PLAN SUMMARY REPORT
for the
UPPER COLORADO STUDY AREA
WATER QUALITY MANAGEMENT PLAN

Prepared by

COLORADO RIVER MUNICIPAL WATER DISTRICT

for

TEXAS DEPARTMENT OF WATER RESOURCES

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PLAN SUMMARY REPORT

FOR THE

UPPER COLORADO STUDY AREA

WATER QUALITY MANAGEMENT PLAN

Developed to satisfy the requirements of Section 208 of the Federal Water Pollution Control Act Amendments of 1972

Pursuant to
Title 40 CFR 130 and 131 and
The State of Texas Continuing Planning Process

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COLORADO RIVER MUNICIPAL WATER DISTRICT

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JUNE/1978

PREFACE

In order to estimate costs and other characteristics of sewage collection and treatment systems, it is necessary to make estimates of future service areas, treatment plant locations, lift station locations, and trunk line layouts. These locations and configurations are estimated for preliminary planning purposes and should be considered as approximate rather than specific. Accordingly, the locations and configurations presented within this report are not specific requirements of the plan. The exact location and sizing of sewer collection/treatment system elements will be determined for a given service area when a detailed engineering study is done either as part of the 201 Facility Plan or as part of a preliminary engineering study undertaken independently of the grant program. Appropriate changes in the recommendations of this report will be made at that time as necessary, to reflect actual conditions for the area.

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CHAPTER A

INTRODUCTION

Section 208 of the Clean Water Act of 1977 (Public Law 95-217) requires areawide wastewater treatment management planning be performed throughout the nation. The planning described in this Section of the Act consists of two types:

1. In areas with complex water quality problems the Governor designates (a) the boundaries of each such area, and (b) a local planning agency which is responsible for preparing a wastewater treatment management plan for that area.

2. The State is responsible for preparing a water quality management plan for the remainder of the State not designated by the Governor.

The policies and procedures established by the Environmental Protection Agency, for the accomplishment of Section 208 planning by both the State and designated areawide planning agencies, are set forth in Title 40, Code of Federal Regulations, Parts 130 and 131.

Within Texas, eight areas have been designated by the Governor as being complex water quality problem areas: Killeen-Temple, Southeast Texas, Corpus Christi, Dallas-Fort Worth, Houston, Lower Rio Grande Valley, San Antonio, and Texarkana. In order to prepare a water quality management plan for the remainder of the state, the state has been divided into fifteen planning areas. The boundaries of these fifteen areas essentially follow the hydrologic boundaries of the major river basins.

The water quality management plan being prepared for each of these state planning areas consists of two primary documents:

1. Volume I. Basic Data Report includes information on existing wastewater treatment facilities; existing water quality; existing land use patterns; existing population; and projections of economic growth, population, and probable land use patterns.

2. Volume II. Plan Summary Report presents the recommended plan for water quality management and the legal, financial, and institutional requirements of that plan. It also includes a description of feasible alternatives, an environmental assessment, and a summary of public participation activities conducted in the development of that plan.

The following document is the final report (Volume II. Plan Summary Report) for the Upper Colorado Basin. It was developed through the efforts of the Colorado River Municipal Water District, for the Texas Department of Water Resources, in conformance with the State of Texas Continuing Planning Process, as amended, April, 1976 and the appropriate federal regulations. All plan content elements as specified in Title 40, Code of Federal Regulations, Part 131 are set forth in either Volume I. Basic Data Report or Volume II. Plan Summary Report.

CHAPTER B

PROBLEM DEFINITION

Volume I identifies two categories of problems which are to be addressed in Volume II. The first category includes water quality problems which can be identified from an analysis of in-stream water quality data. The second category of problems includes those which are due to needs for various types of wastewater system facilities in a given community. The following problem definition chapter summarizes the specific in-stream water quality problems and facility needs which are addressed in this volume.

1. WATER QUALITY PROBLEM AREAS

The purpose of Chapter F, "Water Quality Assessment", in Volume I was to analyze existing data and make comparisons of existing water quality levels to the water quality standards in order to identify water quality problem areas. The majority of the data used to define water quality problems came from the following two sources:

1. Texas Department of Water Resources Surface Water Monitoring Network

2. United States Geological Survey Cooperative Program

The water quality problem areas are generally defined as segments within each basin that have shown violations of the Texas Water Quality Standards as established by the Texas Department of Water Resources.

Following is a summary of the problems identified in Chapter F and other in-stream water quality problems which have been identified subsequent to the preparation of Volume I. These additional problem areas have been identified as a result of public hearings, advisory committee meetings and the review of Volume I by interested parties.

Dissolved oxygen (DO) deficits are the most common water quality problem in the Colorado Basin. Only one stream segment (Pecan Bayou) has exhibited extensive DO problems. The following discussion will present in numerical order the water quality problems exhibited by each segment.

a. Segment 1401. The portion of the Colorado River which is tidally influenced (Segment 1401) exhibited a single water quality violation during water year 1973. On December 13. 1972. monitoring station 1401.01 located at FM 521 north of Matagorda exhibited a DO concentration of 4.7 mg/l. It was visually observed that the sample was collected under normal flow conditions, and the analysis of the water sample indicated that the other measured chemical parameters were within the normal range of ambient conditions. There were no noncompliant measurements recorded during water year 1972 or water years 1974 through 1977.

b. Segment 1403. Lake Austin (Segment 1403) exhibited one water quality violation during water years 1972 through 1975. On July 11, 1975, monitoring station 1403.03 located near the lake's headwaters at Lakeland Park exhibited a DO concentration of 3.6 mg/l. This same station recorded a noncompliant DO measurement of 3.8 mg/l in 1976 and two noncompliant DO measurements during 1977 of 4.8 mg/l and 1.8 mg/l.

c. Segment 1408. Segment 1408 consists of Lake Buchanan. During Water Year 1976, station 1408.03 located near the headwater exhibited an annual average chloride concentration of 110 mg/l. The stream standards for Segment 1408 specify a maximum annual average concentration of 100 mg/l. No noncompliant measurements had been recorded prior to water year 1976 and none were recorded during water year 1977.

d. Segment 1410. Segment 1410 of the Colorado River, located between the San Saba River confluence and E. V. Spence Reservoir, generally exhibited pH values that ranged from 7.0 to 8.5. However, on February 14, 1974, monitoring station 1410.01 located at SH 16 north of San Saba exhibited a noncompliant pH value of 8.8. No noncompliant pH values were recorded in this segment during water years 1975 through 1977, but on August 1, 1977, station 1410.03 recorded a noncompliant DO measurement of 4.8 mg/l.

e. Segment 1411. Segment 1411 consists of E. V. Spence Reservoir. During water years 1976 and 1977, station 1411.01 exhibited annual average chloride concentrations of 510 mg/l and 605 mg/l, respectively. The stream standards for segment 1411 specify a maximum annual average chloride concentration of 500 mg/l. No noncompliant measurements had been recorded prior to water year 1976.

f. Segment 1412. Segment 1412 is the Colorado River between FM 2059 near Silver to Lake J. B. Thomas (Colorado River Dam). On July 6, 1976, station 1412.01 recorded a noncompliant DO measurement of 1.2 mg/l. There were no noncompliant measurements during water years 1972 through 1975 or in water year 1977.

g. Segment 1417. Pecan Bayou (Segment 1417) has exhibited extensive DO problems beginning as early as water year 1972. This segment exhibited fifteen DO violations prior to water year 1976 which ranged from 2.8 mg/l to 4.5 mg/l. Twelve of the fifteen DO violations were recorded at station 1417.01 located at FM 2126 southeast of Brownwood. The other three DO violations were exhibited by station 1417.02 located at US 77 at Brownwood. Station 1417.01 exhibited two low DO measurements of 4.3 mg/l and 2.5 mg/l during water year 1976. and another low DO measurement of 4.2 mg/l during water year 1977. Station 1417.02 exhibited a noncompliant pH value of 8.7 in water year 1977.

h. Segment 1418. Segment 1418 consists of Lake Brownwood. No noncompliant measurements were recorded in the segment during water years 1972 through 1975. During water year 1976, however, station 1418.03 recorded low DO measurements of 4.6 mg/l and 4.4 mg/l. This station also recorded a high annual average of chloride concentrations of 187 mg/l and a high annual average of total dissolved solids concentrations of 556 mg/l during water year 1976. No noncompliant measurements were recorded in the segment during water year 1977.

i. Segment 1419. Segment 1419 consists of Lake Coleman. The segment exhibited no noncompliant measurements during water years 1972 through 1975. However, during water years 1976 and 1977 annual chloride averages of 112 mg/l and 119 mg/l, respectively, were recorded. The stream standards for this segment specify a maximum annual average chloride concentration of 100 mg/l.

j. Segment 1501. The tidal portion of Tres Palacios Creek (Segment 1501) has only one monitoring station. In water years 1973 and 1974, station 1501.01 located at FM 521 east of Palacios exhibited DO concentrations of 3.7 mg/l and 4.5 mg/l, respectively. No noncompliant DO measurements were recorded during water years 1975 through 1977.

k. Segment 1502. The portion of Tres Palacios Creek above tidal influences (Segment 1502) generally did not exhibit DO concentrations less than 5.5 mg/l. However, in 1973 monitoring station 1502.01 exhibited noncompliant DO concentrations of 4.3 mg/l and 2.7 mg/l. No noncompliant DO measurements were recorded after water year 1973, but station 1502.01 recorded a total dissolved solids annual average concentration of 2786 mg/l in water year 1976 and an annual average chloride concentration of 257 mg/l in water year 1977. The annual average for total dissolved solids was derived from four samples with individual values of 320 mg/l, 325 mg/l, 375 mg/l and 10,125 mg/l. The stream standards for total dissolved solids and chlorides for this segment are annual averages of 600 mg/l and 250 mg/l, respectively.

l. Segment 2452. Tres Palacios Bay including Turtle Bay exhibited no DO violations in water year 1972. In water year 1973, both of the monitoring stations located on this segment exhibited DO violations. On December 13, 1972 monitoring station 2452.01 exhibited a DO measurement of 4.1 mg/l and on September 13, 1973, when flood conditions were observed in Tres Palacios Creek, a DO violation of 4.1 mg/l was recorded at monitoring station 2452.02. There were no noncompliant DO measurements recorded during water years 1974 through 1977.

2. FACILITY NEEDS

The water quality problems in the Upper Colorado Study Area are associated principally with nonpoint sources of pollution rather than those from point sources. It can be seen from the inventory that most municipal and industrial operations do not discharge effluent into the water ways of Texas. Those facilities which are discharging are either in compliance with permit standards or are actively working on improvements to meet those standards. The City of Midland has been identified as needing further examination of wastewater treatment facilities in light of recent growth. Other cities requiring expansion of existing facilities during the five-year planning period include Denver City, and Winters; the City of Seminole may require a small expansion by 1990. The City of Stanton has submitted an application for a Step 1 Facility Planning Grant and the cities of Ballinger, Big Spring, Brownfield, and Snyder are currently preparing or have recently completed Step 1 facility plans to address their needs. A centralized wastewater collection system and centralized wastewater collection and treatment facilities are recommended for the septic tank communities of Sand Springs and Wellman, respectively. The cities of Ackerley and Westbrook, originally sewerage planning areas, have been found to have no construction needs due to the adequacy of continued utilization of septic tanks.

All industrial dischargers retain their wastes on their respective premises and are thus not a problem. There are some stream electric generation cooling water systems in the study area, but their effluent is retained in local reservoirs and has not created any water quality problems. Some research has shown that the effluent of those power plants is beneficial to some types of fish production.

Facility needs in the Upper Colorado Study Area have been discerned during two phases of this 208 planning effort. During the basic data gathering effort, evaluation rested primarily on existing visible needs. The second phase, data evaluation, identified areas needing expansion or need systems by 1983 based on projected waste loads. Specific details concerning facility needs are found in Chapter D of this report.

CHAPTER C

SUMMARY OF PLAN

1. WASTE LOAD ALLOCATIONS FOR WATER QUALITY SEGMENTS

The Upper Colorado Study Area is made up of three river segments and a portion of a fourth segment. These segments include all of Segment 1411, 1412, and 1413 and only the portion of segment 1410 which lies above the confluence of the Colorado River and the San Saba River. All of these segments are effluent limited segments and, therefore, do not require wasteload allocations.

2. 1983 PLAN

Included in this section are summaries of the final areawide plan recommendations for communities that require upgrading of existing facilities or implementation of new facilities within the next five years in order to meet state and federal standards. For each community the optimum alternative is presented along with any requirements concerning monitoring programs, data handling systems, and appropriate revision mechanisms.

a. Ballinger. The City of Ballinger currently has a prepared Step 1 facility plan submitted for approval. The optimum alternative consists of upgrading the existing treatment facility by converting the present anaerobic process to an aerobic configuration and adding chlorination facilities. It is felt that the planned improvements are adequate to bring the facility into compliance.

b. Blackwell. The City of Blackwell currently relies on septic tanks as their method of wastewater disposal. It is believed that the continuance of septic tank usage is the most cost effective solution to treatment requirements. Although the underlying earth strata consists of mainly impermeable soils, the upper soil layer coupled with a high evaporation rate (approximately three times the average rainfall) should be adequate for drainage field purposes and prevention of runoff from reaching the reservoir. It is recommended that an effective septic tank control ordinance be established by the City in order to insure adequate design and proper construction of any new systems.

c. Oak Creek Reservoir. The Oak Creek Reservoir residential area uses septic tanks for treatment of domestic wastewaters. Problems have arisen in this area due mainly to either inadequate design or improper construction of existing septic tank systems. Many of these problems have been corrected through efforts of the Texas Department of Health and a septic tank control ordinance is being established for the area. Although drawbacks appear to exist for septic tank systems, it is considered the most cost effective selection and, in addition, it is believed that the control measures implemented will deter any further contamination of the reservoir. The proposed ordinance will serve to control construction of new systems and correct problems in existing systems.

d. Winters. The City presently treats its wastewaters by initial treatment in an Imhoff tank and final treatment in oxidation ponds. The system is classified as "no discharge," as the effluent is used for irrigation purposes. Due to highly impermeable soil layers the area is not conducive to the employment of septic tanks. Three alternatives have been studied for possible selection, with an oxidation ditch type plant (known as a racetrack) determined to be the most cost effective. Construction of the new plant can be easily facilitated by tying into the existing sewer system with some minor extensions.

e. Big Spring. A 201 Facility Plan for the City of Big Spring has been prepared and submitted to the TDWR. This plan was necessitated due to the inability of the existing plant to meet effluent requirements. Of the several alternatives considered, the most cost effective method consisted of upgrading the existing plant by the addition of aeration lagoons prior to chlorination. Estimated cost is 1.5 million dollars.

f. Brownfield. Implementation of a new treatment facility has been initiated under a 201 Facility Plan. Biological treatment followed by land application is considered to be the Best Practical Waste Treatment Technology for this area. The system recommended as most cost effective consists of screening facilities, an oxidation ditch, secondary sedimentation, sludge drying beds, and effluent holding ponds to retain the effluent prior to land application. The new facility will replace the existing plant.

g. <u>Denver City</u>. The City is presently served by two wastewater treatment plants consisting of Imhoff tanks at one plant and oxidation ponds at the other. The effluent from both plants is used for irrigation. By the year 1983, both plants are projected to be slightly overloaded. Expansion requirements are based solely on projected flow increases since, because they are "no discharge", effluent quality is not a design factor. The recommended method for expansion consists of adding oxidation ponds to both plants, sludge drying beds to replace the existing sludge pits, and additional holding ponds. The collection system will also require expansion.

h. <u>Lake Colorado City Development</u>. This area is located on the west side of a reservoir and is mainly a residential and recreational area. Septic tanks and cesspools are currently being used for disposal of liquid wastes with no problems encountered as of the present, but projected increases in population indicate the need for stringent control measures to preclude possible health problems. The most cost effective method of dealing with future problems is the establishment and implementation of a septic tank control ordinance. Proper design and construction of septic tanks will serve to reduce pollution loads to the reservoir. At the present, some eutrophication problems exist in the reservoir and the nutrient contribution by the septic tank systems has been estimated as 8.3% of the total amount reaching the reservoir. The soil conditions in the area are considered moderately suitable for septic tanks if designed properly.

i. <u>Midland</u>. The City currently operates a conventional activated sludge system with 6.0 MGD capacity. Rapid growth in the past few years and future population projections indicate a strong need for expanding the capacities of the treatment system and the collection system. The City presently sells about 1.5 MGD of the effluent to local industries and uses the remainder for land irrigation. A proposal under consideration by the City consists of primary treatment and disinfection for wastewaters used in irrigation projects and continuance of secondary treatment for industrial buyers. Implementation of this plan will require expansion of existing primary treatment and sludge handling facilities. In addition, an application for a "no discharge" permit would be submitted. This plan would pose no increased environmental threat since irrigation with wastewaters is already in practice.

j. <u>Sand Springs</u>. The City of Sand Springs currently uses septic tanks to dispose of liquid wastes. Although continuance of this type of system would incur the least expense, the projected increase in population density warrants the need for a system which requires less land area and will more positively eliminate possible health hazards. The most feasible system consists of constructing a sewage collection system and transporting the wastewater to Big Spring for treatment. Facility requirements include 14.5 miles of gravity sewer line and three lift stations.

k. Snyder. A facility plan which investigates sewage treatment alternatives has been prepared and approved by the TDWR. The most cost effective method is to use the effluent from the existing treatment plant for land application, or sell it to private individuals or industries. This method would not require expansion of the existing treatment plant.

l. Wellman. At the present time, the residents of the City of Wellman principally utilize cesspools for disposal of wastewaters. However, a limited number of septic tanks are being constructed for newer residences. Waste disposal problems have surfaced, particularly with the High School waste disposal facility. The most effective means of treatment for this area appears to be the installation of a treatment and collection system. Several schemes were examined and the most cost effective system is a package type treatment plant with a capacity of 0.04 MGD. This system would satisfy the needs through the study period for the City of Wellman.

m. Westbrook. The use of septic tanks is the principal method of disposal for this community of approximately 300 persons. Problems have developed concerning occasional contamination of the water supply resulting from improperly constructed septic tanks. Although construction of a central sewer system would eliminate these problems, it is felt that establishment of a septic tank control ordinance by the City would effectively reduce existing problems and would be more cost effective. The soils in the area perform moderately well for septic tank systems.

n. Stanton. The existing treatment system for Stanton consistof an Imhoff tank followed by oxidation ponds. Sludge from the system is placed in sludge drying beds and then transported to landfills. The system is classified as an "no discharge", with the effluent used for irrigation purposes. Because of the advanced age of the system and the projected increase in flow, this plant will need to be replaced or upgraded by 1983. The City has submitted an application for a Step 1 Facility Plan but had not received approval at the time of this study. Under consideration is biological oxidation as a secondary treatment method.

3. 1990 PLAN

This section discusses cities which will require a revised facility management plan within the next ten years due to projected increases in wasteloads or flow.

a. Seminole. The City of Seminole currently uses an Imhoff tank and Oxidation ponds for treatment of domestic sewage. Flow projections for 1990 indicate that the plant capacity will be slightly exceeded. Although the increase is small, this plant should be considered for possible revision of the facility plan during this period.

4. 2000 PLAN

There are no other cities or communities which are projected to require expansion or upgrading of facilities by the year 2000. All requirements are contained in the first ten year period.

5. SCHEDULE OF IMPLEMENTATION

The implementation process consists of three steps beginning with preparation of facility plan and review for Step I, preparation of design and review for Step II, and construction of treatment system and review for Step III. Table II-C-1 shows the estimated required time for each step and for each phase within the steps.

Table II-C-1
Time Sequence For Implementation
of Wastewater Treatment Systems

STEP	PHASE	ESTIMATED TIME REQUIRED
I	Preparation of Facility Plan	12 mos.
	Review	6 mos.
II	Preparation of Design	6 mos.
	Review	3 mos.
III	Construction of System	12 mos.
	Review	3 mos.
		42 mos.

Prior to Step II application, submission of request for NPDES/State permits must be made. The review phase consists of technical review of all plans and design by appropriate government agencies. Figure II-C-1 graphically indicates the step-by-step procedures and initiation year in order for a city to obtain federal funding for construction of waste treatment facilities by 1983.

6. INSTITUTIONAL AND LEGAL REQUIREMENTS

a. Introduction. There are several water quality improvement programs under development in the Upper Colorado Study Area. The majority of the programs are being accomplished under joint funding arrangements by Federal and local agencies. A listing of institutions which participate in water quality related programs by making loans and/or grants for qualifying programs are discussed in detail in Appendix B of this report.

b. Existing Water Quality Planning Programs in The Upper Colorado Study Area.

(1) EPA Grants: A number of facility plans in the Upper Colorado Study Area are being developed under Section 201 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500). The scopes of these projects range from planning for basic collection system installations or improvements to planning for complete wastewater systems. The 201 facility plan is intended to document the need for collection and or treatment facilities, to define the area to be served, to address the available alternatives for meeting the defined needs, and to recommend that alternative which is most cost-effective and feasible for the affected community. This type of plan is often referred to as a "Step 1 Plan" under the EPA Construction Grants Program and is a prerequisite to obtaining funding for subsequent construction under that program.

The Texas Department of Water Resources publishes a "Municipal Facilities Construction Grant Priority List" under Public Law 92-500, as approved by the Board. This list is in order of rank and is divided into two classes based on population: Class I - entities with more than 2,500 people and Class II - entities with 2,500 or fewer people. Each class is divided into a first and second ranking group. Projects in the first ranking group are those that have received a Step 2 grant. All other projects are in the second ranking group. Grants are contingent on funds being appropriated by the Congress.

Several municipalities within the boundaries of the study area are ranked by the Board as of July 14, 1977. They are Odessa (2 projects), Big Spring, Brownfield, Snyder, Ballinger, Winters, and Stanton.

The City of Goldsmith in Ector County has completed a wastewater collection system and treatment plant funded under a 75% grant from EPA and a loan from the Texas Department of Water Resources water quality enhancement fund.

