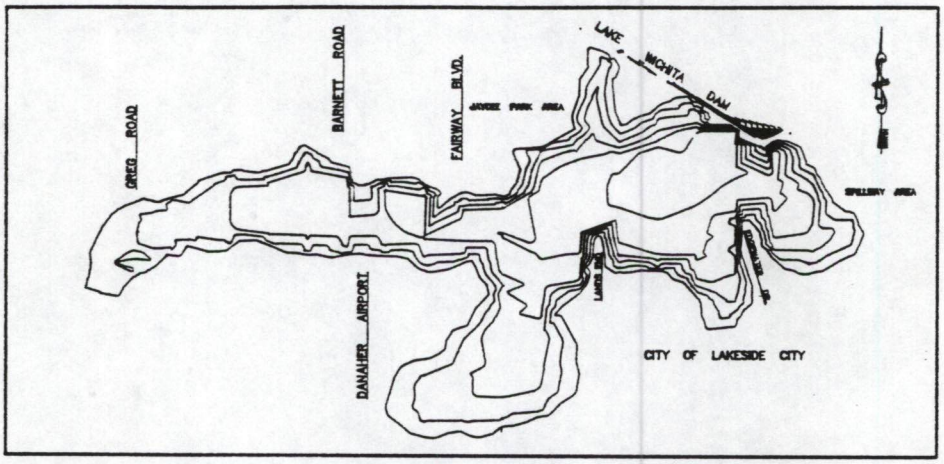
STUDY REPORT
ON
LAKE WICHITA IMPROVEMENTS



FOR

CITY OF
Wichita Falls
TEXAS

Prepared By :

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Consulting Engineers
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Wichita Falls, Texas 76301

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STUDY REPORT
ON
LAKE WICHITA IMPROVEMENTS

1.0 INTRODUCTION

1.1 General

The City of Wichita Falls is considering improvements to Lake Wichita to enhance the opportunities for the general public to utilize the lake for recreational purposes.

The lake was constructed in 1901 with a later construction modification setting spillway crest elevation of 980.7 mean sea level (MSL). The normal pool in the lake fluctuates between 976 MSL and 977 MSL. The top of the dam varies from about elevation 983 MSL to 990 MSL. When constructed the original lake had an average depth of approximately 12 feet and a maximum depth of approximately 17 feet when the water level was at spillway elevation of 980.7 MSL. Based on normal pool levels and before siltation, the average lake depth was 7.5 feet.

An important fact about the lake is there is an enormous loss of water by evaporation. Lake evaporation averages 4.5 feet per year or approximately 5.60 million gallons per day. During the summer months, the evaporation rate can approach 10 million gallons per day.

As part of the dam and spillway reconstruction proposed by the Corps of Engineers, a new spillway will be constructed with a crest at 976.0 MSL.

This spillway elevation was selected by the Corps of Engineers and accepted by the City of Wichita Falls and City of Lakeside City after considering the cost implications of channel size, dam height, and acquisition of right-of-way in the respective cities. This elevation is 4.7 feet below the existing spillway elevation. Pool elevations substantially below 976 MSL can be expected during the summer months as the result of evaporation, with water levels higher than 976 MSL expected only on a very temporary basis during periods of intensive rainfall. Therefore, consideration should be given to increasing the depth of the lake if extensive recreational use is a goal.

1.2 Purpose of Study

The purpose of this study is to investigate and document various options and associated costs relative to reclaiming Lake Wichita for recreational use.

1.3 Scope of Study

In coordination with the City's staff, a scope of services was defined for the study. Generally, the scope of the study is to thoroughly review Lake Wichita and develop a range of options for reclaiming the lake for recreational use. Specifically, options relating to increasing the depth of the lake by dredging were evaluated.

In connection with the Lake Wichita study, the following services were performed:

a) Mapping of Lake Bottom
b) Soil Drilling and Laboratory Testing
c) Development of Alternatives for Spoil Disposal
d) Conceptual Plans and Costs of Selected Options

2.0 DESCRIPTION OF INVESTIGATIONS

2.1 Subsurface Topographic Mapping

The surface area of Lake Wichita was determined in April, 1991 by traversing around the perimeter of the lake along the water's edge, which was approximately elevation 978.4. Also, twenty-two (22) north-south cross-sections were taken along the lake bottom in an attempt to determine its actual depth and bottom elevation.

The prepared topographic survey map is included in APPENDIX "A" along with selected sections across the lake. Based on the survey and mapping information, calculations were performed to determine existing lake conditions relative to various water levels. The following table summarizes the results of the field survey information and mapping process.

LAKE WICHITA TOPOGRAPHIC RESULTS
April, 1991

Pool Elevation (MSL)	Surface Area (Acres)	Average Depth (Ft.)	Maximum Depth (Ft.)	Average Silt Depth (Ft.)
980.7	2,100	9.0	14.0	3.0
978.0	1,578	6.5	11.5	3.0
976.0	1,224	4.5	9.5	3.0
974.0	885	3.5	7.5	3.0
972.0	550	2.5	5.5	3.0
970.0	325	2.0	3.5	3.0

2.2 Sediment Analysis

In mid-April subsurface materials on the lake bottom were explored by 15 borings drilled to depths of approximately 15 to 28 feet below the lake

water surface. The boring logs are included in APPENDIX "B" on Plates A.1 through A.15, and a key to terms and descriptions on the logs is provided on Plate A.16.

Selected laboratory soil tests were performed on representative samples recovered from the borings, in addition to the classification tests, liquid limits, plastic limits, and moisture content tests being performed. Results of these tests are shown next to the respective boring logs and are summarized on Plates A.17 and A.18 in APPENDIX "B".

The depth from the lake surface to the lake bottom varied from approximately 3 feet to 11 feet at the locations explored. The depth of lake sediment, or "muck" as termed on the boring logs, was determined by a combination of: (i) the depth to which the hollow stem auger sank into the lake bottom; (ii) visual observations of the retrieved soil samples; (iii) the hand penetrometer test; and (iv) judgement.

The "muck" depth generally ranged from approximately 1 to 4 feet and was found to be as deep as 8-1/2 feet near the original Holliday Creek channel. The "muck" consists of varying quantities of sand, silt and clay with some organics, and silt and sand seams. Classification tests revealed the "muck" to have plasticity indices ranging from 10 to 52, and the soils classifying as CL and CH materials. It was typically very soft in consistency with a high moisture content. Several locations revealed the "muck" to be dark brown to blackish in color, appearing very organic.

Soils below the "muck" consist of lean clay and sandy clay (CL) materials and sandy silty clay (CL-ML) materials. Plasticity index (PI) values ranging from 7 to 30 were obtained on samples of these soils. The consistency generally ranged from soft to stiff, with a clay shale material encountered in Boring B-8 from 16 to 19.5 feet, being very stiff to hard in consistency. Soils below the "muck" typically were reddish brown in color.

Samples were collected and tested from Borings B-1, B-4, B-7, B-10, B-13 and B-15 to identify possible contamination. Each of these samples were tested for the following:

- Total Metals, EPA Method 3050
- General Solvent Scan, EPA Method 8000

One composite sample from B-1, B-10 and B-15 was also tested for pesticides and herbicides. Specific tests performed were:

- Organochlorine Pesticides, EPA Method 8080
- Organophosphorus Pesticides, EPA Method 8140
- Chlorinated Herbicides, EPA Method 8150

Pesticides, herbicides and solvents were not detected in the testing. A summary of the test results for total metals is presented in Table 1, APPENDIX "C". Also, laboratory data sheets are included in APPENDIX "C".

The levels for total metals are in the typical range for soils in North Texas with the exception of mercury. The Environmental Protection Agency (EPA) lists a material as having toxicity characteristic if the mercury level exceeds 0.2 mg/l (milligrams per liter) using the Toxicity

Characteristic Leaching Procedure (TCLP). Although the samples were not tested using the TCLP method, using the highest solid concentration of 0.02 mg/kg (milligrams per kilogram) and knowing that the TCLP method employs a 20:1 dilution of the sample, the maximum TCLP level that could be expected from the samples is 0.001 mg/l. This level is much less than the EPA toxicity characteristic level of 0.2 mg/l and, therefore, is not considered to be a level of concern.

With regards to lead, the EPA considers a soil to have toxicity characteristics if the lead level exceeds 5 PPM using the TCLP method. Based on the highest solid concentration of 23 mg/kg and again knowing the TCLP method employs a 20:1 dilution of the sample, the maximum TCLP lead level expected from the lake material is 1.15 mg/l (PPM). This level is well below the current EPA toxicity threshold of 5 mg/l (PPM).

The sediment tested is acceptable for fill in park areas or other public areas based upon the results of the analytical testing of the borings. It is recommended that 6 to 12 inches of uncompacted topsoil be placed over the fill and vegetation be established on the surface.

3.0 SPOIL DISPOSAL ALTERNATIVES

3.1 Park Development

Jaycee Park, a City owned and maintained park area, is located along the north shoreline of Lake Wichita and just east of Fairway Boulevard. There are approximately 235 acres within the park boundary of which conservatively 120 acres could be utilized to accommodate a portion of excavated spoil material from the lake.

The material could be used to construct and develop conspicuous topographic features within the park area, thereby adding character to its surroundings.

Obvious advantages of disposing of the spoil at Jaycee Park is the close central proximity to all portions of the lake, and the land is already owned and controlled by the City of Wichita Falls.

3.2 Private Adjacent Lands

Along the southwest, west and northwest shoreline of the lake there are several large private tracts which would be suitable for disposal sites. It is anticipated the City can purchase available land for disposal areas or can negotiate contracts with adjacent private landowners to dispose of all excavated lake material.

The area of land required will be dependent on the volume of material to be excavated from the lake. However, it is estimated that as much as

750 acres of private land suitable for use as disposal areas could be required for the overall Lake Wichita project.

3.3 Island or Jetty Development

Some consideration was given to the construction or development of islands or fishing jetties in the lake. However, after corresponding with the Corps of Engineers, it was determined that approval from the Environmental Protection Agency (EPA) and the Corps of Engineers (COE) for construction of the islands or jetties would be very difficult to obtain. In fact, a Section 404 permit from the Corps of Engineers and approval from the EPA would be necessary if any of the excavated lake material is to be disposed of within the body of the existing lake.

Therefore, any type of construction requiring the disposition of excavated material within the body of Lake Wichita is not considered a disposal alternative.

4.0 CONCEPTUAL PLANS AND COSTS OF OPTIONS

4.1 Option No. 1 - No Action Taken

As stated previously in the final phase of the Holliday Creek Flood Control Project, the spillway elevation of Lake Wichita will be lowered from 980.7 MSL to 976.0 MSL or approximately 4.7 feet.

With no action taken relative to lake improvements, the average water depth would be 4.5 feet at 976.0, and during the summer months the average depth could be as low as 2.5 feet. Also, the surface area of the lake could be reduced by as much as 65% of the area typically covered when the lake level is at 978.0 MSL. Specifically, the surface area covered by water when the lake level is 978.0 MSL is approximately 1,578 acres, and during the summer months if the lake level dropped to 972.0 MSL (which is conceivable due to high evaporation rates), the area covered by water would be only 550 acres.

However, to compensate for evaporation losses, the City of Wichita Falls could divert water from Lake Diversion into Lake Wichita through the southside canal and its associated laterals, which would realistically limit excessive water level fluctuations.

Based on information from the City of Wichita Falls, a peak monthly summer evaporation loss (assuming no rainfall) of 13 million gallons per day (MGD) can be expected. If the lake level is to be maintained during the summer months, 13 MGD must be diverted from Lake Diversion. The City

has a permit from the State to divert up to 5,850 acre feet (1,906,098,480 gallons) per year to Lake Wichita for recreational purposes. The permit also refers to a maximum diversion rate of 100 cfs (64.63 MGD). Therefore, the existing permit is more than adequate for a required diversion rate of 13 MGD to compensate for summer evaporation losses.

Even though the City of Wichita Falls possesses a permit, calculations reveal the capacity of the existing canal system is limited to approximately 7.0 MGD. However, improvements to the existing system by cleaning, widening, and construction of minor flow structures will increase the canal system capacity up to approximately 15 MGD, which is adequate to compensate for lake evaporation losses. All canal improvements should be coordinated with the Wichita County Water Improvement District.

It is anticipated that with a deliberate and conscientious effort by the City and with some relatively minor improvements to the canal system, Lake Wichita water levels could be maintained between 974.0 MSL and 976.0 MSL.

This option would require capital expenditures estimated at approximately $25,000.00 to $30,000.00.

4.2 Option No. 2 - Drain Lake Wichita

This option would virtually eliminate recreational boating and fishing at the lake, even though it would probably be the most cost effective flood control measure.

The lake area would basically be kept dry by low flow facilities within the spillway wier. The dry bottom reservoir would only hold water during periods of intensive rainfall, and then would drain and eventually approach a dry condition.

