PLAN SUMMARY REPORT
for the
UPPER NUECES BASIN
WATER QUALITY MANAGEMENT PLAN

Prepared by

NUECES RIVER AUTHORITY

for

TEXAS DEPARTMENT OF WATER RESOURCES

June, 1978

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FISCAL YEAR 1980 REVISIONS

TO THE

STATE OF TEXAS WATER QUALITY MANAGEMENT PLANS

UPPER NUECES BASIN

Developed in accordance with Section 208
of the Federal Clean Water Act of 1977 and
Title 40 Code of Federal Regulations
Part 35, Subpart G

Compiled by

TEXAS DEPARTMENT OF WATER RESOURCES

July 1980

FISCAL YEAR 1980 REVISIONS
TO THE
STATE OF TEXAS WATER QUALITY MANAGEMENT PLANS

INTRODUCTION

Initial water quality management plans were developed in accordance with the requirements of Section 208 of the Federal Clean Water Act, Public Law 95-217, during the period of 1975-1979. Upon completion of significant plan documents, certification was made by the Governor of Texas that the completed document was prepared in accordance with the Act and applicable federal regulations and that the plan document was adopted as the State Water Quality Management Plan for the affected area. Subsequent to that initial certification, more accurate information has been developed regarding municipal facility needs, facility design information, and facility population projections.

The primary sources of the more recent data are the revised statewide population projections (by county and designated area) contained in the document "POPULATION PROJECTIONS FOR TEXAS" (certified by the Governor) and facility-specific information developed as part of the application and/or facility planning phases of the Section 201 (PL 95-217) Construction Grants Program. The information developed within the Section 201 program has been evaluated by the Texas Department of Water Resources in cooperation with the local 208 planning agency for the affected area and the results of those evaluations are summarized in this document.

The information presented in this document is intended only to revise the facility planning information for the areas listed in the following tables. Other areas for which information is presented in the initial water quality management plans are not affected by this document.

FACILITY INFORMATION

The following tables are organized by 208 planning areas, both state and designated. Within each table, facility planning information is provided in five categories:

1. AREA - City or special district for which proposed needs are identified. The physical planning boundaries for the area are established in the management agency designation for that area certified by the Governor.

2. MANAGEMENT AGENCY - The entity proposed for designation as the management agency for the collection, treatment or both for the area in accordance with Section 208(c) of the Clean Water Act. Many of the entities listed have already been designated by the Governor for the purposes shown.

3. POPULATION - Base and projected population for the area. The population projections presented herein are consistent with the statewide population projections in "POPULATION PROJECTIONS FOR TEXAS"

and the requirements of paragraph 8a of Appendix A to Title 40 Code of Federal Regulations Part 35, Subpart E (Construction Grants).

4. TREATMENT/COLLECTION NEEDS - The columns shown under the TREATMENT NEEDS heading indicate a probable need for new facilities (N), expanded facilities (E) in terms of treatment capacity (volume), and/or upgraded facilities (U), which may be required due to more stringent effluent limits or needed plant rehabilitation. The columns under the COLLECTION NEEDS heading indicate a probable need for a new collection system (N), expansion of an existing system (E), and/or rehabilitation (R) of an existing system.

5. COMMENTS - Any special conditions relative to an area's needs are indicated in this column.

UTILIZATION OF FACILITY INFORMATION

The facility information in this document is intended to be utilized in the preparation of facilities plans and the subsequent design and construction of needed facilities, primarily in the Section 201 Construction Grants Program. Design capacities of units of the treatment and collection systems shall be based upon the population projections contained in this document plus any additional needed capacity established for commercial/industrial influents and documented infiltration/inflow volumes (treatment or rehabilitation).

The probable needs shown under the TREATMENT NEEDS and/or COLLECTION NEEDS headings are preliminary findings; specific needs for an area shall be as established in the completed and certified detailed engineering studies conducted during Step 1 (facilities planning) of the Section 201 Construction Grants Program.

EFFLUENT LIMITS

Specific effluent quality for any wastewater discharges resulting from any of the facilities recommended in this document shall be in accordance with Chapter XVIII, Effluent Standards, of the Permanent Rules of the Texas Department of Water Resources in effect at the time of permit issuance for the specific facility.

UPPER NUECES BASIN

AREA	MANAGEMENT AGENCY (Collection/Treatment)	POPULATION				TREATMENT NEEDS			COLLECTION NEEDS			COMMENTS
		BASE (Year)	5 YEAR (Year)	10 YEAR (Year)	20 YEAR (Year)	N	E	U	N	E	R	
Camp Wood	City of Camp Wood (C/T)	660 (1970)	875 (1983)	1,000 (1990)	1,250 (2000)	X			X			
George West	City of George West (C/T)	1,900 (1975)								X	X	Population projections under review
Jourdanton	City of Jourdanton (C/T)	2,500 (1977)	2,690 (1983)	2,880 (1988)	3,250 (1998)	X				X		
Lytle	City of Lytle (C/T)	1,536 (1970)	2,070 (1980)	2,665 (1990)	3,365 (2000)	X				X		

NUECES BASIN

WATER QUALITY MANAGEMENT PLAN

VOLUME II

PLAN SUMMARY REPORT

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

Prepared by

NUECES RIVER AUTHORITY

for

TEXAS DEPARTMENT OF WATER RESOURCES

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 (EPA) 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 the plan.

The following document is the final report (Volume II. Plan Summary Report) for the Upper Nueces Basin, exclusive of the Corpus Christi Designated Areawide Planning Area. It was developed through the efforts of the Nueces River Authority, 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 DEFINITON

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 (TDWR).

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.

The quality of water found in the Nueces Basin is very much affected by the hydrologic conditions which occur in the hot summer months when there is only a small base flow in

the streams. This condition sometimes results in a violation of the water quality standards.

Specific water quality problems in the Nueces Basin will be discussed for each stream segment. The following discussion will proceed in numerical order, beginning with Segment 2001.

a. Segment 2001. The tidal portion of the Mission River has exhibited a dissolved oxygen concentration that was less than the 4.0 mg/l allowed by the standards. Monitoring station 2001.01, located at Chiltipin Creek at the east end of Plymouth Road northeast of Sinton, exhibited a dissolved oxygen concentration of 2.5 mg/l on June 21, 1973. The annual average dissolved oxygen concentration at this station was 8.4 mg/l for 1973 since the remaining dissolved oxygen concentrations during the year ranged from 6.3 mg/l to 13.7 mg/l.

b. Segment 2002. Segment 2002 (the portion of the Mission River above tidal influences) has exhibited a dissolved oxygen concentration that was less than the 5.0 mg/l allowed by the water quality standards. A dissolved oxygen concentration of 4.5 mg/l was recorded on September 15, 1972. On September 20, 1973, this same monitoring station exhibited a dissolved oxygen concentration of 3.4 mg/l. However, the daily flow recorded on September 20, 1973 did not exceed the average seven-day low flow expected to occur at two-year intervals in Segment 2002, which is the criteria set forth for the application of the dissolved oxygen standard. Hence, this low dissolved oxygen concentration is not considered a dissolved oxygen violation. It does, however, indicate the dissolved oxygen conditions that exist during extremely low-flow periods in the upper reachs of the Mission River. This is a water quality limited segment.

c. Segment 2004. The portion of the Aransas River above tidal influences exhibited two measurements that were less than the 5.0 mg/l standard allowed for dissolved oxygen in Segment 2004. The dissolved oxygen measurements of 4.1 mg/l and 3.9 mg/l were exhibited on May 6, 1972 and September 26, 1972, respectively. During 1972, the annual average dissolved oxygen concentration was 7.2 mg/l, and the individual dissolved oxygen concentrations ranged from 3.9 mg/l to 9.7 mg/l.

Segment 2004 also exhibited measurements exceeding the chloride standard of 150 mg/l in water year 1973 and in water year 1975. In 1973, three water samples exhibited an annual mean chloride concentration of 206 mg/l. The

chloride concentrations of the three samples ranged from 113 mg/l to 316 mg/l. In 1975, an annual mean chloride concentration of 233 mg/l was recorded, which exceeded the standard of 150 mg/l. This average chloride concentration was based on five water samples which had chloride concentrations ranging from 117 mg/l to 378 mg/l. Four of these concentrations exceeded the standard.

d. Segment 2102. Segment 2102 of the Nueces River exhibited a dissolved oxygen concentration that was less than the 5.0 mg/l allowed by the water quality standards. This measurement occurred at monitoring station 2102.01 located at the Cunningham water treatment plant intake. On August 21, 1974, this station exhibited a dissolved oxygen concentration of 2.0 mg/l. The annual average dissolved oxygen concentration for 1974 was 7.5 mg/l and the individual dissolved oxygen concentration recorded during that year ranged from 2.0 mg/l to 9.5 mg/l. After the 2.0 mg/l concentration, the next lowest dissolved oxygen concentration was 6.5 mg/l recorded on October 25, 1973.

e. Segment 2103. Lake Corpus Christi, Segment 2103, exhibited two pH measurements that were less than the pH range of 7.0 to 9.0 allowed by the standards. On March 21, 1974, a pH value of 6.6 was recorded, and on September 25, 1974, a pH value of 6.7 was recorded. During water year 1974 the next lowest recorded pH value was 7.5. The two noncompliant pH measurements were much lower than the normal pH range of 7.3 to 8.9 exhibited by the lake. An Intensive Monitoring Survey was conducted on Lake Corpus Christi in May 1974 by personnel from the Water Quality Assessment Group of the TDWR with the assistance of personnel from the TDWR District 12 Office.

f. Segment 2104. That portion of the Nueces River from the headwaters of Lake Corpus Christi to Holland Dam southeast of Cotulla (Segment 2104) has exhibited one noncompliant water quality measurement at each of the three TDWR monitoring stations located on the segment. Monitoring station 2104.01, which is located at U.S. 281 south of Three Rivers, exhibited a noncompliant pH measurement of 6.6 on March 21, 1974. On August 16 of this same water year, monitoring station 2104.03 exhibited a noncompliant dissolved oxygen measurement of 3.4 mg/l. A second noncompliant dissolved oxygen measurement was exhibited by monitoring station 2104.02. On November 22, 1972, a dissolved oxygen concentration of 4.5 mg/l was

recorded during low flow conditions. The daily flow on the sampling date was marginally higher than the base flow condition required by the water standards. Thus, the dissolved oxygen concentration of 4.5 mg/l constituted a dissolved oxygen violation.

g. Segment 2106. The upper segment of the Frio River exhibited one noncompliant dissolved oxygen measurement of 3.1 mg/l on January 8, 1973. This measurement fell below the 5.0 mg/l allowed by the water quality standards for dissolved oxygen. The flow conditions recorded on this date indicated that the Frio River at Tilden was at normal flow. Other chemical parameters recorded on this date did not indicate any abnormal chemical changes from ambient water quality conditions.

h. Segment 2107. The Atascosa River, from its confluence with the Frio River to the headwaters, exhibited three noncompliant dissolved oxygen measurements during water years 1972 to 1975. Monitoring station 2107.01, which is located at FM 99 west of Whitsett, exhibited the three dissolved oxygen measurements on November 1, 1971, November 22, 1972, and June 18, 1973. Hydrologic conditions recorded on all three dates indicated normal flow levels in the Atascosa River. Fecal coliform values are also too high in this segment.

i. Segment 2473. Segment 2473, St. Charles Bay, has exhibited one noncompliant measurement. On October 3, 1974, monitoring station 2473.01 exhibited an unusually high pH value of 9.4. The range allowed by the standards for pH is 7.0 to 9.0. For water years 1972 to 1975, the remaining pH values recorded in the segment did not exceed 8.9.

j. Segment 2484. Corpus Christi Inner Harbor, Segment 2484, has exhibited two dissolved oxygen measurements that were less than the 3.0 mg/l allowed by the standards. These low dissolved oxygen concentrations were exhibited by the Inner Harbor in water years 1973 and 1974. On September 18, 1973, a dissolved oxygen concentration of 2.7 mg/l was exhibited by TDWR monitoring station 2484.01. In 1974, TDWR monitoring station 2484.02 exhibited an extremely low dissolved oxygen concentration of 0.6 mg/l.

A review of the unpublished water quality data for the two subsequent water years, 1976 and 1977, indicates that the water quality of the Nueces Basin is following a similar trend to that exhibited in water years 1972 to 1975. The following discussion lists the measured values of water quality parameters that do not agree with the numerical value allowed by the water quality standards.

a. Segment 2004. Segment 2004 of the Aransas River exceeded the chloride standard of 150 mg/l in water years 1976 and 1977. Monitoring station 2004.01, located at U.S. 77 between Woodsboro and Sinton, exhibited the non-compliant measurements. In water year 1976, the annual mean chloride concentration for station 2004.01 was 473 mg/l. An annual mean chloride concentration of 189 mg/l was recorded at the same station in water year 1977. Also at station 2004.01 in water year 1976, an annual mean total dissolved solids concentration of 1506 mg/l was recorded. This measurement exceeds the 600 mg/l allowed for total dissolved solids in the water quality standards.

b. Segment 2102. In water year 1976, monitoring station 2102.04 exhibited an annual mean chloride concentration of 294 mg/l. This yearly average exceeded the 250 mg/l allowed by the standards for chloride in Segment 2102.

c. Segment 2104. A low dissolved oxygen measurement was recorded at monitoring station 2104.03, located at SH 16 south of Tilden, on August 18, 1977. The measurement of 4.6 mg/l fell below the 5.0 mg/l allowed for dissolved oxygen by the water quality standards in Segment 2104.

d. Segment 2105. On April 26, 1976, monitoring station 2105.01, located at FM 190 north of Asherton, recorded a dissolved oxygen concentration of 4.5 mg/l. This measurement fell below the 5.0 mg/l allowed by the standards for dissolved oxygen.

2. FACILITY NEEDS

The discussion of facility needs is organized by stream segments and includes a summary of the dischargers with facility needs. As used in the discussion of facility needs, a "Discharge Source" is one that is currently discharging treated effluent. A "Non-Discharge Source" is one which either has a no-discharge permit, has not been constructed, or currently is not in operation.

Segment 2102

There are no facility needs identified in the drainage area of the Nueces River between the saltwater barrier west of U.S. 77 near Calallen and Wesley Seale Dam.

Segment 2103

Facility needs have been identified within the Lake Corpus Christi drainage area for one municipality.

The City of Mathis operates a wastewater treatment plant consisting of a bar screen, primary clarifier, trickling filter, anaerobic digester, sludge drying beds, oxidation ponds, and chlorination facilities. The existing collection system does not serve the entire City, and two of the three lift stations require backup pumps. The City has received a Step 1 construction grant for improving its sewerage system. Therefore, no further planning is provided as part of this study.

Segment 2104

No facility needs have been identified for the portion of the Nueces River from the headwaters of Lake Corpus Christi to Holland Dam.

Segment 2105

Four facilities need improvements in the drainage area of the Nueces River from Holland Dam to FM 1025 north of Crystal City in Zavala County.

The City of Asherton is presently served by septic tanks. However, the City has been in Step II of its 201 construction grant. The proposed sewerage system will replace existing septic tanks. The plant will consist of an oxidation ditch, secondary clarifier, chlorination facilities, and sludge drying beds. No further planning is provided as part of this study.

The City of Carrizo Springs has been awarded a $2 million Economic Development Administration (EDA) grant to build a new 2.5 million gallons per day (mgd) contact stabilization sewage treatment plant to replace the existing facility which is totally inadequate. Therefore, no further planning is provided in this study.

The City of Cotulla operates a sewage treatment plant utilizing a clarigester, two drying beds, and a 10-acre oxidation lagoon. The oxidation lagoon has no baffling system for maximum detention time. The plant, which is in violation of TSS requirements, needs improvement and expansion. The collection system for the City will need expansion and extension to serve the projected population. For these reasons, the City is designated as a sewerage planning area.

The City of Crystal City operates a facility consisting of a grit chamber, primary clarifier, trickling filter, final clarifier, sludge digester, drying beds, and chlorination equipment. The City has applied for EDA public works grant funds to make additions to the existing gravity flow collection system, to build two lift stations, and to modify the existing treatment plant to include a laboratory storage building, flow meter, degritter mechanism, and chlorinator. Since $150,000 of EDA grant funds have been received by the City, no further planning is provided as part of this study.

Segment 2106

Three facility improvements are necessary within the drainage area of the Frio River from its confluence with the Nueces River to U.S. 90 west of Knippa.

The City of Dilley operates a wastewater treatment system with a no-discharge permit. The treatment system consists of an Imhoff tank, ponds, and irrigation fields. The Imhoff tank and two ponds (7.5 acres) are hydraulically overloaded according to the TDWR self-reporting data. Improvements and expansion of the existing facilities are necessary. There are also needs for the expansion of the collection system to serve the septic tank areas. The City of Dilley has therefore been included as a sewerage planning area.

The City of Hondo operates a wastewater treatment system with a no-discharge permit. The system is comprised of three Imhoff tanks, oxidation ponds, and irrigation fields. Records indicate that hydraulic overload has occurred frequently in the past. The Imhoff tanks are in the flood

plain of Elm (Ball Waterhole) Creek and have been flooded several times in the last five years. The plant was reported bypassing on several occasions in the past two years. The City has applied for 201 grant funds, but is presently not on the State funding list. Therefore, it is designated as a sewerage planning area.

The City of Pearsall holds a no-discharge permit for a 0.373 mgd treatment system consisting of a clarigester, oxidation ponds, irrigation fields, and sludge drying beds. There is normally no discharge from the plant except during heavy rainfall period. Based on population projected for the City, both collection and treatment systems need expansion. Therefore, the City is designated as a sewerage planning area.

Segment 2107

The drainage area of the Atascosa River from its confluence with Frio River to its headwater contains four municipal facilities which have improvement needs.

The City of Jourdanton operates a wastewater treatment plant consisting of a grit chamber, bar screen, Imhoff tank, four oxidation ponds in series, and sludge drying beds. The existing plant is obsolete. However, the City has received a Step 1 construction grant for improving and expanding the existing system. Therefore, no further planning is provided as part of this study.

The City of Lytle operates a wastewater treatment plant with a permitted average flow of 0.07 mgd. The plant, which consists of a grit chamber, bar screen, Imhoff tank, and three oxidation ponds, is not in sound condition. Although the City is pursuing a 201 construction grant to upgrade the existing facilities, it is not presently on the State funding list. The collection system for the City needs expansion to serve the existing septic tank areas and future developments. The City of Lytle is therefore identified as a sewerage planning area.

The treatment facility operated by the City of Pleasanton consists of a pre-aeration basin, primary clarifier, trickling filter, stabilization ponds, aerobic digesters, and sludge drying beds. The plant is hydraulically overloaded and is in deteriorating condition. The City is currently in the 201 construction program to replace the plant. Therefore, no further planning is provided as part of this study.

The City of Poteet's wastewater treatment facility utilizes a clarigester-oxidation pond system with sludge drying beds. The plant is hydraulically overloaded and deteriorated. Since the City has received a 201 Step 1 construction grant to upgrade this facility, no further planning is provided in this study.

Segment 2108

One facility need has been identified within the drainage area of the San Miguel Creek from its headwaters in southeastern Medina County to its confluence with the Frio River in McMullen County.

There is no existing sewerage system in the City of Natalia. Septic tanks are utilized for sewage disposal. However, the City is presently in Step 3 of its 201 construction grant program to construct a 0.14 mgd treatment plant. When completed, the plant will provide adequate service through the year 2000. Thus, no further planning is provided in this study.

Segment 2109

No facility needs have been identified in the drainage area of the Leona River before its confluence with the Frio River.

Segment 2110

There are no facility needs identified in the Sabinal River drainage area from its confluence with the Frio River to SH 127 north of Sabinal.

Segment 2111

There are no facility needs identifed in the Sabinal River drainage area from SH 127 to its headwaters.

Segment 2112

No facility needs have been identified in the drainage area of the Nueces River from FM 1025 south of Uvalde to its headwaters.

Segment 2113

There are no facility needs identified in the drainage area of the Frio River from U.S. 90 west of Knippa to its headwaters.

CHAPTER C

SUMMARY OF PLAN

The 208 planning process for the Nueces Basin consists of a series of steps which enable evaluation and selection of alternative abatement measures and the means to implement the measures. These planning steps include identifying problems, constraints, and priorities in meeting the 1983 goals of the Act, identifying possible solutions to problems, developing alternative plans to meet statutory requirements, analyzing alternative plans, and selecting an areawide plan.

