNUAL ARITHMETIC MEAN



the City of Houston Air Control Program of the Public Health Department measures pollutant concentrations at 25 random sampling sites and two continuous monitoring sites in the Houston area. The particulate data collected annually from 1969 through 1973 have been summarized in the following table. The table gives the percentage taken that exceeded the different 24 hour and annual standards established by the Environmental Protection Agency and the Texas Air Control Board. Comparable data for other pollutants (Carbon Monoxide, Sulphur Dioxides, Nitrogen Oxides) are not available.

As Table EE-2 shows, Houston has consistently been in violation of both the Texas Air Control Board and Environmental Protection Agency standards for Particulate Matters in both the 24 hours average and Annual Geometric Mean. That the State standards are far more strict than Federal standards is evident from the above table. On 24 hour standards, Houston comes close to meeting the EPA standards but falls short by 5-10% to meet state standards. The situation is highly critical on the annual geometric mean standards since Houston is well over the allowable levels of concentration permitted by federal and state ambient air standards.

TABLE EE-2

COMPARISON OF HOUSTON'S POLLUTANT CONCENTRATION WITH NATIONAL AND STATE STANDARDS

Federal and State Standards on Pollutant Concentrations for Particulate Matters	Percentages by Which Houston Exceeded National & State Standards on Particulate Matters				
	1969	1970	1971	1972	1973
TACB Standard 150 ug/m^3 24 hr/avg	10.2%	4.6%	4.8%	3.8%	7.7%
EPA Standard 260 ug/m^3 24 hr/avg	1.1%	0.2%	0.3%	0.0%	2.7%
TACB Standard 55 ug/m^3 Annual Geometric Mean	94.1%	70.6%	84.4%	88.0%	88.0%
EPA Standard 75 ug/m^3 Annual Geometric Mean	47.0%	29.4%	41.2%	35.2%	48.0%

SOURCE: City of Houston Department of Public Health, Air Control Program Division, Annual Report, 1973, p.20.

comes close to meeting the EPA standards but falls short by 5-10% to meet state standards. The situation is highly critical on the annual geometric mean standards since Houston is well over the allowable levels of concentration permitted by federal and state ambient air standards.

On the positive side, Houston's Air Pollution Control Program has been able to reduce the levels of pollution by controlling and limiting industrial polluters as shown by generally declining annual concentrations, but it has not been able to bring the City within State and Federal standards. This declining pollution concentration trend is also evident from data presented in Table EE-1. Most sampling locations experienced a reduction during the first quarter from 1972 to 1973. This is to say that the current programs are beginning to have some beneficial impact on pollutant concentrations of Particulate Matters. But the program needs to be expanded further to include control measures on other particulates, particularly Carbon Monoxides, the major source of which is the automobile.

3. The Current Program of the City in Combatting Air Pollution Problems for Houston

The people of Houston and their City Government are aware of some of the problems facing the nation's

sixth largest city. Though the City has a long way ahead of it in cleaning its air and maintaining it that way, nonetheless, it has made a good beginning. The continuation of current trends of program expansion may enable the City in bringing the pollutant concentrations to allowable limits within the next 10 to 15 year period.

a) Program History:

The City of Houston Air Pollution Control Program has developed quite rapidly since its creation in 1967. Established with a goal to clean Houston's air of noxious and annoying pollutants, the growth of the control program has been significant. With an initial staff of less than twenty individuals with technical equipment for air monitoring and pollutant measurement. The following outline reviews the growth which the program realized during the past seven years.

1967 - 1968

(i) The Air Pollution Control Program was established as a section within the City of Houston Health Department.

(ii) Seventeen ambient air monitoring stations were established to monitor for both gaseous and particulate pollutants.

(iii) A survey of vegetation throughout Houston was conducted to determine if any air pollution damage could be verified. The survey indicated no visible damage to vegetation.

(iv) Several public meetings were held to convey to members of industry the information concerning the laws on air pollution.

(v) Much of the program's first year's activities involved the purchasing of necessary equipment and the survey of industrial polluters.

1969

(i) The agency began conducting three hour ambient air sampling to supplement the 24 hour sampling routine. The three hour samples provided a better understanding of pollution concentrations.

(ii) A comprehensive program to develop an emission inventory was undertaken by the program in cooperation with the Texas Air Control Board.

(iii) A second shift was initiated to provide complaint investigation and surveillance between 5 p.m. and midnight.

(iv) During 1969 forty-one positions were budgeted for personnel.

(v) A civil suit filed by the City of Houston against an industrial polluter resulted in a $17,000 fine and an injunction to prevent future violations of the air pollution laws.

1970

(i) A program titled "Survey of the Composition of Particulates in Air Samples from the City of Houston" was performed with the cooperation of the University of Texas School of Public Health. The work constituted a significant part in obtaining a more reliable picture of ambient air quality over the city.

(ii) A stack sampling team was organized and underwent training to familiarize themselves with procedural methods.

(iii) With an increase in available personnel, the enforcement section developed air sampling teams and assigned them to three air quality districts within the city.

(iv) The City of Houston filed five civil suits to enjoin industrial polluters from emitting contaminants in violation of the Regulations.

(v) During 1970 fortey-eight positions were budgeted for personnel.

1971

(i) An incinerator survey program was initiated to determine the impact on air pollution caused by incinerating waste at small business establishments. The survey established the number, type and location of the majority of incinerators within the city. This survey served as the basis for an ordinance which requires a permit to operate an incinerator within the City of Houston.

(ii) The Houston City Council adopted the incinerator ordinance in December 1971 thereby establishing the incinerator permit program.

(iii) The program expanded its manpower and established a permanent night shift to enable 24 hour coverage for air pollution investigation. Standby personnel were on call for weekend duty.

(iv) The Stack Sampling team established in 1970 became operational in 1971 and initiated sampling of emissions directly from the source.

(v) A stack sampling van was purchased to aid in the efficiency of the stack sampling team.

(vi) Two continuous monitoring trailers were assembled by staff members. The units became operational and began sampling for Carbon Monoxide, Nitrogen Oxides, Sulfur Dioxide and Total Oxidants on a continuous basis.

(vii) The Houston Polic Department joined the surveillance activities of the pollution program by reporting emissions sighted by the patrol helicopters.

(viii) The City of Houston filed nine civil suits to prohibit air pollution emission from industries in the city.

(ix) The monitoring technique for determining ambient levels of Sulfur Dioxide was improved by switching from the standard lead peroxide candles to Huey Sulfation plates.

(x) During 1971 fifty positions were budgeted for personnel.

1972

(i) The program began issuing suspended particulate forecasts in February 1972. The predictions currently reach about a million people daily since they are used by television and the Houston Post.

(ii) A program to analyze for heavy metals in the ambient air was established. Utilization of an atomic absorption unit to test the ambient air sampled and determine the background level of the following metals in the ambient air: Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Nickel, Vanadium, Mercury, and Zinc.

(iii) The Emergency Employment Act allowed the program to place ten additional employees and thereby establish a rotating shift. Complete 7 day 24 hour coverage was established and replaced the standby weekend duty.

(iv) Expansion of program personnel permitted establishment of four separate sections for Enforcement, Engineering, Technical Services and Meteorology.

(v) The authority of the program was expanded to include the Ship Channel Industrial District. Through a city entered contract the program personnel were permitted to enter property for investigation and sampling of the industries located in this area.

(vi) The enforcement staff was expanded and the city divided into four sampling districts to permit coverage in the Houston Ship Channel District.

(vii) The ambient air monitoring sites were expanded from 17 to 25. Eight samplers were placed within the Houston Ship Channel Industrial District.

(viii) The Incinerator Permit Program began issuing operating permits in February 1972.

(ix) The Incinerator Program substantially reduced the number of polluting incinerators in Houston during 1972. Forty-six percent of the incinerators were taken out of service, thirtenn percent were permitted and the remainder were awaiting modification.

(x) The Program began issuing citations for incinerator violations. The violations were set for hearings in Municipal Courts.

(xi) Meetings were intiated with the City Planning Department to permit an exchange of information and assist in future city planning.

(xii) The Engineering Section began reviewing applications for Texas Air Control Board Construction Permits.

(xiii) A program to determine odor problems was established under contract to Copley International Corporation. The program conducted sixteen public attitude surveys and conducted training for odor evaluation.

(xiv) Scentometers, a device for determining concentrations of odor, were tested by the program and incorporated as one of the sampling techniques.

(xv) City Council amended the Houston fire prevention ordinance to authorize the air pollution control personnel to issue citations for outdoor burning.

(xvi) The City of Houston filed two civil cases to prohibit air pollution from industry in the area.

(xvii) In November 1972 the program began submitting air pollution violations to the District Attorney's Office for filing in Criminal District Court. Three criminal cases were filed during 1972.

(xviii) A total of 34 cases were filed in Civil, Criminal, and Municipal Courts.

(xix) During 1972 fifty positions were budgeted for personnel and an additional ten personnel were added through the Emergency Employment funds.

1973

(i) Preliminary work has been done on an ozone forecast for use in the summers when the ozone problem can be substantial. Part of the results of this work was used to show that industrial sources were the primary cause of the ozone problem and that radical transportation controls would be of small value in reducing ozone levels.

(ii) A hydrocarbon study was conducted in conjunction with the University of Houston to determine the background levels of hydrocarbon in the ambient air of Houston.

(iii) Field enforcement personnel began routine gaseous and metal sampling of industrial sources.

(iv) The program began publishing monthly reports of current air pollution data to supplement the annual report.

(v) A system seven computer was installed as part of the telemetry system for the continuous monitoring network.

(vi) A trial run of the telemetry system was successfully conducted with equipment supplied by contract companies. The program equipment was on order and being assembled as of March, 1974.

(vii) The Technical Services Section increased its monitoring personnel to four individuals in order to adequately service the continuous monitoring sites.

(viii) The Enforcement Section expanded its staff to include four individuals in each of the four sampling districts.

(ix) City Council approved the expansion of the engineering staff with one public health engineer and three engineering assistants. Seven investigator positions and two technician I positions have also been provided.

(x) Fifteen criminal cases were filed through the District Attorney's Office for air pollution violations.

(xi) Nine civil cases were completed with fines and permanent injunctions imposed.

(xii) A total of 108 cases were filed against air polluters in Civil, Criminal, and Municipal Courts.

(xiii) During 1973, 56 positions were budgeted for personnel and another ten additional positions were added to the program through the Emergency Employment Funds.

(xiv) A total of 633 incinerator operating permits have been issued and 750 incinerators have been removed from service.

b) Program Summary:

The chronological accounts of the various activities by the City of Houston presented in the preceding section explain the current level of involvement by the City in addressing the pollution problems. In summary it can only be said that the program has made a significant stride in reducing concentration of Particulate pollutants. Supplementary programs are needed to combat other pollutant concentrations. The automobile continues to remain the major source of Houston's air pollution problem. The various federal regulations controlling transportation activities under the State Implementation Plans for Transportation Control as well as through the Indirect Source Control will have some effect in the future. But these programs are primarily curative. What is needed is a Comprehensive Prevention Program. The City's current program should be expanded to incorporate federal regulations on local transportation control and more importantly, the City with the aid of the federal government (through the recently passed Mass Transit Bill) should make a shift in the basic pattern of

its transportation system. An aggressive mass transit program is long over-due for Houston.

Tables EE-1, EE-2 and EE-3 show that the progress made by the city in air control during 1973 is praiseworthy. Yet, much remains to be done. A major policy shift is needed and a greater priority placed in the Air Pollution Control Program. Public funds are not unlimited in supply. Their wise allocation to various programs and projects according to a rational order of priority is essential. Air pollution as a program should receive a high priority from the city government. The city has recognized the need for it but commensurate level of priority has not yet been given this program.

TABLE EE-3

HOUSTON AIR POLLUTION CONTROL PROGRAM ACTIVITIES

Activities	Total 1973
Hours on Air Pollution	85566
Conferences Attended	702
Instruments Calibrated	4207
Ambient Lab Samples	9403
Plans Reviewed	108
Inspections	1147
Advisory Visits	2591
Complaints Serviced	3120
Odor Evaluations	84
Visible Emission Evaluations	109
High Volume Samples	276
Gaseous Samples	34
Other Samples	216
Notices Issued	989
Violating Companies	632
Corrections Made	431
Cases Filed	108*
Cases Won	89*
Cases Lost or Dismissed	20

* The difference in case numbers results from a carry-over of cases filed in previous year.