(2) Department of Housing and Urban Development: The section of Beals Creek in the Big Spring area is heavily silted and clogged with shrubbery which causes flooding of some sections of the City during rain storms and a resultant temporary increase of inflow into the City's sanitary sewer collection system. Plans for cleaning and clearing this section of Beals Creek have been formulated under an expected grant from HUD.

(3) Corps of Engineers: The Corps of Engineers has proposed a widening and straightening project for Beals Creek to alleviate flooding conditions and resultant problems under a joint funding arrangement with the City of Big Spring. Public hearings on the project were held at Big Spring during the spring of 1977, after which the City Council approved the plan. However, the cost-benefit ratio was determined by the planning section of the Corps to be near unity. The project is, therefore, marginal and doubtful at this particular time. Further study is being performed on the project.

(4) Soil Conservation Service (SCS): Watershed Treatment Programs: The Soil Conservation Service administers the planning and implementation of protective measures, primarily in the form of small dams to control runoff which otherwise would likely cause flooding, increase erosion, and increase sediment loads to major waterways. There have been numerous flood water retarding structures of this type constructed in the Upper Colorado River Basin area in the counties of Coleman, Mitchell, and Runnels. Recently nineteen such structures have been completed along Valley Creek. Ten additional projects are proposed for Elm Creek.

(5) Great Plains Conservation Program (GPCP)(SCS): This program was initiated in 1958. The primary objective of the program is to institute measures to insure permanent soil and water conservation practices.

An additional high priority objective is agriculture-related pollution abatement. All counties in the Upper Colorado River Basin are within the GPCP area.

Programs which have been implemented to date include planting grasses and reseeding depleted rangeland, thus reducing the amount of erosion by wind and water. As a result of re-vegetation a reduction in sedimentation is being achieved.

(6) Low Flow Diversion Facility: Segment 1410 (Colorado River-San Saba River confluence to E.V. Spence Reservoir) experiences a water quality problem with high levels of total dissolved solids (TDS), chlorides, and sulfates. The salt problem exists in the main stream of the Colorado River below Lake J. B. Thomas Dam and continuing down stream through the Silver monitoring station, E. V. Spence Reservoir, and the monitoring station at Ballinger. The source of this salt has been a matter of diverse opinions. Probably the most accepted opinion is that the salt results from years of improper disposition of oil field brines and intrusion of highly mineralized water from the Santa Rosa formation. The quantity of TDS from this source has been materially reduced by the construction of the low-flow diversion facility on the main stream of the Colorado River about 5 miles northwest of Colorado City, Texas. Pumping facilities and a 2500 acre feet basin are incorporated in the design scheme.

c. Financial and Management Agencies for Sewerage Planning Areas. As part of the areawide water quality management plan, a management agency or management system is to be selected to implement the plan.

The management agency or management system must possess the authority to:

* Carry out appropriate portions of an areawide waste treatment plan.

* Manage effectively waste treatment works and related facilities in conformance with the areawide plan.

* Directly or by contract, design and construct new treatment works, and operate and maintain new and existing works required by the areawide plan.

* Accept and utilize grants, or other funds from any source, for waste treatment purposes.

* Raise revenues, including the assessment of waste treatment charges.

* Incur short and long term indebtedness.

* Assure in the implementation of a plan that each participating community pays its proportionate share of treatment costs.

* Refuse to receive wastes from any municipality or subdivision that does not conform to any provisions of the approved plan, and

* To accept industrial wastes for treatment.

No one agency need meet all the criteria but the total system needs to meet these requirements.

After an agency has been designated in an approved plan, the EPA cannot grant 201 construction funds to anyone except those designated agencies which conform to the approved plan.

Management agencies directly affecting the individual sewerage planning areas are summarized by segment number.

SEGMENT 1410

(1) Ballinger: The City of Ballinger, County Seat of Runnels County, is located at the junction of Elm Creek and the Colorado River. U.S. Highways 67 and 83 serve the City. The City is incorporated and administered by a mayor-council form of government. Population is estimated to be 4,000. Ballinger is a member of the West Central Texas Council of Governments. Domestic water source is Lake Ballinger. The City has a 2.0 MGD water treating plant. Filter washings and sludge generated by the plant are ponded. Excess water is released to Elm Creek.

A Step I facility plan was prepared for Ballinger and a part of the funding has been received. Effluent from the wastewater treating plant is not in compliance with permitted parameters of BOD, TSS and fecal coliform at times. Meanwhile the City has made plant improvements with it's own funds. Improvements include baffling, additional drying beds, a recycling system for low flows and a flow meter. Currently a chlorine contact chamber, with chlorinating equipment, is being constructed. Plans are being formulated to irrigate some 180 acres of land with plant effluent instead of discharging into Elm Creek. The City acquired this land some time ago when the problem with effluent discharge was foreseen.

The City of Ballinger is the recommended agency having the financial and management capabilities for upgrading the present wastewater treatment facilities.

(2) Blackwell - Oak Creek Lake Development: Oak Creek Reservoir is located in the northeast part of Coke County. The lake is owned by the City of Sweetwater which is the county seat of Nolan County. The lake supplies water to the cities of Sweetwater, Blackwell and Bronte. West Texas Utilities Company has a 75 Megawatt steam-electric station located on the reservoir. Lake capacity is rated at 39,200 acres at spillway elevation of 2000 feet.

The City of Sweetwater has approximately 350 lease sites surrounding the reservoir. Development in the area consists of cabins, mobile homes, fishing camps, recreational shelters, and an estimated 30 to 40 permanent residences. There is very little regulation or zoning pertaining to type of structures or waste disposal facilities permitted in the area. Wastewater disposal is mainly by individual septic tanks.

The City of Blackwell is located approximately 3 miles northwest of Oak Creek Reservoir with the major portion of its area lying in Nolan County and with some of its out-reaching areas in Coke County. Blackwell is incorporated and has an estimated population of 279 people. The City assesses and collects a very nominal tax. The Blackwell Independent School District and Nolan County are other taxing authorities in the area.

The City has a water treatment plant for processing domestic water from Oak Creek Reservoir. Wastewater disposal is by individual septic tanks.

The reservoir lies within the geographical boundaries of the Concho Valley Council of Governments. However, the City of Sweetwater, owner of the lake, is located within the boundaries of the West Central Texas Council of Governments. The lake likewise is situated within the boundaries of Upper Colorado River Authority.

Possible financial and management agencies for sewerage planning for the area are the cities of Sweetwater and Blackwell, Coke County, and the Upper Colorado River Authority. An intensified septic tank program with a rigid permitting and inspection program has been proposed for the area in lieu of a collection system and wastewater treatment plant. The City of Sweetwater is recommended for designation as the management agency. The City of Blackwell, being in the Oak Creek Reservoir geographical drainage area, would logically manage septic tank affairs in its corporate limits. A cooperative effort involving Sweetwater, Blackwell, and the Texas Department of Health should be effective in controlling pollution in the area.

(3) Winters, Texas: The City of Winters, Texas is an incorporated, general law municipality located in north central Runnels County. Estimated population is 3,000. Winters is located within the jurisdiction of the West Central Texas Council of Governments.

The municipal water supply comes from a lake on Elm Creek located about 5 miles east of town. The City is currently engaged in seeking additional water supplies.

Generally speaking, very few septic tanks are allowed in the City; however, the City has no means for controlling those installed outside the city limits.

The City has expressed interest in the construction of a new wastewater treatment facility, and has had a preliminary study performed by a consulting firm. An application for a Federal Grant (EPA) through the Texas Water Quality Board was filed several years ago.

Existing financial and management agencies for sewerage planning for the area are the City of Winters and Runnels County. The City of Winters is recommended for designation as the logical management agency.

Segment 1411

Since there are no known problems pertaining to water pollution in this segment, no plans for controlling water quality are proposed.

Segment 1412

(1) Big Spring: Big Spring, the County Seat of Howard County is located in the central section of the county on Interstate Highway 20. The City is incorporated as a "home rule" City and is administered by a Council-

Manager form of government. Population is estimated to be about 29,000. Big Spring is located within the geographical boundaries of the Permian Basin Regional Planning Commission. The economy of the City is diversified, and includes petroleum, agribusiness, building materials, a medical center, and varied manufacturing.

Raw domestic water, which is supplied by CRMWD, is treated and distributed by the City.

The wastewater treatment plant is not able to consistantly meet permit discharge parameters. Recent improvements to the plant have been made. However, a facility plan proposing additional improvements has been prepared and submitted to the TDWR. The July 14, 1977, Municipal Facilities Construction Grant Priority List (PL 92-500) rates Big Spring sewage treatment improvements as number 12 in the second ranking group.

Agencies having financial and management capabilities for area sewerage planning are the City of Big Spring, and Howard County. The City of Big Spring is recommended as the management agency for upgrading their wastewater treatment facilities.

(2) Brownfield: The City of Brownfield, County Seat of Terry County, is located in the central section of the county on U.S. Highway 62 and 385. The City is incorporated as a "home rule" City and is administered by the Manager-Council form of government. Population is estimated to be about 10,000. Brownfield is a member of the South Plains Association of Governments.

The economy of the City is based on oil, gas, process minerals, medical center, agriculture and limited manufacturing.

Domestic water for the City is purchased from Lubbock. Raw water from the Canadian River is processed by the Lubbock treatment plant before pumping to Brownfield.

The City is served by a wastewater treatment plant, but a 201 facility plan has been prepared for construction of a new plant to serve the City.

Effluent from the wastewater treatment plant is used for irrigation of City owned land (about 378 acres) which is leased to individuals for agricultural purposes. There is a water well field consisting of 5 or 6 wells which is protected by not irrigating within 500 feet of the field.

Agencies having financial and management capabilities for sewerage planning for the area are the City of Brownfield, and Terry County. The City of Brownfield is recommended for designation as the management agency for implementing wastewater treatment plans.

(3) Denver City, Texas: Denver City is an incorporated general law City, located in the southern portion of Yoakum County, approximately 80 miles southwest of Lubbock. Estimated population is 4700. Denver City is a member of South Plains Association of Governments.

The municipal water supply is from three well fields consisting of approximately 14 wells.

Denver City presently has two wastewater treatment plants. The south plant, with a design capacity of 0.122 mgd, is of the Imhoff oxidation-pond type with four oxidation ponds in service.

The north wastewater treatment plant has a design capacity of 0.275 mgd. The plant is of the oxidation-pond type and consists of bar screens and three oxidation ponds in service.

Effluent from the waste treatment plants is sold for agricultural irrigation purposes year-round. Crops are cotton, alfalfa, and winter wheat.

The north plant is reported to be in good condition and functioning well. The City Council has made an application for a Federal grant to improve the south plant.

Existing financial and management agencies for sewerage planning for the area are the City of Denver City and Yoakum County. The City of Denver City is recommended for designation as the management agency.

(4) Lake Colorado City Development: Lake Colorado City is located in central Mitchell County, Texas. The lake is owned by Texas Electric Service Company, and, in addition to supplying water requirements for the Morgan Creek Steam Electric Station, it supplies raw water to the City of Colorado City for its municipal use. Lake Colorado City State Park is located on the west side of the lake, while the power plant is situated on the east side, about one mile north of the spillway.

It is estimated that there are eight hundred residences, recreational type homes, mobile homes and commercial installations surrounding the lake. Wastewater disposal is by individual septic tank or by other means. There is no sewage collecting system available. Residential development has been more concentrated on the west side of the lake. Domestic water and natural gas is distributed to the area by the Mitchell County Utilities Co. which is a private organization.

The area is unincorporated. Population figures vary considerably depending on the season. The State park area encompases 575 acres and has 35 campsites having electricity and water. Currently underway is a construction program which will add 44 more campsites with electricity and water, and 52 additional sites with water only. During the State Park fiscal year, September 1, 1976 to August 31,1977, 285,000 people visited the park. Easter weekend was the peak season when 15,000 visitors were recorded. Dump facilities for the collection of wastes from recreational vehicles are provided. Waste disposal from the park is accomplished by septic tank.

Mitchell County is located within the jurisdictional boundaries of the West Central Texas Council of Governments.

Existing financial and management agencies for sewerage planning for the area are the City of Colorado City and Mitchell County. Mitchell County is recommended for designation as the management agency.

(5) <u>Midland</u>: The City of Midland, a major petroleum producing center, is the central City of a Standard Metropolitan Statistical Area that covers Midland County. Estimated population is 69,272.

Midland is a "Home Rule" City and is governed by a Council-Manager form of government. Midland County is a member of the Permian Basin Regional Planning Commission.

Domestic water is supplied by City owned wells and by raw water purchased from the CRMWD.

Existing financial and management organizations for sewerage planning serving the Midland area are the City of Midland, and Midland County. The City of Midland is recommended for designation as the management agency.

(6) Sand Springs: The community of Sand Springs is located on Interstate Highway 20 about 9 miles east of Big Spring, Texas, in Howard County. Population is estimated at 1975 people. Both Sand Springs and Midway, a neighboring community, are unincorporated. Municipal water is purchased from Coahoma, a nearby incorporated City of 1,200 population. Howard County Water Control and Improvement District No. 1 sells the water to Coahoma.

Disposal of wastewater in the Sand Springs-Midway area is by septic tanks. A preliminary study relating to the acquisition of a wastewater treating facility for Sand Springs was made under a grant from the Farmers Home Administration.

The City of Coahoma owns a wastewater treatment plant of the stabilization pond type. Both Sand Springs and Coahoma are located within the boundaries of the Howard County Water Control and Improvement District No. 1. Howard County is within the jurisdictional boundaries of the Permian Basin Regional Planning Commission.

The Howard County Water Control and Improvement District has applied for and been granted by the Texas Public Utility Commission a "Certificate of Convenience and Necessity" to provide sewer service to customers within its geographical boundaries, exclusive of the City of Coahoma.

Existing financial and management agencies for sewerage planning for Sand Springs are the Howard County Water Control and Improvement District No. 1, the City of Coahoma, the City of Big Spring, and Howard County. Howard County WCID #1 and Big Spring are recommended for designation as the management agencies for wastewater collection and treatment, respectively.

(7) Snyder: The City of Snyder, County Seat of Scurry County is located in the central section of the county at the intersection of U.S. Highway 84 and 180. The City is incorporated as a "home rule" City and is administered by a council-manager form of government. Population is estimated to be about 12,500. Snyder is within the geographical boundaries of the West Central Texas Council of Governments.

Raw domestic water is supplied by CRMWD and treated by the City. During summer peak demands some well water is added. The TDWR has required that treatment plant sludge and filter washings not be discharged. Retention facilities for separation of sludge and recycling the treated water are being constructed. Sludge and sediment will be disposed of by hauling to a land fill.

The wastewater treatment plant had difficulty in consistantly meeting effluent requirements for TSS. Effluent was discharged to Deep Creek. After a Step I Study was made and approved, a decision was made to go to "no discharge", and abandon seeking a grant under PL 92-500. Effluent is now being used to irrigate approximately 137 acres of alfalfa. The purchase of additional land for irrigation is under consideration. Another alternative under consideration is increasing the size of an existing golf course and using part of the effluent for irrigation of the course.

It is planned that both the water treatment plant and the wastewater treatment plant will be "no discharge" operations.

Existing agencies having financial and management capabilities for sewerage planning for the area are the City of Snyder and Scurry County. The City of Snyder is recommended for designation as the management agency.

(8) Stanton: The City of Stanton is located in southeast Martin County on Interstate Highway 20. It is incorporated and is administered by a Mayor-Council form of government. Estimated population is 2300. The City is within the geographical boundaries of the Permian Basin Regional Planning Commission.

The economy of Stanton is based on agriculture, agribusinesses, petroleum production, cotton ginning, and cotton compressing.

Raw domestic water is purchased from CRMWD and is treated by a municipal water treatment plant. Sludge generated by the process is separated in ponds, dried and hauled to a landfill.

The City is served by an old wastewater treatment plant consisting of an Imhoff tank and oxidation lagoons. Effluent has been used for agricultural irrigation, but plans are being made to use the effluent for watering the golf course.

The City has made application to the TDWR Construction Grants Section for an EPA grant (PL 92-500) for constructing a new sewage treatment plant.

Existing financial and management agencies for sewerage planning for the area are the City of Stanton and Martin County. The City of Stanton is recommended for designation as the management agency.

(9) <u>Wellman</u>: The City of Wellman is an incorporated general law city located in Terry County approximately 13 miles southwest of Brownfield. Estimated population is 350 persons. The City is governed by a mayor and 5 councilmen. Wellman is located in the jurisdictional boundaries of the South Plains Association of Governments.

Domestic water supply is produced from City owned wells and distributed by the City. Wastewater disposal is by individual septic tanks.

The Wellman Independent School District assesses and collects taxes. The petroleum industry is the largest taxpayer.

Existing financial and management agencies for sewage planning for the area are the City of Wellman and Terry County. The City of Wellman is recommended for designation as the management agency.

(10) <u>Westbrook</u>: The City of Westbrook is an incorporated general law City and is located approximately ten miles west of Colorado City, Texas, on Interstate Highway 20 in Mitchell County. Estimated population is 350 people. The City is administered by a Mayor-Council type of government consisting of a mayor and two councilmen.

Municipal water is purchased from the Westbrook Rural High School District, which purchases the treated water from the City of Colorado City.

Wastewater is disposed of by individual septic tanks. The acquisition of a wastewater treatment plant has been discussed by the populace, but no positive action has been taken on account of cost of construction, operation, and maintenance.

The City has a tax rate of $1.50 per $100.00 assessed valuation. Valuations appear to be about 10%. The City is located within the boundaries of the West Central Texas Council of Governments.

Existing financial and management agencies for sewerage planning for the area are the City of Westbrook, and Mitchell County. The City of Westbrook is recommended for designation as the management agency.

Segment 1413

Since there are no known problems pertaining to water pollution in this segment, no plans for controlling water quality are being proposed.

7. FINANCIAL REQUIREMENTS

A number of sources and programs are necessary to meet financial requirements for study, planning, and construction of collection systems and wastewater treatment plants. Financing arrangements include loans, grants, taxation, revenue bonds, tax supported bonds and in some instances funds derived from revenue sharing. A plan of user charges is usually developed to support the operation and maintenance of the wastewater system.

Federal agencies which support water quality oriented programs by providing grants and/or loans are the Environmental Protection Agency, The Farmers Home Administration, The Department of Housing and Urban Development, and The Economic Development Administration. The Corps of Engineers and the Soil Conservation Service are other Federal agencies which participate directly or indirectly in water management programs.

On the State level, the Texas Water Development Board has the authority to provide financial assistance for water-quality enhancement purposes through the purchase by the Board of bonds issued by the borrowing entity. It is the policy of the Board to make loans to construct treatment works only to political subdivisions that cannot obtain financial assistance at reasonable rates from the commercial market.

"Special Districts" are other sources of financing water quality management programs. These districts, since they are political bodies under the constitution of the State, give a flexibility for accomplishing specific programs. They may, with voter approval, issue bonds, assess taxes, and enter into joint projects with other political bodies in the accomplishment of their functions.

On the local level, county and city governments provide sources of financial assistance, since they posess the legal authority to assess and collect taxes, fees, and user charges. However, the constitution of the State places limitations on tax rates for these government entities and on the amount of debt a city or county may assume.

A detailed discussion of financial arrangements available for water quality management programs is presented in Appendix B of this report.

8. INFORMATIONAL REQUIREMENTS FOR UPDATES

At the present, additional information in the form of sampling surveys is not required for nonpoint sources although planning programs should remain flexible in order to adjust to any problems that cannot be anticipated.

For point sources there are two areas which warrant possible investigation concerning septic tank runoff into adjacent reservoirs. These areas, Oak Creek Lake and Lake Colorado City, are currently using septic tank systems which account for some eutrophication problems in the reservoirs receiving their runoff. A survey has been previously conducted for the Lake Colorado City area in which it was determined that the septic tank system contributed 8.3 percent of the nutrient load to the reservoir. Population projections indicate an approximated 20 percent increase should occur by planning year 2000 at Lake Colorado City, but no population increase is predicted for Oak Creek Reservoir. The implementation of a sampling program would be useful to determine the quantities of pollutants carried to the receiving waters, the contributing sources, and the actions needed to reduce or eliminate the pollution at the various sources. It has been recommended that each of the two communities implement septic tank ordinances to insure proper construction and design of septic tank systems which should prove adequate in reducing runoff pollution, but the use of monitoring programs and dye studies may be required to determine the quantity of runoff which reaches the reservoir and its impact on water quality. A sampling program would be particularly necessary when receiving waters are used as drinking water sources.

CHAPTER D

SEGMENT SUMMARIES

1. SEGMENT 1410

Segment 1410 extends from the proposed Stacy Reservoir site to Robert Lee Dam. This segment includes approximately 236.3 river miles of the Colorado River and drains 2,061 square miles. Flows are regulated to a great extent by releases from E. V. Spence Reservoir. Flows are generally low except for rainy periods in the late spring and early fall. Water quality is primarily governed by nonpoint sources, and influenced primarily from mineral dissolution upstream. Sulfates and dissolved chlorides are relatively high though not exceeding stream standards established for the segment. One source of chlorides is from petroleum brine disposal. Most of the contamination occurred in the 1950's and 1960's, and since 1970 most of the direct contamination has been controlled by the enforcement of disposal regulations. The Colorado River Municipal Water District has also constructed several low-flow diversion structures to control some of the natural salt contribution. During 1974, moderately high nutrient levels were recorded in the segment. A noncompliant pH value was recorded on February 14, 1974, at monitoring station 1410.01 and was apparently related to excessive plankton growth. The causes and sources of the plankton bloom have not been identified.

Fourteen waste control orders have been issued to entities within the segment but only one municipal and two industrial facilities actually discharge effluent into the drainage system. The City of Ballinger's wastewater treatment plant is the only point source contributor of organic waste while West Texas Utilities has two cooling water discharges that are recycled through Oak Creek Reservoir.