This chapter summarizes the management and technical findings and recommendations developed from this planning process. Presented below are the 1983, 1990, and 2000 areawide management plans for the Nueces Basin, wasteload allocation for the water quality segments, the schedule to implement the plan, the institutional, legal, and financial requirements of the plan, stream standards, and plan update information requirements.

1. WASTELOAD ALLOCATIONS FOR WATER QUALITY SEGMENTS

The classification of stream segments as either Water Quality or Effluent Limiting is based upon 40 CFR Part 130.20. It states that a Water Quality Segment is one where the current water quality does not meet applicable water quality standards and/or is not expected to meet applicable water quality standards even after the application of the minimum effluent limitations required for municipal waste treatment systems and industrial waste systems. On the other hand, Effluent Limiting Segments are those where current water quality is meeting and will continue to meet applicable water quality standards or where there is adequate demonstration that water quality will meet applicable water quality standards after the application of the minimum effluent limitations for municipalities and industries.

None of the segments in the Nueces Basin Nondesignated Planning Area are currently classified as "Water Quality." As a result, no wasteload allocations were made for these segments.

2. 1983 PLAN

The development of the areawide water quality management plan for the Nueces Basin involves a systematic evaluation of alternative means to achieve the 1983 water quality goals as prescribed in the Federal Water Pollution Control Act Amendments of 1972. The planning process has integrated both technical needs for pollution abatement and management arrangements capable of implementing measures. The framework under which technical planning is carried out consists primarily of the point source subplan and nonpoint source subplan elements of the areawide plan. Management planning is conducted concurrently with the technical planning and involves selecting management agencies and developing appropriate institutional arrangement through which the plan can be implemented.

The federal requirements contained in Section 208 of P.L. 92-500 are the basis for this water quality management plan. Ten particular powers and functions derived from the listing contained in the Act are necessary in order to have an effective and approvable 208 plan. These ten powers and functions include planning, operating and maintenance of facilities, design and construction of facilities, finance, permitting and regulation of point sources, permitting and regulation of nonpoint sources, standard setting, enforcement, monitoring, and management and coordination. Because of the natural interaction among these functions, they can generally be grouped into three major categories consisting of (a) general management and regulatory, (b) treatment works management, and (c) nonpoint source control. Presented below are the management and technical requirements and features of the 1983 plan by these three major categories.

a. General Management and Regulatory

Findings.

(1) The functions and powers assigned to this group are planning, standard setting, permitting and regulation of point sources, monitoring, enforcement, and management and coordination.

(2) The TDWR is the only agency that meets all criteria and is presently performing these functions with participation of the EPA and regional and local governments. Existing statutes and policy have assigned most of these functions to the TDWR.

(3) The TDWR presently has the responsibility for 208 planning in nondesignated areas. Certain tasks under 208 planning have been performed under contractual arrangements by the Nueces River Authority for the TDWR in the Nueces Basin.

Recommendations.

(1) Statewide water quality and wastewater planning shall remain a function assigned to the TDWR. Certain planning tasks for the Nueces Basin can be delegated to the Nueces River Authority by contractual arrangements. The NRA desires to continue in its present role. Detailed planning for wastewater treatment facilities shall remain with those local entities responsible for treatment.

(2) Standard setting regarding water and wastewater shall remain federal and state responsibilities. The standard setting function of the TDWR is generally patterned after and has the approval of the EPA, which retains ultimate authority for program operation through periodic review and certification.

(3) Permitting and regulation of point sources shall be the responsibility of the TDWR in concert with EPA rules and regulations. The State shall continue to issue discharge permits in the Nueces Basin Planning Area, based on review and evaluations of existing stream quality and the waste allocations necessary to meet stream standards.

(4) Primary monitoring of stream quality, monitoring of effluent quality, and the identification of permit violations shall be a State responsibility. Routine effluent monitoring shall be carried out by the permit holder as part of a statewide self-reporting system. Although the prime responsibility for monitoring rests with the TDWR, there are many other entities involved in data collection, analysis, and evaluation.

(5) The TDWR shall have the prime responsibility for enforcement action under normal conditions. The EPA, however, retains ultimate authority in this area under P.L. 92-500, Title III, Standards and Enforcement.

(6) To ensure that all of the functions described in the Act are allocated and performed, selected management and coordination activities must be carried out. The TDWR shall have the prime responsibility for this function. Appropriate tasks within this general management and coordinations function can be delegated by the TDWR to the Nueces River Authority through contractual arrangments. The NRA desires to carry out the regional tasks of this activity

within the Nueces Basin. The Planning Advisory Committee will make important input regarding policy formulation.

b. Treatment Works Management

Findings.

(1) The functions assigned to this group include design and construction, operation and maintenance, and finance of the treatment facilities. The activities performed in this category are generally intensive and highly localized. State statutes and local governmental activities have traditionally recognized and assigned these functions and required their administration by local entities. In the Nueces Basin planning area, the agencies which currently perform these functions include local governments (cities and counties) and special districts.

(2) In order to carry out the structural control measures for point source pollution abatement, the Treatment Works Management Agencies (TWMA) must be designated in the plan. P.L. 92-500 requires that such agencies must have adequate authority to perform the functions assigned to this category.

(3) No significant water quality problems related to the treatment works management functions have been identified in the Nueces Basin planning area. With existing and proposed municipal wastewater treatment facilities operated to produce the required effluent quality and industrial wastewater treatment facilities operated at federally mandated standards, all segments in the basin are expected to meet the 1983 water quality goals under the low-flow critical conditions.

(4) Two segments in the basin are suspected to have potential point source related water quality problems within the planning period. A simplified modeling analysis performed by the TDWR for Atascosa River (Segment 2107) indicates possible DO violations below the Pleasanton discharge at the year 2000 projected flow. In the Leona River (Segment 2109), an analysis using the EPA simplified model predicts a localized DO problem from the Uvalde discharge in the year 2000.

(5) Most of the point source dischargers in the basin will be able to comply with their respective permits through 1983, when properly operated. Five municipal wastewater treatment facilities in the planning area, however, are projected to have potential problems in meeting their permit requirements by 1983, if additional capacities and/or improvements are not provided. As a result, the cities of Cotulla, Dilley, Hondo, Pearsall, and Lytle have been

identified as sewerage planning areas. Both technical and management alternative subplans were developed for these areas. These alternative plans are presented in the following chapter.

Recommendations.

(1) The 1983 plan recommends continuation of the treatment works management functions by local government. Upon designation as a TWMA, an entity shall be obligated to provide sufficient manpower, fiscal resources, and administrative expertise to assure that the customary tasks of facility management are properly discharged in accordance with the plan.

(2) The entities in the planning area which are recommended as designated TWMA for performing the functions assigned in this group are listed under Institutional and Legal Requirements as given in this chapter. The eligibility of designated TWMA to receive future federal construction grants will be evaluated by the planning agency and local clearing house at preapplication stage.

(3) Existing and proposed municipal and industrial dischargers in the Nueces Basin nondesignated area shall ensure proper operation and maintenance of their wastewater treatment facilities to conform with the permit requirements. Existing practices for disposition of residual wastes shall continue.

(4) An intensive monitoring survey to further document problem areas and wastewater loadings in Segment 2107 is recommended to be carried out in the continuing update process. Control measures will be developed only when the predicted problems are confirmed. The TDWR is recommended as the management agency to conduct this special survey program.

(5) Since the City of Uvalde is planning to utilize all the treated effluent for irrigation purpose, the impact of point source wasteload on Segment 2109 is expected to be minimal. If the no-discharge practice cannot be implemented by the City, a sampling program to monitor changing conditions in the segment should be carried out by the TDWR in the continuing update process to further define the potential problem.

(6) Based on the results of a public participation program conducted for this project and inputs from local governments, a final sewerage improvement plan has been developed for each of the five sewerage planning areas in the Nueces Basin planning area. These plans are presented as follows:

City of Cotulla. Expansion and upgrading of the existing sewerage system to accommodate the projected growth have been considered necessary for the City. Based on approved population estimates provided in the Basic Data Report, a moderate population increase from 3,600 people to 4,500 people is projected for Cotulla over the next twenty years. Based on the planning methodology, appoximately one lift station and 60 inch-miles of sewer will be needed to serve the projected population increase of 900 people. In order to meet the permit requirements and provide additional treatment capacity for future growth, it is recommended that the existing plant be abandoned and a new 0.45 mgd contact stabilization package plant with sludge drying beds be constructed. Sludge disposal would be by contract hauling. Total expenditure for these sewerage system improvements have been estimated to be approximately $1,083,000. Annual operation and maintenance cost will be about $75,000. Since the City of Cotulla has demonstrated adequate management competence in the past, the City is recommended for designation as the TWMA for this facility. Discussions with the Mayor and City Utilities Director indicated that the present population may have already reached 4,200 people, based on a number of water connections. Such a possibility should be documented for State review and approval as part of the next 208 plan update or as part of the 201 facility planning process.

City of Dilley. Consideration is given to improving the City's existing sewerage system. Approved population estimates in Volume I, Basic Data Report indicate a present population of 2,380 with no growth through the year 2000. Discussions with City officials have raised substantial question about this projection. The best current estimate by City representatives is an existing population of about 2,700, with an increase to 3,000 by the year 2008. The difference in projections should be resolved as part of the next update of the 208 plan or during 201 facility planning. For the purpose of this report, the originally approved population projections are used to estimate system requirements. Based on the criteria prescribed in the planning methodology, an addition of approximately 40 inch-miles of lines and one lift station is required to adequately serve the entire City. To improve the existing treatment facility, construction of a new 0.24 mgd contact stabilization package plant is considered as the most cost-effective alternative. Since the City currently holds a no-discharge permit, adoption of this alternative would require a permit revision. For the purpose of this plan, it is assumed that a permit change will be justified and made, although the actual

system to be selected will have to be identified through either the next 208 plan update or the 201 facility planning project. Total capital cost for these proposed sewerage system improvements are estimated to be about $674,000. Maintenance and operation costs are approximately $67,000 per year. The City is recommended for designation as the TWMA for this facility.

City of Hondo. The sewerage needs of the City are for additional collection and treatment capacity to serve the projected population increase of 1,800 people within the next twenty years. In addition, upgrading of existing treatment process is considered necessary for meeting the permit requirements. The required collection system improvements have been estimated to include approximately two lift stations and 108 inch-miles of lines. Construction of a new 0.77 mgd contact stabilization plant with effluent discharge has been identified as the most cost-effecive alternative. Since the City is currently holding a no-discharge permit, adoption of this cost-effective alternative would require a permit revision which must be justified through a special study to assure the stream water quality will not be adversely affected. For the purpose of this study, it is assumed that a permit change can be justified and made; however, the actual system to be selected will have to be identified through the 208 plan update or the 201 facility planning project. Preliminary cost estimates have shown the capital cost for the proposed sewerage system improvements to be approximately $1,629,000 and operation and maintenance cost to be about $125,800 per year. The City is recommended for designation as the TWMA for this facility.

City of Pearsall. Projected population growth in the City creates needs for additional collection and treatment capacity to serve 6,010 people by 1983 and 7,100 people in the year 2000. The required collection system improvements have been estimated to include approximately 95 inch-miles of gravity lines. The most cost-effective treatment system improvement alternative is the addition of a new 0.34 mgd extended aeration package plant similar to the system under construction. This alternative, however, would require a permit revision, since the City currently holds a no-discharge permit. For the purpose of this plan, it is assumed that a permit change will be justified and made, although the actual system to be selected will have to be identified through the 201 facility planning project or the next 208 plan update. Capital cost for the proposed sewerage improvements have been estimated to be approximately $1,398,000. Annual operation and maintenance costs

are about $50,000. The City is recommended for designation as the TWMA for this facility. Discussions with City officials indicated an upward adjustment of the approved present and future population of this study may be justified. However, revision of population estimates must await the next 208 plan update or the 201 facility plannning project.

City of Lytle. Additional collection and treatment capacity to serve 2,050 people by 1983 and 3,100 people in the year 2000 is needed for the City of Lytle. In addition, upgrading the existing treatment process to meet the permit requirement is also required. Based on the criteria prescribed in the planning methodology, approximately two lift stations and 105 inch-miles of lines will be needed. Abandonment of the existing pond system and construction of a new 0.31 mgd contact stablization plant with sludge drying beds have been considered as the most cost-effective treatment system improvement alternative. Total capital cost for these sewerage improvements has been estimated to be about $1,561,000. Annual operation and maintenance costs are approximately $115,400. The City is recommended for designation as the TWMA for this facility.

c. Nonpoint Source Control

Findings.

(1) P.L. 92-500 requires that nonpoint sources of water pollution be addressed as specific water quality concerns. However, at the present time the water quality effects of nonpoint sources are not well documented nor is the effectiveness of the control strategies proven.

(2) Although the State has authority to regulate the nonpoint sources activities, it has been the State's preference for the local government to carry out the nonpoint source control program.

(3) Based on the limited data and analytical technology currently available, no significant water quality problems related to nonpoint sources have been confirmed in the Nueces Basin planning area. All but two of the segments in the basin are projected to meet the 1983 goal under wet-weather conditions.

(4) Segments 2104 (Nueces River from Lake Corpus Christi headwater to Holland Dam southeast of Cotulla) and 2106

(Frio River from Nueces River confluence to U.S. 90 west of Knippa) are the only two segments in the basin identified as having potential water quality problems resulting from nonpoint source activities. However, it should be emphasized that the water quality model used to project the problem was developed by the EPA for dry-weather condition only, and relates particularly to point sources. There is no wet-weather (nonsteady state) model available for the segments at the present time.

Recommendations.

(1) The management system of the 1983 plan for nonpoint source control shall be retained by applicable local entities with the TDWR responsible for review and reporting technical study plans, problems, and progress toward solutions.

(2) Should the extent and causes of nonpoint sources of water pollution become defined before 1983, the plan shall be modified to allow the most effective governmental entity to become responsible for nonpoint source control. Local and state governments shall continue to respond to and comply with EPA regulations involving nonpoint sources such as urban runoff, major stormwater outfalls, and agricultural sources.

(3) Local and state governmental activities should encourage water quality improvement if causes and effects of nonpoint become known. These activities could include the following:

Texas Department of Water Resources
- Evaluate areas of nonpoint source concern and conduct sampling and special studies to verify problems and identify solutions.
- Develop, calibrate, and verify nonsteady state stream models.
- Provide assistance to communities and districts in developing nonpoint source control programs.
- Share technical and operational expertise and experience.

Local Governments
- Encourage improved enforcement of any existing ordinances or development of new ordinances regarding erosion control, anti-litter, leash laws, and building permits.
- Expand level of subdivision plat approval to include forms of nonpoint source control provisions.
- Perform required maintenance of sewer lines, storm sewers, drains, and drainage ditches.

(4) It is recommended that a wet-weather water quality monitoring program be initiated and a stormwater simulation (nonsteady state) model be developed for every segment in the basin to better define the nonpoint source problems in the planning area. Top priority should be assigned to Segments 2104 and 2106. An initial task for this special program will be to define the scope and assess the costs for sampling and analytical work as well as for model development. When sufficient field data become available through the monitoring program, these stormwater models shall be calibrated and verified. Should the verified model indicate any water quality problems in the segment, structural and/or nonstructural control measures then will be developed. Since the TDWR is presently performing the regulatory and monitoring functions, it is recommended that the State carry out this special study program.

3. 1990 PLAN

The 1990 plan, when put into effect, will have resulted from annual updates of the 1983 plan. The 1983 plan allows for refinements and revisions to be made on an annual basis. In addition, the 1983 plan provides for flexibility and adjustments based upon technical, financial, and management needs, capabilities, and limitations. It is envisioned that the basic framework of the 1990 plan will retain many of the same characteristics of the 1983 plan. For planning purposes, the 1990 plan will be discussed in accordance with the three major groupings that exist in the 1983 plan.

a. General Management and Regulatory

Little if any change is expected to occur in this functional group in the 1990 plan. It is envisioned that the State will upgrade stream standards and discharge permits to comply with more rigorous enforcement and regulatory activity at the federal level. This plan shall enable adjustment in treatment capacity and requirements for the local districts and treatment entities. The basic functions of permitting a point source, standard setting, monitoring, and enforcement will continue to be a primary function of the TDWR or its successor entity. For purposes of the current 1990 plan, the TDWR shall provide the management coordination function. However, it is envisioned that this management coordination function may gradually evolve towards a local management and coordinating council. This coordination function on a local basis will augment and provide input to the State management and coordination process.

In summary, the 1990 plan should be implemented using entities that exist at the time of plan formation and subsequent updates. The 1990 plan will make maximum use of the annual updates to the initial plan as it evolves.

b. Treatment Works Management

The design and construction, operation and maintenance, and finance of the wastewater treatment facilities shall continue to be retained as local responsibilities in the 1990 plan. These activities shall be in compliance and be updated to be consistent with local, state, and federal laws in force at the time of planned development. Annual revisions shall compensate for changes and laws requirements and technical treatment alternatives. The interface with the management and coordination agencies shall be increased and made more sensitive to the local participation and review process in its evolution from the 1983 plan to the 1990 plan.

c. Nonpoint Source Control

The 1990 plan will be adjusted to react to nonpoint source control problems identified between now and the completion of the 1983 plan. Presently, the clarity of nonpoint source problems is lacking. As the cause and effect of nonpoint source water pollution problems become identified, annual updates to this plan will reflect control strategies and requirements to effectively treat, minimize, and control their effects. The management of nonpoint source problems, however, shall be retained on a local basis primarily dealing with local laws and ordinances until such time as the scope of the cause of nonpoint source problems can be identified as being regional or statewide in nature. Should that occur, the plan for 1990 should reflect the level of government that can best accommodate resolution and control of these problems. In addition, the 1990 plan may require State control strategies and regulations to insure a full response to nonpoint source problems.

4. 2000 PLAN

The year 2000 plan, when put into effect, will have resulted from annual updates of the 1990 plan. The 1990 plan allows for refinements and revisions on an annual basis. In addition, the 1990 plan will provide for flexibility and adjustments based upon technical, financial, and management needs, capabilities, and limitations. It is envisioned that the basic framework of the 2000 plan will retain many of the same characteristics as the 1990 plan.

5. SCHEDULE OF IMPLEMENTATION

This section presents the implementation schedule of the major actions which must be taken by the designated management agencies to bring about implementation of the recommended technical and management plans. Table II-C-1 summarizes the schedule to carry out the activities recommended under each of these functional groups. Table II-C-2 summarizes the schedule of construction for the five sewerage planning areas.

TABLE II-C-1

Implementation Schedule for Nueces Basin Management Plan

PROGRAM	PROPOSED SCHEDULE	PRIME RESPONSIBILITY
GENERAL MANAGEMENT AND REGULATORY		
Permitting	1978-2000	TDWR
Standard Setting	1978-2000	TDWR
Monitoring	1978-2000	TDWR
Enforcement	1978-2000	TDWR
Data Base Update	1978-2000	TDWR
Public Participation Program	1978-2000	TDWR
Assistance to Local Governments	1978-2000	TDWR
Policy Decisions	1978-2000	TDWR
Coordination Assistance	1978-2000	TDWR
Fiscal Management	1978-2000	TDWR
Intensive Monitoring Survey for Segment 2107	1980-1982	TDWR
TREATMENT WORKS MANAGEMENT		
Operation and Maintenance	1978-2000	Designated Agencies
Financial Needs	1978-2000	Designated Agencies
Facility Construction Needs	See Table II-C-2	
NONPOINT SOURCE CONTROL		
Wet Weather Water Quality Monitoring		
Segments 2104 and 2106	1979-1980	TDWR
All Other Segments	1980-1982	TDWR

TABLE II-C-1 (Cont'd)

PROGRAM	PROPOSED SCHEDULE	PRIME RESPONSIBILITY
Development of Wet Weather Stream Model		
Segments 2104 and 2106	1979-1980	TDWR
All Other Segments	1980-1982	TDWR
Calibration and Verification of Model		
Segments 2104 and 2106	1980-1981	TDWR
All Other Segments	1982-1983	TDWR

TABLE II-C-2

Schedule of Construction for the Sewerage Planning Areas

Name	Proposed Action	Initiation Dates			
		Facility Planning	Detailed Design	Construction	Operation
City of Cotulla	Collection System Expansion	1980	1981	1982	1984
	STP* Expansion	1980	1981	1982	1983
City of Dilley	Collection System Expansion	1980	1981	1982	1984
	STP Expansion	1980	1981	1982	1983
City of Hondo	Collection System Expansion	1979	1980	1981	1983
	STP Expansion	1979	1980	1981	1983
City of Pearsall	Collection System Expansion	1980	1981	1982	1984
	STP Expansion	1980	1981	1982	1983
City of Lytle	Collection System Expansion	1979	1980	1981	1983
	STP Expansion	1979	1980	1981	1983

*Sewage Treatment Plant.