TEXT REFERENCE:

CHAPTER III: SOCIAL AND ENVIRONMENTAL SETTING (NATURAL ENVIRONMENT)

APPENDIX F: BIOLOGICAL ENVIRONMENT FOR THE GREATER HOUSTON AREA AND SERVICE AREA OF DISTRICT 47 TREATMENT PLANT

A. BOTANICAL

B. ZOOLOGICAL

BIOLOGICAL ENVIRONMENT FOR THE GREATER HOUSTON AREA

A. BOTANICAL

Common native plant life in the Houston area includes both tropical and temperate climate zone vegetation. Forest trees include ash, bay, cedar, cotttonwood, cypress, dogwood, elm, hawthorne, honeysuckle, jasmine, laurel, magnolia, oak, pine, poplar and wild peach. There are narrow timberlines extending from main bodies of timber along the streams out onto the prairie and up the small water courses reaching out for miles. The trees line the bayou banks and bay shores up to the water's edge.

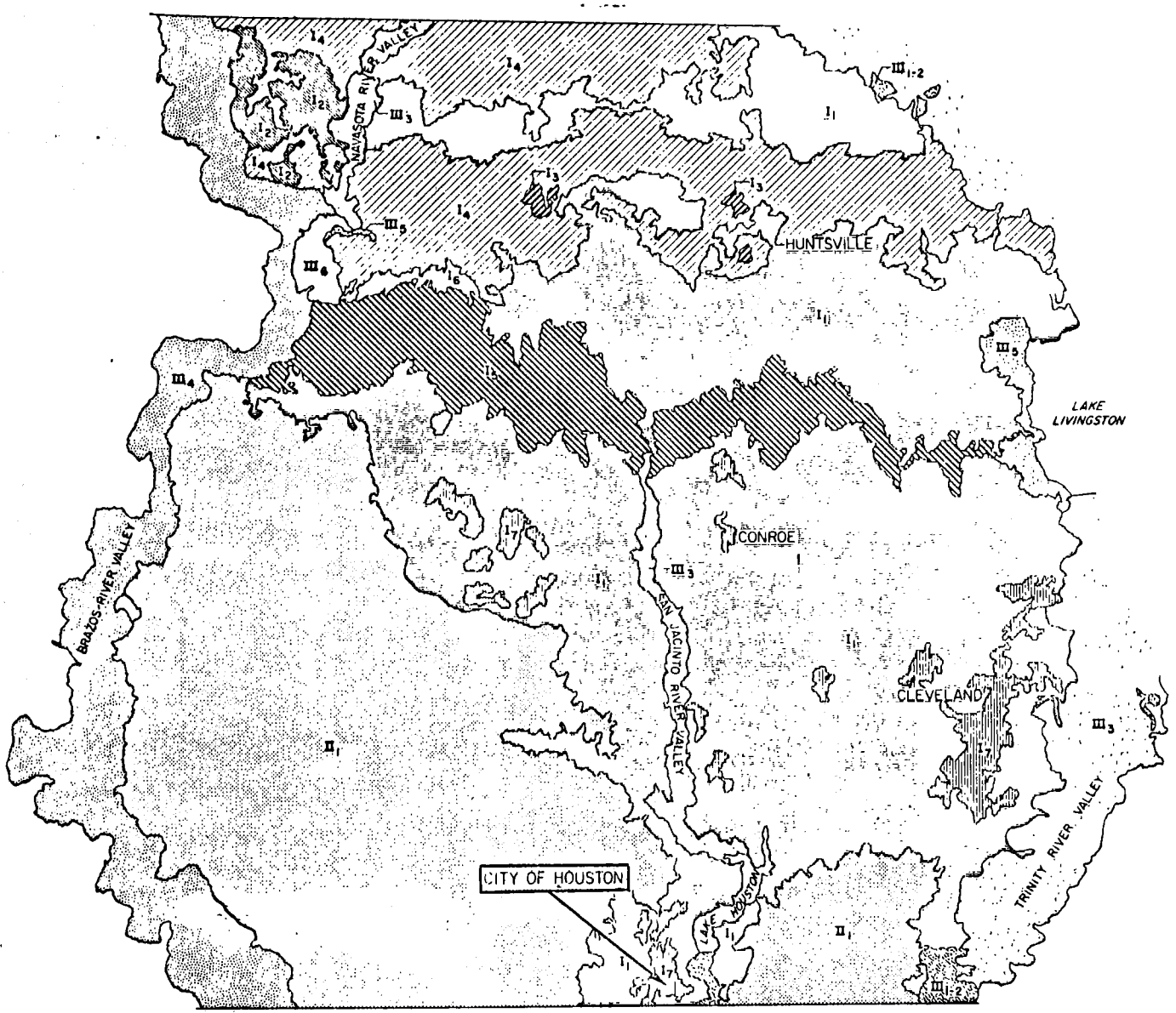
Wild flowers are abundant through spring and summer. The prairie is covered by such flowers as wild plox, evening primrose, Texas bluebonnet, orange milkweed and standing cypress. In the summer Texas bluebells bloom. The green-leaved possumhaw or yaupon bears red berries in the autumn that provide bird food. Many varieties of fruits and vegetables are indigenous to the Houston area, including grapes, dew and blackberries. Houston has both coastal prairie tall-bunch and mid-bunch grasses, as well as true prairie grasses. Some salt and sand tolerant, short grass species are common in the Houston area.

B. ZOOLOGICAL

Native wild animals include prairie chicken, partridge, deer, wild turkey and squirrel. Seasonal or migratory animals include geese, grant, sandhill, crane, curlew, snipe, plover and ducks of every variety. Fire, drought, floods and other natural disasters

sometimes upset the balance of nature by destroying animals and their food, putting a strain on all wildlife struggling for survival. The process is further affected by continuing urbanization of the city and its environments. While man-made activities are needed to sustain civilization, a lasting balance must be found so that man and other species of nature can exist in harmony.

FIGURE F-1
PLANT ASSEMBLAGES FOR THE GREATER HOUSTON AREA



UPLAND FOREST AND SAVANNA ASSEMBLAGES

- I_1 PINE HARDWOOD FOREST
- I_2 HARDWOOD PINE FOREST
- I_3 ISOLATED PINE HARDWOOD GROVE
- I_4 POST OAK SAVANNA
- I_5 UPLAND TALL-GRASS PRAIRIE
- I_6 HARDWOOD FOREST
- I_7 ISOLATED PRAIRIE WITHIN FOREST

COASTAL PLAIN ASSEMBLAGES

- II_1 COASTAL SHORT-GRASS PRAIRIE

BOTTOMLAND ENVIRONMENTS

- III_1 FRESH MARSH
- III_2 SWAMP
- III_3 FLUVIAL WOODLAND
- III_4 GRASS-COVERED FLOODPLAIN
- III_5 GRASS- AND TREE-COVERED DISSECTED, STEEP SLOPE
- III_6 GRASS-COVER TERRACE DEPOSIT

FIGURE F-2: COMMON MACRO-BIOLOGIC ASSEMBLAGES WITHIN TEXAS COASTAL ENVIRONMENTS*

SUBAQUEOUS, PRINCIPALLY BENTHONIC ASSEMBLAGES

SHELF (INNER) AND LOWER SHOREFACE:
Atrina, Dinocardium, Dosinia, Spistula, Tellina, Varicorbula, Nuculana, Pitar (clams); *Architectonica, Busycon, Oliva, Phalium, Terebra, Anachis, Nassarius* (snails); *Luidia* (starfish); *Mellita* (urchin)

UPPER SHOREFACE:
Dinocardium, Dosinia, Tellina, Anadara, Mercenaria, Anomia (clams); *Terebra, Polinices, Oliva, Olivella* (snails); *Mellita* (urchin); *Luidia, Astropecten* (starfish)

INLET AND TIDAL DELTA:
Inlet includes *Crassinella, Lucina, Tellidora* (clams); *Anachis, Polinices, Crepidula, Thais* (snails); *Dentalium* (scaphopod); *Astrangea* (coral); bryozoans; clionid sponges; *Luidia* (starfish); *Mellita* (urchin); *Ophiolepis* (brittle star); tidal delta and marsh includes *Littorina, Neritina, Bulla, Polinices, Busycon, Thais* (snails); *Uca* (fiddler crab); *Paqurus* (hermit crab); *Mellita* (urchin); *Spartina, Salicornia* (marsh plants); *Crassostrea virginica* (oyster)

BAY MARGIN:
Diplanthera wrightii and minor amounts of related plants (marine grass); *Aequipecten, Trachycardium, Mercenaria, Cyrtopleura, Macoma, Mulinia, Chione, Ensis, Tagelus* (clams); *Thais, Busycon, Nassarius, Melampus, Cerithium* and related forms (snails); *Callinectes sapidus* (blue crab)

GRASSFLATS:
Diplanthera wrightii, Ruppia maritima, Thalassia testudinum (marine grass); *Anomalocardia, Amygdalum, Tellina, Phacoides, Laevicardium* (clams); *Cerithium, Cerithidea, Melampus, Neritina, Vermicularia, Modulus* (snails); *Pogonias cromis* (black drum), other fish

OPEN BAY WITH TIDAL INFLUENCE:
Nuculana, Mulinia, Corbula, Abra, Pandora (clams); *Nassarius, Retusa, Cantharus* (snails)

OPEN BAY WITH REEFS:
Similar to open bay, with *Crassostrea* spp. (oyster) and other reef-associated forms (*see* reef)

ENCLOSED BAY:
Nuculana, Mulinia common with *Abra, Corpula* (clams); *Nassarius, Retusa* (snails)

ENCLOSED BAY WITH REEF:
Similar to enclosed bay, with scattered clumps of *Crassostrea virginica* and other reef-associated forms (*see* reef)

REEF:
Abundant *Crassostrea virginica* (oyster); *Anomia, Brachidontes, Diplothyra* (clams); *Anachis, Mitrella, Thais, Crepidula* (snails); *Cliona* (sponge); *Balanus* (barnacle); bryozoans; *Crangon* (crustacean)

REEF FLANK AND MARGIN:
Clumps of *Crassostrea virginica,* broken shell, *Callinectes sapidus* (blue crab)

BAY WITH RIVER INFLUENCE:
Rangia, Macoma, Crassostrea, Petricola (clams); *Littoridina* (snail); *Callinectes, Macrobrachium* (crustaceans)

SUBAQUEOUS SPOIL:
Variable assemblage

FRESH TO BRACKISH-WATER BODIES:
Marsh plants (*see* marsh); *Littorina, Neritina* (snails); *Uca, Cambarus* (crustaceans)

SUBAERIAL, PRINCIPALLY FLORAL ASSEMBLAGES

BEACH:
Donax (clam); *Terebra, Oliva, Olivella, Polinices* (snails); *Ocypode* (ghost crab)

VEGETATED BARRIER FLAT, FOREDUNE RIDGE, BEACH RIDGE, AND VEGETATED FLAT:
Andropogon littoralis (bluestem); *Uniola paniculata* (sea-oats), *Paspalum monostachyum* (Gulf-dune paspalum), *Cenchrus incertus* (coastal sandbur), *Galactia* sp. (milkpea), *Senecio* spp. (groundsel), *Iva ciliata* var. *annua* (sumpweed); marsh plants such as *Salicornia bigelovii* (glasswort), *Spartina alterniflora* (cordgrass); *Ocypode* (ghost crab); rodents, snakes, fowl

SAND FLATS:
Uca (fiddler crab); *Salicornia perennis* (glasswort), *Batis maritima* (maritime saltwort); shore birds

SALT-WATER MARSH:
Spartina alterniflora (cordgrass), *Salicornia perennis, S. bigelovii* (glasswort), *Suaeda* spp. (seepweed), *Batis maritima* (maritime saltwort), *Borrichia frutescens* (sea-oxeye); water fowl

BRACKISH TO FRESH-WATER MARSH:
Spartina spartinae (coastal sacahuista), *Spartina patens* (marsh hay cordgrass), *Spartina cynosuroides* (big cordgrass), rare *Spartina alterniflora* (cordgrass), *Scirpus* spp. (bullrush), *Typha latifolia* (cattail), *Juncus* spp. (rushes); nutria, muskrat, rare mink, snakes, water fowl

BRACKISH-WATER MARSH (CLOSED):
Spartina patens (marsh hay cordgrass), *Spartina cynosuroides* (big cordgrass), *Distichlis spicata* (saltgrass), *Juncus* spp. (rushes); nutria, muskrat, rare mink, water fowl

INLAND FRESH-WATER MARSH:
Juncus spp. (rushes), *Scirpus* spp. (bullrush), *Typha latifolia* (cattail), *Spartina pectinata* (sloughgrass); nutria, muskrat, snakes, water fowl