Four areas within the segment are considered to need improvements in their wastewater collection and treatment system. One facility, the City of Ballinger, is currently discharging poor quality effluent into the Colorado River via Elm Creek and improvement of this facility is required for the enhancement of water quality. The City is currently planning this improvement as part of a 201 Facility Plan. The City of Winters does not discharge its effluent but improvements are required to prevent possible discharges of poor quality effluent into Elm Creek. Two other areas, both around Oak Creek Reservoir, do not presently have sanitary collection and treatment systems. Improvements need to be considered to reduce potential health hazards and protect the water quality of Oak Creek Reservoir which is a source of domestic water supply for the cities of Sweetwater, Bronte and Blackwell.

a. Summary of Existing Agencies & Water Quality Control Programs. Segment 1410 is comprised of portions of Nolan, Taylor, Coke, Runnels, Coleman, Tom Green, and Concho counties. All statewide agencies have jurisdiction in this segment though not all may have active programs in the area. In addition, the state chartered Upper Colorado River Authority, Lower Concho River Water and Soil Conservation Authority, and Central Colorado River Authority cover portions of this area. Major municipal governments in the segment include Ballinger, Robert Lee, Bronte, and Winters. A discussion of the programs and powers of these entities can be found in Appendix B.

b. Nonpoint Source Assessment. The 2,061 square miles of segment 1410 consist primarily of rangeland with some dry cropland. Sulfates are relatively high in this area due to the influence of geological outcrops upstream. Dissolved chloride concentrations are also high. One source of chlorides is that from mining (petroleum) disposal. In the 1950's and 1960's, brine generated from wells were discharged directly into the watercourse or into unlined disposal pits. Since 1970, both the Texas Railroad Commission and the Colorado River Municipal Water District have actively controlled salinity attributed to these sources. The CRMWD has also built several structures to control natural salt sources above this segment. During 1974, moderately high nutrient levels were measured in this segment, but a source was not determined. Releases from Robert Lee Dam greatly influence the hydrologic conditions in this segment but no water quality problems have been recorded that can be attributed to this source.

c. Waste Load Projections. Waste load projections were made in accordance with the Water Quality Management Planning Methodology for Municipal Waste Treatment Needs Assessment using the best available data. Where possible, effluent quantity and quality, influent quality and quantity, plant design data and sewer collection system data were input into the calculations. When these data were not available, certain generalized assumptions were made that may cause results to appear inconsistent. Among these assumptions are that wastewater plants will discharge effluent of the quality specified in their permits, that the average per capita wastewater flow is 100 gallons per day with an average per capita BOD and TSS loading, and that infiltration/inflow will increase exponentially with increasing age of the collection system. In some cases this may result in an increasing flow (because of I/I) but a decreasing mass loading (because of declining population).

Four municipalities presently have wastewater treatment facilities in Segment 1410. Using methods established by the Texas Department of Water Resources, wasteloadings into and out of these facilities were calculated. The results are summarized in Table II-E-1 and more complete results are included in the Appendix. The City of Ballinger is expected to have adequate hydraulic capacity through the planning period (1975-2000). The City of Winters is projected to exceed its hydraulic capacity by 1983 and in fact may be doing so at the present. The City of Winters has, therefore, been included as a sewerage planning area.

Waste load projections for the Oak Creek Lake area have been calculated and are included in Table II-D-1.

d. <u>Waste Load Analysis</u>. There are no category IV Segments; therefore, no waste load analysis were performed.

e. <u>Alternative Plans</u>. This section contains the wastewater disposal alternatives investigated for each of the communities identified as requiring upgrading or expansion for the planning period 1978-2000. Included are the structural requirements, management requirements, costs, and impacts for the various alternatives.

(1) <u>Ballinger</u>: A Step 1 facility plan has been prepared for the City of Ballinger and has been submitted for approval. The facility plan was required to find the most cost effective means for the wastewater treatment plant to meet its effluent requirements. The facility is currently exceeding its permitted levels for Biochemical Oxygen Demand - 5 day (BOD) and Total Suspended Solids (TSS). The plan looks at utilizing extended aeration, contact stabilization and other schemes of treatment. It was concluded that the most cost effective alternative for the City was to alter the existing treatment plant, changing the plant from an anaerobic process to an aerobic one, and then adding chlorination facilities.

The City of Ballinger is currently low in the statewide ranking for improvement funds, but the City has been actively working to make the needed improvement on their own. They have recently increased the size of

TABLE II-D-1
INFLUENT AND EFFLUENT WASTELOAD
PROJECTIONS FOR SEGMENT 1410

Discharger	Year	Flow (MGD)	Influent BOD$_5$ (lb/day)	Influent TSS (lb/day)	Effluent BOD$_5$ (lb/day)	Effluent TSS (lb/day)
Ballinger	1975	0.21	-	-	58.3	61.9
	1983	0.22	664.7	789.8	36.9	230.6
	1990	0.21	629.0	747.4	34.6	216.5
	2000	0.20	595.0	707.0	32.9	205.5
Blackwell	1975	-	-	-	NO EXISTING FACILITY	
	1983	0.03	47.6	56.6		
	1990	0.03	47.6	56.6		
	2000	0.04	47.6	56.6		
Bronte	1975	-	-	-	---NO DISCHARGE---	
	1983	0.23	139.9	166.2		
	1990	0.22	128.7	152.9		
	2000	0.20	107.3	127.5		
Robert Lee	1975	-	-	-	---NO DISCHARGE---	
	1983	0.11	164.9	195.9		
	1990	0.10	153.0	181.8		
	2000	0.09	107.3	127.5		
Winters	1975	-	-	-	---NO DISCHARGE---	
	1983	0.33	520.2	618.1		
	1990	0.37	571.2	678.7		
	2000	0.43	646.0	767.6		

their sludge drying beds and installed recycling pumps and a flowmeter. Chlorination facilities are currently being planned. It is believed that the improvements planned should be adequate to bring the facility into compliance.

(2) Blackwell

(a) General. The community of Blackwell is located on Highway 70, twenty miles south of Sweetwater at the boundary between Nolan and Coke Counties. The City has a population of approximately 280 persons and covers approximately 390 acres. The population of the City is projected to remain constant throughout the study period. Approximately one-half of the City's residents are retired and many of the dwellings have only one or two residents. The land use of Blackwell consists basically of residential housing with only a few commercial establishments. The City is shown in Figure II-D-1. The topography of the area is gently sloping to the southwest and south, with drainage into Oak Creek and Oak Creek Reservoir. The soils of the area are of the Mansker-Potter soil groups which consist of friable clay and sandy loam over thick deposits of chalk and caliche. These calcareous deposits are at a depth of 10 to 20 inches.

In order to determine the size and costs of alternative waste treatment schemes, raw wastewater loadings were projected using the statewide Municipal Waste Treatment Needs Assessment Methodology for the present, 1983, 1990 and the year 2000. These projections were based on population projections, assumed per capita waste loading, and flow variations. The results of these wasteload projections are presented in Table II-D-2. The design criteria are based on wasteloads projected for the year 2000.

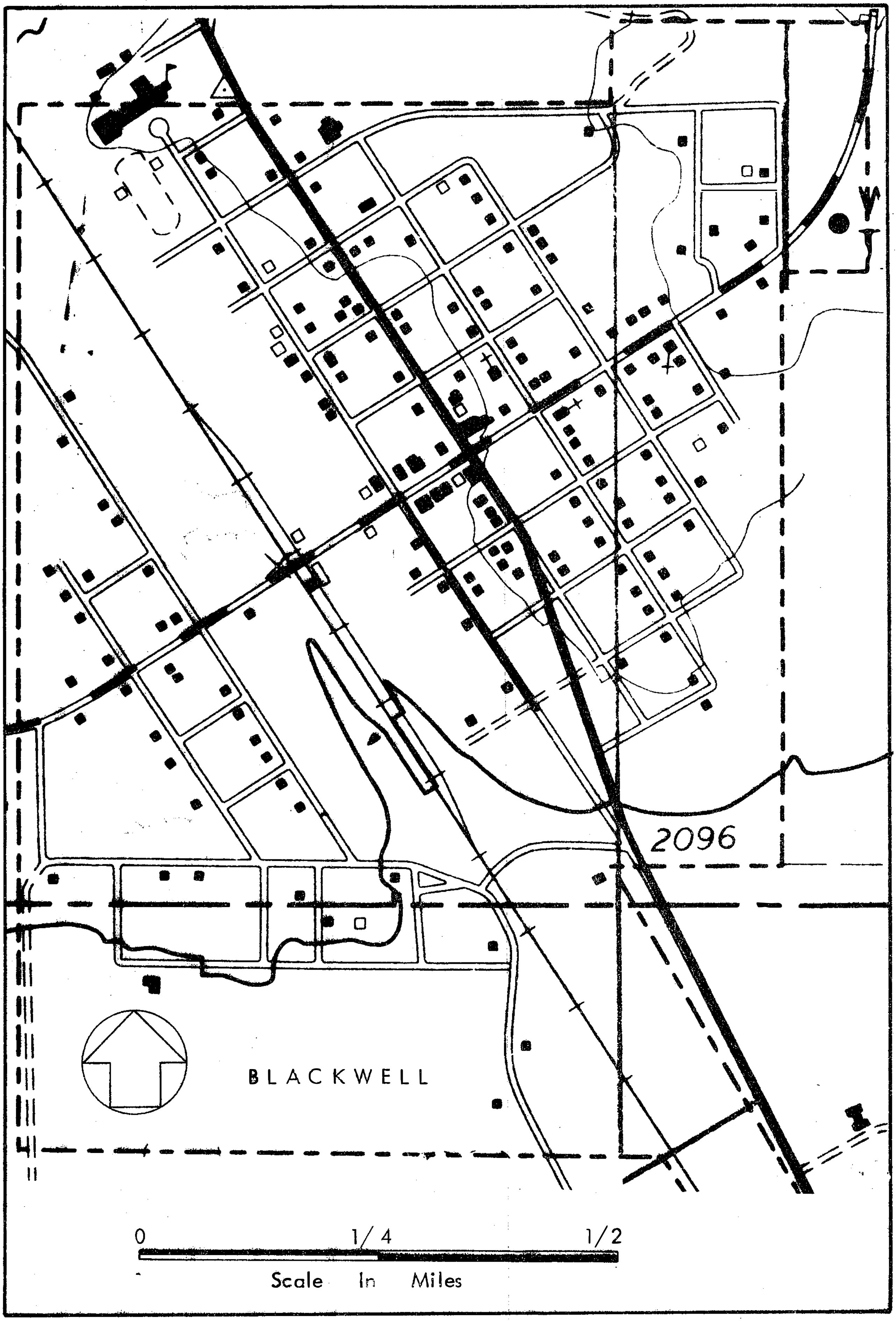


Figure II-D-1 City of Blackwell

Table II-D-2
WASTELOAD PROJECTIONS FOR
CITY OF BLACKWELL

Planning Year	Population	Flow (MGD) Average	Peak
1975	280	-	-
1983	280	0.03	0.10
1990	280	0.03	0.10
2000	280	0.04	0.11

These approximations of wasteloads consider not only the waste flows from residences but also flows due to the infiltration and inflow into the collection system. The increase in wastewater flow shown in the projections are due to the increased quantities of infiltration and inflow which enter the collection system as it deteriorates with age.

(b) Technical Alternative 1.

(1) Technical Plan: Since the residents of Blackwell currently rely on septic tanks as their method of wastewater disposal, the simplest and most effective method of preventing any possible contamination of the reservoir by the City is to continue the use of properly installed and maintained septic tank systems under a septic tank control ordinance. There have been no reports of problems with the existing septic tank systems and no cesspools or other non-approved methods are known to be in use. The establishment of a septic tank control ordinance in the City would primarily be concerned with insuring that new systems which are installed are adequately designed and properly constructed.

Although the soils are underlain by relatively impermeable deposits, the upper horizon of the soil should perform well for septic tank absorption fields. In those areas underlain by unbroken impermeable calcareous deposits, the potential for groundwater contamination is reduced; however, the possibility for septic tank effluent runoff is increased. Due to the high annual evaporation (approximately three times the annual rainfall) and vegetative cover, it is unlikely that this runoff would reach the reservoir except in periods of long intense rainfall. In addition, as many of the dwellings reportedly have only one or two residents, the probability of septic tank systems being overloaded is diminished.

(2) Financial and Management Considerations: Controlling the waste of Blackwell by means of a septic tank control ordinance would not involve a direct outlay of capital as would be required by the construction of a wastewater treatment facility and collection system, but some costs would be incurred to satisfy the legal and institutional requirements of establishing and enforcing the ordinance. Those installing new systems could be faced with increased cost for septic tank systems which are adequately designed according to properly administered percolation tests.

The City of Blackwell could act as the managing agency for the septic tank control ordinance. This would require that qualified personnel be retained to inspect the existing systems and oversee the construction of new systems and could require an increase in the existing tax rate. Another management alternative would be to include the Blackwell area in the proposed septic tank control ordinance for Oak Creek Reservoir. This could have legal complexities, however, since Blackwell is in a different county. This alternative would relieve Blackwell of a major portion of the management cost and responsibility.

(3) Impacts. The method of disposal by septic tanks under a septic tank control ordinance should be effective, and no adverse environmental impacts are forseen. The social impact of this alternative would also be insignificant since it would have little direct effect on the residents of the City.

Economic impacts would vary according to the management alternative chosen. If it is decided that the City should handle the management of the ordinance, a tax increase would be likely. This impact could be significant since many of the residents are on a fixed income and at the present pay only a minimal tax. If an outside agency is chosen the cost should be lower and relatively insignificant.

(c) Technical Alternative 2. A second alternative to the use of a septic tank control ordinance would be the construction of treatment facilities and a collection system. Preliminary cost estimates indicate that even with federal grant monies the monthly charge per connection for this alternative would be approximately $45.00. This, therefore, cannot be considered a feasible alternative for the present population.

(3) Oak Creek Reservoir

(a) General. The Oak Creek Study Area includes all of the residential development along the shores of Oak Creek Reservoir in northeast Coke County. This area encompasses approximately ten and one-half miles of shoreline, along which over 200 residences, recreational homes, mobile homes, and commercial establishments are located. Approximately one-fourth of these dwellings are located on the Gulf Peninsula. West Texas Utilities operates a steam-electric generation plant on Gulf Peninsula that utilizes water from the reservoir for cooling water. The reservoir is owned by the City of Sweetwater and is used to supply water to that City, the City of Blackwell and the City of Bronte. This area is shown in Figure II-D-2.

The topography of this area is flat to gently sloping, with drainage being directly into the reservoir. Based upon the soils description of the area given in the USDA-SCS Soil Survey for Coke County (Oct., 1974) the soils of the area surrounding the reservoir were believed to have severe limitations for the use of septic tanks, due to bedrock and caliche which could be found at a relatively shallow depth. It has since been discovered that percolation tests in the area indicate that the soils around the reservoir are suitable for septic tank use. These tests have been conducted under the direction of local health officials in their efforts to limit health problems in the area of the reservoir.

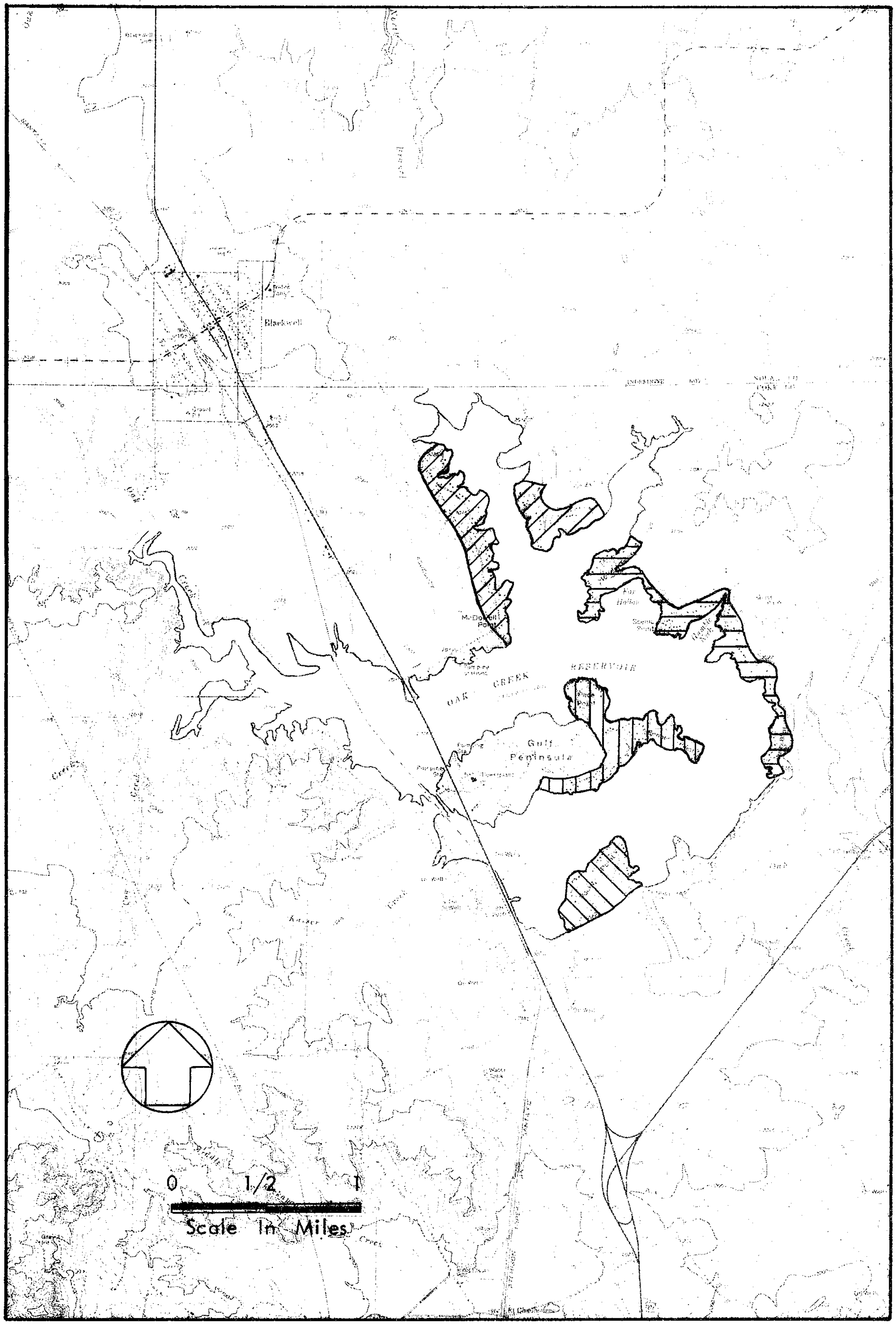


Figure II-D-2 Oak Creek Reservoir Area

(b) Technical Alternative.

(1) Technical Plan: In the first Interim Report several treatment alternatives were examined which would collect and treat the waste from these lakeside areas. The cost of these treatment alternatives were well beyond economic feasibility due to the high collection costs and the small number of customers to pay for the service. In addition, an expensive advanced wastewater treatment method was required for the plant to discharge near the reservoir since this reservoir serves as a water supply source for several cities in the area. The residents of Oak Creek Area are currently using septic tanks as a means of disposal and several problems have been reported. These problems have occurred as the result of inadequate design or improper contruction of these systems. Local officials from the Texas Department of Health have been active in the area and many of these problems have been corrected. In addition, the establishment of a septic tank control order has been initiated which will control the installation of new systems and further correct any existing problems. It is believed that this action will be an effective deterent to further contamination of the reservoir.

(2) Financial and Management Consideration: The costs involved in establishing a septic tank control order are primarily those concerned with the legal and institutional requirements of the order. The City of Sweetwater, owner of the reservoir, is to be designated as the enforcing agency, and the legal arrangements are yet to be resolved. The establishment of this ordinance has been complicated since the Reservoir and the City of Sweetwater are in two different counties. The cost of these requirements should not be felt directly by the residents surrounding the lake; however, the cost of issuing and handling permits for septic tanks, and the cost of the percolation tests and inspections probably will be paid by the residents who require these services.

(3) Impacts: The Texas Department of Health officials of the area believe that the proper use of well designed and constructed septic tanks will be effective in detering the contamination of the reservoir; therefore, no adverse environmental impacts are projected. The social impacts of this alternative would result from the increased land requirements for these systems. Properly designed systems could require larger lot sizes than are presently being used, thus having the affect of spreading the population and possibly limiting growth.

Economic impacts on the area could result if growth is limited by the requirement of a minimum lot size. This could also effect land values since an increase in the lot size required would reduce the quantity of lots that could be sold or leased. The cost for the legal and institutional requirements is the only financial burden to be considered. Although the agency cost may best be estimated by the agency involved, The Texas Methodology for Disposal Activities states that "a guideline of 15 to 20 dollars per inspection may be used," with regard to permitting cost.

(4) Winters

(a) General. The City of Winters is located in Runnels County on U.S. 83 north of Ballinger and encompasses approximately 2,850 persons. Although TDWR population projections show a decline, the City is presently experiencing some growth, particularly in the surrounding area outside of its corporate limits. Land usage is primarily residential, with commercial usage in the central business district and industrial development along the Abilene and Southern Railroad line. The City is underlain by Abilene-Moreta type soils which have very low permeabilities and thus have severe limitations for septic tank use.

The existing wastewater treatment plant is located along Bluff Creek but does not discharge wastes into this stream. This plant consists of an Imhoff tank and a lift station which pumps the wastewater to oxidation ponds on the opposite side of Bluff Creek. The effluent from these ponds is used to irrigate 122 acres of small grain and pastureland. The irrigated fields are diked to prevent return flows to Bluff Creek. The Imhoff tank was constructed in 1949 and has a design capacity of 0.150 MGD. Present inflow into the plant is reported to average about 0.154 MGD. The Imhoff tank and lift station are sometimes overloaded, and sludge drying beds are inadequate. There is no alternate source of power to the plant and when lift station power is lost, overflows from the Imhoff tank occur. An infiltration/inflow problem during wet weather has been reported, and the existing plant becomes inundated during rains.

The quantity of wastewater from industrial sources does not appear to be significant; however, some problems related to these contributions have been reported in the past.