Recreational benefits derived from this option would be limited to wildlife management and/or hunting activities, an area for all-terrain off-road recreational vehicles, or possible public park area use.

No major capital expenditures are anticipated with this option.

4.3 Option No. 3 - Dredge North Portion of Lake Wichita To Contour 976 MSL

This option involves excavation of the existing lake bottom by means of hydraulic dredging equipment in order to remove the existing silt and native soil, and thereby increasing the average depth of the lake.

Under this plan dredging operations would be performed in an area generally bounded on the north by the 976.0 MSL contour and on the south approximately along the center of the lake and old channel (see Fig. 1). To be suitable for a recreational lake, it is believed that an average depth of 10 feet based on a level of 976.0 MSL should provide an average summer lake depth of approximately 8 feet. This depth would be adequate for normal recreational water activities. With an average depth of 10 feet the lake would be approximately one (1) foot deeper than when originally constructed in 1901.

For budget purposes the following cost estimate for this option is provided below:

Cost Estimate - Option No. 3

Mobilization	LS	=	$ 150,000.00
Purchase Disposal Sites	250 AC @ $1500.00	=	375,000.00
Diking & Disposal Site Preparation	LS	=	150,000.00
Excavation by Dredging	4,436,700 CY @ $ 2.50	=	11,091,750.00
Processing at Disposal Site	4,436,700 CY @ $ 0.75	=	3,327,525.00
Estimated Construction Cost		=	$15,094,275.00
Contingencies @ 10%		=	1,509,427.00
Engineering & Project Management		=	775,000.00
TOTAL ESTIMATED COST		=	$17,378,702.00

4.4 Option No. 4 - Dredge North Portion of Lake Wichita to Contour 978 MSL

This option is very similar to the plan in Option No. 3, except the dredging operation would extend to contour 978 MSL on the north with the southern boundary remaining the same (see Fig. 2). Again, the average depth of the lake would be 10 feet based on a level of 976 MSL and would provide an average summer lake depth of approximately 8 feet.

For budget purposes the following cost estimate for this option follows:

Cost Estimate - Option No. 4

Mobilization	LS	=	$ 150,000.00
Purchase Disposal Site	250 AC @ $1500.00	=	375,000.00
Diking & Disposal Site Preparation	LS	=	150,000.00
Excavation by Dredging	5,102,167 CY @ $ 2.50	=	12,755,418.00
Processing at Disposal Site	5,102,167 CY @ $ 0.75	=	3,826,625.00
Estimated Construction Cost		=	$17,257,043.00
Contingencies @ 10%		=	1,725,704.00
Engineering & Project Management		=	875,000.00
TOTAL ESTIMATED COST		=	$19,857,747.00

4.5 Option No. 5 - Dredge Overall Lake to Contour 978 MSL

This option provides for excavation by dredging of the overall lake bounded by contour 978 MSL and encompasses approximately 1,578 surface acres (see Fig. 3). Again, the plan would provide for an average depth of 10 feet based on a level of 976 MSL and would provide an average summer lake depth of 8 feet.

For budget purposes the following cost estimate for this option is provided below:

Cost Estimate - Option No. 5

Mobilization	LS	=	$ 350,000.00
Purchase Disposal Site	750 AC @ $1500.00	=	1,125,000.00
Diking & Disposal Site Preparation	LS	=	300,000.00
Excavation by Dredging	14,002,120 CY @ $ 2.50	=	35,005,300.00
Processing at Disposal Site	14,002,120 CY @ $ 0.75	=	10,501,590.00
Estimated Construction Cost		=	$47,281,890.00
Contingencies @ 10%		=	4,728,189.00
Engineering & Project Management		=	1,750,000.00
TOTAL ESTIMATED COST		=	$53,760,079.00

5.0 STUDY CLOSURE

Lake Wichita has over the past 90 years provided the City of Wichita Falls with a limited source of water supply, flood control, and recreational benefits. Even today there is considerable sentiment attached to the lake.

Upon completion of the final phase of the Holliday Creek Flood Control project, the future of Lake Wichita as a recreational asset will be severely jeopardized. Not only will the surface area of the lake be decreased by 30% to 40%, but the average depth will be reduced to approximately 3.5 feet.

In order to reclaim the lake for recreational purposes, extensive and costly dredging operations must be considered. Depending on the selected improvements, project costs could range from approximately $17,000,000 to $53,000,000. To determine costs for various other dredging plans, a unit cost of $6,200.00 per acre-foot of dredged material is believed to be a reasonable estimate.

The engineering parameters of the project are firmly defined. The ultimate scope of the project will be governed by the intensity of community committment to the capital expenditures required.

APPENDIX "A"

Topographic Survey of Lake Bottom

Selected Sections of Lake Bottom

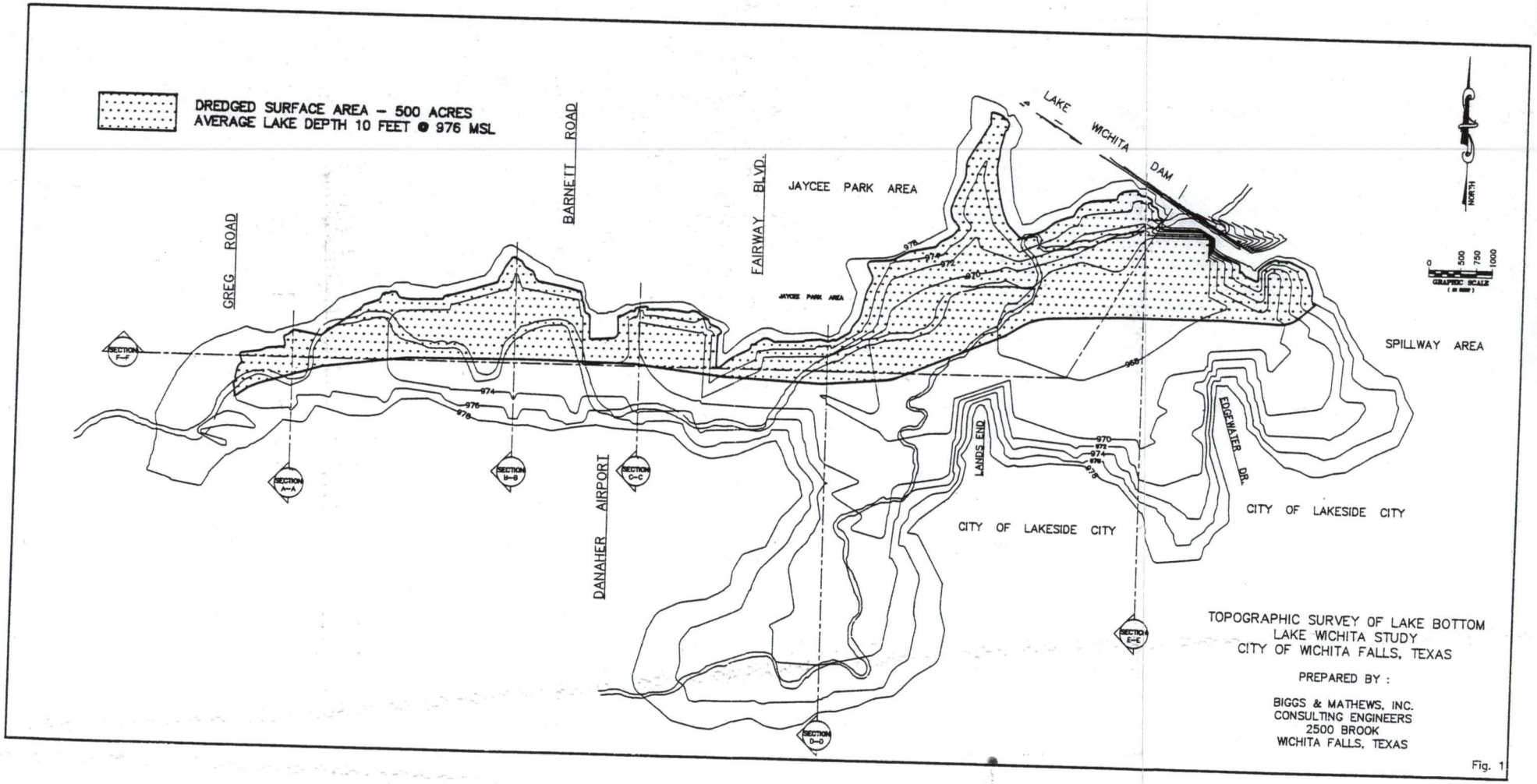
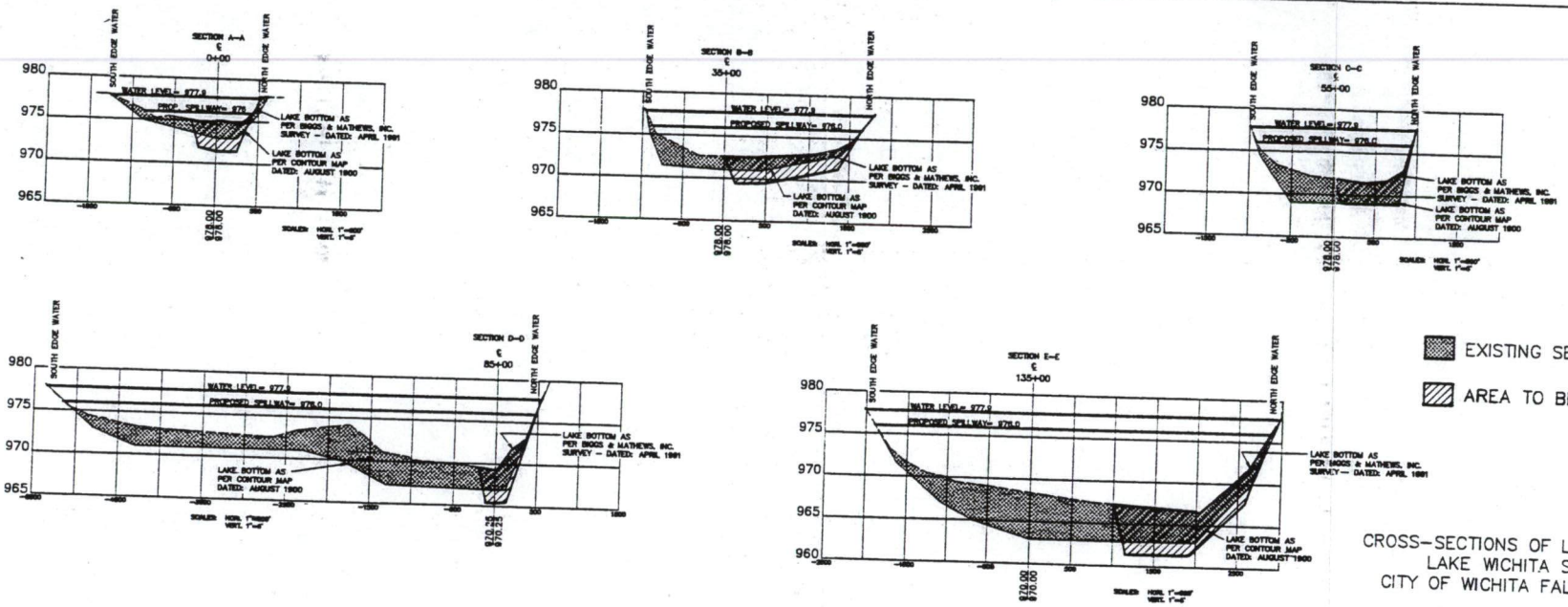

DREDGED SURFACE AREA – 500 ACRES
AVERAGE LAKE DEPTH 10 FEET @ 976 MSL
GREG ROAD
BARNETT ROAD
FAIRWAY BLVD.
JAYCEE PARK AREA
JAYCEE PARK AREA
LAKE WICHITA DAM
SPILLWAY AREA
DANAHER AIRPORT
LANDS END
EDGEWATER DR.
CITY OF LAKESIDE CITY
CITY OF LAKESIDE CITY
SECTION F-F
SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
972
974
976
978
970
NORTH
0 500 750 1000
GRAPHIC SCALE
TOPOGRAPHIC SURVEY OF LAKE BOTTOM
LAKE WICHITA STUDY
CITY OF WICHITA FALLS, TEXAS
PREPARED BY :
BIGGS & MATHEWS, INC.
CONSULTING ENGINEERS
2500 BROOK
WICHITA FALLS, TEXAS

Fig. 1



CROSS–SECTIONS OF LAKE BOTTOM
LAKE WICHITA STUDY
CITY OF WICHITA FALLS, TEXAS

PREPARED BY :