PRAIRIE GRASSLAND:
Andropogon spp. (bluestem), *Sorghastrum* spp. (indiangrass), *Paspalum* spp., *Prosopis* spp. (mesquite), *Sorghum halepense* (Johnson grass), *Celtis* spp. (hackberry), *Acacia farnesiana* (huisache), chaparral, cactus; prairie chicken, quail, some water fowl, rabbits, rodents

SWAMP:
Sabal minor (dwarf palmetto), *Taxodium distichum* (cypress), *Ulmus* spp. (elm), bay, *Morus* spp. (mulberry), *Quercus nigra* (water oak), *Nyssa biflora* (gum), *Vitis* spp. (grape), *Ilex vomitoria* (yaupon); raccoon, opossum, rare mink, squirrel, fowl, snakes

FREQUENTLY FLOODED FLUVIAL AREAS:
Juncus spp. (rushes), *Scirpus* spp. (bullrush), *Typha* spp. (cattail), *Salix* spp. (willow); mammals and fowl similar to swamp

FLUVIAL WOODLAND:
Carya illinoensis (pecan), *Carya* spp. (hickory), *Quercus virginiana* (live-oak), *Q. nigra* (water oak), *Q. marilandica* (blackjack oak), *Ulmus* spp. (elm), *Celtis* spp. (hackberry), *Magnolia* spp. (magnolia), *Liquidambar styraciflua* (sweetgum), *Crataegus viburnifolia* (red haw), *Fraxinus* spp. (ash), *Pinus echinata* (shortleaf pine), *Pinus taeda* (loblolly pine), *Axonopus* spp. (carpetgrass), *Cynodon dactylon* (bermudagrass), *Smilax* spp. (greenbriar), *Ilex vomitoria* (yaupon), *Vitis* spp. (grape); squirrel, raccoon, opossum, rabbit, rodents, quail, other fowl, snakes

MIXED PINE AND HARDWOOD FOREST:
Pinus taeda (loblolly pine), *P. palustris* (longleaf pine), *P. echinata* (shortleaf pine), *Quercus* spp. (oak), *Carya* spp. (hickory); rodents, rabbit, raccoon, opossum, quail, other fowl, snakes

SMALL PRAIRIES IN FORESTED UPLANDS:
Small clumps of mixed pine and hardwood with prairie grasses (*see* prairie grassland and mixed pine and hardwood)

OAK MOTTES AND GROVES:
Quercus virginiana (live-oak); small rodents and snakes

*This table supplements legend description on the *Environments and Biologic Assemblages Map.* Generic rather than specific names are used for most subaqueous invertebrate organisms. Common names have been placed in parentheses. The list does not include an inventory of land and marine vertebrates nor plant and animal micro-organisms. Plants and animals listed are common, environmentally diagnostic organisms that are predominantly bottom-dwelling invertebrates in subaqueous environments, and also higher order plants in subaerial environments.

FIGURE F-3: MAJOR MARINE AND WILDLIFE HABITATS

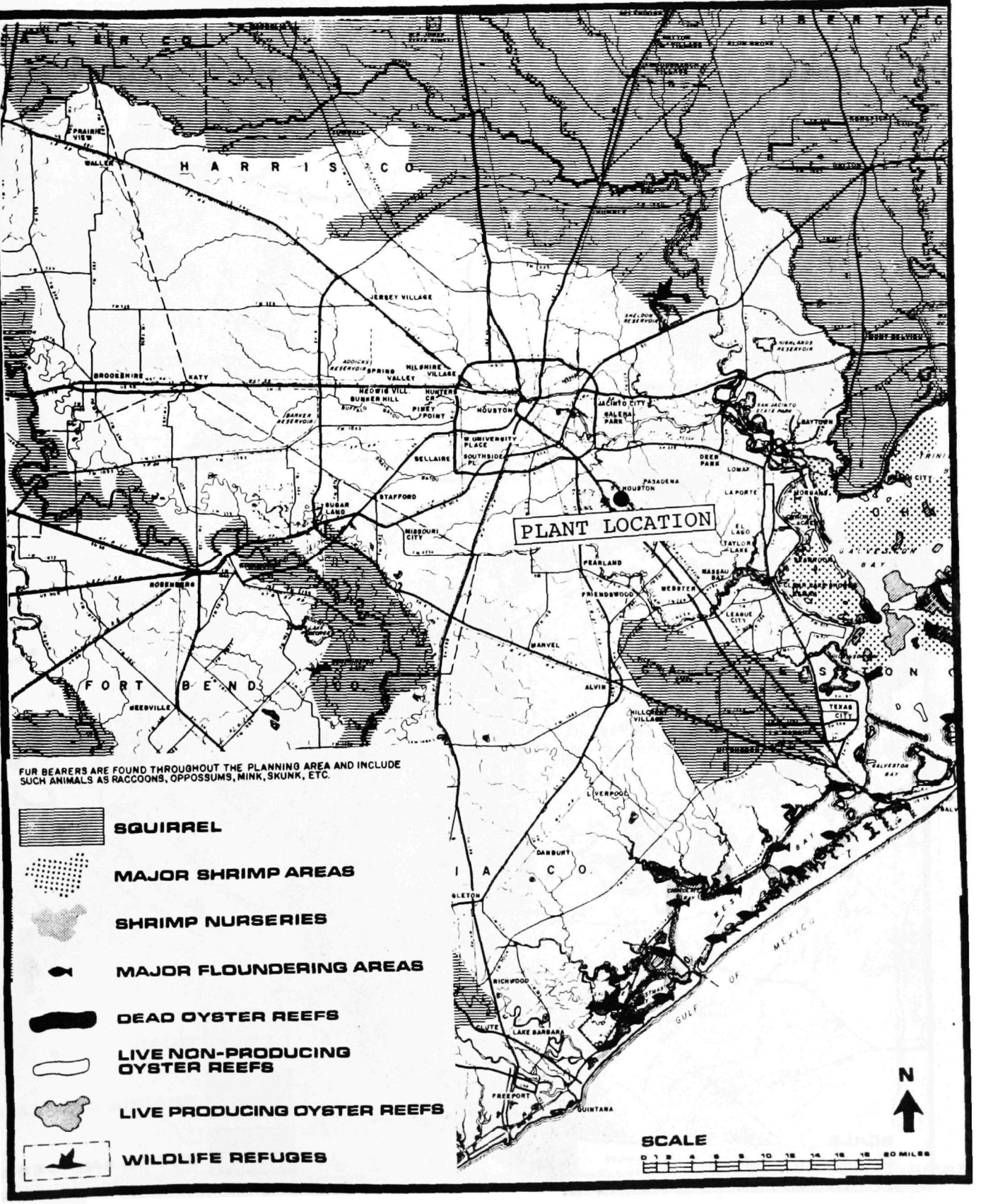


FIGURE F-4: MAJOR WILDLIFE HABITATS (BIRDS)

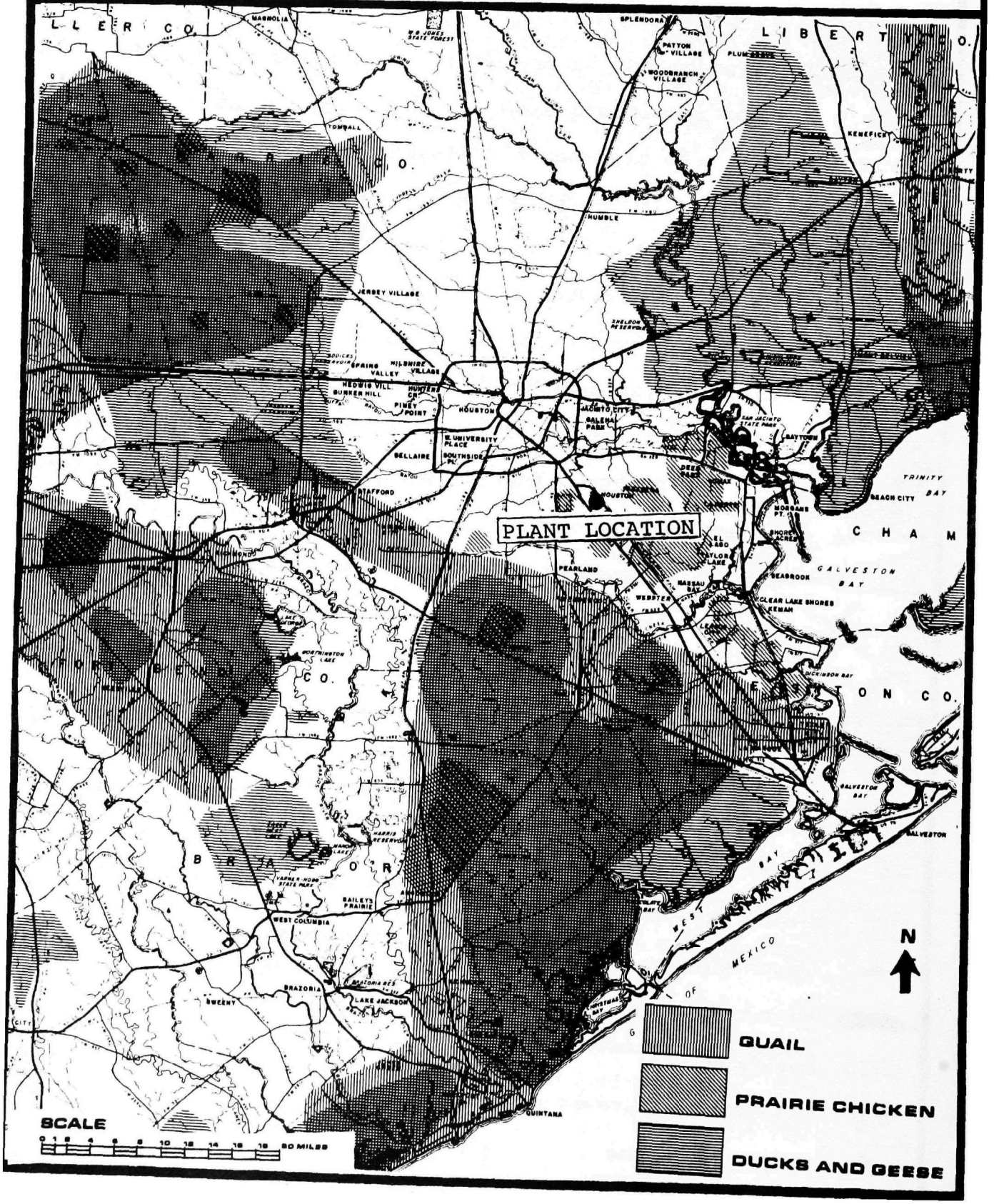
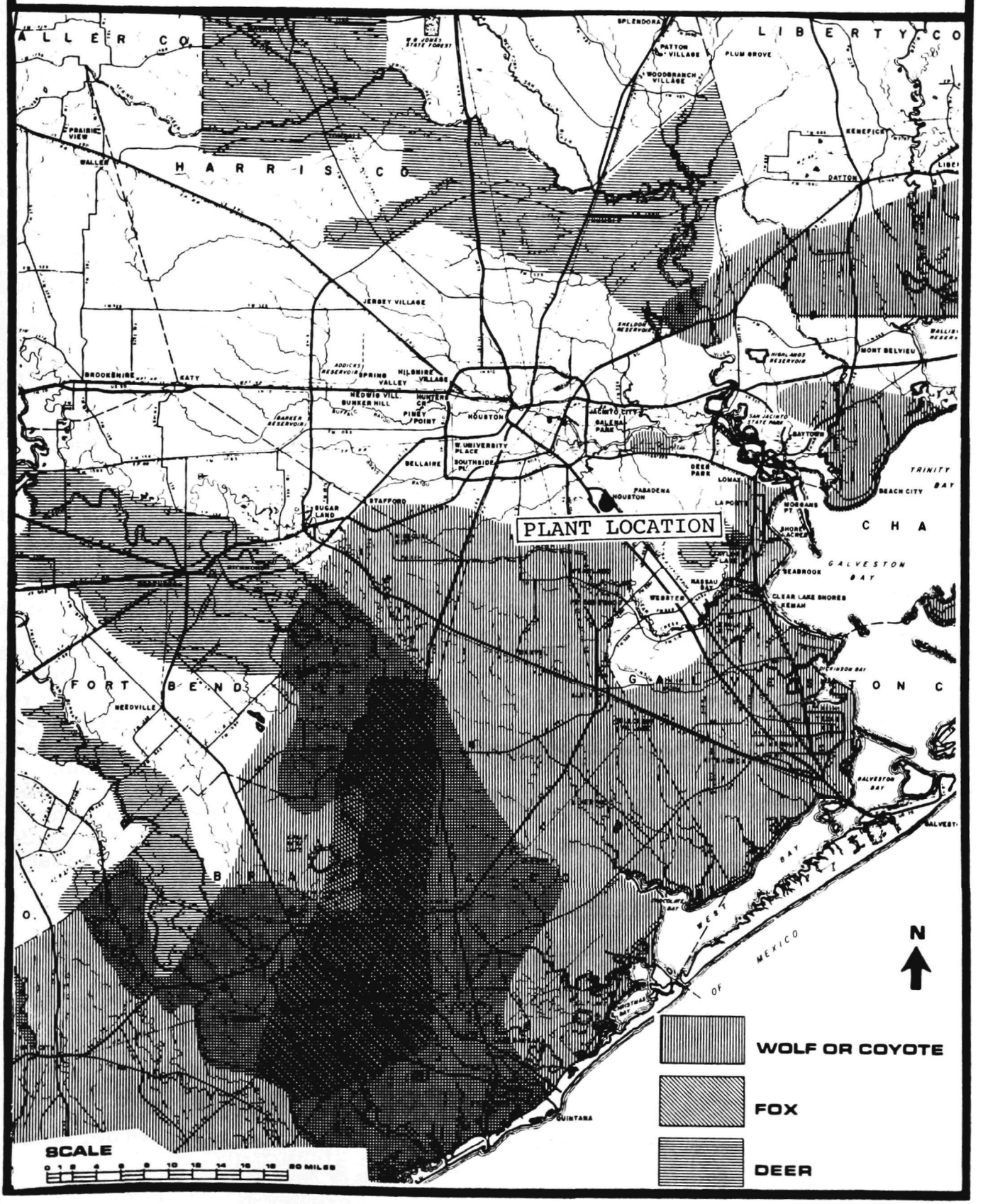