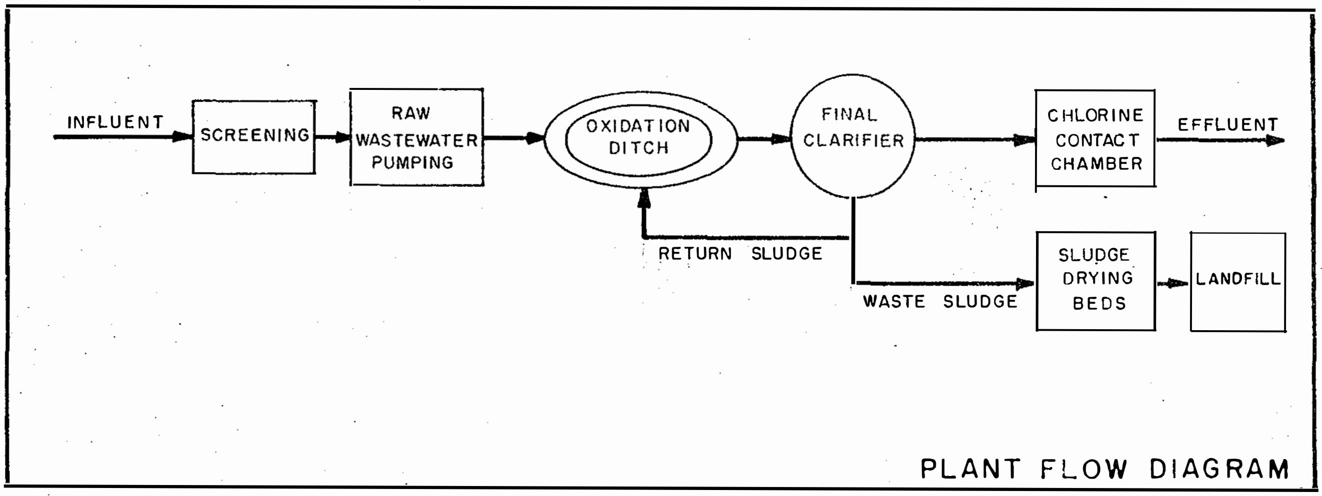
(b) Technical Alternative.

(1) Technical Plan: The City participated in the Public Law 92-500 Step I Facility Planning Process by having a Plan developed in 1975. The City has since dropped to a low priority rating for future funding, largely because of its "no-discharge" status, and planning for future improvements has stopped. In the Facility Plan three alternative treatment schemes were examined: an oxidation ditch, a contact stabilization plant, and a conventional activated sludge type plant. In Interim Report I these same treatment schemes were again examined.

In order to determine the size and costs of these alternative waste treatment schemes, raw wastewater loadings were projected using the statewide Municipal Waste Treatment Needs Assessment Methodology for the present, 1983, 1990 and the year 2000. These projections were based on population projections, assumed per capita waste loading, and flow variations. The results of these wasteload projections are presented in Table II-D-3. The design criteria are based on wasteloads projected for the year 2000.

In Interim Report I, as in the original Facility Plan, it was determined that the oxidation ditch treatment scheme was the most cost effective means of treating the waste

FIGURE II-D-3
WASTEWATER TREATMENT PLANT DATA
CITY OF WINTERS



Design population	3800
Design Flow (MGD)	
Average	0.38
Peak	0.80

Existing Plant is to be abandoned

Effluent Requirements

BOD_5 (mg/l)	20
TSS (mg/l)	20
Receiving Waters	Bluff Creek

TABLE II-D-3

WASTELOAD PROJECTIONS FOR
THE CITY OF WINTERS

Planning Year	Population	Flow (MGD) Average	Flow (MGD) Peak
1975	2710	-	-
1983	3060	0.31	0.66
1990	3360	0.34	0.72
2000	3800	0.38	0.80

from the City. In this variation of the extended aeration treatment process, the wastewater enters an oxidation ditch (known as a racetrack) where the wastewater is mixed and aerated. After leaving the oxidation ditch the wastewater enters a clarifier where solids are settled out and treated as sludge. The clarified water is then chlorinated to disinfect the effluent. Waste sludge from the clarifier is dryed on sludge drying beds. The dried sludge "cake" is then used as dry fertilizer on agricultural land.

This type of treatment system was not only found to be more cost effective than the conventional activated sludge and contact stabilization type plants, but also requires less sludge handling and is simpler to operate. The effluent from this plant can be used for irrigation or can be discharged without violating the effluent standards required for Bluff Creek. This system is depicted in Figure II-D-3.

Almost all significant residential development in the proximity of Winters is located just outside the city limits. These areas rely on septic tanks in soils which have severe limitations for septic tank use. As the population and density of these areas increase the potential for septic tank failures, and thus the creation of a health hazard, will increase. When these conditions do occur, or in order to prevent their occurance, the residents of these areas will be in need of centralized sewage facilities. The most cost effective means to accomplish this is to connect to the City of Winters treatment system. The collection system for the City of Winters is shown in Figure II-D-4.

(2) <u>Financial and Management Alternatives</u>: If the treatment plant and the proposed collection system extensions are constructed, the total capital cost of this alternative is estimated to be $1,958,000.

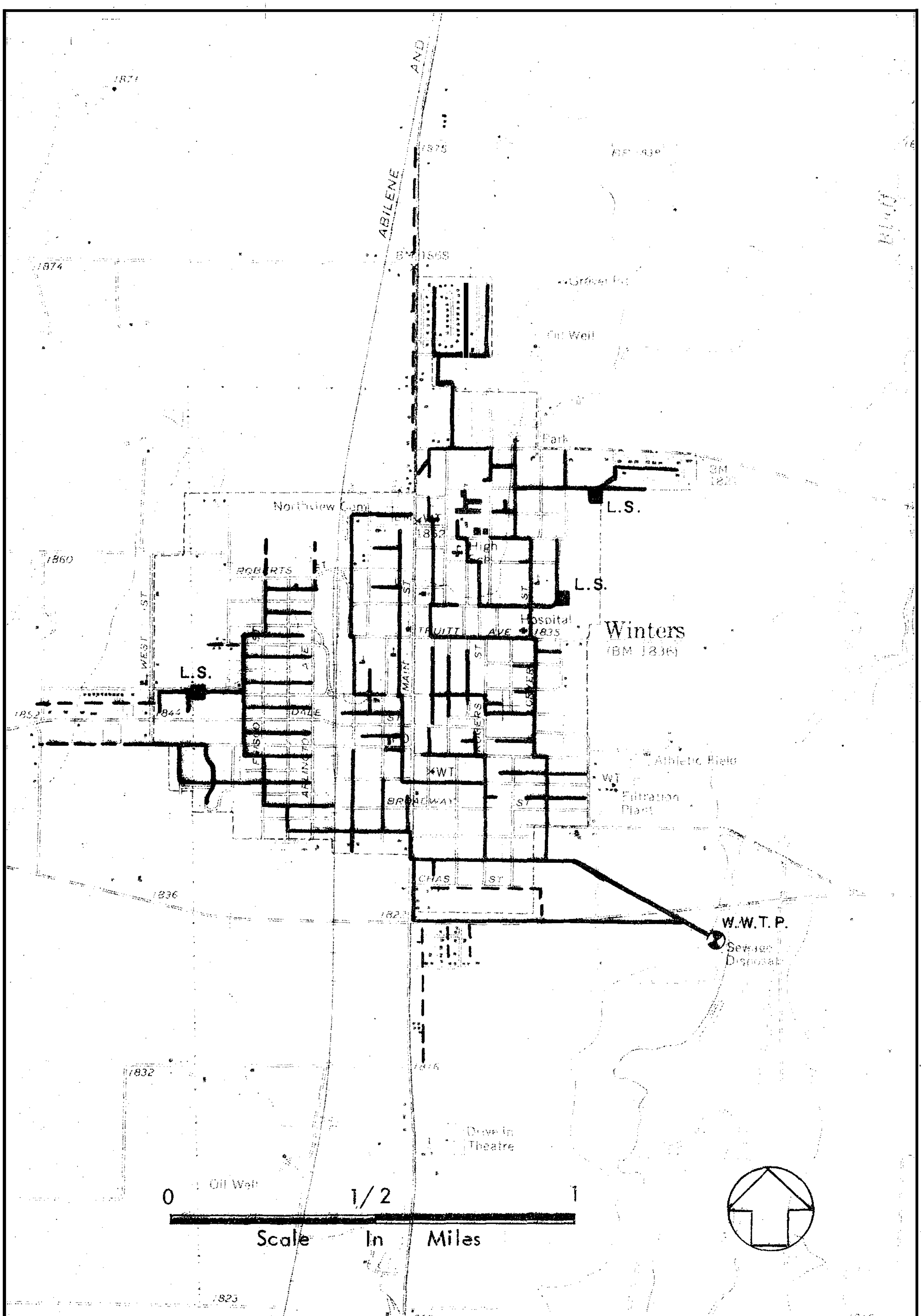


Figure II-D-4 Existing collection system with possible extentions, City of Winters.

Its present worth and total annual cost would be $2,454,000 and $225,000 respectively based on 6 5/8% interest for twenty years. The annual per capita cost would be $59.20 and an average monthly bill per connection would be $14.80. If federal funding were available through PL 92-500 then the annual per capita cost would be $23.80 and an average monthly bill would be $5.95. These costs are presented in Table II-D-4.

The City of Winters presently operates the existing wastewater treatment facility and since significant new service areas outside of the City's jurisdiction are not proposed, there is no reason to suggest an alternative management authority on the local level. It is proposed that the State Department of Water Resources continue in its role of regulation and enforcement of water quality in the area.

(3) Impacts: There are no adverse environmental impacts associated with the construction of an oxidation ditch type plant at the site of the existing facility. A positive aspect of this type of treatment is that in the event that the City should decide to discharge their effluent, this would increase the quantity of water available for reuse downstream. There should be no significant social impact since the City currently has a central collection and treatment system.

The economic impact should also be favorable. The cost per connection for the system and collection line extensions are within the available revenue base and the possibility of increased revenue from industrial growth is good. Where the collection lines extend to populated areas beyond the corporate city limits revenue from user fees should help pay the expenses of the new facility and collection system extension.

2. SEGMENT 1411

Segment 1411 encompasses E. V. Spence Reservoir and its immediate drainage area of about 274 square miles. Water quality in the segment is good and there are no municipal or industrial discharges directly into the segment. The Colorado River Municipal Water District enforces a policy concerning septic tanks adjacent to the lake which limits potential contamination from these sources. Because of the lack of problems, no plan for controlling water quality in this segment is deemed necessary.

TABLE II-D-4

ESTIMATED ALTERNATIVE COSTS
FOR THE CITY OF WINTERS

	Technical Alternative Replace Existing System w/Oxidation Ditch
Collection System	
Capital Cost	$ 1,436,000
O&M Cost	10,000
Treatment Plant	
Total Labor Cost	22,200
Total Energy Cost	8,400
Total Chemical Cost	700
Construction Cost	518,000
Land Acquisition Cost	4,300
O&M Cost	35,400
Capital Cost	522,000
Total Capital Cost	1,958,000
Present Worth	2,454,000
Total Annual Cost	225,000
Per Capita Cost	59.20
Monthly Charge Per Connection	14.80
<u>WITH 75% FEDERAL GRANT IN AID:</u>	
Total Capital Cost	489,000
Present Worth	986,000
Total Annual Cost	90,000
Per Capita Cost	23.80
Monthly Charge Per Connection	5.95

a. Summary of Existing Agencies & Water Quality Control Programs. Segment 1411 includes E.V. Spence Reservoir and its immediate drainage area. The segment lies within Coke and Nolan Counties. The reservoir is owned and operated by the Colorado Municipal Water District, though the Upper Colorado River Authority also has territorial jurisdiction over part of this segment. There are no major municipalities located within this segment.

b. Nonpoint Source Assessment. The immediate drainage area of E.V. Spence Reservoir is 90% rangeland in usage. Water quality problems in the reservoir are primarily because of salinity sources upstream from this segment. During extended periods of low inflow, chlorides, sulfates, and dissolved solids become high as a result of evaporation and saline inflows. The Colorado River Municipal Water District has several projects that are designed to alleviate a major part of this inorganic mineral contamination.

The U.S. Environmental Protection Agency has included E.V. Spence Reservoir in its National Eutrophication Survey. It was found that the lake was eutrophic but little impairment of its intended uses were found. There have been algal blooms and macrophytes observed in the lake as well as depleted oxygen levels below the thermocline. The majority of nutrients found in the lake were from upstream nonpoint sources.

c. Waste Load Projections. There are no existing municipal wastewater treatment facilities located within this segment.

3. SEGMENT 1412

Segment 1412 includes 89.2 river miles between the City of Silver and Lake J. B. Thomas. This segment encompasses approximately 11,723 square miles of drainage area which includes the Beals Creek System. Although no recent violations of the water quality criteria have been recorded, mineral contamination is rather high. The principal area of direct contribution of salt on the main stem of the Colorado has been identified and most of the petroleum contributions have been controlled. Salt contamination in Beals Creek west and north of Big Spring has been controlled to some extent by the Colorado River Municipal Water District.

Most of the facilities in the Upper Colorado Study Area are located in this segment; however, no specific water quality problems are known to be directly attributable to these facilities. Three municipalities discharge effluent (Big Spring, Snyder, and Odessa), and both Big Spring and Snyder are currently participating in the 201 planning process. The City of Odessa has one wastewater treatment plant currently under construction and another facility under design.

Twelve areas in Segment 1412 are expected to require wastewater treatment improvement in the near future. The cities of Brownfield, Big Spring, and Snyder are correcting their problems through the 201 planning process. In addition to the 201 facilities, the cities of Denver City and Midland may require upgrading or construction of a new facility within the next five years based on wasteload projections and available inventory information. Several areas may need the new facilities to handle projected wasteloads and prevent possible health problems resulting from overloaded septic tank absorption fields.

a. Summary of Existing Agencies & Water Quality Control Programs. Segment 1412 includes all or part of Andrews, Borden, Cochran, Coke, Dawson, Ector, Gaines, Glasscock, Hockley, Howard, Lynn, Martin, Midland, Mitchell, Nolan, Scurry, Sterling, Terry, and Yoakum counties. This segment comprises more than 75% of the Upper Colorado Study Area. The primary water authority that operates in this segment is the Colorado River Municipal Water District. The Canadian River Municipal Water Authority serves some of the cities in this segment with domestic water from the Canadian River Basin. The Colorado River Municipal Water District has several water quality programs located in this segment that are designed to protect the quality of the District's two reservoirs. The District operates two low flow diversion dams and a program to alleviate saline discharges from the Santa Rosa aquifer. Eighteen cities operate municipal wastewater treatment facilities in this segment. They are Andrews, Big Spring, Brownfield, Coahoma, Colorado City, Denver City, Goldsmith, Lamesa, Loraine, Meadow, Midland, Odessa, Plains, Seagraves, Seminole, Snyder, Stanton, and Sundown.

b. Nonpoint Source Assessment. Nearly sixty percent of Segment 1412 is in rangeland usage. [Another twenty percent each is in dryland cropland and irrigated cropland usage.] The major water quality problem that exists in the segment is from saline water intrusion. The principal salt contributing area has been identified as being along a 30 mile section of the River between Lake J. B. Thomas and Colorado City. Studies have shown that the majority of the brine entering the river in this area is the result of oil field operations. Since the imposition of brine disposal controls the magnitude of the salt problem has decreased noticeably. It is probable that natural saltwater influence will gradually take over as residual salts from petroleum areas are flushed out. Another area of salt buildup is along Beals Creek north of Big Spring. Efforts have been made by CRMWD to correct salt contributions from this area.

Though a large area of this segment (40%) is in agricultural use, sediment yields are lowest in the areas of highest fertilizer and pesticides usage. Thus agricultural impact is minimized in this area. The major urban area in the segment, Midland-Odessa, is in an area that is noncontributing to the Colorado River. Other urban areas, Big Spring, Snyder, and Colorado City, may contribute high sediments during storm events but the oxygen demand is likely to be low. There is reported to be significant septic tank contributions along the shores of Lake Colorado City.

The high saline buildup in the part of the segment immediately below Lake J. B. Thomas is partially due to the lack of any normal flow of fresh water above the saline inflows. The saline concentrations are only flushed out during storm water runoff.

c. Waste Load Projections. Projections of waste loadings into and out of twenty-one facilities in this segment were made for the planning period 1975-2000. Results of these calculations are summarized in Table II-D-5 with more complete data included in the Appendix. The City of Odessa has been shown to exceed its present capacity during 1975. Odessa, however has prepared plans and is soon to begin construction on a new wastewater treatment facility. Big Spring, Colorado City, Denver City, Loraine, Meadow, and Stanton have been projected to exceed their capacity by 1983. Of these, only Denver City, Meadow, and Loraine are not known to have a wastewater treatment plan in preparation. Both Meadow and Loraine are not considered as needing facilities within the planning period, however, as Meadow's population projections are suspect and Loraine has added an additional oxidation pond. Denver City has been included as a sewerage planning area.

Both Midland and Seminole are expected to exceed their plant's design capacities by 1990. Midland however is expected to possibly reach capacity sooner, as there have already been occasional reports of exceeding capacity.

Waste loads were also calculated for four communities that do not presently have a wastewater treatment facility. Their populations, densities, or soil conditions indicate that a facility needs to be considered. The results of these projections are shown in Table II-D-6.

TABLE II-D-5
INFLUENT AND EFFLUENT WASTELOAD
PROJECTIONS FOR SEGMENT 1412

Discharger	Year	Flow (MGD)	Influent BOD$_5$ (lb/day)	Influent TSS (lb/day)	Effluent BOD$_5$ (lb/day)	Effluent TSS (lb/day)
Andrews	1975	-	-	-	---NO DISCHARGE---	
	1983	0.93	1489.2	1769.5		
	1990	0.96	1513.0	1797.8		
	2000	0.99	1530.0	1818.0		
Big Spring (Plant A)	1975	2.64	-	-	682.5	704.6
	1983	2.92	4505.0	5351.8	486.8	486.8
	1990	3.03	4628.1	5499.2	505.8	505.8
	2000	3.25	4896.2	5817.8	542.0	542.0
Big Spring (Plant B)	1975	-	-	-	---NO DISCHARGE---	
	1983	0.57	915.6	1088.0		
	1990	0.60	947.9	1126.4		
	2000	0.65	1002.8	1191.6		
Brownfield	1975	-	-	-	---NO DISCHARGE ---	
	1983	1.00	1609.9	1912.9		
	1990	1.01	1598.0	1898.8		
	2000	1.01	1564.0	1858.4		
Coahoma	1975	-	-	-	---NO DISCHARGE---	
	1983	0.13	209.1	248.5		
	1990	0.14	221.0	262.6		
	2000	0.16	238.0	282.8		

TABLE II-D-5, (Continued)

Discharger	Year	Flow (MGD)	Influent		Effluent	
			BOD5 (lb/day)	TSS (lb/day)	BOD5 (lb/day)	TSS (lb/day)
Colorado City	1975	-	-	-	---NO DISCHARGE---	
	1983	0.53	839.8	997.9		
	1990	0.52	816.0	969.6		
	2000	0.51	765.0	909.0		
Denver City (North Plant)	1975	-	-	-	---NO DISCHARGE---	
	1983	0.32	513.6	610.2		
	1990	0.34	530.2	630.0		
	2000	0.36	542.0	644.0		
Denver City (South Plant)	1975	-	-	-	---NO DISCHARGE---	
	1983	0.15	227.6	270.5		
	1990	0.15	234.8	279.0		
	2000	0.16	240.0	285.2		
Goldsmith	1975	-	-	-	---NO DISCHARGE---	
	1983	0.04	63.4	75.3		
	1990	0.04	64.6	76.8		
	2000	0.05	65.8	78.2		
Lamesa	1975	-	-	-	---NO DISCHARGE---	
	1983	1.14	1829.2	2173.5		
	1990	1.10	1734.0	2060.4		
	2000	1.04	1598.0	1898.8		

TABLE II-D-5, (Continued)

Discharger	Year	Flow (MGD)	Influent BOD$_5$ (lb/day)	Influent TSS (lb/day)	Effluent BOD$_5$ (lb/day)	Effluent TSS (lb/day)
Loraine	1975	-	-	-	---NO DISCHARGE---	
	1983	0.06	92.3	109.7		
	1990	0.06	81.6	97.0		
	2000	0.05	68.5	81.4		
Meadow	1975	-	-	-	---NO DISCHARGE---	
	1983	0.05	80.4	95.5		
	1990	0.05	81.6	97.0		
	2000	0.06	80.4	95.5		
Midland (Main Plant)	1975	5.10	-	-	680.5	765.6
	1983	6.14	12151.6	14439.0	1024.5	1024.3
	1990	7.03	13465.7	16000.4	1173.2	1173.2
	2000	8.28	15274.5	18149.7	1381.1	1381.1
Midland (Airport)	1975	0.07	-	-	6.2	5.6
	1983	0.08	29.8	35.3	12.9	12.9
	1990	0.08	29.8	35.3	13.0	13.0
	2000	0.08	29.8	35.3	13.3	13.3
Odessa	1975	7.99	-	-	733.0	533.1
	1983	8.79	14614.9	17365.9	1465.9	1465.9
	1990	9.46	15555.0	18483.0	1577.6	1577.6
	2000	10.49	17017.0	20220.2	1750.2	1750.2
Plains	1975	-	-	-	---NO DISCHARGE---	
	1983	0.10	153.0	181.8		
	1990	0.10	153.0	181.8		
	2000	0.10	136.0	161.6		

TABLE II-D-5, (Continued)

Discharger	Year	Flow (MGD)	Influent BOD$_5$ (lb/day)	Influent TSS (lb/day)	Effluent BOD$_5$ (lb/day)	Effluent TSS (lb/day)
Seagraves	1975	-	-	-	---NO DISCHARGE---	
	1983	0.26	402.9	478.7		
	1990	0.25	391.0	464.6		
	2000	0.26	391.0	464.6		
Seminole	1975	-	-	-	---NO DISCHARGE---	
	1983	0.52	827.9	983.7		
	1990	0.52	816.0	969.6		
	2000	0.52	799.0	949.4		
Snyder	1975	1.21	-	-	232.5	232.5
	1983	1.28	1921.0	2282.6	320.1	320.1
	1990	1.31	1938.0	2302.8	327.6	327.6
	2000	1.34	1938.0	2302.8	334.1	334.1
Stanton	1975	-	-	-	---NO DISCHARGE---	
	1983	0.25	396.1	470.7		
	1990	0.27	408.0	484.8		
	2000	0.30	442.0	525.2		
Sundown	1975	-	-	-	---NO DISCHARGE---	
	1983	0.12	187.0	222.2		
	1990	0.12	187.0	222.2		
	2000	0.13	187.0	222.2		

TABLE II-D-6
WASTELOAD PROJECTIONS FOR SEWERAGE
PLANNING AREAS CURRENTLY WITHOUT FACILITIES

City	Year	Flow (MGD)	BOD_5 (lb/day)	TSS (lb/day)
Sand Springs	1983	0.23	367.2	436.3
	1990	0.25	391.0	464.6
	2000	0.28	425.0	505.0
Wellman	1983	0.04	55.3	65.6
	1990	0.04	59.5	70.7
	2000	0.04	59.5	70.7
Westbrook	1983	0.03	51.0	60.6
	1990	0.03	51.0	60.6
	2000	0.04	51.0	60.6
Lake Colorado City	1983	0.14	219.3	260.6
	1990	0.15	232.1	275.7
	2000	0.16	255.0	303.0

d. Alternative Plans.

