Second Phase of the Binational Study Regarding the Presence of Toxic Substances in the Rio Grande/Rio Bravo and its Tributaries Along the Boundary Portion Between the United States and Mexico

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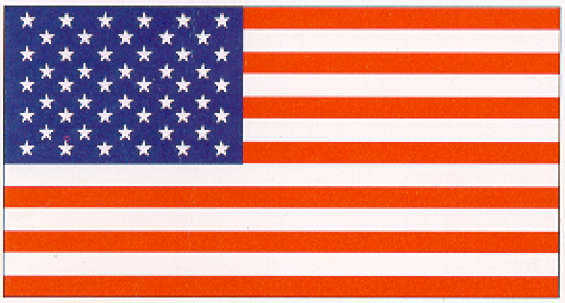
Segunda Fase del
Estudio Binacional sobre la Presencia de Sustancias Tóxicas en el Rio Bravo/Rio Grande y sus Afluentes, en su Porcion Fronteriza Entre México y Estados Unidos



Volume II of II
Final Report, September 1997
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BINATIONAL RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

AN ASSESSMENT OF THE OCCURRENCE AND CAUSES
OF TOXIC SUBSTANCES IN THE RIO GRANDE/RIO BRAVO
AND SELECTED TRIBUTARIES, TEXAS AND MEXICO

PHASE 2
1995

by

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and

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Data Collection Section
Water Quality Division
Texas Natural Resource Conservation Commission

November 1996

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LIST OF ABBREVIATIONS USED IN THE REPORT

APHA	AMERICAN PUBLIC HEALTH ASSOCIATION
AVS	ACID VOLATILE SULFIDE
CFR	CODE OF FEDERAL REGULATION
CNA	COMISION NACIONAL DEL AGUA
DDD	1,1-DICHLORO-2,2-BIS(*P*-CHLOROPHENYL)ETHANE)
DDE	1,1-DICHLORO-2,2-BIS(*P*-CHLOROPHENYL)ETHYLENE)
DDT	1,1,1-TRICHLORO-2,2-BIS(*P*-CHLOROPHENYL)ETHANE)
EPT	EPHEMEROPTERA-TRICHOPTERA- PLECOPTERA INDEX
IBWC	INTERNATIONAL BOUNDARY AND WATER COMMISSION
MGD	MILLION GALLONS PER DAY
MPS	MEAN POINT SCORE
PCB	POLYCHLORINATED BIPHENYLS
QAPP	QUALITY ASSURANCE PROJECT PLAN
RGTSS	RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY
SEM	SIMULTANEOUSLY EXTRACTED METALS
SQC	SEDIMENT QUALITY CRITERIA
TDH	TEXAS DEPARTMENT OF HEALTH
TDS	TOTAL DISSOLVED SOLIDS
TNRCC	TEXAS NATURAL RESOURCE CONSERVATION COMMISSION
TOC	TOTAL ORGANIC CARBON
TPWD	TEXAS PARKS AND WILDLIFE DEPARTMENT
TSWQS	TEXAS SURFACE WATER QUALITY STANDARDS
USEPA	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
USFWS	UNITED STATES FISH AND WILDLIFE SERVICE
WWTP	WASTEWATER TREATMENT PLANT

ENGLISH-METRIC CONVERSION TABLE

ENGLISH				
To Convert		Multiple By	To Obtain	
miles	mi	1.609	kilometers	km
feet	ft	0.3048	meters	m
inches	in	2.540	centimeters	cm
square feet	ft^2	0.0929	square meters	m^2
square miles	mi^2	2.59	square kilometers	km^2
acres	ac	4047	square meters	m^2
cubic feet	ft^3	0.02832	cubic meters	m^3
cubic feet per second	cfs or ft^3/s	0.02832	cubic meters per second	cms or m^3/s
cubic feet per second	cfs or ft^3/s	0.646	million gallons per day	mgd
million gallons per day	mgd	0.04382	cubic meters per second	cms or m^3/s
million gallons per day	mgd	1.547	cubic feet per second	cfs or ft^3/s
degrees Fahrenheit	EF	5/9 (EF-32)	degrees Celcius	EC
METRIC				
kilometers	km	0.6214	miles	mi
meters	m	3.281	feet	ft
centimeters	cm	0.393701	inches	in
square meters	m^2	10.76	square feet	ft^2
square kilometers	km^2	0.3861	square miles	mi^2
square meters	m^2	0.0002471	acres	ac
cubic meters	m^3	35.31	cubic feet	ft^3
cubic meters per second	cms or m^3/s	35.31	cubic feet per second	cfs or ft^3/s
cubic meters per second	m^3/s	22.821	million gallons per day	mgd
degrees Celcius	EC	9/5 (EC) + 32	degrees Fahrenheit	EF

CHAPTER 1

RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

INTRODUCTION

In February 1992, the United States and Mexico issued the first stage of the Integrated Environmental Border Plan (IBEP, now called Border 21) for the United States-Mexico Border area. This plan set up the frame work for the two countries to work jointly on solutions to environmental problems along the border. On November 13, 1992, the United States and Mexican sections of the International Boundary and Water Commission (IBWC) approved Minute No. 289, titled "Observation of the Quality of the Waters Along the United States-Mexico Border". A result of this agreement was the 1992-1993 Rio Grande/Río Bravo Toxic Substance Study (RGTSS), a binational, multi-agency, multi-phase effort to characterize toxic contamination of the Rio Grande/Río Bravo and its tributaries (Fig. 1). This was the very first major effort at binational cooperation in a scientific investigation of common environmental concerns along the United States/Mexico border.

The study was prompted by a widely held public concern that the river was being contaminated by toxic substances originating from increased municipal, industrial and agricultural activities near the border. In recent years, this concern was intensified by the increasing number of industrial plants within the border region (currently over 1500).

Review of prior water quality studies yielded only limited information that, while revealing some evidence of contamination from toxic substances such as pesticides and heavy metals, failed to provide sufficient data on any environmental effects this contamination may have had. The main purpose of the RGTSS was to begin filling in data gaps.

THE STUDY

Through funding from the United States Environmental Protection Agency (USEPA), the Texas Natural Resource Conservation Commission (TNRCC) was given the responsibility to coordinate and carry out the multi-phase investigation jointly with various state, federal and Mexican agencies. TNRCC's primary partner in the joint effort is the Comisión Nacional del Agua (CNA). The United States and Mexican sections of the IBWC act as diplomatic liaisons, provide logistics support and coordinate the participation of the United States and Mexican agencies. USEPA Region 6 and the IBWC are responsible for reviewing and approving a final binational report based on reports from the TNRCC and CNA. The United States report was written by Christine M. Kolbe and Bill Harrison of the TNRCC.

The main goal of the study was to determine if suspected contamination of the Rio Grande/Río Bravo by toxic substances was, in fact, occurring. Two objectives were developed to achieve this goal. The first objective was to identify any sites and contaminants of potential concern, and to assess the effects these toxic substances may have on fish and other aquatic organisms living in the river. The second objective was to identify potential sources at sites where toxic substances were found.

Due to the variety of municipal, industrial and agricultural activities occurring in the Rio Grande/Río Bravo basin, it is difficult to pinpoint exact sources of a particular contaminant. This study should be considered a starting point, and not an answer to all water quality issues facing the Rio Grande/Río Bravo. Concerns identified in the multiple phases of this study help focus resources on those sites and those contaminants most likely to impair water quality.

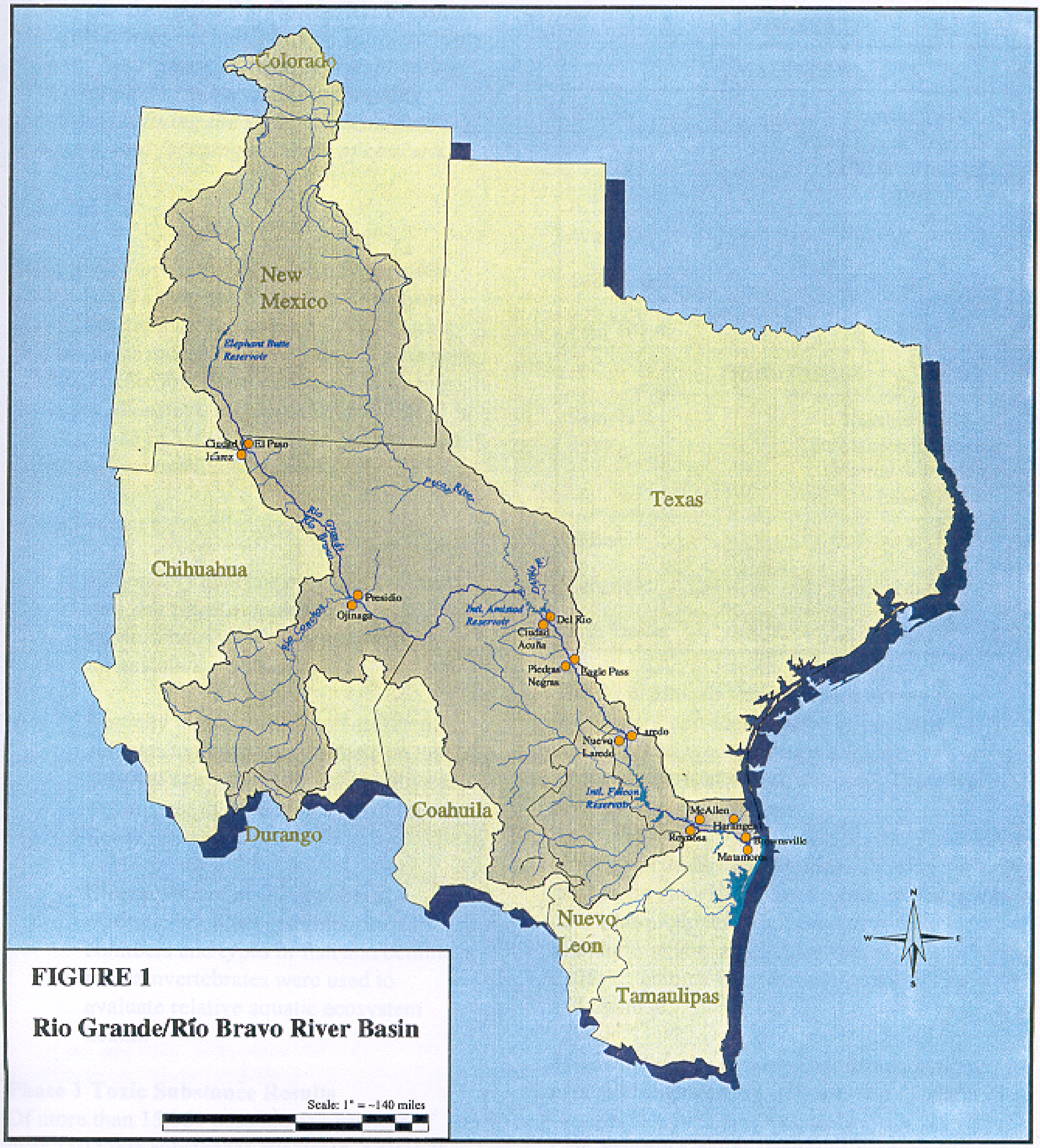

FIGURE 1
Rio Grande/Río Bravo River Basin

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LEGEND

- Rio Grande & Arroyo Colorado Watersheds
- River/stream reach
- Cities

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Due to the size of the Rio Grande/Río Bravo, these objectives are being carried out in multiple phases. ***Each phase is not to be a duplication of the initial phase but rather an ongoing process of refining the study based on data collected, and focusing on areas of concern.***

PHASE 1

Field work for Phase 1 of the Rio Grande/Río Bravo Toxic Substance Study was done from November 1992 through March 1993. During this intensive monitoring program, 45 sites were sampled under low flow conditions, including 19 on the mainstem, and 26 on tributaries (13 in Texas and 13 in Mexico) from El Paso/Ciudad Juárez to Brownsville/Matamoros (Fig. 2).

Three distinct types of analyses were done:

- Laboratory analysis of water, sediment, and fish tissue samples for approximately 150 different toxic chemicals.
- Toxicity tests on water and sediment samples to observe any effects on the survival or reproduction of sensitive test organisms (fathead minnows and water fleas).
- Bioassessment of fish and benthic macroinvertebrate communities. Numbers and types of fish and benthic macroinvertebrates were used to evaluate relative aquatic ecosystem health.

Phase 1 Toxic Substance Results

Of more than 15,000 possible occurrences of over 150 toxic substances evaluated, a total of 48 toxic chemicals were detected, 30 of which exceeded screening levels at some sites. The total number of toxic substances that exceeded criteria/screening levels during Phase 1 are:

PHASE 1

MAINSTEM	
Sample Type	Number Toxic Substances Exceeding Criteria/ Screening Levels
Water	5
Sediment	8
Fish Tissue	13
TRIBUTARIES	
Sample Type	Number Toxic Substances Exceeding Criteria/ Screening Levels
Water	17
Sediment	15
Fish Tissue	8

The 30 chemicals that exceeded screening levels were considered to be of potential concern, and were assigned a level of importance based on occurrence. These were divided into three groups:

High Priority Group: Residual chlorine, methylene chloride, toluene, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, chlordane, DDE, dieldrin, gamma-bhc (lindane), total PCB's, and cyanide.

Medium Priority Group: Unionized ammonia, parachlorometa cresol, phenol, and diazinon.

Low Priority Group: Phenolics recoverable, chloroform, antimony, thallium, diethyl phthalate, bis (2-ethylhexyl) phthalate, and di-n-butyl phthalate.

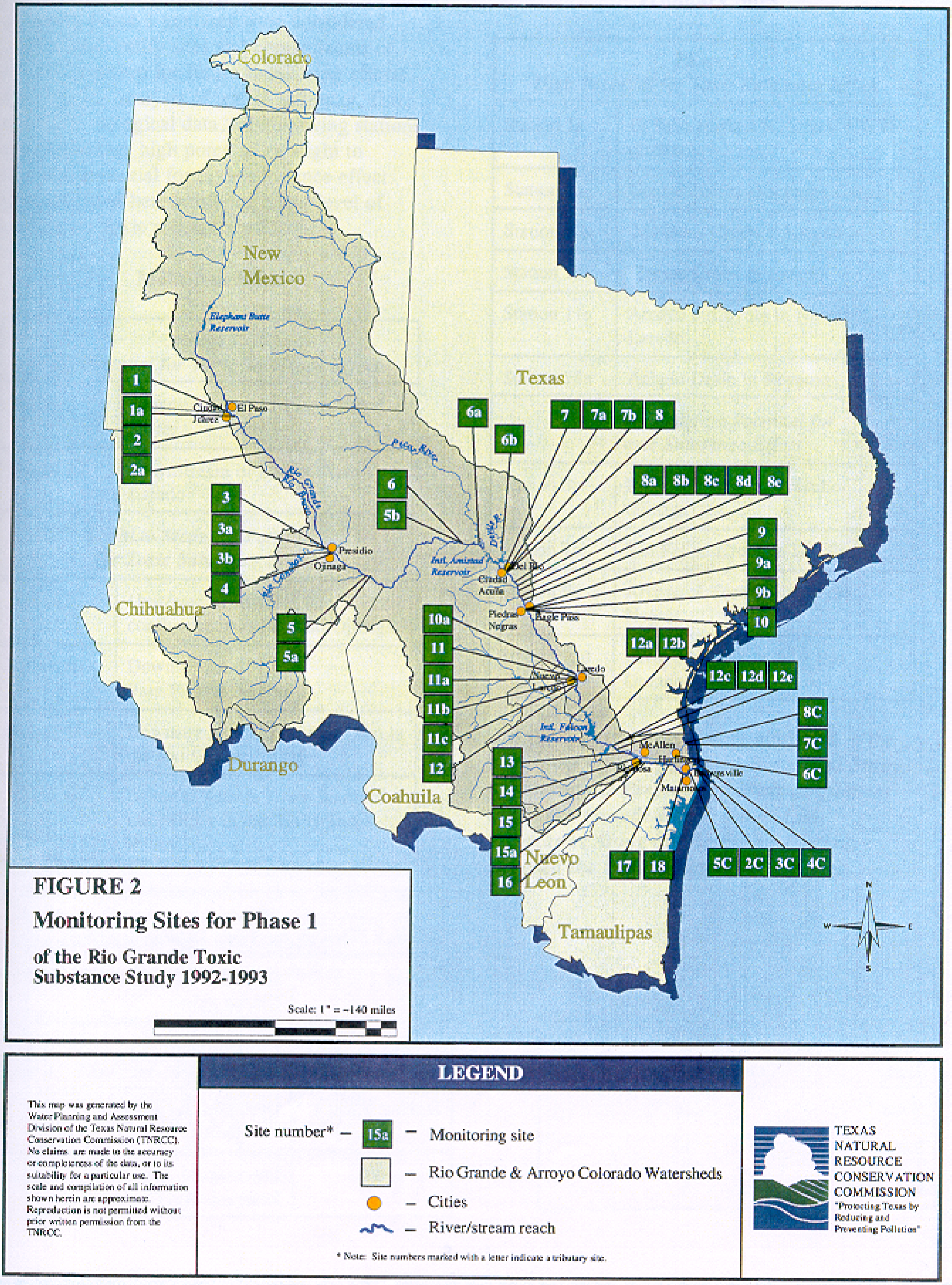

FIGURE 2
Monitoring Sites for Phase 1
of the Rio Grande Toxic Substance Study 1992-1993

This map was generated by the Water Planning and Assessment Division of the Texas Natural Resource Conservation Commission (TNRCC). No claims are made to the accuracy or completeness of the data, or to its suitability for a particular use. The scale and compilation of all information shown herein are approximate. Reproduction is not permitted without prior written permission from the TNRCC.

Phase 1 Sites of Concern
All of the Phase 1 analyses were considered together to identify sites and contaminants of potential concern for future monitoring efforts.

Based on the analysis of water, sediment, fish tissue and biological data, the following stations exhibited either high potential or slight to moderate potential for toxic substance effect. Sites not listed here exhibited a low level of concern for toxic substance effects.

Mainstem Sites

Phase 1 High Potential for Toxic Substance Effect	
Station 2	Downstream of El Paso/Ciudad Juárez
Station 12	Downstream of Laredo/Nuevo Laredo
Slight to Moderate Potential for Toxic Substance Effect	
Station 3	Upstream of Río Conchos confluence near Presidio/Ojinaga
Station 10	Downstream of Eagle Pass/Piedras Negras
Station 14	Downstream of Anzalduas Dam in the Rio Grande Valley
Station 16	Below el Anhelo Drain South of Las Milpas in the Rio Grande Valley

Tributary Sites

Phase 1 High Potential for Toxic Substance Effect	
Station 1a	El Paso Haskell R. Street WWTP discharge
Station 2a	Ciudad Juárez Discharge Canal
Station 10a	Manadas Creek in Laredo
Station 11a	Zacate Creek in Laredo
Station 11c	Arroyo el Coyote in Nuevo Laredo
Station 15a	Anhelo Drain in Reynosa
Slight to Moderate Potential for Toxic Substance Effect	
Station 3a	Río Conchos near Presidio/ Ojinaga
Station 7b	San Felipe Creek in Del Rio
Station 9a	Arroyo el Tornillo in Piedras Negras
Station 12d	Arroyo los Olmos near Rio Grande City

The findings of Phase 1 were published in the September 1994 report titled ***Binational Study Regarding the Presence of Toxic Substances in the Rio Grande/Río Bravo and its Tributaries Along the Boundary Portion Between the United States and Mexico.***

PHASE 2

Field work for Phase 2 of the Rio Grande/Río Bravo Toxic Substance Study was done from May 1995 through December 1995. During the second phase of this intensive monitoring program, 26 sites were sampled under low flow conditions, including 27 on the mainstem and 19 on tributaries from El Paso/Ciudad Juárez to Brownsville/Matamoros.

The types of analyses done in Phase 1 were repeated in Phase 2. Monitoring consisted of:

- Laboratory analysis of water, sediment and fish tissue
- Toxicity tests on water and sediment
- Bioassessments of fish and benthic macroinvertebrate communities

Phase 2 Toxic Substance Results

Of the more than 20,000 possible occurrences of over 145 toxic substances evaluated, a total of 38 toxic substances were detected, 28 of which exceeded criteria/screening levels at some sites. The total number of toxic substances that exceeded criteria/screening levels during Phase 2 are:

PHASE 2

Sample Type	Number Toxic Substances Exceeding Criteria/ Screening Levels
MAINSTEM	
Water	7
Sediment	8
Fish Tissue	11
TRIBUTARIES	
Water	14
Sediment	10
Fish Tissue	5

The 28 toxic substances that exceeded criteria/ screening levels were considered to be of potential concern, and were assigned a level of importance based on the location and number of occurrences. These were divided into three groups:

High Priority Group: Arsenic, copper, zinc, lead, nickel, chloride, chromium, silver, unionized ammonia, cadmium, DDE, mercury, selenium, aroclor 1260, chlordane, phenolics
recoverable, bis (2-ethylhexyl) phthalate, and n-nitrosodi-n-propylamine.

Medium Priority Group: Chloroform and DDT.

Low Priority Group: Antimony, benzene, toluene, xylene, bromodichloromethane, dibromochloromethane, 1,4-dichlorobenzene, and phenol single compound.

Phase 2 Sites of Concern

All of the Phase 2 data was considered together to identify sites of potential concern. Based on the analysis of water, sediment, fish tissue and biological data, the following stations exhibited either high, moderate or low potential for effects from toxic substances. Sites not listed here exhibited a low level of concern for effects from toxic substances, and are discussed in the text.

Mainstem Sites

Phase 2 High Potential for Toxic Substance Effects	
Station 2	Downstream of El Paso/ Ciudad Juárez
Station 12.1	Downstream of Laredo/ Nuevo Laredo
Stations 3 and 4	Upstream and downstream of Presidio/Ojinaga
Station 6.1	International Amistad Reservoir-Rio Grande Arm

Mainstem Sites (cont)

Moderate Potential for Toxic Substance Effects	
Station 5	Big Bend-Santa Elena Canyon
Station 10	Downstream of Eagle Pass/ Piedras Negras
Station 6.2	International Amistad Reservoir-Devils River Arm
Station 16	Downstream of Anhelo Drain near Reynosa
Station 12.2	International Falcon Reservoir-Headwaters
Phase 2 Low Potential for Toxic Substance Effects	
Station 1	Upstream of El Paso-Courchesne Bridge
Station 18	Downstream of Brownsville/ Matamoros
Station 15	Downstream of Hidalgo/Reynosa
Station 1.1	Upstream of the El Paso Haskell Street WWTP
Station 17	Downstream of San Benito in the Rio Grande Valley

Please Note: *Care should be taken when trying to make direct comparisons between results for individual stations Phases 1 and 2.*

Although collection methods used in both Phase 1 and Phase 2 were the same, stations, types of samples and time of year samples were collected varied between the two studies.

In addition, several modifications had to be made to the overall site ranking system used in Phase 1. These modifications and the consideration of different stations in ranking calculations should be kept in mind while comparing the two studies. Direct comparisons could be misleading.

Tributary Sites

Phase 2 High Potential for Toxic Substance Effects	
Station 1a	El Paso Haskell Street WWTP discharge
Station 11c	Arroyo el Coyote near Nuevo Laredo
Station 2a	Ciudad Juárez Wastewater Canal
Station 15a	El Anhelo Drain near Reynosa
Station 10a	Manadas Creek in Laredo
Moderate Potential for Toxic Substance Effects	
Station 11b	Chacon Creek in Laredo
Station 9a	Arroyo el Tornillo-Piedras Negras
Station 0.5a	Montoya Drain near El Paso
Station 12d	Arroyo los Olmos-Rio Grande City
Low Potential for Toxic Substance Effects	
Station 3a	Río Conchos near mouth
Station 3a.1	Río Conchos 25 km Upstream from Mouth
Station 11a	Zacate Creek in Laredo

CHAPTER 2
PHASE 2 STUDY DESCRIPTION

SAMPLING SITES

Phase 1 of the Rio Grande/Río Bravo Toxic Substance Study identified areas with the highest probability of toxic contamination. During this second phase of intensive monitoring, samples were collected at 46 stations, including 27 mainstem sites and 19 tributary sites from El Paso/Ciudad Juárez to Brownsville/Matamoros (Fig.3). Sites from Phase 1 which showed a low potential for impact were excluded from Phase 2. Sixteen sites were added to Phase 2 in areas not covered in Phase 1. Four of these new sites were located on International Falcon and Amistad Reservoirs. Additional work was done in areas where toxic effects were found in Phase 1 to develop a better understanding of contamination and associated effects.

Monitoring consisted of:

- toxic substances and toxicity testing in water at 37 sites and sediment at 33 sites.
- toxic substances in fish tissue samples from 24 sites.
- bioassessment of benthic macroinvertebrate communities at 16 sites.
- bioassessment of fish communities at 24 sites (Tables 1 to 5).

Of the 48 sites scheduled, 46 were sampled. One site was dry (Terlingua Creek in Big Bend National Park), and a second site, at Lozier Canyon was inaccessible during this phase of the study. Twenty-five of the sites were on the mainstem and 21 were on tributaries (11 in Mexico and 10 in the United States)(Tables 1 to 5).

For this study, tributaries were classified as any non-mainstem waterbody that flows or discharges to the Rio Grande/Río Bravo. This broad categorization includes wastewater treatment plant (WWTP) effluent and streams.

The river was broken down into five "reaches":

- El Paso/Ciudad Juárez.
- Presidio/Ojinaga-Big Bend National Park.
- International Amistad Reservoir-Eagle Pass/Piedras Negras.
- Laredo/Nuevo Laredo-International Falcon Reservoir.
- Below International Falcon Reservoir-Brownsville/Matamoros.

Each of the "reaches" are discussed individually in Chapter 5 with a summary comparing all five sections of the river in Chapters 6 and 7.

TYPES OF ANALYSES

Toxic substance analysis consisted of all compounds recognized as priority pollutants in 40 CFR Part 423 Appendix A, except dioxin and asbestos. Supplementary toxic substance parameters consisted of 11 pesticides with numerical criteria established by the State of Texas, 19 pesticides recommended for inclusion by USEPA Region 6, and three additional toxicants with a potential to affect water quality (aluminum, styrene, xylene) (Lewis *et al*. 1991). All toxic substances analyzed in the study are listed in Table 6.

Data collection and assessment methods used in Phase 2 are discussed in Chapter 3. Laboratory analysis methods are listed in Appendix A.

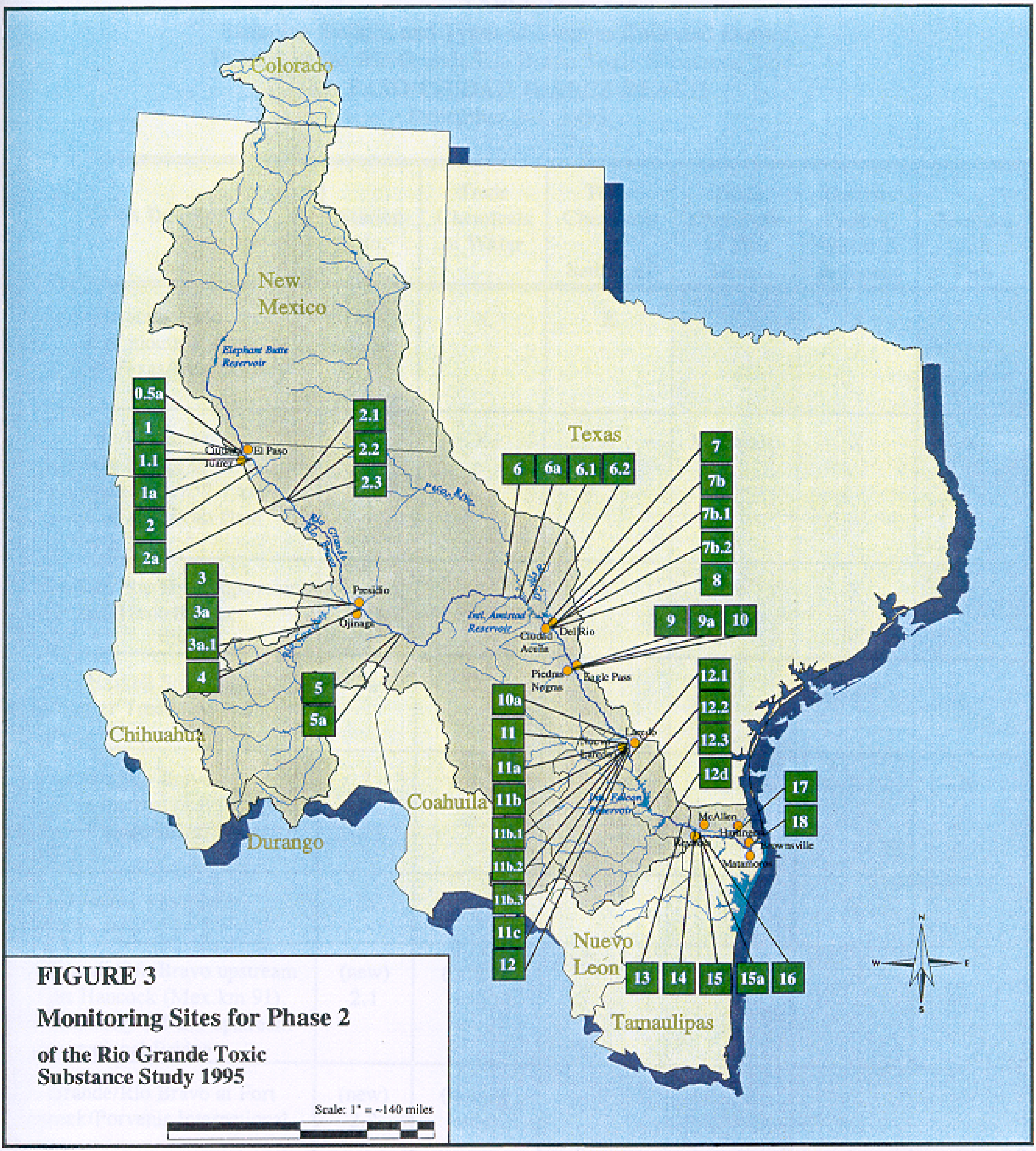

FIGURE 3

Monitoring Sites for Phase 2

of the Rio Grande Toxic Substance Study 1995

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LEGEND

Site number* — 15a — Monitoring site

— Rio Grande & Arroyo Colorado Watersheds

— Cities

— River/stream reach

* Note: Site numbers marked with a letter indicate a tributary site.

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Table 1
Sampling Stations and Types of Samples Collected During
Phase 2 of the Rio Grande/Río Bravo Toxic Substance Study
EL PASO/CIUDAD JUÁREZ REACH
December 2-3, 1995

[- -] = Not Applicable

Station Description	Station No.	Toxic Chemicals in Water	Toxic Chemicals in Sediment	Toxic Chemicals in Fish Tissue	Toxicity Testing in Water & Sediment	Benthics & Fish
Montoya Drain 0.4 km upstream of mouth at Frontera Road near Texas/New Mexico state line.	(new) 0.5a	U	U	- -	U	- -
Rio Grande/Río Bravo at Courchesne Bridge in El Paso/Ciudad Juárez, 2.7 km upstream of American Dam (river km 2,021)	1	U	U	U (metals)	U	U
Rio Grande/Río Bravo upstream of El Paso Haskell Street WWTP	(new) 1.1	U	U	- -	U	- -
El Paso Haskell Street Wastewater Treatment Plant discharge	1a	U	- -	- -	U (water)	- -
Rio Grande/Río Bravo at Zaragosa International Bridge in El Paso/Ciudad Juárez (river km 1,992.8)	2	U	U	U	U	U
Ciudad Juárez wastewater discharge canal	2a	U	U	- -	U	- -
Rio Grande/Río Bravo upstream of Fort Hancock (Mex.km 91), approximately 2.5 km upstream of International Bridge	(new) 2.1	(Sanity Only)	- -	- -	- -	- -
Rio Grande/Río Bravo at Fort Hancock/Porvenir International Bridge	(new) 2.2	(Sanity Only)	- -	- -	- -	- -
Rio Grande/Río Bravo downstream of Fort Hancock (Mex.km 97), approximately 2.5 km downstream of International Bridge	(new) 2.3	(Sanity Only)	- -	- -	- -	- -

Table 2
Sampling Stations and Types of Samples Collected During
Phase 2 of the Rio Grande/Río Bravo Toxic Substance Study
PRESIDIO/OJINAGA-BIG BEND NATIONAL PARK REACH
December 4-5, 1995

[- -] = Not Applicable

Station Description	Station No.	Toxic Chemicals in Water	Toxic Chemicals in Sediment	Toxic Chemicals in Fish Tissue	Toxicity Testing in Water & Sediment	Benthics & Fish
Rio Grande/Río Bravo 5 km upstream of Río Conchos confluence near Presidio/Ojinaga (river km 1,552.2)	3	U	U	U	U	- -
Río Conchos 0.2 km upstream of mouth, 4.8 km northwest of Ojinaga	3a	U	U	U	U	U
Río Conchos 20-25 km upstream of mouth near Ojinaga	(new) 3a.1	U	U	- -	U	U
Rio Grande/Río Bravo 14.4 km downstream of Río Conchos confluence near Presidio/ Ojinaga (river km 1,528.5)	4	U	U	U	U	U
Rio Grande/Río Bravo at mouth of Santa Elena Canyon (river km 1,424.7)	5	U	U	U	U	U
Terlingua Creek 0.2 km upstream of mouth, 13.7 km south of Terlingua-**NOT SAMPLED**	5a	- -	- -	- -	- -	- -
Rio Grande/Río Bravo at downstream of mouth of Lozier Canyon-**NOT SAMPLED**	5b	- -	- -	- -	- -	- -
Rio Grande/Río Bravo at IBWC on weir Foster Ranch near Langtry (river km 1,058.2)	6	(Sanity Only)	- -	- -	- -	- -
Pecos River at Shumla Bend gaging station, 19.2 km east of Langtry, 62.4 km upstream of Rio Grande confluence	6a	(Sanity Only)	- -	- -	- -	- -

Table 3
Sampling Stations and Types of Samples Collected During
Phase 2 of the Rio Grande/Río Bravo Toxic Substance Study
INTERNATIONAL AMISTAD RESERVOIR-
EAGLE PASS/PIEDRAS NEGRAS REACH
May 15-17, 1995

[- -] = Not Applicable

Station Description	Station No.	Toxic Chemicals in Water	Toxic Chemicals in Sediment	Toxic Chemicals in Fish Tissue	Toxicity Testing in Water & Sediment	Benthics & Fish
International Amistad Reservoir in Rio Grande Arm at Buoy #17	(new) 6.1	U	U	U	U	- -
International Amistad Reservoir in Devils River Arm, 6.6 km downstream of Rough Canyon Boat Ramp	(new) 6.2	U	U	U	U	- -
Rio Grande/Río Bravo 0.4 km upstream of US 277 in Del Rio/Ciudad Acuña (river km 903.2)	7	- -	- -	U	- -	U (fish)
San Felipe Creek 1.8 km upstream of mouth in Del Rio	7b	U	U	U	U	U
San Felipe Creek at US 277 in Del Rio	(new) 7b.1	U	U	- -	U	U
San Felipe Creek 6.0 km upstream of mouth in Del Rio	(new) 7b.2	U	U	- -	U	U
Rio Grande/Río Bravo 6.4 km downstream of Del Rio/Ciudad Acuña International Bridge (US 277) (river km 896.8)	8	- -	- -	U	- -	U (fish)
Rio Grande/Río Bravo at US 57 in Eagle Pass/Piedras Negras (river km 799.8)	9	- -	- -	U	- -	U (fish)
Arroyo el Tornillo 3.6 km down-stream of US 57 in Piedras Negras	9a	U	U	- -	U	- -
Rio Grande/Río Bravo 14 km downstream of US 57 in Eagle Pass/Piedras Negras (river km 785.8)	10	U	U	U	U	U

Table 4
Sampling Stations and Types of Samples Collected During
Phase 2 of the Rio Grande/Río Bravo Toxic Substance Study
LAREDO/NUEVO LAREDO-INTERNATIONAL FALCON RESERVOIR REACH
June 5-8, 1995

[- -] = Not Applicable

Station Description	Station No.	Toxic Chemicals in Water	Toxic Chemicals in Sediment	Toxic Chemicals in Fish Tissue	Toxicity Testing in Water & Sediment	Benthics & Fish
Manadas Creek 0.8 km upstream of mouth near Laredo	10a	U	U	- -	U	- -
Rio Grande/Río Bravo near the Laredo Water Treatment Plant Intake, 1.5 km upstream of US 81 in Laredo/Nuevo Laredo (river km 585.9)	11	- -	- -	U	- -	U (fish)
Zacate Creek 0.1 km upstream of mouth near Laredo	11a	U	U	- -	U	- -
Chacon Creek 0.1 km upstream of mouth in Laredo	11b	U	U	- -	U	- -
Laredo Zacate Creek Wastewater Treatment Plant discharge	(new) 11b.1	U	- -	- -	U (water)	- -
Laredo Southside Wastewater Treatment Plant discharge	(new) 11b.2	U	- -	- -	U (water)	- -
Manhole 115 of Riverside III, Stage I collection system, in Nuevo Laredo	(new) 11b.3	U	- -	- -	U (water)	- -
Arroyo el Coyote 0.1 km upstream of mouth in Nuevo Laredo	11c	U	U	- -	U	- -
Rio Grande/Río Bravo 13.2 km downstream of US 81 in Laredo/Nuevo Laredo (river km 567.6)	12	U	U	U	U	U
Rio Grande/Río Bravo 25 km downstream of US 81 in Laredo/Nuevo Laredo (river km 555.8)	(new) 12.1	U	U	U	U	U
International Falcon Reservoir, headwaters at Monument 14	(new) 12.2	U	U	U	U	U (fish)
International Falcon Reservoir, at Monument 1, near the dam	(new) 12.3	U	U	U	U	U (fish)

Table 5
Sampling Stations and Types of Samples Collected During
Phase 2 of the Rio Grande/Río Bravo Toxic Substance Study
BELOW INTERNATIONAL FALCON RESERVOIR-
BROWNSVILLE/MATAMOROS
July 10-13, 1995

[- -] = Not Applicable

Station Description	Station No.	Toxic Chemicals in Water	Toxic Chemicals in Sediment	Toxic Chemicals in Fish Tissue	Toxicity Testing in Water & Sediment	Benthics & Fish
Arroyo los Olmos at US 183, 2.1 km upstream of mouth	12d	U	U	- -	U	- -
Rio Grande/Río Bravo at SH 886 near Los Ebanos (river km 328.8)	13	U	U	U	U	U (fish)
Rio Grande/Río Bravo 0.8 km downstream of Anzalduas Dam (river km 273.3)	14	U	U	U	U	U
Rio Grande/Río Bravo 0.8 km downstream of Anzalduas Dam (river km 273.3)	15	U	U	U (metals)	U	U (fish)
El Anhelo Drain 0.1 km upstream of mouth, 3.2 km east of Reynosa	15a	U	U	- -	U	- -
Rio Grande/Río Bravo downstream of el Anhelo Drain south of Las Milpas (river km 244.1)	16	U	U	U	U	U
Rio Grande/Río Bravo 6.3 km downstream of San Benito (river km 155.8)	17	U	U	U (metals)	U	U (fish)
Rio Grande/Río Bravo 11.2 km downstream of US 83/77 in Brownsville/Matamoros (river km 78.3)	18	U	U	U	U	U

PARAMETERS ANALYZED IN PHASE 2

WATER

Water sample analysis for Phase 2 included the following parameters:

Inorganics

! Total Organic Carbon (TOC)
! Ammonia Nitrogen (NH_3-N)
! Total Hardness
! Nitrite Nitrogen (NO_2-N)
! Total Alkalinity
! Nitrate Nitrogen (NO_3-N)
! Total Suspended Solids (TSS)
! Total Phosphorus (T-P)
! Sulfate (SO_4)
! Orthophosphorus (O-P)
! Chloride (Cl^-)
! Cyanide (CN^-)
! Total Dissolved Solids (TDS)

Organics

! Dissolved Metals
! Phenols and Cresols
! Pesticides
! Ethers
! Halogenated Aliphatics
! Nitrosamines and Other N Compounds
! Polycyclic Aromatic Hydrocarbons (PAH)
! Monocyclic Aromatics
! PCBs and Related Compounds
! Phthalate Esters

Biological

! Toxicity

SEDIMENT

Sediment sample analysis for Phase 2 included the following parameters:

Conventionals

! Total Organic Carbon
! Particle Size Composition
! Acid Volatile Sulfides

Organics

! Metals
! Phenols and Cresols
! Pesticides
! Ethers
! Halogenated Aliphatics
! Nitrosamines and Other N Compounds
! Polycyclic Aromatic Hydrocarbons (PAH)
! Monocyclic Aromatics
! PCBs and Related Compounds
! Phthalate Esters

Biological

! Toxicity

FISH TISSUE

Fish tissue sample analysis for Phase 2 included the following parameters:

Conventionals

! Percent Lipid Content

Organics

! Metals
! Phenols and Cresols
! Pesticides
! Ethers
! Halogenated Aliphatics
! Nitrosamines and Other N Compounds
! Polycyclic Aromatic Hydrocarbons (PAH)
! Monocyclic Aromatics
! PCBs and Related Compounds
! Phthalate Esters

CHAPTER 3
STUDY METHODS

FIELD AND LABORATORY PROCEDURES

The following methods were used in the laboratory and field for the determination of physical, chemical and biological characteristics. All sampling, data collection and sample preservation procedures were done in accordance with standardized TNRCC surface water quality monitoring field procedures (TNRCC 1994). Laboratory analyses were done according to USEPA (1983) and American Public Health Association (APHA)(1989) guidelines. All water, sediment and tissue samples, for chemical analysis, were analyzed by the Texas Department of Health Environmental Chemistry Laboratory in Austin. Analytical methods used by the Texas Department of Health are listed in APPENDIX A. Water and sediment toxicity samples were analyzed at the USEPA Laboratory in Houston. An attempt was made to collect all samples under the lowest flow conditions possible. Sampling under low flow conditions gives a better indication of impact from industrial/municipal discharges. Higher flows tend to have a dilution effect, reducing the ability to assess pollutant impacts.