FIGURE F-5: MAJOR WILDLIFE HABITATS (ANIMALS)



BIOLOGICAL ENVIRONMENT FOR THE DISTRICT 47 AREA

A. BOTANICAL

Vegetation in the area to be served by the proposed wastewater facilities is typical of the Gulf prairie or coastal plain. The service area is approximately 50% undeveloped, with some portions devoted to light industry and single-family dwellings. The area is largely barren of major vegetation with the exception of scattered grasses and weeds and small amounts of scrub timber. Major woody plants include oak, acacia, mesquite and elm. The principal native grasses are tall bunchgrasses, including the big bluestem, little bluestem, seacoast bluestem, Indiangrass, eastern panicums, gulf muhly, bermuda grass and carpet grass. The forbes, or inferior grasses, in the region include western ragweed, tumblegrass, broomsedge bluestem, smutgrass, threeawns, yankeeweed, ragweed, bitter sneezeweed and broomweed.

While native vegetation abounds in undeveloped portions of the service area, it is largely absent from the densely settled portions of the area as well as isolated developments scattered throughout the area. Vegetation in residential areas is characterized by the planting of non-indigenous shade and fruit trees, shrubs and grasses. The only native vegetation found in the developed areas adjoins rights-of-way and occupies the peripheries of developments.

B. ZOOLOGICAL

The service area is relatively undeveloped; however, a major airport, an Interstate Highway and a U.S. Air Force Base border the

area and discourage the presence of wildlife. Wildlife in the service area consists of small fur-bearing mammals such as the cottontail and jack rabbits, squirrels, opposums, skunks and rodents, including mice, rats and moles.

The variety and abundance of aquatic fauna in Berry Creek and Sims Bayou are limited due to their low flow and the poor water quality characteristics. Several species of turtles, frogs, reptiles, mollusks and rough fish, including buffalo, carp, gar, mosquito fish, killy, sheepshead minnows, crayfish and sunfish, are found in the Sims Bayou. On occasion other species of fish enter the bayou at its mouth on the Houston Ship Channel.

A variety of small birds have been sighted in the service area. Cardinals, mockingbirds and house sparrows can be found throughout the year in the residential areas with brown thrashers appearing in winter. In the weedy field portion of the service area, seed-eating birds prevail, including meadowlarks, mourning doves, redwinged blackbirds, grackles and other blackbirds. Other varieties of birds sighted include short-eared owls and, in winter, savannah and other sparrows, goldfinch, sparrow hawks, marsh hawks and other species of hawks. During migration season, orioles, robins and kingbirds can be found in the area.

TEXT REFERENCE:

CHAPTER III: SOCIAL AND ENVIRONMENTAL SETTING (MAN-MADE ENVIRONMENT)

APPENDIX G: POPULATION, EMPLOYMENT, LAND USE AND RELATED SYSTEMS FOR THE DISTRICT 47 AREA, CITY OF HOUSTON AND HARRIS COUNTY

EMPLOYMENT: PAST, PRESENT, FUTURE

POPULATION: PAST, PRESENT, FUTURE

LAND USE: PAST, PRESENT, FUTURE

TRANSPORTATION: EXISTING AND PROPOSED

POPULATION CHARACTERISTICS, TRENDS AND PROJECTIONS

As of April, 1970, the service area of the proposed project had a population of 19,400 persons. This is a gain of 48% since 1960. For comparable population growth rates and projections for the City of Houston, Harris County and the Gulf Coast Planning Region, see Table III-3, Chapter III: Social and Environmental Setting, Page 26. A graphic illustration of these population projections is shown in Figure G-2 in this appendix.

In 1980, the proposed project will be serving an estimated population of 26,100 persons. By 1990, about 42,200 people will require service, 22,800 more people than are being served today. The City of Houston must not only improve sewer and other services to meet existing needs and standards, but must also plan facilities that will serve the future population expected for the city. In 1960, the service area accounted for 1.5% of the City of Houston's population, but in 1970, its share increased to 1.7%. Its projected share for 1980 and 1990 is expected to stabilize between the 1.6% and 1.8% level since the City of Houston is also expected to grow during this period.

1. Geographic Distribution

Figures G-3 and G-4 of this Appendix show the 1970 and 1990 geographic distribution of population for Harris County. At present, the population is heavily confined within the Loop 610 and its immediate outer zone, but continuing dispersion of Houston's population appears most likely. The projected distribution of net population change during 1970 to 1990, as shown in Figure G-4,

would seem to indicate that there will be very little population increase inside the Loop 610 between now and 1990. A close examination of the data presented in this map confirms that population increase is expected for the project area since the service area is located outside the South Loop 610 of the Houston Freeway System.

2. Population Density and Related Characteristics

The service area contains approximately 6 square miles of land area. Gross population density for the area is 3,215 persons per square mile, which is higher than the City of Houston's average density of 2,840 persons per square mile. The 1970 population of the service area was found to be almost entirely white, which enjoyed a median family annual income of approximately $13,000.

With the shortage of lands inside the Loop 610 and processes of urbanization in Houston expected to continue at least at the present rate, the pressure for development utilizing vacant lands within the project's service area will certainly increase. This will increase gross density of population over the existing level. Planning ahead of time and standing ready with the needed utility system will indeed be a wise step on the part of the City of Houston and its citizens.