6. INSTITUTIONAL AND LEGAL REQUIREMENTS

This section identifies the distribution of responsibilities among the principal agencies involved in implementing the plan. The distribution represents the institutional arrangments necessary to meet federal, state, and local requirements regarding wastewater management. If there had been a need, this section would also have identified new legislation, ordinances, and agreements required to implement the plan. However, after review of existing law relating to wastewater management, it is clear that adequate authority is available for the various institutional arrangements to be carried out. For a detailed development of requirements, existing arrangements and alternatives refer to Appendix E, Legal Authority for Water Quality Management; and Appendix F, Financial Capability of Target Entities.

a. Federal Requirements

The federal requirements contained in Section 208 of P.L. 92-500 are the basis for the Nueces Basin management plan. These requirements state that particular powers are necessary in order to have an effective and approvable 208 plan. The list of powers and functions noted below is derived from the listing contained in the Federal Water Pollution Control Act Amendments Section 208 (b) (1) (A) - (I) as well as Section 208 (b) (2) and 204 (b) (1) (A) - (B). The powers and functions are as follows:

(1) Planning
(2) Operation and Maintenance of Facilities
(3) Design and Construction of Facilities
(4) Finance
(5) Permitting and Regulation of Point Sources
(6) Permitting and Regulation of Nonpoint Sources
(7) Standard Setting
(8) Enforcement
(9) Monitoring
(10) Management and Coordination

A series of guidance memoranda and regulations have been issued by EPA which further clarify the requirements and provide the framework for the management plan.

b. State Requirements

The Office of the Governor issued guidelines for management plan development and implementation. The guidelines of the Governor were designed to be compatible with federal requirements. The guidelines, as set forth for the most part in Executive Order Number 18-A, are summarized as follows:

(1) Overall responsibility for review and certification of 208 plans rests with the Governor.

(2) The 208 planning function in nondesignated areas such as the Nueces Basin is delegated to the TDWR.

(3) Participation of locally elected officials is through appointment by the Governor to a Planning Advisory Committee for each 208 planning area.

(4) The general management and coordination of 208 plans in nondesignated areas rests with the TDWR. Tasks within these functions consist of establishing the requirements, guidelines, and review for planning; providing liaison and coordination between the EPA and planning agencies; giving technical advice to planning agencies; insuring consistency of plans from one area to another; monitoring and reporting planning progress to the Governor; and submission of plans, designations, and other recommendations to the Governor for certification.

(5) Existing agencies and entities shall be used to the fullest extent that is consistent with legal authority in performing 208 management functions.

(6) Possible duplication of effort or jurisdictional conflicts must be minimized in attempting to meet requirements of 208 management functions.

(7) A major role will be played by the State in implementation of the 208 plans.

c. Local Requirements

Federal and State requirements are reflected in the characteristics given the greatest attention at the local level. Each of the ten wastewater management functions were assessed regarding the authority, capability, accountability,

and acceptability required at the local level to implement various aspects of the plan. Public participation activities and guidance by the Planning Advisory Committee provided the mechanism for screening alternatives and selecting the plan to be implemented.

d. General Management and Regulation

The implementation of the 208 plan will depend on the management agencies carrying out a number of related functions involving general management and regulatory tasks. The allocation of functions is summarized as follows:

Planning. All planning aspects regarding wastewater management within the nondesignated area must be analyzed and reviewed on an annual basis. The water quality concerns must be integrated with areawide plans. Detailed planning for wastewater treatment facilites is not included within this function, since it will remain with those local entities responsible for treatment. Statewide water quality and wastewater planning will remain a function assigned to the TDWR. The Nueces River Authority, which desires to continue in its present role, can be delegated certain planning tasks by contractual arrangements with the TDWR. The Nueces Basin Planning Advisory Committee will remain active to assure participation by local officials.

Standard Setting. Standard setting regarding water and wastewater are and will remain federal and state responsibilities. This function of standard setting must comply with EPA requirements and their review process. EPA is responsible for administering Sections 303, 306, and 307 of P.L. 92-500 which all refer to standards. The standard setting function of the TDWR is generally patterned after and has the approval of the EPA which retains ultimate authority for program operation through periodic review and certification.

Permitting and Regulation of Point Sources. State and federal law require each point source of wastewater to be regulated with respect to effluent quality standards and be compatible with water quality goals and the available assimulative capacity of the receiving stream. The State administers a waste control order (permit) program which parallels the federal National Pollutant Discharge Elimination System permitting process. Work is in progress to integrate the two programs into one permitting system.

Permitting and Regulation of Nonpoint Sources. Nonpoint source pollution has not been confirmed as a significant factor in the Nueces Basin nondesignated area. Consequently,

this function will not be specifically allocated until the nature and extent of such pollution is defined. The TDWR will coordinate the efforts to study and define the permitting and regulatory system for nonpoint source pollution.

Monitoring. Stream and effluent quality are monitored by the TDWR to determine whether standards and goals are being met. Routine effluent monitoring is carried out by the permit holder as part of a statewide self-reporting system. When violations are identified, an enforcement action could follow. The prime responsibility for monitoring rests with the TDWR, although there are many other entities involved in data collection, analysis, and evaluation.

Enforcement. When discharge standards are not met, a multiple agency involvement in an enforcement action could result. The various levels of government initiating the action could include municipalities, counties, regional authorities, the State, and the EPA. However, the TDWR is identified as having the prime responsibility for this function under normal conditions. The EPA retains ultimate authority in this area under P.L. 92-500, Title III, Standards and Enforcement.

Management and Coordination. To ensure that all of the functions described above are allocated and performed, selected management and coordination activities must be carried out. The objective is to monitor plan implementation and maintain a responsive position to a variety of inputs as the plan takes effect. The management and coordination function includes the primary responsibility for the policy decisions that impact the operation and coordination among treatment facilities, plans for new capacity, and other related water quality concerns. Prime responsibility for this function will rest with the TDWR. However, certain regional tasks within the Nueces Basin can be effectively carried out by the NRA under contractual arrangements with the TDWR. The NRA desires to participate in this function in the most appropriate manner. The Planning Advisory Committee will make important input regarding policy formulation.

e. Treatment Works Management

Pollution abatement and control measures involving structural solutions will depend on management agencies carrying out operational and financial responsibilities. To this end, TWMA(s) must be designated in the plan. P.L. 92-500 requires in Section 208 (c) (2) (C) that such agencies must have adequate authority "directly or by contract, to design

and construct new works, and to operate and maintain new and existing works as required by the plan ...." The law also requires in Section 208 (c) (2) (D) that these agencies shall have adequate authority "to accept and utilize grants, or other funds from any source for waste treatment management purposes." These responsibilities have been discussed in this Chapter and in Appendix E. These responsibilities also must include adequate authority and effective sanctions as described in P.L. 92-500, Section 208 (c) (2) (A-I). Upon designation as a TWMA, an entity is obligated to provide sufficient manpower, fiscal resources, and administrative expertise to assure that the customary tasks of facility management are properly discharged in accordance with the plan.

The experience and capability of jurisdictions responsible for facilities management functions under the plan have been documented. Each existing entity, as well as any one which may be formed in the future, is recommended for designation as a TWMA. A list of existing jurisdictions recommended for designation is as follows:

Asherton

Big Wells

Campbellton
Camp Wood
Carrizo Springs
Charlotte
Christine
Cotulla
Crystal City

Devine
Dilley

Freer
Freer Water Control & Improvement District

George West

Hondo

Jourdanton

Leakey
Lytle

Mathis
Medina County Water Control & Improvement District #2
(D'Hanis)
Medina County Water Control & Improvement District #3
(Natalia)

Natalia

Pearsall
Pleasanton
Poteet

Rocksprings

Sabinal

Three Rivers

Uvalde

7. FINANCIAL REQUIREMENTS

Water quality management activities require a range of financing capabilities as stated in P.L. 92-500, Section 208 (b) (2) (E). Adequate funding is a prerequisite to undertaking water pollution abatement actions, and therefore is a necessary element of this water quality management plan. The State (TDWR) is the planning agency designated by the Governor and is responsible for plan development and update and the funding thereof. The management agency shall be the TDWR with an emphasis toward increasing local involvement over time.

Financial requirements for water quality management involve three major sections of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500). Section 208 requires water quality planning, management, and coordination. Section 201 provides for grants for design and construction of publicly owned treatment works and affects the financial planning in a substantial number of communities and states. Section 204 requires the recipients of 201 construction grants to charge all users in proportion to use and to recover the proportional share of capacity cost from industrial users.

Pertinent regulations regarding financing of wastewater treatment facilities are found in 40 Code of Federal Regulations (CFR) B and 40 CFR 35. The more important federal regulations are summarized below:

° Contained in 40 CFR 35.208-2(a) (5) is the requirement that the planning agency must submit a statement that the planning process will become financially self-sustaining.

° In 40 CFR 13/.11(0) (2) the management agency must have adequate authority to:

  - accept or utilize grants from any source for waste treatment management or nonpoint source control;

  - raise revenues including the assessment of user charges;

  - incur short- and long-term indebtedness; and

  - assure that each entity or participating community pays its proportionate share of treatment costs.

- In 40 CFR 13/.11 (h) (1) municipal waste treatment system needs are required to be determined. The code requires that a program be conducted to provide necessary financial arrangements to develop required systems. Elements of this activity include:

  - definition of needs by five-year increments over at least a 20-year period; and

  - analysis of alternative waste treatment systems including total capital funding.

- Code 40 CFR 13/.11 (n) (1) requires the maintenance of a regulatory needs program. This activity requires the definition of regulatory approaches to water quality management, the statutory basis for the program, and the specification of relevant administrative and financial program aspects.

- Contained in 40 CFR 13/.11 (1) (3) are requirements to determine needs for urban and industrial stormwater systems. Costs must be determined for needs and the impacts of nonstructural strategies (ordinances) on annual capital and operating expenses determined.

The management entities in the 1983 plan will have adequate financial capability. Each of the local entities involved in treatment will be responsible for generating revenues and budgets for expending resources to implement approved plans. The State shall establish priorities for local entities to become eligible for federal 201 construction grants.

A number of considerations are directly related to financial capabilities. Factors such as legal, institutional, and managerial capability are interrelated with the financial function.

GRANTS

Through the Section 201 Construction Grant Program, federal funds are available for the construction of publicly owned wastewater treatment facilities. The P.L. 92-500 specifies several requirements that must be met prior to receiving a 201 grant. Among the requirements are cost-effectiveness analysis, provisions for reserve capacity, establishment of a user charge and industrial cost recovery system, and the legal, institutional, managerial, and financial adequacy of the entity responsible for design, construction, operation, and maintenance of treatment works.

FINANCING AND DEBT SERVICE

Wastewater treatment systems include the collecting, transmitting, treating, and disposal of wastewater or stormwater runoff. All treatment facilities incur costs for capital construction which requires debt service and operation maintenance and repair which requires charges to users proportional to use. In addition, the treatment system incurs administrative costs for planning, engineering, bookkeeping, accounting, and other forms of administrative control.

Capital costs for facility construction can be obtained, as applicable, from 201 federal grants, special state grants, local funds, or bond issues. Only with the federal 201 grants must the portion of capacity used by private industry be recovered. Operating and maintenance costs are covered by general revenues and service changes. The treatment entities shall comply with all local, regional, state, and federal laws regarding the receipt and use of funds.

USER CHARGE/INDUSTRIAL COST RECOVERY (UC/ICF)

To qualify for federal 201 construction grants, the publicly owned treatment facility must establish a user charge and industrial cost recovery system. Present and all future terms regarding financial arrangements shall be adhered to by the requesting local entities. For application, the local entity must:

° Ensure that financial and management arrangements comply with requirements;

° Explore alternative approaches to fulfill treatment requirements.

To ensure the financial and management arrangements comply with requirements, the TDWR shall perform the following:

° Assure that local entities and public officials have a timely plan for compliance with requirements;

° Assist in identifying and evaluating alternative means of complying;

° Provide for area, regional, and statewide actions necessary to achieve compliance, including the development of model ordinances.

Industrial cost recovery, as identified in Section 204, required industrial users of publicly owned treatment works to make annual payment for the portion of the cost of construction which is allocable to the treatment of their industrial wastes. Half of the funds generated through industrial cost recovery shall be retained by the local treatment entity. Of this retained amount, four-fifths must be utilized for future plant expansion and construction and one-fifth is discretionary.

TREATMENT CONSOLIDATION

Where consolidation of treatment system occurs, equitable acquisition and/or transfer of existing facilities and debt must occur. Emphasis shall be placed on timely and accurate resolution of financial areas involving valuation of existing facilities, compensation for facilities, and disposition of outstanding debt.

The creation or consolidation into more regionally oriented treatment facilities, from a financial perspective, must be based on the federal and State requirements in effect at the time of management action.

REGULATORY PROGRAMS

An important element of water quality management is regulatory programs. These programs have a part in non-structural strategies which minimize the likelihood or severity of water quality problems through laws, ordinances, compliance review, and penalties.

Costs of regulatory programs impact the budgets of the imposing agency, the treatment entity, and other participating agencies. Elements of cost include start-up costs, facilities costs, monitoring personnel costs, enforcement costs, and compliance agency assistance costs. Federal grants have been made available for the range of activity necessary to identify problems, define solutions, and implement control strategies. A major program for non-point source control strategies and regularatory programs is operated by the U.S. Department of Agriculture - Soil Conservation Service.

FINANCIAL ADMINISTRATION

Each local treatment entity (TWMA) shall be responsible for the maintenance of adequate financial planning and control activites. All applicable sources of financial

assistance shall be sought by local entities with necessary technical, planning, and administrative assistance provided by the TDWR.

The general steps involved in financial arrangements for water quality financing in the Nueces Basin nondesignated area for the 1983 plan are to produce, implement, and maintain a financial, operational, and physical plan. Annual updates to the Nueces Basin plan shall be made and revisions performed for the issuance of updated 1990 and 2000 plans.

IMPLEMENTATION

Implementation activities, schedules, and resources shall be jointly prepared by the local entities and the TDWR. From a financial perspective, there are two elements in implementation:

° An implementation schedule that relates plan priorities to financial resources; and

° A program budget that commits financial resources that are necessary to effect the plan in accordance with federal, State, and local requirements.

A detailed implementation plan will be prepared to indicate expenditure and revenue characteristics for an integrated program. This implementation plan will concentrate on near-term activities with the level of detail decreasing with time. The plan will identify annual requirements over a twenty-year period.

8. REQUIREMENTS FOR INFORMATION UPDATE

The 208 Water Quality Management Plan for the Nueces Basin Nondesignated Study Area has been developed from current and historical data available at the time of production. Development of the management plan was based on many elements influencing or determining the water quality in the basin. Several of these elements are expected to change, and projections of these factors to the end of the planning period have been used in compiling the Document. In order for the water quality management plan to remain relevant to the end of the planning period, the following five objectives should be accomplished: review of planning area boundaries, update of the data base, review of technical subplans, evaluate the nonpoint source management strategy, and review of stream standards and designations of segments.

Review of Planning Area Boundaries. It is recommended that consideration be given to reviewing the planning area boundaries at the beginning of each planning period. The review should incorporate the feedback from the public participation program and reflect the changes in existing and potential water quality problems.

Update of the Data Base. The elements which have been projected to the end of the planning period are population growth, industrial development, land use changes, and water use requirements. These projections are the basis for development of the 208 Water Quality Management Plan to the year 2000, and their accuracy will determine the usefullness of the plan. Because of the importance of the data base in achieving the goals of the 208 report, the data base should be updated on an annual basis.

Review of Technical Subplans. A review of technical subplans is recommended at the beginning of each planning period. This review should reflect changes in the data base and available technology for wastewater treatment. It is anticipated that plans developed from the best possible projections of information at this time will change before water quality objectives for the year 2000 can be met.

Evaluation of Nonpoint Source Management Strategies. The nonpoint source assessments and water quality data currently available indicate that nonpoint source controls are not

required at this time. As assessment techniques are refined, however, and more extensive water quality data become available, a need for nonpoint source management may become evident. A recommendation is made to continue to evaluate the potential for nonpoint source management strategies and to update the 208 Water Quality Management Plan to reflect any change in the loading estimates from nonpoint sources.

Review of Stream Standards and Designation of Segments. The existing water quality data and wasteload projections indicate that the overall water quality in the basin is good. No specific changes in stream standards or stream designations are recommended at this time. The stream standards and segment designations should be reviewed periodically, however, to determine whether water quality standards continue to be consistent with uses.

An update of the 208 Water Quality Management Plan may be required as information becomes available from citizen input, municipal census, or special study projects. Data from 201 facility plans, public hearings, environmental impact statements, and information on the cost of treatment should be included in the updates. Much of this data will be developed for purposes other than water quality management, and updating of the plan will require monitoring of the information developed by other public or private agencies.

In addition to the basic data, special studies are recommended to develop particular information necessary to a management plan. The following is an inventory of information gaps for those segments where additional studies are considered necessary.

Segment 2104

Some water quality violations have been observed in this segment. These violations include a low pH measured in March 1974 and two low DO concentrations recorded in November 1972 and August 1974. A nonpoint source wasteload analysis utilizing the EPA simplified steady-state model projects the possibility of DO violations in the segment during the planning period. It should be pointed out, however, that the water quality model used in projecting the problems was developed by the EPA for dry-weather conditions only and relates particularly to point sources. Currently no wet-weather (nonsteady state) model is available to predict the impact of nonpoint source wastes

on the segment. Development of a stormwater simulation model for the segment is therefore recommended so that the nonpoint source problem can be better defined. Should a calibrated and verified model indicate any water quality problems in the segment, structural and/or nonstructural control measures will be developed.

Segment 2105

The TDWR conducted an intensive monitoring survey for Segment 2105 in July 1977. The survey did not reveal any DO problems in the segment. However, since the survey did not cover Espantosa Slough, the effects of the Carrizo Springs and Crystal City discharges on the slough are unknown. It is therefore recommended that future monitoring be conducted in this area to determine the potential for water quality problems.

Segment 2106

Nonpoint source wasteload analysis performed for Segment 2106 indicates the possibility of DO violations in the segment within the planning period. However, the water quality model used in projecting the problem was developed by the EPA for dry-weather conditions and relates particularly to point sources. There is no wet-weather (nonsteady state) model available at the present time to predict the impact of nonpoint source wasteload on the segment. As with Segment 2104, development of a stormwater simulation model to better define the nonpoint source problem in this segment is recommended. A wet-weather water quality monitoring problem should be initiated to collect the necessary data for model calibration and verification. Should the verified model indicate any water quality problem in the segment, structural and/or nonstructural control measures then will be developed.

Segment 2107

A simplified modeling analysis recently performed by the TDWR for the segment indicates the possibility of a DO violation below the Pleasanton discharge at the year 2000 projected flow. To further document the problem areas and waste loadings, an intensive monitoring survey is recommended for this segment.

9. STREAM STANDARDS

The Texas Water Quality Standards report is the current revision of a document, Water Quality Requirements, which the TDWR staff developed in early 1967. In order to comply with the requirements of the Federal Water Pollution Control Act Amendments of 1972, the requirements were revised and approved by the EPA on October 25, 1973. The standards were amended, in part, on three occasions: in October 1974, January 1975, and October 1975. The EPA approved these revisions on February 9, 1976. A complete listing of the current standards set for the segments in the Nueces Basin planning area is included in Volume I, Chapter C, of this plan.

Based on the existing water quality data, wasteload projections, and analyses performed in this study, no specific recommendations for changes in stream standards can be made at this time. However, the TDH has raised the question of whether the water quality standards are compatible with the designated water uses in Segments 2104 and 2106. Waters in both segments have been used as direct or indirect sources for potable water supply, but the chlorides, sulfate, and total dissolved solids standards established for the segments are much higher than those allowed by the drinking water standards. It is therefore recommended that an evaluation for consistency of water uses and standards in Segments 2104 and 2106 be considered in the next water quality standards revisions.

CHAPTER D

SEGMENT SUMMARY

1. SEGMENT 2102

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2102. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2102.

(2) Physical Boundaries and Description. Segment 2102 is the Nueces River drainage area from Wesley Seale Dam downstream to the saltwater barrier near Calallen.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the Environmental Protection Agency (EPA) and the Texas Department of Water Resources (TDWR).

Regional agencies within Segment 2102 are the Nueces River Authority and the Coastal Bend Council of Governments.

There are portions of five counties within this segment: Bee, Jim Wells, Live Oak, Nueces, and San Patricio.

The City of Mathis is the only incorporated city in the segment.