PHYSICAL PARAMETERS

Field Measurements

Field instruments were calibrated and post-calibrated with each sampling event. All measurements were done in the field.

Parameter	**Method**
CTemperature (EC)	CHydrolab Surveyor II
CDissolved Oxygen (mg/L)	CHydrolab Surveyor II
CpH (s.u.)	CHydrolab Surveyor II
CConductivity (Fmhos/cm)	CHydrolab Surveyor II
CInstantaneous Flow	CIBWC flow gages; or on-site measurement

CHEMICAL PARAMETERS

Water Sampling

Water samples were generally collected at midstream by either wading or by boat. Reservoir samples were collected by boat. Grab samples for all parameters, with the exception of dissolved metals, were collected from the stream or reservoir by submerging a container to a depth of one foot.

Dissolved metals in water samples were collected using ultra-clean procedures; a peristaltic pump was used to filter water directly from the stream through a 0.45 micron (F) in-line filter and pretreated rubber tubing. The TNRCC Houston Laboratory used metals grade nitric acid to clean the tubing. Dissolved metals samples were collected in commercially preacidified one-quart plastic bottles containing metals grade nitric acid (TNRCC 1994). Sample specifications are listed in Table 7.

Sediment Sampling

Sediment samples were collected using a stainless steel Ekman dredge. Sediment was generally collected along the banks in slack water areas that allowed for sediment accumulation in the immediate vicinity of the designated sampling site. Where conditions allowed, sediment was collected from both the United States and Mexican banks of the river and composited. At several sites teflon scoops were used when the Ekman dredge was ineffective in collecting a sufficient amount of sediment. A minimum of four grab samples were collected and composited. The number of grabs needed depended on the sediment conditions at the site. The entire surface layer of fine grained sediment was collected from each grab. Each of the grabs were composited in a plastic bucket and thoroughly mixed with a teflon scoop. The composite sample was divided into containers for analysis of metals organics, conventionals and toxicity testing (TNRCC 1994). Sample specifications are listed in Table 7.

TABLE 6
LIST OF TOXIC SUBSTANCES ANALYZED FOR IN PHASE 2 OF THE RIO GRANDE/
RIO BRAVO TOXIC SUBSTANCE STUDY (WATER, SEDIMENT, AND FISH TISSUE). ^

Phenols and Cresols

Cparachlorometa cresol *
Cpentachlorophenol
Cphenol (C_6H_5OH) single compound
Cphenolics recoverable
C2-chlorophenol
C2-nitrophhenol
C2,4-dichlorophenol
C2,4-dimethylphenol
C2,4-dinitrophenol
C2,4,6-trichlorophenol
C4-nitrophenol
C4,6-dinitro-ortho-cresol *

Ethers

Cbis (chloromethyl) ether *
Cbis (2-chloroethyoxy) methane
Cbis (2-chloroethyl) ether
Cbis (chloroisopropyl) ether
C2-chloroethyl vinyl ether *
C4-bromophenyl phenyl ether
C4-chlorophenyl phenyl ether

Halogenated Aliphatics

Cbromodichloromethane
Cbromoform
Ccarbon tertrachloride
Cchloroethane
Cchloroform
Cdibromochloromethane
Cdichlorodifluoromethane
Chexachlorobutadiene
Chexachlorocyclopentadiene
Chexachloroethane
Cmethyl bromide *
Cmethyl chloride *
Cmethylene chloride
Ctetrachloroethylene *
Ctrichloroethylene *

Halogenated Aliphatics (cont)

Ctrichlorofluoromethane *
Cvinyl chloride
C1,1-dichloroethane
C1,1-dichloroethylene *
C1,1,1-trichloroethane
C1,1,2-trichloroethane
C1,1,2,2-tetrachloroethane
C1,2-dichloroethane
C1,2-dichloropropane
C1,2-trans-dichloroethylene *
C1,3-trans-dichloropropene
C1,3-cis-dichloropropene

Polycyclic Aromatic Hydrocarbons

Cacenapthene
Cacenaphthylene
Canthracene/phenanthrene
Cbenzo (a) anthracene
C1,2-benzanthracene
Cbenzo (b) fluoranthene
Cbenzo (GHI) perylene
C1,12-benzoperylene
Cbenzo (k) fluoranthene
Cbenzo-a-pyrene
Cchrysene
Cfluoranthene
Cfluorene
Cindeno (1,2,3-CD) pyrene
Cnaphthalene
Cpyrene
C1,2,5,6-dibenzanthracene *

Monocyclic Aromatics

Cbenzene
Cchlorobenzene
Cethylbenzene
Chexachlorobenzene

Monocyclic Aromatics (cont)

Cnitrobenzene
Cstyrene **ä**
Ctoluene
Cxylene **ä**
C1,2-dichlorobenzene
C1,2,4-trichlorobenzene
C1,3-dichlorobenzene **å**
C1,4-dichlorobenzene **å**
C2,4-dinitrotoluene **å**
C2,6-dinitrotoluene **å**

Nitrosamines and Other N Compounds

Cacrylonitrile
Cbenzidine
Cn-nitrosodi-n-propylamine
Cn-nitrosodimethylamine
Cn-nitrosodiphenylamine
C1,2-diphenylhydrazine
C3,3-dichlorobenzidine

Metals

Caluminum **ä**
Cantimony
Carsenic
Cberyllium
Ccadmium
Cchromium
Ccopper
Clead
Cmercury
Cnickel
Cselenium
Csilver
Cthallium
Czinc

TABLE 6 (cont)
LIST OF TOXIC SUBSTANCES ANALYZED FOR IN PHASE 2 OF THE RIO GRANDE/
RIO BRAVO TOXIC SUBSTANCE STUDY (WATER, SEDIMENT, AND FISH TISSUE). ^

Pesticides

Cacrolein *
Caldicarb ã
Caldrin
Caldrin
Calpha benzene hexachloride
Catrazine ã
Cbeta benzene hexachloride
Ccarbaryl â
Ccarbofuran ã
Cchlordane
Cchlorfenvinphos ã
Cchlorothalonil ã
Cchloropyrifos â
Cchlorosulfuron *
C DDD
C DDE
C DDT
Cdelta benzene hexachloride
Cdemeton â*
Cdiazinon ã
Cdibromochloropropane (dbcp) ã*
Cdicamba ã
C2,4-dichlorophenoxyacetic acid
C(2,4-D) â
Cdicofol (kelthane) â
Cdicrotophos ã*
Cdieldrin
Cdinoseb ã
Cendosulfan alpha
Cendosulfan beta
Cendosulfan sulfate
Cendrin
Cendrin aldehyde
Cfenthion (baytex) ã*
Cgamma-bhc (lindane)
Cguthion â
Cheptachlor
Cheptachlor epoxide
Cisophorone
Cmalathion â
Cmetsulfuron ã*

Pesticides (cont)

Cmethomyl ã
Cmethoxychlor â
Cmetolachlor ã
Cmirex â
Cparathion â
Cpicloram ã
Cprometon ã*
Csimazine ã
Ctetraethypyrophosphate
(tepp) ã*
Ctoxaphene
C2,4,5-TP (silvex) â

PCBs and Related Compounds
(Polychlorinated biphenyls)
Caroclor 1016
Caroclor 1221
Caroclor 1232
Caroclor 1242
Caroclor 1248
Caroclor 1254
Caroclor 1260
C2-chloronapthalene

Phthalate Esters

Cbis (2-ethyhexyl) phthalate
Cdiethyl phthalate
Cdimethyl phthalate
Cdi-n-butyl phthalate
Cdi-n-octylphthalate
Cn-butylbenzyl phthalate

General Inorganics

Ccyanide

^ unless otherwise noted, all parameters are designated priority pollutants in 40 CFR Part 423 Appenix A

â parameters with numerical criteria established by the State of Texas

ã parameters recommended for inclusion by USEPA Region VI

ä parameters having potential to affect the Rio Grande (Lewis *et al*. 1991)

å pesticides

* Parameters not reported by laboratory

TABLE 7
SAMPLE SPECIFICATIONS
Volume, Preservation and Holding Time

Parameters	Sample Volume/Type of Container	Preservation	Holding Time
	WATER		
TSS, TDS, Chloride, Sulfate	one 1 qt. cubitainer	ice to 4EC	7 days
Total Hardness, Turbidity	one 1 qt. cubitainer	ice to 4EC	24 hrs
Ammonia, TOC, Phenol	one 1 qt. glass jar with teflon lined lids [a]	conc. H_2SO_4 to pH <2; ice to 4EC	28 days
Dissolved Metals	one 1 qt. plastic bottle [a]	filter;metals grade HNO_3 to pH <2; ice to 4EC [b]	28 days
Volatile Organics	two 40 ml glass scew top vials with teflon lined lids [a]	ice to 4EC	14 days
Pesticides	two 1 qt. glass jars with teflon lined lids [a]	ice to 4EC	7 days
Other Organics	one 1 qt. glass jar with teflon lined lid [a]	ice to 4EC	7 days
Cyanide	one 1 qt. cubitainer	NaOH to pH >12; ice to 4EC [c]	14 days
Toxicity Testing	two 1 gal. cubitainers	ice to 4EC	24 hrs.
	SEDIMENT		
Organics	one 1 qt. glass jar with teflon lined lid [a]	ice to 4EC	14 days
Metals	one 1 qt. glass jar with teflon lined lid [a]	ice to 4EC	28 days
TOC, Acid Volatile, Sulfide, Grain Size	one 1 qt. glass jar with teflon lined lid	ice to 4EC	7 days
Toxicity Testing	two 1 qt. glass jars	ice to 4EC	7 days

[a] Containers pretreated by the manufacturer
[b] 2ml of metals-grade nitric acid added by manufacturer
[c] 0.6 g ascorbic acid added prior to NaOH if residual chlorine present

Fish Tissue Sampling

Fish tissue samples were collected based on data from Phase 1 of the study. Fish tissue collection followed *The Texas Tissue Sampling Guidelines*, a consensus document prepared by state and federal agencies (TNRCC 1994). Fish were collected with a boat mounted electrofishing unit. The fish selected for analysis were kept in native water until processed. The total length of each fish was recorded along with any deformities, wounds or abnormalities. Both whole body and edible tissue samples were double wrapped in aluminum foil (dull side toward fish). Each fish in a composite sample was individually wrapped, labeled and placed in a plastic bag with the other individuals for that composite sample. Fish samples for edible tissue were prepared by the Texas Department of Health (TDH) laboratory personnel.

Two whole body and two edible tissue samples were collected at 18 of 24 tissue sites. One whole body and one edible tissue sample were collected at six of the 24 sites. Five of the original 29 sites were not sampled; one tributary site was dry, three tributary sites were not suitable for tissue collection, and one site was inaccessible during this phase of the study. A concentrated effort was made to include a predatory species, and a bottom-feeding species from each site. The number of fish used in each composite sample ranged from one to four. The number of target species was limited, and varied widely in size at some locations. A decision was made to use fewer fish of similar size rather then more of varying size.

Target species were largemouth bass (*Micropterus salmoides*), channel catfish (*Ictalurus punctatus*), and common carp (*Cyprinus carpio*). Alternate species collected included white bass (*Morone chrysops*), snook (*Centropomus undeimalas*), smallmouth buffalo (*Ictiobus bubalus*) and blue catfish (*Ictalurus furcatus*).

BIOLOGICAL

Toxicity Testing

Water

Ambient water toxicity samples were collected in two one-gallon plastic containers, and kept on ice until delivered to the USEPA Laboratory in Houston. The Houston laboratory test procedures are based on *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*. Test organisms were water fleas *(Ceriodaphnia dubia)* and fathead minnows *(Pimephales promelas)*(USEPA 1989). The basic test consists of exposing organisms to various concentrations of test water for a seven-day period. During that time, checks are made for mortality and abnormal growth/swimming behavior of the fathead minnows, and survival and number of young per female for water fleas. Significant effects were statistically determined at the laboratory. Significant effects for water fleas include survival and number of young per female, and for fathead minnows, survival and abnormal growth/swimming behaviors.

Sediment

Sediment toxicity samples were collected in two one-quart glass jars using the same method described in sediment sampling for chemical parameters. The method for sediment testing is an adaptation of USEPA Corvallis methods (National Environmental Research Center, Corvallis, Oregon), and United States Army Corps of Engineers drilling mud procedures developed by Terry Hollister and Able Uresti at the USEPA Laboratory in Houston. The sediment sample is mixed with culture water in a 1:4 volume-to-volume ratio with one part sediment and four parts culture water. The sediment/culture water mixture is placed in a two-liter nalgene container and tumbled for approximately 24 hours. The container is then placed in a cold room at 3-4EC and allowed to settle for 18-24 hours. The elutriate (upper liquid portion) is siphoned off. If needed the elutriate is filtered (1.5 micron glass fiber filter) to remove background material. The same test procedure used for water was run on water fleas *(Ceriodaphnia dubia)* and fathead minnows *(Pimephales promelas)* using the elutriate (personal communication with Terry Hollister, USEPA). Significant effects were statistically determined at the laboratory.

In a ranking of freshwater chronic sediment toxicity tests, based on reliability, ecological relevance, exposure relevance, availability, interferences and chemical discrimination, fathead minnows had a rating of 11.5, and water fleas had a rating of 13.5 (highest rating was 15, lowest was 7.5) (American Petroleum Institute 1994). The sediment elutriate test is a useful way to represent exposure to chemicals, that occur in sediment, after sediments have been resuspended in the water column. This method is used to test for the toxic effect on organisms inhabiting the water column (plankton, fish). It does not relate to the effects on organisms living at or in the sediment. Testing of whole sediment was not within the scope of this project. For the majority of the Rio Grande/Río Bravo this test procedure is appropriate due to resuspension of sediments under variable flow rates (American Petroleum Institute 1994).

Test Organisms

Fathead Minnow (*Pimephales promelas*)

Currently, the fathead minnow (*Pimephales promelas*) is the most commonly used warm water species for acute and chronic toxicity tests. Fathead minnows belong to the carp/minnows family, Cyprinidae. The number of carp/minnow species makes it the most dominant freshwater family. Specifically, the fathead minnow thrives in ponds, lakes, ditches and slow moving muddy streams, feeding on anything from living invertebrates to detritus. Even though it is a tolerant species, the fathead minnow is an important part of the aquatic food chain, has a widespread distribution in North America and is easily cultured the laboratory (Rand 1995).

Water Flea (*Ceriodaphnia dubia*)

Water fleas (*Ceriodaphnia dubia*) are freshwater microcrusteaceans in a group called Cladocerans. They are abundant throughout North America, inhabiting lakes, ponds and quiet sections of streams and rivers. Water fleas are important in the aquatic community because they represent a significant portion of the diet of numerous fish species (Rand 1995).

Benthic Macroinvertebrate Survey

Two procedures were used to collect benthic macroinvertebrate samples. A Surber square foot sampler was used at stations where riffle and/or shallow run type habitats were available. At these stations, three replicate Surber samples were collected and processed separately. At stations where no suitable habitat was noted, samples of submerged woody debris (snags) were collected. Snags of 3.81 cm (1.5 inches) in diameter or less were cut into sections using lopping shears, and placed in one quart glass jars. Sufficient sections were cut to fill two jars. An effort was made to collect snag samples only from areas exposed to current.

Samples were preserved in 5% formalin in the field, and then hand-sorted in the laboratory with the aid of a dissecting microscope. Specimens were identified and data analysis conducted according to the following taxonomic guidelines:

- Insecta identified to genus
- Gastropoda identified to genus
- Pelecypoda identified to genus
- Isopoda identified to genus
- Ostracoda identified to subclass (Ostracoda)
- Amphipoda identified to genus
- Decapoda identified to genus
- Oligochaeta identified to class (Oligochaeta)
- Nematoda identified to Phylum (Nematoda)
- Turbellaria identified to genus
- Hydracarina left at Hydracarina
- Hirudinea identified to class (Hirudinea)

Fish Community Survey
Fish community surveys were conducted using boat and/or backpack electrofishing unit(s) at all sites and seines where possible. Electrofishing was conducted for 15 minutes with the primary objective being to collect a representative sample of the fish species present in proportion to their relative abundances. An attempt was made to sample all major habitat types in a study reach. Seining was conducted using a twenty-foot straight seine with 1/4 inch mesh. A minimum of six seine hauls were collected. Additional hauls were conducted according to available habitat and whether or not additional species were being added. Fishes not identified in the field were fixed in 10% formalin and later transferred to 75% ethanol.

SAMPLE HANDLING

Recommended storage and preservation requirements, and holding times were observed during shipping and analysis of water, sediment and tissue samples. Sample specifications are listed in Table 7. Samples were shipped to the laboratories on ice in a sealed ice chest by overnight freight. Samples exceeding hold time are noted in data summaries (Appendices E-G).

QUALITY ASSURANCE/ QUALITY CONTROL

The study was conducted in accordance with a USEPA approved quality assurance project plan (QAPP). The QAPP describes the quality assurance procedures in detail. An evaluation of specific data quality measures (field blanks, precision, accuracy, data completeness, comparability, and representativeness) is located in Appendix L.

DATA EVALUATION

The effects of any single chemical can vary in each type of sample (water, sediment, or fish tissue). It is important to note that the criteria/screening levels used to evaluate the toxics data will differ depending on the problem being evaluated. For example, a chemical concentration necessary to protect human health from the consumption of contaminated fish, is likely to be very different than the concentration to protect a drinking water source or that required to protect aquatic life.

Toxic Substances
Water
Water quality criteria and screening levels used to evaluate the Rio Grande/Río Bravo Toxic Substance Study data are summarized in Table 8. Actual numerical concentrations are listed in Table 9. Site specific criteria/screening concentrations are located in APPENDIX I. "*Criteria*" refers to specific numerical based concentrations for the protection of aquatic life and human health. "*Screening Levels*" are more general, and are mainly based on state and national 85th percentiles.

For water, the following criteria/screening levels were used:

! State of Texas Surface Water Quality Standards (TSWQS) for the protection of aquatic life and human health (TNRCC 1995)
! USEPA criteria for the protection of aquatic life and human health (USEPA 1986, 1995).
! State 85th percentiles (TNRCC 1996).
! National 85th percentiles (Greenspun and Taylor 1979).

Texas Surface Water Quality Standards (TSWQS) for certain dissolved metals are site specific and based on hardness (APPENDIX I) (TNRCC 1995). Eighty-fifth percentiles are screening values for given compounds that are higher than 85% of the values for similar areas;

the four categories are freshwater stream, tidal stream, reservoir or estuary.

An exceedance of a human health criterion indicates a potential human health hazard if untreated water and/or fish from a waterbody were consumed on a regular, long-term basis.

State and national screening levels represent a relatively high amount of a particular contaminant in water but do not necessarily have any toxicological significance. Values which exceed screening levels are termed "elevated".

Sediment

Sediment screening levels used to evaluate the Rio Grande/Río Bravo Toxic Substance Study data are summarized in Table 8. Actual numerical concentrations are listed in Table 10. Site specific screening concentrations are located in APPENDIX I. Two primary sediment screening tools were used; site specific sediment quality criteria (SQC) for organics and SEM/AVS Ratios (simultaneously extracted metals/acid volatile sulfides) for metals. These methods, not used in Phase 1, are currently the preferred indicators of contaminant bioavailability.

Both of these methods are based on the idea that the toxic effect of sediment to benthic organisms is determined, not by a total chemical concentration, but by the extent to which a chemical is bound in sediment (Pesch *et al*. 1995).

Sediment Quality Criteria

Sediment quality criteria (SQC) are defined as numerical concentrations for individual chemicals intended to predict biological effects. The equilibrium partitioning method is the basis for generating sediment quality criteria for organic compounds (USEPA 1993a).

Equilibrium partitioning focuses on the chemical interaction between sediments and contaminants. It is based on the assumption that a steady-state can be achieved between chemical activity in water, sediment and aquatic organisms (Rand 1995).

Sediment quality criteria are calculated using the total organic carbon (TOC) concentration, octanol/water partition coefficients (Koc) and freshwater chronic criteria (APPENIDX I) (USEPA 1993a).

Organic carbon is considered the primary factor controlling the bioavailability of nonionic (nonpolar) organic contaminants in sediment (Pesch *et al*. 1995). An organic compound is thought to be less toxic in sediments with high TOC concentrations. The higher the TOC concentration, the greater the capacity of the TOC to absorb nonionic organic compounds, reducing pore water concentrations. *Pore water or interstitial water* is the water found in spaces between particles of sediment. The bioaccumulation and toxicity of many sediment associated contaminants has been related to pore water concentrations (Rand 1995).

The following equation is used to calculate site specific sediment quality criteria values:

SQC = (foc)(Koc)(FCV)	
SQC	sediment quality criterion
log10 Kow	octanol/water partition coefficient
log10 Koc	0.00028 + 0.983 (log10 Kow)
foc	fraction of organic carbon in sediment
Koc	particle organic carbon partition coefficient, mg/kg; antilog of log10 Koc
FCV	final critical value (freshwater chronic criterion)

The *octanol/water partition coefficient* (Kow) is a laboratory produced ratio between octanol and water indicating a chemicals tendency for bioconcentration by aquatic organisms (Rand 1995; TNRCC 1996a).

The *final critical value* (freshwater chronic criterion) is the limit set to protect aquatic organisms from chronic exposure to a contaminant in water. These values were obtained from the TSWQS (TNRCC 1995).

The following is an example of the SQC calculation for **DDE** at Station 2 (Zaragosa Bridge-El Paso).

The following assumptions are made:

CKoc approximately equals Kow
CFCV and Koc remain constant for a given organic compound in sediment
C% TOC is unique for each station

Station 2 TOC = 4590 mg/kg

Î Calculating **foc**:

$$\% \text{ TOC} = \frac{4590 \text{ mg/kg}}{10{,}000 \text{ mg/kg}} = 0.4590$$

$$\textbf{foc} = \frac{0.4590}{100} = 0.00459$$

Ï Final Critical Value Converted to mg/L

$$\textbf{FCV} = \frac{0.001 \text{ Fg/L}}{1000} = 0.000001 \text{ mg/L}$$

Ð Calculating **Koc**:

log10 Kow = 5.996
log10 Koc = 0.00028 + 0.983 (5.996)
= 5.8943

Koc = 783429.6

Koc is the antilog of log10 Koc

Ñ Calculating **SQC**:

SQC = (foc)(Koc)(FCV)
= (0.00459)(783429.6)(0.000001)
= 0.0036 mg/kg

<u>NOTE</u>: The SQCs developed for this study have no regulatory significance.

SEM/AVS Ratios for Metals in Sediment

Acid volatile sulfide has been recognized as an indicator of sediment metal toxicity. Simultaneously extracted metals (SEM)/acid volatile sulfides (AVS) ratios are used to predict the toxicity of metals in sediment. *Simultaneously extracted metals (SEM)* are the metals released during AVS analysis. *Acid volatile sulfides (AVS)* are defined as sediment sulfides that are soluble in hydrochloric acid. The ratio is referred to as the molar SEM/AVS ratio, where all metals and AVS values are converted from mg/kg to Fmoles/kg (Howard and Evans 1993; Casas and Crecelius 1994; Ankley *et al*. 1996).

The SEM/AVS ratio is used with certain divalent cationic metals (arsenic, cadmium, chromium, copper, mercury, nickel, lead and zinc). These metals form insoluble metal sulfide solids (a dissolved metal replaces iron in ferrous sulfide) and are removed from the pore water by precipitation (Casas and Crecelius 1994; Pesch *et al*. 1995). Iron sulfides are formed by a reaction between hydrogen sulfide

(H_2S) and ferrous iron in an anoxic (oxygen poor) environment. H_2S is produced by the oxidation of organic matter by sulfide reducing bacteria (Casas and Crecelius 1995). The formation of these insoluble metal sulfides reduces the bioavailability to benthic organisms (Howard and Evans 1993).

If molar SEM/AVS ratio is less than 1.0, the majority of a metal should be bound as a metal sulfate with little or no metal detected in the pore water. However, if the SEM/AVS ratio is greater than 1.0, excess metal may be available with a potential to be toxic.

The following is an example of the SEM/AVS calculation for **copper** at Station 2 (Zaragosa Bridge-El Paso).

Convert metals and AVS from mg/kg to Fmoles/kg:

<u>Î mg</u> x ~~millimoles~~ x <u>1000 Fmoles</u> = <u>Fmoles</u>
kg Ï mw ~~1 millimole~~ kg

Î = concentration of a metal in sediment
Ï = molecular weight of a metal in grams
or
<u>sediment concentration</u> x 1000 = <u>Fmoles</u>
molecular weight kg

EXAMPLE: Copper at Station 2

Acid Volatile Sulfide Concentration = < 1.0 mg/kg
Copper Concentration = 26.7 mg/kg
Molecular Weight of Copper = 63.5 g
Molecular Weight of Sulfur = 32.1 g

Î AVS = <u>1.0</u> x 1000 = 31.2 Fmoles/kg
32.1

Ï Arsenic = <u>26.7</u> x 1000 = 420.5Fmoles/kg
63.5

Ð SEM/AVS Ratio = <u>420.5</u> = 13.5
31.2

For the purpose of developing site specific screening levels there are two options. The sum of the SEMs for a site compared to the site AVS (3SEM/AVS ratio); or calculating individual SEM/AVS ratios for each metal detected at a site. The 3SEM/AVS ratio gives an indication of metals bioavailability. Using individual SEM/AVS ratios gives an indication of which metals may be a problem. Due to the complexity of sediment and the competition of metals for available AVS make the calculation of individual SEM/AVS ratios inappropriate for deriving sediment quality criteria (Ankley *et al*. 1996a). For the purposes of this study individual SEM/AVS ratios were used in overall site ranking calculations. The individual SEM/AVS ratios were used as indicators of potential problems only and have no regulatory significance.

Other Sediment Screening Tools

For contaminants not included in the previous methods, state and national 85th percentiles were also used (Table 10)(Greenspun and Taylor 1979; TNRCC 1996). State screening levels for toxic substances in sediment were developed by the TNRCC using 10 years of routine fixed station monitoring data. A TNRCC sediment screening value is the level of a given compound that is higher than 85% (85th percentile) of the values for similar areas; like water, the categories include freshwater stream, tidal stream, reservoir or estuary (TNRCC 1996).

State and national screening levels represent a relatively high amount of a particular contaminant in sediment but do not necessarily have any toxicological significance. Values which exceed screening levels are termed “elevated”.

Fish Tissue

Tissue screening levels used to evaluate the Rio Grande/Río Bravo Toxic Substance Study data are summarized in Table 8. Actual numerical concentrations are listed in Table 10. State of

Texas screening levels for toxic substances in fish tissue were developed from the TSWQS human health criteria. Screening levels were developed for 31 organics, and seven metals. Five of the metals, arsenic, cadmium, chromium, copper and selenium are based on Texas Department of Health (TDH) screening levels. These values are slightly less than those the TDH would use to issue consumption advisories (TNRCC 1996).

Other screening levels used were:

! US Fish and Wildlife Service (USFWS) Predator Protection Limits (Irwin 1989)
! US Food and Drug Administration Action Levels (USFDA 1993).
! USEPA (1993) guidance for fish advisories
! National 85th Percentiles (Greenspun and Taylor 1979).
! USFWS 85th Percentiles (Lowe *et al*. 1985; Schmitt and Brumbaugh 1990)(Table 10).

US Fish and Wildlife Service (USFWS) predator protection limits are concentrations used to protect predatory species who might consume contaminants, and are used to compare contaminant concentrations in whole body samples (Irwin 1989).

State and national screening levels represent a relatively high amount of a particular contaminant in tissue but do not necessarily have any toxicological significance. Values which exceed screening levels are termed “elevated”.

Biological

Benthic Macroinvertebrates Community

Initial evaluation of benthic macroinvertebrate data was conducted using the Mean Point Score (MPS), which is routinely used by the TNRCC to evaluate aquatic life use attainment based on Surber samples.

The following metrics are employed in the MPS analysis:

! ***Taxa Richness*** Total number of taxa collected in each benthic sample; Specimens were identified and data analysis conducted according to the following taxonomic guidelines:

CInsecta identified to genus
CGastropoda identified to genus
CPelecypoda identified to genus
CIsopoda identified to genus
COstracoda identified to subclass (Ostracoda)
CAmphipoda identified to genus
CDecapoda identified to genus
COligochaeta identified to class (Oligochaeta)
CNematoda identified to Phylum (Nematoda)
CTurbellaria identified to genus
CHydracarina left at Hydracarina
CHirudinea identified to class (Hirudinea)

! ***Density*** Number of individuals per square meter

! ***EPT*** Number of discrete taxa (genera) within the three orders, Ephemeroptera, Plecoptera, and Trichoptera

! ***Diversity*** Shannon-Wiener diversity, $\log_2$

! ***Equitability*** A measure of the evenness of distribution of individuals among taxa varying from 0 to 1 with increasing values indicating a more even distribution of individuals among taxa

! ***Functional Feeding Groups*** Number of functional feeding groups present in each benthic sample

! ***Most Abundant Functional Group*** Percent of total numbers represented by the most abundant functional group collected in each benthic sample

! ***Cumulative Percentage of Organisms that Feed on Fine Particulate Organic Matter (FPOM)*** Calculated as the sum of the percentages of total numbers for collector-gatherers, and filtering-collectors for each benthic sample

Aquatic Life Use

Each designated waterbody segment in Texas has been assigned an aquatic life use designation. Five categories are defined by the TSWQS as limited, intermediate, high, and exceptional aquatic life use (TNRCC 1995). The aquatic life use was determined for stations with benthic macroinvertebrate data using criteria outlined in Appendix H.

Fish Community

A similarity index (Odum 1971) was employed as a measure of the similarity of species composition between two sampling sites. This index varies from zero, if no species are common between sites, to 1.0, if two sites share all species.

The equation for calculation of the similarity index is as follows:

$$S = 2C/(A+B)$$

where,

S = index of similarity,
A = number of species in sample A
B = number of species in sample B
C = number of species common to both samples.

A community index derived from the Index of Biotic Integrity (IBI) as described by Karr *et al*. (1986) was utilized in the analysis of fish collections. The derivation of the index and rationale for individual metrics and scoring criteria are described in the Phase 1 report (Table 11)(USEPA/IBWC 1994).

TABLE 8
SUMMARY OF CRITERIA AND SCREENING LEVELS USED TO ASSESS
DATA IN PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

SCREENING LEVEL/ CRITERIA SOURCES	SCREENING LEVEL/ CRITERIA	USES
		WATER
Human Health Criteria	Surface Water Quality Standards	CState and Federal criteria for the consumption of FISH and WATER, and the consumption of FISH ONLY. CExceedance of these criteria indicate a potential human health hazard if untreated water and/or fish from a waterbody were consumed on a regular, long-term basis. CLong-term exposure risk
Aquatic Life Criteria (Acute and Chronic)	Surface Water Quality Standards	CState and Federal criteria for the protection of aquatic life. CExceedances of the criteria are indicators of potential short (acute) and long-term (chronic) effects on aquatic life.
State and National 85th Percentiles	Screening Level Only	CRepresents a relatively high amount of a particular contaminant but does not have a direct toxicological meaning. CContaminants > the screening level are considered elevated. CUsed for contaminants without numerical criteria.
		SEDIMENT
Sediment Quality Criteria	Site Specific Screening Level for Organics	CBased on the TOC concentration in sediment, octanol/water partition coefficient and freshwater chronic criteria COnly pertains to organics
Molar SEM/AVS Ratio	Site Specific Screening Level for Metals	CBased on a ratio between metals and acid volatile sulfide concentrations in sediment CPertains to divalent metals (cadmium, copper, lead, mercury, nickel, silver, and zinc)
State and National 85th Percentiles	Screening Level	CRepresents a relatively high amount of a particular contaminant but does not have a direct toxicological meaning. CContaminants > the screening level are considered elevated. CUsed for contaminants without other screening values.
		TISSUE
USFDA Action Levels	Screening Level (Edible Tissue)	CUsed as indicator of potential effects to human health from the consumption of contaminated fish
USEPA Guidance for Fish Advisories	Screening Level (Edible Tissue)	CUsed for guidance in the issuance of fish consumption advisories.
USFWS Predator Protection Limits	Criteria (Whole Fish)	CUsed for the protection of predators; concentrations for the protection of predatory species
State, National and USFWS 85th Percentiles	Screening Level (Whole Fish)	CRepresents a relatively high amount of a particular contaminant but does not have a direct toxicological meaning. CContaminants > the screening level are considered elevated. CUsed for contaminants without other screening levels.

TABLE 9
CRITERIA AND SCREENING LEVEL CONCENTRATIONS FOR WATER USED
IN PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

PARAMETER	Screening Levels		Human Health		Aquatic Life	
	National Î 85th Percentile (Fg/L)	State Ï 85th Percentile (Fg/L)	Consumption of Fish and Water (Fg/L)	Consumption of Fish Only (Fg/L)	Acute Value (Fg/L)	Chronic Value (Fg/L)
CONVENTIONALS						
ammonia (NH_3-N)	NV	1.0 mg/L	NV	NV	NV	NV
unionized ammonia (NH_3)	NV	NV	NV	NV	SS Ð	SS Ð
nitrate-nitrogen (NO_3-N)	NV	NV	10 mg/L Ñ	NV	NV	NV
chloride	NV	NV	NV	NV	860 Ñ	230 Ñ
DISSOLVED METALS						
aluminum	NV	90	NV	NV	991 Ð	87 Ñ
antimony	54	NV	14 Ñ	4300 Ñ	9,000 Ñ	1,600 Ñ
arsenic	10	4.0	0.18 Ñc	1.4 Ñc	360 Ð	190 Ð
cadmium	6.0	1.0	5.0 Ð	10.0 Ñ	SS Ð	SS Ð
chromium	20	5.0	100 Ð	NV	SS Ð	SS Ð
copper	20	5.0	1300 Ñ	NV	SS Ð	SS Ð
lead	20	5.0	5.0 Ð	25.0 Ð	SS Ð	SS Ð
nickel	20	5.0	610 Ñ	4,600 Ñ	SS Ð	SS Ð
selenium	10	3.0	50 Ð	NV	20.0 Ð	5.0 Ð
thallium	NV	NV	17 Ñc	63 Ñc	NV	NV
zinc	80	21.0	NV	NV	SS Ð	SS Ð
PHENOLS AND CRESOLS						
phenol (C_6H_5OH) single compound	13	6.0	21,000 Ñ	4,600,000 Ñ	10,200 Ñ	2,560 Ñ
phenolics recoverable	24	NV	NV	NV	NV	NV
HALOGENATED ALIPHATICS						
chloroform	12	24	57 Ñc	12,130 Ð;470Ñ	28,900 Ñ	1,240 Ñ

TABLE 9 (cont)
CRITERIA AND SCREENING LEVEL CONCENTRATIONS FOR WATER
USED IN PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

PARAMETER	Screening Levels		Human Health		Aquatic Life	
	National Î 85th Percentile (Fg/L)	State Ï 85th Percentile (Fg/L)	Consumption of Fish and Water (Fg/L)	Consumption of Fish Only (Fg/L)	Acute Value (Fg/L)	Chronic Value (Fg/L)
HALOGENATED ALIPHATICS (cont)						
bromodichloromethane	10	NV	2.7 ÑC	220 ÑC	11,000 Ñ	NV
dibromochloromethane	NV	NV	100 Ð; 4.1 ÑC	15,354 Ð; 340 ÑC	NV	NV
NITROSAMINES AND OTHER N COMPOUNDS						
n-nitrosodi-n-propylamine	NV	NV	0.05 ÑC	14 ÑC	NV	NV
MONOCYCLIC AROMATICS						
toluene	NV	2.5	6,800 Ñ	200,000 Ñ	32,000 Ñ	NV
xylene	NV	3.0	NV	NV	NV	NV
1,4-dichlorobenzene	NV	2.75	400 Ñ	2,600 Ñ	250 Ñ	50 Ñ
PHTHALATE ESTERS						
bis (2-ethylhexyl) phthalate	5.0	5.5	18 ÑC	59 ÑC	940 Ñ	30 ÑC

Î National 85th Percentiles (Greenspun and Taylor 1979)
Ï State 85th Percentile (TNRCC 1996)
Ð Texas Surface Water Quality Standards (TNRCC 1995)
Ñ USEPA National Criteria (USEPA 1995)

NV No Screening Value
SS Site Specific

C Based on TNRCC 10-5 risk level, USEPA risk level is 10-6

SEE APPENDIX I for site specific criteria

TABLE 10
SCREENING LEVEL CONCENTRATIONS FOR SEDIMENT AND FISH TISSUE
USED IN PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

PARAMETER	Sediment Screening Levels		Tissue Screening Levels		
	National 85th Î Percentile (mg/kg)	Other Screening Levels (mg/kg)	Whole Body National 85th Percentile Î (mg/kg)	Other Screening Levels (mg/kg)	Edible Tissue (Muscle) Value (mg/kg)
METALS					
aluminum	NV	NV	NV	NV	NV
antimony	8.0	NV	NV	NV	43.1 Ñc
arsenic	14	NV	0.20	3.0 Ó;0.5Ô	0.062 Ñc
beryllium	3.0	NV	NA	NA	NA
cadmium	6.6	SS Ö	0.30	0.05×;0.50 Ó	10 Ò
chromium	60	NV	0.39	100 Ó;0.2Ô	NV
copper	52	SS Ö	2.2	1.0×;40 Ó	NV
lead	110	SS Ö	0.8	0.22×;1.25 Ï	NV
mercury	0.77	SS Ö	0.63	1.0 Ï;0.1Ô	10Ñc;1.0Õ
nickel	44	SS Ö	0.60	NV	215.4 Ñ
selenium	3.5	1.3;<u>1.73</u>˜ Ï	0.83	2.0 Ó;0.5Ô	50 Ò
silver	3.0	1.6 Ï	0.80	NV	NV
thallium	NV	NV	NV	NV	0.75 Ô
zinc	170	SS Ö	28	34.2 ×	NV
OTHER INORGANICS					
cyanide	18	NV	NV	NV	215.4 Ñ
PHENOLS AND CRESOLS					
phenolics recoverable	NA	NA	NV	NV	6,642 Ñ
HALOGENATED ALIPHATIC					
chloroform	NA	NA	NV	0.01 Ï	17.7 Ñ
MONOCYCLIC AROMATICS					
benzene	NA	NA	NV	0.01 Ï	3.7 Ñc
MONOCYCLIC AROMATICS					

TABLE 10 (cont)
SCREENING LEVEL CONCENTRATIONS FOR SEDIMENT AND FISH TISSUE
USED IN PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

PARAMETER	**Sediment Screening Levels**		**Tissue Screening Levels**		
	National 85th Î Percentile (mg/kg)	Other Screening Levels (mg/kg)	Whole Body National 85th Percentile Î (mg/kg)	Other Screening Levels (mg/kg)	Edible Tissue (Muscle) Value (mg/kg)
toluene	NA	NA	NV	NV	2,154 Ñ
PESTICIDES					
alpha benzene hexachloride	NV	SS×,0.75 Ï	NA	NA	NA
chlordane	0.08	SS×7.5 Ï	0.47	0.30 Ï	0.083 ÑC
DDD	0.02	SS×,3.0 Ï	0.64	5.0 Õ;9.6 Ï	0.449 ÑC
DDE	0.02	SS ×	2.9	5.0 Õ;5.45 Ï	0.316 ÑC
DDT	0.02	SS×,3.0 Ï	2.0	5.0 Õ;5.3 Ï	0.316ÑC ;0.3Ò
diazinon	NA	NA	NV	0.9 Ò	NV
dieldrin	NA	NA	0.28	0.057 Ï	0.007ÑC; 0.007Ò
endosulfan alpha	NA	NA	NV	NV	429.3ÑC; 20Ò
endrin	NA	NA	0.15	NV	32.3ÑC; 3.0Ò
PCBs and RELATED COMPOUNDS					
aroclor 1248	NA	NA	NV	< 0.1 Ô	0.014 ÑC
aroclor 1260	NA	NA	28	< 0.1 Ô	0.014 ÑC
PHTHALATE ESTERS					
bis (2-ethylhexyl) phthalate	8,900	750 Ï	NA	NA	07.7 ÑC

˜	7.0 (stream value); 5.0 (reservoir value)	Ó	Texas Department of Health Screening Levels
Î	National 85th Percentiles (Greenspun and Taylor 1979)	Ô	Predator Protection Limit
Ï	TNRCC Screening Levels (TNRCC 1996)	Õ	USFDA Action Levels
Ñ	USEPA National Criteria	Ö	Molar SEM/AVS Ratio
Ò	Guidance for Fish Advisories (USEPA 1993)	×	Sediment Quality Criteria (SQC)
NV	No Screening Value	NA	Not Applicable; No concentration detected
C	Based on TNRCC 10^{-5} risk level, USEPA risk level is 10^{-6}		

SEE APPENDIX I for site specific values.