FIGURE G-1

PAST, PRESENT & PROJECTED ECONOMIC DEVELOPMENT

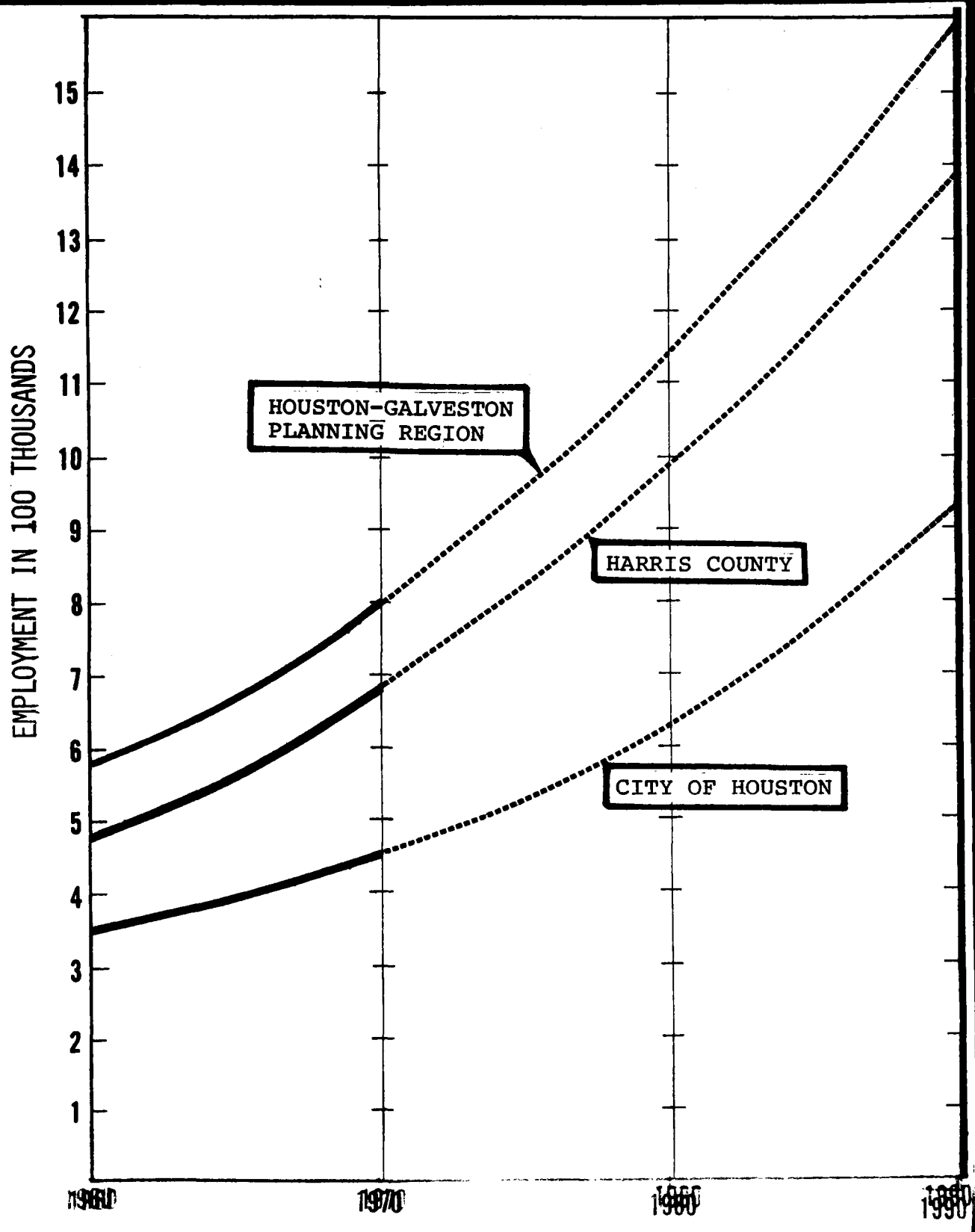


FIGURE G-2

PAST, PRESENT AND PROJECTED POPULATION

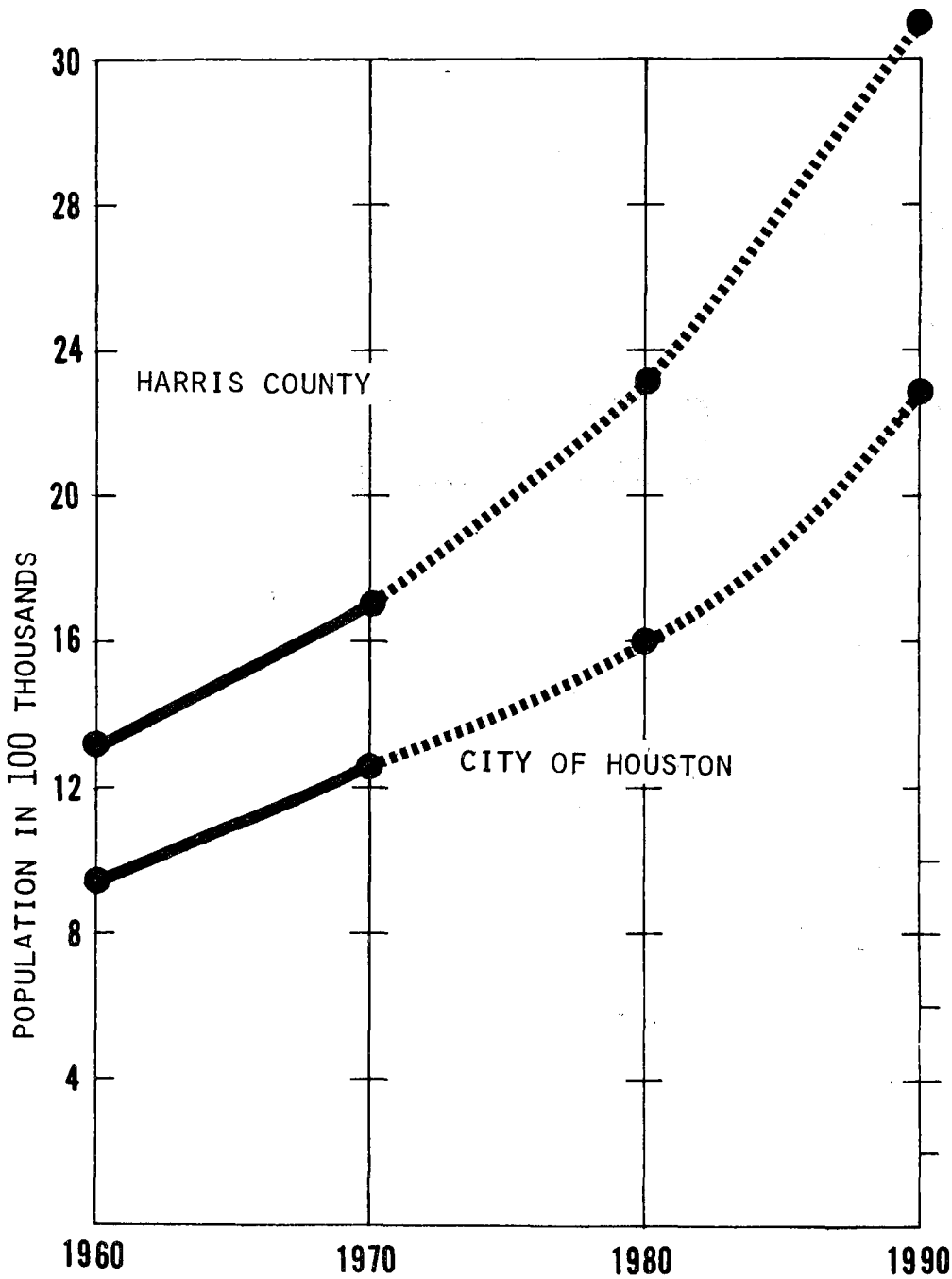


FIGURE G-3: 1970 POPULATION DISTRIBUTION FOR HARRIS COUNTY AND THE SURROUNDING AREAS

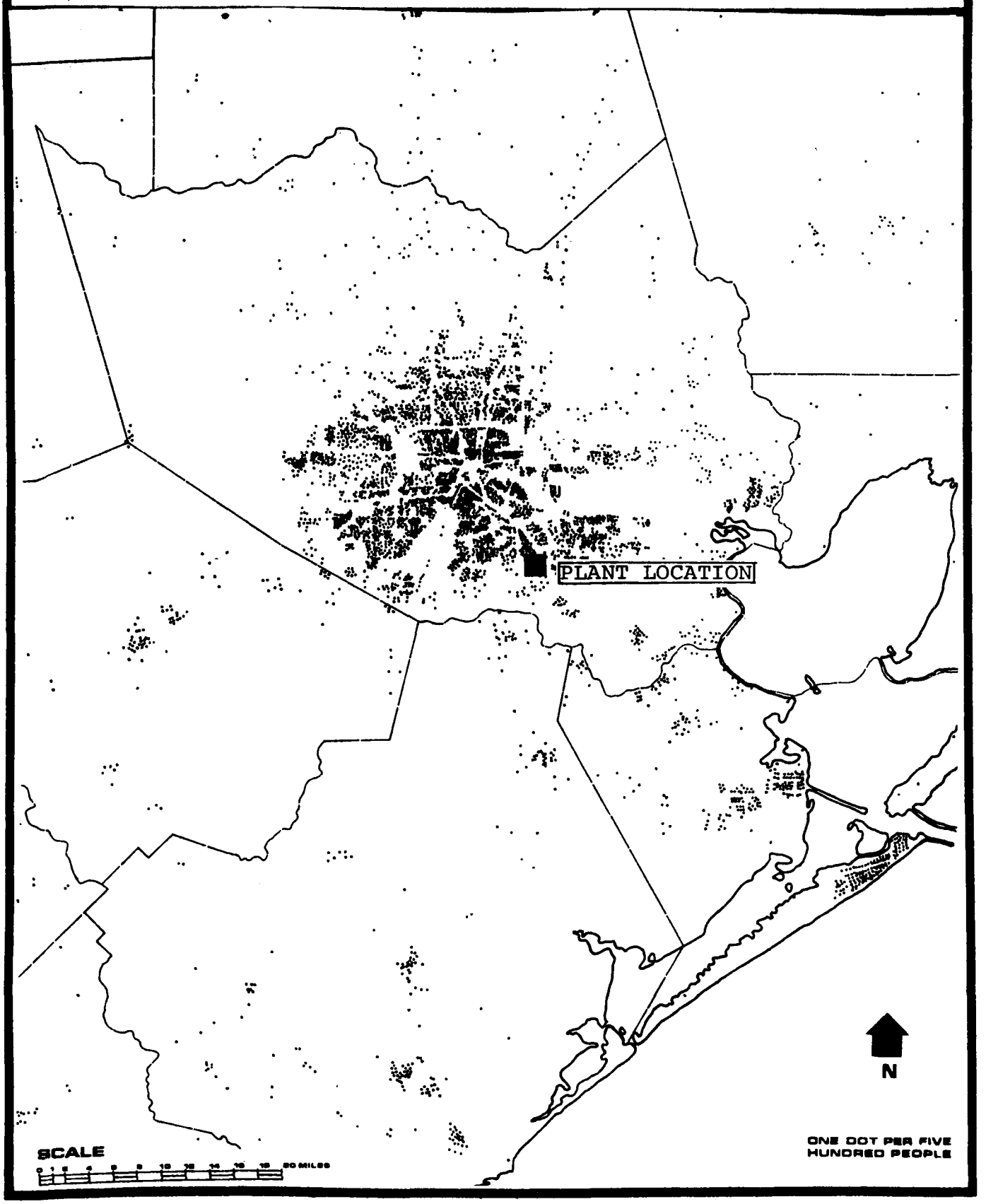


FIGURE G-4: PROJECTED POPULATION DISTRIBUTION FOR HARRIS COUNTY AND ADJOINING AREAS, 1990

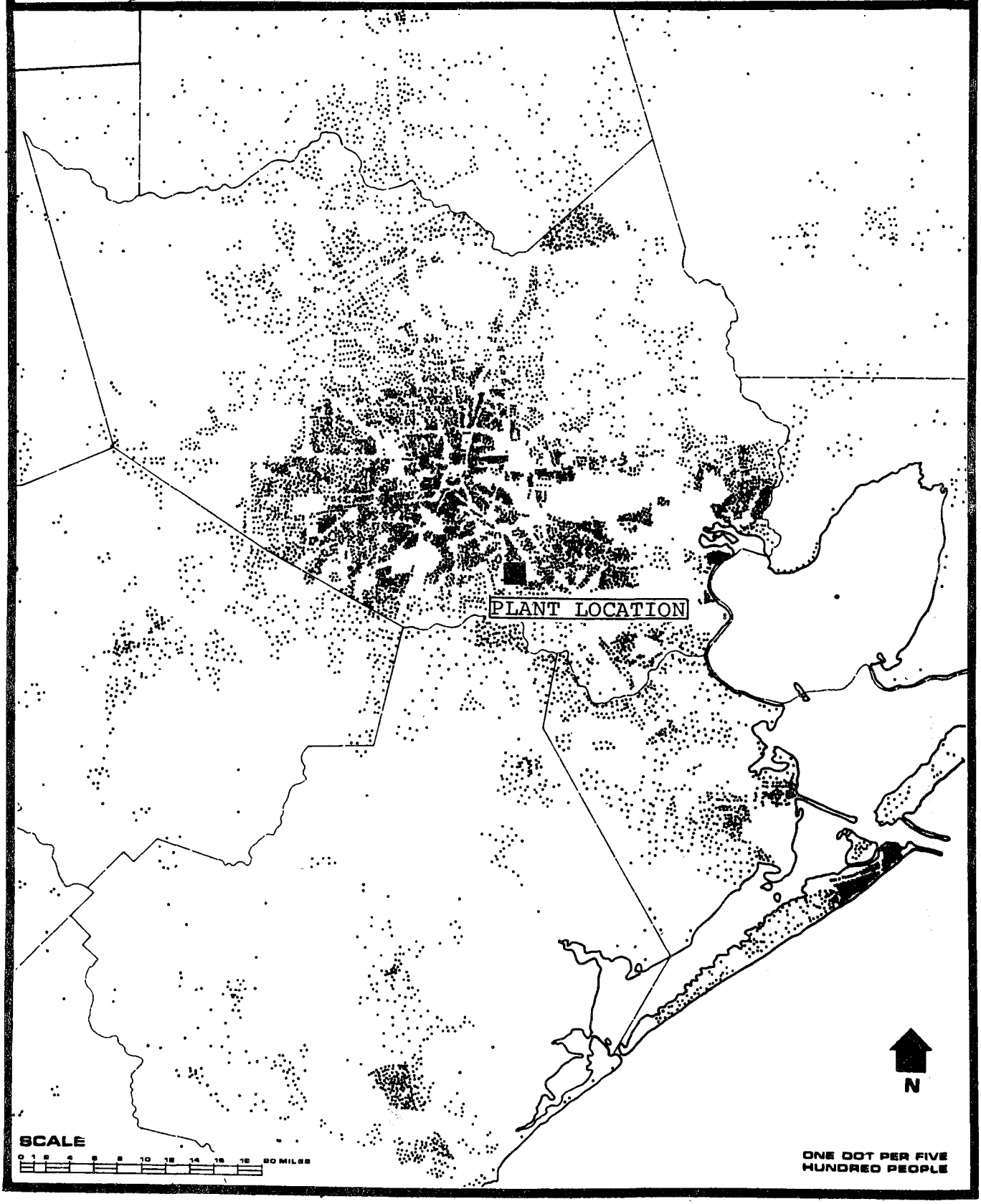


FIGURE G-5

EXISTING LAND USE FOR DISTRICT 47 SERVICE AREA

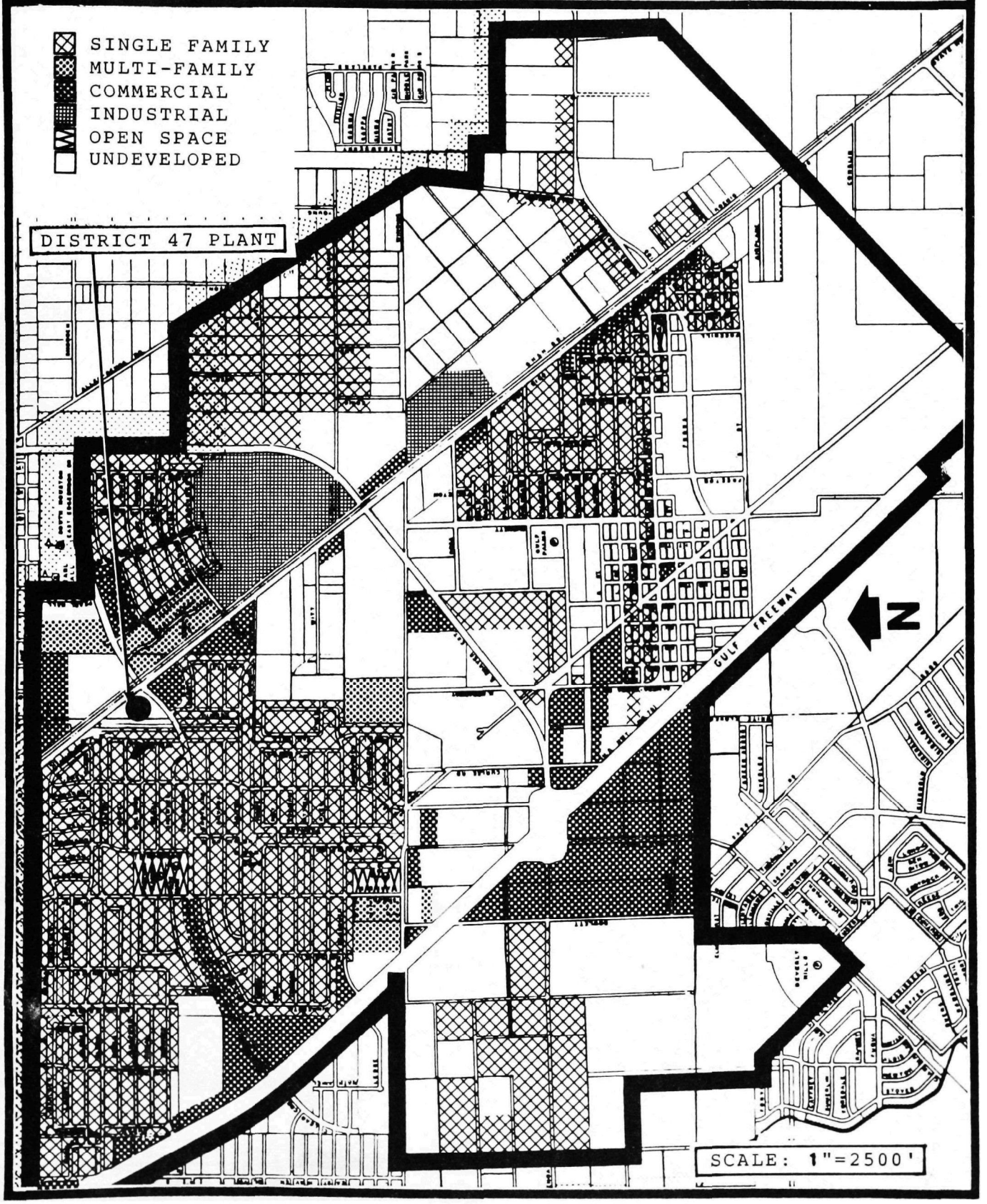


FIGURE G-6

PROJECTED LAND USE PATTERN FOR DISTRICT 47 SERVICE AREA

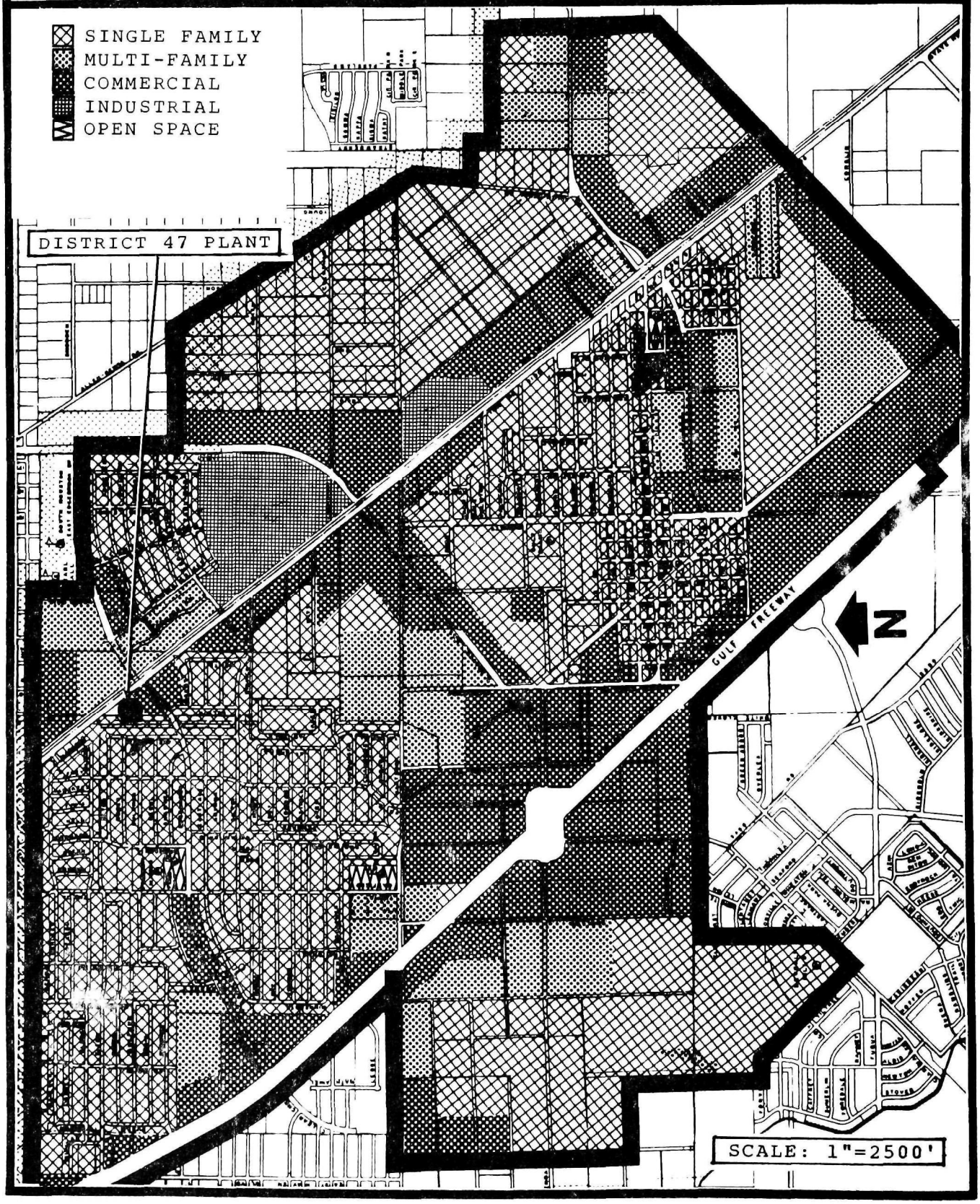
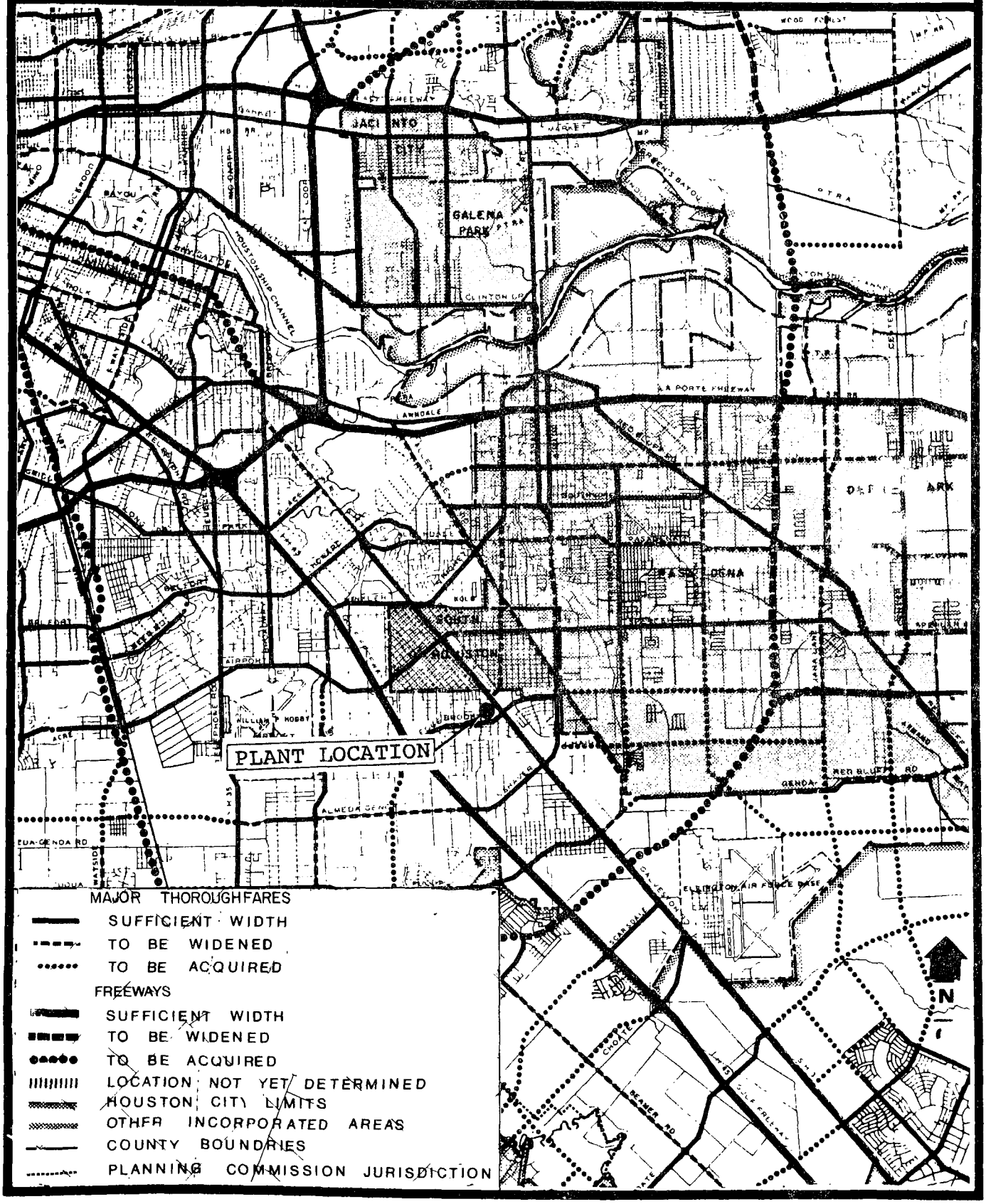


FIGURE G-7: EXISTING AND PROPOSED TRANSPORTATION NETWORK FOR SOUTHEAST HOUSTON



TEXT REFERENCE:

CHAPTER V: DESCRIPTION OF PROPOSED ACTION

APPENDIX H: EXISTING TREATMENT METHODS FOR DISTRICT 4Z, GULF PALM AND GULF TERRACE TREATMENT PLANTS

(1) DISTRICT 47 PLANT:

The existing treatment plant features secondary treatment by the contact-stabilization mode of the activated sludge treatment process.

Influent raw sewage is lifted into the plant from the lift station. It passes through a bar screen for removal of gross solids. It then flows into an aerated contact chamber where the raw sewage is mixed with recycled sludge. In this chamber dissolved organics are adsorbed or absorbed by the sludge solids. The flow passes into the final clarifier where the solids are allowed to settle out. The clarified effluent flows to a contact chamber for disinfection by chlorination. The chlorinated effluent is discharged to a Harris County Flood Control District drainage ditch leading to Berry Gully.

Most of the sludge from the clarifier is pumped to the stabilization basin where the organics are oxidized the the sewage microorganisms and converted into the energy or cellular matter. The stabilized sludge is recycled to the contact basin. Excess sludge is wasted and is pumped off-site for further treatment and disposal at the Sims Bayou Multi-Regional Sludge Disposal Plant.

(2) GULF PALM TREATMENT PLANT

The existing treatment plant features primary treatment in an Imhoff tank and secondary treatment in a trickling filter.