BIGGS & MATHEWS, INC.
CONSULTING ENGINEERS
2500 BROOK
WICHITA FALLS, TEXAS

Fig. 1–A

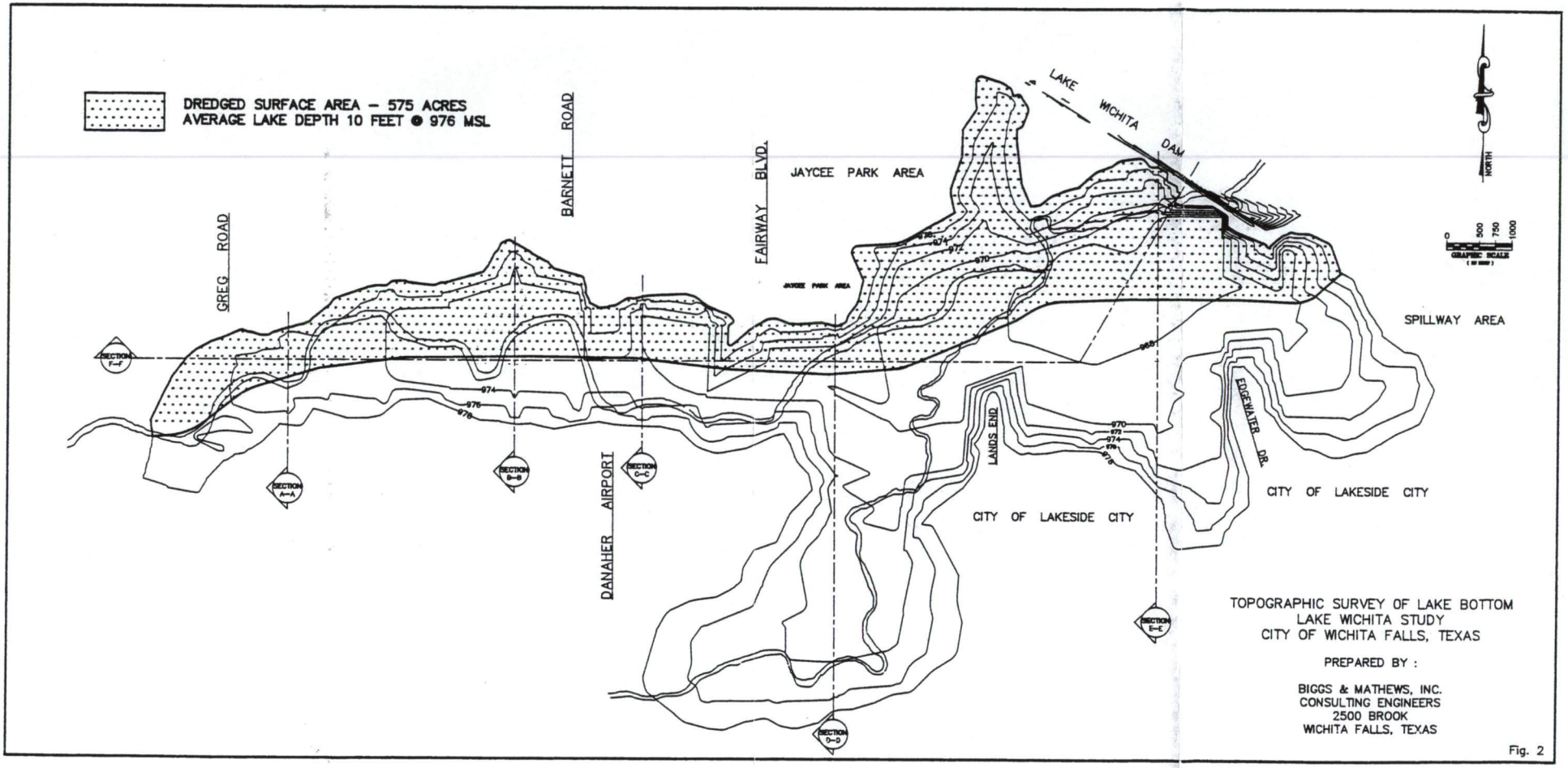
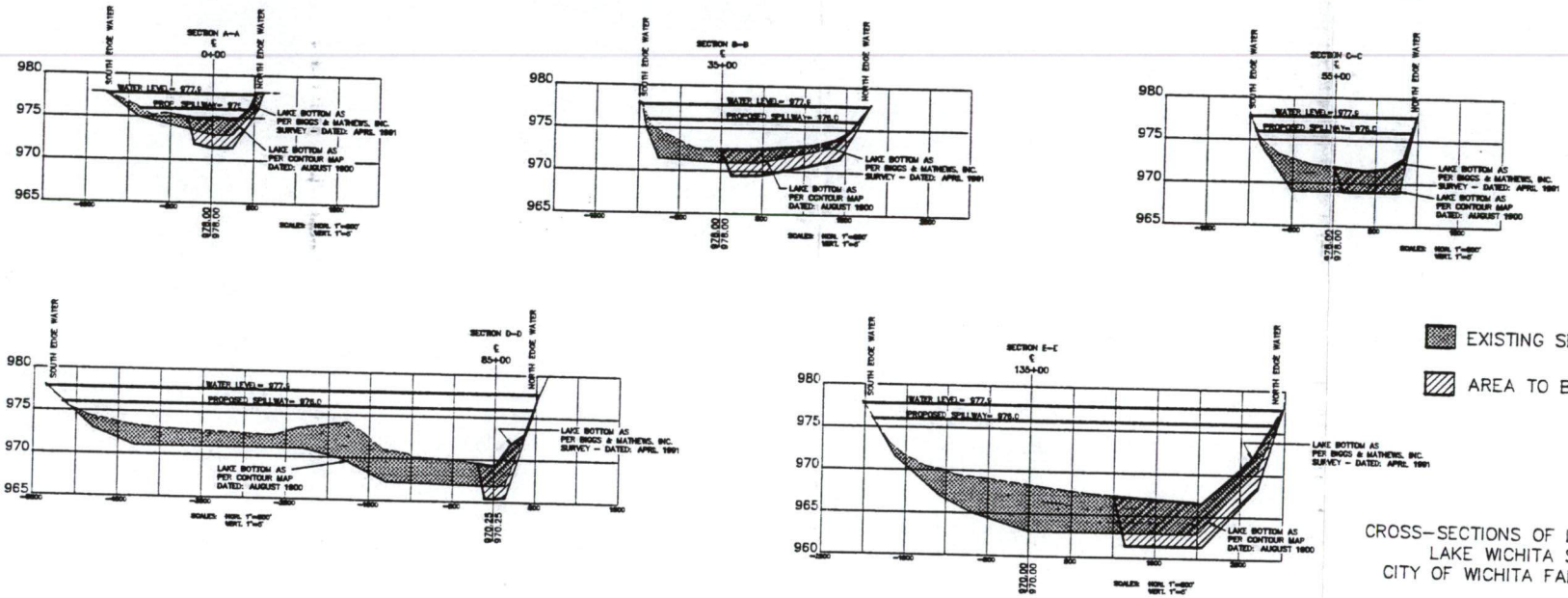

DREDGED SURFACE AREA – 575 ACRES
AVERAGE LAKE DEPTH 10 FEET @ 976 MSL
GREG ROAD
BARNETT ROAD
FAIRWAY BLVD.
JAYCEE PARK AREA
LAKE WICHITA DAM
NORTH
0 500 750 1000
GRAPHIC SCALE
SPILLWAY AREA
EDGEWATER DR.
LANDS END
CITY OF LAKESIDE CITY
CITY OF LAKESIDE CITY
DANAHER AIRPORT
SECTION F-F
SECTION A-A
SECTION B-B
SECTION C-C
SECTION D-D
SECTION E-E
974
976
978
970
972
974
976
978
980
TOPOGRAPHIC SURVEY OF LAKE BOTTOM
LAKE WICHITA STUDY
CITY OF WICHITA FALLS, TEXAS
PREPARED BY :
BIGGS & MATHEWS, INC.
CONSULTING ENGINEERS
2500 BROOK
WICHITA FALLS, TEXAS

Fig. 2



EXISTING SEDIMENT

AREA TO BE DREDGED

CROSS-SECTIONS OF LAKE BOTTOM
LAKE WICHITA STUDY
CITY OF WICHITA FALLS, TEXAS

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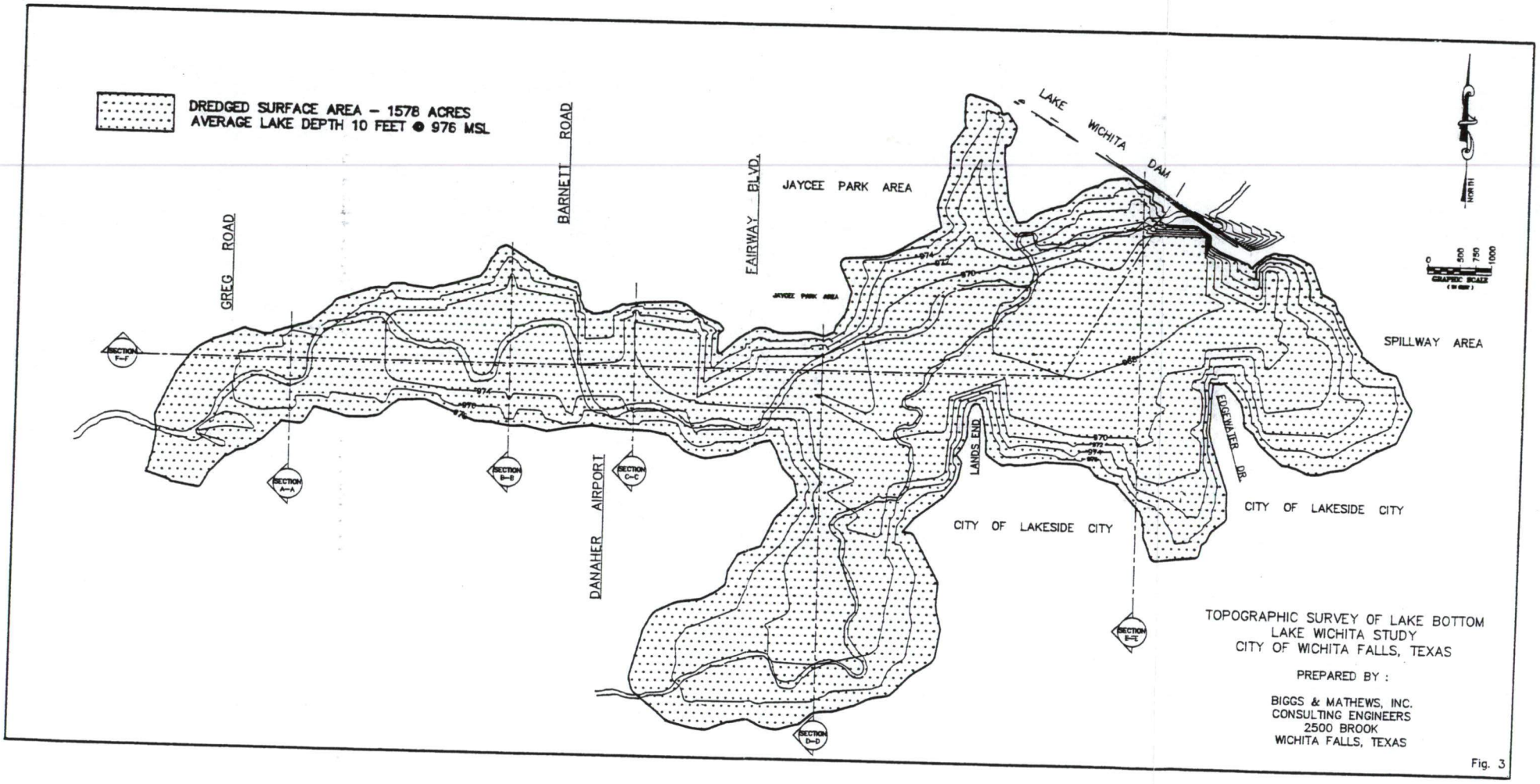
Fig. 2-A



TOPOGRAPHIC SURVEY OF LAKE BOTTOM
LAKE WICHITA STUDY
CITY OF WICHITA FALLS, TEXAS

PREPARED BY :