Special districts include the Lower Nueces River Water Supply District, Bee County Soil and Water Conservation District, Live Oak Soil and Water Conservation District, Nueces-Jim Wells-Kleberg County Soil and Water Conservation District, the San Patricio Soil and Water Conservation District, the San Patricio County Drainage District, and the San Patricio County Municipal Utility District No. 1. Nueces County Water Control and Improvement District No. 3 (Robstown) may be partially within this segment.

(4) Water Quality Control Programs. Segment 2102 contains one Section 201 facility planning area, #1109-Mathis, and no sewerage planning areas. The segment is currently within the monitoring networks of the TDWR, U.S. Geological Service (USGS), and Texas Department of Health (TDH). There are no regional sewage treatment facilities or plans in the segment.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 2102. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Upper Nueces River Basin, and Appendix I, Segment Layouts with Nonpoint Source Inventory.

(2) Assessment. Nonpoint source activity in the drainage area of Segment 2102 is varied. There are 5 oil fields, 2 of which are active, and 14 combination oil and gas fields, 12 of which are active. Brine brought to or near the surface as a by-product of oil production can reach streams over the surface or through the ground. Oilfield brine poses potential water quality problems in terms of increasing the dissolved solids concentration in streams. There are six sand and gravel mining sites in the segment drainage area. The primary method of treating wastewater from sand and gravel mining is through the use of settling ponds. These are usually located adjacent to a stream, making proper treatment of the wastewater essential. Potential water quality changes which may result from sand and gravel operations include increases in total suspended solids and turbidity.

The city of Mathis in San Patricio County is the major source of urban runoff in the segment area with potential water quality problems. Waste disposal in the drainage area includes two animal feedlots and three areas serviced by septic tanks. A septic tank area is defined as an area which contains more than 100 people and has a density of greater than two dwellings per acre. Potential pollution problems include increased coliforms and dissolved oxygen reductions. The segment has a high sediment load potential resulting from agriculture relative to other segments in the study area. Agricultural runoff may contribute to increases in dissolved and suspended solids and/or short-term dissolved oxygen reductions. In 1974, the TDWR noted a dissolved oxygen violation in Segment 2102.

c. Wasteload Projections

This segment is classified as a Category II segment. Wasteloads are projected for point source discharges only.

No municipal dischargers are located in this segment. Discharge from the single industrial point source occurs only when rainfall runoff exceeds the capacity of the storage ponds. Self-reporting data indicate no discharge from the plant. As such, existing and projected wasteloads were assumed to be zero.

d. Wasteload Analysis

The portion of Nueces River from the discharge at Wesley Scale Dam to the saltwater barrier west of U.S. 77 near Calallen has been classified as "Effluent Limiting."

The desirable water uses designated for this segment are recreation, propagation of fish and wildlife, and domestic raw water supply. To accommodate these needs, the following water quality standards have been established for the segment:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	7.0 to 9.0
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	91°F
Chloride (not more than)	250 mg/l
Sulfate (not more than)	250 mg/l
Total Dissolved Solids (not more than)	500 mg/l

Presently, the segment does not have any point source wasteload contribution. Nonpoint source wasteloads to the segment are possibly attributed to oil and gas production, mining activity, septic tanks, animal feedlot operation, and agricultural runoff.

Existing water quality in the segment is generally good. Although a low DO concentration of 2.0 mg/l was observed in August 1974, the segment has maintained high annual average DO concentrations, ranging from 7.0 to 9.0 mg/l, in recent years. No apparent explanation was given for the 1974 violation; however, it could be the result of natural causes. Except for this observed DO violation, no other water quality problems were identified within this segment.

As no significant urban development is anticipated in this segment, point source wasteloads to the segment for the

year 2000 are projected to be negligible. Based on land-use projections for the year 2000, future nonpoint source activities in the drainage area of the segment are unlikely to change significantly. Since the existing nonpoint source discharges do not cause any known water quality violations, significant water quality problems are not anticipated in this segment through the planning period.

e. Sewerage Planning Area Alternative Plans

There are no sewerage planning areas in Segment 2102, and therefore no alternative plans have been developed.

2. SEGMENT 2103

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2103. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2103.

(2) Physical Boundaries and Description. Segment 2103 contains Lake Corpus Christi and the streams that drain into the lake which is located on the lower Nueces River.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Regional agencies within Segment 2103 are the Nueces River Authority, the San Antonio River Authority, the Coastal Bend Council of Governments, and the Alamo Area Council of Governments.

There are portions of six counties in the segment: Bee, Duval, Jim Wells, Karnes, Live Oak, and McMullen.

The City of George West is the only incorporated town in the segment.

Special districts include the Lower Nueces River Water Supply District, Bee County Soil and Water Conservation District, Live Oak Soil and Water Conservation District, Nueces-Jim Wells-Kleberg County Soil and Water Conservation District, Duval County Conservation and Reclamation District, Karnes County Soil and Water Conservation District, and the Agua Poquita Soil and Water Conservation District.

(4) Water Quality Control Programs. Segment 2103 contains no Section 201 facility planning areas, no sewerage planning areas, and no regional sewage treatment facilities or plans. The segment is currently within the monitoring networks of TDWR, TDH, and USGS.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 2103. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Upper Nueces River Basin and Appendix I, Segment Layouts with Nonpoint Source Inventory.

(2) Assessment. Segment 2103 is potentially influenced by several nonpoint source activities. Extensive oil and gas production is found in the area, including 9 active gas fields, 9 oil fields, 5 of which are active, and 49 combination oil and gas fields, 37 of which are active. Oilfield brine may adversely affect groundwater or surface water quality in terms of increases in total dissolved solids and total suspended solids. There are five secondary recovery projects in the area using saltwater injection, four active and one abandoned. Salt water can be injected underground to facilitate further oil extraction and abate pollution; however, injected brine may move upward along fault zones and eventually reach surface streams or further concentrate dissolved solids in groundwater supplies. In addition, brine from abandoned wells and unplugged or improperly plugged test holes may contribute to the salinity of streams. There are seven active uranium mines in the drainage area of Segment 2103. Mineral extraction and surface runoff at these sites can potentially degrade water quality with increases in suspended and dissolved solids and various toxicants.

There are four sanitary landfills, three septic tank areas, and one animal feedlot in the drainage area which can potentially affect water quality with increases in coliforms and dissolved solids or dissolved oxygen reductions. An even greater potential for adverse water quality effects may exist as a result of unauthorized solid waste sites which apparently have developed from recreational activity in the vicinity of Lake Corpus Christi. A recent TDH survey has revealed 13 illegal sites in this area. There is also one no-discharge treatment plant where effluent cannot be released directly into the watercourse. The City of George West in Live Oak County is the major source of urban stormwater runoff with potential water quality problems. Construction-related nonpoint source pollution poses little problem, with one on-going operation in the watershed; any

effects would be localized. Segment 2103 has a low sediment load potential resulting from agricultural activity relative to other segments in the study area. Agricultural runoff may contribute to increases in suspended and dissolved solids and/or short-term dissolved oxygen reductions.

c. Wasteload Projections

This segment is classified as a Category IV segment. Wasteloads are projected for point sources. Nonpoint source impact assessment is presented in Appendix D, Results of Special Studies in Intensive Planning Areas.

There are two municipal but no industrial point source discharges in the segment. The wasteload contribution from these existing municipal sources amounts to approximately 108 pounds per day (lbs/day) of 5-day Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS), respectively. These loads are projected to nearly double by the year 2000, with the most significant increase occurring between now and 1983. The existing and projected wasteloads to the segment are summarized below.

Planning Year	BOD (lb/day)	TSS (lb/day)
Existing	108	108
1983	190	190
1990	195	195
2000	198	198

A more detailed breakdown of these loads is presented in Appendix K as well as a discussion of the methodology used.

d. Wasteload Analysis

Lake Corpus Christi is classified as an "Effluent Limiting" segment and has water uses for recreation, propagation of fish and wildlife, and domestic raw water supply. The water quality standards for the segment are established as follows:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	7.0 to 9.0
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	93°F
Chloride (not more than)	250 mg/l
Sulfate (not more than)	250 mg/l
Total Dissolved Solids (not more than)	500 mg/l

Two point sources currently discharge a total oxygen demand of 310 lbs/day to the segment. Both dischargers are located within a five-mile distance from the lake. Nonpoint source wasteloads to the segment are possibly attributed to oil and gas production, mining activity, sanitary landfills, septic tank operation, agricultural runoff, and urban stormwater runoff.

The lake exhibited two pH violations, 6.6 and 6.7, in March and September of 1974. The two pH violations were much lower than the normal pH range of 7.3 to 8.9 exhibited by the lake. From the available water quality data, the cause of these two low pH measurements was not determinable. No violations of other water quality parameters were identified within this segment. However, due to the increased residential development around the lake, some eutrophication conditions, along with increased sedimentation and septic tank-related problems, were observed in the lake. The segment was therefore designated as an intensive study area. Sampling programs are currently underway to collect the necessary data to determine the effects of the residential development on water quality in the lake. Upon completion of this special study, the results of the analysis will be provided as a technical appendix to the final plan.

Based on an analysis recently performed by the TDWR for Segment 2103, treatment levels of 10 mg/l BOD and 15 mg/l TSS are recommended for the cities of George West and Mathis. The policy for effluent standards for domestic wastewater treatment plants governs those discharges within five miles of a lake which serves as a source for domestic drinking water.

e. Sewerage Planning Area Alternative Plans

There are no sewerage planning areas located in this segment; thus, no alternative plans were developed.

3. SEGMENT 2104

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2104. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2104.

(2) Physical Boundaries and Description. Segment 2104 is the Nueces River drainage area from the headwaters of Lake Corpus Christi in central Live Oak County to Holland Dam southeast of Cotulla in LaSalle County.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Regional agencies within Segment 2104 are the Nueces River Authority, the Coastal Bend Council of Governments, the Middle Rio Grande Development Council, and the South Texas Development Council.

There are portions of six counties in Segment 2104: Dimmit, Duval, LaSalle, Live Oak, McMullen, and Webb.

The City of Freer is the only incorporated town in the segment.

Special districts include the Dimmit County Soil and Water Conservation District, Duval County Conservation and Reclamation District, Freer Water Control and Improvement District, LaSalle County Water Improvement District No. 1, Webb County Conservation and Reclamation District, Webb Soil and Water Conservation District, Dos Rios Soil and Water Conservation District, and Agua Poquita Soil and Water Conservation District.

(4) Water Quality Control Programs. Segment 2104 contains no Section 201 facility planning areas, no sewerage planning areas, and no regional sewage treatment facilities or plans. The segment is currently within the monitoring networks of TWQB, TDH, and USGS.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 2104. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Upper Nueces River Basin, and Appendix I, Segment Layouts with Nonpoint Source Inventory.

(2) Assessment. Oil and gas production is the principal nonpoint source activity in the drainage area of Segment 2104. There are 15 oil fields, half of which are active, 3 active gas fields, and 44 combination oil and gas fields, 39 of which are active. Large amounts of brine brought to or near the surface as a byproduct of oil production can reach streams over the surface or through the ground. In addition, leakage of brine from abandoned wells can increase the salinity of surface waters. There are 14 active and 4 abandoned secondary recovery projects using saltwater injection. Salt water can be injected underground to facilitate further oil extraction and abate pollution; however, injected brine may move upward along fault zones and eventually reach surface streams. Other mining activity in the drainage area includes nine sandstone and uranium mines, seven of which are active. Mineral extraction and surface runoff at these sites may contribute to water quality impairment. Potential changes include increases in suspended and dissolved solids and various toxicants.

There are eight sanitary landfills, six municipal and two industrial, one septic tank area, and two animal feedlots. Water quality changes can take the form of increases in coliforms and dissolved solids or dissolved oxygen reductions. Dissolved oxygen and pH violations were noted for Segment 2104 by the TDWR in 1974, possibly related to waste disposal. There are two ongoing construction operations in La Salle County near Encinal. The major water pollutant generated by construction activity is suspended sediment. Oils and greases at these sites also contribute to changes in water quality. Urban stormwater runoff from Three Rivers in Live Oak County and Freer in Duval County can potentially affect water quality.

c. Wasteload Projections

This segment is classified as a Category IV segment. Wasteloads are projected for both point and nonpoint sources.

(1) Point Sources. There is one municipal wastewater treatment plant located in the segment. This municipal plant operates on a no-discharge basis; as such, no projections of wasteloads were made. There are no industrial discharges into this segment.

(2) Nonpoint Sources. For Segment 2104 a detailed assessment of potential pollution consequences was undertaken, based upon the predominant nonpoint source activity, namely agriculture/silviculture. Mining, waste disposal, and urban runoff can also potentially contribute to nonpoint source pollution; however, these sources were judged less significant than agriculture in overall effect. The predominance of agricultural land and rangeland in the segment drainage area permitted the potential for nonpoint source pollution to be assessed in terms of sediment contributed to the main river segment. The drainage area of Segment 2104 was subdivided into 15 subcatchment areas on the basis of similarities in topography, land uses, and soils. The Modified Universal Soil Loss Equation was applied to each subcatchment area to arrive at sediment loads generated during the critical season of the year. (The procedures for selecting the critical season and determining the sediment loads is discussed in Appendix G, Nonpoint Source Assessment Methodology.) The main river segment, the Nueces River from Lake Corpus Christi headwater to Holland Dam, was marked off at specific points of impact where the loads ultimately reach the numbered segment. At these points, average streamflows were also determined for the critical season. Tables 1 and 3 of Appendix J contain the parameters of the soil loss equation and the resultant sediment loads.

d. Wasteload Analysis

Segment 2104, the reach of the Nueces River from Lake Corpus Christi headwaters to Holland Dam southeast of Cotulla, has been classified as "Effluent Limiting." The desirable water uses designated for the segment are noncontact recreation and propogation of fish and wildlife. In designating desirable uses, consideration should also be given to the impact of river water on Lake Corpus Christi, which is a potable water supply source. The TDH asks that water quality standards for Segment 2104 be set as near to those of drinking water standards as is practical. Water quality standards established for the segment are as follows:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	7.0 to 9.0
Coliform (log. avg. not more than)	1,000 FECAL/100 ml

Temperature	90°F
Chloride (not more than)	700 mg/l
Sulfate (not more than)	300 mg/l
Total Dissolved Solids (not more than)	1,500 mg/l

The segment does not have any point source wasteload contribution at the present time. Agriculture and oil and gas production are the principal nonpoint source activities in the drainage area of the segment. Other nonpoint source wasteloads are possibly contributed from mining activity, sanitary land fills, septic tank operation, animal feedlots, and urban stormwater runoff.

Some water quality violations have been observed in this segment. A pH violation was recorded in March 1974, with a low pH of 6.6. Two DO violations were found in November 1972 and August 1974, respectively. The first DO violation occurred during low flow conditions, while the second violation happened under extremely high flow conditions. The specific source of these two DO violations is not known at this time.

Since no point sources are projected to discharge wastes into the segment by the year 2000, water quality problems resulting from point source discharges are not anticipated within the planning period.

To evaluate the impact of the projected nonpoint source loads at the critical season average flow conditions, an analysis utilizing the EPA simplified steady-state model was performed. The analysis predicts that violation of DO standards will occur in most parts of the segment. In light of the limited data available and the simplified assumptions used in the analysis, however, these calculated violations should be considered only as a preliminary indication of potential problems rather than a projection of actual DO levels in the stream. A more detailed study to better determine the sources and impact of these nonpoint source wasteloads on Segment 2104 is necessary before any conclusions can be drawn. It is therefore recommended that a special study be performed by the Nueces River Authority, under contract with, and funded by, the Texas Department of Water Resources, for Segment 2104.

e. Sewerage Planning Area Alternative Plans

There are no sewerage planning areas located in this segment; thus, no alternative plans were developed.

4. SEGMENT 2105

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2105. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2105.

(2) Physical Boundaries and Description. Segment 2105 is the Nueces River drainage area from Holland Dam, southeast of Cotulla, to FM 1025 north of Crystal City in Zavala County.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Regional agencies within Segment 2105 are the Nueces River Authority, the Middle Rio Grande Development Council, the South Texas Development Council, and the Edwards Underground Water District.

There are portions of seven counties in Segment 2105: Dimmit, Kinney, LaSalle, Maverick, Uvalde, Webb, and Zavala.

Incorporated towns in the segment are the cities of Asherton, Carrizo Springs, Cotulla, Crystal City, and Big Wells.

Special districts include the Chaparral Soil and Water Conservation District, Dimmit Soil and Water Conservation District, Dos Rios Soil and Water Conservation District, LsSalle County Water Improvement District No. 1, Nueces-Frio-Sabinal Soil and Water Conservation District, Webb County Conservation and Reclamation District, Webb Soil and Water Conservation District, West Nueces-Las Moras Soil and Water Conservation District, Winter Garden Soil and Water Conservation District, and Zavala-Dimmit Counties Water Improvement District No. 1.

(4) Water Quality Control Programs. Segment 2105 contains no 201 facility planning areas. The City of Cotulla is the only sewerage planning area in the segment. There are no regional sewage treatment facilities or plans. The segment is currently within the monitoring networks of TDWR, TDH, and USGS.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities and related waste loadings in Segment 2105. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Upper Nueces River Basin, and Appendix I, Segment Layouts With Nonpoint Source Inventory.

(2) Assessment. Segment 2105 is potentially influenced by several nonpoint source activities. There are eight sanitary landfills, four animal feedlots, three areas serviced by septic tanks, and one no-discharge treatment plant. These forms of waste disposal potentially contribute to increases in coliforms and dissolved solids or dissolved oxygen reductions. Oil and gas production is concentrated in the western portions of the drainage area. There are 17 fields, 12 of which are active. Oilfield brine can potentially alter the quality of both surface and groundwater supplies. There are five active secondary recovery projects using saltwater injection. Salt water can be injected underground to facilitate further oil extraction and also serve as a means of pollution abatement; however, injected brine may move upward along fault zones and eventually reach surface waters. There are two active mines from which surface runoff can be a potential source of water pollutants.

Urban stormwater runoff can be a potential source of pollution in the cities of Cotulla, Carrizo Springs, and Crystal City. Table II-D-1 gives an indication of urban pollutant loads as measured by average daily dust and dirt accumulation. Construction activity is currently found at three sites in Uvalde and Zavala counties. The effects of these operations are likely to be localized. Segment 2105 presently has a low sediment load potential resulting from agricultural activity relative to other segments in the basin.

c. Wasteload Projections. This segment is classified as a Category IV segment. Wasteloads are projected for point sources. Nonpoint source impact assessment is presented in Appendix D, Results of Special Studies in Intensive Planning Areas.

There are three municipal sources and one industrial source which discharge into this segment. A new municipal treatment plant is scheduled to be constructed in 1978 to serve

TABLE II-D-1

SELECTED URBAN AREAS IN THE NUECES BASIN[1]

SEGMENT	COUNTY	URBAN AREA	1970 POPULATION	AREA (ACRES)	POPULATION DENSITY	CURB MILES	POLLUTANT LOAD (x 10^3)
2102	San Patricio	Mathis	5351	1190	4.5	56.3	8.8
2102	San Patricio	Odem	2130	372	5.7	19.7	3.1
2103	Live Oak	George West	2022	930	2.2	30.0	4.7
2104	Live Oak	Three Rivers	1761	790	2.2	25.4	4.0
2104	Duval	Freer	2804	930	3.0	35.2	5.5
2105	La Salle	Cotulla	3415	1160	2.9	44.0	6.9
2105	Dimmitt	Carrizo Springs	5374	1466	3.7	63.8	10.0
2105	Zavala	Crystal City	8104	1861	4.4	88.1	13.7
2106	Medina	Hondo	5487	3258	1.7	98.7	15.4
2106	Frio	Dilley	2362	930	2.5	31.7	4.9
2107	Atascosa	Jourdanton	1841	910	2.0	29.3	4.6
2107	Atascosa	Lytle	1271	2560	0.5	58.2	9.1
2107	Atascosa	Pleasanton	5407	1861	2.9	70.5	11.0
2107	Atascosa	Poteet	3013	930	3.2	37.0	5.8
2108	Frio	Pearsall	5545	2610	2.1	84.0	13.1
2108	Medina	Devine	3311	2234	1.5	67.7	10.6
2108	Medina	Natalia	1296	930	1.4	28.2	4.4
2108	Atascosa	Charlotte	1329	1120	1.2	29.7	4.6
2109	Uvalde	Uvalde	10764	2200	4.9	112.5	17.6
2110	Uvalde	Sabinal	1554	640	2.4	21.8	3.4
2112	Edwards	Rocksprings	1221	350	3.5	14.7	2.3

[1]Average daily dust and dirt accumulation in lbs./curb mile/day.

the needs of the City of Asherton. The municipal loads are projected to increase approximately 35 percent by the year 2000. The industrial TSS load is expected to increase appreciably from an existing load of 9 lbs/day to approximately 60 lbs/day by the year 2000, and the industrial BOD load is projected to increase from 5 lbs/day to 14 lbs/day during that period. The differences in the industrial BOD and TSS loads are due to different treatment requirements specified by the existing permit. The following is a summary of the existing and projected wasteloads.