Influent raw sewage from the lift station enters the Imhoff tank sedimentation basin where suspended solids are allowed to settle out. The wastewater flows to a trickling filter where it is distributed over a bed of slime covered rocks. Microorganisms in the slime adsorb and absorb the organic material from the wastewater and oxidize it to create energy or cellular material. The flow continues to a clarifier where residual solids are allowed to settle out. The clarified effluent flows to a contact chamber for disinfection by chlorination. The chlorinated effluent is discharged into a HCFCD drainage ditch which discharges into Berry Gully.

The solids from the Imhoff tank sedimentation basin drop into the Imhoff tank sludge digestion chamber where they undergo anaerobic digestion. The digested sludge is periodically wasted to sludge drying beds. Dried sludge is taken to a city landfill for final disposal. Sludge solids from the clarifier are returned to the plant lift station for recycling through the plant.

(3) GULF TERRACE TREATMENT PLANT

The treatment process for this plant is completely identical to that to the Gulf Palms Plant described in the preceding section.

TEXT REFERENCE:

CHAPTER VII: ADVERSE IMPACTS WHICH CANNOT BE AVOIDED SHOULD THE PROPOSAL BE IMPLEMENTED (UNDER PRESENT CONDITIONS)

APPENDIX HH: SECONDARY IMPACT ON AIR POLLUTION

IMPACT OF URBANIZATION ON AMBIENT AIR QUALITY

It appears that the people of Houston and their City Government desire additional growth. To attract urbanization, public facilities are needed such as expanded sanitary facilities. A previous section has shown that the construction of the proposed facilities will aid the city in bringing about an additional growth of 22,000 persons for the project area. This population will require the development of an estimated 1881 acres of land for various purposes such as housing, work places, schools, and related facilities. The construction of the project elements will improve the existing public health conditions for those sections of the service area which are currently served by septic tanks and the Gulf Palm and Gulf Terrace Plants. On a short term basis, the quality of water in HCFCD Drainage Ditch, Berry Gully, Sims Bayou, and the Houston Ship Channel would also experience a beneficial impact from the construction of the proposed facilities.