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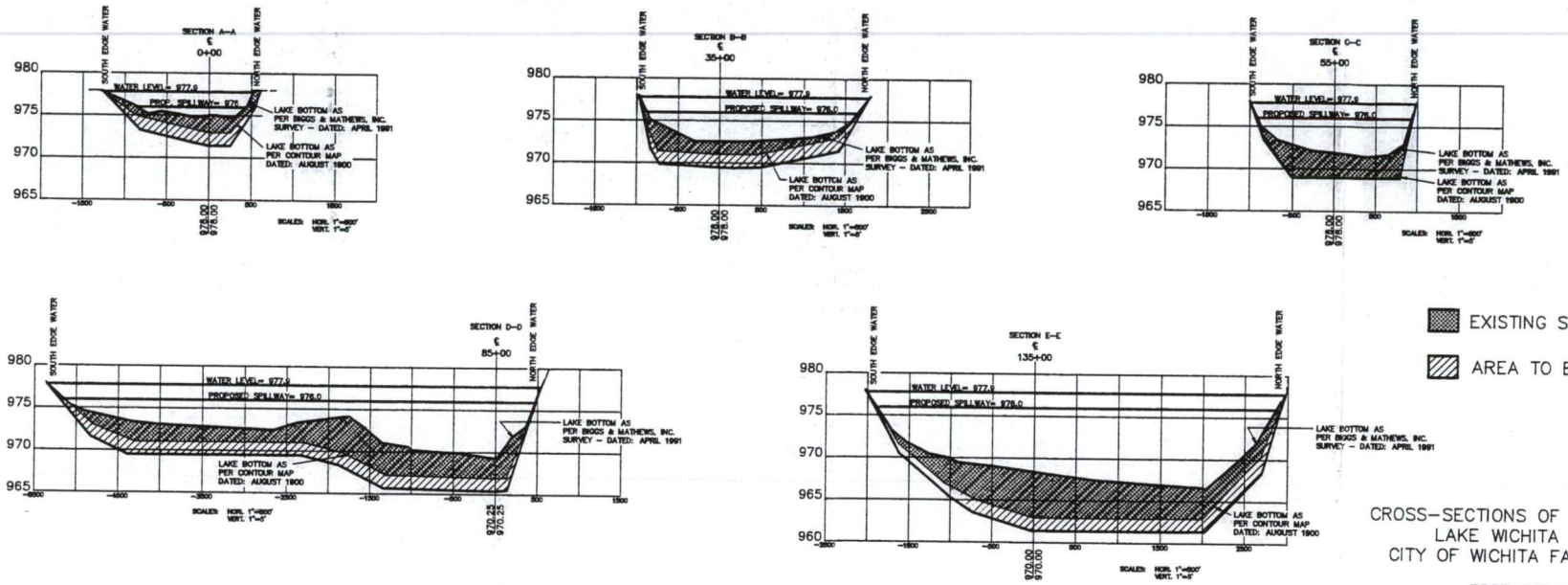
CONSULTING ENGINEERS
2500 BROOK
WICHITA FALLS, TEXAS

Fig. 3



CROSS-SECTIONS OF LAKE BOTTOM
LAKE WICHITA STUDY
CITY OF WICHITA FALLS, TEXAS

PREPARED BY :

BIGGS & MATHEWS, INC.
CONSULTING ENGINEERS
2500 BROOK
WICHITA FALLS, TEXAS

Fig. 3-A

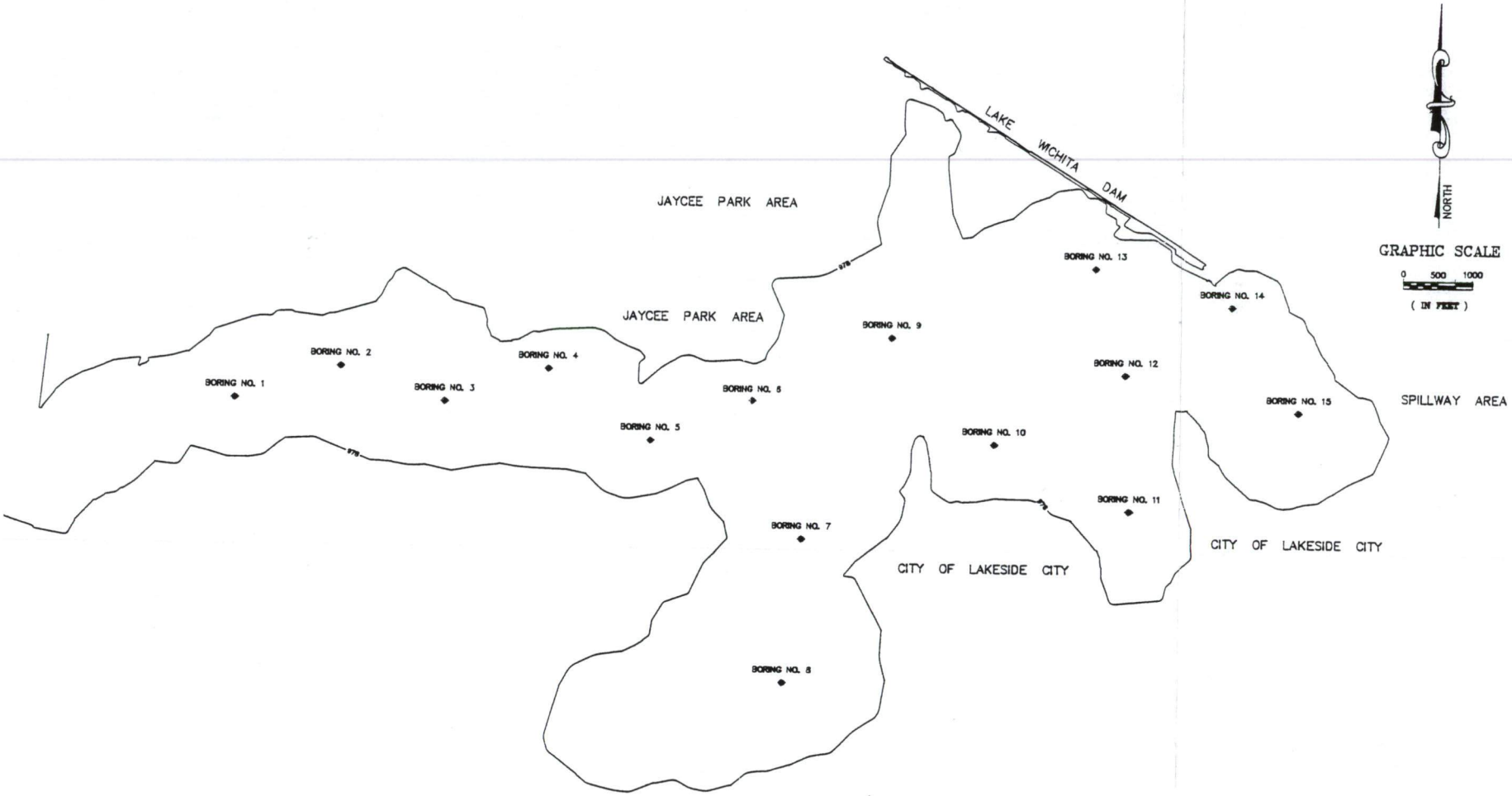
APPENDIX "B"

Logs of Sediment (B-1 through B-15)

General Notes

Summary of Laboratory Tests

Grain Size Distribution



LOCATION MAP
SOIL BORINGS

BIGGS & MATHEWS, INC.
CONSULTING ENGINEERS
2500 BROOK • WICHITA FALLS, TEXAS

COUNTY WICHITA	DATE: JUNE 6, 1991
SCALE: AS SHOWN	NO.
JMJ	

LOG OF BORING NO. B - 1

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 3 FEET (3.0')							
2.5											
5				[MUCK], consisting of clay, silt & sand, dark brown to blackish, very soft, w/reddish tan silt, sand & clay seams (9.5')							
7.5											
	U- 1	0.0									
10				LEAN CLAY, sand, reddish brown, soft (13.0')							
	U- 2	0.5	CL		25		33	15	18	72	
12.5											
	U- 3	2.0									
15	U- 4	1.5		LEAN CLAY, reddish brown to reddish tan, w/silty sand seams (20.0')							
	U- 5	1.0	CL		21		35	15	20	86	
17.5											
	U- 6	1.0									
20											
22.5											
25											

Completion Depth: 20.0 Feet
Date: 4-16-91
Project Number: 912985

BAKER-SHIFLETT, INC.

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 2

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 4.5 FEET							
2.5											
				(4.5')							
5	U- 1	0.5		[MUCK], dark brown sand, silt & clay (5.0')							
				LEAN CLAY, w/sand, reddish tan to reddish brown, soft to firm, w/silty sand layers							
7.5	U- 2	2.5									
	U- 3	2.5	CL		16	121	30	14	16	79	
10											
12.5				(12.5')							
				SANDY LEAN CLAY, reddish brown, w/silty sand seams							
15	U- 4	0.0	CL		18		24	14	10	59	
17.5	U- 5	0.0									
	U- 6	0.0									
20											
	U- 7	0.0									
22.5											
	U- 8	2.0			17						
25				(25.0')							

Completion Depth: 25.0 Feet
Date: 4-16-91
Project Number: 912985

BAKER-SHIFLETT, INC.

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 3

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 5.5 FEET (5.5')							
2.5											
5											
	U- 1	0.0		[MUCK], consisting of brown clay, silt & sand, very soft (7.0')							
7.5											
	U- 2	0.5	CL	LEAN CLAY, reddish brown to reddish tan, soft	25	108	44	15	29	94	
10	U- 3	0.8	CL	(11.5')	23	107	39	15	24	94	0.8
12.5	U- 4	0.5	CL	SANDY LEAN CLAY, reddish tan, soft, w/silty sand layers	20	116	28	14	14	69	
15	U- 5	0.0			21	110					
	U- 6	2.5	CL		20	113	26	14	12	69	0.8
17.5	U- 7	0.0			21						
20				(20.0')							
22.5											
25											

LABORATORY TESTS

Completion Depth: 20.0 Feet
Date: 4-15-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 4

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 5.5 FEET							
2.5											
5				(5.5')							
				[MUCK], consisting of brown clay, very soft, w/lean clay & silty sand layers							
7.5	U- 1	0.0	CH				72	23	49	92	
10											
	U- 2	0.0									
12.5				(13.0')							
				SANDY LEAN CLAY, reddish brown, w/silty sand seams							
	U- 3	1.0									
15				(15.5')							
17.5											
20											
22.5											
25											

Completion Depth: 15.5 Feet
Date: 4-23-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 5

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 6 FEET (6.0')							
2.5											
5											
7.5	U- 1	0.0	CL	[MUCK], consisting of lean clay w/sand, brown to reddish brown, very soft (9.0')	24		27	17	10	71	
	U- 2	1.0									
10	U- 3	2.0	CL	LEAN CLAY, reddish brown, firm to stiff, w/silty sand seams	20	111	45	15	30	92	1.4
12.5	U- 4	2.0									
15	U- 5	2.5			18						
17.5	U- 6	2.0									
	U- 7	2.0									
20	U- 8	2.5									
				(22.0')							
22.5											
25											

Completion Depth: 22.0 Feet
Date: 4-17-91
Project Number: 912985

BAKER-SHIFLETT, INC.

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 6

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 9.5 FEET (9.5')							
10	U- 1	1.5	CL	[MUCK], consisting of lean clay w/sand, brown, firm, w/clay seams (11.0')			31	16	15	83	
12.5	U- 2	1.0	CL	LEAN CLAY, w/sand, reddish brown, firm to stiff, w/silty sand seams & calcareous nodules	20		45	16	29	84	
15	U- 3	0.5									
17.5	U- 4	3.0									
	U- 5			(19.5')							
20											
22.5											
25											

Completion Depth: 19.5 Feet
Date: 4-18-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 7

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 4 FEET (4.0')							
2.5											
5	U- 1	0.0		[MUCK] consisting of brown clay, silt & sand, brown, very soft (5.0')							
7.5	U- 2	0.5	CL	SANDY LEAN CLAY, reddish brown, soft	20	112	31	13	18	61	
	U- 3	0.5		(9.5')							
10	U- 4	2.0	CL	LEAN CLAY, w/sand, reddish brown, firm to stiff, w/silty sand seams	18	123	28	13	15	71	
12.5	U- 5	3.0									
15	U- 6	4.0		(15.5')							
17.5											
20											
22.5											
25											

Completion Depth: 15.5 Feet
Date: 4-18-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 8

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 4 FEET							
2.5				(4.0')							
	U- 1	0.0		[MUCK], consisting of brown clay, silt & sand, very soft (5.5')							
5											
	U- 2	0.0	CL	LEAN CLAY, brown to reddish brown, very soft	30		40	17	23	97	
7.5											
	U- 3	0.0									
				- firm below 9.5 ft.							
10	U- 4	2.0		(10.5')							
				SANDY LEAN CLAY, reddish brown, firm to sitff, w/silty sand seams & calcareous nodules							
	U- 5	0.5									
12.5											
	U- 6	2.0									
15											
	U- 7	2.5		(16.0')							
				CLAY SHALE, reddish brown, very stiff to hard							
17.5											
	U- 8	4.5		(19.5')							
20											
22.5											
25											

LABORATORY TESTS

Completion Depth: 19.5 Feet
Date: 4-18-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 9