(1) Big Spring: A facility plan for the City of Big Spring has been prepared. At the time of this report the plan has been submitted to TDWR but has not been approved. This plan was required due to the inability of the existing facilities to meet the effluent requirements. In preparing this plan many treatment alternatives were considered, including the construction of a new plant to accomodate the City, construction of a regional system, and the construction of "no-discharge" facilities. It was found to be most cost effective to serve only the existing Big Spring service area by upgrading the existing facilities and adding aeration lagoons before chlorination to meet the effluent requirements. The cost presented in the facility plan was estimated at 1.5 million dollars.

(2) Brownfield: A 201 facility plan has been prepared for the City of Brownfield for the construction of a new wastewater treatment plant. This plant is to totally replace the existing facilities which will continue to function until the new plant is put into operation. In this plan it was determined that the Best Practical Waste Treatment Technology for this area consists of biological treatment followed by land application of the effluent. Several methods of biological treatment, including trickling filters, were considered and the use of an oxidation ditch was found to be the most cost effective at 37.4¢/1000 gal. These facilities, which are designed for a dry weather flow of 1.25 MGD, consist of screening facilities, oxidation ditch, secondary sedimentation, sludge drying beds, and effluent holding ponds to retain the effluent, which is used to irrigate adjacent city-owned agricultural lands.

(3) Denver City

(a) General. Denver City is located in the southern portion of Yoakum County along State Highway 83. The City encompasses approximately 900 acres and has a 1975 population of approximately 4200 persons. The City is located on the relatively flat southern High Plains, with soils of the Brownfield and Amarillo type. These soils have relatively high permeabilties, so that few limitations are imposed upon the use of septic tanks. The City is expected to exhibit moderate growth through the planning period.

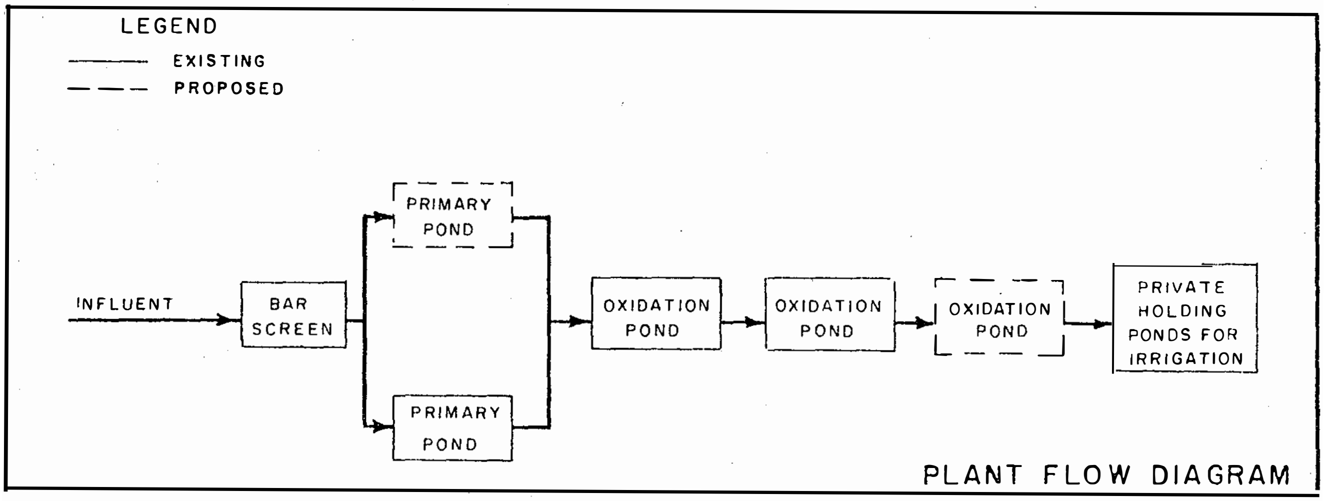
The City is presently served by two wastewater treatment plants consisting of Imhoff tanks and oxidation ponds. Effluent from both plants is used for irrigation - 160 acres at the North Plant and 60 acres at the South Plant. The North Plant has a design capacity of 0.275 MGD, and the South Plant has a design capacity of 0.122 MGD. Both plants are projected to be slightly overloaded by 1983. The City limits contains 510 acres and 100% of the persons within the City limits are provided with sewerage service. Some unsewered development exists outside of the City limits.

To determine design sizes of the proposed treatment requirements, raw wasteload projections were made in accordance with the Municipal Waste Treatment Needs Methodology. The results of these projections are presented in Tables II-D-7 and II-D-8, and are based on population projections, per capita waste loadings and expected inflow rates.

(b) Technical Alternative 1.

(1) Technical Plan: One alternative for consideration consists of expanding and upgrading the two existing treatment facilities. For the North Plant, this would require the addition of another primary pond to operate in parallel with the existing primary pond and another oxidation pond to follow the existing ponds. Additional holding pond capacity would also be required. These additions are depicted in Figure II-D-5. The South Plant would also require the addition of an oxidation pond and increased holding pond capacity. The existing sludge pits would have to be replaced with sludge drying beds. These requirements are illustrated in the schematic in Figure II-D-6. These expansions will increase the capacity of the existing facility to accommodate the increasing flows. No expansion or upgrading to improve the quality of the effluent is required since all effluent is used for irrigation.

FIGURE II-D-5
WASTEWATER TREATMENT PLANT DATA
CITY OF DENVER CITY - NORTH PLANT
ALTERNATIVES 1 and 2



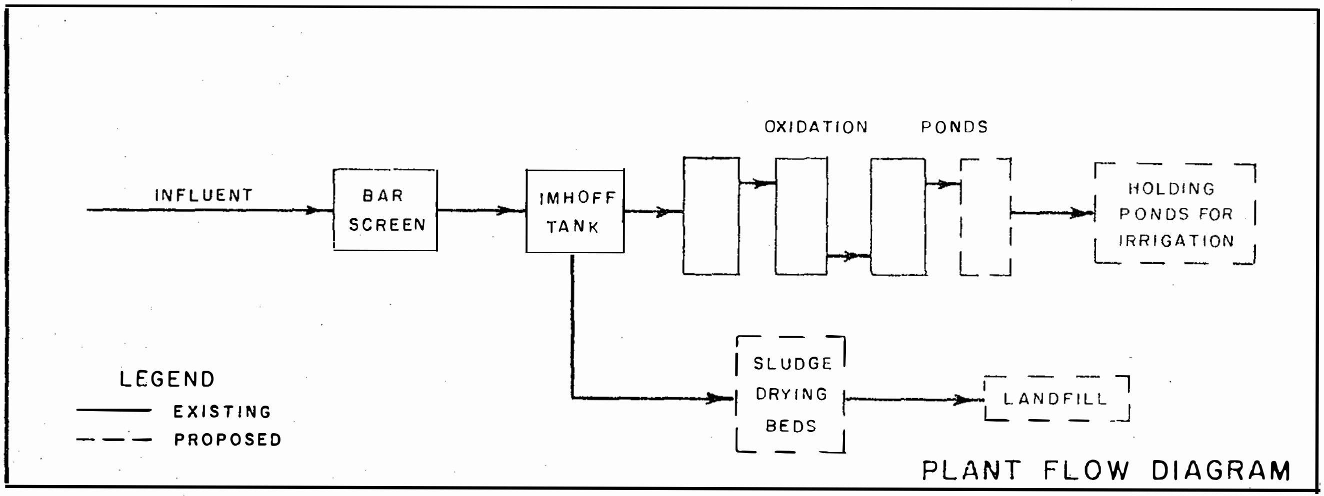
Design Population 3190
Design Flow (MGD)
Average 0.36
Peak 0.76
Existing Design Flow (MGD) 0.275 (Avg)

Effluent Requirements
BOD_5 (mg/l) No Discharge
TSS (mg/l) No Discharge
Receiving Waters: Sulphur Draw

TABLE II-D-7
WASTE LOAD PROJECTIONS FOR
CITY OF DENVER CITY - NORTH PLANT

Planning Year	Population	Flow (MGD) Average	Flow (MGD) Peak
1975	2,920	-	-
1983	3,020	0.32	0.69
1990	3,120	0.34	0.73
2000	3,190	0.36	0.76

FIGURE II-D-6
WASTEWATER TREATMENT PLANT DATA
CITY OF DENVER CITY - SOUTH PLANT
ALTERNATIVE 1



Design Population	1,410	Effluent Requirements	
Design Flow (MGD)		BOD_5 (mg/l)	No Discharge
Average	0.16	TSS (mg/l)	No Discharge
Peak	0.39	Receiving Waters:	McKenzie Creek

Existing Design Flow (MGD) 0.122 (Average)

TABLE II-D-8
WASTELOAD PROJECTIONS FOR
CITY OF DENVER CITY - SOUTH PLANT

Planning Year	Population	Flow (MGD) Average	Peak
1975	1,300	-	-
1983	1,340	0.15	0.35
1990	1,380	0.15	0.37
2000	1,410	0.16	0.39

The collection system could be expanded to service those unsewered developments outside of the city limits. A map of the existing collection systems and the proposed expansions is presented in Figure II-D-7. Although the soils of this area are suitable for septic tank use, the growth in these areas could become densely populated enough to warrant extension of the existing collection lines to these areas to prevent the creation of a health hazard. All of the extensions would be serviced by the South Plant.

(2) Financial and Management Considerations: The estimated cost of this treatment alternative, including collection system extensions are shown in Table II-D-9. These costs are for both the North and South Plants. The total capital costs for the treatment plants would be $228,000 and the total capital costs for the collection system would be $81,600. The combined annual operation and maintenance costs would be $14,500. The present worth would be $467,000 with a total annual cost of $42,800. The per capita cost would be $13.40 and a typical monthly bill per connection would be $3.40. If Federal funding were available through PL 92-500, the annual cost would be $22,000. Per capita annual cost would then be $6.80 and a typical monthly bill would be $1.70.

At present, the City of Denver City operates the two wastewater treatment facilities and the collection system. There appears to be no reason to suggest any other management agency. The Texas Department of Water Resources would continue as the regulatory and enforcement agency.

(3) Impacts: The North Plant does not appear to have any adverse effect on the environmental quality of the area. The South Plant has, however, presented a continual odor problem. The prevailing southwest winds carry the odor across the entire City. There have been many complaints because of this problem, and the City has given consideration

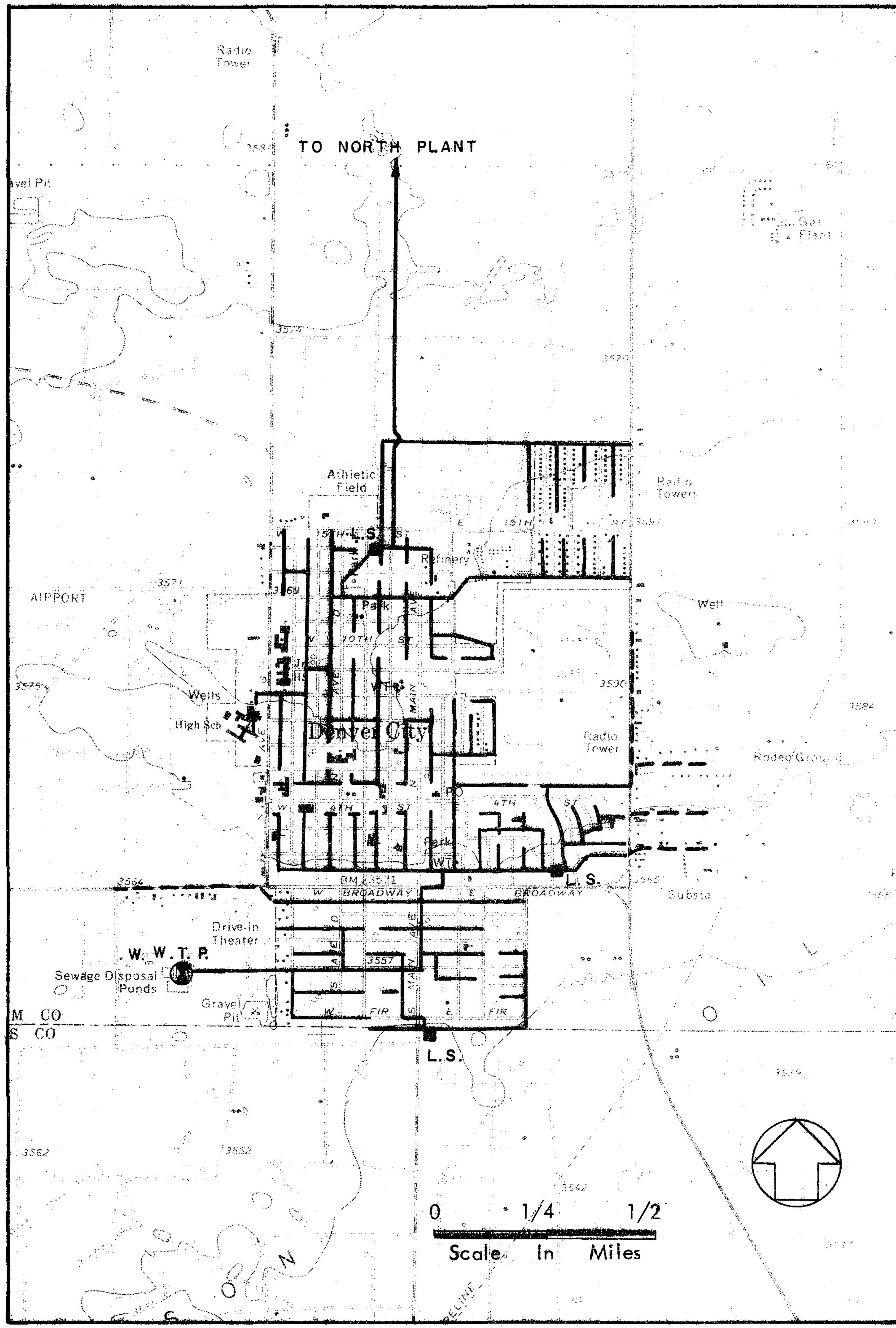


Figure II-D-7 Existing and possible extentions to the collection system of Denver City.

TABLE II-D-9

ESTIMATED ALTERNATIVE COSTS
FOR THE CITY OF DENVER CITY

	Technical Alternative 1 Upgrade Both North and South Plants	Technical Alternative 2 Upgrade North Plant Replace South Plant w/Package Plant
Collection System		
Capital Cost	$ 81,200	$ 81,200
O&M Cost	600	600
Treatment Plant		
Total Labor Cost	11,700	18,000
Total Energy Cost	0	7,300
Total Chemical Cost	0	350
Construction Cost	226,000	320,000
Land Acquisition Cost	1,900	890
O&M Cost	13,900	29,000
Capital Cost	228,000	321,000
Total Capital Cost	309,000	402,000
Present Worth	467,000	729,000
Total Annual Cost	42,800	66,800
Per Capita Cost	13.40	21.00
Monthly Charge per Connection	3.40	5.20
WITH 75% FEDERAL GRANT IN AID:		
Total Capital Cost	77,200	101,000
Present Worth	235,000	427,000
Total Annual Cost	22,000	39,100
Per Capita Cost	6.80	12.30
Monthly Charge per Connection	1.70	3.10

to constructing a new facility at a greater distance from the City. The effect of replacing the sludge pits with drying beds has not been evaluated with respect to odor reduction. As the City is currently being served by a central collection and treatment system, no social impacts are projected.

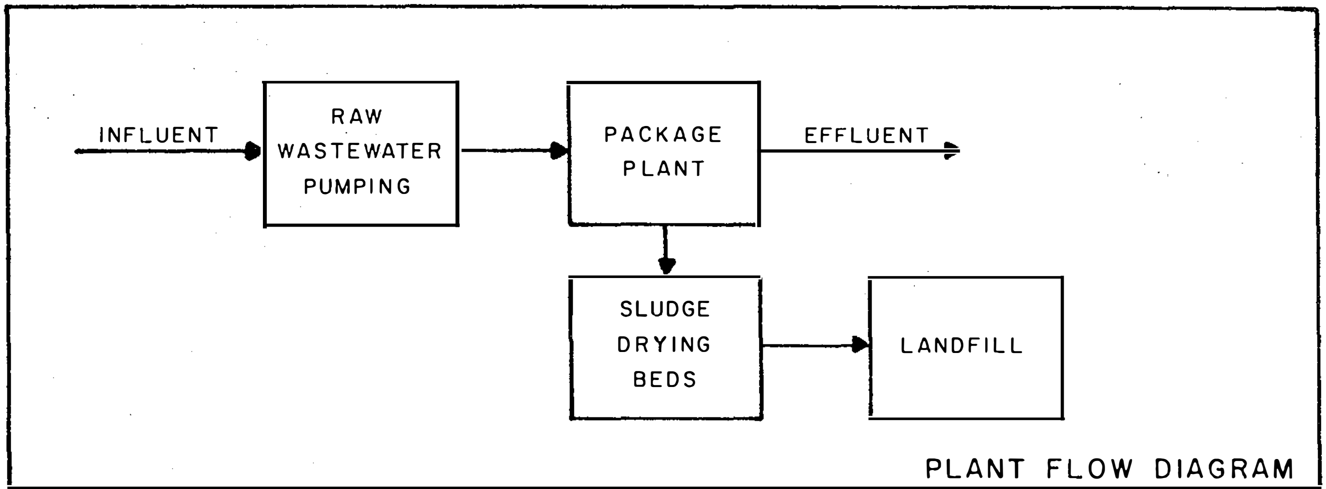
Economic impact of this alternative should be favorable. This alternative is the most cost effective means of providing the treatment capacity for the expanding population.

(c) Technical Alternative 2.

(1) Technical Plan: This alternative consists of expanding the North Plant as presented in Technical Alternative 1 and replacing the South Plant with a package type treatment facility located at a greater distance south of the City than the existing plant. This new plant, schematically depicted in Figure II-D-8, would eliminate the nuisances associated with the existing facility for the south side of the City. The effluent from the facility could either be used for irrigation, as is the effluent from the existing facility, or could be discharged into a nearby watercourse. If the collection system were expanded as discussed in the first treatment alternative, these increased flows would be treated at the new facility.

(2) Financial and Management Considerations: Although the cost of this alternative is greater than those presented for Technical Alternative 1, the environmental impacts of the first alternative might make this alternative more desirable even though the costs are higher. The total estimated capital cost of both treatment facilities would be $402,000, with a present worth of $729,000 and total annual costs of $66,800. The annual per capita cost would be $21.00 and a typical monthly bill per connection would be $5.20. If PL 92-500 funds were available the annual cost would be $39,100 and the monthly charge per connection would be $3.10.

FIGURE II-D-8
WASTEWATER TREATMENT PLANT DATA
CITY OF DENVER CITY - SOUTH PLANT
ALTERNATIVE 2



Design Population 1,410
Design Flow (MGD)
Average 0.16
Peak 0.39
Existing Plant is to be abandoned

Effluent Requirements
BOD_5 (mg/l) 20
TSS (mg/l) 20
Receiving Waters: McKenzie Creek

The management agency for this alternative would also be the City of Denver City under the regulation of TDWR.

(3) Impacts: The environmental impact of this alternative would be to alleviate the City of the existing odor problem and to move the treatment facility away from any possible residential areas. If effluent from the proposed south plant were discharged rather than being used for irrigation, it is doubtful that there would be a noticeable impact on the water supplies of the downstream segments of the Colorado River Basin.

A social impact of this alternative would be a more pleasant environment with the odor problem removed. Also, residential development might be encouraged in areas which are presently considered undesirable because of the existing South Plant.

Economic impacts of this alternative might include growth of the City which was previously inhibited by the existing South Plant. Although this alternative is not the most cost effective, it is economically feasible and could be implemented.