	BOD (lbs/day)			TSS (lbs/day)		
Planning Year	Mun.	Ind.	Total	Mun.	Ind.	Total
Existing	351	5	356	413	9	422
1983	496	7	503	496	31	527
1990	506	10	516	506	41	547
2000	527	14	541	527	60	587

A more detailed breakdown of these loads is presented in Appendix K, as well as a discussion of the methodology used.

d. Wasteload Analysis

Segment 2105 is the stretch of the Nueces River from Holland Dam southeast of Cotulla to FM 1025 south of Uvalde. The segment is classified as "Effluent Limiting" and the desirable uses are for recreation, propagation of fish and wildlife, and domestic raw water supply. The water quality standards established for the segment are as follows:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	7.0 to 9.0
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	90°F
Chloride (not more than)	200 mg/l
Sulfate (not more than)	200 mg/l
Total Dissolved Solids (not more than)	900 mg/l

An Intensive Monitoring Survey of this segment conducted by the TDWR Special Studies staff during July 1977 did not reveal any dissolved oxygen problems in this segment. The significant dischargers, Carrizo Springs and Crystal City, both discharge into normally dry tributaries which drain into Espantosa Slough 10-14 miles from the Nueces River. Flow in this segment of the Nueces River is altered by Boynton Reservoir (one of several in the segment) which is an irrigation diversion reservoir. Water which is backed up above the reservoir flows down Espantosa Slough (locally known as Rock Quarry Slough). The diverted water then flows

into Soldier Slough before emptying back into the Nueces River. The above-mentioned survey did not cover Espantosa Slough. Therefore the effects of the Carrizo Springs and Crystal City discharges on the sloughs are unknown. Future monitoring should be conducted in this area to determine the potential for water quality problems. Treatment levels of 20 mg/l BOD and 20 mg/l TSS are recommended for this segment by the TDWR.

Segment 2105 contains a truck farming area known as the Winter Garden region, which experiences intensive farming, and therefore the use of chemicals, pesticides, and herbicides. During wet periods, runoff does occur in this area. Further, the irrigated truck farming activity uses groundwater with a high mineral content; through irrigation, this water further increases in total dissolved solids (TDS) and, if returned to the stream, could result in high TDS levels in the segment. Segment 2105 was therefore designated as an intensive study area, and a sampling program has been initiated to verify the nonpoint source loadings contributing to the relatively high chlorides and TDS in the segment, especially in the Winter Garden area. Upon completion of the special study, the results of this analysis will be presented as a technical appendix to the final plan.

e. Alternative Plans for the City of Cotulla Sewerage Planning Area

The City of Cotulla is an incorporated general law municipality located in the western portion of LaSalle County. Land use for the City is characterized by scattered residential development and concentrated commercial and public facilities in the central areas of the City and along major thoroughfares. The economic resource base is primarily agriculatural with no known significant industrial contribution. Planning methodology projects a moderate population increase from 3,600 to 4,500 people for Cotulla over the next twenty years. However, discussions with the Mayor and City Utilities Director indicated that the present population may have already reached 4,200 people, based on a number of water connections. Such a possibility should be documented for State review and approval as part of the next 208 plan update or as part of the 201 facility planning process. For the purpose of this current plan, population estimates must remain as originally approved in Volume I, Basic Data Report. The population estimates for the planning years are as follows:

Year	Existing	1983	1990	2000
Population	3,600	3,890	4,100	4,500

The existing sewage collection system of the City is comprised of 6-inch laterals, 8- and 10-inch trunk lines, and a 12-inch outfall sewer. The system serves the entire City with adequate capacity and there are no significant areas of town where septic tanks are the primary means of sewage disposal. However, infiltration problems were observed during heavy rains due to old lines. To serve the projected population growth, the system would need expansion within the planning period.

The City's existing wastewater treatment plant consists of a clarigester, two sludge drying beds, and a 10-acre oxidation lagoon. The plant has a design capacity of 0.287 mgd. Although the facility is not hydraulically overloaded at the present time, it is not producing the required effluent quality of Effluent Set 1 (20 mg/l BOD_5, 20 mg/l TSS). The inferior effluent quality is basically due to inadequacy of the existing treatment process, since the oxidation lagoon system generally cannot achieve the treatment level of Effluent Set 1. An additional factor compounding poor system performance is channelized short circuiting of wastewater through the lagoon.

In order to meet the permit requirements and provide additional capacity for future growth, the existing treatment facility has to be modified and expanded.

(1) Structural Alternatives

(a) Collection System. Since the existing collection system has adequately served the current needs, expansion of the collection lines is needed only for future growth. The additional capacity required would serve the projected population increase of 900 people within the next twenty years. The expansion of the existing system will most likely continue to consist of gravity lines and pump stations at appropriate locations. Construction of needed facilities will probably take place in a single phase, considering the moderate population increase.

Based on a statewide methodology, Water Quality Management Planning Methodology for Municipal Waste Treatment Needs Assessment, an analysis for collection system requirements was made. The required improvements have been estimated to include approximately one lift station and 60 inch-miles of sewer lines. It should be emphasized that the analysis made in this study is not intended to replace a full engineering study, but rather to serve as a basis for estimating the approximate costs of the projected system improvements.

(b) Treatment and Disposal. There are generally three broad options available for disposal of sewage from the Cutulla service area. These options are (1) treatment and discharge, (2) treatment and reuse, and (3) land application. Since there are few industries in the area, reuse of treated wastewater for industrial processes is of little potential. Further, factors such as public health, soil conditions, and economic considerations make the reuse of treated water as a potable water source or groundwater recharge infeasible.

Therefore, only treatment and discharge and land application of sewage effluent are considered in this analysis. Based on the statewide methodology mentioned previously, two structural alternatives were developed from these two broad options for the City of Cotulla.

Alternative 1. This alternative includes abandonment of the existing plant and construction of a new 0.45 mgd prefabricated contact stabilization package plant with sludge drying

beds. The package plant would include units for preliminary treatment, aeration and reaeration, final clarification, disinfection, and aerobic digestion. Sludge disposal would be by contract hauling.

Alternative 2. Land application of sewage effluent is considered in this alternative. Construction of 0.45 mgd capacity units for primary treatment and disinfection would be required. Spray irrigation facility, additional sludge drying beds, and approximately 150 acres of land would be needed. The existing clarigester would be converted to an aerobic sludge digester and the oxidation pond would be utilized as a holding pond. The treated and chlorinated effluent is to be sprayed over the irrigation field, resulting in no discharge from the plant. Sludge disposal would be by contract hauling.

It is emphasized that these two alternatives shown are from a prescribed list given in the State methodology, and presentation of the two alternatives is not intended to eliminate any viable alternative from use for this location, but rather to limit for planning purposes the number of possible solutions to those which offer a meaningful difference in various project costs. The options presented should be understood in the context of being representative examples of reasonable planning level solutions and costs.

(2) Management Alternatives. Management functions which most directly apply to the structural alternatives are operation, maintenance, design, construction, and financial. At the present time, the City of Cotulla has the authority and is performing these functions relative to sewage treatment within its boundaries. There are alternatives open to the City for performing by other arrangements any or all of these management functions, if the City would so desire. Intergovernmental devices allow for contracting of these functions between districts, cities, and regional authorities.

(3) Costs of Alternatives. Based on the State methodology referenced previously, costs for collection and treatment alternatives were estimated. For each alternative, capital cost, operation and maintenance cost, and annualized total and per capita costs (with and without EPA grants) were calculated. All costs are given in terms of 1977 dollars and presented in Table II-D-2. The interest rate used in this analysis is 6-3/8 percent and the service life of all equipment and structures is assumed equal to 20 years. The capital costs are assumed to be incurred in 1980 and are

TABLE II-D-2

COSTS OF TECHNICAL ALTERNATIVE PLANS FOR

CITY OF COTULLA

	Alternative 1	Alternative 2 (Land cost included)	Alternative 2 (Land cost excluded)
Capital Cost			
Collection System	$ 651,000	$ 651,000	$ 651,000
Treatment Plant	432,000	1,480,000	1,276,000
Total	$1,083,000	$2,131,000	$1,927,000
O & M Cost			
Collection System	$ 22,800/yr	$ 22,800/yr	$ 22,800/yr
Treatment Plant	52,600/yr	56,500/yr	56,500/yr
Total	$ 75,400/yr	$ 79,300/yr	$ 79,300/yr
Annualized Cost			
Without Grant			
Total	$ 172,700/yr	$ 270,700/yr	$ 252,500/yr
Per Capita	$ 46/yr	$ 72/yr	$ 67/yr
With Grant			
Total	$ 99,700/yr	$ 127,000/yr	$ 122,600/yr
Per Capita	$ 26/yr	$ 34/yr	$ 32/yr

spread over the projected population for the same year as the basis for calculating the annualized per capita costs.

(4) Impacts of Alternatives. The monetary cost for the developed alternatives is only one of several aspects which should be considered in selecting the most beneficial alternative. The environmental, social, and economic impacts of these alternatives should also be evaluated. These nonmonetary costs or impacts are presented in Table II-D-3. The summarized impacts do not indicate any adverse or unusual effects that could be expected from implementation of any of these alternatives.

TABLE II-D-3

IMPACTS FOR TECHNICAL ALTERNATIVE PLANS FOR

CITY OF COTULLA

Criterion	Alternative 1	Alternative 2
Electricity Use	Approx. 550,000 KWH/yr	Approx. 433,000 KWH/yr
Chemical Use	6.8 tons Chlorine per yr.	17.1 tons Chlorin per yr.
Manpower Requirements	2.1 man-yr/yr	2.5 man-yr/yr
Land Requirements	Existing plant site	Approximately 150 acres
Aesthetics	Visual impression will be matter of good architectural design and site maintenance.	Land disposal site could be utilized as green belt.
Local Health	Local health improved because of better effluent quality.	Local health improved because of no effluent discharges.
Sensitive Ecosystems	Temporary disruption of plant site for construction.	Amount of land required could cause destruction of habitat and cause land use shift.
Air Quality	No serious odor problem anticipated if properly operated	No serious odor problem anticipated if properly operated.

5. SEGMENT 2106

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2106. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2106.

(2) Physical Boundaries and Description. Segment 2106 is the Frio River drainage area from its confluence with the Nueces River in Live Oak County upstream to U.S. 90 west of Knippa.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Reginal agencies within Segment 2106 include the Nueces River Authority, Alamo Area Council of Governments, Middle Rio Grande Development Council, Coastal Bend Council of Governments, and the Edwards Underground Water District.

There are portions of ten counties in Segment 2106: Atascosa, Bandera, Dimmit, Frio, Live Oak, LaSalle, McMullen, Medina, Uvalde, and Zavala.

Incorporated towns in the segment include the cities of Dilley, Pearsall, Three Rivers, and Hondo.

Special districts include the Bandera County River Authority, Bandera Soil and Water Conservation District, Dimmit County Soil and Water Conservation District, Dos Rios Soil and Water Conservation District, LaSalle County Water Improvement District No. 1, LaSalle-McMullen Counties Water Control and Improvement District No. 1 (Los Angeles), Live Oak Soil and Water Conservation District, McMullen County Water Control and Improvement District No. 1 (Tilden), McMullen County Water Control and Improvement District No. 2 (Calliham), Medina County Water Control and Improvement District No. 2 (D'Hanis), Medina Valley Soil and Water Conservation District, Nueces-Frio-Sabinal Soil and Water Conservation District, Winter Garden Soil and Water Conservation District, Three Rivers Water District, and the Evergreen Underground Water Conservation District.

(4) Water Quality Control Programs. Segment 2106 contains no 201 facility planning areas and no regional sewage treatment facilities or plans. It contains three sewerage planning areas, being the cities of Hondo, Dilley, and Pearsall. The segment is currently within the monitoring networks of TDWR, TDH, and USGS.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities and related waste-loadings in Segment 2106. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Upper Nueces River Basin, and Appendix I, Segment Layouts With Nonpoint Source Inventory.

(2) Assessment. Nonpoint source activity in the drainage area of Segment 2106 is varied. Oil and gas production is concentrated in the southeastern portions of the drainage area. There are 23 fields, 16 of which are active. Oilfield brine may adversely affect water quality in terms of an increasing dissolved solids concentration in streams. Saline water could also migrate into aquifers through improperly sealed oil and gas wells. There are four mines in the area, two of which are active. Surface runoff can be a potential source of water pollutants.

Waste disposal consists of ten sanitary landfills, six animal feedlots, and seven areas serviced by septic tanks. Water quality can potentially be affected in terms of increases in coliforms and dissolved solids and/or dissolved oxygen reductions. The use of septic tanks in the upper Frio River does not presently contribute to a significant problem of pollution of surface and/or groundwaters. More detailed discussion can be found in Appendix H of this report. There are four no-discharge treatment plants in Medina County. These plants do not have permits to discharge directly into streams; consequently, treated effluent is used as irrigation water or disposed of in evaporation pits. Construction-related nonpoint source activity is found at two sites in Hondo and Dilley in the central portion of the drainage area. The major water pollutant generated by construction activity is suspended sediment. Oils and greases at these sites can also contribute to water pollution. Agricultural runoff can potentially impair water quality with increases in suspended and dissolved solids and short-term dissolved oxygen reductions. The cities of Hondo and Dilley, in Medina and Frio

counties respectively, are the principal sources of urban runoff with potential pollution consequences. In addition, continued subdivision development along the Frio River upstream of the groundwater recharge zone can potentially contribute to pollution problems associated with urban runoff. Any number of pollutants can be present in urban stormwater runoff, including suspended and dissolved solids, organic matter, and toxicants.

Consideration must also be given to the potential nonpoint source pollution which could arise from construction of the proposed Choke Canyon Reservoir in Live Oak and McMullen counties. The project's primary purpose will be the development of a dependable water supply for municipal and industrial use to meet short-term as well as part of the long-term water needs of the Coastal Bend area. Other purposes will include fish and wildlife conservation and outdoor recreation opportunities. Potential water quality impacts of the proposed reservoir include those stemming from actual construction. Impact in the reservoir area can potentially occur as a result of erosion of the cut-and-fill slopes required for construction of the dam, access roads, borrow areas, and other project features. As a result of construction operations, turbidity of waters in the Frio River may temporarily increase. Total dissolved solids (TDS) at the reservoir are likely to be slightly higher than natural flows due to evaporation from the reservoir. TDS of the Choke Canyon Reservoir outflow are estimated to range from 171 parts per million to a maximum of 533 parts per million, acceptable for municipal and industrial use. Algae growths in the reservoir when it is built may cause taste and odor problems from time to time, and periodically the dissolved oxygen content may be low, depending on a number of variable conditions. However, these deficiencies in quality will probably be corrected to some degree while the flows are in transit between Choke Canyon Reservoir and Lake Corpus Christi.

c. Wasteload Projections

This segment is classified as a Category IV segment. Wasteloads are projected for both point and nonpoint sources.

(1) Point Sources. Three municipal dischargers presently contribute a wasteload of approximately 103 lbs/day of BOD and 103 lbs/day of TDS. There are no industrial sources located on this segment. The municipal wasteloads are projected to increase to about 360 lbs/day of BOD and 215 lbs/day of TSS by the year 2000. The following is a summary table of the wasteload projections.

Planning Year	BOD (lbs/day)	TSS (lbs/day)
Existing	103	103
1983	313	313
1990	333	201
2000	360	215

A more detailed breakdown of these loads is presented in Appendix K, as well as a discussion of the methodology used.

(2) Nonpoint Sources. For Segment 2106 a detailed assessment of potential pollution consequences was undertaken, based upon the predominant nonpoint source activity, namely agriculture/silviculture. Mining, waste disposal, and urban runoff can also potentially contribute to nonpoint source pollution; however, these sources were judged less significant than agriculture in overall effect. The predominance of agricultural land and rangeland in the segment drainage area permitted the potential for nonpoint source pollution to be assessed in terms of sediment contributed to the main river segment. The drainage area of Segment 2106 was subdivided into 23 subcatchment areas on the basis of similarities in topography, land use, and soils. The Modified Universal Soil Loss Equation was applied to each subcatchment area to arrive at sediment loads generated during the critical season of the year. (The procedures for selecting the critical season and determining the sediment loads is discussed in Appendix G, Nonpoint Source Assessment Methodology.) The main river segment, the Frio River from its confluence with the Nueces River to U. S. 90 west of Knippa, was marked off at specific points of impact where the loads ultimately reach the numbered segment. At these points, average streamflows were also determined for the critical season. Tables 4 through 6 of Appendix J contain the parameters of the soil loss equation and the resultant sediment loads.

d. Wasteload Analysis

Segment 2106, the reach of the Frio River from Nueces River confluence to U. S. 90 west of Knippa, has been classified as "Effluent Limiting." The desirable water uses are recreation, propagation of fish and wildlife, and domestic raw water supply. Water quality standards established for this segment are as follows:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	6.5 to 8.5
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	90°F

Chloride (not more than)	650 mg/l
Sulfate (not more than)	500 mg/l
Total Dissolved Solids (not more than)	2,000 mg/l

The TDH has raised the question of whether the water quality standards are compatible with the designated water uses. The Department has pointed out that the above values for chloride, sulfate, and total dissolved solids are greater than allowed by drinking water standards. Since a desirable water use is listed as a domestic supply, there is an inconsistency. The special study planned for this segment should address this question to determine whether or not these parameters are expected to exceed drinking water standards and, if so, for what reason. If the very high quality required to meet drinking water standards cannot be reached, a change which drops water supply as a desirable use should be considered.

Three point sources are discharging an estimated total oxygen demand of 300 lbs/day to the segment. One point source discharges directly into the segment while the other two discharge into the tributaries. Nonpoint source wasteloads to the segment are possibly attributed to oil and gas production, mining sanitary landfills, animal feedlots, septic tank operations, construction activity, agricultural runoff, and stormwater runoff.

Existing water quality in the segment is generally good. Although one DO violation, 3.1 mg/l, was recorded in January 1973, the segment is free of violations of other established standards. The cause of this single DO violation cannot be explained at the present time, and no other DO violations have been recorded since that time.

The total oxygen demand contributed by the point source discharges for the year 2000 has been projected to be about 1,100 lbs/day. This total load includes potential discharges by the cities of Hondo, Dilley, and Pearsall, which until recently held discharge permits. To evaluate treatment requirements consistently for all permit holders, the potential effects of their discharge on water quality in the segment was determined by the EPA simplified model. Since the five permit holders are located quite far apart, DO levels were predicted for each tributary as well as the main stem of the segment. Results indicate DO standards probably will not be violated in the tributaries or main stem. Therefore, the existing treatment levels required

by each permit appear sufficient to allow discharge to surface water of the segment. However, there has been a shift to a no-discharge condition in three of the five municipal permits in the segment. Therefore, before a recommendation can be made to change back to discharge permits for all five systems, a special study should be conducted to calibrate and verify a more advanced model for calculating total maximum daily loads that the tributaries and main stem can accept at low flow conditions. Nevertheless, for planning purposes, it is assumed that treatment to effluent set 1 with discharge will be allowed, considering the costs to be incurred for a strictly designed and operated land application (no discharge) alternative.

To evaluate the impact of the projected nonpoint source loads at the critical season average flow conditions, a multiple source analysis utilizing the EPA simplified model was performed. The results of the analysis predict that violation of DO standards will occur in most parts of Segment 2106. However, in light of the limited data available and the simplified assumptions used in the analysis, these calculated violations should only be considered as a preliminary indication of potential problems rather than projections of actual DO levels in the stream. A more detailed study is required before a realistic conclusion can be drawn. Therefore, it is recommended that a special study to better determine the sources and impact of the nonpoint source pollution in Segment 2106 be conducted.

e. Alternative Plans for the City of Dilley Sewerage Planning Area

The City of Dilley is an incorporated general law municipality located in the southern portion of Frio County. Land use for the City is generally residential with some light commercial development. Population projections were made in 1977 and reported in Volume I, Basic Data Report. Those projections indicated a present population of 2,380 with essentially no growth through the year 2000. Discussions with the City's Mayor, Utilities Superintendent and engineering consultant have raised substantial question about the 1977 projections. The best current estimate by City representatives is an existing population of about 2,700 with an increase to 3,000 by the year 2008. The difference in projections should be resolved as part of the next update of the 208 plan or during 201 facility planning. For the purpose of this report the originally approved population projection will be used to estimate system requirements.