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 9 FEET							
2.5											
5											
7.5				(9.0')							
10				[MUCK], consisting of brown clay, silt & sand, very soft (11.0')							
12.5	U- 1	1.0	CL	LEAN CLAY, brown, soft, w/clay & silt seams (13.0')	27		41	17	24	93	
15	U- 2	1.0		LEAN CLAY, reddish brown, firm to stiff, w/silty sand seams & calcareous nodules							
	U- 3	1.5	CL		23	107	42	15	27	89	0.8
17.5	U- 4	2.0									
20	U- 5	1.0									
	U- 6	1.0									
25	U- 7	1.0									
	U- 8	2.5			18	116					
	U- 9	1.5		(28.5)							
30											

Completion Depth: 28.5 Feet
Date: 4-18-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 10

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 8 FEET							
2.5											
5											
7.5				(8.0')							
				[MUCK], consisting of brown lean clay w/sand, very soft, w/clay seams							
10	U- 1	0.0	CL				36	19	17	83	
				(12.0')							
12.5	U- 2	0.0	CL	LEAN CLAY, w/sand, reddish brown, soft to firm, w/silty sand seams	20		30	14	16	71	
15	U- 3	2.3									
17.5	U- 4	1.5									
				(18.0')							
20											
22.5											
25											

LABORATORY TESTS

Completion Depth: 18.0 Feet
Date: 4-18-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 11

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 5 FEET							
2.5											
5				(5.0')							
	U- 1	0.0		[MUCK], consisting of brown clay, silt & sand, very soft, w/organics							
7.5											
	U- 2	0.0									
10				(10.0')							
	U- 3	1.5	CL-ML	SANDY SILTY CLAY, brown to reddish brown, firm to stiff			23	16	7	39	
12.5											
	U- 4	2.0									
15				(14.5')							
	U- 5	1.5		SANDY LEAN CLAY, reddish brown, w/sand seams							
				(16.5')							
17.5											
20											
22.5											
25											

Completion Depth: 16.5 Feet
Date: 4-22-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 12

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 9.5 FEET (9.5')							
2.5											
5											
7.5											
10	U- 1	0.0		[MUCK], consisting of brown clay, silt & sand, very soft (12.0')							
12.5	U- 2	0.5	CL	LEAN CLAY, w/sand, brown, soft (13.5')			34	14	20	71	
15	U- 3	1.5		SANDY LEAN CLAY, brown to reddish brown, firm to stiff, w/sand seams							
	U- 4	1.5	CL				29	13	16	66	
17.5	U- 5	2.0		(18.5')							
20											
22.5											
25											

Completion Depth: 18.5 Feet
Date: 4-22-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 13

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 11 FEET							
2.5											
5											
7.5											
10				(11.0')							
12.5	U- 1	0.0	CH	[MUCK], consisting of brown clay, very soft, w/silt & sand seams			73	21	52	81	
15				(15.0')							
17.5	U- 2	0.5	CL	LEAN CLAY, brown to reddish brown, soft to firm, w/silty sand seams			37	16	21	92	
20	U- 3	2.0									
22.5	U- 4	1.5		(22.5')							
25											

Completion Depth: 22.5 Feet
Date: 4-22-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 14

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 10 FEET							
2.5											
5											
7.5											
10				(10.0')							
				[MUCK], consisting of brown clay, very soft, w/silt & sand seams & organics							
12.5											
15	U- 1	0.0	CH				75	24	51	95	
17.5				(18.5')							
				SANDY LEAN CLAY, reddish brown, soft							
20	U- 2	0.5					29	13	16	58	
				(21.0')							
22.5											
25											

LABORATORY TESTS

Completion Depth: 21 Feet
Date: 4-22-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

LOG OF BORING NO. B - 15

LAKE WICHITA
WICHITA FALLS, TEXAS

Approx. Surface Elevation: 977.8

Location: As located by Biggs & Mathews, Inc.

Depth, ft.	Samples	Penetrometer, TSF / Penetration Resistance, Blows/Ft.	Unified Classification System	MATERIAL DESCRIPTION	Moisture Content, %	Unit Dry Weight, pcf	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Passing No. 200, %	Unconfined Compressive Strength, tsf
				WATER DEPTH 7 FEET							
2.5											
5											
				(7.0')							
7.5				[MUCK], consisting of lean clay, brown, soft							
	U- 1	0.5	CL	(9.0')			44	16	28	90	
10				LEAN CLAY, w/sand, reddish brown, firm to stiff							
	U- 2	1.5									
12.5											
	U- 3	2.0	CL				39	14	25	80	
15											
	U- 4	2.0									
17.5											
	U- 5	1.5									
20				(20.0')							
22.5											
25											

Completion Depth: 20 Feet
Date: 4-22-91
Project Number: 912985

THE STRATIFICATION LINES REPRESENT APPROXIMATE STRATA BOUNDARIES. IN SITU, THE TRANSITION MAY BE GRADUAL.

GENERAL NOTES

DRILLING AND SAMPLING SYMBOLS:

U : Thin-Walled Tube - 3" O.D., Unless otherwise noted
S : Split Spoon - 2" O.D., Unless otherwise noted
C : Double Tube Core Barrel
T : THD Cone Penetrometer

A : Auger Sample
W : Wash Sample
P : Packer Test
D : Denison Sample

RELATIVE DENSITY OF COARSE-GRAINED SOILS:

Penetration Resistance Blows/foot	Relative Density
0-4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
over 50	Very Dense

CONSISTENCY OF FINE-GRAINED SOILS:

Unconfined Compressive Strength, Qu, tsf	Consistency
Less than 0.25	Very Soft
0.25 to 0.50	Soft
0.50 to 1.00	Firm
1.00 to 2.00	Stiff
2.00 to 4.00	Very Stiff
4.00 and higher	Hard

TERMS CHARACTERIZING SOIL STRUCTURE:

Slickensided : Having inclined planes of weakness that are slick and glossy in appearance.
Fissured : Containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
Laminated : Composed of thin layers of varying color and texture.
Interbedded : Composed of alternate layers of different soil types.
Calcareous : Containing appreciable quantities of calcium carbonate.
Well graded : Having wide range in grain sizes and substantial amounts of all intermediate particle sizes.
Poorly graded : Predominantly of one grain size, or having a range of sizes with some intermediate size missing.

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths because of planes of weakness or cracks in the soil. The consistency ratings of such soils are based on penetrometer readings.

DEGREE OF WEATHERING:

Unweathered : Rock in its natural state before being exposed to atmospheric agents.
Slightly Weathered : Noted predominantly by color change with no disintegrated zones.
Weathered : Complete color change with zones of slightly decomposed rock.
Severely Weathered : Complete color change with consistency, texture, and general appearance approaching soil.

SUBSURFACE CONDITIONS:

Soil and rock descriptions on the boring logs are a compilation of field data as well as from laboratory testing of samples. The stratification lines represent the approximate boundary between materials and the transition can be gradual.

Water level observations have been made in the borings at the times indicated. It must be noted that fluctuations in the groundwater level may occur due to variations in rainfall, hydraulic conductivity of soil strata, construction activity, and other factors.

SUMMARY OF LABORATORY TESTS

Project: Lake Wichita
Wichita Falls, Texas

Project No.: 912985
Date: April, 1991

Boring No.	Sample Depth, ft.	Liquid Limit	Plastic Limit	Plasticity Index	Minus 200	Unit Dry Weight,pcf	M.C. %	U.C. tsf
B-1	10.0 - 12.0	33	15	18	72	-	25	-
B-1	16.0 - 18.0	35	15	20	86	-	21	-
B-2	8.0 - 9.0	30	14	16	79	121	16	-
B-2	14.0 - 16.0	24	14	10	59	-	18	-
B-2	22.5 - 25.0	-	-	-	-	-	17	-
B-3	7.5 - 9.5	44	15	29	94	108	25	-
B-3	9.5 - 11.5	39	15	24	94	107	23	0.8
B-3	11.5 - 13.5	28	14	14	69	116	20	-
B-3	13.5 - 15.5	-	-	-	-	110	21	-
B-3	15.5 - 17.5	26	14	12	69	113	20	0.8
B-3	17.5 - 20.0	-	-	-	-	-	21	-
B-4	5.5 - 10.5	72	23	49	92	-	-	-
B-5	6.0 - 8.0	27	17	10	71	-	24	-
B-5	10.0 - 12.0	45	15	30	92	111	20	1.4
B-5	14.0 - 16.0	-	-	-	-	-	18	-
B-6	9.5 - 11.5	31	16	15	83	-	-	-
B-6	12.5 - 14.5	45	16	29	84	-	20	-
B-7	6.0 - 8.0	31	13	18	61	112	20	-
B-7	10.0 - 12.0	28	13	15	71	123	18	-
B-8	5.0 - 7.0	40	17	23	97	-	30	-
B-8	7.0 - 9.0	-	-	-	-	95	29	-
B-8	11.0 - 13.0	-	-	-	-	116	18	-
B-8	19.0 - 19.5	-	-	-	-	-	17	-
B-9	11.0 - 13.0	41	17	24	93	-	27	-
B-9	15.0 - 17.0	42	15	27	89	107	23	0.8
B-9	25.0 - 27.5	-	-	-	-	116	18	-
B-10	9.0 - 12.0	36	19	17	83	-	-	-
B-10	12.0 - 14.0	30	14	16	71	-	20	-
B-11	10.0 - 12.5	23	16	7	39	-	-	-
B-12	11.5 - 14.0	34	14	20	71	-	-	-
B-12	16.0 - 17.5	29	13	16	66	-	-	-
B-13	11.0 - 15.0	73	21	52	81	-	-	-
B-13	15.0 - 17.5	37	16	21	92	-	-	-

SUMMARY OF LABORATORY TESTS

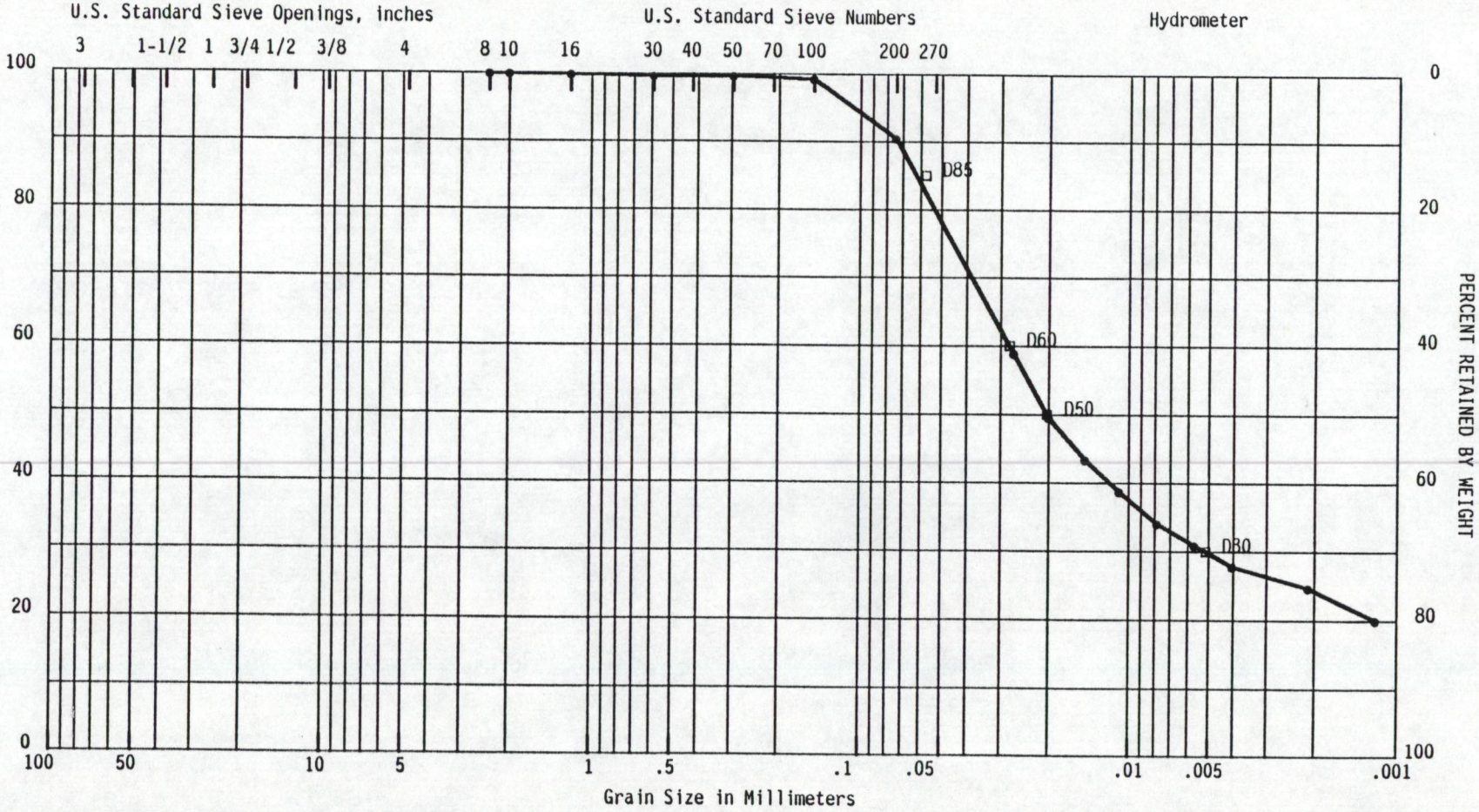
Continued

Boring No.	Sample Depth, ft.	Liquid Limit	Plastic Limit	Plasticity Index	Minus 200	Unit Dry Weight,pcf	M.C. %	U.C. tsf
B-14	10.0 - 18.5	75	24	51	95	-	-	-
B-14	18.5 - 21.0	29	13	16	58	-	-	-
B-15	7.5 - 10.0	44	16	28	90	-	-	-
B-15	12.5 - 15.0	39	14	25	80	-	-	-

GRAIN SIZE DISTRIBUTION

PROJECT: Lake Wichita
PROJECT NO.: 912985
DATE: April, 1991

BORING NO. & DEPTH: B-6 9.5 - 11.5 ft.
MATERIAL DESCRIPTION: Brown lean clay, w/sand
CLASSIFICATION: (CL)



GRAVEL		SAND			SILT or CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	

BAKER-SHIFLETT, INC.