(4) Lake Colorado City

(a) General. Lake Colorado City (Figure II-D-9) is located in central Mitchell County on Morgan Creek and is owned and operated by Texas Electric Service Company. This reservoir provides cooling water for a steam-electric generation station and is the supply source for Colorado City's municipal water needs. At the present time, the only lakeside development with a potential for the contamination of this water source is located on the west side of the reservoir. This area has over 400 residences, recreational homes, mobile homes, and commercial establishments, with an estimated population of approximately 1,240. The area has experienced a steady growth since Lake Colorado City was first built in 1949 and this trend is expected to continue to some degree. The popula-

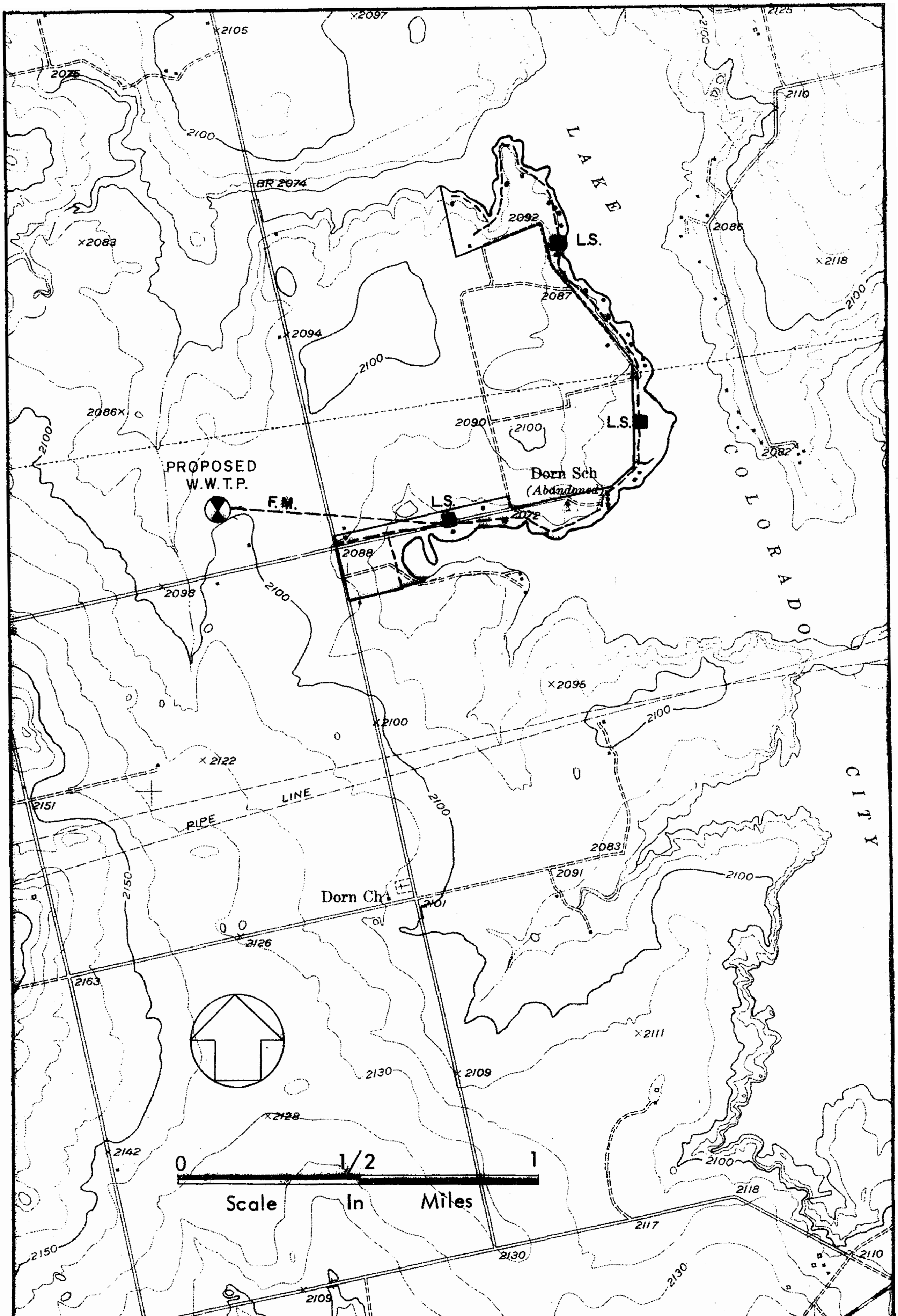


Figure II-D-9 Proposed collection system fc. Lake Colorado City area.

tion of this area is projected to increase to 1,500 by the year 2000. The population projections and the wasteloads produced by these populations are shown in Table II-D-10. These projected wasteloads are from domestic sources only, with infiltration/ inflow allowances, and contain no other projected contributions.

This is an unincorporated area which encompasses approximately 130 acres. Land usage is primarily residential and recreational with a few commercial usages. The topography of Lake Colorado City is nearly flat with the general direction of drainage toward the lake. The area is underlain by Cobb-Miles type soils which have moderate to high permeabilities and thus present only moderate limitations on the use of septic tanks.

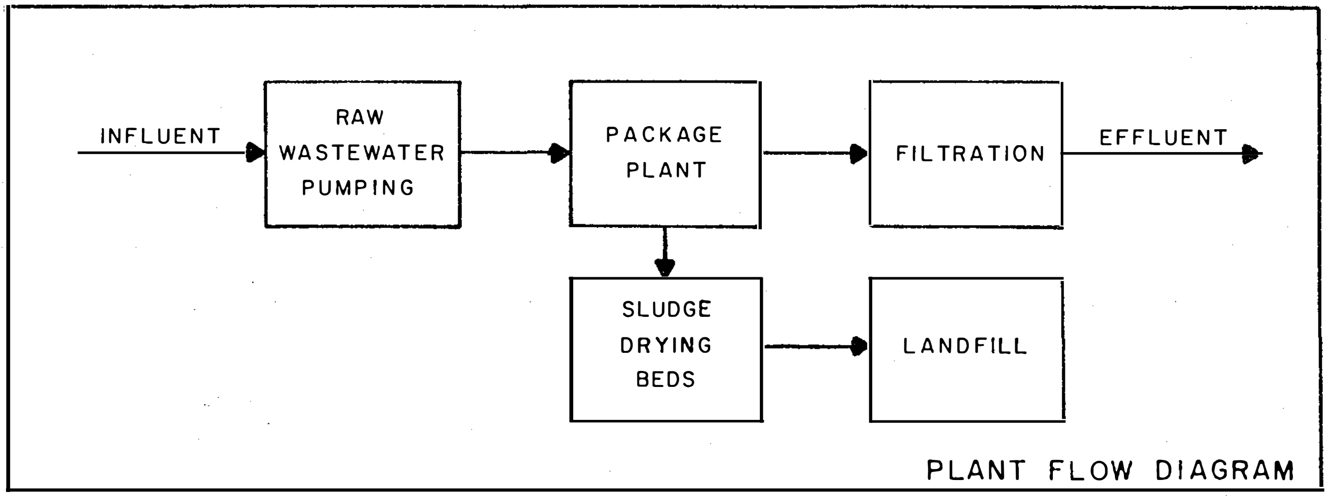
The residents of this lakeside area do not have access to a central wastewater treatment system, and septic tanks and cesspools are currently being used for the disposal of liquid wastes. Although no specific septic tank problems are known to exist, the density of the housing and its proximity to the lake presents a potential health hazard.

The U.S. Environmental Protection Agency has estimated that septic tanks contribute about 8.3% of the total phosphorus entering the lake, thus contributing to the eutrophic character of the reservoir.

(b) Technical Alternative 1.

(1) Technical Plan: The establishment of a septic tank control ordinance is one method of wastewater disposal which should be considered. If properly enforced, this would ensure that all new septic tanks are adequately designed and constructed, and that existing systems meet performance standards. No problems have been reported with those septic tank systems currently being used and the soils of the area are moderately suitable for septic tank use. The design of these septic tank systems would be based on percolation tests performed by qualified personnel to minimize any threat of ground or surface water contamination.

FIGURE II-D-10
WASTEWATER TREATMENT PLANT DATA
LAKE COLORADO CITY AREA



Design Population 1,500
Design Flow (MGD)
Average 0.16
Peak 0.38
No Existing Facility

Effluent Requirements
BOD_5 (mg/l) 10
TSS (mg/l) 15
Receiving Waters: Lake Colorado Cit

TABLE II-D-10
WASTELOAD PROJECTIONS FOR
LAKE COLORADO CITY

Planning Year	Population	Flow (MGD) Average	Flow (MGD) Peak
1975	1,245	-	-
1983	1,290	0.14	0.32
1990	1,365	0.15	0.35
2000	1,500	0.16	0.38

(2) Financial and Management Considerations: The cost of establishing a septic tank control ordinance is primarily involved in the legal and institutional requirements necessary for establishing the ordinance. The cost for the legal and institutional requirements depend on the management alternative chosen.

There are several entities which could serve as the managing agency for such a control order. One management alternative is the formation of a Water Control and Improvement District which would assume the responsibility of overseeing the design and construction of new systems and of taking steps to correct existing problems. The authority for the formation of such a district is available through several legislative bodies and generally requires the approval of the voters residing within the proposed jurisdictional bounds. A second alternative would be the establishment of a county wide waste control order with all of the duties of inspection and enforcement being handled by the qualified personnel of the county. The legal and institutional cost for the lakeside area would be minimized by this management alternative.

(3) Impacts: The establishment of a septic tank control ordinance should be an effective method of controlling the waste of this community and no adverse environmental impacts are projected. The social impacts of this alternative would result from the increased land requirements for these systems. Properly designed systems could require larger lot sizes than are presently being used, thus having the effect of spreading the population and possibly limiting growth. A local contractor who specializes in the construction of septic tank systems reports that almost all of the permanent residents have installed septic tank systems, and that the majority of the dwellings continuing to use cesspools are seasonal in nature.

Economic impacts to the area could result if growth is limited by the requirement of a minimum lot size. This could also effect land values since an increase in the lot size required would reduce the quantity of lots that could be sold or leased from a given quantity of land. The cost for the legal and institutional requirements are the only financial burden to be considered. Although the agency cost may best be estimated by the agency involved, the Texas Methodology for Disposal Methods states that "a guideline of 15 to 20 dollars per inspection may be used." for inspection and permit costs.

(c) Technical Alternative 2.

(1) Technical Plan: A second alternative for the disposal of the wastes of this area is the construction of a centralized collection and treatment system. The collection system for this alternative, shown in Figure II-D-9, consists of over 3.5 miles of service line. This system is adequate for the present needs of the area and is capable of serving the projected growth in the population as well. Because of the flatness of the topography, three lift stations will be required to pump the wastewater to the treatment plant.

Of the alternative treatment schematics examined in the first interim report, the use of a package treatment plant was found to be the most cost effective. This package plant is a solids contact type process, with effluent filters and sludge drying beds. The effluent would be chlorinated before being discharged into an unnamed draw which drains into the lake. The sludge is removed from the drying beds and used in land application. This is presented in schematic form in Figure II-D-10. A wastewater collection and treatment system will be totally effective in abating groundwater contamination and, due to the higher effluent requirements, should be very effective in controlling surface water pollution. The standards for a plant discharging into or above a reservoir require effluent BOD_5 values of less than 10 mg/l and TSS values less than 15 mg/l. The only parameters that may continue to cause trouble are nutrients. A eutrophication problem has already been identified in the lake and the installation of a treatment plant may not correct the problem. If steps must be taken to alleviate this problem, either tertiary treatment or land application of these wastes should be investigated.

(2) Financial and Management Considerations: Cost estimates for this proposed treatment alternative are shown in Table II-D-11. The total capital cost for the treatment plant would be $291,000. The present worth for this system would be $977,000 and the total annual cost would be $89,600. This would give a per capita cost of $59.70 or a typical monthly bill of $14.90. If Federal funding were available for this project the total annual cost would be $48,800. The percapita cost would then be $32.50 and the monthly connection cost estimate would be $8.15.

The Lake Colorado City area is presently an unincorporated area, with the lake proper being the property of the Texas Electric Service Company. One management alternative is the formation of a Water Control and Improvement District which would assume the responsibility for providing the proposed service to the residents. The authority for the formation of such a district is available through several legislative bodies and generally requires the approval of the voters residing within the proposed jurisdictional bounds. The WCID would be a legal entity which could make agreements, assess user charges, and be eligible for State and Federal funding.

Another management alternative would be for the area to incorpoate as a municipal entity and provide the proposed services to its citizens. The problem would be that the proposed government would be liable to provide all other municipal services, which might impose too great a financial burden on a new municipality.

TABLE II-D-11

ESTIMATED ALTERNATIVE COSTS
FOR LAKE COLORADO CITY

	Technical Alternative 2 Package Plant Treatment System
Collection System	
Capital Cost	$ 291,000
O&M Cost	7,200
Treatment Plant	
Total Labor Cost	16,400
Total Energy Cost	7,300
Total Chemical Cost	300
Construction Cost	301,000
Land Acquisition Cost	400
O&M Cost	28,100
Capital Cost	301,000
Total Capital Cost	592,000
Present Worth	977,000
Total Annual Cost	89,600
Per Capita Cost	59.70
Monthly Charge per Connection	14.90
WITH 75% FEDERAL GRANT IN AID:	
Total Capital Cost	148,000
Present Worth	533,000
Total Annual Cost	48,800
Per Capita Cost	32.50
Monthly Charge per Connection	8.15

(3) Impacts: No adverse environmental impacts are anticipated as a result of the construction of a central collection and treatment facility and the social impacts likewise have positive aspects. Growth would be encouraged, as would be the development of a more permanent type of residence.

The economic impact of this alternative is quite significant and greatly detracts from the attractiveness of this method of disposal. Monthly bills in excess of $11 are considerable more expensive than the previously discussed alternative. However, if septic tanks do appear to be contributing to the contamination of the reservoir a collection and treatment system may be required. A positive economic impact would be an increase in the value of the land and an increase in the economic activity of the area that would result from this growth.

(5) Midland

(a) General. The City of Midland is located in northwest Midland County along Interstate Highway 20. The City has a current population of approximately 63,840 persons and is expected to grow steadily throughout the planning period. The City is a major distribution center for petroleum and livestock in the region. The City's wastewater disposal needs are presently served by a centralized wastewater treatment plant which is located in the southeast section of the City. The plant was constructed in 1974 but flows are already approaching design levels because of the growth of the City. The projected wasteloads for the City of Midland are presented in Table II-D-12.

Table II-D-12
WASTELOAD PROJECTIONS FOR
THE CITY OF MIDLAND

Planning Year	Population	Flow (MGD) Average	Flow (MGD) Peak
1975	63,840	-	-
1983	71,480	6.14	9.33
1990	79,210	7.03	10.56
2000	89,850	8.28	12.24

(b) Technical Alternative.

(1) Technical Plan: The City currently operates a conventional activated sludge plant with a design capacity of 6.0 MGD. The wasteload projections, shown in Table II-D-12, indicate that this plant will become overloaded by the year 1983. The current TDWR discharge permit for the City of Midland requires that the facility produce an effluent with a maximum 30-day average concentration of less than 20 mg/l BOD_5 and less than 20 mg/l Total Suspended Solids (TSS). The City uses this water for irrigation purposes and sells approximately 1.5 MGD to industrial users. The energy costs for this secondary treatment have prompted the City to consider a different treatment scheme for future expansions. Currently the City is examining the possibility of treating the wastewater to be used for irrigation purposes by only primary treatment and disinfection. The existing secondary aeration facilities would be utilized for that portion of the effluent to be sold to industries. This would require a change in the existing TDWR permit, which requires a higher effluent which may only be discharged during certain flow conditions, to one which would allow for the lower quality primary effluent to be applied to the land. This type plant would not only save the City some of the funds required to operate these secondary facilities, but the "no-discharge" status requested would pose no increased environmental threat since land application is currently being used for effluent disposal. In order to implement this plan the City of Midland would be required to expand the existing primary treatment facilities and increase the sludge handling capabilities.

In order to serve this growing population the collection system also will need expanding. These service line extensions, which include approximately 20 miles of sewer line, are shown in Figure II-D-11. In addition to the main plant, the City operates a 1.0 MGD contact stabilization plant at the Midland Regional Airport. The existing inflow is

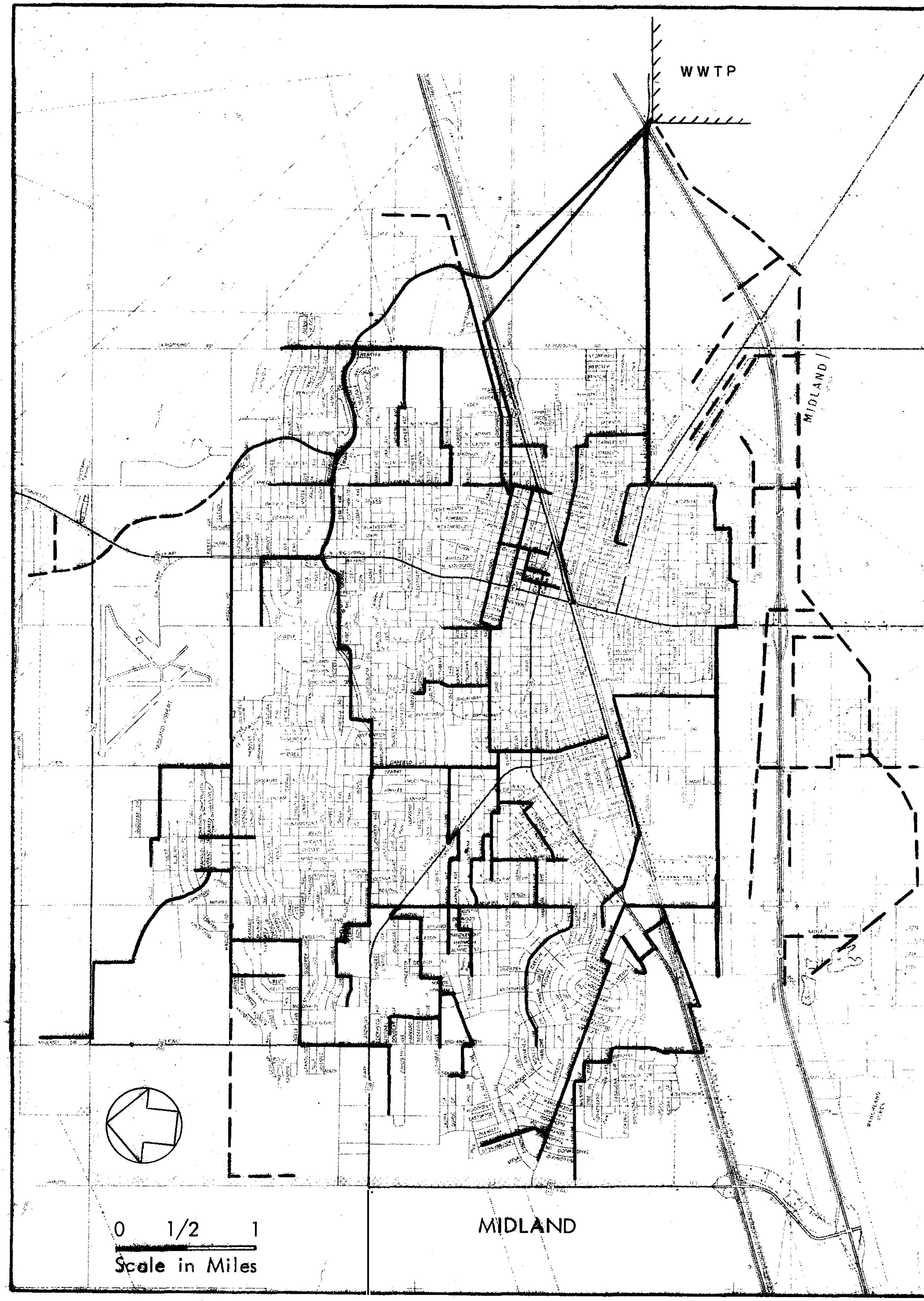


Figure II-D-11 Proposed collection system for Midland serving entire area by Main Treatment Plant.

only a fraction of the design flow but some operational problems have been reported in the past. In general, however, the present plant appears adequate with the exception that chlorination of effluent is needed.

(2) Financial and Management Considerations: Cost estimates were made based upon the expansion of the primary treatment and sludge handling units and on the collection system expansions shown in Table II-D-13. The capital cost estimated for the treatment plant would be $1,452,000 and the cost for the collection system would be $1,757,000. The present worth of this expansion would be $4,366,000 and the total annual cost would be $400,000. This would give a per capita cost of $4.45 or a typical monthly bill per connection of $1.10. If Federal funding were available for this project the total annual cost would be $180,000. The per capita cost would then be $2.00 and the monthly connection cost estimate would be $0.50.

The City of Midland currently operates and maintains the existing facility and is the logical choice for the management agency.

(3) Impacts: This proposed treatment alternative is basically a continuation of the existing treatment procedure and therfore no adverse change in the environment is forseen. This alternative effectively prohibits any pollution contribution to surface waters and, properly operated, should pose no threat to groundwater resources. The change to a no discharge permit would only be a legal status change since the City is currently not discharging, and should have very little effect on the water rights of downstream users. The treatment plant expansion should have no significant social impact; however, the collection system expansion could effect the patterns of growth in the City.

No economic impact is forseen directly attributable to this treatment system.

TABLE II-D-13

ESTIMATED ALTERNATIVE COSTS
FOR THE CITY OF MIDLAND

	Technical Alternative Land Application of Increased Flows
Collection System	
Capital Cost	$ 1,757,000
O&M Cost	10,400
Treatment Plant	
Total Labor Cost	53,600
Total Energy Cost	25,600
Total Chemical Cost	4,900
Construction Cost	1,443,000
Land Acquisition Cost	9,000
O&M Cost	95,900
Capital Cost	1,452,000
Total Capital Cost	3,208,000
Present Worth	4,366,000
Total Annual Cost	400,000
Per Capita Cost	4.45
Monthly Charge per Connection	1.10
WITH 75% FEDERAL GRANT IN AID:	
Total Capital Cost	802,000
Present Worth	1,960,000
Total Annual Cost	180,000
Per Capita Cost	2.00
Monthly Charge per Connection	0.50

(8) Sand Springs

(a) General. The community of Sand Springs is located along approximately four miles of Interstate Highway 20 in Howard County between Big Spring and the City of Coahoma. The study area, which includes the communities of Sand Springs and Midway, has a population of approximately 2000 and covers approximately 2,200 acres.

The topography of the area is one of gentle relief and is generally rolling with several small draws and ridges. The drainage of the area is generally southeast into Beals Creek. The study area is underlain by soils with a moderate to high permeability, imposing only slight limitations on the use of septic tanks.

The population of the service area is projected to increase to 2050 by the year 2000. This residential growth is expected to occur in the already established residential areas, thus increasing the density of the population. The land use is generally typical of that of other small communities which are characterized by scattered residential development and a concentration of commercial and public facilities along major thoroughfares in the central areas of the City. The economy is based on oil and gas production in nearby Big Spring with a small contribution coming from agriculture.