It is not disputed that the growth and urbanization are in themselves harmful. But going a step further when an analysis of the possible consequences of urbanization on the quality of the environment is considered, one faces the issue of deciding whether or not such urbanizations are desirable. There are options available for avoiding adverse ramifications of growth, though in some instances people are not aware of or are not willing to take necessary steps

to make sure that only the beneficial impact of urbanization is wanted and not its adverse consequences. For example, unless the people of Houston are willing to undertake parallel programs to keep the problem of air pollution to a minimum, the additional growth of 22,000 persons would further deteriorate the quality of air in the District 47 area of Houston. The following shows how this may occur.

1. Impact of Population Increase on Travel Demand:

Travel demand is defined as the total number of vehicular miles driven per day by the service area population in the process of satisfying social and economic needs: work, shop, do business, etc. In 1960, the people of Harris County traveled a total vehicular miles of 9.6 million miles on an average day (source: Houston-Harris County Transportation Study by the Texas Highway Department, November 1971, page XXIV). The average trip length was 2.6 vehicular miles and approximately 3 vehicular trips per day were generated on a per capita basis.

Total vehicular miles of travel by the net population increase of the District 47 Plant's Service Area:

Total net population increase by 1990 = 22,000 persons

No. of trips = 22,000 x 3 = 66,000 vehicular trips

Total vehicular miles to be traveled per day = 66,000 x 2.60 = 172,000 vehicular miles per day.

Alternately,

$Y = P(f_1)(f_2)(f_3)(f_4)$ where

Y = vehicular miles per year

P = population increase

f_1 = total passenger miles per person

f_2 = the factor expressing the travel allocation to the motor vehicle after adjustment for mass transit

f_3 = vehicular occupancy rate (no. of persons per vehicle)

f_4 = allocation of total miles to urban and non-urban travel

[f_1 = 7,000 miles/year, f_2 = 0.85, f_3 = 0.58 @1.72 persons per vehicle, and f_4 = .80. Source: A Guide for Considering Air Quality in Urban Planning, PB-234 341, prepared for the Environmental Protection Agency, distributed by NTIS, U.S. Department of Commerce, March 1974, page 71.]

The values of f_1, f_2, and f_3 as suggested by the above study appear to be appropriate for the Houston situation.

Y (for the District 47 Service Area) = 22,000 x 7,000 x .85 x .58 x .

= 54,800,000 miles per year

Total vehicle miles to be traveled per day by the 22,000 additional people in the service area = $\frac{54,800,000}{365}$ = 150,000 vehicle miles/day

Average vehicle miles per day = $\frac{172,000 + 150,000}{2}$

=161,000 miles per day.

2. Vehicular Transportation Emission Rates:

Considerable research has been conducted through the auspices of the various federal agencies particularly the Environmental Protection Agency to determine the emission rates of transportation and motor vehicles. These emission rates would vary from one urban area to another, depending on the vehicular mix in terms of the proportion of automobiles as a percent of total vehicular distribution, vehicular age distribution, and related factors. Based on the results compiled by an EPA study[1], the following emission rates appear to apply to the Houston situation. Also see page 64, Table 8, A Guide for Considering Air Quality in Urban Planning, March, 1974.

Pollutant	Emission Rates in Grams per Mile		
	1975	1980	1990 and later
CO	60.0	36.5	23.8
HC	7.66	4.1	2.5
NO_x	4.9	2.8	1.6

[1] Compilation of Air Pollutant Emission Factors, Second Edition, AP-42, April 1973, Table 3.1.1-1)

The declining emission rates from 1975 through 1990 are reflective of the projected impact of federal and state regulations on motor vehicles under the Transportation Control Programs of the 1970 Federal Clean Air Act Amendments.

3. Estimated Secondary Net Impact of the Proposed District 47 Sanitary Facilities on Ambient Air Quality:

Applying the emission rates in grams per mile to the projected vehicular miles of travel by the 22,000 persons, the pollutant concentration per day in 1990 is estimated as follows:

CO	161,000 x 23.8	= 3,830,000 grams/day
HC	161,000 x 2.5	= 403,000 grams/day
NO_x	161,000 x 1.6	= 257,000 grams/day

The corresponding pollution concentration in lbs/day is as follows:

CO	8,600 lbs/day	= 4.30 tons/day
HC	910 lbs/day	= .455 tons/day
NO_x	579 lbs/day	= .290 tons/day

4. Comparison Against National Ambient Air Quality Standards:

The preceding step shows the impact of the additional transportation development in the service area of the District 47 Treatment Plant on ambient air quality in terms of Carbon Monoxide,

Hydrocarbons, and Nitrogen Oxides pollutants. In order for this data to be compared against the pollution concentration defined by the National Ambient Air Quality Standards, this net increase in pollutant concentration must be added to the level of existing air quality for the service area. The 25 monitoring stations established and used by the City Air Pollution Control Program, as discussed in detail in Appendix EE, are at present collecting and processing air pollution information only for particulate matters. The District 47 area has no monitoring station within 1.5 miles from the location of the plant. Data on pollution concentration on Particulate Matters is of limited use in defining the projected impact of 1990 urbanization on the total air quality for the service area.

The transportation impact on air quality measured as 4.30 tons per day or 1600 tons per year in Carbon Monoxides is certainly substantial in magnitude. This is the adverse effect which can only be avoided if the City of Houston undertakes an ambitious program of public transportation so that the travel need of the increased population can be met not through the conventional method of private automobile, but through a mode that will not pollute the ambient air. This is an adjustment which the Houstonians will have to make in order for them to have both urbanization and clean air at the same time. This is a "trade off" which should be given consideration. Appendix EE has shown that Houston as a whole is violating the national standards in every category of pollutants. Ways must be found to bring the pollution level within allowable limits.

APPENDIX I: RECORDS OF PUBLIC HEARING BY EPA

JANUARY 6, 1975

RICE HOTEL, HOUSTON

BEFORE THE

ENVIRONMENTAL PROTECTION AGENCY

Public hearing in the matter of:

DRAFT ENVIRONMENTAL IMPACT STATEMENT
ON DISTRICT 47 WASTEWATER TREATMENT
FACILITIES, WPC-TEX-1000

Sam Houston Room
Rice Hotel
Main at Texas Street
Houston, Texas

January 6, 1975

BAGBY COURT REPORTING SERVICE
Suite 716
910 Houston Street
Fort Worth, Texas 76102

C O N T E N T S

E X H I B I T S

NUMBER	FOR IDENTIFICATION	IN EVIDENCE
1	17	17

P R O C E E D I N G S

HEARING OFFICER: Good morning, gentlemen, and welcome to this public hearing on the Draft Environmental Impact Statement regarding the Houston District 47 Region Wastewater Treatment Facility, which I now call to order.

My name is Jim Collins. I am a licensed attorney and the Regional Hearing Officer for Region VI of the Environmental Protection Agency.

Mr. Arthur W. Busch, the Regional Administrator, to whom I directly report, has designated me as the Presiding Officer of today's hearing.

Also participating in today's proceeding is Ms. Teresa Shavney, on my right, who is an Environmental Scientist from the Office of Grants Coordination of Region VI.

For the record, this hearing is being convened on January 6, 1975, in the Rice Hotel, Houston, Texas.

Now I would like to give you a brief explanation of what this hearing is about and the rules that will apply. This is a public administrative hearing, held by and through the authority of the Environmental Protection Agency under Public Law 91-190.

Section 102 of the National Environmental Policy Act, which is Public Law 91-190, also referred to as NEPA, requires that all agencies of the Federal Government shall, and I quote:

"Utilize a systematic, interdisciplinary approach which will insure the integrated use of the natural and social sciences, and the environmental design arts in planning and in decision making, which may have an impact on man's environment.

"Secondly, identify and develop methods and procedures, in consultation with the Council on Environmental Quality established by Title II of this Act, which will insure that presently unquantified environmental amenities and values may be given appropriate consideration in decision making along with economic and technical considerations.

"Thirdly, include in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on the environmental impact of the proposed action, any adverse environmental effects which cannot be avoided should the proposal be implemented, alternatives to the proposed action, the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, also any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.

"Prior to issuing the final statement, the responsible federal official shall consult with and obtain the comments of

any federal agency which has jurisdiction by law, or special expertise with respect to any environmental impact involved.

"Copies of such statements and the comments and views of the appropriate federal, state and local agencies, which are authorized to develop and enforce environmental standards, shall be made available to the President, the Council on Environmental Quality, and to the public, as provided by Section 552 of Title 5 of the U. S. Code, and shall accompany the proposal through the existing agency review processes."

To comply with the Act, the Office of Grants Coordination, Region VI in Dallas, has prepared a Draft Environmental Impact Statement for the proposed expansion of the Houston District No. 47 Region Wastewater Treatment Facility.

This Draft Environmental Impact Statement was made available to federal, state and local agencies, private organizations and certain individuals on November 30, 1974.

I am certain that many of you have received a copy of that document. If not, there are a limited number available at the registration table out in the hall.

The Council on Environmental Quality guidelines, promulgated to implement NEPA, established the following policy:

"Federal agencies will, in consultation with other

appropriate federal, state and local agencies, assess in detail the potential environmental impact in order that adverse effects are avoided, and environmental quality is restored or enhanced, to the fullest extent practicable.

"In particular, alternative actions that will minimize adverse impact should be explored and both long and short-range implications to man, his physical and social surroundings, and to nature, should be evaluated in order to avoid to the fullest extent practicable undesirable consequences for the environment."

EPA policy is directed to fully comply with the National Environmental Policy Act and Council on Environmental Quality guidelines.

Public participation is an integral part of the agency planning and decision-making process. The agency intends to keep the public fully informed about the status and progress of the studies and findings, and to actively solicit comments from all concerned groups and individuals.

Approval of the proposed project here, the subject of this hearing, cannot be given until the Environmental Impact Statement process is completed and until the project meets all state and federal requirements.

In an effort to assure the fullest degree of public participation possible in all of its environmental programs, the Environmental Protection Agency, in addition to soliciting

written comments, holds public hearings, such as this one, on those issues where significant action is about to be taken, or when public interest is indicated. We encourage the citizens from all sectors of the public to make their views known.

Mr. Arthur W. Busch, Regional Administrator, has determined that the proposed federal action here will have a significant impact on the environment, and that a public hearing might identify environmental issues that might otherwise be overlooked. This is why we are here today.

This hearing provides all interested persons an opportunity to express their opinions which will be pertinent to the proposed project and the Draft Impact Statement.

Please bear in mind that the draft statement serves only as a means of assessing the environmental impact of proposed agency actions and is not to be construed as justification for decisions already made.

All relevant testimony presented today will be considered by EPA in arriving at a final decision and Impact Statement. That statement, in turn, will relate to the question of whether or not, or under what conditions, federal funds will be granted to further the project.

Since today's hearing is not a rule-making hearing under the Administrative Procedure Act, nor a court of law, no formal procedures or rules of evidence will apply. Because

this hearing is for the sole purpose of gathering all pertinent facts relating to the environmental issues involved, our rules of evidence will be rather liberal; however, they will be kept as consistent as possible with orderly proceedings.

Participants may present any information which they feel should be brought to the attention of the planning agencies. Also, participants in this hearing may question or discuss any issue or point which is brought up by any speaker, but only after the close of his or her presentation.

I do require that all formal testimony submitted today be relevant to the Draft Impact Statement we are considering, and that it not be repetitive of previous testimony.

I may limit oral presentation if not pertinent or material to the relevant issues surrounding the Draft Impact Statement, and I may ask that redundant or corroborative material be submitted rather than read.

I also ask that all statements by any one individual in excess of twenty minutes be summarized.

The procedure for today's hearing will be as follows. After my opening remarks, we will hear from Ms. Shavney from the Office of Grants Coordination of Region VI. Ms. Shavney will present pertinent facts and comments concerning the application, investigation and Draft Impact Statement. Then

we will hear from all those persons who have indicated a desire to present formal testimony.

I would like to caution you now that this is not a forum for debate, nor argumentative conversation, but rather, one for the gathering of facts and opinions regarding this Draft Environmental Impact Statement.

It is important that we have only one person at a time speaking. Therefore, I ask that you not engage in cross-conversation, but rather, that you wait your turn and identify yourself prior to speaking in order that the reporter may make an accurate, permanent record of the testimony.

As you can see, a verbatim transcript is being made of today's proceeding, and it will be the sole official record. Persons desiring to purchase copies of the transcript should make arrangements with the reporter at the conclusion of the hearing.

Shortly, a copy of the transcript will be available to the public for inspection between the hours of 8:00 a.m. and 4:30 p.m., Monday through Friday, in the Office of the Regional Hearing Clerk in Dallas, Texas. That's on the 11th floor, 1600 Patterson Street.