APPENDIX "C"

Summary of Test Results for Metals

Analytical Test Results (NDRC Lab., Inc.)

LAKE WICHITA
WICHITA FALLS, TEXAS

TABLE 1

TEST RESULTS FOR METALS

PARAMETER	BORING NO. AND DEPTH OF SAMPLE					
	B-1 8'-10'	B-4 5.5'-10.5'	B-7 4'-6'	B-10 9'-12'	B-13 11'-15'	B-15 7.5'-10'
TOTAL METALS						
Silver	ND	ND	ND	ND	ND	ND
Arsenic	2.7	4.1	2.5	3.4	3.7	3.7
Barium	95.1	9.0	54.9	127	86.5	48.2
Cadmium	3.0	4.1	2.8	4.4	3.3	3.0
Chromium	10.0	11.8	9.7	14.7	10.4	7.9
Mercury	0.02	ND	0.01	ND	ND	ND
Lead	23.0	16.0	11.2	18.6	8.7	14.8
Selenium	0.1	0.2	0.1	0.3	0.4	0.1

Units are milligrams per kilogram (mg/Kg) = parts per million

ND = none detected

Baker-Shiflett, Inc.

NDRC LABORATORIES, INC.

A member of the Inchcape Environmental Group

1101 Commerce Drive, Richardson, Texas 75081 • (214) 238-5591 • FAX (214) 238-5592

BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-1
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-1 8-10'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000					
Acetone	100	mg/Kg	<	100	mg/Kg
Benzene	10	mg/Kg	<	10	mg/Kg
Benzyl alcohol	10	mg/Kg	<	10	mg/Kg
Butanol	100	mg/Kg	<	100	mg/Kg
t-Butanol	100	mg/Kg	<	100	mg/Kg
2-Butanone(MEK)	100	mg/Kg	<	100	mg/Kg
n-Butyl acetate	10	mg/Kg	<	10	mg/Kg
Butyl Carbitol	10	mg/Kg	<	10	mg/Kg
Butyl cellosolve	10	mg/Kg	<	10	mg/Kg
Carbon tetrachloride	10	mg/Kg	<	10	mg/Kg
Cellosolve	100	mg/Kg	<	100	mg/Kg
Cellosolve acetate	10	mg/Kg	<	10	mg/Kg
Chlorobenzene	10	mg/Kg	<	10	mg/Kg
m-Cresol	10	mg/Kg	<	10	mg/Kg
Cresols	10	mg/Kg	<	10	mg/Kg
Cyclohexane	10	mg/Kg	<	10	mg/Kg
Cyclohexanol	10	mg/Kg	<	10	mg/Kg
Cyclohexanone	10	mg/Kg	<	10	mg/Kg
1,2-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,3-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,4-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,2-Dichloroethene	10	mg/Kg	<	10	mg/Kg
Diesel fuel	10	mg/Kg	<	10	mg/Kg
Ethanol	100	mg/Kg	<	100	mg/Kg
Ethyl acetate	10	mg/Kg	<	10	mg/Kg
Ethyl benzene	10	mg/Kg	<	10	mg/Kg
Freon TF	10	mg/Kg	<	10	mg/Kg
Gasoline	10	mg/Kg	<	10	mg/Kg
Heptane	10	mg/Kg	<	10	mg/Kg
Hexane	10	mg/Kg	<	10	mg/Kg
Isobutanol	100	mg/Kg	<	100	mg/Kg

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BEAUMONT DALLAS HOUSTON

REPORT NUMBER: D91-3169-1

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000 (Continued)					
Kerosene	10	mg/Kg	<	10	mg/Kg
Medium Petroleum Distillate	10	mg/Kg	<	10	mg/Kg
Methanol	100	mg/Kg	<	100	mg/Kg
Methyl acetate	10	mg/Kg	<	10	mg/Kg
Methyl cellosolve	100	mg/Kg	<	100	mg/Kg
Methylene chloride	10	mg/Kg	<	10	mg/Kg
4-Methyl-2-pentanone(MIBK)	10	mg/Kg	<	10	mg/Kg
Methyl isoamyl ketone	10	mg/Kg	<	10	mg/Kg
N-Methyl-2-pyrollidone	10	mg/Kg	<	10	mg/Kg
Mineral spirits	10	mg/Kg	<	10	mg/Kg
Naphtha	10	mg/Kg	<	10	mg/Kg
Naphthalene	10	mg/Kg	<	10	mg/Kg
Phenol	10	mg/Kg	<	10	mg/Kg
2-Propanol(IPA)	100	mg/Kg	<	100	mg/Kg
Propyl acetate	10	mg/Kg	<	10	mg/Kg
n-Propylbenzene	10	mg/Kg	<	10	mg/Kg
Propylene Glycol Methyl Ether	10	mg/Kg	<	10	mg/Kg
PGME Acetate	10	mg/Kg	<	10	mg/Kg
Stoddard solvent	10	mg/Kg	<	10	mg/Kg
Styrene	10	mg/Kg	<	10	mg/Kg
Tetrachloroethene	10	mg/Kg	<	10	mg/Kg
Tetrahydrofuran	100	mg/Kg	<	100	mg/Kg
Toluene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,1,1-Trichloroethane	10	mg/Kg	<	10	mg/Kg
Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethane	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trimethylbenzene	10	mg/Kg	<	10	mg/Kg
Unidentified Glycol Ethers	10	mg/Kg	<	10	mg/Kg
Xylenes	10	mg/Kg	<	10	mg/Kg

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
Chief Executive Officer

NDRC LABORATORIES, INC.

A member of the Inchcape Environmental Group

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-1
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-1 8-10'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
TOTAL METALS:					
Silver	1.0	mg/Kg	<	1.0	mg/Kg
Arsenic	0.1	mg/Kg		2.7	mg/Kg
Barium	1.0	mg/Kg		95.1	mg/Kg
Cadmium	1.0	mg/Kg		3.0	mg/Kg
Chromium	1.0	mg/Kg		10.0	mg/Kg
Mercury	0.01	mg/Kg		0.02	mg/Kg
Lead	1.0	mg/Kg		23.0	mg/Kg
Selenium	0.1	mg/Kg		0.1	mg/Kg

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
Chief Executive Officer

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

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SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-1 8-10'
Project 912985

TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids	0.01 %	79.1 %

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
Chief Executive Officer

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-2
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-4 5.5-10.5'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000					
Acetone	100	mg/Kg	<	100	mg/Kg
Benzene	10	mg/Kg	<	10	mg/Kg
Benzyl alcohol	10	mg/Kg	<	10	mg/Kg
Butanol	100	mg/Kg	<	100	mg/Kg
t-Butanol	100	mg/Kg	<	100	mg/Kg
2-Butanone(MEK)	100	mg/Kg	<	100	mg/Kg
n-Butyl acetate	10	mg/Kg	<	10	mg/Kg
Butyl Carbitol	10	mg/Kg	<	10	mg/Kg
Butyl cellosolve	10	mg/Kg	<	10	mg/Kg
Carbon tetrachloride	10	mg/Kg	<	10	mg/Kg
Cellosolve	100	mg/Kg	<	100	mg/Kg
Cellosolve acetate	10	mg/Kg	<	10	mg/Kg
Chlorobenzene	10	mg/Kg	<	10	mg/Kg
m-Cresol	10	mg/Kg	<	10	mg/Kg
Cresols	10	mg/Kg	<	10	mg/Kg
Cyclohexane	10	mg/Kg	<	10	mg/Kg
Cyclohexanol	10	mg/Kg	<	10	mg/Kg
Cyclohexanone	10	mg/Kg	<	10	mg/Kg
1,2-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,3-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,4-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,2-Dichloroethene	10	mg/Kg	<	10	mg/Kg
Diesel fuel	10	mg/Kg	<	10	mg/Kg
Ethanol	100	mg/Kg	<	100	mg/Kg
Ethyl acetate	10	mg/Kg	<	10	mg/Kg
Ethyl benzene	10	mg/Kg	<	10	mg/Kg
Freon TF	10	mg/Kg	<	10	mg/Kg
Gasoline	10	mg/Kg	<	10	mg/Kg
Heptane	10	mg/Kg	<	10	mg/Kg
Hexane	10	mg/Kg	<	10	mg/Kg
Isobutanol	100	mg/Kg	<	100	mg/Kg

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BEAUMONT **DALLAS** **HOUSTON**

REPORT NUMBER: D91-3169-2

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000 (Continued)					
Kerosene	10	mg/Kg	<	10	mg/Kg
Medium Petroleum Distillate	10	mg/Kg	<	10	mg/Kg
Methanol	100	mg/Kg	<	100	mg/Kg
Methyl acetate	10	mg/Kg	<	10	mg/Kg
Methyl cellosolve	100	mg/Kg	<	100	mg/Kg
Methylene chloride	10	mg/Kg	<	10	mg/Kg
4-Methyl-2-pentanone(MIBK)	10	mg/Kg	<	10	mg/Kg
Methyl isoamyl ketone	10	mg/Kg	<	10	mg/Kg
N-Methyl-2-pyrollidone	10	mg/Kg	<	10	mg/Kg
Mineral spirits	10	mg/Kg	<	10	mg/Kg
Naphtha	10	mg/Kg	<	10	mg/Kg
Naphthalene	10	mg/Kg	<	10	mg/Kg
Phenol	10	mg/Kg	<	10	mg/Kg
2-Propanol(IPA)	100	mg/Kg	<	100	mg/Kg
Propyl acetate	10	mg/Kg	<	10	mg/Kg
n-Propylbenzene	10	mg/Kg	<	10	mg/Kg
Propylene Glycol Methyl Ether	10	mg/Kg	<	10	mg/Kg
PGME Acetate	10	mg/Kg	<	10	mg/Kg
Stoddard solvent	10	mg/Kg	<	10	mg/Kg
Styrene	10	mg/Kg	<	10	mg/Kg
Tetrachloroethene	10	mg/Kg	<	10	mg/Kg
Tetrahydrofuran	100	mg/Kg	<	100	mg/Kg
Toluene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,1,1-Trichloroethane	10	mg/Kg	<	10	mg/Kg
Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethane	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trimethylbenzene	10	mg/Kg	<	10	mg/Kg
Unidentified Glycol Ethers	10	mg/Kg	<	10	mg/Kg
Xylenes	10	mg/Kg	<	10	mg/Kg

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
Chief Executive Officer

NDRC LABORATORIES, INC.

A member of the Inchcape Environmental Group

1101 Commerce Drive, Richardson, Texas 75081 • (214) 238-5591 • FAX (214) 238-5592

BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-2
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-4 5.5-10.5'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
TOTAL METALS:					
Silver	1.0	mg/Kg	<	1.0	mg/Kg
Arsenic	0.1	mg/Kg		4.1	mg/Kg
Barium	1.0	mg/Kg		9.0	mg/Kg
Cadmium	1.0	mg/Kg		4.1	mg/Kg
Chromium	1.0	mg/Kg		11.8	mg/Kg
Mercury	0.01	mg/Kg	<	0.01	mg/Kg
Lead	1.0	mg/Kg		16.0	mg/Kg
Selenium	0.1	mg/Kg		0.2	mg/Kg

NDRC Laboratories, Inc.

David R. Godwin, Ph.D.
Chief Executive Officer

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BEAUMONT **DALLAS** **HOUSTON**

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-2
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-4 5.5-10.5'
Project 912985

TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids	0.01 %	51.5 %

NDRC Laboratories, Inc.