These projections are shown as follows:

Year	Existing	1983	1990	2000
Population	2,380	2,400	2,400	2,400

The existing wastewater collection system for Dilley is comprised of 6- and 8-inch sewer lines and two lift stations. The system is considered old and does not serve the entire City. Expansion and renovation of the existing lines to handle the entire service area are needed.

The City currently holds a no-discharge permit for wastewater disposal by Imhoff tank, two oxidation ponds (7.5 acres), and about 12 acres of irrigation fields. The treatment units which precede the irrigation fields are old and overloaded. The land area secured by long-term contract (30 years) for irrigation is substantially under the recommended amount as measured by planning methodology. As a result, alternative plans are developed for improving the City's sewerage system.

(1) Structural Alternatives

(a) Collection System. Since no significant population increase is projected for Dilley, collection system improvements are needed only for the existing system. An inventory of the existing lines shows the system is comprised of approximately 87 inch-miles of sewer lines. Using the State methodology, Water Quality Management Planning Methodology for Municipal Waste Treatment Needs Assessment, an analysis

of additional collection system needs for the City was performed. The analysis indicates an addition of approximately 40 inch-miles of lines and one lift station is required. It should be noted, however, that the analysis made in this study is not intended to replace a full engineering study, but rather to serve as a basis for estimating the approximate costs of the collection system improvement needs.

(b) Treatment and Disposal. Three broad options for disposal of sewage are generally available. These options include (1) treatment and discharge, (2) treatment and reuse, and (3) land application of sewage effluent. For the purpose of this study, reuse of treated wastewater is not considered as a viable solution due to the nonexistence of significant industries, potential public health problems, and economic considerations. Therefore, only treatment and discharge and land application were examined. Based on the methodology mentioned previously, two structural alternatives were developed from these two broad options for the City of Dilley.

Alternative 1. This alternative proposes abandonment of the existing plant and construction of a new 0.24 mgd prefabricated contact stabilization package plant with sludge drying beds. The package plant would include units for preliminary treatment, aeration and reaeration, final clarification, disinfection, and aerobic digestion. Sludge disposal would be handled by contract hauling.

Alternative 2. Land application is considered in this alternative. It would require construction of 0.24 mgd units for primary treatment, disinfection, and sludge drying beds. A spray irrigation facility and approximately 80 acres of land would be needed. The existing Imhoff tank would be converted into an aerobic digester, and existing oxidation ponds would be utilized as emergency holding ponds. The treated and disinfected effluent would be sprayed over the irrigation field, resulting in no discharge from the plant. Sludge disposal would be by contract hauling.

It is emphasized that these two alternatives shown are from a prescribed list given in the statewide methodology, and presentation of these alternatives is not intended to eliminate any viable alternative from use for this location, but rather to limit for planning purposes the number of possible solutions to those which offer a meaningful difference in various project costs. The options presented should be understood in the context of being representative examples of reasonable planning level solution and costs.

The alternative most acceptable to the City is likely to involve a new race track system, followed by the existing ponds which will be used for evaporation and storage prior to final disposal by irrigation. Such a system would satisfy permit requirements, enhance segment water quality, and exceed the minimum level of treatment required for the segment. Selection of such a system would raise the question of grant eligibility for sub-systems beyond the race track process, since water quality objectives apparently can be met by secondary treatment and discharge. Conversely, to identify and select alternative 1 as the most cost-effective system, which inherently maximizes grant eligibility, would require a permit revision. For the purpose of this plan, it is assumed that a permit change will be justified and made. As discussed under wasteload analysis, justification for a permit change should be based on a special study to determine the total maximum daily load the stream can accept from the City of Dilley without causing a DO violation. The actual system to be selected will be identified through the 208 program special study and plan update. A 201 facility planning project (or equivalent engineering study) could also accomplish the necessary in-depth evaluations to make a selection.

(2) Management Alternatives. Management functions which most directly apply to the structural alternatives are operation, maintenance, design, construction, and financial. At the present time the City of Dilley has the authority and is performing these functions relative to sewage treatment within its boundaries. There are alternatives open to the City for performing by other arrangements any or all of these management functions if the City would so desire. Intergovernmental devices allow for contracting of these functions between districts, cities, and regional authorities.

(3) Costs of Alternatives. Based on the State methodology referenced previously, costs for collection and treatment alternatives were estimated. For each alternative, capital cost, operation and maintenance cost, and annualized total and per capita costs (with and without EPA grants) were calculated. All costs are given in terms of 1977 dollars and presented in Table II-D-4. The interest rate used in this analysis is 6-3/8 percent and the service life of all equipment and structures is assumed equal to 20 years. The capital costs assumed to be incurred in 1980 are spread over the projected population for the same year as the basis for calculating the annualized per capita costs.

TABLE II-D-4

COSTS OF TECHNICAL ALTERNATIVE PLANS FOR

CITY OF DILLEY

	Alternative 1	Alternative 2 (Land cost included)	Alternative 2 (Land cost excluded)
Capital Cost			
Collection System	$368,000	$ 368,000	$368,000
Treatment Plant	306,000	648,000	500,000
Total	$674,000	$1,016,000	$868,000
O & M Cost			
Collection System	$ 24,000/yr	$ 24,000/yr	$ 24,000/yr
Treatment Plant	43,000/yr	40,000/yr	40,000/yr
Total	$ 67,000/yr	$ 64,000/yr	$ 64,000/yr
Annualized Cost			
Without Grant			
Total	$128,000/yr	$ 155,000/yr	$142,000/yr
Per Capita	$ 53/yr	$ 65/yr	$ 59/yr
With Grant			
Total	$ 82,000/yr	$ 87,000/yr	$ 83,500/yr
Per Capita	$ 34/yr	$ 36/yr	$ 35/yr

(4) Impacts of Alternatives. The monetary cost for the developed alternatives is only one of several aspects which should be considered in selecting the most beneficial alternative. The environmental, social, and economic impacts of these alterantives should also be evaluated. These non-monetary costs or impacts are presented in Table II-D-5. The summarized impacts do not indicate any adverse or unusual effects that could be expected from implementation of any of these alternatives.

TABLE II-D-5

IMPACTS FOR TECHNICAL ALTERNATIVE PLANS FOR

CITY OF DILLEY

Criterion	Alternative 1	Alternative 2
Electricity Use	Approx. 360,000 KWH/yr	Approx. 245,000 KWH/yr
Chemical Use	3.6 tons Chlroine per yr.	9.1 tons Chlorine per yr.
Manpower Requirements	2.0 man-yr/yr	2.1 man-yr/yr
Land Requirements	Existing plant site	Approximately 130 acres
Aesthetics	Visual impression will be matter of good architectural design and site maintenance.	Land disposal site could be utilized as green belt.
Local Health	Local health improved because of better effluent quality.	Local health improved because of no effluent discharges.
Sensitive Ecosystems	Temporary disruption of plant site for construction.	Amount of land required could cause destruction of habitat and a shift in land use.
Air Quality	No serious odor problem anticipated if properly operated.	No serious odor problem anticipated if properly operated.

f. Alternative Plans for the City of Hondo Sewerage Planning Area

The City of Hondo is an incorporated general law municipality located in the central portion of Medina County. Land use for the City is generally residential with light commercial development. Existing population is estimated to be about 5,900. A moderate increase in population is projected for the City by the year 2000. Population estimates for the planning years are shown as follows:

Year	Existing	1983	1990	2000
Population	5,900	6,410	6,900	7,700

The City's existing wastewater collection system is comprised of 6- and 8-inch laterals with 10- and 15-inch main trunks. Two pump stations are utilized in the system to lift the sewage through 6- and 8-inch lines to the 10-inch mains. The existing system is running close to its peak capacity at the present time and is burdened with infiltration/inflow from the old air base. Recent system checks at the air base revealed 24 open lines of 4-inch diameter which allowed wet-weather runoff flow to enter the sewer system of the City. Additional points of entry are suspected. A full sewer system evaluation study under a 201 facility planning grant may be necessary to resolve the question of possible excessive infiltration/inflow. To accommodate the projected future needs, expansion and extension of the existing lines are considered necessary.

The existing wastewater treatment plant was constructed in 1943 with a design and permit capacity of 0.405 mgd. It consists of a bar screen, three Imhoff tanks, four oxidation ponds, irrigation fields, and sludge drying beds. The plant is located within the flood plain of Elm Creek and has been flooded several times within the past five years. Effluent Set 1 (20 mg/l BOD_5, 20 mg/l TSS) is required for intermediate treatment prior to disposal by irrigation under a no-discharge permit. A recent TDWR inspection report indicates the plant is overloaded and experiences occasional bypassing. The TDWR District 8 office has received numerous complaints from downstream owners in regard to bypassing and/or possible percolation of sewage effluent into the shallow groundwater.

The City's present plan is to construct a race-track system at the present site location above the flood plain. However, the preliminary engineering necessary to design such a system has not been completed. The City has applied for a 201

construction grant but is not presently within the available funds. Therefore, it has been identified as a sewerage planning area and alternative plans are developed for the City to improve the sewerage system.

(1) Structural Alternatives

(a) Collection System. For planning purpose, it is assumed the existing collection system is adequate to serve the current population, while future growth of the City will create needs for additional capacity to serve the projected population increase of 1,800 by the year 2000. The expansion of the existing system will most likely continue to be gravity lines and pump stations at appropriate locations. Construction of needed facilities will probably take place in stages as needs grow. However, for planning purpose only single-stage construction is considered in this study. Using the State methodology, Water Quality Management Planning Methodology for Municipal Waste Treatment Needs Assessment, an estimate of additional collection system needs was made. The required improvements have been estimated to include approximately two lift stations and 108 inch-miles of sewer lines. It is emphasized that the analysis made in this study is not intended to replace a full engineering study, but rather to serve as a basis for estimating the approximate costs of the collection system improvements.

(b) Treatment and Disposal. Since the City's existing treatment plant is overloaded and located within the flood plain of Elm Creek, a new treatment facility located outside the flood plain is considered necessary. Three broad options were investigated for constructing a new facility to dispose of sewage from the City's service area.

These options are (1) treatment and discharge, (2) treatment and reuse, and (3) land application. Since there are few industries in the area, reuse of treated wastewater for industrial processes is of little potential. Further, factors such as public health, soil conditions, and economic considerations make the reuse of treated water as a potable water source or groundwater recharge infeasible. Therefore, only treatment and discharge and land application are considered as two viable options. Using the previously mentioned statewide methodology, three alternatives were developed from these two broad options for the City of Hondo.

Alternative 1. This alternative proposed construction of a new 0.77 mgd contact stabilization plant. The plant would include a main lift station, preliminary treatment facility,

contact and stabilization basins, final clarifiers, disinfection facility, aerobic digester, and sludge drying beds. A race track system could be substituted for the contact and stabilization basins without substantially altering system performance. Sludge disposal would be by contract hauling.

Alternative 2. This alternative proposes construction of two new prefabricated contact stabilization package plants, each with a capacity of 0.4 mgd. The major components of this alternative would be two package plants and sludge drying beds. Each package plant would include units for preliminary treatment, aeration and reaeration, final clarification, disinfection, and aerobic digestion. Sludge disposal would be by contract hauling.

Alternative 3. Land application of effluent is considered in this alternative. Construction of a 0.77 mgd primary treatment plant, including units for preliminary treatment, primary clarification, and disinfection would be required. Spray irrigation facilities, emergency holding ponds, and approximately 250 acres of land would be needed. The treated and chlorinated effluent would be sprayed over the irrigation field, resulting in no discharge from the plant. In addition, an aerobic digester and sludge drying beds would be constructed to handle the sludge from the primary clarification system. Dry sludge disposal would be by contract hauling.

It should be emphasized that these three alternatives shown are from a prescribed list given in the statewide methodology, and presentation of the three alternatives is not intended to eliminate any viable alternative from use for this location, but rather to limit for planning purposes the number of possible selections to those which offer a meaningful difference in various project costs. The options presented should be understood in the context of being representative examples of reasonable planning level solutions and costs.

To implement alternative 1 as the most cost-effective plan, which inherently maximizes grant eligibility, will require a permit revision. As discussed more fully for the City of Dilley, it is assumed that a permit change will be justified and made. Such justification should be based on a special study to determine the total maximum daily load the stream can accept from the City of Hondo without causing a DO violation. The actual system to be selected will be identified through a 208 program special study and plan update. A 201 facility planning project (or equivalent engineering study) could also accomplish the necessary in-depth evaluations to make a selection.

(2) Management Alternatives. Management functions which most directly apply to the structural alternatives are operation, maintenance, design, construction, and financial. At the present time, the City of Hondo has the authority and is performing these functions relative to sewage treatment within its boundaries. There are alternatives open to the City for performing by other arrangements any or all of these management functions, if the City would so desire. Intergovernmental devices allow for contracting of these functions between districts, cities, and regional authorities.

(3) Costs of Alternatives. Based on the State methodology referenced previously, costs for collection and treatment alternatives were estimated. For each alternative, capital cost, operation and maintenance cost, and annualized total and per capita costs (with and without EPA grants) were calculated. All costs are given in terms of 1977 dollars and presented in Table II-D-6. The interest rate used in this analysis is 6-3/8 percent and the service life of all equipment and structures is assumed equal to 20 years. The capital costs are assumed to be incurred in 1980 and are spread over the projected population for the same year as the basis for calculating the annualized per capita costs.

(4) Impacts of Alternatives. The monetary cost for the developed alternatives is only one of several aspects which should be considered in selecting the most beneficial alternative. The environmental, social, and economic impacts of three alternatives should also be evaluated. These non-monetary costs or impacts are presented in Table II-D-7. The summarized impacts do not indicate any adverse or unusual effects that could be expected from implementation of any of these alternatives.

TABLE II-D-6

COSTS OF TECHNICAL ALTERNATIVE PLANS FOR

CITY OF HONDO

	Alternative 1	Alternative 2	Alternative 2 (Land cost included)	Alternative 2 (Land cost excluded)
Capital Cost				
Collection System	$1,100,000	$1,100,000	$1,100,000	$1,100,000
Treatment Plant	529,000	760,000	2,422,000	2,088,000
Total	$1,629,000	$1,860,000	$3,522,000	$3,188,000
O & M Cost				
Collection System	$ 50,500/yr	$ 50,500/yr	$ 50,500/yr	$ 50,500/yr
Treatment Plant	73,500/yr	87,900/yr	82,800/yr	82,800/yr
Total	$ 125,800/yr	$ 138,400/yr	$ 133,300/yr	$ 133,300/yr
Annualized Cost				
Without Grant				
Total	$ 272,200/yr	$ 305,600/yr	$ 449,900/yr	$ 419,800/yr
Per Capita	$ 44/yr	$ 49/yr	$ 72/yr	$ 67/yr
With Grant				
Total	$ 162,400/yr	$ 180,200/yr	$ 212,400/yr	$ 204,900/yr
Per Capita	$ 26/yr	$ 29/yr	$ 34/yr	$ 33/yr

TABLE II-D-7

IMPACTS OF TECHNICAL ALTERNATIVE PLANS FOR

CITY OF HONDO

Criterion	Alternative 1	Alternative 2	Alternative 3
Electricity Use	Approx. 600,000 KWH/yr	Approx. 900,000 KWH/yr	Approx. 547,000 KWH/yr.
Chemical Use	11.7 tons Chlorine per yr.	11.7 tons Chlorine per yr.	29.3 tons Chlroine per yr.
Manpower Requirements	3.0 man-yr/yr	3.2 man-yr/yr	3.4 man-yr/yr
Land Requirements	Approx. 2 acres	Approx. 2 acres	Approx. 250 acres
Aesthetics	Visual impression will be matter of good architectural design and site maintenance.	Visual impression will be matter of good architectural design and site maintenance.	Land disposal site could be utilized as green belt.
Local Health	Local health improved because of better effluent quality.	Local health improved because of better effluent quality.	Local health improved because of no effluent discharges.
Sensitive Ecosystems	Temporary disruption of plant site for construction.	Temporary disruption of plant site for construction.	Amount of land required could cause destruction of habitat and a shift in land use.
Air Quality	No serious odor problem anticipated if properly operated.	No serious odor problem anticipated if properly operated.	No serious odor problem anticipated if properly operated.

g. Alternative Plans for the City of Pearsall Sewerage Planning Area

The City of Pearsall is an incorporated general law municipality located in the central portion of Frio County. Land use for the City is generally characterized by scattered residential development and concentrated commercial and public facilities along the major thoroughfares in the central area of the City. The existing population was originally estimated as about 5,700 people, but discussions with the City's mayor and assistant city manager indicated an estimate of 6,000 people is probably more accurate. An upward adjustment for present and future appears justified on the basis of the increased oil well drilling activity in the area. However, for the purpose of the current plan, population estimates must remain as originally approved in Volume I, Basic Data Report. Revision of population estimates must await the next 208 plan update or 201 facility planning project. Estimated population for different planning years are shown as follows:

Year	Existing	1983	1990	2000
Population	5,700	6,010	6,500	7,100

Existing wastewater collection system for the City of Pearsall generally consists of 6-, 8-, and 10-inch gravity lines. The system is considered adequate for serving the existing needs. In order to serve the projected population growth, however, expansion of the system would be required within the planning period.

The City's wastewater treatment system consists of a clarigester, 10-acre oxidation pond, irrigation fields, and sludge drying beds. The City's permit is classified as no-discharge. The land area used for irrigation is privately owned, secured only by informal agreement for use by the City, and under the amount (area) required by planning methodology. The oxidation pond produces an effluent with more than 30 mg/l suspended solids. The design capacity of the system preceding irrigation is equivalent to 3,730 people as compared to a potential current population to be served of about 5,700. As a result, alternative plans are developed for these needs.

1. Structural Alternatives

(1) Collection System. The existing collection system is currently under study by the City to establish its adequacy. Results to date suggest inadequacies exist that will require correction in order to serve the City's present

population. However, for planning purposes, it is assumed that the collection system is adequate to serve about 5,700 people and that facilities will be required for an additional 1,400 people by the year 2000. The expansion of the existing system will most likely continue to consist of gravity lines and pump stations, if required, at appropriate locations. Construction of needed facilities will probably take place in stages as needs grow. However, for planning purposes, only single-stage construction is considered in this study.

Based on the statewide methodology, Water Quality Management Planning Methodology for Municipal Waste Treatment Needs Assessment, an analysis for additional collection system needs of Pearsall was made. The required improvements have been estimated to include approximately 95 inch-miles of gravity sewer lines.

It should be noted that the analysis made in this study is not intended to replace a full engineering study, but rather to serve as a basis for estimating the approximate costs of the projected system needs.

(b) Treatment and Disposal. There are generally three broad options available for disposal of sewage from the service area of the City of Pearsall. These options are (1) treatment and discharge, (2) treatment and reuse, and (3) land application. Reuse of treated wastewater is considered impractical at this time because no potential users can be identified and economic costs are too high. Treatment and discharge and land application of treated sewage are the two broad options examined as alternatives. The definition of alternatives incorporates as a given condition the 0.37 mgd extended aeration unit, final clarifier, and disinfection unit currently under construction. Two structural alternatives were developed from the two broad options according to the given planning methodology.

Alternative 1. This alternative proposes the addition of a new 0.34 mgd extended aeration package plant similar to the system under construction. The package plant will consist of raw sewage pumping, preliminary treatment, aeration, final clarification, disinfection, and sludge digestion. Sludge will be dewatered on beds and hauled away to a suitable site for disposal by spreading. The effluent, treated to Set 1 (20 mg/l BOD, 20 mg/l TSS), will be suitable for discharge, if the existing permit is changed from the no-discharge classification.

Alternative 2. This alternative proposes a no-discharge system employing the spray irrigation technique. Construction will include a new 0.34 mgd extended aeration package

plant as described under alternative 1. The new plant, along with the facility currently under construction, will provide pre-irrigation treatment to the degree required in the City's permit. The existing oxidation pond will be modified to provide emergency storage and evaporation capacity. Other existing units will be incorporated, after necessary modification, into the proposed system to the fullest extent possible. Sludge will be dried on beds and then spread on land. The irrigation system will consist of a pumping station, pipeline, sprinkler system, monitoring wells, tail water interception, and 230 acres of land suitably cleared and graded. The sewage will receive secondary treatment and disinfection prior to application on the irrigation fields.