Sand Springs currently relies on septic tanks which operate moderately well in the soils of the area for the disposal of sewage. However, the population density has increased to a point where the septic tank concentrations in the area may become an offensive nuisance and a hazard to health.

In order to determine the size and costs of alternative waste treatment schemes, raw wastewater loadings were projected using the statewide Municipal Waste Treatment Needs Assessment Methodology for the present, 1983, 1990, and the year 2000. These projections were based on population projections, assumed per capita waste loading, and flow variations. The result of these wasteload projections are presented in Table II-D-14. The design criteria are based on wasteloads projected for the year 2000.

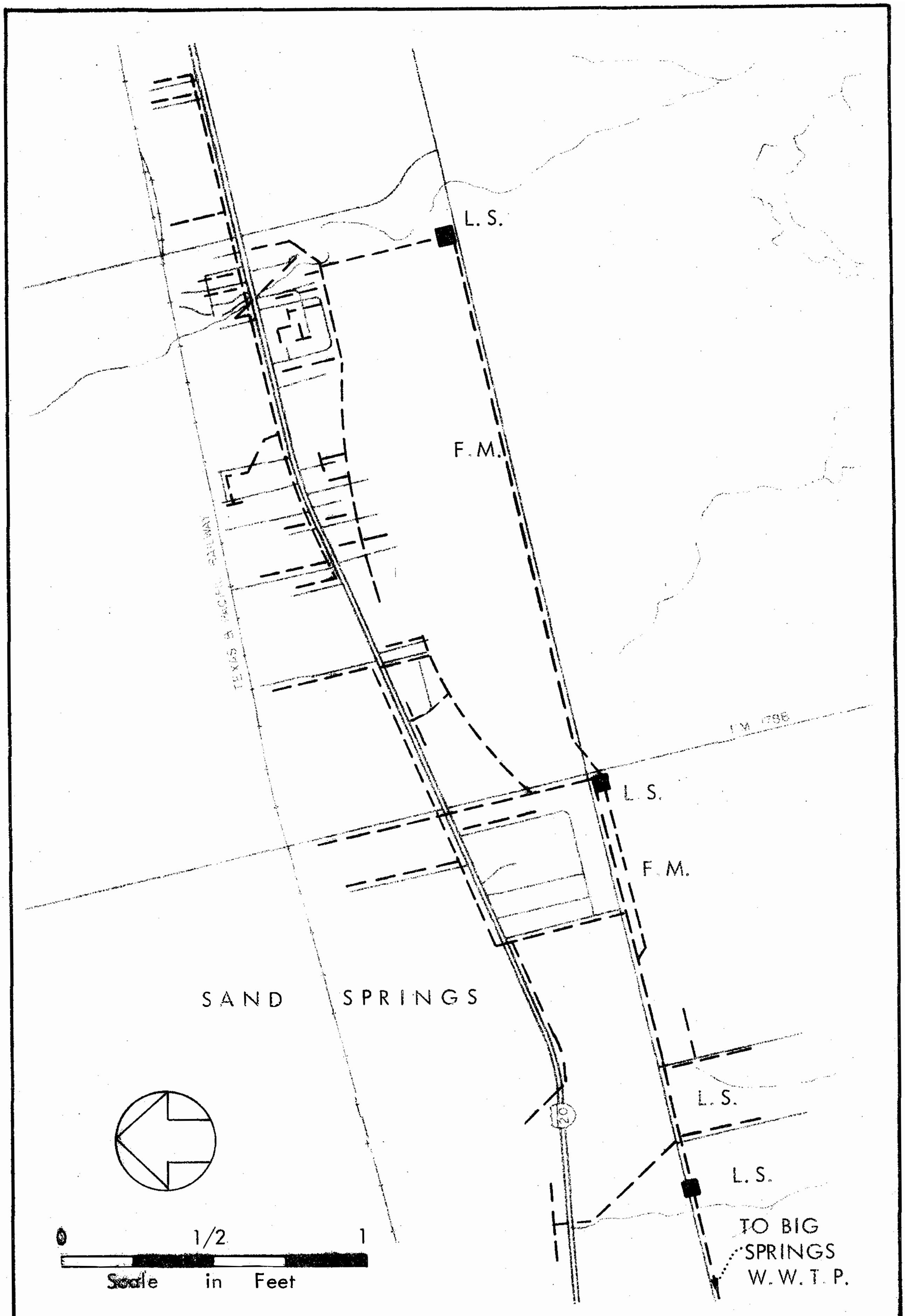


Figure II-D-12 Proposed collection system for Sand Springs Area, Alternative 1

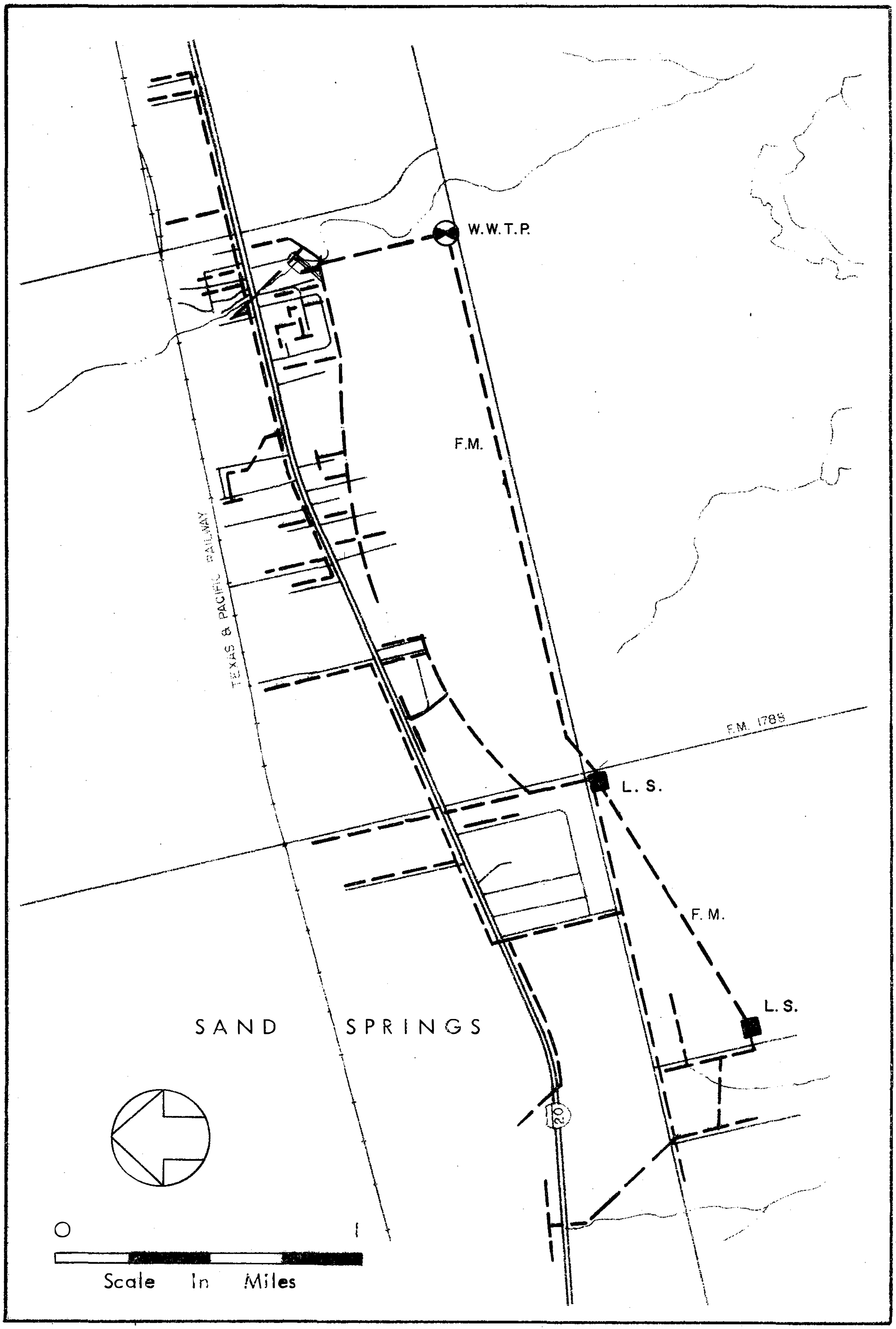
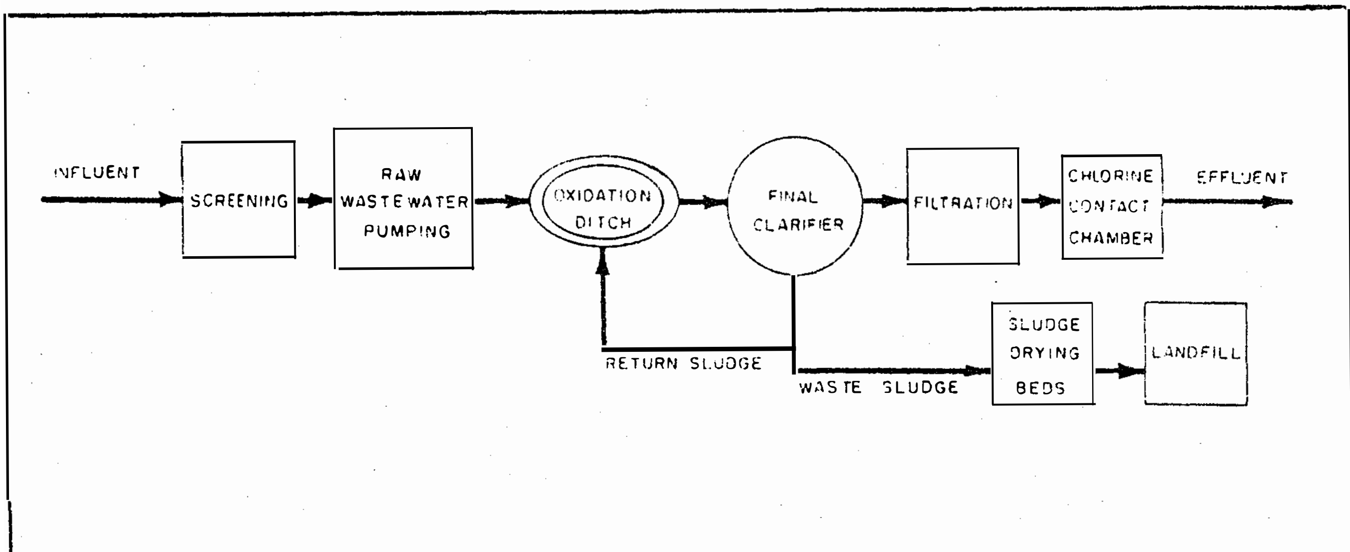


Figure II-D-... ...osed collection s... ...n f... Sand Springs
...a, Alternative 2

FIGURE II-D-14
WASTEWATER TREATMENT PLANT DATA
FOR COMMUNITY OF SAND SPRINGS AREA



PLANT FLOW DIAGRAM

Design Population	2,050	Effluent Requirements	
Design Flow (MGD)		BOD_5 (mg/L)	10
Average	0.23	TSS (mg/L)	15
Peak	0.50	Receiving Waters: Beals Creek	
No Existing Facility			

TABLE II-D-14
WASTELOAD PROJECTIONS FOR
SAND SPRINGS AREA

Planning Year	Population	Flow (MGD) Average	Flow (MGD) Peak
1975	2,000	-	-
1983	2,000	0.21	0.48
1990	2,025	0.22	0.49
2000	2,050	0.23	0.50

(b) Technical Alternative 1.

(1) Technical Plan: In order to dispose of it's wastes the community of Sand Springs could construct a collection system as shown in Figure II-D-12 and transport the collected wasteflow to the existing facility owned and operated by the City of Big Spring. This plant is currently a 201 Facility Planning project and very little data for the project is available. However, since the plant is being expanded, it would be possible to increase the size of the proposed expansion to accommodate the wasteflows anticipated from the Sand Springs Area. The collection system would consist of over 14.5 miles of gravity sewer line, 4.5 miles of pressurized force main, and would require 3 lift stations.

(2) Financial and Management Considerations: At the present there is not enough data available to estimate the cost of the expansion of the Big Spring facility; therefore, the proportion of this cost for which the residents of Sand Springs would be responsible has not been determined. The proposed collection system would have an estimated capital cost of $1,660,000 and would have a monthly connection cost of $17.40. If Federal funds were available for the construction cost for this system, the monthly collection cost would be reduced to approximately $6.00 per connection. The costs are summarized in Table II-D-15. The Sand Springs area is presently unincorporated. Water service is provided by the Howard County Water Control and Improvement District No. 1. The WCID also has a Public Utility Commission Certificate of Convenience for the provision of sewer service to the area, although the City of Coahoma has contested the Certificate. One management alternative would be for the Howard Co. WCID No. 1 to assume the responsibility of providing wastewater collection service for the area and to contract with the City of Big Spring for treatment services.

TABLE II-D-15

ESTIMATED ALTERNATIVE COSTS
FOR THE COMMUNITY OF SAND SPRINGS AREA

	Technical Alternative 1 Collect Waste and Transport to Big Spring For Treatment	Technical Alternative 2 Collect Waste and Treat at Oxidation Ditch Treatment Plant
Collection System		
Capital Cost	$ 1,660,000	$ 1,314,000
O&M Cost	21,600	12,700
Treatment Plant		
Total Labor Cost	0	23,000
Total Energy Cost	0	7,500
Total Chemical Cost	0	600
Construction Cost	0	544,000
Land Acquisition Cost	0	3,800
O&M Cost	0	36,200
Capital Cost	0	548,000
Total Capital Cost	1,660,000	1,861,000
Present Worth	1,895,000	2,394,000
Total Annual Cost	173,700	219,500
Per Capita Cost	69.50	87.80
Monthly Charge per Connection	17.40	21.95
WITH 75% FEDERAL GRANT IN AID:		
Total Capital Cost	415,000	465,000
Present Worth	650,000	998,000
Total Annual Cost	59,600	91,500
Per Capita Cost	23.85	36.60
Monthly Charge per Connection	5.95	9.15

(3) Impacts: The environmental quality of the area would be enhanced by any alternative to collect and treat the waste at a central location. This type disposal method would effectively protect both ground water and surface water resources. This alternative would also increase the quantity of return flow into Beals Creek and make more water available downstream. The social impact would be the encouragement of growth in the Sand Springs area and a greater densification of the existing residential areas along the proposed sewer lines.

The impact of the cost of the system itself cannot be evaluated until the full cost of this alternative is known.

(c) Technical Alternative 2.

(1) Technical Plan: Another alternative for the Sand Springs area would be for the area to collect and treat its own waste. The collection system for this alternative, shown in Figure II-D-13, consists of 14 miles of service line and requires 2 lift stations. The treatment plant could be located at any one of the three locations indicated, with lift stations at the other two locations. The easterlymost location at Sandy Hollow; however, would offer the advantage of being the area farthest away from existing population, and is the least likely area for future residential development.

Cost estimates for various types of treatment schemes revealed that the most cost effective method of waste treatment was an oxidation ditch type treatment facility with filtration. The treatment scheme, shown in Figure II-D-14, has the benefits of low construction costs and easy maintenance. This system consists of four unit processes-the aeration basin, a final clarifier, a filtration unit, and a chlorine contact chamber. The facility should meet the 10 BOD_5 and 15 TSS effluent requirement needed to discharge into the effluent dominated Beals Creek.

(2) Financial and Management Considerations: The total capital cost for the treatment plant would be $548,000 and the cost for the collection system would be $1,314,000. The

present worth of this alternative would be $2,394,000 with a total annual cost of $219,500 and a typical monthly bill per connection of $21.95. If Federal funding were available through PL 92-500, the present worth would be $998,000 and the typical monthly bill per connection would be $9.15.

The management alternative would be for the Howard Co. WCID No. 1 to assume the responsibility of providing wastewater collection and treatment service for the area.

(3) Impacts: The impacts of this alternative would be the prevention of a possible health hazard in the densely populated areas of the community of Sand Springs and increases in the flow quantity available for downstream use. The social impacts would be the same as for the first technical alternative. Economically this alternative is not currently feasible because of the high capital cost and lack of a revenue base to finance its construction. Also, since an estimated cost was not available for the first alternative no cost comparison of the two alternatives was made. The high estimated cost of the collection system, comprising over 72% of the total capital cost, is due partially to the topography of the area.

(9) Snyder: A facility plan has been prepared by the City of Snyder and approved by TDWR which examines sewage treatment alternatives that might be used by the City to meet its effluent requirments. In this plan many alternatives were investigated, including constructing activated sludge or other more advanced methods of waste treatment facilities. Basically it was determined that the most cost effective method is to apply the effluent from the existing plant to City owned land or to sell the effluent to private individuals for irrigation or industrial use. The plan also examined the alternatives for the implementation of this land application scheme and determined that no additions or expansion of the existing facility are necessary.

(10) Stanton: The City of Stanton is located at the junction of Interstate 20 and U.S. 137. The current population is approximately 2500 person and projections indicate further moderate growth. Agriculture is the

main source of income for the area. The existing treatment plant consists of an Imhoff tank which discharges to eight oxidation ponds. The effluent from the system is currently used to irrigate cotton crops but a recent change in permit request has been submitted to allow use of the effluent to irrigate the City golf course. The plant was built in 1933 and, due to deterioration, consideration for replacement has been initiated. The method of disposal under investigation is secondary treatment using biological oxidation.

(11) Wellman

(a) General. The town of Wellman is a community of approximately 300 persons located about fifteen miles southwest of Brownfield in Terry County, along U.S. Highway 62. The town is also served by the Atchison, Topeka, and Santa Fe Railroad. Development is within a triangular shaped area formed by U.S. 62 and F.M.303.

The town has moderate topographic relief and slopes from north to south, with a total drop of about 15 feet. The general direction of drainage is toward the south and southwestern portion of the town. The soils of the town generally have a sandy loam surface underlain by sandy clay loam. The permeability of the soil poses no limitations to the use of septic tanks.

The population of the town is projected to increase to 350 by the year 2000. Projected growth is expected to occur along the southern side of town and in presently vacant sites within the developed area. The land use for the town is generally typical of that of other small towns which are characterized by scattered residential development and a concentration of commercial and public facilities along major thoroughfares in the central areas of the town. The economic base of the area is primarily agricultural with no existing or anticipated industrial contribution.

The residents of Wellman do not have access to a central sewerage system. At the present, most of the residents utilize cesspools for disposal of wastes, with several of the newer residences using septic tanks. Waste disposal problems have been reported, and the potential for the creation of a health hazard is high. The high school waste disposal facility, which was constructed in about 1939, is now inadequate. For these reasons, a central sewerage system is very desirable.

In order to prevent the creation of a health hazard, two possible methods of waste treatment and disposal should be considered. One method would be the construction of a collection system and package type wastewater treatment system. The other method for consideration would be the establishment of a waste control order to control the use of septic tanks and eliminate the unsafe practice of utilizing cesspools.

(b) Technical Alternative 1.

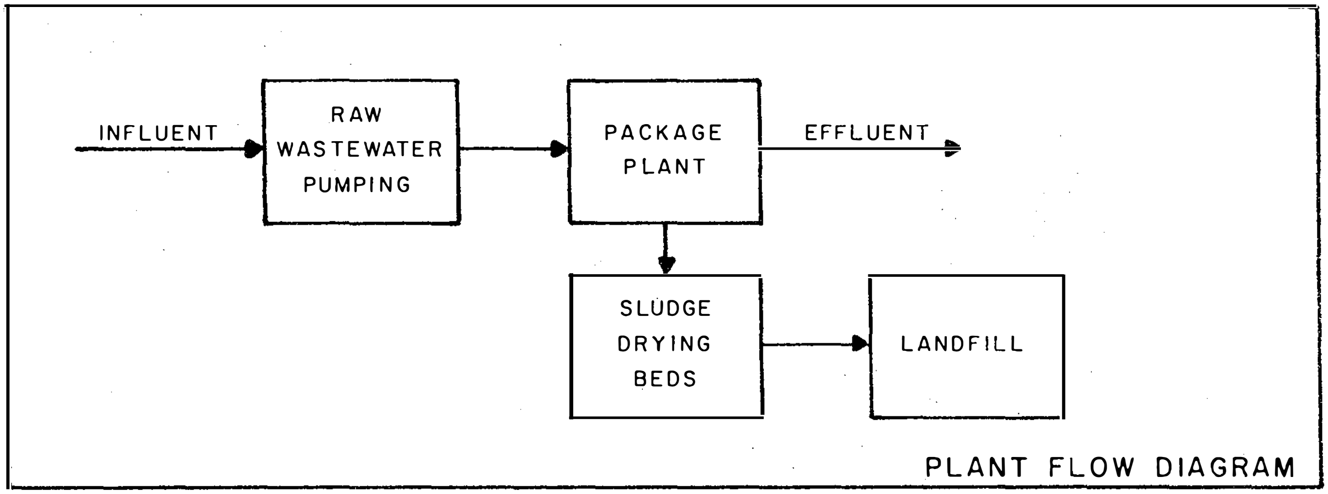
(1) Technical Plan: Investigations in Interim Report 1 indicated that a package type treatment plant was a more cost effective means of treating the waste to an acceptable quality than either an oxidation ditch or land application type treatment scheme. A schematic of this process is shown in Figure II-D-15. This type of treatment has been used widely to treat waste of relatively low volume because of its low costs and ease of maintenance. The effluent from this plant can be discharged or used as an irrigation water source in an area where water is a valuable resource. This method of waste disposal would end any threat of ground water pollution and, considering the infrequent flows of the surface water of the area, would pose no threat of contamination to surface water resources should the water be discharged.

The wastewater would be carried to the proposed wastewater treatment plant by means of the collection system shown in Figure II-D-16. This system consists of approximately 3.5 miles of service line and is adequate to serve both the present need and the projected service area expansion.

Some preliminary planning for this treatment alternative is currently being done by a local consultant.