David R. Godwin, Ph.D.
Chief Executive Officer

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1101 Commerce Drive, Richardson, Texas 75081 • (214) 238-5591 • FAX (214) 238-5592

BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-3
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-7 4-6'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000					
Acetone	100	mg/Kg	<	100	mg/Kg
Benzene	10	mg/Kg	<	10	mg/Kg
Benzyl alcohol	10	mg/Kg	<	10	mg/Kg
Butanol	100	mg/Kg	<	100	mg/Kg
t-Butanol	100	mg/Kg	<	100	mg/Kg
2-Butanone(MEK)	100	mg/Kg	<	100	mg/Kg
n-Butyl acetate	10	mg/Kg	<	10	mg/Kg
Butyl Carbitol	10	mg/Kg	<	10	mg/Kg
Butyl cellosolve	10	mg/Kg	<	10	mg/Kg
Carbon tetrachloride	10	mg/Kg	<	10	mg/Kg
Cellosolve	100	mg/Kg	<	100	mg/Kg
Cellosolve acetate	10	mg/Kg	<	10	mg/Kg
Chlorobenzene	10	mg/Kg	<	10	mg/Kg
m-Cresol	10	mg/Kg	<	10	mg/Kg
Cresols	10	mg/Kg	<	10	mg/Kg
Cyclohexane	10	mg/Kg	<	10	mg/Kg
Cyclohexanol	10	mg/Kg	<	10	mg/Kg
Cyclohexanone	10	mg/Kg	<	10	mg/Kg
1,2-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,3-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,4-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,2-Dichloroethene	10	mg/Kg	<	10	mg/Kg
Diesel fuel	10	mg/Kg	<	10	mg/Kg
Ethanol	100	mg/Kg	<	100	mg/Kg
Ethyl acetate	10	mg/Kg	<	10	mg/Kg
Ethyl benzene	10	mg/Kg	<	10	mg/Kg
Freon TF	10	mg/Kg	<	10	mg/Kg
Gasoline	10	mg/Kg	<	10	mg/Kg
Heptane	10	mg/Kg	<	10	mg/Kg
Hexane	10	mg/Kg	<	10	mg/Kg
Isobutanol	100	mg/Kg	<	100	mg/Kg

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BEAUMONT DALLAS HOUSTON

REPORT NUMBER: D91-3169-3

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000 (Continued)					
Kerosene	10	mg/Kg	<	10	mg/Kg
Medium Petroleum Distillate	10	mg/Kg	<	10	mg/Kg
Methanol	100	mg/Kg	<	100	mg/Kg
Methyl acetate	10	mg/Kg	<	10	mg/Kg
Methyl cellosolve	100	mg/Kg	<	100	mg/Kg
Methylene chloride	10	mg/Kg	<	10	mg/Kg
4-Methyl-2-pentanone(MIBK)	10	mg/Kg	<	10	mg/Kg
Methyl isoamyl ketone	10	mg/Kg	<	10	mg/Kg
N-Methyl-2-pyrollidone	10	mg/Kg	<	10	mg/Kg
Mineral spirits	10	mg/Kg	<	10	mg/Kg
Naphtha	10	mg/Kg	<	10	mg/Kg
Naphthalene	10	mg/Kg	<	10	mg/Kg
Phenol	10	mg/Kg	<	10	mg/Kg
2-Propanol(IPA)	100	mg/Kg	<	100	mg/Kg
Propyl acetate	10	mg/Kg	<	10	mg/Kg
n-Propylbenzene	10	mg/Kg	<	10	mg/Kg
Propylene Glycol Methyl Ether	10	mg/Kg	<	10	mg/Kg
PGME Acetate	10	mg/Kg	<	10	mg/Kg
Stoddard solvent	10	mg/Kg	<	10	mg/Kg
Styrene	10	mg/Kg	<	10	mg/Kg
Tetrachloroethene	10	mg/Kg	<	10	mg/Kg
Tetrahydrofuran	100	mg/Kg	<	100	mg/Kg
Toluene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,1,1-Trichloroethane	10	mg/Kg	<	10	mg/Kg
Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethane	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trimethylbenzene	10	mg/Kg	<	10	mg/Kg
Unidentified Glycol Ethers	10	mg/Kg	<	10	mg/Kg
Xylenes	10	mg/Kg	<	10	mg/Kg

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
Chief Executive Officer

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-3
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-7 4-6'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
TOTAL METALS:					
Silver	1.0	mg/Kg	<	1.0	mg/Kg
Arsenic	0.1	mg/Kg		2.5	mg/Kg
Barium	1.0	mg/Kg		54.9	mg/Kg
Cadmium	1.0	mg/Kg		2.8	mg/Kg
Chromium	1.0	mg/Kg		9.7	mg/Kg
Mercury	0.01	mg/Kg		0.01	mg/Kg
Lead	1.0	mg/Kg		11.2	mg/Kg
Selenium	0.1	mg/Kg		0.1	mg/Kg

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
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SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-7 4-6'
Project 912985

TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids	0.01 %	82.5 %

NDRC Laboratories, Inc. David R Godwin PE

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-4
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-10 9-12'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000					
Acetone	100	mg/Kg	<	100	mg/Kg
Benzene	10	mg/Kg	<	10	mg/Kg
Benzyl alcohol	10	mg/Kg	<	10	mg/Kg
Butanol	100	mg/Kg	<	100	mg/Kg
t-Butanol	100	mg/Kg	<	100	mg/Kg
2-Butanone(MEK)	100	mg/Kg	<	100	mg/Kg
n-Butyl acetate	10	mg/Kg	<	10	mg/Kg
Butyl Carbitol	10	mg/Kg	<	10	mg/Kg
Butyl cellosolve	10	mg/Kg	<	10	mg/Kg
Carbon tetrachloride	10	mg/Kg	<	10	mg/Kg
Cellosolve	100	mg/Kg	<	100	mg/Kg
Cellosolve acetate	10	mg/Kg	<	10	mg/Kg
Chlorobenzene	10	mg/Kg	<	10	mg/Kg
m-Cresol	10	mg/Kg	<	10	mg/Kg
Cresols	10	mg/Kg	<	10	mg/Kg
Cyclohexane	10	mg/Kg	<	10	mg/Kg
Cyclohexanol	10	mg/Kg	<	10	mg/Kg
Cyclohexanone	10	mg/Kg	<	10	mg/Kg
1,2-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,3-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,4-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,2-Dichloroethene	10	mg/Kg	<	10	mg/Kg
Diesel fuel	10	mg/Kg	<	10	mg/Kg
Ethanol	100	mg/Kg	<	100	mg/Kg
Ethyl acetate	10	mg/Kg	<	10	mg/Kg
Ethyl benzene	10	mg/Kg	<	10	mg/Kg
Freon TF	10	mg/Kg	<	10	mg/Kg
Gasoline	10	mg/Kg	<	10	mg/Kg
Heptane	10	mg/Kg	<	10	mg/Kg
Hexane	10	mg/Kg	<	10	mg/Kg
Isobutanol	100	mg/Kg	<	100	mg/Kg

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BEAUMONT DALLAS HOUSTON

REPORT NUMBER: D91-3169-4

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000 (Continued)					
Kerosene	10	mg/Kg	<	10	mg/Kg
Medium Petroleum Distillate	10	mg/Kg	<	10	mg/Kg
Methanol	100	mg/Kg	<	100	mg/Kg
Methyl acetate	10	mg/Kg	<	10	mg/Kg
Methyl cellosolve	100	mg/Kg	<	100	mg/Kg
Methylene chloride	10	mg/Kg	<	10	mg/Kg
4-Methyl-2-pentanone(MIBK)	10	mg/Kg	<	10	mg/Kg
Methyl isoamyl ketone	10	mg/Kg	<	10	mg/Kg
N-Methyl-2-pyrollidone	10	mg/Kg	<	10	mg/Kg
Mineral spirits	10	mg/Kg	<	10	mg/Kg
Naphtha	10	mg/Kg	<	10	mg/Kg
Naphthalene	10	mg/Kg	<	10	mg/Kg
Phenol	10	mg/Kg	<	10	mg/Kg
2-Propanol(IPA)	100	mg/Kg	<	100	mg/Kg
Propyl acetate	10	mg/Kg	<	10	mg/Kg
n-Propylbenzene	10	mg/Kg	<	10	mg/Kg
Propylene Glycol Methyl Ether	10	mg/Kg	<	10	mg/Kg
PGME Acetate	10	mg/Kg	<	10	mg/Kg
Stoddard solvent	10	mg/Kg	<	10	mg/Kg
Styrene	10	mg/Kg	<	10	mg/Kg
Tetrachloroethene	10	mg/Kg	<	10	mg/Kg
Tetrahydrofuran	100	mg/Kg	<	100	mg/Kg
Toluene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,1,1-Trichloroethane	10	mg/Kg	<	10	mg/Kg
Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethane	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trimethylbenzene	10	mg/Kg	<	10	mg/Kg
Unidentified Glycol Ethers	10	mg/Kg	<	10	mg/Kg
Xylenes	10	mg/Kg	<	10	mg/Kg

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
Chief Executive Officer

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BEAUMONT **DALLAS** **HOUSTON**

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-4
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-10 9-12'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
TOTAL METALS:					
Silver	1.0	mg/Kg	<	1.0	mg/Kg
Arsenic	0.1	mg/Kg		3.4	mg/Kg
Barium	1.0	mg/Kg		127	mg/Kg
Cadmium	1.0	mg/Kg		4.4	mg/Kg
Chromium	1.0	mg/Kg		14.7	mg/Kg
Mercury	0.01	mg/Kg	<	0.01	mg/Kg
Lead	1.0	mg/Kg		18.6	mg/Kg
Selenium	0.1	mg/Kg		0.3	mg/Kg

NDRC Laboratories, Inc. David R. Godwin

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-4
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-10 9-12'
Project 912985

TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids	0.01 %	71.9 %

NDRC Laboratories, Inc. David R. Godwin

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Chief Executive Officer

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-5
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-13 11-15'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000					
Acetone	100	mg/Kg	<	100	mg/Kg
Benzene	10	mg/Kg	<	10	mg/Kg
Benzyl alcohol	10	mg/Kg	<	10	mg/Kg
Butanol	100	mg/Kg	<	100	mg/Kg
t-Butanol	100	mg/Kg	<	100	mg/Kg
2-Butanone(MEK)	100	mg/Kg	<	100	mg/Kg
n-Butyl acetate	10	mg/Kg	<	10	mg/Kg
Butyl Carbitol	10	mg/Kg	<	10	mg/Kg
Butyl cellosolve	10	mg/Kg	<	10	mg/Kg
Carbon tetrachloride	10	mg/Kg	<	10	mg/Kg
Cellosolve	100	mg/Kg	<	100	mg/Kg
Cellosolve acetate	10	mg/Kg	<	10	mg/Kg
Chlorobenzene	10	mg/Kg	<	10	mg/Kg
m-Cresol	10	mg/Kg	<	10	mg/Kg
Cresols	10	mg/Kg	<	10	mg/Kg
Cyclohexane	10	mg/Kg	<	10	mg/Kg
Cyclohexanol	10	mg/Kg	<	10	mg/Kg
Cyclohexanone	10	mg/Kg	<	10	mg/Kg
1,2-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,3-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,4-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,2-Dichloroethene	10	mg/Kg	<	10	mg/Kg
Diesel fuel	10	mg/Kg	<	10	mg/Kg
Ethanol	100	mg/Kg	<	100	mg/Kg
Ethyl acetate	10	mg/Kg	<	10	mg/Kg
Ethyl benzene	10	mg/Kg	<	10	mg/Kg
Freon TF	10	mg/Kg	<	10	mg/Kg
Gasoline	10	mg/Kg	<	10	mg/Kg
Heptane	10	mg/Kg	<	10	mg/Kg
Hexane	10	mg/Kg	<	10	mg/Kg
Isobutanol	100	mg/Kg	<	100	mg/Kg