It should be emphasized that these two alternatives shown are from a prescribed list given in the statewide methodology, and presentation of the two alternatives is not intended to eliminate any viable alternative from use for this location, but rather to limit for planning purposes the number of possible solutions to those which offer a meaningful difference in various project costs. The options presented should be understood in the context of being representative examples of reasonable planning level solution and costs.

The alternative most acceptable to the City is likely to involve an extended aeration system, followed by the existing ponds, which will be used for evaporation and storage prior to final disposal by irrigation. Such a system would satisfy permit requirements, enhance segment water quality, and exceed the minimum level of treatment required for the segment. Selection of such a system would raise the question of grant eligibility for sub-systems beyond the extended aeration system, since water quality objectives apparently can be met by secondary treatment and discharge. Conversely, to identify and select alternative 1 as the most cost-effective system, which inherently maximizes grant eligibility, would require a permit revision. For the purpose of this plan, it is assumed that a permit change will be justified and made. As discussed under wasteload analysis, justification for a permit change should be based on a special study to determine the total maximum daily load the stream can accept from the City of Pearsall without causing a DO violation. The actual system to be selected will be identified through the 208 program special study and plan update. A 201 facility planning project (or equivalent engineering study) could also accomplish the necessary in-depth evaluations to make a selection.

(2) Management Alternatives. Management functions which most directly apply to the structural alternatives are operation, maintenance, design, construction, and financial. At the present time the City of Pearsall has the authority and is performing these functions relative to sewage treatment within its boundaries. There are alternatives open to the City for performing by other arrangements any or all of these management functions, if the City would so desire. Intergovernmental devices allow for contracting of these functions between districts, cities, and regional authorities.

(3) Costs of Alternatives. Based on the State methodology referenced previously, costs for collection and treatment alternatives were estimated. For each alternative, capital cost, operation and maintenance cost, and annualized total and per capita costs (with and without EPA grants) were calculated. All costs are given in terms of 1977 dollars and presented in Table II-D-8. The interest rate used in this analysis is 6-3/8 percent, and the service life of all equipment and structures is assumed equal to 20 years. The capital costs are assumed to be incurred in 1980 and are spread over the projected population for the same year as the basis for calculating the annualized per capita costs.

(4) Impacts of Alternatives. The monetary cost for the developed alternatives is only one of several aspects which should be considered in selecting the most beneficial alternative. The environmental, social, and economic impacts of these alternatives should also be evaluated. These nonmonetary costs or impacts are presented in Table II-D-9. The summarized impacts do not indicate any adverse or unusual effects that could be expected from implementation of any of these alternatives.

TABLE II-D-8

COSTS OF TECHNICAL ALTERNATIVE PLANS FOR

CITY OF PEARSALL

	Alternative 1	Alternative 2 (Land cost included)	Alternative 2 (Land cost excluded)
Capital Cost			
Collection System	$ 973,000	$ 973,000	$ 973,000
Treatment Plant	425,000	1,272,000	996,000
Total	$1,398,000	$2,245,000	$1,969,000
O & M Cost			
Collection System	$ 13,000/yr	$ 13,000/yr	$ 13,000/yr
Treatment Plant	37,000/yr	64,000/yr	64,000/yr
Total	$ 50,000/yr	$ 77,000/yr	$ 77,000/yr
Annualized Cost			
Without Grant			
Total	$ 176,000/yr	$ 279,000/yr	$ 254,000/yr
Per Capita	$ 30/yr	$ 48/yr	$ 44/yr
With Grant			
Total	$ 81,400/yr	$ 127,000/yr	$ 121,000/yr
Per Capita	$ 14/yr	$ 22/yr	$ 21/yr

TABLE II-D-9

IMPACTS OF TECHNICAL ALTERNATIVE PLANS FOR

CITY OF PEARSALL

Criterion	Alternative 1	Alternative 2
Electricity Use	Approx. 581,000 KWH/yr	Approx. 780,000 KWH/yr.
Chemical Use	10.8 tons chlorine per year	10.8 tons chlorine per year
Manpower Requirements	3.2 man-year/year	4.7 man-year/year
Land Requirements	Existing Plant Site	Approximately 230 acres
Aesthetics	Visual impression will be matter of good architectural design and site maintenance.	Land disposal site could be utilized as green belt.
Local Health	Local health improved because of better effluent quality.	Local health improved because of no effluent discharges.
Sensitive Ecosystems	Temporary disruption of plant site for construction.	Amount of land required could cause destruction of habitat and a shift in land use.
Air Quality	No serious odor problem anticipated if properly operated.	No serious odor problem anticipated if properly operated.

6. SEGMENT 2107

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2107. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2107.

(2) Physical Boundaries and Description. This segment is the total drainage area of the Atascosa River.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Regional agencies within Segment 2107 include the Nueces River Authority, the San Antonio River Authority, the Edwards Underground Water District, Alamo Area Council of Governments, and Coastal Bend Council of Governments.

There are portions of eight counties in the segment: Atascosa, Bexar, Frio, Karnes, Live Oak, McMullen, Medina, and Wilson.

Incorporated towns in the segment include the cities of Jourdanton, Lytle, Pleasanton, Poteet, Campbellton, and Christine.

Special districts include the Atascosa County Soil and Water Conservation District, Frio Soil and Water Conservation District, Live Oak Soil and Water Conservation District, Medina Valley Soil and Water Conservation District, and the Evergreen Underground Water Conservation District.

(4) Water Quality Control Programs. Segment 2107 contains three Section 201 facility planning areas: #1185 Pleasanton, #1218 Poteet, and #1256 Jourdanton. The City of Lytle is a sewerage planning area. There are no regional sewage treatment facilities or plans in this segment. The segment is currently within the monitoring network of TDWR and USGS. There are no TDH monitoring stations.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 2107. Detailed discussion of each nonpoint source category and techiques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution in the Upper Nueces River Basin, and Appendix I, Segment Layouts With Nonpoint Source Inventory.

(2) Assessment. Segment 2107 does not currently exhibit any significant water quality problems. The TDWR has noted dissolved oxygen and pH violations in past years, and in recent years the State has noted mean annual sulfate concentrations somewhat higher than other segments in the basin. These conditions may possibly be related to oil production in the drainage area of Segment 2107. There are 24 fields, 19 of which are active. Brine brought to or near the surface as a by-product of oil production can reach streams over the surface or through the ground. Unplugged or improperly plugged wells or test holes can contribute additional problems. There are seven active secondary recovery projects in the area using saltwater injection. Injected brine may potentially reach groundwater supplies. Other mining sites include 14 uranium mines (11 active) and 7 sand and gravel operations. Mineral extraction and surface runoff at these sites may contribute to water pollution. The primary method of treating wastewater from sand and gravel mining is through the use of settling ponds. These are usually located adjacent to a stream, making proper treatment of the wastewater essential. Potential water quality changes which may result from sand and gravel operations include increases in total suspended solids and turbidity.

Waste disposal includes nine sanitary landfills, five septic tank areas, and three animal feedlots. Potential pollution problems can take the form of increases in coliforms and dissolved solids or dissolved oxygen reductions. Any potential adverse effects related to urban stormwater runoff would be found largely in Atascosa County. There are four urban areas, Jourdanton, Lytle, Pleasanton, and Poteet, which may produce pollutant loads detrimental to nearby watercourses. Construction activity consists of two sites; any effects are likely to be localized. Agricultural runoff can potentially degrade water quality with increased sediment yields.

c. Wasteload Projections

This segment is classified as a Category II segment. Wasteloads are projected for point source discharges only.

There are four municipal and no industrial wasteload contributions to this segment. The total municipal wasteload is projected to increase from a present load of 210 lbs/day of BOD and TSS to about 341 lbs/day of BOD and TSS by the year 2000. A brief summary of the wasteload projections for the segment is given below.

Planning Year	BOD (lbs/day)	TSS (lbs/day)
Existing	210	210
1983	273	273
1990	298	298
2000	341	341

A more detailed breakdown of these loads is presented in Appendix K, as well as a discussion of the methodology used.

d. Wasteload Analysis

A simplified modeling analysis has recently been performed by the TDWR for the segment. The results indicate that dissolved oxygen levels under 5.0 mg/l can be expected below the Pleasanton discharge at the year 2000 projected flow. Treatment levels of 20 mg/l BOD and 20 mg/l TSS are recommended at this time, with additional monitoring undertaken in the form of an Intensive Monitoring Survey to document problem areas and wastewater loadings.

e. Alternative Plans for the City of Lytle Sewerage Planning Area

The City of Lytle is an incorporated general law municipality located in the northwest corner of Atascosa County. Land use for the City is characterized by scattered residential development and concentrated commercial and public facilities along the major thoroughfares in the central areas of the City. Existing population of Lytle has been estimated to be about 1,560. The population is projected to double by the year 2000. The population estimate for the planning years are shown as follows:

Year	Existing	1983	1990	2000
Population	1,560	2,050	2,400	3,100

Existing wastewater collection system for the City of Lytle is comprised of 6-, 8-, and 10-inch gravity lines. No lift stations are utilized in the system. The existing lines serve most parts of the City, although some areas in the outskirts of the City are not sewered. Considering the significant increase in population, a major expansion of the existing system is necessary within the planning period.

The City Of Lytle's wastewater treatment plant was constructed in 1962 with a design capacity of 0.07 mgd. The plant consists of a grit chamber, bar screen, Imhoff tank, and three oxidation ponds. Effluent Set 0 (30 mg/l BOD, 30 mg/l TSS) is required for this facility, although the plant is not meeting its TSS requirements at the present time. The existing plant is old and considered obsolete. The City has applied for a 201 construction grant to build a new plant but is not presently on the State funding list. Therefore, alternative plans are developed for the City of Lytle to improve its sewerage system.

(1) Structural Alternatives

(a) Collection System. The present condition and future growth of Lytle create needs for additional collection system capacity. The expansion of the existing system will most likely continue to consist of gravity lines and pump stations, if required, at appropriate locations. Construction of needed facilities probably will take place in stages as needs grow. However, for the purpose of this study, only single-stage construction is considered.

Based on the State methodology, Water Quality Management Planning Methodology for Municipal Waste Treatment Needs Assessment, an analysis of collection system requirements

was made for Lytle. The analysis indicates approximately 105 inch-miles of lines, and two lift stations would be needed.

It should be emphasized that the analysis made in this study is not intended to replace a full engineering study, but rather to serve as a basis for estimating the approximate costs of the required improvements.

(b) Treatment and Disposal. There are generally three broad options available for disposal of sewage from the Lytle service area. These options are (1) treatment and discharge, (2) treatment and reuse, and (3) land application. Since there are few industries in the area, reuse of treated wastewater for industrial process is of little potential, and factors such as public health, soil conditions, and economic considerations make the reuse of treated water as a potable water source or groundwater recharge infeasible. Treatment and discharge and land application of sewage effluent are therefore the two options examined in this analysis. Based on the State methodology mentioned previously, two structural alternatives were developed from these two broad options.

Alternative 1. This alternative proposes abandonment of the existing oxidation pond system and construction of a new 0.31 mgd prefabricated contact stabilization package treatment plant with sludge drying beds. The package plant would include units for preliminary treatment, aeration and reaeration, final clarification, disinfection, and aerobic digestion. Sludge disposal would be by contract hauling.

Alternative 2. Land application of sewage effluent is considered in this alternative. Construction of 0.31 mgd units for primary treatment, disinfection, and sludge drying beds would be required. A spray irrigation facility and approximately 110 acres of land would be needed. The existing Imhoff tank would be converted into an aerobic digester, and existing oxidation ponds would be utilized as emergency holding ponds. The treated and disinfected effluent would be sprayed over the irrigation field, resulting in no discharge from the plant. Sludge disposal would be by contract hauling.

It should be emphasized that the alternatives presented above are from a prescribed list given in the methodology, and presentation of these alternatives is not intended to eliminate any viable alternative from use for this location.

The alternatives presented should be understood in the context of being representative examples of reasonable planning level solution and costs.

(2) Management Alternatives. Management functions which most directly apply to the structural alternatives are operation, maintenance, design, construction, and financial. At the present time the City of Lytle has the authority and is performing these functions relative to sewage treatment within its boundaries. There are alternatives open to the City for performing by other arrangements any or all of these management functions, if the City would so desire. Intergovernmental devices allow for contracting of these functions between districts, cities, and regional authorities.

(3) Costs of Alternatives. Based on the State methodology referenced previously, costs for collection and treatment alternatives were estimated. For each alternative, capital cost, operation and maintenance cost, and annualized total and per capita costs (with and without EPA grants) were calculated. All costs are given in terms of 1977 dollars and presented in Table II-D-10. The interest rate used in this analysis of 6-3/8 percent and the service life of all equipment and structures is assumed equal to 20 years. The capital costs are assumed to be incurred in 1980 and are spread over the projected population for the same year as the basis for calculating the annualized per capita costs.

(4) Impacts of Alternatives. The monetary cost for the developed alternatives is only one of several aspects which should be considered in selecting the most beneficial alternative. The environmental, social, and economic impacts of these alternatives should also be evaluated. These nonmonetary costs or impacts are presented in Table II-D-11. The summarized impacts do not indicate any adverse or unusual effects that could be expected from implementation of any of these alternatives.

TABLE II-D-10

COSTS OF TECHNICAL ALTERNATIVE PLANS FOR

CITY OF LYTLE

	Alternative 1	Alternative 2 (Land cost included)	Alternative 2 (Land cost excluded)
Capital Cost			
Collection System	$1,182,000	$1,182,000	$1,182,000
Treatment Plant	$ 379,000	$1,244,000	$ 774,000
Total	$1,561,000	$2,426,000	$1,956,000
O & M Cost			
Collection System	$ 68,000/yr	$ 68,000/yr	$ 68,000/yr
Treatment Plant	$ 47,400/yr	$ 128,900/yr	$ 128,900/yr
Total	$ 115,400/yr	$ 196,900/yr	$ 196,900/yr
Annualized Cost			
Without Grant			
Total	$ 255,700/yr	$ 415,000/yr	$ 312,700/yr
Per Capita	$ 137/yr	$ 221/yr	$ 199/yr
With Grant			
Total	$ 150,500/yr	$ 251,000/yr	$ 240,800/yr
Per Capita	$ 80/yr	$ 134/yr	$ 129/yr

TABLE II-D-11

IMPACTS FOR TECHNICAL ALTERNATIVE PLANS FOR

CITY OF LYTLE

Criterion	Alternative 1	Alternative 2
Electricity Use	Approx. 450,000 KWH/yr	Approx. 1,073,000 KWH/yr
Chemical Use	4.7 tons Chlorine per yr.	11.8 tons Chlorine per yr.
Manpower Requirements	1.8 man-yr/yr	4.5 man-yr/yr
Land Requirements	Existing Plant site	Approx. 108 acres
Aesthetics	Visual impression will be matter of good architectural design and site maintenance.	Land disposal site could be utilized as green belt.
Local Health	Local health improved because of better effluent quality.	Local health improved because of no effluent discharges.
Senisitve Ecosystems	Temporary disruption of plant site for construction.	Amount of land required could cause destruction of habitat and cause land use shift.
Air Quality	No serious odor problem anticipated if properly operated.	No serious odor problem anticipated if properly operated.

7. SEGMENT 2108

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2108. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2108.

(2) Physical Boundaries and Description. This segment is the total drainage area of San Miguel Creek which is a tributary of the Frio River.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Regional agencies within segment 2108 include the Nueces River Authority, the Edwards Underground Water District, the Alamo Area Council of Governments, and Coastal Bend Council of Governments.

There are portions of four counties in this segment: Atascosa, Frio, McMullen, and Medina.

There are three incorporated towns in the segment, being the cities of Charlotte, Devine, and Natalia.

Special districts include the Atascosa Soil and Water Conservation District, Atascosa County Water Control and Improvement District No.1 (Charlotte), Bexas-Medina-Atascosa Counties Water Improvement District No.1, Frio Soil and Water Conservation District, Medina County Water Control and Improvement District No.3 (Natalia), Medina Valley Soil and Water Conservation District, and the Evergreen Underground Water Conservation District.

(4) Water Quality Control Programs. Segment 2108 contains no Section 201 facility planning areas, no sewerage planning areas, and no regional sewage treatment facilities or plans. The segment is currently within the monitoring network of TDWR and USGS. There are no TDH monitoring stations.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities and related waste loadings in Segment 2108. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Upper Nueces River Basin, and Appendix I, Segment Layouts With Nonpoint Source Inventory.

(2) Assessment. Existing water quality data indicate that Segment 2108 has exhibited average annual total dissolved solid concentrations that come very close to exceeding the standard. Oil production, waste disposal, and urban runoff may be potential nonpoint source contributors to these conditions. There are nine oil and gas fields, two-thirds of which are active. Oilfield brine can adversely affect both surface and groundwater supplies. There are five sanitary landfills, three septic tank areas, and three animal feedlots in the drainage area which can potentially affect groundwater. There are three urban areas which may contribute significant amounts of urban runoff. These include Devine, Charlotte, and Natalia. Table II-D-1 gives an indication of urban pollutant loads as measured by average daily dust and dirt accumulation. Agricultural runoff can potentially degrade water quality with increased sediment yields.

c. Wasteload Projections

This segment is classified as a Category II segment. Wasteloads are projected only for point source discharges.

There are two municipal and no industrial treatment plants located in this segment. However, one of the municipal plants is under construction and not operating at the present time. Existing wasteload contributed by the operating municipal discharger is approximately 25 lbs/day of BOD and TSS. Both municipal facilities are expected to be in operation by 1983, by which time the total wasteload is expected to be 50 lbs/day of BOD and TSS. No significant increase is expected between the years 1983 and 2000. The following table gives a summary of wasteloads for the planning period.

Planning Year	BOD (lbs/day)	TSS (lbs/day)
Existing	25	25
1983	50	50
1990	51	51
2000	53	53

A more detailed breakdown of these loads is presented in Appendix K, as well as a discussion of the methodology used.

d. Wasteload Analysis

San Miguel Creek is classified as an "Effluent Limiting" segment. Its water use is deemed desirable for noncontact recreation and propagation of fish and wildlife. Water quality standards established for this segment are as follows:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	6.5 to 8.5
Coliform (log. avg. not more than)	1,000 FECAL/100 ml
Temperature	95°F
Chloride (not more than)	700 mg/l
Sulfate (not more than)	700 mg/l
Total Dissolved Solids (not more than)	2,000 mg/l

The City of Charlotte's wastewater treatment plant is the only existing point source discharging into the segment. The total oxygen demand load from this facility is estimated to be 70 lbs/day and is discharged into Langunillas Creek approximately 17 miles upstream from its confluence with San Miguel Creek. Nonpoint source wasteloads to this segment are principally contributed by oil production, sanitary landfills, and urban stormwater runoff.

A review of the Water Quality Assessment Chapter of the Basic Data Report indicates no violations of the stream standards as a result of these existing point and non-point wasteloads, although the total dissolved solids concentration runs close to that defined by the standard.

The estimated total oxygen demand to the segment from point sources is projected to increase to 160 lbs/day by the year 2000. The projected increase will be principally from the Medina County WCID No. 3 wastewater treatment plant which is currently under construction. This facility will be discharging into Chacon Creek approximately 15 miles upstream from its confluence with San Miguel Creek and is expected to contribute about 80 lbs/day total oxygen demand loads by the year 2000. The loads from the City of Charlotte are projected to increase only slightly. The effect of the projected oxygen demand from these two facilities was analyzed, using the EPA simplified model. A minimum DO of 5.5 mg/l is predicted for Chacon Creek and 5.6 mg/l for Langunillas Creek. Thus, no water quality problems are expected to result from these point source discharges. No change in the existing treatment level is recommended. Land-use projections for the year 2000 suggest that no

significant change in nonpoint source wasteloads is expected. Therefore, nonpoint source related water quality problems are not anticipated within the planning period.

e. Sewerage Planning Area Alternative Plans

There are no sewerage planning areas located in this segment; thus, no alternative plans were developed.

8. SEGMENT 2109

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2109. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2109.

(2) Physical Boundaries and Description. This segment is the total drainage area of the Leona River, which is a tributary of the Frio River.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Regional agencies within Segment 2109 include the Nueces River Authority, the Edwards Underground Water District, the Alamo Area Council of Governments, and the Middle Rio Grande Development Council.

There are portions of three counties in this segment: Frio, Uvalde, and Zavala.

The only incorporated town in the segment is the City of Uvalde.

Special districts include the Frio Soil and Water Conservation District, Nueces-Frio-Sabinal Soil and Water Conservation District, and the Winter Garden Soil and Water Conservation District.