TABLE 11
INDEX OF BIOTIC INTEGRITY (IBI) METRICS USED TO ASSESS FISH COMMUNITY
DATA IN PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

Fish Community Metrics	**Ratings**		
	5	**3**	**1**
Metrics Used for Stations 1-5, 7-12, 3a, 3a.1, 7b, 12.1			
1. Total number of species	> 14	8 - 14	< 8
2. Number of minnow species	> 5	3 - 5	< 3
3. % of individuals in most abundant species	< 40	40 - 55	> 55
4. Total number of individuals*			
a. Individuals per hour electrofishing	> 224	112 - 224	< 112
b. Individuals per seine haul	> 67	34 - 67	< 34
5. % diseased individuals	< 0.5	0.5 - 1.0	> 1.0
6. % of individuals as introduced species	< 6	6 - 12	> 12
Metrics Used for Stations 13-18			
1. Total number of species	> 14	8 - 14	< 8
2. % of individuals as estuarine/marine species	#18	> 18 - 49	> 49
3. % of individuals in most abundant species	< 40	40 - 55	> 55
4. Total number of individuals*			
a. Individuals per hour electrofishing	> 224	112 - 224	< 112
b. Individuals per seine haul	> 67	34 - 67	< 34
5. % diseased individuals	< 0.5	0.5 - 1.0	> 1.0
6. % of individuals as introduced species	< 6.0	6.0 - 12.0	> 12.0

***** Rating calculated as a mean of a and b.

OVERALL SITE RANKING

The following method was used to rank sites according to level of concern. The rankings were based on water, sediment, fish tissue, toxicity, and biological community data. This method is a modified version of the system used in Phase 1. It should be noted that this site ranking system was developed as an assessment tool and does not have any regulatory significance.

CATEGORIES		COMPONENTS		SCORES
	INITIAL SITE SCORES for level of concern were calculated using five categories; water, sediment, fish tissue and toxicity (water and sediment). Each category consists of three individual components.			
1	**WATER CHEMISTRY**	**1**	# of Toxic Substances Detected	1 + 2 + 3 = **WATER SCORE**
		2	# of Toxic Substances > Criteria/Screening Levels	
		3	Mean Factor * for Values > Criteria/Screening Levels	
2	**SEDIMENT CHEMISTRY**	**4**	# of Toxic Substances Detected	4 + 5 + 6 = **SEDIMENT SCORE**
		5	# of Toxic Substances > Screening Levels	
		6	Mean Factor * for Values > Screening Levels **	
3	**FISH TISSUE CHEMISTRY**	**7**	# of Toxic Substances Detected	7 + 8 + 9 = **FISH TISSUE SCORE**
		8	# of Toxic Substances > Screening Levels	
		9	Mean Factor * for Values > Screening Levels	
4	**TOXICITY IN WATER**	**10**	Water Flea Mortality, Percent > Control	10 + 11 + 12 = **TOXICITY IN WATER SCORE**
		11	Water Flea Reproduction Percent < Control	
		12	Fathead Minnow Mortality, Percent > Control	
5	**TOXICITY IN SEDIMENT**	**13**	Water Flea Mortality, Percent > Control	13 + 14 + 15 = **TOXICITY IN SEDIMENT SCORE**
		14	Water Flea Reproduction Percent < Control	
		15	Fathead Minnow Mortality, Percent > Control	

***INITIAL SITE SCORE* = THE SUM OF THE FIRST FIVE CATEGORY SCORES or WATER + SEDIMENT + FISH TISSUE + TOXICITY IN WATER + TOXICITY IN SEDIMENT**

*****An *exceedance factor* is defined as the number of times a specific concentration exceeded a criterion or screening level. *Mean factor* is the average of all exceedance factors for a given site.

****** The actual SEM/AVS ratios for metals in sediment were used as exceedance factors in the mean factor calculation. All other exceedance factors were equal to the number of times a concentration exceeded a criterion/ screening level.

Due to the variation of data collected between sites, the components used in the ranking varied from station to station. At most mainstem stations all five categories were used. At most tributary stations all categories with the exception of fish tissue were used. In order to include stations where only water or fish tissue were collected, sites were also ranked separately for water, sediment and fish tissue (See Appendix K).

OVERALL SITE RANKING (cont)

CATEGORIES		COMPONENTS		SCORES
HUMAN HEALTH AND AQUATIC LIFE COMPONENTS In order to add weight to the exceedance of human health and/or aquatic life criteria, additional factors were added to the initial overall site score.				
6	**Aquatic Life**	**16**	2.5 Points for each value > aquatic life water criterion	**SUM OF ALL POINTS FOR A SITE**
7	**Human Health**	**17**	5.0 Points for each value > human health water criterion	
		18	10 Points for each value > human health edible tissue criterion	
BIOLOGICAL COMMUNITY COMPONENTS For 20 sites, these 18 components were used to calculate total site scores. For 16 of the 20 sites, where in addition to the above, biological community data was also collected, another factor was added to the total site score. The level of concern for biological communities was calculated separately from the overall ranking with a different set of criteria. The biological community levels of concern were then factored into the total site score for the 16 stations were biological data was collected.				
8	**Benthic Community**	**19**	0.0 Points for No Concern	**INDIVIDUAL SCORE FOR A SITE** (based on Biological Community Ranking)
			2.5 Points for Potential Concern	
			5.0 Points for Concern	
9	**Fish Community**	**20**	0.0 Points for No Concern	**INDIVIDUAL SCORE FOR A SITE** (based on Biological Community Ranking)
			2.5 Points for Potential Concern	
			5.0 Points for Concern	
TOTAL SITE SCORE **= SUM OF SCORES FOR ALL CATEGORIES USED FOR A SITE**				
RANK SCORE **= TOTAL SITE SCORE DIVIDED BY NUMBER OF COMPONENTS USED TO DERIVE THE TOTAL SITE SCORE**				
RANK SCORES The final step was to divide the total site score by the number of individual components used in the calculation. Due to some variation between stations in the types of samples collected, dividing by the number of individual components used to calculate the total site score was necessary to balance the sites. The resulting number is called the "Rank Score". This score is only used to determine a level of concern for the sites based on data collected during this study. The rank scores for mainstem and tributary sites were calculated separately due to variations in the types of samples collected.				
CATEGORIES OF CONCERN Based on these rank scores sites were placed in categories of concern. These categories are only meant as a data analysis tool.				

LEVEL OF CONCERN

$75 - 100%	HIGH
$50 - < 75%	MODERATE
$25 - < 50%	LOW
< 25%	SLIGHT

Additional information on site ranking and numbers used in calculations is located in Appendix K.

BIOLOGICAL COMMUNITY RANKING

Sites were also ranked according to biological community data. The scores generated for the sites were placed into categories of concern for potential impairment to biological communities by toxic substances. The outcome of this ranking method was factored into the overall site ranking discussed in the previous section.

Benthic Macroinvertebrate Community
A level of concern was calculated by combining factors which express: (1) the occurrence and concentrations of toxic substances, and (2) the integrity of the benthic macroinvertebrate community. These factors were used to produce a score for each site. Based on the scores, each site was placed in one of three categories according to the level of concern regarding the integrity of the benthic macroinvertebrate community relative to the occurrence of toxic substances.

In general, categories were defined based on percentiles:

C**NO CONCERN** = **$** 75th percentile
C**POTENTIAL CONCERN =** > 25th and < 75th percentile
C**CONCERN = #** 25th percentile

The equation used to calculate benthic scores is:

Biological Site Score = (Score for Benthic MPS x 10) + (score for taxa richness x 5) + (EPT x 2.5) + (Score for Concentration of Arsenic in Sediment x -1) + (Score for Concentration of Copper in Sediment x -1) + (Score for Concentration of Nickel in Sediment) + (Score for Concentration of Zinc in Sediment x -1) + (Score for Sediment Toxicity x -1) + (Score for Water Toxicity x -1) + (Score for Concentration of Chloride in Water x -1)

Equal weight was given to the four measures of toxic substances in sediment, as well as to the score for the concentration of chloride in water (based on the relative equality of correlation strength, as indicated by the value of the Spearman rank correlation coefficient, *r*).

Fish Community
A level of concern was calculated by combining factors which express: (1) the occurrence and concentrations of toxic substances, and (2) the integrity of the fish community. These factors were used to produce a score for each site. Based on the scores, each site was placed in one of three categories according to the level of concern regarding the integrity of the fish community relative to the occurrence of toxic substances.

In general, categories were defined based on percentiles:

C **NO CONCERN = $** 75th percentile
C **POTENTIAL CONCERN =** > 25th and < 75th percentile
C **CONCERN = #** 25th percentile

The equation used to calculate fish scores is:

Biological Site Score = (Score for IBI rating x 10) + (Score for Fish Species Richness x 5) + (Score for Percentage of Individuals in Most Abundant Species x 2.5) + (Water Toxics Score x -2) + (Score for Sediment Toxics) + (Score for Chloride x -2.5) + (Score for Tissue Toxics) + (Score for Water Toxicity)

Added weight was given to the water toxics score as well as to the score for chloride based on the strength of the negative correlation noted between these parameters and measures of fish community integrity.

CHAPTER 4

RIO GRANDE/RIO BRAVO

BACKGROUND

The Rio Grande/Río Bravo, the fifth longest river in North America and among the top 20 in the world, was once a formidable river. The river extends 3051 km (1,896 miles) from the San Juan Mountains in Colorado through New Mexico and Texas to the Gulf of Mexico. In Texas, from El Paso/Ciudad Juárez to the Gulf of Mexico, approximately two-thirds of the total length of the river forms the 2,008 km (1,248 mile) international boundary between United States and Mexico.

The United States/Mexico section of the Rio Grande/Río Bravo has been significantly modified in order to support the lives of millions of inhabitants along the border. Diversion for agricultural and domestic/ industrial water supplies, and receipt of treated and untreated domestic/industrial wastewaters and agricultural runoff, have reduced the quantity and quality of the Río Grande/Río Bravo. Diversion structures and dams impounding water on the Rio Grande/Río Bravo have eliminated natural flow in the mainstem. As a result the Rio Grande/Río Bravo is a very complex hydrologic system (TNRCC 1994a; Miyamoto *et al*. 1995; Collier *et al*. 1996).

The entire Rio Grande/Río Bravo Basin drains a 335,500 mi^2 area in the United States (Colorado, New Mexico and Texas), and Mexico (Chihuahua, Coahuila, Durango, Nuevo Leon and Tamaulipas). Not all of the basin drains to the Rio Grande. Half of the total area lies within closed basins (153,285 mi^2) where water either evaporates or soaks into the ground, never making it to the Rio Grande/Río Bravo. The actual drainage area of the Rio Grande/Río Bravo is 182,215 mi^2. Approximately half is in the United States (88,968 mi^2) and the remaining half in Mexico (93,250 mi^2) (Miyamoto *et al*. 1995).

FLOW

El Paso/Ciudad Juárez to International Amistad Reservoir

Flow in the Rio Grande/Río Bravo, originating in the mountains of Colorado and New Mexico, is stored in Elephant Butte Reservoir. This reservoir was designed to retain all flow on the Rio Grande/Río Bravo (Collier *et al*. 1996). Flow to El Paso/Ciudad Juárez is controlled by irrigation releases from Elephant Butte Dam. Most of this flow is diverted for irrigation in the Mesilla Valley in New Mexico. The remainder is diverted at the American Dam (United States) and International Dam (Mexico) in El Paso/Ciudad Juárez for municipal use, and in the El Paso and Juárez Valleys for irrigation. This causes the Rio Grande/Río Bravo flow to be intermittent from downstream of El Paso/Ciudad Juárez to Presidio/Ojinaga. This section of the river receives occasional stormwater runoff, treated municipal wastewater from El Paso, untreated wastewater from Ciudad Juárez, irrigation return flows, and occasional unscheduled releases from Elephant Butte Dam due to high runoff (TNRCC 1994a; Miyamoto *et al*. 1995; Collier *et al*. 1996).

The majority of surface water flow into the Rio Grande/Río Bravo originates in Mexico. The next main source of flow comes from the Río Conchos near Presidio/Ojinaga (454 km [284 miles]) downstream of El Paso), which replenishes the Rio Grande/Río Bravo by providing three quarters of the flow to the Big Bend area (Table 12). In the past few years, flow in the Río Conchos has been jeopardized by a severe drought in northern Mexico, and the state of Chihuahua (personal communication, Bio. Julio Vazquez Seriano, Comisión Nacional del Agua-Chihuahua City).

Flow continues to International Amistad Reservoir, 312 miles (500 km) downstream of El Paso/Ciudad Juárez. Two major United States tributaries, the Pecos and Devils Rivers, flow into International Amistad Reservoir. Most of the smaller tributaries are intermittent, having defined channels but ceasing to flow during dry periods (Bowman 1993; TNRCC 1994a; Miyamoto *et al*. 1995).

International Amistad Reservoir to International Falcon Reservoir

Seventy-two percent of the flow in the next 481 km (281 miles) of river between International Amistad and Falcon Reservoirs originates in Mexico (Miyamoto *et al*. 1995). Major Mexican tributaries in this section are the Río San Diego and Río San Rodrigo which enter the Rio Grande/Río Bravo between Amistad and Laredo/Nuevo Laredo. San Felipe Creek, a spring fed stream, is located on the United States side in Del Rio, and is that city's source of drinking water. The Río Salado is a major tributary of International Falcon Reservoir (Table 12).

Major diversions in the middle basin are the sister cities of Del Rio/Ciudad Acuña, Eagle Pass/Piedras Negras and Laredo/Nuevo Laredo. Flow in the Rio Grande/Río Bravo at Laredo/Nuevo Laredo is enhanced by large volumes of treated and untreated domestic wastewater entering from both sides of the river (USEPA 1996). The largest portion of irrigated lands along the Texas/Mexico border lies between International Amistad and Falcon Reservoirs (80%)(Buzan 1990; Miyamoto *et al*. 1995)

International Falcon Reservoir to Brownsville/Matamoros

The remaining 442 km (275 miles) of the Rio Grande/Río Bravo extend from International Falcon Dam to the Gulf of Mexico. Releases from International Falcon Reservoir are the main source of water for domestic and industrial uses and irrigation in the Lower Rio Grande Valley (Mendieta 1974). Flow into this section of the river is from the Mexican tributaries, Río Alamo and Río San Juan, and irrigation return flows (Table 12).

The major use of Rio Grande/Río Bravo water in the Lower Rio Grande Valley is for agriculture. Overall, 88% of the United States land and 96% of Mexican land is irrigated by the Rio Grande/Río Bravo (Miyamoto *et al*. 1995).

CLIMATE

The upper portion of the Rio Grande/Río Bravo flows through the northern Chihuahuan Desert and has an arid/semi-arid climate. As the river flows south, it becomes less arid and more tropical as it reaches the Gulf of Mexico. The Rio Grande/Río Bravo region tends to be hot, warm and windy, and averages more 38EC (100E F) days from May to September than any part of Texas. Temperatures tend to be warmer in the lower portion of the basin than in the north. Rainfall averages 19.8 cm (7.8 inches) at El Paso/Ciudad Juárez, 30.5 cm (12 inches) at Amistad, 51 cm (20.1 inches) at Laredo/Nuevo Laredo, and 64.5 cm (25.4 inches) at Brownsville/ Matamoros (Miyamoto *et al*. 1995; TNRCC 1994a).

BORDER POPULATION

According to data from the 1990 census, there are approximately 9.5 million residents living along the United States/Mexico border. This figure represents a growth of over 60% in the past 10 years. Of the total, approximately 82% (7.9 million) live in 12 sister cities (United States/Mexican paired border cities). The remaining 28% of United States and Mexican border residents live in rural areas (USEPA 1996).

Of the 12 sister cities, seven are located along the Texas/Mexico border. The population of

TABLE 12
RIO GRANDE/RIO BRAVO TRIBUTARIES AND DIVERSIONS
(modified from TNRCC 1994a)

		El Paso/Ciudad Juárez		
American Canal	»	-	°	Acequia Madre
Alamito Creek	°		»	Río Conchos
Terlingua Creek	°		»	Carima Springs and Other Springs
Pecos River	°			
Devils River	°			
		International Amistad Reservoir		
San Felipe Creek, Creeks near Del Rio	°		»	Creeks Near Ciudad Acuña
Maverick Canal	»		»	Río San Diego
Maverick Canal Return Flow	°		»	Río San Rodrigo
			»	Río Escondido
			»	Río Salado
		-		
		International Falcon Reservoir		
Numerous diversions Falcon Dam to Brownsville	»		»	Río Alamo
			°	Anzalduas Canal
			»	Río San Juan
		-	»	Irrigation Return Flows
		Brownsville/Matamoros		
		-		
		Gulf of Mexico		

TABLE 13
POPULATION OF MAJOR SISTER CITIES ALONG
THE UNITED STATES/MEXICO BORDER (USEPA 1996)

SISTER CITIES	**POPULATION**	% OF TOTAL
San Diego/Tijuana	3,240,702	41.2
Imperial County/Mexicali	711,693	9.0
Yuma/San Luis Colorado	218,403	2.8
Nogales/Nogales	136,795	1.7
Douglas/Agua Prieta	136,669	1.7
El Paso/Ciudad Juárez	1,389,289	17.7
Presidio/Ojinaga	30,584	0.39
Del Rio/Ciudad Acuña	195,471	2.5
Eagle Pass/Piedras Negras	134,555	1.7
Laredo/Nuevo Laredo	352,707	4.5
Mc Allen/Reynosa	760,221	9.7
Brownsville/Matamoros	563,512	7.2
TOTAL	**7,870,601**	**100**
Total-Texas/Mexico Border area	**3,426,339**	**44**
Total-California, Arizona, New Mexico/Mexico Border area	4,444,262	56

these seven sister cities represents 43.5% of the total United States/Mexico metropolitan border population (Table 13)(USEPA 1996).

POTENTIAL SOURCES OF CHEMICAL CONTAMINATION

An objective of the study was to determine potential sources of contaminants in the Rio Grande/Río Bravo. The following are a few general categories associated with the Rio Grande/Río Bravo basin.

Wastewater Sources

Large volumes of treated and untreated municipal/industrial wastewater flow in to the Rio Grande/Río Bravo daily. Industrial and municipal wastewater can contain thousands of chemicals with only a few causing aquatic toxicity (Rand 1995). Many components of water including total organic carbon (TOC), total suspended solids (TSS), pH, and hardness can have a strong effect on toxicity. Toxic effect is dependent upon the synergistic (total effect > sum of the individual effects), and antagonistic (interaction of two or more substances) activities of the toxic substances present. Wastewaters containing toxic substances are influenced by mixing, by effluent characteristics, and by receiving stream characteristics, all of which can produce toxicity levels different from pure compounds. These factors make wastewater toxicity difficult to determine by chemical analysis alone (Rand 1995).

Industrial Sources

Prior to the 1900's, the border region was sparsely populated. With the construction of Elephant Butte Dam in New Mexico (1916), International Falcon Dam (1954) and International Amistad Dam (1968), the Rio Grande/Río Bravo flood plain was transformed from a largely barren region into a major agricultural center for Texas. In the 1950's the Rio Grande/Río Bravo border population began to grow with increased employment opportunities in the textile and apparel industries. By the 1980's, manufacturing began to grow with the construction of industrial assembly plants in Mexico commonly referred to as maquiladoras. Maquiladoras have attracted mainly the electronic, automobile, petrochemical and textile manufacturing industries. More than 80% of the Mexican maquiladoras are located in the border region. Of the 1551 maquildoras along the Texas, Arizona and California borders, 614 (39.6%) are located between El Paso/Ciudad Juárez and Brownsville/ Matamoros (Table 14). Of the 614 maquiladoras, most are located in Ciudad Juárez, Nuevo Laredo, Reynosa and Matamoros (Miyamoto *et al*. 1995; USEPA 1996).

TABLE 14
NUMBER OF MAQUILADORAS
IN MEXICAN BORDER CITIES
(USEPA 1995)

Border Cities	# Maquiladoras
Ciudad Juárez	278
Matamoros	111
Nuevo Laredo	54
Reynosa	78
Piedras Negras	43
Ciudad Acuña	50
Total Mexico/Texas Border	**614**
Total Texas, Arizona, California/Mexico Borders	1551

Nonpoint Source

There are several major categories of nonpoint source pollution along the Rio Grande/Río Bravo. In the heavily populated areas, the main source is urban runoff and storm sewers. In other areas, on-site disposal (septic systems), runoff from irrigated cropland, rangeland and natural erosion are the dominant nonpoint sources (Table 15).

TABLE 15
POSSIBLE NONPOINT SOURCE POLLUTION
CATEGORIES FOR THE RIO GRANDE/RIO BRAVO

River Reach	**Sources**
El Paso/Ciudad Juárez	Urban Runoff/Storm Sewers; On-site Disposal (Septic Tanks); Irrigated Cropland Production; Erosion; Rangeland
Presidio/Ojinaga-Big Bend National Park	Irrigated Cropland Production; Urban Runoff; On-site Disposal (Septic Tanks); Erosion; Rangeland; Mining
International Amistad Reservoir-Eagle Pass/Piedras Negras	Urban Runoff/Storm Sewers; On-site Disposal (Septic Tanks); Irrigated Cropland Production; Erosion; Rangeland
Laredo/Nuevo Laredo-International Falcon Reservoir	Urban Runoff/Storm Sewers; On-site Disposal (Septic Tanks); Rangeland
Below International Falcon Reservoir-Brownsville/Matamoros	Urban Runoff/Storm Sewers; On-site Disposal (Septic Tanks); Irrigated Cropland Production; Rangeland

CONVENTIONAL WATER QUALITY

Since this study focuses on toxic substances in the Rio Grande/Río Bravo, conventional parameters are not addressed with the exception of ammonia and chloride. This section briefly discusses the state of the Rio Grande/Río Bravo Basin based on criteria for conventional parameters from the Texas Surface Water Quality Standards (TSWQS).

Texas Surface Water Quality Standards
Under Chapter 26.023 of the Texas Water Code, the TNRCC has the authority to make rules setting surface water quality standards for all state waters. Specific water uses and numerical criteria were developed by the TNRCC for each of the designated segments. The purpose of numerical criteria is to protect water quality from the influence of point and nonpoint source pollution rather than the protection of a specific use (TNRCC 1995).

Table 19 lists the Title 30 Texas Administrative Code (TAC), Chapter 307, TSWQS uses and criteria for the segments included in this study (TNRCC 1995).

Unclassified waters are smaller streams, rivers, bays and estuaries that are **not** designated as segments with specific uses and criteria listed in Appendix A or D of the TAC, Title 30, §307.10, TSWQS. Unclassified waters are preliminarily assumed to have high aquatic life and contact recreational uses [30 TAC §307.4(h)]. These uses are protected by 5/3 mg/L (24-hour average/minimum) dissolved oxygen, and 200 colonies per 100 ml fecal coliform density (30-day geometric mean) criteria.

Assessment Criteria
Texas water quality criteria for water temperature, dissolved oxygen, pH, chloride, sulfate and total dissolved solids were established to protect surface water from the influence of point and nonpoint pollution sources. Segment specific criteria for these parameters are based on physical, chemical and biological characteristics of a stream or reservoir (Table 19).

Data for a four-year period (Texas Water Quality database) were used to determine compliance with the TSWQS. This assessment was completed for the State of Texas Water Quality Inventory (TNRCC 1996).

The following are used to evaluate water temperature, pH and dissolved oxygen for criteria support:

C*Fully Supporting*; 0-10% of the values exceed the criterion

C*Partially Supporting*; 11-25% of the values exceed the criterion

C*Not Supporting*; > 25% of the values exceed the criterion.

The following were used to evaluate chloride, sulfate and total dissolved solids for criteria support:

C*Fully Supporting*; segment average less than criterion

C*Not Supporting*; segment average exceeds criterion.

All data collected in the four-year period, September 1990 to June 1994, were averaged for each of these three parameters. These averages are compared to segment criteria for chloride, sulfate and total dissolved solids (TNRCC 1996).

Nutrients Screening Levels
State criteria do not exist for nutrients; therefore, nutrient data for fixed station monitoring events from September 1990 to June 1994, were compared with screening levels used to evaluate pollutant impact.

The following screening levels are used:

Cammonia (NH_3-N) = 1.0 mg/L
Cnitrite + nitrate (NO_2-N + NO_3-N) = 1.0 mg/L
Corthophosphorus = 0.1 mg/L
Ctotal phosphorus = 0.2 mg/L
Cchlorophyll *a* = 30 Fg/L)

The following categories are used for identifying nutrient concerns:

C*No Concern*; 0-10% of the values, for any one parameter, exceed the screening level

C*Potential Concern*; 11-25% of the values, for any one parameter, exceed the screening level

C*Concern*; more than 25% of the values, for any one parameter, exceed the screening level (TNRCC 1996).

Designated Water Uses in the Rio Grande/ Río Bravo

Of the ten segments included in the study, nine are designated for contact recreation, public water supply, and high aquatic life use. These segments cover the Rio Grande/Río Grande from El Paso/Ciudad Juárez to Brownsville /Matamoros (the tidal segment, 2301, was not sampled during this study). One segment, Rio Grande Below the International Dam in El Paso/Ciudad Juárez, is designated for non-contact recreation and limited aquatic life use. This segment is not designated as a public water supply (Table 16).

Criteria for Rio Grande/Río Bravo segments included in this study are listed in Table 16.

Routine Surface Water Quality Data Assessment

The following is an assessment of overall water quality in the river, and the level of support of designated uses and specific criteria listed in the TSWQS. This assessment was done using four years of routine fixed station surface water quality monitoring data (September 1990 to August 1994) from the State of Texas water quality data base, maintained by the TNRCC (TNRCC 1996).

Elevated fecal coliform concentrations caused non-support of the contact recreation use in the river from downstream of International Amistad Reservoir to Brownsville/ Matamoros, but not including International Falcon Reservoir (Table 17).

Chloride, sulfate and total dissolved solids are a concern in the Rio Grande/Río Bravo. The surrounding land is often high in salts which are carried to the river by irrigation return flow and normal runoff. Criteria for these three parameters were not supported in Segment 2307-Rio Grande Below the Riverside Diversion Dam in El Paso/Ciudad Juárez or in Segment 2310-The Lower Pecos River. These criteria are based on averages. Although, chloride, sulfate and total dissolved solids may exceed criteria in individual instances, the average of more than four samples must exceed a criterion for nonsupport to occur.

Temperature and pH criteria were supported in all of the segments.

Nutrients (total and orthophophorus, nitrite-nitrogen, nitrate-nitrogen and ammonia-nitrogen) are important water quality indicators. Excessive nutrients can result in depressed dissolved oxygen values in lakes and streams. The segments with the greatest nutrient concerns were 2307 and 2308 in the El Paso/Ciudad Juárez reach (Table 17).

Based on this assessment, International Amistad and Falcon Reservoirs (Segments 2303 and 2305) were the only two with no known water quality problems.

TABLE 16
USES AND CONVENTIONAL CRITERIA FOR SEGMENTS OF THE RIO GRANDE/
RIO BRAVO BASIN INCLUDED IN PHASE 2 OF THE TOXIC SUBSTANCE STUDY

RIO GRANDE BASIN		USE			CRITERIA						
Segment Number	**SEGMENT NAME**	**Recreation**	**Aquatic Life**	**Domestic Water Supply**	**Chloride (mg/L)**	**Sulfate (mg/L)**	TDS (mg/L)	**Dissolved Oxygen (mg/L)**	**pH (SU)**	**Fecal Coliform (#/100 ml)**	**Temperature (EF)**
2302	Rio Grande Below International Falcon Reservoir	CR	H	PS	270	350	880	5.0	6.5-9.0	200	90
2303	International Falcon Reservoir	CR	H	PS	140	300	700	5.0	6.5-9.0	200	93
2304	Rio Grande Below International Amistad Reservoir	CR	H	PS	200	300	1000	5.0	6.5-9.0	200	95
2305	International Amistad Reservoir	CR	H	PS	150	270	800	5.0	6.5-9.0	200	88
2306	Rio Grande Above International Amistad Reservoir	CR	H	PS	300	570	1550	5.0	6.5-9.0	200	93
2307	Rio Grande Below Riverside Diversion Dam	CR	H	PS	300	550	1500	5.0[1]	6.5-9.0	200	93
2308	Rio Grande Below International Dam	NCR	L		250	450	1400	3.0	6.5-9.0	2000	95
2310	Lower Pecos River	CR	H	PS	1000	500	3000	5.0	6.5-9.0	200	92
2313	San Felipe Creek	CR	H	PS	25	30	500	5.0	6.5-9.0	200	90
2314	Rio Grande Above International Dam	CR	H	PS	340	600	1800	5.0	6.5-9.0	200	92

[1] The dissolved oxygen criteria in the upper reach of Segment 2307 (Riverside Diversion Dam to the end of the channel below Fort Quitman) shall be 3.0 mg/L when headwater flow over the Riverside Dam is less than $0.99 m^3/s$ ($35 ft^3/s$) (Texas Surface Water Quality Standards, 1995).

TABLE 17
GENERAL RIO GRANDE/RIO BRAVO
BASIN WATER QUALITY SUMMARY
(segments included in RGTSS Phase 2. Data from Phase 2 was not included. This assessment was based on four years routine-fixed station water quality monitoring)

Segment	**Segment 2302**	**Segment 2303**	**Segment 2304**	**Segment 2305**	**Segment 2306**	**Segment 2307**	**Segment 2308**	**Segment 2309**	**Segment 2310**	**Segment 2313**	**Segment 2314**
DESIGNATED USE SUPPORT											
Contact Recreation	|	O	|	O	O	O	NA	O	O	O	O
Public Water Supply	O	O	O	O	O	O	NA	O	O	O	O
Fish Consumption	O	O	O	O	O	O	O	O	O	O	O
AQUATIC LIFE											
Dissolved Oxygen	O	O	O	O	O	O	O	O	O	O	O
Water Toxics	O	O	O	O	O	O	O	O	O	F	O
CRITERIA SUPPORT											
Water Temperature	O	O	O	O	O	O	O	O	O	O	O
pH	O	O	O	O	O	O	O	O	O	O	O
Chloride	O	O	O	O	O	|	O	O	|	O	O
Sulfate	O	O	O	O	O	|	O	O	|	O	O
Total Dissolved Solids	O	O	O	O	O	|	O	O	|	O	O
CONCERNS											
Ammonia	G	G	G	G	G	}	}	G	G	G	G
Nitrite + Nitrate	G	G	G	G	G	G	}	}	G	}	G
Total Phosphorus	G	G	G	G	}	}	}	G	G	G	}
Orthophosphorus	G	G	G	G	G	}	}	G	G	}	}
Chlorophyll *a*	G	G	G	G	G	}	G	G	G	G	G
SEDIMENT	G	G	}	G	}	}	}	G	G	G	}
FISH TISSUE	G	G	G	G	}	G	G	G	G	G	G

O = SUPPORT **|** = NONSUPPORT **G** = NO CONCERN **}** = CONCERN **"** = NO DATA

CHAPTER 5
PHASE 2 DATA REVIEW

EL PASO/CIUDAD JUAREZ REACH

El Paso/Ciudad Juárez is the most populated urban and industrialized area along the boundary portion of the Rio Grande/Río Bravo in Texas. Almost half (44%) of the Rio Grande/Río Bravo border population lives in this area. Of the 614 maquiladoras located along the Rio Grande/Río Bravo border area, 278 are located in Ciudad Juárez (Tables 13 and 14) (USEPA 1996). Flow in the through the El Paso/Ciudad Juárez area is dependent upon releases from Elephant Butte Dam in New Mexico. Most of the water is used by El Paso/Ciudad Juárez for municipal, industrial and agricultural purposes. This portion of the Rio Grande/Río Bravo is located in an arid climate with desert and mountainous terrain. Rainfall averages around 19.8 cm (7.8 inches) in the El Paso/Ciudad Juárez area.

FLOW

Occasional stormwater runoff, treated municipal wastewater from El Paso, and irrigation return flows are the only additional flow this section receives. Heavy use of water in the El Paso/Ciudad Juárez area causes flow in the Rio Grande/Río Bravo to be intermittent downstream. For the purpose of this study, and because flow from El Paso does not always extend below Fort Hancock, the El Paso/Ciudad Juárez reach extends to the Fort Hancock area. At certain times of the year little flow exists this far below El Paso/Ciudad Juárez. However, due to large releases from Elephant Butte Dam, this section of the river was flowing at the time of sample collection in December 1995. Data for a one month period was used as a relative indicator of flow conditions prior to and on the actual sample collection date. IBWC daily average flows were consistently less than 0.58 cubic meters per second (cms)(25 cubic feet per second [cfs]) the month prior to sampling in the El Paso/Ciudad Juárez area.

Flow during sample collection was 0.52 cms (175 cfs) which was about average for this reach. Additional flow information is located in Appendix C.

SAMPLE STATIONS

Nine sites were sampled between El Paso and Fort Hancock. Stations 2.1, 2.2 and 2.3 near Fort Hancock were sampled for salinity and conventional parameters only (Fig.4) (Table 18). Water and sediment were collected at three mainstem stations (1, 1.1 and 2), and two tributary stations (0.5a and 2). Only water samples were collected at Station 1a, the El Paso Haskell Street WWTP. Tissue samples were collected at Stations 1 and 2. Toxicity tests were run on water from six stations and sediment from five stations. Fish and benthic macroinvertebrate community data were collected at Stations 1 and 2.

SAMPLE RESULTS

The complete data set for this reach is located in Appendices D, E.1, F.1, G.1, and H. Water data is located in Appendix E.1, sediment in Appendix F.1, fish tissue in Appendix G.1, water and sediment toxicity data in Appendix D, and biological community data in Appendix H. A summary of the contaminants detected and values exceeding screening/criteria levels are located at the beginning of each appendix for water, sediment and fish tissue. Appendix J contains a summary of criteria/screening levels exceeded and exceedance factors.