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BEAUMONT DALLAS HOUSTON

REPORT NUMBER: D91-3169-5

TEST REQUESTED	DETECTION LIMIT		RESULTS		
General Solvent Scan by EPA Method 8000 (Continued)					
Kerosene	10	mg/Kg	<	10	mg/Kg
Medium Petroleum Distillate	10	mg/Kg	<	10	mg/Kg
Methanol	100	mg/Kg	<	100	mg/Kg
Methyl acetate	10	mg/Kg	<	10	mg/Kg
Methyl cellosolve	100	mg/Kg	<	100	mg/Kg
Methylene chloride	10	mg/Kg	<	10	mg/Kg
4-Methyl-2-pentanone(MIBK)	10	mg/Kg	<	10	mg/Kg
Methyl isoamyl ketone	10	mg/Kg	<	10	mg/Kg
N-Methyl-2-pyrollidone	10	mg/Kg	<	10	mg/Kg
Mineral spirits	10	mg/Kg	<	10	mg/Kg
Naphtha	10	mg/Kg	<	10	mg/Kg
Naphthalene	10	mg/Kg	<	10	mg/Kg
Phenol	10	mg/Kg	<	10	mg/Kg
2-Propanol(IPA)	100	mg/Kg	<	100	mg/Kg
Propyl acetate	10	mg/Kg	<	10	mg/Kg
n-Propylbenzene	10	mg/Kg	<	10	mg/Kg
Propylene Glycol Methyl Ether	10	mg/Kg	<	10	mg/Kg
PGME Acetate	10	mg/Kg	<	10	mg/Kg
Stoddard solvent	10	mg/Kg	<	10	mg/Kg
Styrene	10	mg/Kg	<	10	mg/Kg
Tetrachloroethene	10	mg/Kg	<	10	mg/Kg
Tetrahydrofuran	100	mg/Kg	<	100	mg/Kg
Toluene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,1,1-Trichloroethane	10	mg/Kg	<	10	mg/Kg
Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethane	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trimethylbenzene	10	mg/Kg	<	10	mg/Kg
Unidentified Glycol Ethers	10	mg/Kg	<	10	mg/Kg
Xylenes	10	mg/Kg	<	10	mg/Kg

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
Chief Executive Officer

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-5
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-13 11-15'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
TOTAL METALS:					
Silver	1.0	mg/Kg	<	1.0	mg/Kg
Arsenic	0.1	mg/Kg		3.7	mg/Kg
Barium	1.0	mg/Kg		86.5	mg/Kg
Cadmium	1.0	mg/Kg		3.3	mg/Kg
Chromium	1.0	mg/Kg		10.4	mg/Kg
Mercury	0.01	mg/Kg	<	0.01	mg/Kg
Lead	1.0	mg/Kg		8.7	mg/Kg
Selenium	0.1	mg/Kg		0.4	mg/Kg

NDRC Laboratories, Inc. David R. Godwin

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BEAUMONT **DALLAS** **HOUSTON**

DATE RECEIVED: 25-APR-1991

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REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-13 11-15'
Project 912985

TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids	0.01 %	50.5 %

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-6
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-15 7.5-10'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000					
Acetone	100	mg/Kg	<	100	mg/Kg
Benzene	10	mg/Kg	<	10	mg/Kg
Benzyl alcohol	10	mg/Kg	<	10	mg/Kg
Butanol	100	mg/Kg	<	100	mg/Kg
t-Butanol	100	mg/Kg	<	100	mg/Kg
2-Butanone(MEK)	100	mg/Kg	<	100	mg/Kg
n-Butyl acetate	10	mg/Kg	<	10	mg/Kg
Butyl Carbitol	10	mg/Kg	<	10	mg/Kg
Butyl cellosolve	10	mg/Kg	<	10	mg/Kg
Carbon tetrachloride	10	mg/Kg	<	10	mg/Kg
Cellosolve	100	mg/Kg	<	100	mg/Kg
Cellosolve acetate	10	mg/Kg	<	10	mg/Kg
Chlorobenzene	10	mg/Kg	<	10	mg/Kg
m-Cresol	10	mg/Kg	<	10	mg/Kg
Cresols	10	mg/Kg	<	10	mg/Kg
Cyclohexane	10	mg/Kg	<	10	mg/Kg
Cyclohexanol	10	mg/Kg	<	10	mg/Kg
Cyclohexanone	10	mg/Kg	<	10	mg/Kg
1,2-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,3-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,4-Dichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,2-Dichloroethene	10	mg/Kg	<	10	mg/Kg
Diesel fuel	10	mg/Kg	<	10	mg/Kg
Ethanol	100	mg/Kg	<	100	mg/Kg
Ethyl acetate	10	mg/Kg	<	10	mg/Kg
Ethyl benzene	10	mg/Kg	<	10	mg/Kg
Freon TF	10	mg/Kg	<	10	mg/Kg
Gasoline	10	mg/Kg	<	10	mg/Kg
Heptane	10	mg/Kg	<	10	mg/Kg
Hexane	10	mg/Kg	<	10	mg/Kg
Isobutanol	100	mg/Kg	<	100	mg/Kg

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BEAUMONT DALLAS HOUSTON

REPORT NUMBER: D91-3169-6

TEST REQUESTED	DETECTION LIMIT			RESULTS	
General Solvent Scan by EPA Method 8000 (Continued)					
Kerosene	10	mg/Kg	<	10	mg/Kg
Medium Petroleum Distillate	10	mg/Kg	<	10	mg/Kg
Methanol	100	mg/Kg	<	100	mg/Kg
Methyl acetate	10	mg/Kg	<	10	mg/Kg
Methyl cellosolve	100	mg/Kg	<	100	mg/Kg
Methylene chloride	10	mg/Kg	<	10	mg/Kg
4-Methyl-2-pentanone(MIBK)	10	mg/Kg	<	10	mg/Kg
Methyl isoamyl ketone	10	mg/Kg	<	10	mg/Kg
N-Methyl-2-pyrollidone	10	mg/Kg	<	10	mg/Kg
Mineral spirits	10	mg/Kg	<	10	mg/Kg
Naphtha	10	mg/Kg	<	10	mg/Kg
Naphthalene	10	mg/Kg	<	10	mg/Kg
Phenol	10	mg/Kg	<	10	mg/Kg
2-Propanol(IPA)	100	mg/Kg	<	100	mg/Kg
Propyl acetate	10	mg/Kg	<	10	mg/Kg
n-Propylbenzene	10	mg/Kg	<	10	mg/Kg
Propylene Glycol Methyl Ether	10	mg/Kg	<	10	mg/Kg
PGME Acetate	10	mg/Kg	<	10	mg/Kg
Stoddard solvent	10	mg/Kg	<	10	mg/Kg
Styrene	10	mg/Kg	<	10	mg/Kg
Tetrachloroethene	10	mg/Kg	<	10	mg/Kg
Tetrahydrofuran	100	mg/Kg	<	100	mg/Kg
Toluene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trichlorobenzene	10	mg/Kg	<	10	mg/Kg
1,1,1-Trichloroethane	10	mg/Kg	<	10	mg/Kg
Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethane	10	mg/Kg	<	10	mg/Kg
1,1,2-Trichloroethene	10	mg/Kg	<	10	mg/Kg
1,2,4-Trimethylbenzene	10	mg/Kg	<	10	mg/Kg
Unidentified Glycol Ethers	10	mg/Kg	<	10	mg/Kg
Xylenes	10	mg/Kg	<	10	mg/Kg

NDRC Laboratories, Inc. David R Godwin

David R. Godwin, Ph.D.
Chief Executive Officer

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-6
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-15 7.5-10'
Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
TOTAL METALS:					
Silver	1.0	mg/Kg	<	1.0	mg/Kg
Arsenic	0.1	mg/Kg		3.7	mg/Kg
Barium	1.0	mg/Kg		48.2	mg/Kg
Cadmium	1.0	mg/Kg		3.0	mg/Kg
Chromium	1.0	mg/Kg		7.9	mg/Kg
Mercury	0.01	mg/Kg	<	0.01	mg/Kg
Lead	1.0	mg/Kg		14.8	mg/Kg
Selenium	0.1	mg/Kg		0.1	mg/Kg

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-6
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Boring B-15 7.5-10'
Project 912985

TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids	0.01 %	64.7 %

NDRC Laboratories, Inc. David R. Godwin

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-7
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Composite of Borings B-1,B-10 & B-15 Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
Organochlorine Pesticides and PCBs					
Aldrin	2.7	µg/Kg	<	2.7	µg/Kg
Alpha-BHC	2.0	µg/Kg	<	2.0	µg/Kg
Beta-BHC	4.0	µg/Kg	<	4.0	µg/Kg
Delta-BHC	6.0	µg/Kg	<	6.0	µg/Kg
Gamma-BHC(Lindane)	2.6	µg/Kg	<	2.6	µg/Kg
Chlordane	9.3	µg/Kg	<	9.3	µg/Kg
4,4'-DDD	7.3	µg/Kg	<	7.3	µg/Kg
4,4'-DDE	2.6	µg/Kg	<	2.6	µg/Kg
4,4'-DDT	8.0	µg/Kg	<	8.0	µg/Kg
Dieldrin	1.3	µg/Kg	<	1.3	µg/Kg
Endosulfan I	9.3	µg/Kg	<	9.3	µg/Kg
Endosulfan II	2.6	µg/Kg	<	2.6	µg/Kg
Endosulfan Sulfate	44.2	µg/Kg	<	44.2	µg/Kg
Endrin	4.0	µg/Kg	<	4.0	µg/Kg
Endrin Aldehyde	15.4	µg/Kg	<	15.4	µg/Kg
Heptachlor	2.0	µg/Kg	<	2.0	µg/Kg
Heptachlor Epoxide	55.6	µg/Kg	<	55.6	µg/Kg
Methoxychlor	118	µg/Kg	<	118	µg/Kg
Toxaphene	161	µg/Kg	<	161	µg/Kg
Aroclor-1016	6.0	µg/Kg	<	6.0	µg/Kg
Aroclor-1221	6.0	µg/Kg	<	6.0	µg/Kg
Aroclor-1232	6.0	µg/Kg	<	6.0	µg/Kg
Aroclor-1242	6.0	µg/Kg	<	6.0	µg/Kg
Aroclor-1248	6.0	µg/Kg	<	6.0	µg/Kg
Aroclor-1254	6.0	µg/Kg	<	6.0	µg/Kg
Aroclor-1260	6.0	µg/Kg	<	6.0	µg/Kg

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
Chief Executive Officer

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BEAUMONT DALLAS HOUSTON

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-7
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Composite of Borings B-1,B-10 & B-15 Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
Organophosphorus Pest.- EPA Method 8140					
Azinphos Methyl	3020	µg/Kg	<	3020	µg/Kg
Bolstar	302	µg/Kg	<	302	µg/Kg
Chlorpyrifos	603	µg/Kg	<	603	µg/Kg
Coumaphos	3020	µg/Kg	<	3020	µg/Kg
Demeton-O	503	µg/Kg	<	503	µg/Kg
Demeton-S	503	µg/Kg	<	503	µg/Kg
Diazinon	1010	µg/Kg	<	1010	µg/Kg
Dichlorvos	201	µg/Kg	<	201	µg/Kg
Disulfoton	402	µg/kg	<	402	µg/kg
Ethoprop	503	µg/Kg	<	503	µg/Kg
Fensulfothion	3020	µg/Kg	<	3020	µg/Kg
Fenthion	201	µg/Kg	<	201	µg/Kg
Malathion	804	µg/Kg	<	804	µg/Kg
Merphos	503	µg/Kg	<	503	µg/Kg
Mevinphos	603	µg/Kg	<	603	µg/Kg
Naled	201	µg/Kg	<	201	µg/Kg
Parathion	503	µg/Kg	<	503	µg/Kg
Parathion Methyl	503	µg/Kg	<	503	µg/Kg
Phorate	302	µg/Kg	<	302	µg/Kg
Ronnel	603	µg/Kg	<	603	µg/Kg
Stirophos(tetrachlorvinphos)	10100	µg/Kg	<	10100	µg/Kg
Tokution(Prothiofos)	1010	µg/Kg	<	1010	µg/Kg
Trichloronate	302	µg/Kg	<	302	µg/Kg

NDRC Laboratories, Inc. David R. Godwin

David R. Godwin, Ph.D.
Chief Executive Officer

NDRC LABORATORIES, INC.

A member of the Inchcape Environmental Group

1101 Commerce Drive, Richardson, Texas 75081 • (214) 238-5591 • FAX (214) 238-5592

BEAUMONT **DALLAS** **HOUSTON**

DATE RECEIVED: 25-APR-1991

REPORT NUMBER: D91-3169-7
REPORT DATE: 9-MAY-1991

SAMPLE SUBMITTED BY: Baker Shiflett
ADDRESS: P.O. Box 15822
Fort Worth, TX 76119
ATTENTION: Mr. Tom Baker

SAMPLE MATRIX: SOIL
ID MARKS: Composite of Borings B-1,B-10
& B-15 Project 912985

TEST REQUESTED	DETECTION LIMIT			RESULTS	
Chlorinated Herbicides EPA 8150					
2,4-D	804	µg/Kg	<	804	µg/Kg
2,4,5-T	134	µg/Kg	<	134	µg/Kg
2,4,5-TP(Silvex)	134	µg/Kg	<	134	µg/Kg

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& B-15 Project 912985

TEST REQUESTED	DETECTION LIMIT	RESULTS
Total Solids	0.01 %	69.3 %

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