I am also in the habit of sending a copy to those localities concerned. In this case, we will send a copy to the Houston Chamber of Commerce, probably to Mr. Louie Welch's office.

The hearing record today will remain open for ten calendar days after adjournment of this hearing. If anyone has any additional comments, or if you wish to modify any of the testimony you presented at this hearing, please send them to my attention at Region VI in Dallas, and it will become a part of the record.

In addition to the testimony at this hearing, written materials which have been submitted directly here or to the Regional Administrator of Region VI, previously or within the extension period that I announced will also be considered in reaching a final decision.

If your oral presentation has been reduced to writing, I would appreciate copies being given to the Chair and to the staff as an aid in transcribing today's proceedings.

As you come forward to testify, which will be at this podium over here by the microphone, please identify yourself by name, title if with an organization, the actual organization and location, and if you are representing someone, the name of the person or organization you are representing.

Does anyone in the audience have any question now as to how the hearing is to be conducted?

[No response.]

HEARING OFFICER: No one so indicating, I will now call on Ms. Shavney for her comments.

MS. SHAVNEY: Thank you, Mr. Collins.

The Draft Environmental Impact Statement on Houston's District 47 wastewater treatment facilities has been prepared and distributed in accordance with the Environmental Protection Agency interim regulations on impact statements, dated January 17, 1973; Council on Environmental Quality Guidelines, dated August 1, 1973, and the EPA Preliminary Draft Manual For Preparing Impact Statements, dated March 2, 1973.

This statement is intended to present EPA's analysis of the environmental impact of the proposed project. In complying with this objective, Chapter VI of the statement, entitled, "Environmental Effects Of The Proposed Action," is organized to contain a discussion on short-term impacts, normally construction impacts such as noise and erosion; long-term impacts such as water quality and land use, and secondary impacts such as those resulting from additional growth.

Discussions of short- and long-term impacts cover areas of environmental concern which are obvious, related to the project, and which for the most part, can be measured or understood.

Secondary or indirect impacts of the proposed project are not as easily understood or quantifiable.

This is a draft statement and no final conclusions or recommendations have been prepared.

The information presented in this draft statement,

together with all pertinent information presented at this hearing, will lay the groundwork for our continued review as the final impact statement is prepared.

Thank you, Mr. Collins.

That completes my presentation.

HEARING OFFICER: Thank you, Ms. Shavney.

Do we have any questions at this time before we start into the ones here who have formal testimony?

[No response.]

HEARING OFFICER: If not, we will turn now to Mr. Vic Hansen of the Houston Geological Society.

MR. HANSEN: This is a statement of the Houston Geological Society.

The Houston Geological Society, with a membership of over 2,000 in the metropolitan area of Houston, is vitally interested in the project described in the Draft Impact Statement.

Geologists are exposed to environmental problems quite early in their educational and professional careers and, as a consequence, are very much aware of the importance of changes that occur to the surface and the subsurface of urban areas.

The majority of our membership live within the confines of the city of Houston and as residents are concerned citizens and therefore doubly interested in the proposed program.

We feel that improvement of water quality in our streams, bayous, the ship channel, and consequently Galveston Bay is a prime environmental consideration.

Therefore, we are in favor of the construction of additional wastewater facilities for the city of Houston to insure a better water environment.

However, the proposed wastewater facilities may be affected by active geologic processes in the general area of the proposed District 47 facilities.

These processes include active surface faulting and land subsidence. Active faults have been noted in the area surrounding the proposed facilities, that is, one-half mile north in the city of South Houston, two and a half miles west northwest on Panair Street, and two and a half miles west southwest near the intersection of Radio and Almeda-Genoa Roads.

The project area has undergone several feet of subsidence since 1943, and will continue to subside as ground water is withdrawn in the greater Houston area.

We ask these questions. Are there any active surface faults in the project area which might break the sludge lines and gathering systems?

If so, can this be compensated for prior to construction?

What effect will continued subsidence have on gravity flow patterns in the gathering systems?

We do not wish to see wastewater projects delayed, but we do suggest additional geologic studies of both the surface and subsurface be made.

The above questions should be answered prior to the beginning of construction, and a system installed to continually monitor geologic processes affecting wastewater facilities.

HEARING OFFICER: Thank you, Mr. Hansen.

I believe the same question was raised back a few months ago on the Almeda-Sims project and also the Northwest facility by your organization, and I believe that you have probably found it obvious since then, that we took some special note.

Mr. Greg Edwards of the Office of Grants Coordination is here also today, and I would like to ask Greg at this time, do you have any comment as to this question now, at this point on this project?

Has that already been taken into consideration?

MR. EDWARDS: We did additional geological studies for Almeda-Sims and Northwest, and we will do the same on this one.

HEARING OFFICER: All right.

Mr. Hansen, are you aware of anything at this point in the project as to what we are doing, when it comes to your questions? Have you seen any results yet?

MR. HANSEN: No, sir. I'm not familiar with it.

HEARING OFFICER: Well, I hope you pursue it and can get it together to your satisfaction that we are pursuing that question. We think it is a vital question.

We will turn then to Mr. D. F. Olbrich, of Turner, Collie & Braden.

MR. OLBRICH: Thank you, Mr. Collins.

My name is Doug Olbrich. I'm an engineer with Turner, Collie & Braden, located here in Houston.

Turner, Collie & Braden prepared the original environmental assessment for this project, and I have prepared just a brief summary of the proposed project and what it will accomplish, and I will read that now for the record.

This is the District 47 Regional Wastewater Facility.

The proposed project involves the expansion of wastewater collection and related facilities for the District 47 Regional Sewage Treatment Plant.

The total cost is estimated at $4,394,776. This includes an underground pump station with a capacity of 12,000 gallons per minute, and construction of 25,430 linear feet of 15-inch through 54-inch diameter sewer pipe.

This construction will allow the city of Houston to bypass and abandon two small urban inadequate sewage treatment plants, Gulf Palm and Gulf Terrace, and also handle areas currently served by septic tanks. All wastewater will be

processed at the District 47 plant.

The District 47 Sewage Treatment Plant is located at the intersection of Old Galveston Highway and Edgebrook. The plant was designed to treat an average daily flow of three million gallons per day, and features secondary treatment by the contact stabilization mode of de-activated sludge treatment process.

Treated effluent is discharged into the Harris County flood control ditch, thence to Baird Gulley, thence to Baird Creek and thence into the Houston Ship Channel.

Presently three sewage treatment plants are in operation in the District 47 service area; Gulf Palm, treating an average daily flow of 0.2 MGD, and Gulf Terrace, treating 0.28 MGD. Gulf Palm and Gulf Terrace do not meet the effluent standards set forth by the Texas Water Quality Board or the Environmental Protection Agency.

In comparison, District 47 produces effluent that surpasses the parameters set forth by the TWQB; although District 47's design capacity is three million gallons per day, its existing load is only 1.66 MGD.

The District 47 plant can usually treat another 1.34 MGD, and the combined capacity if Gulf Palm and Gulf Terrace total only 0.48 MGD.

The proposed facilities are designed to accurately carry the wastewater flow through 1990, and will improve the

quality of public health in the project service area and enhance water flow quality into the Houston Ship Channel.

HEARING OFFICER: Thank you, Mr. Olbrich.

Any questions on the presentation of Mr. Olbrich?

[No response.]

HEARING OFFICER: Any questions from anyone?

[No response.]

HEARING OFFICER: At this time is there anyone who would like to add something?

Yes, sir.

MR. MILLER: Mr. Collins, I'm Charles Miller with the Harris County Pollution Control Department.

I thank you for the opportunity to be notified about this hearing that is held at this time.

I do have some data for you, which are our results from the sewage treatment plants for the last three years, and even in a few years before that because we concentrated on that as well.

HEARING OFFICER: Thank you very much, Mr. Miller. I will make this data Exhibit No. 1.

(Exhibit No. 1 was marked for identification and was received in evidence.)

HEARING OFFICER: Are there any other comments or persons who wish to testify?

[No response.]

HEARING OFFICER: Any questions?

[No response.]

HEARING OFFICER: If not, I will remind you that the hearing record will remain open for ten calendar days and I will accept anything you want to send in in writing or anything you wish to add to it.

Hearing no further comments, then, I call this hearing to a close.

(Whereupon, at 10:25 a.m., the record was closed.)

---oOo---

C E R T I F I C A T E

This is to certify that the attached proceedings before the Environmental Protection Agency in the matter of

DRAFT EIS PUBLIC HEARING ON THE
DISTRICT 47 WASTEWATER TREATMENT
FACILITIES, WPC-TEX-1008

Houston, Texas

January 6, 1975

were had as herein appear, and that this is the official transcript thereof for the files of the Environmental Protection Agency.

BAGBY COURT REPORTING SERVICE
Suite 716
910 Houston Street
Fort Worth, Texas 76102

By: Harry J. Essner
Certified Court Reporter

W. A. QUEBEDEAUX, JR., PH.D.
DIRECTOR

HARRIS COUNTY POLLUTION CONTROL DEPARTMENT
107 NORTH MUNGER • BOX 6031
PHONE (713) 228-8311, EXT. 681
PASADENA, TEXAS 77502

December 30, 1974

Mr. James L. Collins
Regional Hearing Officer
Environmental Protection Agency
1600 Patterson Street Suite 1100
Dallas, Texas 75201

Dear Mr. Collins:

Submitted herewith are the results of samples taken by our office at three of the existing treatment plants in the area of the proposed District 47 Wastewater Treatment Facility. We trust this data may be of value to you in evaluating the historical data of the area and give some guidance to future planning. The attached data represents the results for the past three years. Data is probably available from our office for earlier dates if needed.

Sincerely yours,

C. E. Miller
Assistant Director-Engineering
Harris County Pollution Control Dept.

sg

Copy to Greg Edwards 1/7/75

GULF PALMS SEWAGE TREATMENT PLANT

T.W.Q.B. Waste Control Order No. 10495

Date	BOD	TSS
11/13/74	62	38
10/10/74	46	26
9/03/74	31	42
8/01/74	60	48
6/18/74	55	34
5/09/74	53	38
4/09/74	--	86
2/26/74	135	38
1/31/74	73	78
1974 average	64	48
11/27/73	217	16
10/04/73	102	28
9/12/73	88	22
8/29/73	131	16
7/31/73	81	31
6/26/73	57	39
5/24/73	102	18
4/10/73	167	14
2/01/73	59	22
1973 average	112	23
11/21/72	27	7
11/07/72	28	38
10/11/72	71	34
9/19/72	48	66
8/16/72	53	40
7/18/72	53	42
6/14/72	67	0
5/16/72	61	56
2/29/72	12	12
2/03/72	49	48
1/13/72	36	40
1972 average	46	35

GULFWAY TERRACE SEWAGE TREATMENT PLANT

T.W.Q.B. Waste Control Order No. 10495

Date	BOD	TSS
11/13/74	111	48
10/10/74	48	48
9/03/74	14	16
8/01/74	30	38
6/18/74	56	108
5/09/74	14	34
4/09/74	--	34
2/26/74	130	22
1/31/74	43	34
1974 average	56	42
11/27/73	71	20
10/04/73	83	28
9/12/73	30	19
8/29/73	23	22
7/31/73	73	48
6/26/73	32	32
5/24/73	136	32
4/10/73	24	17
2/01/73	35	38
1973 average	56	26
11/21/72	18	0
11/07/72	31	48
10/11/72	26	26
9/19/72	132	36
8/16/72	81	112
7/18/72	39	31
6/14/72	50	44
5/16/72	54	60
2/29/72	21	128
2/03/72	51	12
1/13/72	47	44
1972 average	50	49

FREEWAY MANOR S.T.P. WC&ID #47

T.W.Q.B. Waste Control Order No. 10495

Date	BOD	TSS
11/13/74	5	8
10/10/74	3	2
9/03/74	4	1
8/01/74	2	10
6/18/74	4	7
5/09/74	4	6
4/09/74	--	6
2/26/74	6	5
1/31/74	4	0
1974 average	4	5
11/27/73	16	0
10/04/73	9	1
9/12/73	6	2
8/29/73	6	1
7/31/73	13	3
6/26/73	3	7
5/24/73	13	1
4/10/73	11	1
2/11/73	2	4
1973 average	9	2
11/21/72	3	--
11/07/72	7	14
10/11/72	7	10
9/19/72	7	8
8/16/72	4	7
7/18/72	1	10
6/14/72	9	8
5/16/72	11	44
2/29/72	6	28
2/03/72	10	8
1/13/72	10	12
1972 average	7	15