WATER

Conventional Parameters
Unionized Ammonia/Chloride

Unionized ammonia exceeded USEPA acute and/or chronic aquatic life criteria at six of the nine stations sampled for conventional

TABLE 18
EL PASO/CIUDAD JUAREZ STATIONS

STATION DESCRIPTION	STATION NO.
Montoya Drain 0.4 km upstream from Mouth at Frontera Road Located near the Texas/New Mexico state line. The stream is channelized with steep, muddy banks. The vegetation was grassy with some scrubby vegetation. The sediment was a soft clay/silt that was grayish/black with a fine greenish brown surface layer. Instantaneous flow was measured at 1.2 cms (40.7 cfs). Influenced by urban/agricultural runoff. El Paso Co.,Texas/Chihuahua.	**0.5a**
Rio Grande/Río Bravo at Courchesne Bridge Located near the Texas/New Mexico state line. The river at this site was shallow with 2 to 2.5 ft deep pools. The sediment was sandy with a light covering of silt. The vertical banks were 2 to 3 feet high and covered with grassy vegetation. The surrounding area was sparsely covered with grass. Influenced by urban/agricultural runoff. Instantaneous flow was measured at 5.0 cms (175.6 cfs). El Paso Co., Texas/Chihuahua.	**1**
Rio Grande/Río Bravo Upstream of the El Paso Haskell Street WWTP Located downstream of the Santa Fe Street and Stanton Street International Bridges and upstream of the Cordova International Bridge. Influenced by urban/agricultural runoff. The river is concrete lined and channelized at this point. There is no riparian vegetation on either side of the river. The sediment was sandy with patches of brown clay/silt. The water was a turbid brown/green color. Instantaneous flow was measured at 5.1 cms (180.2 cfs). El Paso Co., Texas/Chihuahua.	**1.1**
El Paso Haskell Street Wastewater Treatment Plant Permitted to discharge 27.7 MGD. Only samples of the discharge were collected. The daily average flow at the time of sample collection was 21.6 MGD (33.4 cfs). Wastewater is discharged to the concrete lined/channelized part of the river. El Paso Co., Texas/Chihuahua.	**1a**
Rio Grande/Río Bravo at Zaragosa International Bridge Located downstream of a significant part of El Paso/Ciudad Juárez. Influenced by urban/agricultural runoff. The moderately steep banks were 2 to 3 feet high, and sparsely covered with grassy vegetation. The surrounding area was disturbed with sparse vegetation. Heavily urbanized. Sediment was a grayish brown silt over sand. Water was a greenish brown color. El Paso Co., Texas/Chihuahua.	**2**
Ciudad Juárez Wastewater Canal Located downstream of El Paso/Ciudad Juárez. The flow is sometimes used for irrigation. At other times the discharge flows directly to the Rio Grande/Río Bravo. Flow was detected but not measured. Average flow is approximately 60 MGD but is not a constant discharge. Sediment was black with a sewage odor. Water was a gray-green color with a strong sewage odor. Banks were low and grass covered. Surrounding area had scrubs and small trees along the banks. Area remote with no development. The area is predominantly range/agricultural type land. The Rio Grande/Río Bravo is channelized at its confluence with the canal. Hudspeth Co., Texas/Chihuahua.	**2a**
Rio Grande/Río Bravo Upstream of Fort Hancock International Bridge -Located just downstream of the Ciudad Juárez Wastewater Canal (2.5 km upstream from Fort Hancock International Bridge. The Rio Grande/Río Bravo at this point is channelized with low but steep banks. Hudspeth Co., Texas/Chihuahua.	**2.1**
Rio Grande/Río Bravo at Fort Hancock International Bridge. Located downstream of the Ciudad Juárez Wastewater Canal. The Rio Grande/Río Bravo at this point is channelized with low but steep banks. Hudspeth Co., Texas/Chihuahua.	**2.2**
Rio Grande/Río Bravo Downstream of Fort Hancock International Bridge- Located just downstream of the Ciudad Juárez Wastewater Canal (2.5 km downstream from Fort Hancock International Bridge). The Rio Grande/Río Bravo at this point is channelized with low but steep banks. Hudspeth Co., Texas/Chihuahua.	**2.3**

parameters (Table 19). Station 1a, the El Paso Haskell Street wastewater treatment plant (WWTP), had a value that exceeded both the USEPA acute and chronic criterion. The concentration at the first station downstream of the Haskell Street WWTP, Station 2 at Zaragosa Bridge, exceeded the chronic aquatic life criterion. Unionized ammonia did not exceed either acute or chronic criteria upstream of the WWTP at Stations 1 (Courchesne Bridge) and 1.1 (upstream of Haskell Street WWTP) or at Station 0.5a (Montoya Drain) upstream of El Paso.

The unionized ammonia concentration at Station 2a, the Ciudad Juárez wastewater canal, exceeded the chronic aquatic life criterion. Effects of this discharge were observed downstream at Stations 2.1, 2.2 and 2.3 near Fort Hancock where the chronic aquatic life criterion was exceeded.

Chloride in water exceeded the USEPA aquatic life chronic criterion at all nine stations. Elevated chloride and salinity are common problems in the Rio Grande/Río Bravo (Table 19).

Organics/Pesticides

Only two organics in water exceeded screening levels, phenols at Station 2a (Ciudad Juárez wastewater canal), and phenolics recoverable at Station 1.1 (upstream of Haskell Street WWTP). Chloroform and 1,4-dichlorobenzene were also detected at Station 1a (El Paso Haskell Street WWTP) but did not exceed screening levels (Table 19).

Metals

Metals were the most common contaminants detected (Table 19). Of nine metals detected in the reach, three exceeded screening levels or criteria. Arsenic exceeded the state 85th percentile, and human health criteria (for consumption of water and fish, and consumption of fish only) at all stations. Copper and nickel exceeded the state 85th percentile but did not exceed human health or aquatic life criteria.

Other metals detected included aluminum, antimony, chromium, selenium, thallium, and zinc. Of the metals exceeding screening/ criteria levels, arsenic and copper were the only two found in the mainstem. Arsenic, copper and nickel occurred in tributaries; all three were found at Station 0.5a near the Texas/New Mexico state line (Table 19).

TABLE 19
CONTAMINANTS IN WATER THAT EXCEEDED SCREENING LEVELS

Contaminant	Criteria/Screening Level Exceeded	Stations
CONVENTIONAL		
Unionized Ammonia	Aquatic Life Acute and Chronic	1a, 2, 2.1, 2.2, 2.3, 2a
Chloride	Aquatic Life Acute and Chronic	0.5a, 1, 1.1, 1a, 2, 2.1, 2.2, 2.3, 2a
METALS		
Arsenic	85th Percentiles Human Health	0.5a, 1, 1.1, 1a, 2, 2a
Copper	85th Percentiles	0.5a, 1, 1.1
Nickel	85th Percentile	0.5a, 2a
ORGANICS		
Phenols	85th Percentiles	1.1, 2a

For additional information on water data, criteria/screening level exceedances and exceedance factors see Appendices E.1 and J.

SEDIMENT

Organics/Pesticides

Alpha benzene hexachloride (lindane) was detected in sediment at Station 2 (Zaragosa Bridge), and DDE was detected at Stations 0.5a, 2 and 2a. Only DDE exceeded the screening level at Montoya Drain (Station

0.5a) and Ciudad Juárez wastewater canal (Station 2a) (Table 20).

Metals

Thirteen metals were detected in sediment. Of the 13, arsenic, cadmium, copper, lead, mercury, nickel, selenium and zinc were detected at all stations in the reach (Table 20). Copper exceeded the screening levels at all stations in the reach. Lead, nickel and zinc exceeded screening levels at all stations with the exception of the Ciudad Juárez wastewater canal (2a). Arsenic did not exceed sediment screening values at any of the mainstem stations. Arsenic and silver exceeded screening levels at the Ciudad Juárez wastewater canal (2a). Cadmium exceeded screening levels at the two upstream most stations in the reach, Montoya Drain (0.5a) and Rio Grande at Courchesne Bridge (1). Sediment at Stations 0.5a, 1, 1.1 and 2 contained the highest number of metals exceeding screening levels (Table 20).

TABLE 20
CONTAMINANTS IN SEDIMENT THAT EXCEEDED SCREENING LEVELS

Contaminant	*Screening Level Exceeded*	*Stations*
METALS		
Arsenic	85th percentile	2a
Cadmium	SEM/AVS Ratio	0.5a, 1
Copper	SEM/AVS Ratio	0.5a, 1, 1.1, 2, 2a
Lead	SEM/AVS Ratio	0.5a, 1, 1.1, 2
Nickel	SEM/AVS Ratio	0.5a, 1, 1.1, 2
Zinc	SEM/AVS Ratio	0.5a, 1, 1.1, 2
Silver	85th percentiles	2a
ORGANICS		
DDE	Sediment Quality Criteria	0.5a, 2a

Note:Concentrations which exceed SEM/AVS and sediment quality criteria screening levels indicate that excess metal may be available with a potential for toxic effects to benthic organisms.

For additional information on sediment data, criteria/screening level exceedances and exceedance factors see Appendices F.1 and J.

FISH TISSUE

Organics/Pesticides

Fish tissue samples were collected at Stations 1 and 2. Although phenolics recoverable and DDE were detected at Station 2, none of the values exceeded screening levels or criteria.

Metals

Cadmium and copper, found in carp whole body samples from Stations 1 and 2, exceeded the USFWS 85th percentile. Zinc exceeded National and USFWS 85th percentiles at Station 2 (Tables 21). Other metals detected were aluminum, antimony, chromium, lead, mercury, nickel, selenium and silver.

TABLE 21
CONTAMINANTS IN FISH TISSUE THAT EXCEEDED SCREENING LEVELS

Contaminant	*Screening Level Exceeded*	*Stations*
METALS		
Cadmium	SEM/AVS Ratio	1, 2
Copper	SEM/AVS Ratio	1, 2
Zinc	SEM/AVS Ratio	2

For additional information on fish tissue data, criteria/screening level exceedances and exceedance factors see Appendices G.1 and J.

TOXICITY

Water

Significant effects of water on test organisms were observed in samples from Stations 1a (El Paso Haskell Street WWTP) and 2a (Ciudad Juárez Wastewater Canal). One hundred percent mortality to fathead minnows and water fleas occurred in samples from Stations

1a and 2a. Significant toxic effects in water were not found at Stations 0.5a, 1 and 1.1 on either fathead minnows or water fleas.

Sediment

Toxic effects of sediment on fathead minnows were found in samples from Stations 2 and 2a, with 100% and 70% mortality, respectively (APPENDIX D).

BIOLOGICAL

Benthic Macroinvertebrate Community

Snag samples were collected at Station 1; Surber samples as well as snags were collected at Station 2. Surber samples at Station 2 were collected from a small riffle immediately downstream of the Rio Vista diversion dam, approximately 2 km (1.2 miles) downstream of the Zaragosa Bridge.

Considering both stations together, a total of 6,688 benthic macroinvertebrates representing 11 orders and approximately 42 genera were collected (APPENDIX H). Chironomidae were predominant in both Surber samples and snag samples at Station 2, accounting for 72.3% and 70.6% of total numbers, respectively. Chironomidae accounted for 34.1% of the total number at Station 1, while the caddisfly *Smicridea* sp., blackflies (*Simulium* sp.), oligochaetes, and the mayfly *Tricorythodes* sp. collectively accounted for 62.4% of the total number. Taxa richness at Station 1 was higher than that in the Surber sample from Station 2, but lower than that in the snag sample from Station 2 (Table 22).

Collector-gatherers and filtering-collectors were the predominant functional groups at both sites, accounting for 96.8% of the total number in the snag sample from Station 1, and 94.1% and 92.2% of total numbers in the snag and Surber samples, respectively from Station 2. However, the sites differed in terms of relative abundance of each of the two functional groups. Filtering-collectors, primarily *Smicridea* sp. and *Simulium* sp., were most numerous among at Station 1, accounting for approximately 55.4% of the total number. At Station 2, collector-gatherers were predominant in both the snag and Surber samples, accounting for 66.0% and 77.7% of total numbers, respectively (Table 23).

Species richness was higher at Station 2 than at Station 1. The mean point score for the snag sample from Station 1 reflected an intermediate aquatic life use, one category lower than that designated for Segment 2314 in the TSWQS (Table 16). A relatively low EPT index, and a high proportion of individuals which utilize fine particulate organic matter as the primary food resource, contributed to this finding.

Relatively high taxa richness, EPT index, and diversity for the snag sample from Station 2 were reflected in a mean point score which corresponds to a high aquatic life use (Table 22). This is two categories higher than that designated in the TSWQS for Segment 2308. Relatively low taxa richness, EPT index, and imbalanced trophic structure resulted in an intermediate aquatic life use rating for the Surber sample.

Fish Community

Fish community surveys were conducted at two sites in this reach from which a total of ten species of fishes were collected (APPENDIX H). Station 1 was located upstream of wastewater point source discharges in El Paso but was influenced by urban and agricultural runoff (Table 18). Station 2 was located downstream of wastewater point source discharges in El Paso as well as most stormwater runoff from El Paso/Ciudad Juárez. Considering both sites together, common carp (*Cyprinus carpio*) and gizzard shad (*Dorosoma*

TABLE 22
SUMMARY OF METRIC VALUES FOR BENTHIC MACROINVERTEBRATE SAMPLES COLLECTED DURING PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

Station	Sample Type	Taxa (Species) Richness	Density (No/m^2)	EPT	Diversity	Equitability	Number of Functional Feeding Groups	Percent Dominant Functional Group	Cumulative Percent FPOM Feeders
1	Snag	24	28620	5	2.69	0.59	5	55.4 (FC)	96.8
2	Snag	31	20380	7	2.92	0.59	5	66.0 (CG)	94.1
2	Surber	15	301	4	2.51	0.64	5	77.7 (CG)	92.2
3	Surber	16	3279	7	1.29	0.32	5	78.2 (FC)	96.2
3a	Surber	8	161	1	1.81	0.60	4	46.7 (CG)	90.0
3a	Snag	23	12808	4	2.86	0.63	5	63.8 (CG)	93.5
4	Surber	29	3663	10	2.48	0.51	5	75.6 (FC)	91.4
5	Surber	19	825	9	3.61	0.85	5	37.7 (CG)	73.1
7b	Snag	41	15609	8	2.80	0.52	5	79.7 (CG)	85.8
7b.1	Surber	51	4531	13	3.81	0.67	5	59.8 (SCR)	30.6
7b.2	Surber	47	3330	12	3.43	0.62	5	55.2 (SCR)	30.7
10	Surber	41	4456	15	4.17	0.78	5	27.2 (SCR)	40.3
12	Surber	18	603	6	2.34	0.56	5	40.7 (CG)	48.8
12.1	Surber	26	2027	7	3.13	0.67	5	40.7 (CG)	47.0
14	Surber	39	29554	9	2.32	0.44	5	71.5 (CG)	86.0
16	Snag	34	49773	7	2.72	0.53	5	44.4 (CG)	79.0
18	Snag, Cane	12	186	0	2.78	0.78	5	55.7 (CG)	58.9
18	Snag, Woody	9	4073	2	10.8	0.34	4	90.0 (CG)	93.2
18	Snag, Woody ,Cane	14	3462	2	2.01	0.53	5	58.7 (CG)	71.2

EPT = EPHEMEROPTERA (mayflies)/PLECOPTERA (stoneflies)/TRICHOPTERA (caddisflies) INDEX
SCR = SCRAPER
FC = FILTERING COLLECTOR
CG = COLLECTOR GATHERER
FPOM = FINE PARTICULATE ORGANIC MATTER

TABLE 23
SUMMARY OF FUNCTIONAL FEEDING GROUPS FOR BENTHIC MACROINVERTEBRATES COLLECTED DURING PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

Station	Sample Type	Percentage Collector-Gatherer	Percentage Scraper	Percentage Predator	Percentage Filtering Collector	Percentage Shredder
1	Snag	41.38	2.04	0.95	55.45	0.16
2	Snag	65.99	3.38	2.14	28.12	0.36
2	Surber	77.71	3.01	3.61	14.46	1.20
3	Surber	18.01	2.73	0.62	78.23	0.40
3a	Surber	46.67	3.33	6.67	43.33	0
3a	Snag	63.84	3.39	2.69	29.67	0.29
4	Surber	15.84	4.41	3.65	75.56	0.52
5	Surber	37.70	13.26	8.36	35.43	5.09
7b	Snag	79.71	5.64	7.9	6.06	0.76
7b.1	Surber	26.42	59.78	8.69	4.19	2.15
7b.2	Surber	26.29	55.24	10.71	4.42	3.30
10	Surber	23.63	27.25	21.65	16.67	10.54
12	Surber	43.45	15.18	20.53	5.36	15.48
12.1	Surber	40.75	33.33	15.48	6.29	4.14
14	Surber	71.49	13.25	0.49	14.56	0.20
16	Snag	44.39	18.10	1.77	34.62	1.11
18	Snag, Cane	55.69	1.32	29.71	3.22	10.06
18	Snag, Woody	89.99	0	6.03	3.20	0.77
18	Snag, Cane & Woody	58.74	0.03	24.65	12.49	4.09

cepedianum) were numerically predominant, accounting for 55.5% and 12 %, respectively, of the total number of fish collected. Three of the ten species, common carp, channel catfish (*Ictalurus punctatus*), and gizzard shad were collected at both sites.

Station 1, and community similarity between the two sites was moderate (Table 24). Of the six species collected at Station 1, gizzard shad and common carp were numerically predominant accounting for 31.4% and 25.7% respectively, of the total number of fish collected (APPENDIX H). At Station 2, common carp, and gray redhorse (*Moxostoma congestum*) were numerically predominant accounting for 69.9% and 10.9%, respectively, of the total number of fish collected. Headwater catfish (*Ictalurus lupus*), a species which Hubbs *et al*. (1991) identify as being of special concern, was collected at Station 2. This taxon, as well as gray redhorse, largemouth bass (*Micropterus salmoides*), and longear sunfish (*Lepomis megalotis*) were collected at Station 2 but not at Station 1.

The index of biotic integrity (IBI) rating was slightly higher at Station 1 (Table 25). The rating for Station 2 was lowest among all stations for Phase 2 with the exception of that for Station 7 (upstream of Del Rio/Ciudad Acuña). The scores for Stations 2 and 7 were equal. The higher score for Station 1 was primarily the result of a more even distribution of individuals among taxa at that site. With the exception of Station 7, Station 1 exhibited the highest percentage of diseased individuals among all the Phase 2 sites. The scores for Stations 1 and 2 were below the median of all sites upstream of International Falcon Reservoir.

TABLE 24
SUMMARY OF SIMILARITY INDEX VALUES FOR FISH SAMPLES COLLECTED FROM SELECTED MAINSTEM AND TRIBUTARY SITES DURING PHASE 2 OF THE RIO GRANDE/ RIO BRAVO TOXIC SUBSTANCE STUDY

Sites of Comparison	S	Sites of Comparison	S
1 and 2	0.60	7b and 9	0.48
1 and 3	0.40	7b and 10	0.52
1 and 3a	0.44	8 and 9	0.42
1 and 3a.1	0.25	8 and 10	0.67
1 and 4	0.55	9 and 10	0.60
1 and 5	0.40	11 and 12	0.35
2 and 3	0.43	11 and 12.1	0.60
2 and 3a	0.46	12 and 12.1	0.53
2 and 3a.1	0.30	13 and 14	0.44
2 and 4	0.53	13 and 15	0.57
2 and 5	0.22	13 and 16	0.33
3 and 4	0.40	13 and 17	0.50
3 and 3a	0.31	13 and 18	0.44
3 and 3a.1	0.20	14 and 15	0.50
3 and 5	0.44	14 and 16	0.71
3a and 3a.1	0.32	14 and 17	0.46
3a and 4	0.43	14 and 18	0.57
3a and 5	0.25	15 and 16	0.53
3a.1 and 4	0.29	15 and 17	0.55
3a.1 and 5	0.00	15 and 18	0.67
4 and 5	0.20	16 and 17	0.50
7 and 7b	0.36	16 and 18	0.59
7 and 8	0.25	17 and 18	0.92
7 and 9	0.53		
7 and 10	0.35		
7b and 8	0.62		

TABLE 25
SUMMARY OF INDEX OF BIOTIC INTEGRITY
RATINGS FOR FISH COLLECTED DURING PHASE 2
(Using metric set derived for Phase 1)

Metric	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**
Station	1		2		3		3a	
Total number of species	6	1	7	1	7	1	6	1
Number of minnow species	2	1	0	1	0	1	0	1
% of individuals in most abundant species	31.4	5	69.9	1	42.1	3	70.2	1
Total number of individuals								
a. Individuals per hour electrofishing	88	1	292	3	112	2	140	2
b. Individuals per seine haul	3		0		2		2.5	
% diseased individuals	8.6	1	1.4	1	0	5	0	5
% of individuals as introduced species	25.71	1	69.9	1	34.2	1	19.1	1
Total Score		10		8		13		11
Metric	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**
Station	3a.1		4		5		7	
Total number of species	13	3	8	3	2	1	6	1
Number of minnow species	3	3	1	1	0	1	0	1
% of individuals in most abundant species	36.1	5	60.5	1	66.7	1	44.4	3
Total number of individuals								
a. Individuals per hour electrofishing			152	2	60	1	36	1
b. Individuals per seine haul	9	1	1		0			
% diseased individuals	0	5	0	5	0	5	11.1	1
% of individuals as introduced species	1.4	5	13.1	1	33	1	44.4	1
Total Score		22		13		10		8

TABLE 25 (cont)
SUMMARY OF INDEX OF BIOTIC INTEGRITY
RATINGS FOR FISH COLLECTED DURING PHASE 2
(Using metric set derived for Phase 1)

Metric	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**
Station	7b		8		9		10	
Total number of species	16	5	10	3	9	3	11	3
Number of minnow species	2	2	3	3	1	1	5	3
% of individuals in most abundant species	35.6	5	80.0	1	31.2	5	42.7	3
Total number of individuals								
a. Individuals per hour electrofishing	236	5	480	5	128	3	120	2
b. Individuals per seine haul	na				na		17	
% diseased individuals	0	0	0	5	6.2	1	0	5
% of individuals as introduced species	30.5	1	4.2	5	3.1	5	0.8	5
Total Score		18		22		18		21
Metric	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**
Station	11		12		12.1		13	
Total number of species	11	3	6	1	9	3	2	1
Number of minnow species	2	1	0	1	0	1	86.1	1
% of individuals in most abundant species	42.1	3	44.4	3	34.6	5	86.1	1
Total number of individuals								
a. Individuals per hour electrofishing	100	1	108	1	104	1	144	3
b. Individuals per seine haul	6		na		na		na	
% diseased individuals	0	5	0	5	3.8	1	0	5
% of individuals as introduced species	5.3	5	0	5	15.4	1	0	5
Total Score		18		16		12		16

TABLE 25 (cont)
SUMMARY OF INDEX OF BIOTIC INTEGRITY
RATINGS FOR FISH COLLECTED DURING PHASE 2
(Using metric set derived for Phase 1)

Metric	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**
Station	14		15		16		17	
Total number of species	7	1	5	1	10	3	6	1
Number of minnow species	77.4	1	85.3	1	56.4	1	73.9	1
% of individuals in most abundant species	45.2	3	85.3	1	46.1	3	39.1	5
Total number of individuals								
a. Individuals per hour electrofishing	124	3	136	3	156	3	92	1
b. Individuals per seine haul	na		na		na		na	
% diseased individuals	0	5	0	5	0	5	0	5
% of individuals as introduced species	0	5	5.9	3	5.1	5	4.3	5
Total Score		18		14		20		18
Metric	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**	**Metric Value**	**Score**
Station	18							
Total number of species	7	1						
Number of minnow species	80.8	1						
% of individuals in most abundant species	42.3	3						
Total number of individuals								
a. Individuals per hour electrofishing	104	1						
b. Individuals per seine haul	na							
% diseased individuals	0	5						
% of individuals as introduced species	11.5	3						
Total Score		14						

PRESIDIO/OJINAGA-BIG BEND NATIONAL PARK REACH

The reach from upstream of Presidio/Ojinaga to Big Bend National Park is the least populated portion of the study area. The primary population center is Presidio/Ojinaga with a combined population of 30,584 (USEPA 1996). The area is primarily rangeland with mining and a few industries. Some crop irrigation occurs upstream of Presidio/Ojinaga. The portion of the river downstream of Presidio/Ojinaga follows a winding channel through deep canyons separated by narrow valleys. The largest canyons are Santa Elena and Mariscal, both located in Big Bend National Park. The land between Presidio/Ojinaga and Big Bend National Park is used for open range cattle grazing and recreation (Big Bend National Park, Rio Grande Wild and Scenic River, and Big Bend Ranch in the United States; Santa Elena and Del Carmen protected areas in Mexico) (National Park Service 1996). Nonpoint source pollution originates from agricultural runoff, and urban runoff from the Presidio/Ojinaga area.

FLOW

The primary source of flow in the reach is the Río Conchos which provides 3/4 of the flow to Big Bend National Park. Two smaller tributaries on the U.S. side, Alamito and Terlinqua creeks, are intermittent. Data for a one month period were used as a relative indicator of flow conditions prior to and on the sample collection date. Daily average flows upstream of the Río Conchos confluence steadily decreased through the month prior to sampling. Flow during sample collection was 283 cfs, which was about average for the reach. Flow contributed by the Río Conchos was very low in December 1995, with 0.48 cms (17 cfs) measured during sample collection. Normal daily average flows for the month of December (1989-1993) range from 4.9 to 48.1 cms (173 to 1698 cfs). Flow at Station 3a.1 on the upper Río Conchos was also very low, 0.006 cms (0.22 cfs) (August 1995). Flow downstream of the Río Conchos confluence (Station 4) had also decreased through the month prior to sample collection, and daily average flow at the time samples were collected was the lowest observed in the six year period. Flow measured at Station 4 during the study was 8.3 cms (295 cfs). Similar flow conditions were observed at Station 5, where the daily average flow at the time samples were collected was the lowest recorded in the six years. Additional flow information is located in Appendix C.

SAMPLE STATIONS

Five sites were sampled between Presidio/ Ojinaga and Big Bend National Park (Fig. 5) (Table 26). Stations 6 and 6a were sampled for salinity only. Three mainstem stations and two tributary stations were sampled for toxics in water and sediment Tissue samples were collected at Stations 3, 3a, 4 and 5. The reach was originally scheduled to be sampled in August 1995. Due to very high flows in the Rio Grande/Río Bravo and Terlingua Creek, only the upper Río Conchos station was sampled in August. In December 1995, when the remaining stations were sampled, Terlingua Creek was dry, therefore, no sampling occurred. Toxicity tests were run on water and sediment at all five stations. Fish and benthic macroinvertebrate community data were collected at Stations 3, 3a, 4 and 5. Fish community data were also collected at Station 3a.1.

SAMPLE RESULTS

The complete data set for this reach is located in Appendices D, E.2, F.2, G.2, and H. Water data is located in Appendix E.2, sediment in Appendix F.2, fish tissue in Appendix G.2, water and sediment toxicity data in Appendix D, and biological community data in Appendix H.

TABLE 26
PRESIDIO/OJINAGA-BIG BEND NATIONAL PARK STATIONS

STATION DESCRIPTION	STATION NO.
Rio Grande/Río Bravo Upstream Rio Conchos Confluence Located near Presido/Ojinaga. The surrounding area is predominantly range land with some irrigated crops. Mainly influenced by rangeland/agricultural runoff. The banks were low and covered with grass and small scrubs and trees. Instantaneous flow was measured at 9.8 cms (283 cfs). Presidio Co., Texas/Chihuahua.	**3**
Río Conchos 0.2 km Upstream from Mouth Located near Presidio/Ojinaga. The surrounding area is predominantly range land with some irrigated crops. Mainly influenced by rangeland/agricultural runoff. The banks were moderately steep covered with mixture of grass/scrubs and trees. Instantaneous flow was measured at 0.59 cms (17 cfs). Presidio Co., Texas/Chihuahua.	**3a**
Río Conchos 25 km Upstream from Mouth Located outside of Ojinaga. The surrounding land use was predominantly cattle ranching with some crops. Mainly influenced by rangeland/agricultural runoff. The stream bottom was gravel/cobble with light brown silt. Instantaneous flow was measured at 0.006 cms (0.22 cfs). Flow was very low. Station downstream of a dam. Ojinaga, Chihuahua.	**3a.1**
Rio Grande/Río Bravo Downstream Río Conchos Confluence Located downstream of Presidio/Ojinaga. Mainly influenced by rangeland/agricultural runoff as well as urban runoff from Presidio/Ojinaga. Surrounding area is the start of the rocky mountainous terrain. One bank was low with grass and small shrubby vegetation. The river bottom was gravel with light brown silt. Water was turbid and light green in color. Instantaneous flow was measured at 8.3 cms (295 cfs). Ojinaga, Chihuahua	**4**
Rio Grande/Río Bravo at Santa Elena Canyon Located at the canyon mouth in Big Bend National Park. One bank was low with flood plain type vegetation. The other was the high Santa Elena canyon wall. The water was olive green. The sediment was a gray/brown silt with a thin layer of algae on the surface. Instantaneous flow was measured at 9.3 cms (329 cfs). Brewster Co., Texas/Chihuahua.	**5**

A summary of the contaminants detected and values exceeding screening/criteria levels are located at the beginning of each appendix for water, sediment and fish tissue. Appendix J contains a summary of criteria/screening levels exceeded and exceedance factors.

WATER

Conventional Parameters

Unionized Ammonia/Chloride

Chloride in water exceeded the USEPA aquatic life chronic criterion at all stations except 3a.1 (Table 27). The aquatic life criterion for chloride was exceeded by an average factor of 2.2 times. Total dissolved solids (TDS) were elevated at Stations 3, 3a, 4 and 5, ranging from 2,000 to 2,500 mg/L. Elevated chloride and salinity are common problems in the Rio Grande/Río Bravo. Unionized ammonia did not exceed the USEPA criteria.

Organics/Pesticides

Only one organic, bis (2-ethylhexyl) phthalate, was detected and exceeded a criterion and/or screening level (Table 27). State and national 85th percentiles were exceeded at both Stations 3a and 3a.1, while the human health criterion for the consumption of water and fish was exceeded at Station 3a.

Metals

Of the four metals detected in this reach, arsenic, copper, selenium and thallium, only arsenic exceeded criteria and/or screening levels (Table 27). Arsenic exceeded the state 85th percentile and both human health criteria at Stations 3, 3a.1, 4 and 5. Human health criterion for the consumption of fish was exceeded by an average factor of 45.4 times with the exceedance factors ranging from 38.3 to 61.1 times (APPENDIX J).

TABLE 27
CONTAMINANTS IN WATER THAT EXCEEDED SCREENING LEVELS

Contaminant	Criteria/Screening Level Exceeded	Stations
METALS		
Chloride	Aquatic Life Chronic	3, 3a, 4, 5
Arsenic	85th Percentile Human Health	3, 3a.1, 4, 5
ORGANICS		
Bis (2-ethylhexyl) phthalate	85th Percentiles	3, 3a

For additional information on water data, criteria/screening level exceedances and exceedance factors see Appendices E.2 and J.

SEDIMENT

Organics/Pesticides

The only pesticide detected in sediment, DDE, was found at Station 3a, Río Conchos upstream of Rio Grande/Río Bravo confluence. This value exceeded the site specific screening level (Table 28).

Metals

Metals were the most common contaminant detected in sediment. Of the 13 metals detected in this reach, cadmium, copper, lead, nickel, and zinc exceeded site specific screening levels (Table 28). Copper, lead, and nickel exceeded site specific screening levels at three stations (3, 3a.1 and 4), and zinc at four (Stations 3, 3a, 3a.1, and 4). Metals in sediment at Santa Elena Canyon (Station 5) did not exceed site specific screening levels. Other metals detected were aluminum, antimony, arsenic, beryllium, chromium, mercury, selenium, and thallium.

TABLE 28
CONTAMINANTS IN SEDIMENT THAT EXCEEDED SCREENING LEVELS

Contaminant	Screening Level Exceeded	Stations
METALS		
Cadmium	SEM/AVS Ratio	4
Copper	SEM/AVS Ratio	3, 3a.1 , 4
Lead	SEM/AVS Ratio	3, 3a.1 , 4
Nickel	SEM/AVS Ratio	3, 3a.1 , 4
Zinc	SEM/AVS Ratio	3, 3a, 3a.1 , 4
ORGANICS		
DDE	Sediment Quality Criteria	3a

Note: Concentrations which exceed sediment screening levels indicate that excess metal may be available with a potential for toxic effects to benthic organisms.

For additional information on sediment data, criteria/screening level exceedances and exceedance factors see Appendices F.2 and J.

FISH TISSUE

Organics/Pesticides

Although DDE, DDE, DDT and endrin were detected, only DDE exceeded a criterion. DDE values at Stations 3 and 4 exceeded the USEPA edible tissue criterion by an average of 3.0 times (Table 29) (APPENDIX J).

Metals

Fish tissue samples were collected at four stations. As seen for sediment, metals were the most commonly detected contaminants in tissue. Of eleven metals detected, four exceeded screening levels; cadmium, cooper, selenium, and zinc (Table 29). Selenium exceeded the national 85th percentile and USFWS predator protection limit at Stations 3, 3a and 4. In addition, the Texas Department of Health (TDH) screening value was exceeded at Station 3. Zinc, the second most common metal in tissue was found at Stations 3a, 4 and 5. Zinc exceeded the national 85th percentile and the USFWS 85th percentile. Cadmium, found at Stations 3a and 5, exceeded the USFWS 85th percentile. Copper also exceeded the USFWS 85th percentile at Station 5. Samples in which screening criteria exceedances occurred involved carp along with one sample of smallmouth buffalo (APPENDIX J). Other metals detected were aluminum, antimony, arsenic, lead, mercury and silver.

TABLE 29
CONTAMINANTS IN FISH TISSUE THAT EXCEEDED SCREENING LEVELS

Contaminant	Screening Level Exceeded	Stations
METALS		
Cadmium	85th Percentiles	3a, 5
Copper	85th Percentiles	5
Selenium	85th Percentile Predator Protection Limit TDH Screening Level	3, 3a, 4
Zinc	85th Percentiles	3a, 4, 5
ORGANICS		
DDE	USEPA Edible Tissue	3, 4

For additional information on fish tissue data, criteria/screening level exceedances and exceedance factors see Appendices G.2 and J.

TOXICITY

Water/Sediment

Significant effects of site water on water fleas were found at Stations 4 and 5. At both sites the number of young per female was significantly different from the control. Fathead minnows were not affected at either station. Significant effects in water were not found at Stations 3, 3a, or 3a.1 on either fathead minnows or water fleas. No significant effect was detected in sediment at any of the stations (APPENDIX D).

BIOLOGICAL

Benthic Macroinvertebrate Community

Benthic macroinvertebrates were collected at five stations in this reach, including three (Stations 3, 4, and 5) on the mainstem of the Rio Grande/Río Bravo, and two (Stations 3a, 3a.1) on the Río Conchos (Fig. 5) (Table 26). Surber samples only were collected from the mainstem stations, and Station 3a.1 on the Río Conchos. Surber as well as snag samples were collected at Station 3a. A total of 7,571 benthic macroinvertebrates representing 11 orders and approximately 46 genera were collected from the five stations (APPENDIX H).

At the three mainstem stations, a total of 5,534 individuals representing 10 orders and approximately 39 genera were collected. Taxa richness among the three stations was lowest at Station 3 and highest at Station 4 (APPENDIX H). Blackfly larvae, *Simulium sp.*, were predominant at Station 3, comprising approximately 75.9% of total numbers. At Station 4, hydropsychid caddisflies, *Smicridea* sp. and *Cheumatopsyche* sp., were most numerous, collectively accounting for approximately 70.0% of the total numbers. At Station 5 individuals were more evenly distributed among taxa as reflected by a relatively high equitability index value (Table 22), which was the highest among all stations. Thus, although *Smicridea sp.*, and *Cheumatopsyche sp.* were predominant at Station 5, their combined relative contribution to total numbers, 23.9%, was much lower at Station 5 than at either Station 3 or Station 4.

A total of 2,037 individuals representing nine orders, and approximately 27 genera were collected at Station 3a on the Río Conchos. No benthic macroinvertebrates were present in Surber samples from Station 3a.1. Taxa richness for the Surber sample from Station 3a was the lowest among all samples (Table 22) with the Chironomidae, primarily *Dicrotendipes* sp., collectively accounting for 82.2% of total numbers. Taxa richness for the snag sample was relatively high, higher than that for Surber samples from two of the mainstem stations (3 and 4) in this reach. In terms of relative numbers, the snag sample was dominated by the Chironomidae, primarily *Dicrotendipes* sp., *Orthocladius* sp., *Cricotopus* sp., and *Tanytarsus* sp., which collectively comprised approximately 76.4% of total numbers. Other than the chironomidae, the only taxa to contribute more than 1% of total numbers were the caddisfly *Smicridea* sp., the elmid beetle *Microcylloepus* sp., the blackfly *Simulium* sp., and the mayfly *Baetis* sp.

Filtering-collectors were the predominant functional group at Stations 3 and 4, comprising 78.2% and 75.6% of total numbers respectively. At Station 5, the trophic structure was more balanced with collector-gatherers and filtering collectors being the two most numerous groups comprising 37.7% and 35.4% of total numbers respectively (Table 23).

At Station 3a, collector-gatherers and filtering collectors were relatively equally represented in the Surber sample, comprising 46.7% and 43.3% of total numbers respectively (Table 22). The relative proportion of collector-gatherers (63.8%) was higher in the snag sample with filtering collectors comprising 29.67% of total numbers. At Stations 3 and 4 relatively low taxa richness, a predominance of one or two taxa, and unbalanced trophic structure contributed to mean point scores which fell into the intermediate aquatic life use subcategory, one subcategory lower than that designated in the TSWQS (Table 16). Conversely, at Station 5 a high EPT index value, as well as a more even distribution of individuals among taxa and a more balanced trophic structure, contributed to a mean point score which indicated support of the designated high aquatic life use category.

At Station 3a, low taxa richness, low density of individuals, and a low EPT value for the Surber sample contributed to a mean point score which fell into the range associated with a limited aquatic life use. Taxa richness, density, EPT, and diversity were higher in the snag sample, resulting in a mean point score which corresponded to an intermediate aquatic life use category.

Fish Community

Fish community surveys were conducted at five sites in this reach, including Stations 3a and 3a.1 on the Río Conchos, Stations 3 and 4 upstream and downstream of Presidio/Ojinaga and Station 5 downstream of Santa Elena Canyon in Big Bend National Park (APPENDIX H). Considering all sites collectively, a total of 282 individuals representing 22 species of fishes were collected. Gizzard shad and green sunfish (*Lepomis cyanellus*) predominated the collections, accounting for approximately 34.4% and 18.8% of total number of fish collected, respectively.

Species richness ranged from two at Station 5 to 13 at Station 3a.1 (APPENDIX H). Gizzard shad was the most numerous taxon at Stations 3, 3a, and 4, comprising 42.1%, 70.2% and 60.5% of the total number of fish collected, respectively. Headwater catfish, a taxon identified by Hubbs *et al*. (1991) as being of special concern, was collected only at Station 4. At Station 3a.1, green sunfish (*Lepomis cyanellus*) was most numerous, accounting for 23.6% of the total number of fish collected. Only two taxa, common carp, and blue sucker (*Cycleptus elongatus*) were collected at Station 5. Blue sucker, which is also a species of special concern, was the most abundant comprising 66.7% of the total number collected. The low number of taxa collected at this site, which is relatively undisturbed, is difficult to explain. It should be noted that fish kills and discolored water, possibly associated with an algal bloom of *Pyrmesium parvum*, were reported to the Texas Parks and Wildlife Department in late January, one to two months after the date that this survey was conducted. Blooms of *Pyrmesium parvum* have caused fish kills in the Pecos River.

Station 3 and 4 are located upstream and downstream, respectively, of Presidio/Ojinaga (Fig. 3). Taxa richness was higher at the downstream site (Station 4) and community similarity between the two sites was low (Tables 24 and 25). Gray redhorse, Mexican tetra (*Astyanax mexicanus*), river carpsucker (*Carpiodes carpio*), and blue sucker were collected at the upstream site (Station 3) but not at the downstream site (Station 4). One intolerant taxon (blue sucker) was collected at the upstream site but not at the downstream site. Four taxa, channel catfish (*Ictalurus punctatus*), headwater catfish (*Ictalurus lupus*), threadfin shad (*Dorosoma petenense*), and red shiner (*Cyprinella lutrensis*) were collected at Station 4 but not at Station 3.

Index of biotic integrity (IBI) ratings for the two Río Conchos stations were divergent (Table 25). The score for the site furthest upstream from the confluence (Station 3a.1) was highest among the four sites in the reach (with the exception of Station 8, with which it was equal), above International Falcon Reservoir for Phase 2. The high IBI rating for Station 3a.1 was associated with relatively high species richness, an even distribution of individuals among taxa, a low percentage of diseased individuals, and a relatively low percentage of individuals as introduced species. Conversely, the rating for the site closest to the confluence (Station 3a) was second lowest among the four stations in the reach and fifth lowest among all stations above International Falcon Reservoir for Phase 2. Relatively low species richness, low number of minnow species, a dominance of one taxon, and a high percentage of individuals as introduced species contributed to the low score at Station 3a. The rating for Station 3a.1 was higher than the median among all sites upstream of International Falcon Reservoir, while the score at Station 3a was lower.

The IBI ratings for the two sites bracketing Presidio/Ojinaga (Stations 3 and 4) were equal. Differences in individual metrics between the two sites include lower species richness, and a more even distribution of individuals among taxa at Station 3. The IBI score for the two sites was equal to the median (Table 25).

The IBI score for Station 5 was second lowest among all stations upstream of International Falcon Reservoir. Relatively low species richness, a low number of minnow species, a dominance of total numbers by one taxon, and a high percentage of individuals as introduced species contributed to the low rating for the site (Table 25).

INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS REACH

The dominant feature in this reach is International Amistad Reservoir located 19.3 km (12 miles) northwest of Del Rio/Ciudad Acuña. Amistad is one of two multi-purpose reservoirs located along the Texas/Mexico section of the Rio Grande/Río Bravo. The primary purpose of the reservoir is flood control and water storage in addtion to recreational uses. Built in 1968, the reservoir was the result of the 1944 treaty between the United States and Mexico which called for the equitable distribution of Rio Grande/Río Bravo waters (Mendieta 1974). The river also provides water for industrial and municipal uses in Eagle Pass/Piedras Negras and Ciudad Acuña where the combined population is 330,026 (Basin 1990). There are 50 maquiladoras in Ciudad Acuña and 43 in Piedras Negras (USEPA 1996). Agriculture/ rangeland is the major land use on both sides of the river. Recreation at International Amistad Reservoir is also important to the economy of the northern portion of the area.

FLOW

The Rio Grande/Río Bravo downstream of International Amistad Dam is heavily influenced by releases from the reservoir. Major tributaries to International Amistad Reservoir are the Pecos and Devils Rivers on the United States side. San Felipe Creek flows into the Rio Grande/Río Bravo at Del Rio. The San Felipe Springs are the primary drinking water source for Del Rio. Major withdrawls for irrigation by the United States and Mexico occur between Del Rio/Ciudad Acuña and Eagle Pass/Piedras Negras. The Rio Grande/Río Bravo receives treated and untreated wastewater from Del Rio/Ciudad Acuña and Eagle Pass/Piedras Negras. Although both Ciudad Acuña and Piedras Negras have lagoon systems for wastewater treatment, some untreated wastewater is discharged due to high volumes of wastewater from these cities. Annual rainfall in the area averages 51 cm (20 inches).

IBWC daily average flow data for the Del Rio/Ciudad Acuña and Eagle Pass/Piedras Negras areas (1989-1993 and 1995) was used as a relative indicator of flow conditions one month prior to and on the sample collection date. Flow at Del Rio/Ciudad Acuña and Eagle Pass/Piedras Negras the month prior to sampling was relatively low until the middle of the month. Flow increased to > 170 cms (> 6,000 cfs) due to a brief period of release from International Amistad Reservoir. However, the week prior to sample collection the flow was < 57 cms (< 2,000 cfs), the lowest recorded daily average flows in the five year period. Flow measured during sample collection was 38.4 cms (1356.1 cfs). Additional flow information is located in Appendix C.

SAMPLE STATIONS

Ten sites were sampled between International Amistad Reservoir and Eagle Pass/Piedras; four tributaries and six mainstem sites (Fig. 6) (Table 30). Toxic substances in water/ sediment, and ambient water/sediment toxicity tests were run on samples from Stations 6.1, 6.2, 7b, 7b.1, 7b.2, 9a, and 10 . Fish tissue samples were collected at all stations except 7b.1, 7b.2 and 9a. Fish and/or macrobenthic community surveys were done at all sites with the exception of Station 9a.

SAMPLE RESULTS

The complete data set for this reach is located in Appendices D, E.3, F.3, G.3, and H. Water data is located in Appendix E.3, sediment in Appendix F.3, fish tissue in Appendix G.3, water and sediment toxicity data in Appendix D, and biological community data in Appendix H. A summary of the contaminants detected

TABLE 30
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS STATIONS

STATION DESCRIPTION	STATION NO.
International Amistad Reservoir in the Rio Grande arm. Water was clear. Sediment was light brown/gray silt over a dark sand/clay. Water storage and recreation are major use of Amistad.	**6.1**
International Amistad Reservoir in the Devils River Arm. Water was clear. Sediment was light brown/gray silt over a dark sand/clay. Val Verde Co., Texas/Coahuila	**6.2**
Rio Grande/Río Bravo Upstream of US 277 in Del Rio/Ciudad Acuña. Rangeland is the major land use on both sides of the river. River is heavily influenced by releases from Amistad. Recreation and tourism economically important to this area. Fish only collected at this site. Upstream of wastewater discharges from Del Rio and Ciudad Acuña. Val Verde Co., Texas/Coahuila	**7**
San Felipe Creek Upstream of Mouth. Originates at San Felipe Springs, approximately 14.5 km (9 miles) upstream from the mouth. Del Rio gets 100% of their drinking water from these springs which are the third largest in Texas. There are no wastewater discharges into San Felipe Creek but it may be impacted by urban and stormwater runoff. Water color was a milky light green color. The creek at this point was approximately 6 feet deep and 30 to 40 feet wide. The sediment was largely sand. The area adjacent to the site was largely undeveloped except for a cattle ranch. Thick river cane and tree growth along the moderately steep banks. Water at this station may have been diluted by Rio Grande/Río Bravo water. Instantaneous flow was 1.7 cms (61.1 cfs). Val Verde Co., Texas	**7b**
San Felipe Creek at US 277 in Del Rio. Located next to a main highway in Del Rio, not far from the source. Located near a park. Some commercial development directly adjacent to the station. People swimming in springs upstream of sample point. Water was clear. Riffles and deeper pool areas present. Swift current with submerged aquatic macrophytes. Val Verde Co., Texas	**7b.1**
San Felipe Creek 6.0 km Upstream from Mouth in Del Rio. Samples were collected at Academy Street, a largely residential area. This station is in the middle portion of the creek. Shallow with rocky/cobble bottom, swift current and clear water. Low banks were covered with river cane. City park along one bank. Submerged aquatic macrophytes and filamentous algae were moderate. Sediment in small pockets. Instantaneous flow was 2.1 cms (72.7 cfs). Val Verde Co., Texas	**7b.2**
Rio Grande/Rio Bravo Downstream of Del Rio/Ciudad Acuña. Site is located downstream of wastewater discharges and urban runoff from Del Rio/Ciudad Acuña. Ciudad Acuña has 50 maquiladoras located upstream of this site, primarily textiles, electronics, leather and plastics. Fish tissue only collected at this station. Val Verde Co., Texas/Coahuila	**8**
Rio Grande/Río Bravo at US 57 in Eagle Pass/Piedras Negras. Upstream of the wastewater discharges from Eagle Pass/Piedras Negras. Land use in the area is predominantly goat and sheep ranching and some irrigated croplands. Fish tissue only collected at this station. Maverick Co., Texas/Coahuila	**9**
Arroyo el Tornillo Downstream of Piedras Negras. Sediment was black, septic, and full of bloodworms. Water was clear with little odor. Shallow and narrow with 1 to 2 foot pools. Small unidentified discharge coming into arroyo adjacent to station. Water was coming from the wastewater lagoons in Piedras Negras. Located is a residential area. Actual creek had scrubs and trees along very steep banks. Instantaneous flow was 0.01 cms (0.46 cfs). Piedras Negras, Coahuila	**9a**
Rio Grande/Río Bravo Downstream of Eagle Pass/Piedras Negras. Gentle sloping banks, some steep and eroded. Covered with river cane, scrubs, grass and some trees. Trees dominant on the Mexico bank. Station located downstream of the Eagle Pass/Piedras Negras wastewater discharges. Also influenced by urban and stormwater runoff. Instantaneous flow was 38.4 cms (1356 cfs). Piedras Negras has 43 maquiladoras, primarily transportation equipment and food processing. Maverick Co.,Texas/Coahuila	**10**

and values exceeding screening/criteria levels are located at the beginning of each appendix.

WATER

Conventional Parameters

Unionized ammonia and chloride exceeded USEPA chronic aquatic life criteria at one site, Station 9a. The aquatic life criterion for unionized ammonia was exceeded by a factor of 5.5 times, and 2.2 times for chloride. This tributary system transports partially treated/untreated wastewater from Piedras Negras (Table 31).

Organics/Pesticides

There were no organics/pesticides detected in water at any of the stations.

Metals

Three metals were detected in water; arsenic, cadmium and copper. Arsenic was the only metal to exceed a screening/criterion level. Values at Stations 6.1, 6.2, 9a and 10 exceeded the state 85th percentile and human health criterion (Table 31). The human health criterion for the consumption of fish and water was exceeded by an average factor of 27 times. The human health criterion was exceeded by an average factor of 3.5 times.

TABLE 31
CONTAMINANTS IN WATER THAT EXCEEDED SCREENING LEVELS

Contaminant	Screening Level Exceeded	Stations
METALS		
Unionized Ammonia	Aquatic Life Chronic	6.1, 6.2, 9a, 10
Chloride	Aquatic Life Acute Aquatic Life Chronic	6a, 9a
Arsenic	85th Percentile Human Health	9a

For additional information on water data, criteria/screening level exceedances and exceedance factors see Appendices E.3 and J.

SEDIMENT

Organics/Pesticides

Chlordane in sediment was detected at Stations 7b.1 and 7b.2. The value at 7b.1 exceeded the site specific sediment screening level (Table 32). DDE was detected in sediment at Station 9a but did not exceed a screening level.

Metals

Metals were the most common of the contaminants detected in sediment. Of the 13 metals detected in the reach, chromium, copper, lead, nickel and zinc exceeded site specific sediment screening levels at Station 6.1, the Rio Grande arm of International Amistad Reservoir (Table 32). With the exception of arsenic at Station 6.2, the Devils River Arm of International Amistad Reservoir, there were no other screening level exceedances at the remaining stations in the reach. Other metals detected were aluminum, antimony, arsenic, chromium, beryllium, cadmium, mercury, selenium, and thallium.

TABLE 32
CONTAMINANTS IN SEDIMENT THAT EXCEEDED SCREENING LEVELS

Contaminant	Screening Level Exceeded	Stations
METALS		
Arsenic	85th percentile	6.2
Copper	SEM/AVS Ratio	6.1
Lead	SEM/AVS Ratio	6.1
Nickel	SEM/AVS Ratio	6.1
Zinc	SEM/AVS Ratio	6.1
ORGANICS/PESTICIDES		
Chlordane	Sediment Quality Criteria	7b.1

Note: Concentrations which exceed sediment screening levels indicate that excess metal may be available with a potential for toxic effects to benthic organisms.

For additional information on sediment data, criteria/screening level exceedances and exceedance factors see Appendices F.3 and J.

FISH TISSUE

Organics/Pesticides

Five organics/pesticides (benzene, toluene, chloroform, DDD and DDE) were detected in the reach. Chloroform and benzene exceeded screening levels in carp filet and whole body samples from Station 7b. Values exceeded the state 85th percentile by factors that ranged from 2.3 to 5.0 times.

Metals

Of ten metals detected in fish tissue, arsenic, copper, mercury and zinc exceeded screening levels (Table 33). Arsenic exceeded the national 85th percentile in a whole largemouth bass sample at Station 6.2 (Rio Grande Arm of International Amistad Reservoir). The USEPA edible tissue criteria for arsenic was exceeded at Station 10, downstream of Eagle Pass/Piedras Negras. A whole largemouth bass sample at Station 6.1 (Devils River Arm of International Amistad Reservoir) exceeded the USFWS predator protection limit for mercury. Copper and zinc exceeded 85th percentiles. Other metals detected included aluminum, cadmium, chromium, nickel, selenium, and thallium.

TABLE 33
CONTAMINANTS IN FISH TISSUE THAT EXCEEDED SCREENING LEVELS

Contaminant	Screening Level Exceeded	Stations
METALS		
Arsenic	85th Percentile USEPA Edible Tissue	6.2 10
Copper	85th Percentile	7, 7b, 8
Mercury	Predator Protection Limit	6.2
Zinc	85th Percentile	7b, 8
ORGANICS		
Chloroform	85th Percentile	7b
Benzene	85th Percentile	7b

For additional information on fish tissue data, criteria/screening level exceedances and exceedance factors see Appendices G.3 and J.

TOXICITY

Water/Sediment

Significant effects of water samples on water fleas or fathead minnows were not observed at any site in the reach. Station 9a was the single site that exhibited significant effects from sediment elutriate on fathead minnows (87% mortality)(APPENDIX D).

BIOLOGICAL

Benthic Macroinvertebrate Community

Benthic macroinvertebrate samples were collected at four stations in the reach, including 7b, 7b.1, 7b.2 on San Felipe Creek, and Station 10 on the Rio Grande/Río Bravo downstream of Eagle Pass/Piedras Negras (Fig. 6)(Table 30). At Station 7b on San Felipe Creek, which was relatively deep and lacked riffle habitat, only snag samples were collected. Only Surber samples only were collected at Stations 7b.1, 7b.2, and 10. A total of 6,128 benthic macroinvertebrates representing 17 orders and approximately 85 genera were collected from the four stations (APPENDIX H.3).

Approximately 80 taxa were collected from San Felipe Creek (APPENDIX H.3). Taxa richness values for Stations 7b.1, and 7b.2 were the highest among all stations sampled during the study (Table 22). Gastropods, primarily *Melanoides tuberculata* and *Elimia* sp., were the most common taxa at these two stations, collectively accounting for 42.1% of total numbers. Taxa richness at the downstream station (7b) was lower than at the two upstream sites but high relative to other collections (Table 22). The mayfly *Tricorythodes* sp. was most numerous, accounting for 53.4% of total numbers.

At Station 10, a total of 1,242 individuals were collected, which were distributed among 13 orders and approximately 41 genera. Taxa richness was equal to that at Station 7b and third highest among all stations sampled during the study (Table 22). In terms of relative numbers, individuals were fairly well distributed among taxa. The five most abundant taxa, which included the caddisfly *Hydroptila* sp., the flatworm *Dugesia* sp., the chironomid *Polypedilum* sp., the caddisfly *Stactobiella* sp., and the Oligochaeta accounted for 54.8% of total numbers.

Stations 7b.1, 7b.2, and 10 were the only three stations in the study at which the scrapers, primarily the gastropods *Melanoides tuberculata* and *Elimia* sp., the mayflies *Dactylobaetis* sp., *Baetis* sp. and *Thraulodes* sp., the caddisflies *Helicopsyche* sp., and *Hydroptila* sp., and the lepidopteran *Petrophila* sp., were found to be the most numerous functional group (APPENIDX H.3). This indicates that instream primary production by periphyton is an important resource at these sites. At Station 7b, collector-gatherers, primarily *Tricorythodes* sp., *Microcylloepus* sp., and oligochaetes, were the most abundant functional group, accounting for approximately 79.7% of total numbers.

Relatively high taxa richness, EPT, and diversity values as well as relatively balanced trophic structure (Table 22) contributed to mean point scores for Stations 7b.1 and 7b.2 which indicate support of the high aquatic life use designated in the TSWQS (Table 16). Despite the finding that the trophic structure at Station 7b was less balanced than at the other three stations in the reach, a relatively high taxa richness, EPT index value, and diversity contributed to a mean point score indicating support of the high aquatic life use designated in the TSWQS.

High values for taxa richness, EPT, diversity, and equitability, as well as a balanced trophic structure contributed to a mean point score at Station 10 which corresponds to an exceptional aquatic life use, one category higher than that designated for Segment 2304. The mean point score at Station 10 was the highest among all stations sampled during the study, and was the only mean point score which reflected an exceptional aquatic life use.

Fish Community

Fish community surveys were conducted at five stream stations in this reach, including Station 7b on San Felipe Creek, Stations 7 and 8 located on the Rio Grande/Río Bravo upstream and downstream of Del Rio/Ciudad Acuña and Station 10 downstream of Eagle Pass/Piedras Negras (Fig. 6) (Table 30) (APPENDIX H.3). Considering all four sites combined, a total of 18 species of fishes were collected. Blacktail shiner (*Cyprinella venusta*) was most abundant, accounting for 54.7% of the total number of fish collected. Though accounting for only 3.9% of total numbers, common carp was the only species collected at all five stream stations.

Seining was conducted at Station 10 but not at any of the other four stations in the reach. A factor which may contribute to some of the differences noted.

Station 7b (San Felipe Creek) exhibited the highest species richness of all stream sites in the reach (Table 25). Big scale log perch (*Percina macrolepida)*, the only darter observed during Phase 2, was collected at this site. Among mainstem stations, species richness ranged from six at Station 7 to eleven at Station 10 (Downstream of Eagle Pass).

Stations 7 and 8 are located upstream and downstream, respectively, of wastewater discharges and urban runoff from Del Rio/Ciudad Acuña. Species richness was higher at the downstream station (Table 25) and community similarity between the two sites was low (Table 24). Largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), bluegill sunfish (*Lepomis macrochirus*), and redbreast sunfish (*L. auritus*) were collected at the upstream site but not at the downstream site. Flathead catfish (*Pylodictus olivaris*), Mexican tetra (*Astyanax mexicanus*), longnose gar (*Lepisosteus osseus*), blacktail shiner (*C. venusta*), red shiner (*Cyprinella lutrensis*), Texas shiner (*Notropis amabilis*), and inland silverside (*Menidia beryllina*) were collected at the downstream site (Station 8) but not at the upstream site (Station 7). The only intolerant taxa collected from the reach, smallmouth bass and log perch were collected at Stations 7 and 7b, respectively. Station 7 was located upstream of wastewater discharges from Del Rio/Ciudad Acuña, and although there are no wastewater discharges into San Felipe Creek, it may be influenced by urban runoff (Table 30).

The Eagle Pass/Piedras Negras area was bracketed by Stations 9 and 10. Species richness was higher at the downstream site (Station 10) and community similarity between the two sites was moderate (Table 24). Channel catfish, gray redhorse, and Rio Grande cichlids were collected at the upstream site (Station 9) but not at the downstream site (Station 10). Present at the downstream site but not at the upstream site were Mexican tetra, red shiner, Texas shiner, fathead minnow (*Pimphales promelas*), and inland silverside.

The relationship of index of biotic integrity (IBI) ratings for sites above and below Del Rio/Ciudad Acuña was similar to that observed for species richness, in that the overall score for the downstream station (Station 8) was higher than that for the upstream site (Station 7). Lower species richness, number of minnow species, catch rate, and a higher percentage of individuals as introduced species contributed to the lower score at Station 7 (Table 25). The IBI rating for the upstream site was lower than the median among all stations upstream of International Falcon Reservoir. The score for the downstream site was higher than the median and with the exception of Station 3a.1, which had an equivalent rating, was highest among all sites upstream of International Falcon Reservoir.

In contrast to the trend for species richness, the overall IBI score for the site downstream of Eagle Pass/Piedras Negras (Station 10) was greater than that of the upstream station (Station 9). The lower rating for the upstream site was associated with a lower number of minnow species, and a higher percentage of diseased individuals relative to the downstream site. The scores for both sites were higher than the median among all stations upstream of International Falcon Reservoir.

LAREDO/NUEVO LAREDO-INTERNATIONAL FALCON RESERVOIR

Laredo/Nuevo Laredo is the largest population center in this reach of the river. The combined population of the sister cites is 352,707 (USEPA 1996). The river provides water for industrial and municipal uses in Laredo/Nuevo Laredo. The 54 maquiladoras in Nuevo Laredo are primarily involved in automobile production. A dominant feature in the reach is International Falcon Reservoir located 129 km (80 miles) northwest of Laredo/Nuevo Laredo. Falcon was the first of the two multi-purpose reservoirs constructed along the boundary section of the Rio Grande/Río Bravo. The primary purpose of the reservoir is flood control and water storage in addition to recreational uses. Built in 1954, construction of the reservoir was the result of the 1944 Treaty between the United States and Mexico which called for the equitable distribution of Rio Grande/Río Bravo waters (Mendieta 1974).

FLOW

Water quality and quantity in the Rio Grande/ Río Bravo at Laredo/Nuevo Laredo are heavily influenced by large volumes of treated and untreated wastewaters. Laredo has five wastewater treatment plant (WWTP) discharges with an average volume of 29 million gallons per day (MGD), and at the time of the study Nuevo Laredo discharged 25 to 30 MGD of untreated wastewater. Since April 1996, this number was significantly reduced by the new Nuevo Laredo International Wastewater Treatment Plant (NLIWWTP) with approximately 17 MGD of treated wastewater and 7 MGD of untreated wastewater being discharged to the river. Urban/stormwater runoff and agricultural runoff also impact this section of the river. Annual rainfall in the area averages 51 cm (20.1 inches) (Buzan 1990; TNRCC 1994a). The majority of tributary inflow between International Amistad and Falcon Reservoirs originates in Mexico. Two major tributaries, the Río San Diego and Río San Rodrigo, flow into the river upstream of Laredo/Nuevo Laredo. The Río Salado is a major tributary of International Falcon Reservoir. IBWC daily average flow data for the Laredo/Nuevo Laredo area (1989-1993 and 1995) were used as a relative indicator of flow conditions the month prior to and on the sample collection date. Flow at Laredo/Nuevo Laredo the month prior to sampling was relatively low until the middle of the month when it increased slightly to > 2,000 cfs. However, a week prior to sample collection, the flow was < 57 cms (< 2,000 cfs), some of the lowest recorded daily average flows in the five-year period. Flow measured during sample collection was 45.6 cms (1610.3 cfs). Additional flow information is located in Appendix C.

SAMPLE STATIONS

Twelve sites were sampled between Laredo/ Nuevo Laredo and International Falcon Reservoir: seven tributaries and five mainstem sites (Fig.7)(Table 34). Toxic substances in water and ambient water toxicity tests were run on samples from all stations except Station 11 where only fish tissue was collected. Toxic substances in sediment and sediment toxicity tests were run on all stations except Stations 11, 11b.1, 11b.2, and 11b.3. All but Station 11 were end-of-the-pipe wastewater discharges. Fish tissue samples were collected at Stations 11 (upstream of Laredo), 12 and 12.1 (downstream of Laredo), and 12.2 and 12.3 (International Falcon Reservoir). Fish and macrobenthic community surveys were also done at Stations 12 and 12.1.

SAMPLE RESULTS

The complete data set for this reach is located in Appendices D, E.4, F.4, G.4, and H. Water data is located in Appendix E.4, sediment in Appendix F.4, fish tissue in Appendix G.4,

TABLE 34
LAREDO/NUEVO LAREDO-INTERNATIONAL FALCON RESERVOIR STATIONS

STATION DESCRIPTION	STATION NO.
Manadas Creek Upstream from Mouth in Laredo. Carries urban and stormwater runoff. Drains a industrial warehouse area of Laredo. Station located adjacent to a sand and gravel operation. The creek was narrow and shallow. The steep banks were covered with trees and shrubs. Webb Co., Texas	**10a**
Rio Grande/Río Bravo Near the Laredo Water Intake. Located downstream of the Manadas Creek confluence. Area may also be influenced by irrigation return flows agricultural runoff, oil and gas operations and mining. Webb Co., Texas/Tamaulipas	**11**
Zacate Creek Upstream from the Mouth in Laredo. Influenced by urban/stormwater runoff from Laredo. Samples collected downstream from the Laredo Zacate Creek WWTP discharge. Creek water was a turbid light green color, and the sediment was a light brown silt with a slight sewage odor. The creek was located in an urban setting. Instantaneous flow was 0.001 cms (0.25 cfs). Webb Co., Texas	**11a**
Chacon Creek Upstream from the Mouth in Laredo. Influenced by urban/stormwater runoff from Laredo. Area around station was heavily disturbed with scrubby vegetation. Little development along the creek. Instantaneous flow was 0.02 cms (0.71 cfs). Webb Co., Texas	**11b**
Laredo Zacate Creek Wastewater Treatment Plant Discharge. Instantaneous flow was 15.2 cfs (9.8 MGD). Discharges to Execute Creek just above the mouth. Webb Co., Texas	**11b.1**
Laredo Southside Wastewater Treatment Plant Discharge. Instantaneous flow was 2.0 cfs (1.3 MGD). Discharges directly to the river upstream of Station 12. Webb Co., Texas	**11b.2**
Manhole 115, Stage I Collection System in Nuevo Laredo. Located near Arroyo el Coyote. Discharge untreated wastewater was from a large cement pipe. Surrounding area disturbed but largely undeveloped. Instantaneous flow was 22.6 cfs (14.6 MGD). Nuevo Laredo, Tamaulipas	**11b.3**
Arroyo el Coyote Upstream from Mouth. Water was gray, sediment black during Phase 2. Untreated wastewater discharge. Instantaneous flow was 4.2 cfs (2.7 MGD). [The water quality in this stream has vastly improved with the start-up of the new Nuevo Laredo International WWTP, April 1996]. Nuevo Laredo, Tamaulipas.	**11c**
Rio Grande/Río Bravo 13.2 km Downstream of US 81. Flow in the Rio Grande at Laredo/Nuevo Laredo is augmented by large volumes of domestic wastewater entering from both sides of the river. Nuevo Laredo has 54 maquiladoras, primarily automobile production. Located downstream of Laredo/Nuevo Laredo wastewater discharges. Laredo has five wastewater treatment plant discharges with a total average discharge volume of 29 MGD, and Nuevo Laredo discharged 25-30 MGD of untreated wastewater at the time of the study. This number will change now that the new Nuevo Laredo WWTP is in operation. Daily average flow was 44.4 cms (1568 cfs). Webb Co., Texas/Tamaulipas	**12**
Rio Grande/Río Bravo 25 km Downstream of US 81. A few residential developments in the area. El Cenizo discharge located near the sample site. Banks were covered with river cane. Sediment was a sand/silt mixture. High flow surge 4 days prior to sampling due to locally heavy rainfall. Instantaneous flow was 46.5 cms (1610 cfs). Water was a turbid light green color. Webb Co., Texas/Tamaulipas	**12.1**
International Falcon Reservoir at Monument 14. Original stations were dry. The conservation pool was normally 301.7 feet and was at 263 feet at the time of sample collection. Water was a light muddy brown color. The total depth was 7 feet. Sediment was a light brown silt. Area used primarily for recreation. Zapata Co., Texas/Tamaulipas	**12.2**
International Falcon Reservoir at Monument 1. Water was a clear medium green. Sediment was a medium brown silt over sandy silt. The total depth was approximately 35 feet. Area used primarily for recreation. Zapata Co., Texas/Tamaulipas	**12.3**

water and sediment toxicity data in Appendix D, and biological community data in Appendix H.4. A summary of the contaminants detected and values exceeding screening/criteria levels are located at the beginning of each appendix for water, sediment and fish tissue. Appendix J contains a summary of criteria/screening levels exceeded and exceedance factors.

WATER

Conventional Parameters

Unionized Ammonia/Chloride

Unionized ammonia was detected at nine of the eleven sites but exceeded the acute and chronic aquatic life criteria only at Stations 11b.3 and 11c, both untreated wastewater discharges (Table 35). The chronic criterion for unionized ammonia was exceeded by an average factor of 16 times.

Chloride also exceeded the chronic aquatic life criterion at these two stations. Both the acute and chronic aquatic life criteria for chloride were exceeded at Station 11b (Chacon Creek) (Tables 35). Cyanide was detected in sediment at two tributary stations but did not exceed any criteria/screening levels. It was also detected in fish tissue samples from Stations 12, 12.1, 12.2 and 12.3 but values were less than criteria/screening levels.

Organics/Pesticides

The largest number of organics in water were found within this reach. Concentrations of chloroform, bromodichloromethane, dibromochloromethane, toluene, xylene, 1,4-dichlorobenzene, and n-nitrosodi-n-propylamine exceeded criteria/screening levels at four stations (Table 35). Chloroform concentrations, at Stations 11b.2 and 11c were greater than national and state 85th percentiles. Bromodichloromethane and dibromochloromethane were found at Station 11b.2, and exceeded human health criterion by factors of 7.4 to 1.1 times, respectively. Toluene, xylene and 1,4-dichlorobenzene were found at Station 11b.3. All three exceeded the state 85th percentile by an average factor of 3.6 times. These stations were all treated or untreated wastewater discharges. Only n-nitrosodi-n-propylamine was found in the mainstem, at Station 12.1 downstream of Laredo/Nuevo Laredo; the value exceeded the human health criteria for consumption of water and fish by a factor of 194 times.

Metals

Six metals were detected in water: aluminum, antimony, arsenic, cadmium, lead and zinc. Arsenic exceeded human health criteria at all 11 stations including the criterion for consumption of water and fish (an average factor of 22 times), and for consumption of fish only (an average of 2.3 times) (Table 35).

TABLE 35
CONTAMINANTS IN WATER THAT EXCEEDED SCREENING LEVELS

Contaminant	Criteria/Screening Level Exceeded	Stations
	METALS	
Unionized Ammonia	Aquatic Life Acute Aquatic Life Chronic	10a, 11a, 11b.1, 11b.2, 11b.3, 11c
Chloride	Aquatic Life Acute Aquatic Life Chronic	10a, 11b, 11b.3, 11c
Arsenic	85th Percentile Human Health	10a, 11a, 11b, 11b.1, 11b.2, 11b.3, 11c, 12,12.1,12.2, 12.3
Zinc	85th Percentile	11b.2
	ORGANICS/PESTICIDES	
Bromodi-chloromethane	85th Percentile Human Health	11b.2
Chloroform	85th Percentiles	11b.2, 11c
Dibromochloro-methane	Human Health	11b.2
N-nitrosodi-n-propylamine	Human Health	12.1

TABLE 35 (cont)
CONTAMINANTS IN WATER THAT EXCEEDED SCREENING LEVELS

ORGANICS/PESTICIDES		
Toluene	85th Percentile	11b.3
Xylene	85th Percentile	11b.3
1,4 dichlorobenzene	85th Percentile	11b.3

For additional information on water data, criteria/screening level exceedances and exceedance factors see Appendices E.4 and J.

SEDIMENT

Organics/Pesticides

DDE and DDT were the only organics/ pesticides detected in sediment. DDT concentrations at Stations 10a and 11b (Manadas and Chacon Creeks in Laredo) were greater than site specific sediment screening levels values by an average of 102 times (Table 36). DDE exceeded a site specific screening level in Chacon Creek (Station 10a), Arroyo el Coyote (Station 11c) and at the headwaters of International Falcon Reservoir (Station 12.2). Organic/pesticides were not detected in sediment at any of the mainstem sites.

Metals

Metals were the most common contaminants detected in sediment. Of 14 metals detected in the reach, antimony, copper, lead, nickel, silver and zinc exceeded screening levels (Table 36). Copper, lead, nickel, and zinc exceeded screening levels at Station 12.1, downstream of Laredo/Nuevo Laredo and Station 12.2 in the headwaters of International Falcon Reservoir. Arsenic was detected at all eight stations, but did not exceed site specific screening concentrations. Other metals detected in the reach were aluminum, beryllium, cadmium, chromium, selenium, and thallium.

TABLE 36
CONTAMINANTS IN SEDIMENT THAT EXCEEDED SCREENING LEVELS

Contaminant	Screening Level Exceeded	Stations
METALS		
Antimony	SEM/AVS Ratio	10a
Copper	SEM/AVS Ratio	12.1, 12.2
Lead	SEM/AVS Ratio	12.1, 12.2
Nickel	SEM/AVS Ratio	12.1, 12.2
Silver	85th Percentile	11c, 12
Zinc	SEM/AVS Ratio	12.1, 12.2
ORGANICS/PESTICIDES		
DDT	Sediment Quality Criteria	10a, 11b
DDE	Sediment Quality Criteria	11b, 11c, 12.2

Note: Concentrations which exceed sediment screening levels indicate that excess metal may be available with a potential for toxic effects to benthic organisms.

For additional information on sediment data, criteria/screening level exceedances and exceedance factors see Appendices F.4 and J.

FISH TISSUE

Organics/Pesticides

Six organics/pesticides were detected in fish tissue: DDD, DDE, DDT, diazinon, dieldrin and toluene. None exceeded criteria/screening levels. DDE was detected in all fish tissue samples collected in the reach.

Metals

Aluminum, arsenic, cadmium, chromium, copper, lead, mercury, selenium, thallium, and zinc were detected in fish tissue samples from the reach. Of these, arsenic and mercury were found in a largemouth bass edible tissue sample collected at Station 11 (upstream of Laredo); the arsenic concentration exceeded the USEPA edible tissue criterion by a factor of 11.1 times, while the mercury concentrations exceeded the USFDA action level and the state 85th percentile (Table 37). A whole carp sample, also collected at Station 11, contained copper and zinc. Lead and zinc were found in whole fish samples collected at Station 12.2 at the headwaters of International Falcon Reservoir.

TABLE 37
CONTAMINANTS IN FISH TISSUE THAT EXCEEDED SCREENING LEVELS

Contaminant	Screening Level Exceeded	Stations
METALS		
Arsenic	USEPA Edible Tissue	11
Copper	85th Percentile	11
Lead	85th Percentile	12.2
Mercury	USFDA Action Level 85th Percentile	11
Zinc	85th Percentile	11, 12.2

For additional information on fish tissue data, criteria/screening level exceedances and exceedance factors see Appendices G.4 and J.

TOXICITY

Water/Sediment

Toxic effects of water on water fleas were observed in samples from Stations 10a, 11b, 11b.1, 11b.3 and 11c, with 100% mortality at all stations except one, 11b (50% mortality). Stations 10a (Manadas Creek) and 11b (Chacon Creek) are urban creeks flowing through Laredo. Station 11b.1 was the Laredo Southside WWTP discharge, and 11b.3 and 11c were untreated wastewater discharges from Nuevo Laredo. One hundred percent mortality of fathead minnows was observed in water and sediment samples from Station 11c. The sediment sample from Station 11c also caused 100% mortality in water fleas (APPENDIX D).

BIOLOGICAL

Benthic Macroinvertebrate Community

Benthic macroinvertebrate samples were collected at stations 12 and 12.1 (Fig. 7) (Table 34). Surber samples were collected at both stations; no snag samples were collected. A total of 733 benthic macroinvertebrates representing 14 orders and approximately 29 genera were collected in the reach.

Forty-one individuals representing nine orders, and approximately 18 genera were collected from Station 12 (APPENDIX H). Chironomidae, primarily *Polypedilum* sp. and *Thienemanniella* sp., were most numerous, accounting for approximately 60.5% of total numbers. These two genera, together with oligochaetes, mayflies (primarily *Tricorythodes* sp., *Thraulodes* sp. and *Baetis* sp.), gastropods (primarily *Ferrisia rivularis)*, a caddisfly *(Hydroptila* sp.), and leeches, accounted for 98.1% of the total number.

Taxa richness was higher at Station 12.1 as 13 orders and approximately 26 genera were collected (Table 22). The Chironomidae were less predominant, collectively accounting for only 16.5% of the total number. Five taxa, including *Ferrisia rivularis*, *Tricorythodes* sp., *Polypedilum* sp., oligochaetes, and the flatworm *Dugesia* sp., collectively accounted for 77.5% of the total number (APPENDIX H.4).

In terms of relative numbers, the trophic structure was well balanced at both sites (Table 22). Collector-gatherers were dominant at each site accounting for 43.4% of the total number at Station 12 and 40.7% of the total numbers Station 12.1. Scrapers, predators, and shredders were well represented, accounting for 15.2%, 20.5%, and 15.5% of the total number, respectively at Station 12. Scrapers and predators accounted for 33.3%, and 15.5% of the total number, respectively at Station 12.1 (Table 23).

At Station 12, comparatively low taxa richness, density, EPT, and diversity, as well as concentration of numbers among relatively few taxa, resulted in a mean point score which corresponded to an intermediate aquatic life use, one category lower than that designated in the TSWQS for Segment 2304 (Table 16). Relatively high taxa richness, EPT index, and diversity, more even distribution of individuals among taxa, and a balanced trophic structure at Station 12.1 contributed to a mean point score which indicates support of the designated high aquatic life use.

Fish Community

A total of 16 species of fishes were collected from the three stream stations at which fish community surveys were conducted in this reach, including Station 11 upstream of Laredo/ Nuevo Laredo and Stations 12 and 12.1 downstream of Laredo/Nuevo Laredo (Fig. 7) (Table 34)(APPENDIX H.4). Gizzard shad was most abundant, comprising approximately 32.7% of the total number of fish collected.

Station 11 is located upstream of wastewater discharges from Laredo/Nuevo Laredo, but downstream of Manadas creek which drains a heavily industrialized area of Laredo. Stations 12 and 12.1 are both located downstream of wastewater discharges and stormwater runoff from Laredo/Nuevo Laredo (Table 34). However, Station 12 is located approximately 13.2 km downstream of Laredo, while station 12.1 is located 25 km downstream.

The relative positions of the three sites are reflected in species richness values as well as in the community similarity index. That is, species richness was highest at the upstream site, lowest at the downstream site closest to Laredo (Station 12) and intermediate at the site furthest downstream (Station 12.1)(Table 25). Likewise, community similarity was low between Stations 11 and 12, moderate between 11 and 12.1, and moderate to low between Stations 12 and 12.1 (Table 24).

Flathead catfish, smallmouth buffalo (*Ictiobus bubalus*), Mexican tetra, and red shiner were collected at the upstream site (Station 11) but not at either downstream site (Stations 12 and 12.1). Five species including threadfin shad, Rio Grande cichlid, blue tilapia (*Tilapia aurea*), bluegill sunfish, and freshwater drum (*Aplodinotus grunniens*) were collected at the furthest downstream site (Station 12.1) but not at the site located closer to Laredo/Nuevo Laredo (Station 12). Blue catfish (*Ictalurus furcatus*) and longear sunfish (*Lepomis megalotis*) were the only taxa which were collected at the downstream site closest to Laredo (Station 12) but not at either the upstream site (Station 11) or the site further downstream (Station 12.1). In terms of relative numbers, tolerant taxa were less dominant at the upstream site, comprising approximately 43.8% of the total number of fish collected. At Stations 12 and 12.1, tolerant taxa accounted for approximately 77.8% and 70.4% of the total numbers, respectively. Common carp, gizzard shad, and largemouth bass were collected from all three sites.

The relationship between index of biotic integrity (IBI) ratings upstream and downstream of Laredo/Nuevo Laredo was similar to that observed for species richness in that the score for the upstream site (Station 11) was higher than that observed for both downstream stations (12 and 12.1)(Table 25). However, the relationship between the two downstream stations was reversed in that the IBI rating was lower at Station 12.1 than at the downstream site nearest to Laredo/Nuevo Laredo (Station 12). Relatively low species richness, number of minnow species and catch rate contributed to the low score at Station 12.1. The low score at Station 12.1 was related to a low number of minnow species, low catch rate, relatively high percentage of diseased individuals and a high percentage of individuals as introduced species. The IBI scores for the Station 11 and for Station 12 were higher than the median among all stations above International Falcon Reservoir. The IBI rating for the furthest downstream site (Station 12.1) was lower than the median.

BELOW INTERNATIONAL FALCON RESERVOIR-BROWNSVILLE MATAMOROS REACH

This section of the river is commonly referred to as the Lower Rio Grande Valley. Most of the area is broad, flat coastal plain. The combined population of McAllen/Reynosa and Brownsville/Matamoros is 1,323,733, second to El Paso/Ciudad Juárez (1,389,289), and 42 % of the Rio Grande/Río Bravo border population (Table 15). However, this population is spread over several hundred miles. From International Falcon Dam to the Gulf of Mexico the river travels 442 km (275 miles). There are 111 maquiladoras in Matamoros, second to Ciudad Juárez, and 78 in Reynosa (Table 16). The major use of Rio Grande/Río Bravo water in the Lower Rio Grande Valley is for agriculture, mainly irrigated crops. Rainfall in the Lower Rio Grande Valley is the highest along the Rio Grande/Río Bravo border, averaging 64.5 cm (25.4 inches) annually (Miyamoto *et al*. 1993; TNRCC 1994a; USEPA 1996).

FLOW

Residents in the reach rely on releases from International Falcon Reservoir for agricultural and municipal water supplies. Flow in this section of the river mainly comes from Mexico's Río Alamo, Río San Juan, and Río Salado (main tributary of International Falcon Reservoir). During dry weather there is no inflow from the United States side downstream of International Falcon Reservoir.