(2) Financial and Management Considerations: The estimated capital cost for the package plant is $141,000, and the capital cost for the collection system would be $203,000. The present worth would be $480,000 and the total annual cost would be $44,000. The annual per capita cost would be $126.00 and the average monthly charge per connection would be $31.40. If Federal funding were available through PL 92-500, the present worth would be $222,000

FIGURE II-D-15
WASTEWATER TREATMENT PLANT DATA
FOR CITY OF WELLMAN



Design Population	350
Design Flow (MGD)	
Average	0.04
Peak	0.12
No Existing Facility	

Effluent Requirements

BOD_5 (mg/l)	20
TSS (mg/l)	20

Receiving Water: Unnamed Draw

TABLE II-D-16
WASTELOAD PROJECTIONS FOR
THE CITY OF WELLMAN

Planning Year	Population	Flow (MGD) Average	Peak
1975	215	-	-
1983	325	0.04	0.10
1990	350	0.04	0.12
2000	350	0.04	0.12

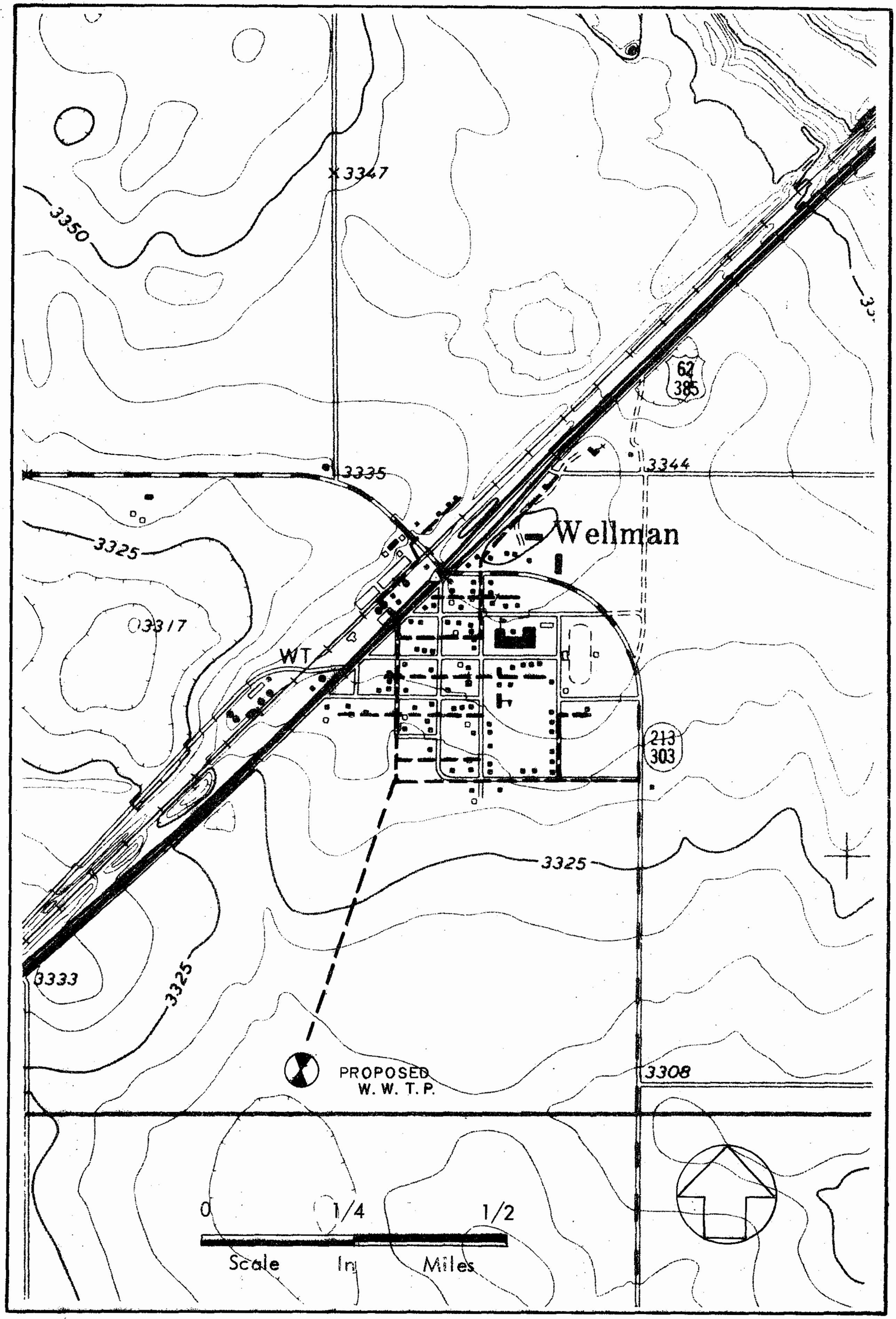


Figure II-D-16 Proposed collection system for the City of Wellman.

and the average monthly charge per connection would be $14.50. These costs are presented in Table II-D-17. The City of Wellman is an incorporated municipality and is a logical choice for the local management agency. The City owns and operates the City water system but does not have a public works department. The Texas Department of Water Resources would assume the regulatory and enforcement role.

(3) Impacts: The construction of a centralized collection and disposal system would do much to improve the environmental quality of the City of Wellman. The current method of disposal is inadequate and more problems are foreseen as the existing cesspool systems deteriorate with age. The proposed treatment scheme would be an effective means of preventing, not only the contamination of groundwater and surface water supplies, but also a health nuisance for the citizens of Wellman. The construction of a facility would stimulate growth for the City within the city limits and create a more healthful atmosphere for the area. The citizens have been actively looking into and planning toward that objective and it should be well received.

The economic impact of this alternative would not be favorable unless adequate funding were available to sufficiently reduce the monthly charge per connection to an affordable level. As with most of the communities examined, the cost of installing a collection system is the major portion of the estimated alternative costs and, if the monthly bills are to be reduced, additional Federal funding would best be applied to this segment of the project.

(c) Technical Alternative 2.

(1) Technical Plan: A second alternative would be to establish a septic tank control ordinance for the City of Wellman. This alternative may require that many residents discontinue the use of cesspools and install septic tank systems. Cesspools create not only potential sources of groundwater pollution but a health hazard as well and are no longer considered to be an approved means of sewage

TABLE II-D-17

ESTIMATED ALTERNATIVE COSTS
FOR THE CITY OF WELLMAN

	Technical Alternative 1 Construction of Package Treatment Plant and Collection System
Collection System	
Capital Cost	$ 203,000
O&M Cost	1,490
Treatment Plant	
Total Labor Cost	6,570
Total Energy Cost	3,000
Total Chemical Cost	90
Construction Cost	141,000
Land Acquisition Cost	80
O&M Cost	11,000
Capital Cost	141,000
Total Capital Cost	344,000
Present Worth	480,000
Total Annual Cost	44,000
Per Capita Cost	126.00
Monthly Charge per Connection	31.40
WITH 75% FEDERAL GRANT IN AID:	
Total Capital Cost	86,000
Present Worth	222,000
Total Annual Cost	20,300
Per Capita Cost	58.00
Monthly Charge per Connection	14.50

disposal by the Texas Department of Health. Although the proportion of the residents utilizing cesspools has not been established, the percentage is believed to be significant. These residents might be required to install septic tanks to meet the basic requirement of the ordinance, depending upon the condition of their existing systems.

A septic tank control ordinance is established to control the construction of new individual disposal systems and ensure that the system design is adequately engineered for the soil and other conditions which affect the performance of these systems. The ordinance could require periodic inspection through a permit process to guarantee that the systems are properly maintained and operating as they should. This ordinance would also require that deficiencies in existing systems be corrected to adequately maintain the disposal standards required to protect water sources from contamination and to prevent the creation of a health hazard.

(2) Financial and Management Considerations: The cost of a septic tank control ordinance would be in fulfilling the legal and institutional requirements to pass and enforce the ordinance. Costs would be those required for qualified personnel to inspect these systems during construction and while in operation, and the clerical work involved with this process. If many of the existing systems were found to be inadequate the owners of these unsuitable systems could be faced with the cost of installing new septic tank adsorption field systems to replace the systems they are now using. The Texas Methodology of Disposal Methods estimates the total cost for systems to be approximately $1000 where soil conditions are good. The City of Wellman is an incorporated municipality and is a logical choice for the local management agency.

(3) Impacts: The discontinued use of cesspools could only enhance the environmental quality of the area. Since Wellman depends upon wells as a municipal water supply source, the prevention of groundwater contamination is

very important. The use of properly designed septic tank systems should reduce the potential for groundwater pollution. The effectiveness, however, depends upon how strictly the ordinance is enforced. The social impact would depend upon the regulation adopted and could be significant. If many of the existing systems were found to be unsuitable and many corrections were required for the existing systems, a public outcry will result. It is therefore advisable that a more detailed survey of the individual systems be conducted in order to fully access the impact of this alternative. Economic impact would, likewise, be significant if many of the existing systems require replacement. A tax increase may be required for the institutional expenses of the ordinance while the inspection expenses could be defrayed by permit fees.

(12) Westbrook

(a) General. The town of Westbrook is a community of approximately 300 persons located about ten miles west of Colorado City in Mitchell County, along Interstate Highway 20. The town is also served by the Texas and Pacific Railroad and has grown somewhat in the period between 1970 and the present, but the future growth is expected to be at a slower rate. Residential growth will be scattered through the town in presently vacant areas. The area of large growth in recent years has been toward the southwest and this trend may continue to some degree.

The town has moderate topographic relief with the highest point at the northern central part and lower toward the south, with a drop of about 15 feet. The general direction of drainage is toward the southeast to a tributary of Sulphur Creek. The town is underlain by Cobb-Miles type soils which have moderate permeabilities and thus have moderate limitations on the use of septic tanks.

The incorporated area of the town encompasses approximately 110 acres. Land usage is primary residential, with commercial usage in the central business district. The economic resource base is primarily agricultural with no known industrial contribution and none anticipated in the near future.

The residents of Westbrook do not have access to a central sewerage system, and septic tanks are currently used for the disposal of the wastewater. Some contamination of the water supply source and some health complaints have been reported from septic tanks in this area. Even though the population is projected to be stable, as shown in Table II-D-18, the wasteload is projected to increase through the study period. Therefore, a central sewerage system is very desirable both from a public health viewpoint and in meeting the Federal and State water pollution regulations.

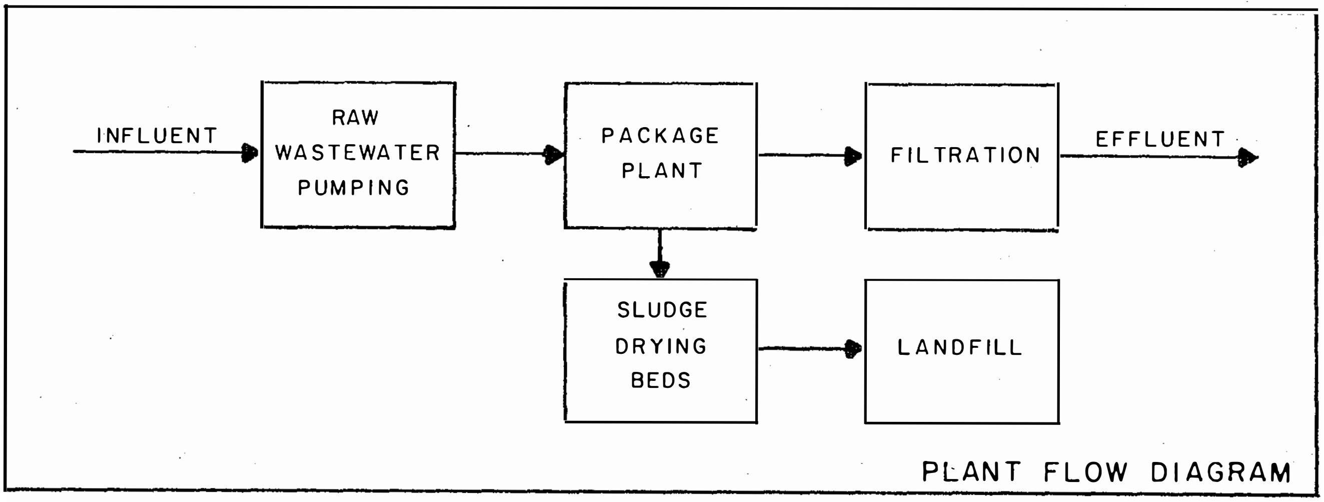
(b) Technical Alternative 1.

(1) Technical Plan: One treatment alternative for the City of Westbrook would be for the City to construct a collection and treatment system to dispose of the City's liquid waste. Earlier investigations, in the first interim report, indicate that a package type treatment plant with filtration would be the most cost effective means of treatment. This treatment scheme is represented graphically in Figure II-D-17. Filtration is required in order to obtain an effluent quality suitable for discharge above a reservoir which is used as a municipal water supply. Lake Colorado City is located within five miles downstream of the proposed discharge point. This method of waste disposal would end any threat of groundwater pollution and would greatly reduce surface water contamination possibilities.

Wastewater would be collected by the system depicted in Figure II-D-18. This system consists of over four miles of service line and would depend entirely on gravity flow, without lift stations.

(2) Financial and Management Considerations: The cost estimates for this alternative are presented in Table II-D-19. The capital costs for the treatment plant are $177,000 and the capital cost for the collection system is $302,000. The present worth is $638,000 with a total annual cost of $58,500. The typical monthly bill for this alternative without Federal funding would be $48.70. With Federal funding the estimated monthly charge per connection would be $21.30.

FIGURE II-D-17
WASTEWATER TREATMENT PLANT DATA
FOR THE CITY OF WESTBROOK



Design Population 300
Design Flow (MGD)
Average 0.04
Peak 0.11
No Existing Facility

Effluent Requirements
BOD_5 (mg/l) 10
TSS (mg/l) 15
Receiving Water: Unnamed Creek to Lake Colorado City

TABLE II-D-18
WASTELOAD PROJECTIONS FOR
THE CITY OF WESTBROOK

Planning Year	Population	Flow (MGD) Average	Peak
1975	300	-	-
1983	300	0.03	0.10
1990	300	0.03	0.10
2000	300	0.04	0.11

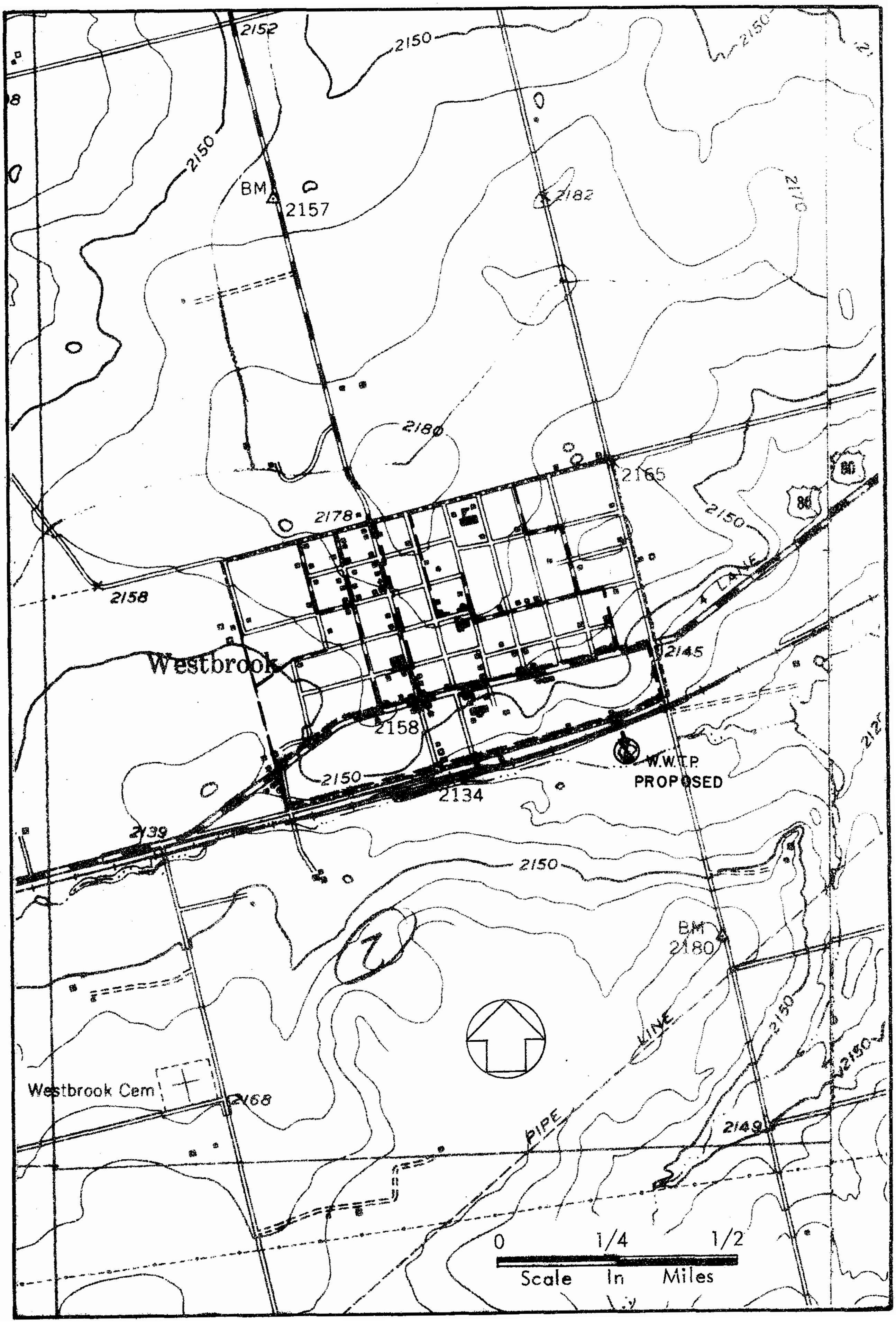


Figure II-D-18 Proposed collection system for the City of Westbrook

TABLE II-D-19

ESTIMATED ALTERNATIVE COSTS
FOR THE CITY OF WESTBROOK

	Technical Alternative
Collection System	
Capital Cost	$ 302,000
O&M Cost	2,200
Treatment Plant	
Total Labor Cost	7,600
Total Energy Cost	2,900
Total Chemical Cost	100
Construction Cost	177,000
Land Acquisition Cost	100
O&M Cost	12,000
Capital Cost	177,000
Total Capital Cost	479,000
Present Worth	638,000
Total Annual Cost	58,500
Per Capita Cost	195.00
Monthly Charge per Connection	48.70
<u>WITH 75% FEDERAL GRANT IN AID:</u>	
Total Capital Cost	120,000
Present Worth	279,000
Total Annual Cost	25,600
Per Capita Cost	85.25
Monthly Charge per Connection	21.30

The City of Westbrook is an incorporated municipality with the authority to administer the proposed waste treatment plan. The City does not have a public works department. The plan would require the employment of additional personnel to operate the treatment plant and collection system. The Texas Department of Water Resources would assume the regulatory and enforcement of the plant operations.

(3) Impacts: The construction of a centralized system would be 100% effective in preventing groundwater contamination and very effective in preventing surface water contamination. The only possible problem forseen would be those related to the nutrients which would not be removed. These nutrients could contribute to the eutrophic conditions which already exist in the reservoir. This central collection and treatment system would also reduce any potential health hazards. The social impact of this alternative would not be significant with the exception of those resulting from the economic impacts.

The costs of this alternative make the project economically not feasible unless Federal funding is made available to significantly reduce the monthly charge per connection to an acceptable level. The installation of this system could encourage growth in the area.

(c) Technical Alternative 2.

(1) Technical Plan: The establishment of a septic tank control ordinance is another method of controlling the contamination by domestic wastes which should be considered. The threat of health hazard can be reduced by making sure that all new septic tanks are adequately designed and constructed and that existing systems meet performance standards. Since the residents of Westbrook currently rely on septic tanks as their method of wastewater disposal this alternative is the simplest and most cost effective. The soils of this area perform moderately well; therefore, the installation of conventional septic tank systems, and evapotranspiration systems where necessary, should adequately dispose of the liquid waste of this community.

(2) Financial and Management Considerations: The costs of implementing a septic tank control ordinance are primarily those involved in fulfilling the legal and institutional requirements of establishing and enforcing the ordinance. If some residents were required to replace their existing systems the cost of the new systems could run as high as $1000 per system. In addition, the residents would be required to pay a nominal permit fee to cover the cost of periodic inspection to insure that the systems are functioning properly.

The City of Westbrook would be the logical choice for the management agency. However, qualified personnel would have to be retained to make system inspections and properly enforce the ordinance.

(3) Impacts: Environmental impacts would be concerned with the effectiveness of this means of disposal which would depend upon how strictly the ordinance is enforced. A strictly enforced ordinance should play a significant role in maintaining a healthy environment in the City of Westbrook. This ordinance might reduce the density of growth in the area, however, since the growth is not expected to be great the effect of this impact should be negligible. The economic impact of this alternative for most citizens should not be significant.

4. SEGMENT 1413

Segment 1413 encompases J. B. Thomas Reservoir and its immediate drainage area of about 1303 square miles. Water quality in the segment is good and there are no municipal or industrial discharges directly into the segment. The Colorado River Municipal Water District enforces a policy concerning septic tanks adjacent to the lake which limits potential contamination from these sources. Because of the lack of problems, no plan for controlling water quality in this segment is deemed necessary.

a. Summary of Existing Agencies & Water Quality Control Programs. Segment 1413 includes Lake J. B. Thomas and its immediate drainage area. The segment lies in parts of Borden, Dawson, Howard and Scurry Counties. The Colorado River Municipal Water District owns and operates Lake J. B. Thomas. There are no major municipalities in the segment.

b. Nonpoint Source Assessment. Approximately 72% of the drainage area in Segment 1413 is in rangeland usage with about 15% each of dry cropland and irrigated cropland. Most of the cropland is distant from the lake itself and may be in an area which is none contributing. There are no major urban areas or other major nonpoint sources within the segment and the waters of the Lake are of good quality.

c. Waste Load Projections. There are no municipal wastewater treatment facilities located within Segment 1413.