(4) Water Quality Control Programs. Segment 2109 contains no Section 201 facility planning areas, no regional sewage treatment facilities or plans, and no sewerage planning areas. The Segment is currently within the monitoring network of TDWR and USGS. There are no TDH monitoring stations.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 2109. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Upper Nueces River Basin, and Appendix I, Segment Layouts with Nonpoint Source Inventory.

(2) Assessment. Agriculture is the principal nonpoint source activity in the drainage area of Segment 2109. Most of the cropland is found in the central portions of the drainage area in Zavala County. Agricultural runoff may contribute to increases in dissolved and suspended solids and/or short-term dissolved oxygen reductions. There are several waste disposal sites in Uvalde and Zavala counties, including two sanitary landfills, one septic tank area, and five animal feedlots. Groundwater contamination can potentially result. At a waste treatment plant in the City of Uvalde, improperly sealed joints have resulted in overflows into Cooks Slough; however, in recent months the problem has been corrected. Oil and gas production is minimal, relative to other areas of the basin. There are two active fields from which oilfield brine may impair water quality. The City of Uvalde is the major source of urban runoff with potential pollution consequences.

c. Wasteload Projections

This segment is classified as a Category IV segment. Wasteloads are projected for both point and nonpoint sources.

(1) Point Sources. There are one municipal and two industrial dischargers in this segment. The two industrial dischargers are not presently in operation but are expected to contribute wasteloads by the year 1983. The wasteload contribution from the existing municipal point source amounts to approximately 370 lbs/day of BOD and TSS. These municipal loads are projected to increase approximately 30 percent by the year 2000. The 1983 industrial wasteloads to the segment are expected to be small and not projected to increase significantly through the remaining planning period. These existing and projected wasteloads are summarized as follows.

Planning Year	BOD (lbs/day) Mun.	Ind.	Total	TSS (lbs/day) Mun.	Ind.	Total
Existing	370	-	370	370	-	370
1983	410	-	410	410	20	430
1990	443	-	443	443	20	463
2000	493	-	493	493	24	517

A more detailed breakdown of these loads is presented in Appendix K, as well as a discussion of the methodology used.

(2) Nonpoint Sources. The predominance of agricultural land and rangeland in the segment drainage area permitted the potential for nonpoint source pollution to be assessed in terms of sediment contributed to the main river segment. The drainage area of Segment 2109 was subdivided into six subcatchment areas on the basis of similarities in topography, land use, and soils. The Modified Universal Soil Loss Equation was applied to each subcatchment area to arrive at sediment loads generated during the critical season of the year. (The procedures for selecting the critical season and determining the sediment loads is discussed in Appendix G, Nonpoint Source Assessment Methodology.) The main river segment, the Leona River, was marked off at specific points of impact where the loads ultimately reach the numbered segment. At these points, average streamflows were also determined for the critical season. Tables 7 through 9 of Appendix J contain the parameters of the soil loss equation and the resultant sediment loads.

d. Wasteload Analysis

Leona River is classified as an "Effluent Limiting" segment. Its water use is deemed desirable for noncontact recreation and propagation of fish and wildlife. The following are the water quality standards established for the segment.

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	6.5 to 8.5
Coliform (log. avg. not more than)	1,000 FECAL/100 ml
Temperature	90°F
Chloride (not more than)	650 mg/l
Sulfate (not more than)	500 mg/l
Total Dissolved Solids (not more than)	2,000 mg/l

The City of Uvalde is the only point source discharging into the segment at the present time. The total oxygen demand from this facility is estimated to be about 1,000 lbs/day. Approximately 1.3 mgd of the treated effluent from this

facility is used for irrigation, and it is estimated that only about 15 percent of the total wasteloads is discharged into the segment. Nonpoint source wasteloads to the segment are principally contributed by agricultural runoff. Other nonpoint sources include sanitary landfills, animal feedlots, septic tanks, and urban stormwater runoff.

A review of the Water Quality Assessment Chapter of the Basic Data report indicates existing water quality in the segment is quite good. The segment is free of any violation of the established standards.

Although the City of Uvalde is projected to contribute a total oxygen demand of 1,340 lbs/day to the segment by the year 2000, the City is planning to utilize all the treated effluent for irrigation purpose. Therefore, the impact of future point source wasteloads on the segment is expected to be minimal. However, since the City does have a permit to discharge its treated effluent, for the purpose of this study an EPA simplified analysis was made to evaluate the impact of this discharge. The results indicate a possible DO violation might occur in the localized area of the Leona River within the planning period. Therefore, it is recommended the City operate its treatment plant only on a no-discharge basis in the future.

Since significant change in nonpoint source activities in the drainage area of this segment is not expected, water quality problems resulting from nonpoint sources are not anticipated within the planning period.

e. Sewerage Planning Area Alternative Plans

No sewerage planning areas have been identified in Segment 2109, and therefore no alternative plans are developed.

9. SEGMENT 2110

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2110. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2110.

(2) Physical Boundaries and Description. This segment is the drainage area of the Sabinal River from its confluence with the Frio River to S.H. 127 north of Sabinal.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Regional agencies within Segment 2110 include the Nueces River Authority, the Edwards Underground Water District, the Alamo Area Council of Governments, and the Middle Rio Grande Development Council.

There are portions of two counties within the segment: Medina and Uvalde.

The only incorporated town in the segment is the City of Sabinal.

Special districts include the Medina Valley Soil and Water Conservation District and the Nueces-Frio-Sabinal Soil and Water Conservation District.

(4) Water Quality Control Programs. Segment 2110 contains no Section 201 facility planning areas, no sewerage planning areas, and no regional sewage treatment facilities or plans. The segment is currently within the monitoring network of TDWR and USGS. There are no TDH monitoring stations.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 2110.

Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Upper Nueces River Basin, and Appendix I, Segment Layouts with Nonpoint Source Inventory.

(2) Assessment. Nonpoint source activity in the drainage area of Segment 2110 is minimal. The City of Sabinal in Uvalde County is the major source of urban runoff in the segment; however, no significant water quality problem is evident. There are a few waste disposal sites and one no-discharge treatment plant. Agricultural runoff may potentially impair water quality with increased sediment yields.

c. Wasteload Projections

This segment is classified as a Category II segment. Wasteloads are projected for point sources. The City of Sabinal is the only permit holder in the segment. Although the City has a discharge permit, no effluent discharge has been reported from this facility at the present time. Wasteloads are projected for this facility based on the permitted treatment level. A summary of the projections for the planning years is presented as follows.

Planning Year	BOD (lbs/day)	TSS (lbs/day)
Existing	0	0
1983	45	45
1990	48	48
2000	53	53

A more detailed breakdown of these loads is presented in Appendix K, as well as a discussion of the methodology used.

d. Wasteload Analysis

Segment 2110, the stretch of the Sabinal River from the confluence with Frio River to S.H. 127, has been classified as "Efflent Limiting" and its water use is deemed desirable for recreation, propagation of fish and wildlife, and domestic raw water supply. Water quality standards established for this segment are as follows:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	6.5 to 8.5
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	90°F
Chloride (not more than)	200 mg/l
Sulfate (not more than)	75 mg/l
Total Dissolved Solids (not more than)	700 mg/l

The only point source discharges in the segment is the City of Sabinal's wastewater treatment plant. The plant is currently operated on a no-discharge basis, and therefore does not contribute any wasteloads to the segment. Nonpoint source activity in the drainage area of the segment is minimal. Urban stormwater runoff and agricultural runoff have been identified as the two possible sources.

Available monitoring information, as presented in Chapter F of the Basic Data Report, indicates there have not been any existing water quality problems to date with the waters of this segment.

The projected total oxygen demand load from the City of Sabinal's treatment facility is estimated to be 140 lbs/day by the year 2000. Although the City is not discharging treated effluent to the segment at the present time, it does have a permit to discharge and may do so in the future. Therefore, the EPA simplified model was used to analyze the water quality impact of this possible future discharge. The results of the analysis indicate a minimum DO of 5.4 mg/l will be maintained in the Sabinal River by the year 2000. Based on the 5.0 mg/l DO standard for the segment, no violation is expected to result from this discharge. Therefore no changes in the present treatment requirements are recommended.

An examination of land-use projections for the year 2000 indicates significant change in nonpoint source activity in the drainage area of the segment is not expected. Since the existing nonpoint source discharges do not cause any water quality violations in the segment, nonpoint source related water quality problems are not anticipated within the planning period.

e. Sewerage Planning Area Alternative Plans

No water quality problems have been identified and no sewerage planning areas have been defined in Segment 2110; therefore, no alternative plans have been developed.

10. SEGMENT 2111

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2111. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2111.

(2) Physical Boundaries and Description. This segment is the drainage area of the Sabinal River from S.H. 127 upstream to its headwaters.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Regional agencies within Segment 2111 include the Nueces River Authority, the Edwards Underground Water District, Alamo Area Council of Governments, and the Middle Rio Grande Development Council.

There are portions of three counties within the segment: Bandera, Real, and Uvalde.

There are no incorporated towns in the segment.

Special districts include the Bandera County River Authority, Bandera Soil and Water Conservation District, Nueces-Frio-Sabinal Soil and Water Conservation District, the Real-Edwards Conservation and Reclamation District, and Upper-Nueces Frio Soil and Water Conservation District.

(4) Water Quality Control Programs. Segment 2111 contains no Section 201 facility planning areas, no sewerage planning areas, and no regional sewage treatment facilities or plans. The segment is currently within the monitoring network of TDWR, USGS, and TDH.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 2111.

Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Upper Nueces River Basin, and Appendix I, Segment Layouts With Nonpoint Source Inventory.

(2) Assessment. Existing water quality reveals no apparent problems in Segment 2111. Agricultural/silviculture would account for most of the nonpoint source activity. Runoff could potentially degrade water quality with increases in sediment. The use of septic tanks in the upper reaches of the Sabinal River does not presently pose a significant problem of pollution of surface and/or groundwaters. More detailed discussion on septic tank operations can be found in Appendix H of this report. Continued subdivision development along the Sabinal River upstream of the groundwater recharge zone can potentially contribute to pollution problems associated with urban runoff. Any number of pollutants can be present in urban stormwater runoff, including suspended and dissolved solids, organic matter, and toxicants.

c. Wasteload Projections

This segment is classified as a Category II segment. A wasteload projection for point sources is required. However, there are no point source discharges in this segment, and thus no projections of wasteloads in the segment were made.

d. Wasteload Analysis

Segment 2111 is the reach of the Sabinal River from S.H. 127 to its headwaters. The segment is classified as "Effluent Limiting" and its water uses are for recreation, propagation of fish and wildlife, and domestic raw water supply. Water quality standards for the segment are established as follows:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	7.0 to 9.0
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	90°F
Chloride (not more than)	40 mg/l
Sulfate (not more than)	75 mg/l
Total Dissolved Solids (not more than)	500 mg/l

There are no existing point sources discharging wastes into the segment. Agriculture accounts for most of the

nonpoint source activities in the drainage area of the segment. Other nonpoint source activities include mining and septic tank operations.

Available information, as presented in the Water Quality Assessment Chapter of the Basic Data Report, indicates there have not been any existing water quality problems to date with the waters of this segment.

No point source wasteloads are projected to be discharged into the segment by the year 2000. Since the existing nonpoint source discharges do not create any water quality problems in the segment, nor is any significant change in nonpoint source activity anticipated, water quality in the segment is expected to remain good throughout the planning period.

e. Sewerage Planning Area Alternative Plans

Since there are no sewerage planning areas in Segment 2111, no alternative plans have been developed.

11. SEGMENT 2112

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2112. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2112.

(2) Physical Boundaries and Description. This segment is the Nueces River drainage area from FM 1025 north of Crystal City to its headwaters, including the West Nueces River.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Regional agencies within Segment 2112 include the Nueces River Authority, the Edwards Underground Water District, and the Middle Rio Grande Development Council.

There are portions of five counties within this segment: Edwards, Kinney, Real, Uvalde, and Zavala.

The only incorporated towns in the segment are the cities of Rocksprings and Camp Wood.

Special districts include the Nueces-Frio-Sabinal Soil and Water Conservation District, Real-Edwards Conservation and Reclamation District, Upper Nueces-Frio Soil and Water Conservation District, West Nueces Las Moras Soil and Water Conservation District, Winter Garden Soil and Water Conservation District, and the Zavala County Water Control and Improvement District No. 1 (La Pryor).

(4) Water Quality Control Programs. Segment 2112 contains one Section 201 facility planning area - #1326, La Pryor FWSD. There are no sewerage planning areas and no regional sewage treatment systems or plans. The segment is currently within the monitoring network of TDWR, USGS, and TDH.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities in Segment 2112. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Nueces River Basin, and Appendix I, Segment Layouts With Nonpoint Source Inventory.

(2) Assessment. Nonpoint source activity in the drainage area of Segment 2112 is minimal. There are two sanitary landfills, one animal feedlot, and two septic tank areas in the vicinity of Barksdale and Campwood. Water quality parameters associated with these forms of waste disposal include coliforms, dissolved solids, and dissolved oxygen. The use of septic tanks in the upper reaches of the Nueces River does not presently pose a significant problem of pollution of surface and/or groundwaters. More detailed discussion can be found in Appendix H of this report. There are two no-discharge treatment plants in the area. These plants do not have permits to discharge directly into streams; consequently, effluent is used for irrigation or disposed of in evaporation pits. There is a construction site in Uvalde County with no serious water quality implications. Agricultural runoff can potentially degrade water quality with increased sediment yields.

Continued subdivision development along the Nueces River upstream of the groundwater recharge zone can potentially contribute to pollution problems associated with urban runoff. Any number of pollutants can be present in urban stormwater runoff, including suspended and dissolved solids, organic matter, and toxicants.

c. Wasteload Projections

Segment 2112 is classified as a Category IV segment. This segment presently receives no point source discharges and is not projected to have any by the year 2000. Nonpoint source impact assessment is presented in Appendix D, Results of Special Studies in Intensive Planning Areas.

d. Wasteload Analysis

Segment 2112, the portion of the Nueces River from FM 1025 south of Uvalde to headwater, has been classified as

"Effluent Limiting" and its water use is deemed desirable for recreation, propagation of fish and wildlife, and domestic raw water supply. Water quality standards established for this segment are as follows:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	7.0 to 9.0
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	90°F
Chloride (not more than)	40 mg/l
Sulfate (not more than)	40 mg/l
Total Dissolved Solids (not more than)	300 mg/l

Currently, no point source wastes are discharged into the segment. Nonpoint source activity in the drainage area of the segment is minimal. Two sanitary landfills, two septic tank areas, and one animal feedlot have been identified as possible nonpoint sources. Agricultural runoff also contributes a portion of the nonpoint source wasteloads to the segment.

A review of the Water Quality Assessment Chapter of the Basic Data Report indicates existing water quality in the segment is generally good and free of any violations of established standards. Since no point source wasteloads are projected to be discharged into the segment by the year 2000, and no significant change in nonpoint source activity is anticipated, water quality in the segment is expected to remain good through the planning period.

e. Sewerage Planning Area Alternative Plans

There are no sewerage planning areas located in this segment; thus, no alternative plans were developed.

12. SEGMENT 2113

a. Summary of Existing Agencies and Water Quality Control Programs

(1) Introduction. This section summarizes the existing management agencies and water quality programs in the Nueces River Basin Segment 2113. Additional detailed information is provided in Appendix E, Legal Authority for Water Quality Management, and Appendix F, Financial Capability of Target Entities. This section contains three major topics: description of boundaries, identification of major management agencies, and the definition of water quality control programs in Segment 2113.

(2) Physical Boundaries and Description. This segment is the Frio River drainage area from U.S. 90 west of Knippa upstream to its headwaters.

(3) Existing Management Agencies. Although numerous federal and state agencies have some water quality management within this segment, the primary agencies are the EPA and the TDWR.

Regional agencies within Segment 2113 include the Nueces River Authority, the Edwards Underground Water District, Alamo Area Council of Governments, and the Middle Rio Grande Development Council.

There are portions of three counties within this segment: Kerr, Real, and Uvalde.

The only incorporated town in the segment is the City of Leakey.

Special districts include the Nueces-Frio-Sabinal Soil and Water Conservation District, Real-Edwards Conservation and Reclamation District, the Upper Guadalupe River Authority, and Upper-Nueces Frio Soil and Water Conservation District.

(4) Water Quality Control Programs. Segment 2113 contains no Section 201 facility planning areas, no sewerage planning areas, and no regional sewage treatment facilities or plans. The segment is currently within the monitoring network of TDWR, USGS, and TDH.

b. Nonpoint Source Assessment

(1) Introduction. This section presents an assessment of the various nonpoint source activities and related waste loadings in Segment 2113. Detailed discussion of each nonpoint source category and techniques utilized to compile level of activity information is provided in Appendix G, Nonpoint Source Assessment Methodology. Additional information is also provided in Appendix H, Septic Tank Pollution Potential in the Upper Nueces River Basin, and Appendix I, Segment Layouts With Nonpoint Source Inventory.

(2) Assessment. The drainage area of Segment 2113 is principally forest and rangeland and a few patches of cropland. Runoff from agricultural/silvicultural activities can potentially affect water quality with increased sediment yields. Table 3 of Appendix G gives an indication as to the sediment load potential of Segment 2113 as it compares to other segments in the basin. Continued subdivision development along the Frio River upstream of the groundwater recharge zone can potentially contribute to pollution problems associated with urban runoff. Any number of pollutants can be present in urban stormwater runoff, including suspended and dissolved solids, organic matter, and toxicants.

There are two sanitary landfills, three septic tank areas, and two animal feedlots in the drainage area. Water quality parameters associated with these forms of waste disposal include coliforms, dissolved solids, and dissolved oxygen. The use of septic tanks in the upper reaches of the Frio and Dry Frio rivers does not presently constitute a signficant problem of pollution of surface and/or groundwaters. More detailed discussion can be found in Appendix H of this report.

In addition, intensive recreational use can be potentially detrimental to water quality in the upper Frio River. Garner State Park in northern Uvalde County is about to undergo a six- to eight-month period of redevelopment in order to regulate park use and to alleviate some of the pressures on water and land resources in the vicinity. At the present time camping is permitted anywhere throughout the park, resulting in a tremendous problem of overcrowding. During fiscal year 1977 the park had an annual visitation of slightly over 375,000, of which approximately two-thirds were overnight visitors. Following construction, all overnight visitation will be controlled through the use of designated campsites. This will regulate locations as well as number of visitors to the park.

c. Wasteload Projections

This segment is classified as a Category IV segment. Wasteloads are projected only for nonpoint sources, since there are no existing point source discharges contributing wasteload to this segment.

The predominance of rangeland and forestland in the segment drainage area permitted the potential for nonpoint source pollution to be assessed in terms of sediment contributed to the main river segment. The drainage area of Segment 2113 was subdivided into two subcatchment areas on the basis of similarities in topography, land use, and soils. The Modified Universal Soil Loss Equation was applied to each subcatchment area to arrive at sediment loads generated during the critical season of the year. (The procedures for selecting the critical season and determining the sediment loads are discussed in Appendix G, Nonpoint Source Assessment Methodology.) The main river segment, the Frio River from U.S. 90 west of Knippa to headwater, was marked off at specific points of impact where the loads ultimately reach the numbered segment. At these points, average streamflows were also determined for the critical season. Tables 10 through 12 of Appendix J contain the parameters of the soil loss equation and the resultant sediment loads.

d. Wasteload Analysis

Segment 2113, the reach of the Frio River from U.S. 90 west of Knippa to headwater, is currently classified as "Effluent Limiting" and its water uses are for recreation, propagation of fish and wildlife, and domestic raw water supply. Water quality standards established for the segment are as follows:

Dissolved Oxygen (not less than)	5.0 mg/l
pH Range	7.0 to 9.0
Coliform (log. avg. not more than)	200 FECAL/100 ml
Temperature	90°F
Chloride (not more than)	25 mg/l
Sulfate (not more than)	30 mg/l
Total Dissolved Solids (not more than)	300 mg/l

There are no point sources discharging into the segment. Agricultural activity contributes the majority of the nonpoint source wasteloads to the segment. Other nonpoint source activities include sanitary landfills, septic tanks, and animal feedlots.

A review of the Water Quality Assessment Chapter of the Basic Data Report indicates that existing water quality in the segment is generally good and free of any violations of established standards. Since no point source wasteloads are projected to be discharged into the segment by the year 2000, and significant change in nonpoint source activity is not anticipated, water quality in the segment is expected to remain good through the planning period.

e. Sewerage Planning Area Alternative Plans

No sewerage planning areas have been identified in this segment; thus, no alternative plans have been developed for Segment 2113.