IBWC daily average flow data for 1989 to 1993 and 1995 were used as a relative indicator of flow conditions prior to and on the sample collection date. At Station 13 (Los Ebanos) historical flow was represented by daily average flows from Rio Grande City just upstream. The month prior to sampling flow averaged 69 cms (2,451 cfs). Flow during sample collection was 8.3 cms (295 cfs), a low value for the area. Historical flows at Stations 14 (Hidalgo) and 15 (downstream Anhelo Drain) were represented by daily average flows from the Rio Grande/Río Bravo below Anzalduas Dam. Flows were relatively high the month prior to sample collection, some of the highest values in the five-year period. Flows measured during sample collection were 66.6 cms (2,353 cfs) at Station 14 and 63.7 cms (2,250 cfs) at Station 15. The month prior to sampling flow at San Benito (Station 17) was relatively low, never exceeding 28 cms (1,000 cfs). Flow measured during sample collection was 9.7 cms (343 cfs). Similar flow conditions were observed at Station 18; daily average flow at the time samples were collected was 10.3 cms (365 cfs). Additional flow information is located in Appendix C.

SAMPLE STATIONS

Eight sites were sampled from downstream of International Falcon Dam to Brownsville/ Matamoros including two tributaries and six mainstem sites (Fig. 8)(Table 38). Toxics in water and sediment, and ambient water and sediment toxicity tests were run on samples from all eight stations. Toxics in fish tissue were determined for at all mainstem stations. Fish and/or macrobenthic community surveys were done at all six mainstem sites.

SAMPLE RESULTS

The complete data set for this reach is located in Appendices D, E.5, F.5, G.5, and H. Water data is located in Appendix E.5, sediment in Appendix F.5, fish tissue in Appendix G.5, water and sediment toxicity data in Appendix D, and biological community data in Appendix H.5. A summary of the contaminants detected and values exceeding screening/criteria levels are located at the beginning of each appendix for water, sediment and fish tissue. Appendix J contains a summary of criteria/screening levels exceeded and exceedance factors.

TABLE 38
BELOW INTERNATIONAL FALCON RESERVOIR-BROWNSVILLE MATAMOROS STATIONS

STATION DESCRIPTION	STATION NO.
Arroyo los Olmos at US 183 near Rio Grande City. Located near Rio Grande City next to a major highway. Influenced by urban/stormwater runoff from Rio Grande City. Area land uses include rangeland and rural residential development. Water color was a turbid yellow green. Sediment was dark gray/black with an anoxic odor. Area heavily disturbed, steep banks covered with grass, mesquite and weeds. Instantaneous flow was measured at 0.04 cms (1.5 cfs). Starr Co., Texas	**12d**
Rio Grande/Río Bravo at SH 886 Near Los Ebanos. Located just downstream of a hand operated ferry crossing. Influenced by International Falcon Reservoir releases, irrigation return flows, and small WWTPs. Area population relatively low. Water pea green, sediment a brown, sand/silt mixture. Surrounding area agricultural with a few homes near the crossing. Banks moderately steep with thick growth of vegetation. Instantaneous flow was measured at 8.3 cms (295 cfs). Hidalgo Co., Texas/Tamaulipas	**13**
Rio Grande/Río Bravo Downstream of Anzalduas Dam. Located upstream of Mc Allen, Reynosa/Hidalgo. Area is upstream of the influence of wastewater discharges from Hidalgo/Reynosa. Influenced by irrigation return flow from both the U.S. and Mexico. Area around site is primarily agriculture and rangeland. Park on the U.S side. Extremely steep, eroded banks on both sides of the river. Water was a clear green milky light green color. Sediment was a light tan/gray. Bottom was a hard clay. Sediment collected closer to shore. Instantaneous flow was measured at 66.6 cms (2352 cfs). Hidalgo Co., Texas/Tamaulipas	**14**
Rio Grande/Río Bravo at US 281 in Hidalgo/Reynosa. Located at a border crossing. Influenced by urban and agricultural runoff. Water was a turbid light green color. Sediment was mostly sand. Banks had a moderate slope and were covered with river cane, except near the bridge. This area was greatly disturbed with little vegetation. Instantaneous flow was measured at 63.7 cms (2250 cfs). Hidalgo Co., Texas/Tamaulipas	**15**
El Anhelo Drain Upstream from Mouth Near Reynosa. Carries untreated wastewater from Reynosa to the Rio Grande/Río Bravo along with urban/stormwater runoff from Reynosa, possible industrial runoff. Water was a muddy gray color with a sewage type odor. Sediment was black and septic. Instantaneous flow was estimated at 0.57 cms (20 cfs). Reynosa, Tamaulipas.	**15a**
Rio Grande/Río Bravo Downstream el Anhelo Drain. Located upstream of the Santa Ana National Wildlife Refuge. Area between the refuge and site had thick vegetation growing along the banks. Very little disturbance. Reynosa has 78 maquiladoras. Downstream of the untreated wastewater discharge of Reynosa. Urban runoff from McAllen, Hidaglo, Mission, Pharr and Reynosa and irrigated cropland may impact the site. Water was a turbid light green color. Sediment was a gray-tan sand/silt mixture. Flow not measured, taken from IBWC daily average flow. Hidalgo Co., Texas/Tamaulipas	**16**
Rio Grande/Río Bravo Downstream of San Benito. Land use is primarily irrigated cropland and rural subdivisions. Station located directly south of Harlingen/San Benito area. May be influenced by some urban runoff. Downstream of the Retamal Dam. Accounts for lower flows than at upper stations. Water was a turbid light pea green color. Sediment was a brown and sandy. Banks had a moderate slope with grass, shrubs, and trees. Area adjacent to site was irrigated cropland. Instantaneous flow was measured at 343 cfs. Cameron Co., Texas/Tamaulipas	**17**
Rio Grande/Río Bravo Downstream of US 83/77 in Brownsville/Matamoros. Located downstream side of Brownsville/Matamoros near the El Jardin pump station. Influenced by urban /stormwater runoff. Matamoros has 111 maquiladoras but most discharges flow toward the Gulf of Mexico. Swimmers upstream of the site. Water was a turbid light pea green color. Sediment was brown and sandy. Banks were steep with grass and shrubby vegetation. Instantaneous flow was measured at 10.3 cms (365 cfs). Cameron Co., Texas/Tamaulipas	**18**

WATER

Conventional Parameters

Unionized Ammonia/Chloride

Unionized ammonia was detected at all sites but exceeded acute and chronic aquatic life criteria only at Station 15a (Anhelo Drain)(Table 39). Chloride exceeded acute and chronic criteria at Station 12d (Arroyo Los Olmos).

Organics/Pesticides

There were no organics detected in water in this reach.

Metals

Four metals were detected in water: aluminum, arsenic, thallium and zinc. Arsenic exceeded human health criteria at all eight stations where water samples were collected. The criterion for consumption of water and fish was exceeded by an average factor of 25 times, and the criterion for consumption of fish only was exceeded by an average factor of 3.2 times. Some of the values were also greater than state and national 85th percentiles (Table 39).

TABLE 39
CONTAMINANTS IN WATER THAT EXCEEDED SCREENING LEVELS

Contaminant	Screening Level Exceeded	Stations
METALS		
Unionized Ammonia	Aquatic Life Acute Aquatic Life Chronic	15a
Chloride	Aquatic Life Acute Aquatic Life Chronic	12d, 15a
Arsenic	85th Percentiles Human Health	12d, 13, 14, 15, 15a, 16, 17, 18

For additional information on sediment data, criteria/screening level exceedances and exceedance factors see Appendices E.5 and J.

SEDIMENT

Organics/Pesticides

Two organics were detected in sediment: DDE at Stations 12d (Arroyo los Olmos) and 15a el Anhelo Drain), and bis (2-ethlyhexyl) phthalate at Station 15a. Only DDE exceeded the site specific screening levels, at Stations 12d and 15a.

Metals

Metals were the most common contaminants detected in sediment. Of 14 metals detected in the reach, copper, lead, and nickel exceeded site specific screening concentrations. The majority of metals exceeding site specific screening concentrations were found at Stations 14 (below Anzalduas Dam) and 16 (downstream of el Anhelo Drain), and 17 (downstream of San Benito). Silver exceeded 85th percentiles at all of the stations sampled in the reach (Table 40). Other metals detected were aluminum, antimony, arsenic, beryllium, cadmium, chromium, copper, mercury, selenium, thallium, and zinc.

TABLE 40
CONTAMINANTS IN SEDIMENT THAT EXCEEDED SCREENING LEVELS

Contaminant	Screening Level Exceeded	Stations
METALS		
Copper	SEM/AVS Ratio	14, 16
Lead	SEM/AVS Ratio	14, 17
Nickel	SEM/AVS Ratio	14, 16, 17
Silver	85th Percentile	13, 14, 15, 15a, 16, 17, 18
Zinc	SEM/AVS Ratio	14, 16, 17, 18
ORGANICS/PESTICIDES		
DDE	Sediment Quality Criteria	12d, 15a

Note: Concentrations which exceed sediment screening levels indicate that excess metal may be available with a potential for toxic effects to benthic organisms.

For additional information on sediment data, criteria/screening level exceedances and exceedance factors see Appendices F.5 and J.

FISH TISSUE

Organics/Pesticides

Five organics were detected in fish tissue samples: chlordane, dieldrin, DDE, and aroclor 1248 and 1260. Chlordane exceeded the USEPA edible tissue criterion in a carp filet sample from Station 16. Aroclor 1260 was found in a whole snook sample at Station 18 downstream of Brownsville/Matamoros (Table 41).

Metals

Of nine metals detected in fish tissue, only three were greater than criteria/screening levels; copper, lead, and zinc. Lead was greater than the USFWS 85th percentile in a whole largemouth bass sample from Station 15. A whole white bass sample from Station 16 had a copper concentration greater than USFWS and national 85th percentiles. At Station 17, a whole largemouth bass sample also had a copper concentration that exceeded USFWS and national 85th percentiles. Zinc in a whole carp sample from Station 16 was greater than the national 85th percentile.

TABLE 41
CONTAMINANTS IN FISH TISSUE THAT EXCEEDED SCREENING LEVELS

Contaminant	Screening Level Exceeded	Stations
METALS		
Copper	85th Percentiles	16, 17
Lead	85th Percentiles	15
Zinc	85th Percentile	16

TABLE 41 (cont)
CONTAMINANTS IN FISH TISSUE THAT EXCEEDED SCREENING LEVELS

ORGANICS/PESTICIDES		
Chlordane	USEPA Edible Tissue	16
Aroclor 1260	Predator Protection Limit	18

For additional information on sediment data, criteria/screening level exceedances and exceedance factors see Appendices G.5 and J.

TOXICITY

Water

Toxic effects of water on fathead minnows and water fleas were observed in samples from Station 15a, with 100% mortality of both test organisms (APPENDIX D).

Sediment

Significant effects of sediment on fathead minnows were also noted at Station 15a (20% mortality), el Anhelo Drain in Reynosa. Toxic effects of sediment were not observed at any other station in the reach.

BIOLOGICAL

Benthic Macroinvertebrates

Benthic macroinvertebrate samples were collected from three stations (14, 16, and 18) in the reach (Fig. 8)(Table 38). Surber samples only were collected at Station 14, while only snag samples were collected at Stations 16 and 18. A total of 14,339 individuals representing 16 orders and approximately 60 genera were collected from the three sites (APPENDIX H.5).

At Station 14, a total of 8,237 individuals were distributed among 14 orders and approximately 39 genera. Distribution of individuals among taxa was relatively uneven. Oligochaetes accounted for approximately 53.4% of the total number. This group, along with the next five most abundant taxa,(*Orthocladius* sp., *Smicridea* sp., *Melanoides tuberculata*, *Dicrotendipes* sp., and *Hydroptila* sp., collectively accounted for 95% of the total number)(APPENDIX H).

Twelve orders and approximately 34 genera were collected in the snag sample from Station 16 (APPENDIX H). As at Station 14, a high proportion of the total number of individuals were concentrated in relatively few taxa. *Smicridea* sp., the most abundant taxon accounted for approximately 31.0% of the total number. This taxon, along with the next 5 most abundant taxa (*Baetis* sp., oligochaetes, *Tricorythodes* sp., *Dicrotendipes* sp., and the biting midge *Forcipomyia* sp.), accounted for approximately 90.9% of the total number (APPENDIX H). Density of individuals at this station (49,773 per m^2) was the highest among all stations. This probably was due in part due to the presence of filamentous algae on the snags, which effectively increased the surface area available for habitat (although not included in the measured surface area, which included only the snags themselves).

No riffle habitat was available at Station 18, and snag habitat consisted primarily of river cane and small amounts of woody snags and debris. Snag samples were collected from each of the two types of snags. A total of 354 benthic macroinvertebrates were collected, representing six orders and approximately 14 genera.

The density of macroinvertebrates on cane was lowest among all snag samples, and second lowest among all samples (Table 22). Taxa richness was relatively low, third lowest among all samples, as only twelve genera were collected. Cumulatively, Chironomidae and Oligochaeta accounted for approximately 89.7% of the total number. The elmid beetle *Microcylloepus* sp., the hydrophilid beetle *Berosus* sp., the damselfly *Enallagma* sp., and the hemipteran *Trepobates* sp. were the only other taxa collected (APPENDIX H).

Density on wood was higher, but still second lowest among all samples (Table 22). However, taxa richness was lower than in the cane sample, and second lowest among all samples. Oligochaeta were predominant in the sample, accounting for approximately 81.2% of the total number.

Collector-gatherers dominated trophic structure in both samples, accounting for 55.7% of the community in the cane sample and 90.0% in the wood sample (Table 23). The percentage of scrapers was low relative to all other samples for both the cane and the woody snags. The woody snag sample was the only sample collected which contained no scrapers. These findings likely reflect high turbidity and relatively sluggish flow in the reach.

Among all samples from the reach, only the snag sample from station 16 exhibited a mean point score which achieved the high aquatic life use designated for Segment 2302 (Table 16). Relatively high taxa richness, EPT index, and a balanced trophic structure contributed to this finding. Mean point scores for both the Surber sample and cane snag sample from Station 14 were indicative of an intermediate aquatic life use, one category lower than that designated for the segment. High prevalence of FPOM feeders, and concentration of numbers among few taxa were primary factors at Station 14. Low number of taxa, density of individuals, and EPT index, and a relatively unbalanced trophic structure contributed to the finding of an intermediate aquatic life use for the cane snag sample from Station 18. Low taxa richness and EPT index, concentration of numbers among only a few taxa, and an imbalanced trophic structure accounted for the limited aquatic life use rating for the woody snag sample from Station 18.

Fish Community
A total of 14 species of fishes were collected from the six sites at which fish community surveys were conducted in the reach, including Stations 13, 14, 15, 16, 17, and 18 (Fig. 8) (Table 38)(APPENDIX H). Gizzard shad (*Dorosoma cepedianum*) and largemouth bass (*Micropterus salmoides*) were collected at all six of the stations. Gizzard shad were most abundant, comprising approximately 48.7% of total numbers. One or more estuarine (Hubbs *et al*. 1991) species, including gizzard shad, snook (*Centropomus undecimalis*), bigmouth sleeper (*Gobiomorus dormitor*), striped mullet (*Mugil cephalus*), and mountain mullet (*Agonostomus monticola*),were collected at all six sites. The only intolerant taxon, snook, was collected at Stations 17 and 18 only, an observation likely related to proximity of coastal waters rather than with perturbation of some type. Species richness ranged from two at Station 13 to ten at Station 16.

Stations 14 and 16 are located upstream and downstream, respectively, of wastewater discharges and urban runoff from McAllen, Reynosa/Hidalgo (Table 38). Species richness was lower at the upstream site (Station 14); however, community similarity between the two sites was relatively high (Table 24). All taxa, with the exception of smallmouth buffalo, which were collected at the upstream site were collected at the downstream site (Station 16). Four taxa, common carp, spotted gar (*Lepomis oculatus*), white bass (*Morone chrysops*), and freshwater drum (*Aplodinotus grunniens*) were collected at the downstream site (Station 16) but not at the upstream site (Station 14).

Stations 17 and 18 are located upstream and downstream, respectively, of wastewater discharges and urban runoff from Brownsville/Matamoros (Table 38). In terms of species richness and taxonomic composition, the two sites were quite similar, with the collection of bigmouth sleeper (*Gobiomorus dormitor*) at the downstream site (Station 18) but not at the upstream site (Station 17) being the only difference. These factors are reflected in the high community similarity index value between the two sites (Table 24).

Index of biotic integrity scores for the reach below International Falcon Reservoir ranged from 14 to 20 out of a possible 30 points (Table 25). Stations 13, 15, and 18 scored below the median, while sites 14, 16, and 17 scored higher. The lowest score was for the sample collected at Station 15. Relatively low species richness, a high percentage of individuals as estuarine species, and a relatively high dominance by a single species contributed to the low score. At Station 13, low species richness, a high percentage of estuarine/marine species and dominance by a single species contributed to the low score.

Divergent results were obtained for sites bracketing urban areas in the reach. That is, the station upstream of McAllen/Reynosa (Station 14) rated slightly lower than the downstream site (Station 16). At Station 14, low species richness and a high percentage of individuals as estuarine species contributed to the low score. The higher score at Station 16 was a function of higher taxa richness and a more even distribution of individuals among species. The station upstream of Brownsville/ Matamoros (Station 17) scored higher than the downstream station (Station 18). A greater dominance of one taxon, as well as a higher percentage of introduced species at Station 18 contributed to the lower score relative to Station 17.

CHAPTER 6

SUMMARY OF TOXIC SUBSTANCES FOUND IN PHASE 2

WATER QUALITY

Water samples were analyzed for 161 toxic chemicals at 37 mainstem and tributary sites on the Rio Grande/Río Bravo. Of the 161 chemicals, 21 were above detection limits. Of the 21 detected, 14 exceeded a criterion or screening level. Twelve of the 14 were found in tributaries: arsenic, copper, nickel, zinc, phenols, bromodichloromethane, chloroform, dibromochloromethane, toluene, xylene, 1,4-dichlorobenzene, and bis (2-ethylhexyl) phthalate. Five of the 14 were found in the Rio Grande/Río Bravo. These included arsenic, copper, phenolics recoverable, bis (2-ethylhexyl) phthalate, and n-nitrosodi-n-propylamine (Table 42). All of the contaminants, with the exception of arsenic, were detected in less than five samples, and exceeded criteria/screening levels a maximum of three times. Arsenic was detected in 33 of the 37 samples analyzed, and exceeded criteria/ screening levels in all 33 (APPENDIX P).

Organics

The largest number of organics in water were found in the Laredo/Nuevo Laredo area (8 of the 10 detected in the study) (Table 42). Six of the eight were found in two wastewater discharges, the Laredo Southside Wastewater Treatment Plant (WWTP) (Station 11b.2), and Manhole 115 of the Nuevo Laredo wastewater collection system (Station 11b.3). Chloroform was also found in the Arroyo el Coyote in Nuevo Laredo (Station 11c). N-nitrosodi-n-propylamine was the only organic in water found at the mainstem site downstream of Laredo (Station 12.1). Laredo/Nuevo Laredo is a heavily industrialized area with numerous treated and untreated wastewater discharges influencing water quality. All of these manmade compounds, commonly used in various manufacturing processes, were found in wastewater discharges, suggesting industrial sources. None of the organics found in tributaries were detected in the mainstem in this reach. Phenols and phenolics recoverable were found in the El Paso/Ciudad Juárez area, one at Station 1.1 downstream of the El Paso Haskell Street WWTP, and the other at the Ciudad Juárez wastewater canal (Station 2a). Both sites are heavily influenced by urban/industrial

TABLE 42

CONTAMINANTS DETECTED IN WATER

El Paso/Ciudad Juárez to Brownsville/Matamoros

Contaminant	Mainstem		Tributary	
Aluminum	X		X	
Antimony	X		X	
Arsenic	X	Ž	X	Ž
Cadmium	X		X	
Chromium			X	
Copper	X	Ž	X	Ž
Lead	X			
Nickel			X	Ž
Selenium	X		X	
Thallium	X		X	
Zinc	X		X	Ž
Phenols			X	Ž
Phenolics Recoverable	X	Ž	X	
1,4-Dichlorobenzene			X	Ž
Bis (2-ethylhexyl) phthalate	X	Ž	X	Ž
Bromodichloromethane			X	Ž
Chloroform			X	Ž
Dibromochloromethane			X	Ž
N-nitrosodi-n-propylamine	X	Ž		
Toluene			X	Ž
Xylene			X	Ž

X = detected; Ž = exceed screening level activities. The remaining organic, bis (2-ethylhexyl) phthalate, was found in the Presidio/Ojinaga area in the mainstem upstream of the Río Conchos confluence, and in the Río Conchos near the mouth (Stations 3 and 3a). Both stations are located near Presidio/Ojinaga and have the potential to be impacted by some industrial activities. Bis (2-ethylhexyl) phthalate, a manmade chemical widely used in plastics, is commonly found in water, sediment and tissue and is known to persist in the environment (University of Virginia Database).

Pesticides

Pesticides were not detected in water at any of the sites.

Metals

Arsenic was the most common of the metals found in the Rio Grande/Río Bravo and tributaries. As stated earlier, arsenic was detected in, and exceeded criteria/screening levels in 33 of 37 samples. Arsenic is a naturally occurring element, and is found in association with areas of past volcanic activity. Arsenic enters the environment from soil erosion, pesticide application, industrial/ municipal wastewater effluent, and coal fired power plant emissions (U.S. Department of Health and Human Services 1993a; USEPA 1980c). The widespread occurrence of arsenic would suggest a combination of natural and manmade sources. The other metals found in water, copper, nickel, and zinc, all occurred in the El Paso/Ciudad Juárez reach. Copper and nickel were greater than screening levels at Station 0.5a (Montoya Drain). Copper and zinc also exceeded screening levels at Station 1, Rio Grande/Río Bravo at Courchesne Bridge. Both of these stations are located near the Texas/New Mexico state line, and are influenced by agricultural runoff and some urban activities. Copper is very common in rocks, soils, and municipal/industrial wastewater discharges. Zinc is one of earth's most common elements, and has numerous commercial uses (USEPA 1980c). Elevated zinc was also found in the discharge from the Haskell Street WWTP.

SEDIMENT QUALITY

Sediment samples were also analyzed for the same 161 toxic chemicals at 33 mainstem and tributary sites on the Rio Grande/Río Bravo. Of the 161 chemicals, 19 were found above detection limits. Of the 19 detected, 11 exceeded a screening level. All 11 contaminants were found at tributary sites, including antimony, arsenic, cadmium, copper, lead, nickel, silver, zinc, chlordane, DDT, and DDE. Seven of the 11 were found at mainstem stations, including arsenic, cadmium, copper, lead, nickel, silver, and zinc (Table 43).

Organics

Only one organic was detected in sediment, bis (2-ethylhexyl) phthalate at Stations 2 (Zaragosa Bridge downstream of El Paso/ Ciudad Juárez) and 2a (Ciudad Juárez wastewater canal), but did not exceed screening levels.

Pesticides

Five pesticides were detected in sediment: alpha benzene hexachloride (BHC), chlordane, DDT, and DDE. Chlordane was found in San Felipe Creek sediment at the upper station (7b.1). This station is located in an urban residential area of Del Rio adjacent to a city park. DDT was found in two urban tributaries, Manadas and Chacon Creeks in Laredo. Warehouses storing industrial materials, both products and raw, are located along Manadas and Chacon Creeks. Both creeks have golf courses located nearby (personal communication, Alicia Reinmund, TNRCC, Austin). DDE was found in sediments of the Río Conchos near the mouth (3a), downstream of Presidio/ Ojinaga (4), Arroyo el Coyote in Nuevo Laredo (11c), at the headwaters of International Falcon Reservoir (12.2), Arroyo los Olmos near Rio

TABLE 43
CONTAMINANTS DETECTED IN SEDIMENT
El Paso/Ciudad Juárez to Brownsville/Matamoros

Contaminant	Mainstem		Tributary	
Aluminum	X		X	
Antimony	X		X	Ž
Arsenic	X	Ž	X	Ž
Cadmium	X		X	
Chromium	X	Ž	X	Ž
Copper	X	Ž	X	Ž
Lead	X	Ž	X	Ž
Mercury	X			
Nickel	X	Ž	X	Ž
Selenium	X			
Silver	X	Ž	X	Ž
Thallium	X			
Zinc	X	Ž	X	Ž
Alpha BHC (lindane)	X			
Chlordane	X		X	Ž
DDT	X		X	Ž
DDE	X		X	Ž

X = detected; Ž = exceed screening level

Grande City (12d), and el Anhelo Drain near Reynosa (15a). These areas receive a mixture of agricultural and urban runoff. The USEPA banned the use of DDT in 1972 and chlordane in 1983. DDT and its breakdown products, DDE and DDD, along with chlordane are known to persist in the environment for many years (USEPA 1980i).

Metals

Metals were the most common of the contaminants found in sediment. Nickel, arsenic, chromium, copper, lead, and zinc were the most commonly occurring metals, and were detected in all 33 samples (Table 43). Copper, lead, nickel, and zinc exceeded screening levels in 8 to 16 samples. Arsenic was found slightly above the screening level at two stations. Chromium did not exceed sediment screening levels. Silver was detected in 12 samples and exceeded screening levels at 10 sites. Cadmium was also detected in all 33 samples but exceeded screening levels at three sites. Mercury was detected in 23 of 33 samples but did not exceed screening levels. Selenium, found in 31 of 33 samples, did not exceed screening level concentrations (APPENDIX P).

Most metals are common in rocks and soils in addition to being common components of numerous industrial manufacturing processes. Arsenic enters the environment from soil erosion, pesticide application, and coal fired power plant emissions (USEPA 1980c; U.S. Department of Health and Human Services 1993a). Nickel can be found in all soils, is the 24th most abundant metal on earth, and is a component of many commonly used products. Chromium, also a naturally occurring element, can be a by-product of the burning of fossil fuels, and of many manufacturing processes. Copper is extremely common in rocks and soils and is a common component of industrial and municipal wastewater discharges. Lead, a common component of numerous minerals, has many industrial uses. Zinc, one of the earths most common elements has many commercial uses (USEPA 1980g, 1980h, 1980m, 1980s, and 1986).

All of these metals can enter the aquatic environment through stormwater/urban runoff, soil erosion, air emissions and wastewater discharges. The widespread occurrence of these metals in the Rio Grande/Río Bravo system suggests a combination of natural and manmade sources.

FISH TISSUE

Fish tissue samples were collected from 24 mainstem sites and two tributary sites; San Felipe Creek and the Río Conchos. Fish tissue samples were analyzed for the same parameters run on water and sediment. Twenty-seven toxic contaminants were detected in 68 samples (33 edible tissue and 35 whole tissue samples). Four of the 68 samples were analyzed for metals only. Of the 27, 13 exceeded criteria/screening concentrations. Eleven of the 13 contaminants were found at mainstem stations: arsenic, cadmium, chromium, copper, lead, mercury, selenium, zinc, chlordane, DDE and aroclor 1260. Six of the 13 were found at tributary stations: cadmium, chromium, selenium, zinc, chloroform and benzene (Table 44).

Organics

Six of the 27 contaminants detected were organics. Three of the six exceeded criteria/screening levels: chloroform, benzene, and aroclor 1260. Chloroform and benzene were found in San Felipe Creek (7b.1) in Del Rio. There was no obvious source for these compounds. Neither of these compounds has the tendency to bioaccumulate in tissue. Chloroform and benzene were found in whole and edible tissue samples. Toluene was also detected at this station but no exceedances were noted. Aroclor 1260, a PCB, was detected in a whole snook sample from Station 18 just south of Brownsville/ Matamoros. Aroclor 1260 exceeded the United States Fish and Wildlife Service predator protection limit. Aroclor 1248 and 1260 were detected once each in fish tissue but not in water or sediment.

Pesticides

Seven pesticides were detected but only two exceeded criteria/screening level concentrations: chlordane and DDE (Table 44). Chlordane was detected in six of 62 samples, and exceeded criteria/screening level concentrations in one carp edible tissue sample from Station 16 (downstream of Anhelo Drain near Reynosa). The reach below International Falcon Reservoir is heavily influenced by agricultural runoff and irrigation return flows.

TABLE 44
CONTAMINANTS DETECTED IN FISH TISSUE
El Paso/Ciudad Juárez to Brownsville/Matamoros

Contaminant	Mainstem		Tributary	
Aluminum	X		X	
Antimony	X		X	
Arsenic	X	Ž	X	
Cadmium	X	Ž	X	Ž
Chromium	X	Ž	X	
Copper	X	Ž	X	Ž
Lead	X	Ž	X	
Mercury	X	Ž	X	
Nickel	X			
Selenium	X	Ž	X	Ž
Silver	X		X	
Thallium	X			
Zinc	X	Ž	X	Ž
Cyanide	X			
Phenolics Recoverable	X			
Chloroform			X	Ž
Benzene			X	Ž
Toluene	X			
Chlordane	X	Ž		
Diazinon	X			
Dieldrin	X			
DDT	X		X	
DDE	X	Ž	X	
DDD	X			
Endosulfan Alpha	X			
Endrin	X			
Aroclor 1248	X			
Aroclor 1260	X	Ž		

X = detected; Ž = exceed screening levels

Edible tissue criterion for DDE were exceeded in (carp and carpsucker) samples from Station 3 and Station 4, upstream and downstream of Presidio/Ojinaga. This breakdown product of DDT is known to persist in the environment for years, and to bioaccumulate in fish tissue. It should be noted that although DDE exceeded criteria/screening levels at only two stations, was detected in 57 of 62 samples. DDT and DDD were detected four and seven times, respectively, but there were no exceedances. Other pesticides detected, endosulfan alpha, diazinon, dieldrin and endrin, were found in only one or two of the 62 samples (APPENDIX P).

Metals

Seven of 13 metals detected exceeded criteria/screening levels: arsenic, cadmium, copper, lead, mercury, selenium and zinc (Table 44). The two most common metals were copper and zinc in whole body samples, primarily carp. In the El Paso/Ciudad Juárez area, cadmium, copper, and zinc were found in whole body carp samples. In the Presidio/ Ojinaga-Big Bend National Park area, cadmium, copper, selenium, and zinc were found in whole body carp (and one smallmouth buffalo) samples, and one carp edible tissue sample. Selenium was found only at sites immediately upstream and downstream of the Río Conchos confluence, and in the Río Conchos itself. Arsenic, cadmium, lead and mercury were found in two to four samples. Arsenic, chromium and mercury were found from International Amistad Reservoir to Laredo/Nuevo Laredo, mainly in whole fish samples (although arsenic and mercury were also found in one edible tissue sample each)(APPENDIX J). Other metals detected were antimony, aluminum, nickel, silver and thallium. Reflecting on water and sediment data, it is not surprising that metals were also common in fish tissue samples. The widespread occurrence of metals in the study area suggests a combination of natural and manmade sources.

POTENTIAL SOURCES OF TOXIC SUBSTANCES IN THE RIO GRANDE/RIO BRAVO AND TRIBUTARIES

Due to the variety of activities occurring in the Rio Grande/Río Bravo basin, it is difficult to pinpoint exact sources of a particular contaminant. This study should be considered a starting point, and not the answer to all of the water quality issues facing the Rio Grande/Río Bravo. Concerns identified in the multiple phases of this study help focus resources on those sites, and those contaminants most likely to impair water quality. A discussion of contaminant sources in relation to sample stations in located in Table 45. Potential sources of individual toxic substances and potential adverse affects are outlined in Table 46.

TOXIC SUBSTANCES OF POTENTIAL CONCERN IN THE RIO GRANDE/RIO BRAVO AND TRIBUTARIES

The 28 toxic chemicals that exceeded criteria/screening levels (in water, sediment, and/or fish tissue) can be considered of potential concern to the Rio Grande/Río Bravo system. These chemicals were assigned a relative level of importance based on the location and number of occurrences. The most commonly occurring of the toxic substances to exceed criteria/screening levels in the mainstem all were metals: arsenic, nickel, chromium, lead, copper, zinc, and silver. Metals also were the most common toxic substances to exceed criteria/ screening levels at tributary sites, including arsenic, nickel, chromium, lead and zinc (Table 47).

TOXICITY

Water

Of 37 stations from which water samples were tested, toxicity was found in 12 instances (Table 48). Affected sites included two mainstem stations between Presidio /Ojinaga and Big Bend National Park, and ten tributary stations.

One hundred percent mortality of water fleas and fathead minnows at Stations 1a, 2a, 11c and 15a (treated and untreated wastewater discharges from El Paso, Ciudad Juárez, Nuevo Laredo and Reynosa) was an effect of elevated unionized ammonia and chloride concentrations, both of which exceeded aquatic life criteria. Stations 1a, 11c and 15a had levels of unionized ammonia that exceeded acute and chronic aquatic life criteria; at Station 2a, only the chronic aquatic life criterion was exceeded. Chloride exceeded the chronic aquatic life criterion at all four stations. Arsenic was also present but did not exceed aquatic life criteria. Nickel and phenol exceeded state 85th percentiles at Station 2a, and may have contributed to the overall toxic effect on fathead minnows and water fleas (Table 48).

Only water fleas were affected at Stations 4, 5, 10a, 11b, 11b.1, and 11b.3. At Stations 4 (downstream of Presidio) and Station 5 (in Big Bend National Park), water fleas exhibited a reduction in the number of young per female. These were the only stations where a significant effect other than mortality was observed. The two most obvious contributing factors were elevated chloride and total dissolved solids concentrations. Elevated TDS and chloride levels are a common problem in the Rio Grande/Río Bravo (TNRCC 1994a; TNRCC 1994b; Miyamoto *et al*. 1995). Use and reuse of river water for irrigation, oil and gas wells, industrial and municipal wastewater discharges,
and the natural occurrence of salts in surrounding soils contribute to this problem.

Approximately one month following sample collection a fish kill in Big Bend National Park portion of the river was reported to Texas Parks and Wildlife. No definite cause was identified, however, a bloom of toxic algae (*Prymnesium parvum*) was considered a potential cause. In the past, *Prymnesium parvum* has been cited as a cause of fish kills on the Pecos River, and is usually associated with increased salinity (personal communication, TPWD). This may have contributed to the significant effect noted on the water flea toxicity test.

One hundred percent mortality of water fleas was found for Stations 10a, 11b, 11b.1 and 11b.3. Stations 10a and 11b are urban creeks within Laredo (Manadas and Chacon). Stations 11b.1 (Laredo Zacate Creek WWTP) and 11b.3 (Manhole 115, Nuevo Laredo) were treated wastewater discharges from Laredo and untreated discharges from Nuevo Laredo, respectively (Table 48).

Elevated chloride and TDS were the probable cause of toxicity to water fleas. Excessive chloride concentrations in freshwater can adversely affect aquatic organisms. Freshwater invertebrates tend to be more sensitive to chlorides than vertebrates (USEPA 1988). Arsenic was elevated in water but did not exceed aquatic life criteria. Unionized ammonia was not a factor at Stations 10a, 11b and 11b.1, but was at Station 11b.3 (Table 48). Unionized ammonia and chloride were present at other stations but did not exert significant effects on the test organisms. Industrial and municipal wastewater can contain thousands of chemicals with only a few causing aquatic toxicity. Many parameters in water including total organic carbon (TOC), total suspended solids (TSS), pH, and hardness can have a strong effect on toxicity (Rand 1995).

Toxic effect is dependent upon the synergistic (total effect > sum of the individual effects), and antagonistic (interaction of two or more substances) activities of the toxicants present (Rand 1995). Although unionized ammonia was elevated at Station 2 (downstream of the El Paso Haskell Street WWTP) toxic effects were not observed in water. Wastewaters containing toxicants are influenced by mixing, by effluent characteristics, and by receiving stream characteristics, all of which can produce toxicity levels different from pure compounds (Rand 1995). In this case, undiluted effluent from the El Paso Haskell Street WWTP had a greater effect on test organisms than did the mixture of effluent and river water downstream.

Sediment

In sediment elutriate tests, significant effects occurred to fathead minnows in samples from Stations 2, 2a, 9a, 11c and 15a. All but Station 2 were untreated wastewater discharges from Ciudad Juárez, Piedras Negras, Nuevo Laredo and Reynosa, respectively. Station 2, located downstream of El Paso at Zaragosa Bridge, was the only mainstem station where significant effects occurred in sediment samples (Table 48). Copper, lead, nickel and zinc were elevated in sediment at Station 2, which is influenced by wastewater discharges and urban stormwater runoff (Table 52). Copper, silver and DDE were elevated at Station 2a. Any one and/or combination of metals found could have caused a toxic effect. Arsenic and nickel have high acute and chronic toxicity to aquatic life, while silver has high chronic toxicity which is dependent on pH (University of Virginia database) (Table 46). Metals at Stations 9a, 11c and 15a were not elevated.

TABLE 45
POTENTIAL SOURCES OF CONTAMINANTS BY STATION FROM PHASE 2
OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

STATION	POTENTIAL SOURCES OF CONTAMINATION AT STUDY SITES
Station 0.5a - Montoya Drain, near Texas/New Mexico state line	Originates in New Mexico. A horse race track facility is located upstream of the site, and El Paso Electric is located downstream. The area is influenced by urban and agricultural runoff.
Station 1 - Rio Grande/Río Bravo at Courchesne Bridge in El Paso	No potential sources were located immediately adjacent to this site but it was surrounded by disturbed urban setting. This site is influenced by flows coming from Elephant Butte Dam in New Mexico. The use of water for irrigation upstream contributes large volumes of irrigation return flow and agricultural runoff. The Rio Grande/Río Bravo also receives urban runoff and wastewater discharges from the Cities of Anthony, Canutillo and El Paso.
Station 1.1 -Rio Grande/Río Bravo Upstream of El Paso WWTP	Vehicle traffic is heavy in the surrounding area. The El Paso/Ciudad Juárez border crossings are the most heavily used on the Texas/Mexico border. In 1994, 15,747,393 passenger vehicles and 580,200 trucks crossed the border at El Paso/Ciudad Juárez, second only to San Ysidro/Otay Mesa, California (USEPA 1996). The area is also affected by urban runoff.
Station 2 -Rio Grande/Río Bravo at Zaragosa International Bridge in El Paso/Ciudad Juárez.	This area is influenced by urban runoff, wastewater discharges from the El Paso Haskell Street WWTP and runoff from industrial facilities on both sides of the border.
Station 2a - Ciudad Juárez Wastewater Canal.	Receives large amounts of wastewater from domestic and industrial sources. Although future plans include wastewater treatment plants for the Mexican border cities, the Ciudad Juárez Wastewater Canal carried untreated wastewater during this phase of the study.
Station 3- Rio Grande/Río Bravo Upstream of Presidio/Ojinaga	This area is mostly influenced by agricultural activities, predominantly rangeland with some irrigated croplands. Mining and industry occur in the area.
Station 3a- Río Conchos Near Mouth.	Located near Presidio/Ojinaga. Surrounding area is predominantly rangeland with some irrigated cropland. Might also be affected by runoff from Ojinaga.
Station 3a.1-Río Conchos 25 km Upstream of Mouth near Ojinaga.	Area is outside of Ojinaga. Surrounding area is predominantly rangeland with some irrigated cropland.
Station 4-Rio Grande/Río Bravo Upstream of Presidio/Ojinaga	The area is also predominantly rangeland but is also influenced by urban runoff and wastewater discharges. Some mining in the area.
Station 5- Rio Grande/Río Bravo at Santa Elena Canyon in Big Bend National Park	Area is predominantly used for recreation with some rangeland activities upstream. Some mining may occur outside of Big Bend National Park. One of the least impacted areas in the study.
NOTE: The stations from El Paso to Big Bend National Park were sampled under low flow conditions; however, high flows dominated this reach for months before flows returned to normal. High flows were due to large releases from Elephant Butte Reservoir. This may have had an impact on what was found in water and sediment samples.	
Station 6.1-International Amistad Reservoir in the Rio Grande Arm	Influenced by inflow from Rio Grande/Río Bravo. Area is mostly used as rangeland and for recreation. Air deposition from industry may have a long-term impact on the reservoir.
Station 6.2-International Amistad Reservoir in the Devils River Arm	Influenced by inflow from Devils River. Area is mostly used as rangeland and for recreation. Air deposition from industry may have a long-term impact on the reservoir.

TABLE 45 (cont)
POTENTIAL SOURCES OF CONTAMINANTS BY STATION FROM PHASE 2
OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

STATION	POTENTIAL SOURCES OF CONTAMINATION AT STUDY SITES
Station 7-Rio Grande/Río Bravo Upstream Del Rio/Ciudad Acuña	Heavily influenced by releases from International Amistad Reservoir. Upstream of wastewater discharges.
Station 7b-San Felipe Creek Lower	Located in a more rural part of Del Rio. Surrounding land use is rangeland.
Station 7b.1-San Felipe Creek Mid	Located in an urban residential section of Del Rio. Main impact urban/stormwater runoff.
Station 7b.2-San Felipe Upper	Located next to major highway in Del Rio. Influenced by urban/stormwater runoff. No wastewater discharged to this creek. Wastewater was discharged to the creek prior to 1990's.
Station 8-Rio Grande/Río Bravo Upstream of Del Rio/Ciudad Acuña	Located downstream of the wastewater discharges and urban runoff from Del Rio/Ciudad Acuña. Acuña has 50 maquiladoras located upstream of the site, primarily textiles, electronics, leather and plastics.
Station 9-Rio Grande/Río Bravo at US 57 in Eagle Pass/Piedras Negras	Located upstream of Eagle Pass/Piedras Negras wastewater discharges. Surrounding land is primarily used for rangeland and some irrigated crops.
Station 9a-Arroyo el Tornillo in Piedras Negras	Used to carry untreated wastewater from Piedras Negras wastewater lagoons.
Station 10-Rio Grande/Río Bravo Downstream of Eagle Pass/Piedras Negras	Located downstream of Eagle Pass/Piedras Negras wastewater discharges. Piedras Negras has 43 maquiladoras, primarily transportation equipment and food processing.
Station 10a - Manadas Creek in Laredo	Carries stormwater and urban runoff from a heavily industrialized area of Laredo.
Station 11-Rio Grande/Río Bravo Upstream of Laredo/Nuevo Laredo	Located upstream of Laredo/Nuevo Laredo and above wastewater discharges.
Station 11a- Zacate Creek in Laredo	Located in Laredo. Influenced by WWTP discharges and urban/stormwater runoff.
Station 11b -Chacon Creek in Laredo	Located in Laredo. Influenced by urban/stormwater runoff.
Station 11b.1-Laredo Zacate Creek WWTP	WWTP located in Laredo. Discharges to Zacate Creek upstream of Station 11a.
Station 11b.2-Laredo Southside WWTP	WWTP located downstream of Laredo. Discharges upstream of Station 12.
Station 11b.3-Manhole 115 of the Nuevo Laredo Wastewater Collection System	Untreated wastewater discharge point for Nuevo Laredo. Located upstream of Stations 12 and 12.1.
Station 11c- Arroyo el Coyote in Nuevo Laredo	Untreated wastewater discharge point for Nuevo Laredo. Located upstream of Stations 12 and 12.1.
Station 12 -Rio Grande/Río Bravo 13.2 km downstream of Laredo/ Nuevo Laredo	Located downstream of Laredo/Nuevo Laredo. Laredo discharges 29 MGD (treated wastewater), and Nuevo Laredo 25-30 MGD (untreated wastewater-at the time of the study) upstream of this site.

TABLE 45 (cont)

POTENTIAL SOURCES OF CONTAMINANTS BY STATION FROM PHASE 2
OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

STATION	POTENTIAL SOURCES OF CONTAMINATION AT STUDY SITES
Station 12.1 -Rio Grande/Río Bravo 25 km downstream of Laredo/Nuevo Laredo	Located further downstream of Station 12. Same impacts.
Station 12.2-International Falcon Reservoir Headwaters	Influenced by inflow from Laredo/Nuevo Laredo. Area primarily used as rangeland and for recreation.
Station 12.3-International Falcon Reservoir near Dam	Influenced by inflow from Texas/Mexico. Area primarily used as rangeland and for recreation.
Station 12d-Arroyo los Olmos near Rio Grande City	Located near Rio Grande City. Influenced by urban/stormwater runoff. Area rural, residential development, and rangeland.
Station 13-Rio Grande/Río Bravo at SH 886 near Los Ebanos	Influenced by releases from Falcon Reservoir. Surrounding area primarily agricultural.
Station 14-Rio Grande/Río Bravo Downstream of Anzalduas Dam	Located upstream of McAllen/Reynosa and upstream of wastewater discharges from these cities. Surrounding area primarily agricultural.
Station 15-Rio Grande US 281 at Hidalgo/Reynosa	Located at border crossing. Influenced by urban/stormwater runoff.
Station 15a -El Anhelo Drain in Reynosa	Carries untreated wastewater from Reynosa.
Station 16-Rio Grande/Río Bravo Downstream of el Anhelo Drain	Located downstream of El Anhelo Drain discharge. Reynosa has 78 maquiladoras. Also influenced by urban/stormwater runoff and agricultural runoff.
Station 17-Rio Grande/Río Bravo Downstream of San Benito	Land is primarily irrigated cropland. Influenced by irrigation return flows and urban/stormwater runoff from Harlingen/San Benito area.
Station 18-Rio Grande/Río Bravo Downstream of Brownsville/ Matamoros	Located downstream of Brownsville/Matamoros. Influenced by urban/stormwater runoff. Matamoros has 111 maquiladoras but most of the wastewater flows toward the Gulf of Mexico. May also be influenced by irrigation return flows.

TABLE 46
SOURCES/USES FOR TOXIC SUBSTANCES DETECTED IN THE
RIO GRANDE/RIO BRAVO DURING PHASE 2 OF TOXIC SUBSTANCE STUDY
5/95 to 12/95

Parameter	Sources/Uses	Environment/Health Effects
Aluminum	***Sources*** Occurs naturally, one of most abundant metals. Found in combination with other rocks and minerals; mined from bauxite. ***Uses***: Cooking utensils, containers, appliances, airplanes and building materials; in paints, fireworks, and production of glass, rubber, and ceramics; in combination with other chemicals, used in antacids (aluminum hydroxide), deodorants (aluminum chlorohydrate), and to treat drinking water (aluminum sulfate), baking powder, fireproofing, tanning, dyes, catalysts, and medicines. Î Ð	May be present in the aquatic environment due to erosion, mining, and industrial/municipal wastewater treatment plant (WWTP) effluent; common in point and nonpoint source discharges; solubility in lakes, streams, and rivers depends on pH; moderate acute effect on aquatic life and high acute toxicity to birds; high chronic toxicity to aquatic life; very persistent in water; does not bioaccumulate in fish tissue. Î Ð
Antimony	***Sources***: Element occurs naturally as a component of certain minerals; little mined in the United States; brought in from other countries for processing; some companies in the United States produce antimony as a by-product of smelting lead and other metals. ***Uses***: Used as a flame retarding agent; used to form metal alloys with lead, bismuth, tin, copper, nickel iron, and cobalt; used in the manufacture of bearings, ammunition, sheet and pipe metal, castings, pewter and batteries; manufacture of fireworks and matches; used in paints, ceramics, plastics, metal and glass. Î Ï Ð	Enters the aquatic environment from weathering of rocks, runoff from soils and effluents from mining and manufacturing operations, municipal and industrial WWTP effluent; high acute and chronic toxicity in aquatic life. Î Ï Ð
Arsenic	***Sources***: Naturally occurring element; common in areas with volcanic activity; ***Uses***: Mainly used to preserve wood; used in insecticides and weed killers; veterinary uses; used to make glass, cloth, and electrical semiconductors. Î ÐÑ	Carcinogen; dissolves in water; changes from one form to another; persistent in water; can bioaccumulate in fish and shellfish tissue; enters environment mainly from use as a pesticide, industrial/municipal WWTP effluent, and emissions from coal fired power plants; erosion; certain forms have a high acute and chronic toxicity in aquatic life. Î ÐÑ
Beryllium	***Sources***: Found in mineral rocks, coal, and soil; beryllium compounds are commercially mined ***Uses***: Purified form used in electrical parts, machine parts, ceramics, aircraft parts, nuclear weapons, and mirrors. Î Ï Ð	Carcinogen; enters water from weathering of rocks, runoff from soils and industry; mainly settles to the bottom in water; does not bioaccumulate in fish tissue. Î Ï Ð

TABLE 46 (cont)
SOURCES/USES FOR TOXIC SUBSTANCES DETECTED IN THE
RIO GRANDE/RIO BRAVO DURING PHASE 2 OF TOXIC SUBSTANCE STUDY
5/95 to 12/95

Parameter	Sources/Uses	Environment/Health Effects
Cadmium	***Sources:*** Natural element in the earth's crust; usually found as a mineral combined with other elements; all soils and rocks, including coal and mineral fertilizers contain some cadmium ***Uses***: Cadmium does not corrode easily and has many uses in industry and consumer products; batteries, pigments, photoelectric cells, process engraving, electroplating, metal alloys, metal coatings, and plastics. Î ÏÐÑ	Carcinogen; enters the air from mining, industry and the burning of coal and household waste; enters water from metal plating industry effluent and municipal WWTP effluent; doesn't break down in the environment, very persistent in water; bioaccumulates in tissue; high acute and chronic toxicity to aquatic life. Î ÏÐÑ
Chromium	***Sources***: Naturally occurring element in rocks, plants, animals, volcanic dust, and gases; manufacturing, disposal of products or chemicals containing chromium or burning of fossil fuels release chromium to the air, soil, and water ***Uses***: Making steel and other alloys, bricks in furnaces, dyes and pigments, chrome plating, leather tanning, and wood preserving. Î ÏÐÑ	Carcinogen and Mutagen; a small amount dissolves in water; rest settles to the bottom; chromium does not accumulate in fish tissue; very persistent in water; more toxic in soft water than hard; chromium (III) has a moderate acute toxicity and high chronic toxicity to aquatic life and chromium (VI) has high acute and chronic toxicity to aquatic life. Î ÏÐÑ
Copper	***Sources:*** Extremely common in rocks and soil; corrosion of brass and copper pipes and tubes, industrial/municipal WWTP discharges, the use of copper compounds as aquatic algicides ***Uses***: Smelting and refining industries, copper wire mills, coal burning industries, and iron and steel production. Î ÏÐ	One of the most common contaminants of urban runoff; enters natural waters by runoff, industrial/municipal WWTP effluent or by atmospheric fallout from industry; rainfall may be a significant source of copper to the aquatic environment in industrial and mining areas; industrial and municipal discharges. Î ÏÐ
Lead	***Sources:*** Lead is a major constituent of > 200 identified minerals. Only three are found in sufficient abundance to form mineral deposits ***Uses***: Lead pipe, lead lined containers for corrosive gases and liquids, paint, pigments, alloys used in metallurgy, storage batteries, ceramics, electronic devices, and plastics. ÎÐ	Teratogen; reaches the aquatic environment through rainfall, fallout of lead dust, urban runoff and both industrial and municipal WWTP discharges. ÎÐ

TABLE 46 (cont)
SOURCES/USES FOR TOXIC SUBSTANCES DETECTED IN THE
RIO GRANDE/RIO BRAVO DURING PHASE 2 OF TOXIC SUBSTANCE STUDY
5/95 to 12/95

Parameter	**Sources/Uses**	**Environment/Health Effects**
Mercury	***Sources***: Occurs naturally, runoff from urban and industrial sources, municipal and industrial discharges ***Uses***: Major use is as a cathode in the preparation of chlorine and caustic soda, electrical components, industrial control instruments (switches, thermometers, and barometers), pulp and paper manufacture, mining, pharmaceuticals, and general laboratory uses. Î Ï Ð	Several forms, ranging from elemental to dissolved organic and inorganic, occur in the environment; Certain microorganisms have the ability to convert the organic and inorganic forms to highly toxic methyl and dimethyl mercury has made all forms of mercury highly hazardous to the environment. Î Ï Ð
Nickel	***Sources:*** Weathering of rocks, rainfall and runoff; 24th most abundant mineral and can be found in all soils; ***Uses***: Nickel is combined with other metals to form alloys; the most common alloy is nickel-iron used to make stainless steel; other alloys are used to make coins, jewelry, plumbing, and heating equipment, gas-turbine engines and electrodes; nickel compounds are also used in plating, to color ceramics, and to make some batteries. Î Ï Ð	Carcinogen; one of the most common metals in surface water; burning of coal and other fossil fuels; discharges from industry (electroplating and smelting); does not bioaccumulate in fish tissue; nickel common in air and is washed out by rain or snow; most ends up attached to soil or sediment particles; high acute and chronic toxicity in aquatic life. Î Ï Ð
Selenium	***Sources***: Major source is the weathering of rocks and soil, abundant in the drier soils for North America from the Great Plains to the Pacific Ocean; human activities contribute approx. 3,500 metric tons/year; mining or smelting of certain ores; present in coal, and fuel oil ***Uses***: Photocopying, the manufacture of glass, electronic devices, pigments, dyes, and insecticides. Ï Ð	Runoff; natural weathering of soils and rocks; industrial/municipal WWTP effluent; trace amounts essential for plants and animals; high acute and chronic toxicity in aquatic life. Ï Ð
Silver	***Sources***: Occurs in pure form or in ores; ***Uses***: Photographic material, electroplating, as a conductor, in dental alloys, solder and brazing alloys, paints, jewelry, silverware, coinage, and mirror production. Ï Ð	Usually found in low concentrations in the aquatic environment; sorption and precipitation processes reduce dissolved silver concentrations in water which result in higher concentrations in sediments; high chronic toxicity to aquatic life; toxicity depends on the hardness of the water. Ï Ð

TABLE 46 (cont)
SOURCES/USES FOR TOXIC SUBSTANCES DETECTED IN THE
RIO GRANDE/RIO BRAVO DURING PHASE 2 OF TOXIC SUBSTANCE STUDY
5/95 to 12/95

Parameter	Sources/Uses	Environment/Health Effects
Thallium	***Sources:*** Found in trace amounts in the earth's crust; once obtained as a by-product from smelting of other metals but has not been produced in the United States since 1984; all thallium is currently obtained from imports and thallium reserves ***Uses***: Manufacturing electronic devices mainly for the semiconductor industry; limited use in the manufacture of special glass and some medical procedures. Î Ï Ð	Enters the environment mainly from coal burning and smelting; usually a trace contaminant; persists in air, water and soil of long periods of time; absorbed by plants and enters the food chain; builds up in fish and shellfish; high acute and chronic toxicity to aquatic life. Î Ï Ð
Zinc	***Sources:*** One of the earths most common elements; found in air, soil, and water and is present is all foods ***Uses***: Many commercial uses; as coating to prevent rust, in dry cell batteries, mixed with other metals to make alloys like brass and bronze; zinc compounds are widely used to make paint, rubber, dye, wood preservatives, and ointments. Î Ï Ð	Enters the environment by natural processes in addition to activities like mining, steel production, coal burning and waste burning; builds up in fish and other organisms; readily transported in most natural waters-groundwater, lakes, streams and rivers. Î Ï Ð
Cyanide	***Sources:*** Most cyanides come from industrial processes; small amounts of cyanide occur naturally in almonds, lima beans, cassava, and in the pits of apricots and peaches; certain bacteria, fungi, and algae also produce cyanide. ***Uses***: Used extensively in the chemical industry to make nylon and other chemicals; metal cyanides are used in electroplating and metallurgy. Î Ñ	Cyanide does not bioaccumulate in fish tissue; small organisms in water and soil convert some cyanides to less harmful chemicals. Î Ñ
Toluene	***Sources:*** Formed during the production of gasoline and other fuels from crude oil; making coke from coal and a by-product in the manufacture of styrene ***Uses***: Making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber; used in some printing and leather tanning processes. Î Ð	Enters the environment mainly from industrial discharges; does not persist in the environment; readily broken down by microorganisms; evaporates quickly from soil and surface water; moderate acute and chronic toxicity to aquatic life. Î Ð
Phenol	***Sources:*** Common component of oil refinery wastes; produced in the conversion of coal into gaseous or liquid fuels and in the production of metallurgical coke from coal; produced in large volumes; ***Uses***: Mostly used as an intermediate in the production of other chemicals.	Enters the environment from oil refinery discharges, coal conversion plants, industrial/municipal WWTP effluent and spills.

TABLE 46 (cont)
SOURCES/USES FOR TOXIC SUBSTANCES DETECTED IN THE
RIO GRANDE/RIO BRAVO DURING PHASE 2 OF TOXIC SUBSTANCE STUDY
5/95 to 12/95

Parameter	Sources/Uses	Environment/Health Effects
Chloroform	***Sources:*** Naturally occurring but most of the chloroform that gets into the environment is manufactured ***Uses***: Used to make other compounds; small amounts are formed when chlorine is added to water (chlorine is used as a disinfectant at wastewater and water treatment plants, swimming pools and spas); used as a solvent, an anesthetic, a cleansing agent, and in fire extinguishers, in making dyes, drugs and pesticides. Î Ï Ð	Carcinogen; numerous ways for chloroform to get into the environment; enters air and water from industry, leaky storage containers and waste disposal; evaporates quickly (mostly in the air); dissolves easily in water; does not persist in water; does not bioaccumulate in plants and animals; moderate acute and chronic toxicity. Î Ï Ð
Bromo-dichloro-methane	***Sources:*** Manmade ***Uses***: Used as a chemical intermediate, solvent, and fire extinguisher fluid ingredient. Ð	Carcinogen; highly soluble in water; does not persist in water; most ends up in the air; can bioaccumulate in tissue, concentrations in fish tissue higher than in the surrounding water; enters the environment through industrial discharges and spills; moderate acute and chronic toxicity to aquatic life. Ð
N-Nitrosodi-n-Propylamine	***Sources***: Manmade. ***Uses***: Used for research purposes, as a synthetic intermediate or as a solvent in chemical manufacture. Ð	A carcinogen; enters the environment through industrial discharges and spills; does not persist in water; about 54 % will end up in air, 45 % in water and the rest in terrestrial soils and aquatic sediments; insufficient data to assess acute and chronic effects to aquatic life, plants, birds, or land animals; can bioaccumulate in tissue. Ð
Benzene	***Sources:*** Volcanoes and forest fires are examples of natural sources that release small amounts of benzene to the environment; found in crude oil and gasoline. ***Uses***: Used in industry to make chemicals for styrofoam, plastics, resins, nylon, and synthetic fibers; also used to make some types of rubber, lubricants, dyes, detergents, drugs, and pesticides. Î Ï Ð	Carcinogen and Mutagen; enters the environment from human and natural activities; liquid form mixes easily with air and water; benzene in water changes quickly to vapor; breaks down more slowly in water than air; plants and animals do not store high concentrations; high acute and chronic toxicity to aquatic life. Î Ï Ð

TABLE 46 (cont)
SOURCES/USES FOR TOXIC SUBSTANCES DETECTED IN THE
RIO GRANDE/RIO BRAVO DURING PHASE 2 OF TOXIC SUBSTANCE STUDY
5/95 to 12/95

Parameter	Sources/Uses	Environment/Health Effects
Xylene	***Sources***: mixture of three isomers of xylene (ortho,meta and para) with possible trace amounts of ethyl benzene. ***Uses***: Used as a solvent; in the production of organic chemicals used to make polyester fibers and to make dyes; sterilizing catgut and microscopy; used in making drugs, insecticides, and gasoline. Ð	Enters the environment from industrial discharges municipal wastewater treatment plant discharges or spills; high chronic toxicity to aquatic life; xylene does not persist in water; the concentration of xylene in fish tissue is expected to be somewhat higher than the average concentration of the surrounding water. Ð
1,4-Dichloro-benzene	***Sources***: Manufactures chemical ***Uses***: used to control moths, molds, and mildew; to deodorize restrooms and waste containers; when exposed to air the solid turns to a vapor, and the vapor deodorizes or kills insects. Î Ð	Most comes from the use as moth repellent products and toilet deodorizer blocks; breaks down to harmless product in about a month; does not dissolve easily in water; mostly found in the air; bioaccumulates in plants and fish; moderate acute toxicity and high chronic toxicity to aquatic life. Î Ð
Alpha Benzene Hexachloride (Lindane)	***Sources***: Manmade-organochlorine insecticide. Alpha BHC is one of five isomers of hexachlorocyclohexane ***Uses***: Broad spectrum insecticide; Lindane is the most common isomer. Ï	Enters the environment through runoff. Does not readily bioaccumulate. Ï
Chlordane	***Sources*** : Manmade, polycyclic chlorinated hydrocarbon group of pesticides ***Uses***: Broad spectrum pesticide; used extensively over the past 30 years for termite control, home and garden insecticide and the control of soil insects during crop production; EPA banned the use chlordane for all but termite control in 1983; in 1988 EPA banned all use of chlordane. Î Ï ÐÑ	Carcinogen; enters the aquatic environment from urban and agricultural runoff, can remain in the soil for over 20 years; breaks down very slowly; doesn't dissolve readily in water; bioaccumulates in fish, birds and animals; high acute and chronic toxicity to aquatic life. Î Ï ÐÑ
DDT **DDE** **DDD**	***Sources***: Manufactured chemical, (DDT=1,1,1-trichloro-2,2-bis (p-chlorophenyl) ethane) does not occur naturally in the environment; ***Uses***: Widely used to control insects on agricultural crops and disease carrying insects (malaria, typhus); due to damage to wildlife and potential harm to human health DDT was banned by the EPA in 1972, except for public health emergencies; DDT is still used in other countries. DDE and DDD are similar to DDT; DDD was also used to kill pests but has also been banned; DDE has no commercial use. Î Ï	Levels of DDT build up in plants and in the fatty tissues of fish, birds, and animals; DDT breaks down to form DDE and DDD; DDT in surface water can evaporate from surface water and can be broken down by sunlight and microorganisms; last a long time in soil. Î Ï

TABLE 46 (cont)
SOURCES/USES FOR TOXIC SUBSTANCES DETECTED IN THE
RIO GRANDE/RIO BRAVO DURING PHASE 2 OF TOXIC SUBSTANCE STUDY
5/95 to 12/95

Parameter	Sources/Uses	Environment/Health Effects
Diazinon	***Sources***: Manmade organophosphorus compound ***Uses***: Used extensively by commercial and home applicators to control flies, lice on sheep, insect pests of ornamental plants, food crops (corn, rice, onions, and sweet potatoes), forage crops (alfalfa); also control of nematodes and soil insects in lawns and agricultural land. Ñ	In water, diazinon breaks down to relatively nontoxic compounds with little known hazard potential to aquatic life but the degradation rate is highly dependent on pH; birds are more sensitive than mammals. Ñ
Dieldrin	***Sources:*** Manmade, does not occur in naturally in the environment. ***Uses***: Insecticide. From 1950 to 1970, aldrin and dieldrin were used from crops (ex:corn and cotton). Due to concerns about environmental damage and potential harm to human health, EPA banned all uses of aldrin and dieldrin in 1974 except for termite control. EPA banned all uses, in 1987. Î Ï	Dieldrin breaks down very slowly; binds tightly to soil; plants accumulate dieldrin from the soil; dieldrin accumulates in fat and leaves the body very slowly; aldrin quickly breaks down to dieldrin in the body and environment. Î Ï
Endosulfan Alpha	***Sources:*** Manufactured chemical ***Uses***: Endosulfan is a mixture of alpha and beta endosulfan; it has not been produced in the US since 1982; it is still used here to produce other chemicals; used as an insecticide to control insects on grain, tea, fruits, vegetables, tobacco, and cotton; in the US it is mainly applied to tobacco and fruit crops; it is also a wood preservative. Î Ï	Enters the environment primarily through spraying on farm crops; does not dissolve easily in water; stays in the soil for years before it breaks down; bioaccumulates in the bodies of fish and other organisms. Î Ï
Endrin	***Sources***: Manmade member of the chlorinated hydrocarbon group of pesticides; ***Uses***: Known uses in the US are as an avicide, rodenticide, and insecticide, the latter being the most common. The largest single use of endrin is to control Lepidopteran (butterflies and moths) larvae attacking cotton crops in the Mississippi delta states; broad spectrum pesticide. Ï	Enters the environment primarily as a result of direct application to soil and crops; waste material discharge from endrin manufacturing and container disposal are significant contributors to the environment; persists in the soil; has a high acute toxicity to aquatic organisms and mammals; insoluble in water. Ï

TABLE 46 (cont)
SOURCES/USES FOR TOXIC SUBSTANCES DETECTED IN THE
RIO GRANDE/RIO BRAVO DURING PHASE 2 OF TOXIC SUBSTANCE STUDY
5/95 to 12/95

Parameter	Sources/Uses	Environment/Health Effects
PCBs **(Polychlorinated Biphenyls)**	***Sources:*** A group of common industrial chemicals that share the same structure; do not occur naturally; aroclor is a popular trade name ***Uses***: Coolants, insulating materials and lubricants in electrical equipment. U.S. stopped manufacturing them in 1977 because of health effects. Pre-1977 products still contain PCBs-old fluorescent lighting fixtures, electrical devices or appliances with PCB capacitors, old microscope oil, and hydraulic fluids. **Î Ï ĐÑ**	Carcinogen and Teratogen; enter the environment leaking industrial and electrical equipment, industrial discharges, spills, leaching from landfills and previously contaminated sediments; contained in rain or snow runoff; adhere tightly to soil; small amounts dissolve in water; high acute and chronic toxicity to aquatic life; bioaccumulate in fish and other seafood; levels in fish can be 1000's of times higher than in water **Î Ï ĐÑ**
Bis (2-ethylhexyl) Phthalate	***Sources***:Manmade ***Uses***: Widely used in plastics; component of many products found in homes and automobiles and in the medical and packaging industries. **Đ**	Carcinogen and Teratogen; wide use and distribution; commonly found in water, sediment and tissue; persists in the environment. **Đ**

Î U.S. Department of Health and Human Services-ToxFAQs (1993)
Ï USEPA Ambient Water Quality Criteria (1980-1980s; 1985; 1986; 1986a)
Đ University of Virginia database-AQUIRE (USEPA) and New Jersey Dept of Health
Ñ USFWS Contaminant Hazard Reviews (Eisler 1985-1991)

TABLE 47
TOXIC CHEMICALS OF POTENTIAL CONCERN IDENTIFIED IN
PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

HIGH PRIORITY GROUP		
Includes 18 chemicals that exceeded criteria/screening levels in the mainstem of the Rio Grande/Río Bravo. They are listed from highest to lowest occurrence. ( ) indicates number of times criteria/screening level was exceeded.		
Arsenic (20)	Silver (7)	Chlordane (1)
Copper (15)	Unionized Ammonia (4)	Phenolics Recoverable (1)
Zinc (15)	Cadmium (4)	Bis(2-ethylhexyl) phthalate (1)
Lead (11)	DDE (3)	N-nitrosodi-n-propylamine (1)
Nickel (11)	Mercury (2)	
Chloride (9)	Selenium (2)	
Chromium (9)	Aroclor 1260 (1)	
MEDIUM PRIORITY GROUP		
Includes 2 chemicals that exceeded criteria/screening levels at multiple tributary sites. They are listed from highest to lowest occurrence. Thirteen chemicals occurring at multiple tributary sites were included in the high priority group; all listed metals, DDE, unionized ammonia, and chloride.		
Chloroform	DDT	
LOW PRIORITY GROUP		
Includes 8 chemicals that exceeded criteria/screening levels at a single tributary site, and not included in the high or medium priority groups. They are listed from highest to lowest occurrence.		
Antimony	Xylene	1,4-Dichlorobenzene
Benzene	Bromodichloromethane	Phenol Single Compound
Toluene	Dibromochloromethane	

TABLE 48
SUMMARY OF TOXICITY DATA AND
POTENTIAL CAUSES OF TOXICITY DETECTED IN THE
RIO GRANDE/RIO BRAVO DURING PHASE 2 OF TOXIC SUBSTANCE STUDY

Station	Organism Affected	Water	Sediment	Probable Cause
1a-El Paso Haskell Street WWTP	Fathead Minnow	T		100% mortality of fathead minnows; 100% mortality of water fleas; unionized ammonia exceeded the acute and chronic aquatic life criterion; arsenic and chloride possible stressors; arsenic exceeded human health criteria but not aquatic life; chloride exceeded the aquatic life chronic criterion
	Water Flea	T		
2-Rio Grande at Zaragosa Bridge-El Paso/Juárez	Fathead Minnow		T	100% mortality; arsenic, copper, lead, nickel, and zinc elevated in sediment; unionized ammonia, arsenic and chloride elevated in water; arsenic exceeded human health criteria but not aquatic life; possible combined effect
2a-Ciudad Juárez Wastewater Canal	Fathead Minnow	T	T	100% mortality in water and 70% in sediment-fathead minnows; 100% mortality in water-water fleas; ***water***-unionized ammonia, chloride in water exceeded chronic aquatic life criteria; arsenic, nickel, and phenol exceeded 85th percentiles in water; ***sediment***- copper, silver, and DDE exceeded sediment screening levels
	Water Flea	T		
4-Rio Grande Downstream of Presidio-Río Conchos Confluence	Water Flea	T		No mortality-reduced # of young/female; chloride exceeded the chronic aquatic life criterion; high TDS; arsenic in water was elevated (exceeded human health criteria but not aquatic life); arsenic, lead, and nickel elevated in sediment
5-Rio Grande at Santa Elena Canyon in Big Bend National Park	Water Flea	T		No mortality-reduced # of young/female; chloride exceeded the chronic aquatic life criterion; arsenic in water was elevated (exceeded human health criteria but not aquatic life); arsenic, lead, and nickel elevated in sediment.
9a-Arroyo el Tornillo in Piedras Negras	Fathead Minnow		T	87% mortality; metals did not exceed sediment screening levels; unionized ammonia and chloride exceeded the chronic aquatic life criteria; arsenic in water was elevated (exceeded human health criteria but not aquatic life)
10a-Manadas Creek in Laredo	Water Flea	T		100% mortality; high TDS; arsenic in water was elevated (exceeded human health criteria but not aquatic life); arsenic, antimony, chromium, lead, and nickel were elevated in sediment; DDT was found at 105 times the sediment screening level.

TABLE 48 (cont)
SUMMARY OF TOXICITY DATA AND
POTENTIAL CAUSES OF TOXICITY DETECTED IN THE
RIO GRANDE/RIO BRAVO DURING PHASE 2 OF TOXIC SUBSTANCE STUDY

Station	Organism Affected	Water	Sediment	Probable Cause
11b-Chacon Creek in Laredo	Water Flea	**T**		50% mortality; chloride exceeded the acute and chronic aquatic life criteria; high TDS; arsenic in water was elevated (exceeded human health criteria but not aquatic life); DDT in sediment was elevated (100 times screening level).
11b.1-Laredo Zacate Creek WWTP	Water Flea	**T**		100 % mortality; elevated TDS; arsenic in water was elevated (exceeded human health criteria but not aquatic life)
11b.3-Manhole 115 of Riverside Collection System, Nuevo Laredo	Water Flea	**T**		100 % mortality; unionized ammonia exceeded both the acute and chronic aquatic life criteria, chloride exceeded the chronic criterion; elevated TDS; arsenic in water was elevated (exceeded human health criteria but not aquatic life); toluene, xylene, and 1,4-dichlorobenzene were elevated
11c-Arroyo el Coyote, Nuevo Laredo	Fathead Minnow	**T**	**T**	100 % mortality in water and sediment-fathead minnow and water fleas; ***water***-unionized ammonia exceeded both the acute and chronic aquatic life criteria, chloride exceeded the chronic criterion; elevated TDS; arsenic in water was elevated (exceeded human health criteria but not aquatic life); chloroform was also elevated; ***sediment***-arsenic, chromium, lead, mercury, nickel, silver, zinc, and DDE exceeded screening levels.
	Water Flea	**T**	**T**	
15a-El Anhelo Drain-Reynosa	Fathead Minnow	**T**	**T**	100% mortality in water and 20% in sediment-fathead minnow; 100% mortality-water fleas; ***water***-unionized ammonia exceeded both the acute and chronic aquatic life criteria, chloride exceeded the chronic criterion; arsenic in water was elevated (exceeded human health criteria but not aquatic life); ***sediment***- chromium, nickel, silver, and DDE exceeded screening levels
	Water Flea	**T**		

T = Significant Effect; BLANK = No Significant Effect; SHADED = No Test Run

CHAPTER 7

BIOLOGICAL COMMUNITY SUMMARY

Benthic Macroinvertebrate Communities

Benthic macroinvertebrate samples were collected at 15 stations, including 11 mainstem stations and four tributary stations (Tables 1 and 5). A total of 33 individual Surber samples were collected from 11 of the 15 stations. Snag samples were collected at six stations.

Considering all samples collectively, a total of 32,095 benthic macroinvertebrates representing 20 orders, and approximately 120 taxa were collected (APPENDIX H). Taxa richness ranged from eight in the Surber sample from Station 3a to 51 in the Surber sample from Station 7b.1. Overall, in terms of relative numbers, Oligochaeta, the caddisfly *Smicridea* sp., and the chironomid *Orthocladius* sp. were the most abundant taxa, contributing 19.3%, 15.8%, and 19.4%, respectively of total numbers. Collectively, Oligochaeta, Trichoptera, and Chironomidae accounted for approximately 67.4% of the total collection.

A total of 190 taxa were reported for Phase 1 of the study (USEPA/IBWC 1994). Several factors contribute to the inter-phase difference in total number of taxa. A number of genera were split into several species in Phase 1 but left at genus in Phase 2; oligochaetes were identified to genus/species in Phase 1 but left at the order level in Phase 2; and 18 mainstem sites were samples in Phase 1 versus 11 in Phase 2. Based on the level of taxonomy used in Phase 2, approximately 132 taxa were collected in Phase 1.

Fourteen of the sixteen stations where benthic macroinvertebrate samples were collected are located in segments with a designated use specified in the Texas Surface Water Quality Standards (TSWQS). At eight (Stations 2, 5, 7b, 7b.1, 7b.2, 10, 12.1, and 16) of the fourteen stations, the aquatic life use determination was the same or higher than the designated use. At Station 2, both snag and Surber samples were collected, and both types of samples yielded a higher aquatic life use than that designated in the TSWQS. At the remaining six stations (1, 3, 4, 12, 14, and 18) the aquatic life use was lower than that designated in the TSWQS (Table 49).

Concentrations exceeding screening criteria for one or more toxic chemicals in sediment and/or water were noted at all stations at which benthic macroinvertebrates were collected. Among the eight stations at which the characteristics of the benthic macroinvertebrate community met those expected based on the designated use, the number of screening criteria accedences ranged from one at Station 7b.2 to nine at Station 2. At six stations at which the observed use did not meet the designated use, the number of accedences ranged from three at Station 12 to nine at Station 4.

Significant effects for toxicity tests were noted at three of the stations, Station 2 for the sediment elutriate test, and at Stations 4 and 5 for the toxicity in water test (Table 48). For each of these stations results for the benthic macroinvertebrate community surveys to some extent lend support to the laboratory toxicity results. It might be expected that snag habitats would provide some refuge from sediment toxicity. Thus, results at Station 2, indicating a higher aquatic life use for the snag sample than for the Surber sample, may corroborate the significant results of the sediment toxicity test. Although the mean point score for both the snag and the Surber reflect a higher use than designated, the snag sample indicated a high aquatic life use while the Surber mean point score was in the intermediate aquatic life use range. Taxa richness and density for the Surber sample at Station 2 were the lowest among all Surber samples. Also, EPT was relatively low in the Surber, and trophic structure was apparently imbalanced.

TABLE 49
SUMMARY OF MEAN POINT SCORES FOR BENTHIC MACROINVERTEBRATE SAMPLES COLLECTED DURING PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCES STUDY
(Includes data from Phase 1 for Comparison)

Station	Sample Type	Mean Point Score Phase 2	Aquatic Life Use Phase 2	Mean Point Score Phase 1	Aquatic Life Use Phase 1	Designated Use
1	Snag	2.33	I	3.00	H	H
2	Snag	2.67	H			
2	Surber	2.17	I	2.83	H	L
3	Surber	1.50	I	1.50	I	H
3a	Surber	1.33	L			
3a	Snag	2.00	I			
4	Surber	2.00	I	3.17	H	H
5	Surber	2.83	H	2.83	H	H
7b	Snag	2.67	H			H
7b.1	Surber	3.00	H			H
7b.2	Surber	3.33	H			H
10	Surber	3.67	E	3.33	H	H
12	Surber	2.00	I	2.67	H	H
12.1	Surber	3.00	H			H
14	Surber	2.33	I	3.67	E	H
16	Snag	3.00	H	2.50	H	H
18	Snag, Cane & Woody	2.00	I	2.33	I	H

E = EXCEPTIONAL
H = HIGH
I = INTERMEDIATE
L = LIMITED

At Station 4, the observed aquatic life use fell one category below that designated, primarily as a result of the concentration of numbers of individuals among only a few species, and imbalanced trophic structure. Despite the finding that the observed aquatic life use at Station 5 met the designated use, taxa richness and density were somewhat depressed.

Several correlations (Spearman Rank Order Correlation) were noted which may reflect some non-random changes in the integrity of the benthic macroinvertebrate community in response to variation in the occurrence of toxicants in water and/or sediment. Statistically significant ($p \le 0.10$) negative correlations were detected between the MPS and the concentration of arsenic in sediment (Spearman r = -0.50; $p = 0.04$), the sediment toxics score and the EPT index (Spearman r = -0.43; $p = 0.10$), and taxa richness and the concentration of copper (Spearman r = -0.55; $p = 0.02$), nickel (Spearman r = -0.49; $p = 0.05$), and zinc (Spearman r = -0.53; $p = 0.03$) in sediment. Statistically significant negative correlations also were noted between the mean point score (MPS) and the concentration of chloride in water (Spearman r = -0.60; $p = 0.01$), taxa species richness and the concentration of chloride (Spearman r = -0.61; $p = 0.01$).

Sites of Concern

A level of concern was calculated by combining factors which express: (1) the occurrence and concentrations of toxic substances, and (2) the integrity of the benthic macroinvertebrate community. These factors were used to produce a score for each site. Based on the scores, each site was placed in one of three categories according to the level of concern regarding integrity of the benthic macroinvertebrate community relative to occurrence of toxicants. Distribution of stations among categories of concern are listed in Table 50.

Two of the three stations (3 and 18) in the category of concern did not meet the aquatic life use designation for the respective segments. At Station 3, the low mean ponit score (MPS) coupled with elevated levels of arsenic, copper, and nickel in sediment samples, as well as high chloride in water resulted in the low score. Agriculture activities upstream of the site are considered a likely source of contaminants. The MPS and taxa richness were relatively low for both the snag sample and the Surber sample which, coupled with relatively high levels of arsenic, lead, and nickel in sediment, as well as an elevated level of chloride in water contributed to the low score for Station 3a. The low score at Station 18 was a function of low taxa richness and EPT, as well as relatively high levels of arsenic, chromium, nickel, and lead in sediment (Table 22).

Of the sixteen stations at which benthic macroinvertebrate community surveys were conducted during Phase 2, ten were also sampled during Phase 1 (Table 49). Six of the ten pairs of samples the MPS was lower in Phase 2. Two mean point scores were higher in Phase 2, and MPS's were equal in the other two cases. In four of these cases (Stations 1, 2, 4, and 14), the difference in MPS was enough to place the samples in different aquatic life use subcategories. In all four, the aquatic life use subcategory derived from Phase 1 data was higher than that based on samples from Phase 2. At Station 1, the MPS for Phase 2 was at the upper end of the range for the intermediate aquatic life use subcategory. Relatively small differences in the EPT, diversity, and equitability, as well as a higher proportion of functional groups that utilize fine particulate organic matter (FPOM) in the benthic macroinvertebrate sample from Phase 1 contributed to the difference. Lower taxa richness, slightly lower equitabilty, and a slightly higher proportion of groups that utilize FPOM caused the lower score for the sample from Station 2 in Phase 2. At Station 4 lower taxa richness, EPT, diversity, equitability, and

TABLE 50
DISTRIBUTION OF SITES AMONG CATEGORIES OF CONCERN FOR PHASE 2 BENTHIC MACROINVERTEBRATE COMMUNITY DATA

CONCERN
Upstream of Presidio/Ojinaga (Station 3)
Rio Conchos near the Mouth (Station 3a)
Downstream of Brownsville/Matamoros (Station 18)
POTENTIAL CONCERN
Upstream of El Paso/Ciudad Juárez (Station 1)
Downstream of El Paso/Ciudad Juárez (Station 2)
Downstream of Presidio/Ojinaga (Station 4)
Downstream of Santa Elena Canyon in Big Bend National Park (Station 5)
San Felipe Creek near the Mouth (Station 7b)
Downstream of Laredo/Nuevo Laredo (Stations 12 and 12.1)
Downstream of Anzalduas Dam (Station 14)
NO CONCERN
San Felipe Creek at US 277 in Del Rio (Station 7b.1)
San Felipe Creek 6.0 km upstream of Mouth (Station 7b.2)
Downstream of Eagle Pass/Piedras Negras (Station 10)
Downstream of Anhelo Drain near Hidalgo/Reynosa (Station 16)

a greater dominance of functional structure groups which use FPOM (Table 23) produced the lower MPS for Phase 2. Lower diversity, equitability, and a higher proportion of groups that utilize FPOM resulted in the lower score at Station 14.

Differences in MPS together with differences in concentration and occurrence of toxics between Phase 1 and Phase 2 produced contrasts in the overall level of concern for the integrity of the benthic macroinvertebrate community relative to occurrence of toxicants. Stations 3 and 18 were stations of concern in Phase 2 while these two stations were placed in the category of slight concern in Phase 1. At Station 3, the MPS was equal for both Phase 1 and Phase 2. Higher levels of arsenic and nickel in sediment in Phase 2 contributed to the difference in rating. The MPS for station 18 was lower in Phase 2, although both scores were within the intermediate aquatic life use range. Higher concentrations of arsenic in water and sediment, as well as elevated levels of chromium, lead, and nickel in sediment in Phase 2 may account for the lower MPS. Similarities between the two phases include moderate to high concern for Stations 2 and 12, and slight to no concern for Stations 10, 14, and 16 (Table 50).

Seasonal changes in benthic macroinvertebrate community structure have been relatively well documented (Sweeney 1984). This is especially true in more northern latitudes which experience more distinct and drastic change between seasons than is typical of west and especially southwest Texas. Nevertheless, seasonal factors cannot be discounted as potential causes for some of the differences noted between Phase 1 and Phase 2 benthic macroinvertebrate community structure, at least at some stations. At seven stations benthic macroinvertebrate samples were collected during the same season in both phases (Stations 1, 2, 3, 4, 5, 10, and 12). However, at Stations 14, 16, and 18 benthic macroinvertebrate samples were collected in winter in Phase 1, and summer in Phase 2. Results, at least in terms of the MPS, were the same at Stations 16 and 18 for both Phase 1 and Phase 2. Also, community similarity index values comparing the benthic macroinvertebrate collections from Phase 1 and Phase 2 at Stations 16 and 18, 0.57 and 0.40, respectively, reflect moderate to high similarity. Thus, at these two stations seasonally induced differences in community structure, if any, were inadequate to significantly affect the measures of benthic macroinvertebrate community integrity employed in the study.

At Station 14, taxa richness values from Phase 1 and Phase 2 were equal. At that site, approximately 17 taxa were collected in Phase 1 which were not collected in Phase 2, and 18 taxa collected in Phase 2 were not collected in Phase 1. Twenty-one taxa were collected at Station 14 in both phases, yielding a community similarity index value of 0.54 which reflected a moderate to high degree of similarity between the two collections in terms of taxonomic composition. However, differences in the relative distribution of individuals among species, primarily a large increase in numbers of individuals in the Oligochaeta and Chironomidae, were sufficient to produce contrasting values for diversity, equitability, and proportion of individuals as FPOM users. Collectively, Oligochaetea and Chironomidae accounted for 26.63% of total numbers collected in Phase 1 and 74.06% of total numbers collected in Phase 2. These factors produced a disparity between MPS values for Phase 1 and Phase 2 for benthic macroinvertebrate samples from Station 14 which was the greatest among all sample pairs. The MPS for Phase 1 was in the range designating exceptional aquatic life use, whereas the MPS for Phase 2 fell into the range designating intermediate aquatic life use. It seems likely that some of the differences were due to seasonally induced change in community structure and/or chance variability between samples. However, the number of parameters exceeding screening levels, and exceedance factors, were greater for toxicant samples from Phase 2, especially for sediment. Thus, the potential that toxicant induced stresses accounted for some of the differences cannot be discounted.

Fish Communities

Fish community surveys were conducted at 21 lotic stations, including 18 stations on the mainstem and three stations on tributaries (Tables 1 to 5).

Electrofishing was supplemented by seining at eight stations (1, 2, 3, 3a, 3a.1, 4, 5 and 10). Electrofishing with no supplemental seining was conducted at the other 13 stations. Only within the International Amistad Reservoir-Eagle Pass/Piedras Negras Reach were there differences in sample effort across sites. Seining and electrofishing were used at Station 10 but only electrofishing at Stations 7, 7b, 8 and 9. Thus, comparisons among stations within a reach were not likely to be affected by differences in sampling effort. However, differences in sampling effort may contribute to some of the differences in community composition noted among stations across all reaches as well as between Phase 1 and 2.

A total of 1,051 individuals representing 38 species were collected (Table 51). Gizzard shad (*Dorosoma cepedianum*), blacktail shiner (*Cyprinella venusta*), and common carp (*Cyprinus carpio*) were most abundant, accounting for 26.5%, 17.0%, and 12.7% of total numbers collected. Species richness ranged from two at Stations 5 and 13 to 16 at Station 7b (Table 51).

Among the 18 mainstem stations, a total of 797 individuals representing 33 species were collected. Species richness ranged from two at Stations 5 and 13 to 11 at Stations 10 and 11, with a median value of seven. Fourteen of the 33 species collected from one or more mainstem stations were not collected from tributary stations (Table 51).

A total of 255 individuals representing 24 species were collected from the three tributary stations. Gizzard shad, green sunfish (*Lepomis cyanellus*), and longear sunfish (*Lepomis megalotis*) accounted for approximately 31.0%,

TABLE 51
SUMMARY OF FISHES COLLECTED DURING PHASE 2
OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

TAXON	**1**	**2**	**3**	**3a**	**3a.1**	**4**	**5**	**7**	**7b**	**8**	**9**	**10**
Cyprinus carpio	9	51	13	9		5	5	4	13	5	1	1
Ictalurus furcatus									1			
Ictalurus punctatus	3	5			8	2					1	
Ictalurus lupus		5				4						
Pylodictus olivaris				1					1	1		
Dorosoma cepedianum	11	2	16	33	25	23			21		2	15
Dorosoma petenense						1						
Moxostoma congestum		8	1					1	1	1	4	
Moxostoma austrinum					1							
Astyanax mexicanus			1		9				1	2		4
Lepisosteus oculatus									4			
Lepisosteus osseus					1				3	3		
Cichlasoma cyanoguttatum											1	
Tilapia aurea					2				5			
Carpiodes carpio			1									
Cycleptus elongatus			5				10					
Ictiobus bubalus			1			1						
Micropterus dolomieu								1	1			
Micropterus salmoides		1						1	2			2
Lepomis auritus								1				5
Lepomis cyanellus				1								
Lepomis macrochirus					52			1				
Lepomis megalotis		1		2	34				2			
Lepomis sp.					4				1	2		3
Percina macrolepida									1			
Morone chrysops												
Centropomus undecimalis												
Aplodinotus grunniens				1		1						

TABLE 51 (cont)
SUMMARY OF FISHES COLLECTED DURING PHASE 2
OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

TAXON	**1**	**2**	**3**	**3a**	**3a.1**	**4**	**5**	**7**	**7b**	**8**	**9**	**10**
Cyprinella lutrensis	8				2	1				2		34
Cyprinella venusta									1	96		50
Notropis amabilis									1	7		1
Notropis braytoni					3							
Pimephales promelas					3							1
Pimephales vigilax	2											
Menidia beryllina										1		1
Gambusia affinis	2			3	2							
Gobiomorus dormitor												
Mugil cephalus												
Agonostomus monticola												
Total	**35**	**73**	**38**	**50**	**146**	**38**	**15**	**9**	**59**	**120**	**32**	**117**
Species Richness	6	7	7	7	13	8	2	6	16	10	9	11

TABLE 51 (cont)
SUMMARY OF FISHES COLLECTED DURING PHASE 2
OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

TAXON	11	12	12.1	13	14	15	16	17	18	Total	% of Total
Cyprinus carpio	1	4	3			2	2	1	3	**132**	12.6
Ictalurus furcatus		1								**2**	0.19
Ictalurus punctatus		5	1		7		2	1	1	**36**	3.4
Ictalurus lupus										**9**	0.86
Pylodictus olivaris	1									**4**	0.38
Dorosoma cepedianum	15	12	9	31	14	19	18	9	1	**276**	26.2
Dorosoma petenense			3							**4**	0.38
Moxostoma congestum										**16**	1.5
Moxostoma austrinum										**1**	0.10
Astyanax mexicanus	4									**21**	2.0
Lepisosteus oculatus							1			**5**	0.48
Lepisosteus osseus										**7**	0.67
Cichlasoma cyanoguttatum	1		1							**3**	0.29
Tilapia aurea	2		13							**22**	2.1
Carpiodes carpio					6		7			**14**	1.3
Cycleptus elongatus										**15**	1.4
Ictiobus bubalus	1				2					**5**	0.48
Micropterus dolomieu										**2**	0.19
Micropterus salmoides	2	4	4	5	2	2	1	3	1	**34**	3.2
Lepomis auritus										**9**	0.86
Lepomis cyanellus										**53**	5.0
Lepomis macrochirus	3		3							**7**	0.67
Lepomis megalotis		1								**40**	3.8
Lepomis sp.										**20**	1.9
Percina macrolepida										**1**	0.10
Morone chrysops							3			**3**	0.29
Centropomus undecimalis								1	3	**4**	0.38
Aplodinotus grunniens			1				1			**4**	0.38

TABLE 51 (cont)
SUMMARY OF FISHES COLLECTED DURING PHASE 2
OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

TAXON	11	12	12.1	13	14	15	16	17	18	Total	% of Total
Cyprinella lutrensis	3									**50**	4.8
Cyprinella venusta	24									**177**	16.8
Notropis amabilis										**9**	0.86
Notropis braytoni										**3**	0.29
Pimephales promelas										**4**	0.38
Pimephales vigilax										**2**	0.19
Menidia beryllina										**2**	0.19
Gambusia affinis										**7**	0.67
Gobiomorus dormitor					6	10	3		11	**30**	2.9
Mugil cephalus								8	6	**14**	1.3
Agonostomus monticola					4		1			**5**	0.48
Total	**57**	**27**	**38**	**36**	**41**	**33**	**39**	**23**	**26**	**1052**	**100**
Species Richness	11	6	9	2	7	4	10	6	7		

20.8%, and 14.9%, respectively, of the total numbers collected at tributary stations. Five species collected in tributaries: Mexican redhorse (*Moxoxstoma austrinum*), green sunfish, big scale log perch (*Percina macrolepida*), Tamaulipas shiner (*Notropis braytoni*), and mosquito fish (*Gambusia affinis*), were collected from one or more tributary station but not from any of the mainstem stations. Fish species richness was lower at the downstream sites in four of seven cases where sample sites bracketed urban areas: Laredo/Nuevo Laredo, McAllen/ Reynosa, Harlingen/San Benito, and Brownsville/ Matamoros. In the three other urban areas, including El Paso/Ciudad Juárez, Presidio/ Ojinaga, and Del Rio/Ciudad Acuña, species richness was higher at the downstream site. Index of biotic integrity (IBI) ratings followed the same pattern as species richness at Laredo/Nuevo Laredo, McAllen/Reynosa, Del Rio/Ciudad Acuña, Harlingen/San Benito, and Brownsville/ Matamoros. At El Paso/Ciudad Juárez, the IBI score was higher at the upstream site, while at Presidio/Ojinaga, upstream/downstream IBI scores were the same.

Concentrations that exceeded screening criteria for one or more toxic substances in sediment and/or water were noted at all stations where fish community surveys were conducted. There appeared to be a tendency for sites with higher integrity to have a lower number of parameters exceeding criteria/screening levels for toxic substances in water. At 62% of the sites, where the IBI score was greater than or equal to ($)14, the number of accedences for toxicants in water was less than or equal to one. At 38% of the sites, where IBI scores were less than or equal to (#) 13, the number of accedences for toxic substances in water was greater than or equal to two.

This tendency was corroborated by a statistically significant (p#0.10) negative correlation between IBI score and number of accedences for toxic substances in water (Spearman Rank Order Correlation: Spearman $r = -0.85$, $p = 0.00003$), and may reflect synergistic effects. Also, statistically significant negative correlations were noted between IBI score and concentration of chloride in water (Spearman $r = -0.66$, $p = 0.004$), as well as between chloride and species richness (Spearman $r = -0.44$, $p = 0.08$). These individual parameters appear to be better predictors of fish community integrity than overall toxic substance scores. No significant correlations were noted between measures of fish community integrity and overall scores for toxic substances.

Sites of Concern

A level of concern was calculated by combining factors which express: (1) the occurrence and concentrations of toxic substances, and (2) the integrity of the fish community. These factors were used to produce a score for each site. Based on the scores, each site was placed in one of three categories according to the level of concern regarding integrity of the fish community relative to the occurrence of toxic substances (Table 52).

Scores for five stations (1,2, 3a, 5, and 15) were in the category of concern. At Station 1, a depressed IBI score combined with a relatively high chloride in water concentration contributed to the low score. Agricultural activities upstream of the site along with urban runoff and wastewater discharges from the Cities of Anthony, Canutillo and El Paso are potential sources of contamination (Table 45).

High chloride, unionized ammonia, and arsenic in water, as well as elevated levels of copper, lead, and nickel in sediment, and elevated cadmium, copper, and zinc in tissue, contributed to the low rating for Station 2 (APPENDIX J). Significant effects occurred in the toxicity test for sediment at Station 2. Elevated lead and nickel in sediment, as well as elevated concentrations of ammonia, arsenic, and chloride in water were probable causes (Table 48). Urban runoff and wastewater discharges from the City of El Paso are potential sources of contamination at the site.

Significant effects were noted in toxicity tests of effluent from the El Paso Haskell Street WWTP, which is located upstream of Station 2. Elevated levels of unionized ammonia, arsenic, and chloride were likely causes.

At Station 3a, the low IBI score coupled with a high concentration of chloride in water and a high occurrence of toxic substances in fish tissue contributed to the low score. Agricultural activities upstream of the site are considered the most likely sources of contaminants. Station 5 is located in a remote area with few obvious potential sources of contaminants. Yet water samples from the site contained high chloride concentrations which exceeded the chronic aquatic life criterion, and arsenic concentrations that exceeded the state 85th percentile and human health criteria. Also contributing to the low score at the site were high concentrations of cadmium, copper, and zinc in fish tissue. A reduction in number of young per female (water flea) was noted for the water toxicity test for the site. In addition to elevated concentrations of chloride and arsenic in water, a fish kill was reported to the Texas Parks and Wildlife Department in this reach of the river approximately one month sample collection. No definite cause was identified; however, a bloom of toxic algae (*Prymnesium parvum*) was considered a potential cause. In the past, *Prymnesium parvum* has been cited as a cause of fish kills on the Pecos River, and is usually associated with increased salinity (personal communication, TPWD). This factor may have been partly responsible for the depressed fish community observed. High concentrations of arsenic and chloride in water also contributed to the low overall rating for Station 5.

Low species richness, a relatively high percentage of individuals in the most abundant species, a high occurrence of toxic substances in water, and an elevated chloride concentration in water resulted in a low score for Station 15. Stormwater runoff from the Hidalgo/Reynosa and McAllen areas are potential sources of contamination at the site. Distribution of stations among categories of concern are listed in Table 52.

TABLE 52
DISTRIBUTION OF SITES AMONG CATEGORIES OF CONCERN FOR PHASE 2 FISH COMMUNITY DATA

CONCERN
Upstream of El Paso/Ciudad Juárez (Station 1)
Downstream of El Paso/Ciudad Juárez (Station 2)
Rio Conchos near the Mouth (Station 3a)
Downstream of Santa Elena Canyon in Big Bend National Park (Station 5)
Rio Grande near Hidalgo/Reynosa (Station 15)
POTENTIAL CONCERN
Upstream of Presidio/Ojinaga (Station 3)
Downstream of Presidio/Ojinaga (Station 4)
Downstream of Laredo/Nuevo Laredo (Stations 12 and 12.1)
Downstream of Los Ebanos (Station 13)
Downstream of Anzalduas Dam (Station 14)
Downstream of San Benito (Station 17)
Downstream of Brownsville/Matamoros (Sta.18)
NO CONCERN
Río Conchos 25 km Upstream (Station 3a.1)
San Felipe Creek near the Mouth (Station 7b)
Downstream of Eagle Pass/Piedras Negras (Sta.10)
Downstream of el Anhelo Drain near Hidalgo/Reynosa (Station 16)

Phase 1 and Phase 2 Data Comparison
Comparative data for fish community assessments for 19 stations are available from both Phase 1 and Phase 2. A total of 50 species of fish were collected from these

stations in Phase 1, versus 38 in Phase 2 (Table 53). Eighteen of the 50 species collected during Phase 1 were not collected during Phase 2. Of the 18 species, nine were collected at only one station, and most were collected in low numbers with four of the nine represented by only one individual. Thus, it seems likely that failure to collect these taxa in Phase 2, at least in part, was a function of low abundance and spotty distribution. Four of the 38 species collected during Phase 2 were not collected during Phase 1. The value of the community similarity index comparing the two collections (0.79) reflects high similarity. At 13 of the 19 stations, the similarity index reflects moderate to high similarity ($0.40), in terms of species composition (Table 54). Community similarity indices were relatively low at the other six stations (< 0.40).

Considering fish collections from these 19 stations for both Phase 1 and Phase 2, the IBI scores ranged from a low of eight at Stations 2 and 7 to 26 at Station 15, with a median of 18 (Table 55). IBI scores from both Phase 1 and Phase 2 were lower than the median for four of the stations (3a, 5, 7, 12).

At 14 of the 19 stations, the IBI scores from Phase 2 were lower than that obtained in Phase 1 (Table 55). At three stations (8, 10 and 12) the IBI score was higher in Phase 2 than in Phase 1. The IBI score at Station 16 was 20 for both Phase 1 and Phase 2. Differences ranged from two at Station 14 to 12 at Station 15. These differences coupled, with differences in sample results for toxicants between Phase 1 and Phase 2, were reflected in the overall rating for each station regarding the level of concern for the fish community integrity relative to occurrence of toxic substances.

For Station 12, the difference between IBI scores for Phase 1 and 2 was three (Table 55). The community similarity index reflects moderate similarity in species richness composition between phases (Table 54). Despite the small difference in IBI scores and relative similarity of species composition, the station was identified as having a high potential for impact by toxic substances on the integrity of the fish community in Phase 1, but was categorized as only a potential concern in Phase 2. Differing levels of concern for the station may have been a function of the higher occurrence of toxic substances noted in Phase 1, especially for fish tissue samples.

Conversely, Stations 1, 2, 3a, 5 and 15 were identified as sites of concern in Phase 2, but as no (1, 2, 15), very slight (5), or slight (3a) concern in Phase 1. The community similarity index reflects moderate to high similarity species composition at three of these stations (1, 2, and 3a), and relatively low similarity at Stations 5 and 15 (Table 54). At Stations 1, 2, and 15, the higher level of concern for fish community integrity relative to occurrence of toxic substances in Phase 2 may have been related to the frequent occurrence of contaminant concentrations greater than screening levels. At Station 5, the occurrence of toxicants, in terms of number of accedences of screening values, was similar for Phase 1 and Phase 2, but the IBI score was substantially lower in Phase 2. The decline in IBI score may have been related to reported fish kills at the station, possibly due to blooms of toxic algae, near the Phase 2 sampling date.

Fish community structure may be expected to change seasonally (Karr *et al*. 1986), a factor which must be considered as possibly contributing to differences in Phase 1 and Phase 2 fish collections. Samples were collected in different seasons at eight of the 19 stations where fish surveys were conducted in both Phase 1 and Phase 2. At two of the eight

TABLE 58

SUMMARY OF FISHES COLLECTED DURING PHASE 1 AND PHASE 2. INCLUDES ONLY TAXA FROM SITES SAMPLED DURING BOTH PHASES. **V** Indicates taxon was collected at one or more site.

TAXON	PHASE 2	PHASE 1	TAXON	PHASE 2	PHASE 1
Ictalurus furcatus	V	V	*Percina macrolepida*	V	
Ictalurus punctatus	V	V	*Stizostedian vitreum*		V
Ictalurus lupus	V		*Centropomus undecimalis*	V	
Strongylura marina		V	*Aplodinotus grunniens*	V	V
Cyprinodon variegatus		V	*Dorosoma cepedianum*	V	V
Fundulus zebrinus		V	*Dorosoma petenense*	V	V
Gambusia affinis	V	V	*Cyprinella lutrensis*	V	V
Poecilia formosa		V	*Cyprinella proserpina*		V
Poecilia latipinna		V	*Cyprinella venusta*	V	V
Menidia beryllina	V	V	*Notropis amabilis*	V	V
Astyanax mexicanus	V	V	*Notropis braytoni*	V	V
Lepisosteus oculatus	V	V	*Notropis jemezanus*		V
Lepisosteus osseus	V	V	*Pimephales promelas*	V	V
Anguilla rostrata		V	*Pimephales vigilax*	V	V
Cichlasoma cyanoguttatum	V	V	*Cyprinus carpio*	V	V
Tilapia aurea	V	V	*Dionda episcopa*		V
Micropterus dolomieu	V	V	*Macrhybopsis aestivalis*		V
Micropterus salmoides	V	V	*Rhinichthys cataratae*		V
Morone chrysops	V	V	*Carpiodes carpio*	V	V
Lepomis auritus	V	V	*Cycleptus elongatus*	V	V
Lepomis cyanellus	V	V	*Ictiobus bubalus*	V	V
Lepomis gulosus		V	*Moxostoma austrinum*	V	V
Lepomis macrochirus	V	V	*Moxostoma congestum*	V	V
Lepomis megalotis	V	V	*Gobiomorus dormitor*	V	V
Lepomis microlophus		V	*Agonostomus monticola*	V	V
Etheostoma grahami		V	*Mugil cephalus*	V	V
Pylodictus olivaris	V	V			

TABLE 54
SUMMARY OF SIMILARITY INDEX VALUES FOR FISH COMMUNITIES AT SITES COMMON TO PHASES 1 AND 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

Sites of Comparison	Similarity Index
1 and 1	0.71
2 and 2	0.47
3 and 3	0.24
3a and 3a	0.40
4 and 4	0.50
5 and 5	0.27
7 and 7	0.27
7b and 7b	0.50
8 and 8	0.35
9 and 9	0.43
10 and 10	0.52
11 and 11	0.52
12 and 12	0.48
13 and 13	0.17
14 and 14	0.50
15 and 15	0.36
16 and 16	0.48
17 and 17	0.42
18 and 18	0.42

stations (7 and 8) surveys were conducted in spring in Phase 2 and in winter in Phase 1. At the remaining six stations (13, 14, 15, 16, 17, and 18) fish were collected in summer in Phase 2 and in winter in Phase 1. Community similarity index values for fish collections from four of the eight stations (14, 16, 17, and 18) reflect moderate to high similarity across seasons/phases. At the other four stations (7, 8, 13, and 15) similarity was relatively low across seasons/phases, reflecting appreciable differences in species composition. For seven of the eight stations the level of concern for fish community integrity relative to occurrence of toxic substances was essentially the same for Phase 1 and Phase 2. This indicates that either seasonally induces differences in community structure, if any, were not great enough to substantially affect measures of fish community integrity, or that seasonally induced changes were sufficient to mask any effects of toxic substances.

At Station 15, the level of concern regarding potential effects of toxic substances on fish community integrity was very different between Phase 1 and Phase 2. The fact that levels of concern regarding fish community integrity relative to occurrence of toxic substances were consistent across Phase 1 and 2 for seven of eight stations sampled in different seasons may indicate that differences noted for Station 15 were associated with the high frequency with which screening levels were exceeded in Phase 2.

TABLE 55
SUMMARY OF INDEX OF BIOTIC INTEGRITY (IBI) SCORES FOR SITES COMMON TO BOTH PHASE 1 AND PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

Site	IBI Score Phase 2	IBI Score Phase 1
1	10	19
2	8	19
3	13	20
3a	11	17
4	13	24
5	10	17
7	8	14
7b	18	18
8	22	17
9	18	22
10	21	18
11	18	22
12	16	13
13	16	24
14	18	20
15	14	26
16	20	20
17	18	22
18	14	19

CHAPTER 8

STATUS OF THE RIO GRANDE/ RIO BRAVO AND TRIBUTARIES DURING PHASE 2

OVERALL SITE RANKING

Sites were ranked according to potential effects of toxic chemicals found in Phase 2. The ranking was used as a data analysis tool used to provide a general idea of conditions at the sample sites. It also allowed prioritization of areas where further investigation may be warranted. Information on the calculation of site ranks is located in Appendix K. In addition to the overall site ranking, stations were ranked separately for water, sediment, and fish tissue concerns to determine which components had the most effect on the overall site ranking. This allowed for data assessment at stations where water or fish tissue were the only types of samples collected.

Mainstem

High Concern

Mainstem sites of highest concern for potential impairment by toxic substances were located downstream of El Paso/Ciudad Juárez and Laredo/Nuevo Laredo, upstream and downstream of Presidio/Ojinaga and in the Rio Grande/Río Bravo arm of International Amistad Reservoir (Tables 45 and 56). Stations 2 and 12.1 were both below two of the largest Rio Grande/Río Bravo border cities, and previously were identified as areas of high concern in Phase 1.

Station 2, located on the downstream side of El Paso/Ciudad Juárez, and downstream of the El Paso Haskell Street WWTP, is ranked number two (1 = highest concern; 19 = lowest concern). In addition to urban/industrial runoff and heavy vehicle traffic, the site was affected by the Haskell Street WWTP effluent (Table 45). Although the WWTP discharge was not included in the overall site ranking, it ranked number one (1 = highest concern) when compared to other tributaries for water quality (APPENDIX K). This station had the highest unionized ammonia value of any tributary or mainstem station. The unionized ammonia concentration exceeded both acute and chronic aquatic life criteria. The effluent also caused toxicity to water fleas and fathead minnows.

Station 12.1 was the second of two stations located downstream of Laredo/Nuevo Laredo. The station ranked number one (1 = highest concern; 19 = lowest concern) while Station 12, the downstream site closest to Laredo/Nuevo Laredo ranked 18th, reflecting a slight potential for impairment (Table 45). In contrast, Station 12 ranked number one in Phase 1, having the highest potential for negative effects by toxic substances. This variation was likely due to flow dynamics in the Rio Grande/Río Bravo. Station 12, downstream of all major point source discharges and tributary inflows from Laredo/Nuevo Laredo, would seem to be the most likely place to detect any effects from these discharges and inflows. However, the site may not be representative of water quality in the area. It may take many miles for the discharges from Laredo/Nuevo Laredo to completely mix with river water.

It is more difficult to explain the presence of Stations 3, 4 and, 6.1 in the high concern group (Table 56). Stations 3 and 4 are located above and below Presidio/Ojinaga. The area is primarily influenced by agriculture, industry in Presidio/Ojinaga and inflow from the Río Conchos. Station 4 was one of two mainstem sites where water had a significant toxic effect on water fleas (reduced number of young per female). The cause appeared to be elevated chloride. Chloride exceeded the aquatic life chronic criterion at Stations 1, 2, 3, 4, and 5, with Stations 3, 4, and 5 having the highest chloride concentrations. A fish kill was reported in Big Bend National Park shortly after sample collection. The suspected cause was a bloom of toxic algae (*Prymnesium* *parvum*). In the past, *Prymnesium parvum* has been cited as a cause of fish kills on the Pecos River. Blooms of this toxic algae are closely associated with salinity concentrations. Elevated salinity is a known problem in the Rio Grande/Río Bravo and Pecos River (TNRCC 1992; TNRCC 1996).

Station 6.1, the Rio Grande/Río Bravo arm of International Amistad Reservoir, was also in the high concern group. This was primarily due to numerous metals in sediment, arsenic in water and mercury in whole fish. It should also be noted that the reservoir stations were ranked along with the river stations, which represent two very different systems. International Amistad and Falcon Reservoirs can act as a sink for contaminants flowing in from the Rio Grande/Río Bravo. Reservoirs are depositional environments. The significance of the contamination is different from the river stations. In particular, lake sediment tends to concentrate contaminants with the water column free of elevated contaminant concentrations. Aquatic organisms would be more likely to come in contact with contaminants in a river system than in a reservoir.

Moderate Concern

Sites with a moderate potential for effects by toxic chemicals were located downstream of Santa Elena Canyon in Big Bend National Park (Station 5), downstream of Eagle Pass/Piedras Negras (Station 10), the Devils River Arm of International Amistad Reservoir (Stations 6.2), downstream of Anhelo drain near Reynosa (Station 16), and at the headwaters of International Falcon Reservoir (Station 12.2). Stations 6.2 and 16 ranked high for sediment concerns. Station 10 ranked high for fish tissue concerns (Table 56).

Station 5 at Santa Elena Canyon was the second mainstem station where water had a significant toxic effect on water fleas (reduced number of young per female). Similar to Station 4, the cause was also thought to be elevated chlorides. As previously stated, chloride concentrations exceeded the aquatic life criterion at Stations 1, 2, 3, 4 and 5. Stations 3, 4 and 5 had the highest exceedance of chloride criteria.

A fish kill was reported in Big Bend National Park following sample collection. The suspected cause was a bloom of toxic algae (*Prymnesium parvum*). In the past, *Prymnesium parvum* has been cited as a cause of fish kills on the Pecos River. Blooms of this toxic algae are closely associated with salinity concentrations. Elevated salinity is a known problem in the Rio Grande/Río Bravo and Pecos River (TNRCC 1996). Chloride concentrations at Station 6a (Pecos River east of Langtry), sampled due to salinity concerns, exceeded both the acute and chronic aquatic life criteria (APPENDIX J).

Station 12.2, at the headwaters of Falcon Reservoir, appeared to be heavy influenced by Laredo/Nuevo Laredo. Contaminants found in sediment downstream of Laredo/Nuevo Laredo (Station 12.1) were to those found at the headwaters of Falcon. Station 12.3, near the Falcon Dam, ranked 19th (slight concern).

The most likely causes for ranking as a moderate concern are urban/agricultural runoff, municipal wastewater discharges and industry.

The remaining stations were ranked as low to slight concern. With the exception of Station 12, these rankings reflected lesser industrial influence. Included in the group are Stations above and below Brownsville/ Matamoros (Stations 17 and 18), International Falcon Reservoir at the dam (Station 12.3), upstream of El Paso/Ciudad Juárez (Station 1), upstream of the Haskell Street WWTP (Station 1.1), downstream of Anzalduas Dam (Station 14), downstream of San Benito (Station 13), and at Hidalgo/Reynosa (Station 15).

Tributaries

High Concern

The four tributary sites of highest concern were the Arroyo el Coyote near Nuevo Laredo (11c), Ciudad Juárez wastewater canal (2a), Anhelo Drain near Reynosa (Station 15a) and Manadas Creek in Laredo (Station 10a) (Table 45). The three Mexican tributaries carry wastewater from industrial areas, but Manadas Creek does not. Manadas Creek in located in an area of Laredo containing warehouses which store a variety of hazardous materials (Alicia Reinmund, TNRCC, personal communication).

Moderate Concern

Tributaries of moderate concern for potential impact were Chacon Creek in Laredo, Arroyo el Tornillo in Piedras Negras (Station 9a), Montoya Drain (Station 0.5a), and Arroyo los Olmos near Rio Grande City (Station 12d). Chacon Creek (Sation 11b), like Manadas Creek, has adjacent warehouses storing a variety of hazardous materials (Alicia Reinmund, TNRCC, personal communication). Arroyo el Tornillo transports partially treated wastewater from the treatment ponds in Piedras Negras. Arroyo los Olmos drains a rural residential area near Rio Grande City and is probably influenced by urban and agricultural runoff. The Río Conchos 25 km upstream of the mouth is primarily affected by agricultural runoff. Montoya Drain is located downstream of a horse race track and in urbanized area. It may also be influenced by agricultural runoff.

The remaining stations, Zacate Creek in Laredo (Station 11a), San Felipe Creek in Del Rio (Stations 7b, 7b.1 and 7b.2), the Río Conchos near the mouth and 25 km upstream of the mouth (Stations 3a and 3a.1), were all placed in the low to slight concern group.

A summary of Phase 2 data and site rankings for water, sediment, fish tissue, and overall level of concern are located in Table 57.

TABLE 56
OVERALL SITE RANKINGS FOR MAINSTEM AND
TRIBUTARY STATIONS SAMPLED DURING PHASE 2 OF THE
RIO GRANDE/RIO BRAVO TOXIC SUBSTANCES STUDY

OVERALL SITE RANKINGS			
MAINSTEM SITES		**TRIBUTARY SITES**	
Rank	**HIGH CONCERN**		**Rank**
1	Rio Grande at Zaragosa Bridge in El Paso (2)	Arroyo el Coyote near Nuevo Laredo (11c)	1
2	Rio Grande 25 km Downstream of Laredo (12.1)	Ciudad Juárez Wastewater Canal (2a)	2
3	Rio Grande Downstream of Presidio (4)	El Anhelo Drain near Reynosa (15a)	3
4	Rio Grande Upstream of Presidio (3)	Manadas Creek in Laredo (10a)	4
5	International Amistad Reservoir-Rio Grande Arm (6.1)		
	MODERATE CONCERN		
6	Rio Grande at Santa Elena Canyon (5)	Chacon Creek in Laredo (11b)	5
7	Rio Grande Downstream of Eagle Pass (10)	Arroyo el Tornillo in Piedras Negras (9a)	6
8	International Amistad Reservoir-Devils River Arm (6.2)	Montoya Drain near El Paso (0.5a)	7
9	Rio Grande Downstream of Anhelo Drain (16)	Arroyo los Olmos near Rio Grande City (12d)	8
10	International Falcon Reservoir near Headwaters (12.2)		
	LOW CONCERN		
11	Rio Grande at Courchesne Bridge-El Paso (1)	Río Conchos 25 km Upstream from Mouth (3a)	9
12	Rio Grande Downstream of Brownsville (18)	Río Conchos 25 km Upstream of Mouth (3a.1)	10
13	Rio Grande at Hidalgo/Reynosa (15)	Zacate Creek in Laredo (11a)	11
14	Rio Grande Upstream of WWTP-El Paso (1.1)		
15	Rio Grande Downstream of San Benito (17)		
	SLIGHT CONCERN		
16	Rio Grande Downstream of Anzalduas Dam (14)	San Felipe Creek in Del Rio Upstream of Mouth (7b)	12
17	Rio Grande near Los Ebanos (13)	San Felipe Creek at US 277-Del Rio (7b.1)	13
18	Rio Grande 13.2 km Downstream of Laredo (12)	San Felipe Creek 6.0 km Upstream of Mouth (7b.2)	14
19	International Falcon Reservoir near Dam (12.3)		

TABLE 57
SUMMARY OF DATA FOR MAINSTEM AND TRIBUTARY STATIONS SAMPLED
DURING PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCES STUDY

STATION / OVERALL LEVEL OF CONCERN	TYPE	WATER	SEDIMENT	FISH TISSUE	TOXICITY & BIOLOGICAL LEVEL OF CONCERN
0.5a-Montoya Drain Near the Texas/New Mexico State Line	Conventionals	Chloride		NO DATA	No Toxicity
	Metals	Arsenic, Copper, Nickel	Cadmium, Copper, Lead, Nickel, Zinc	NO DATA	NO DATA
MODERATE	Level of Concern	**LOW**	**HIGH**		NO DATA
1-Rio Grande at Courchesne Bridge in El Paso	Conventionals	Chloride			No Toxicity
	Metals	Arsenic, Copper	Cadmium, Copper, Lead, Nickel, Zinc	Cadmium, Copper	Benthics-**POTENTIAL CONCERN**
LOW	Level of Concern	**LOW**	**MODERATE**	**LOW**	Fish-**CONCERN**
1.1-Rio Grande/Río Bravo Upstream of El Paso Haskell Street WWTP	Conventionals	Chloride			No Toxicity
	Metals	Arsenic, Copper	Arsenic, Copper, Lead, Nickel, Zinc	NO DATA	
	Organics	Phenolics Recoverable		NO DATA	
LOW	Level of Concern	**SLIGHT**	**LOW**		NO DATA
1a- El Paso Haskell Street WWTP	Conventionals	Unionized Ammonia, Chloride	NO DATA	NO DATA	Toxicity -Water Water Fleas Fathead Minnows
	Metals	Arsenic	NO DATA	NO DATA	
	Level of Concern	**HIGH**			NO DATA
2-Rio Grande/Río Bravo at Zaragosa Bridge in El Paso/Ciudad Juárez	Conventionals	Unionized Ammonia, Chloride			Toxicity-Sediment Fathead Minnows
	Metals	Arsenic	Arsenic, Copper, Lead, Nickel, Zinc	Cadmium, Copper, Zinc	Benthics-**POTENTIAL CONCERN**
HIGH	Level of Concern	**LOW**	**HIGH**	**MODERATE**	Fish-**CONCERN**
2.1-Rio Grande/Río Bravo Upstream of Fort Hancock International Bridge	Conventionals	Unionized Ammonia	NO DATA	NO DATA	NO DATA
2.2-Rio Grande/Río Bravo at Fort Hancock International Bridge	Conventionals	Unionized Ammonia	NO DATA	NO DATA	NO DATA

TABLE 57 (cont)
SUMMARY OF DATA FOR MAINSTEM AND TRIBUTARY STATIONS SAMPLED
DURING PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCES STUDY

STATION / **OVERALL LEVEL OF CONCERN**	**TYPE**	**WATER**	**SEDIMENT**	**FISH TISSUE**	**TOXICITY & BIOLOGICAL LEVEL OF CONCERN**
2.3-Rio Grande/Río Bravo Downstream of Fort Hancock International Bridge	Conventionals	Unionized Ammonia	NO DATA	NO DATA	NO DATA
2a-Ciudad Juárez Wastewater Canal	Conventionals	Unionized Ammonia, Chloride		NO DATA	Toxicity-Water Water Fleas & Fathead Minnows
	Metals	Arsenic, Nickel	Arsenic, Silver	NO DATA	
	Organics	Phenol		NO DATA	
HIGH	Level of Concern	**HIGH**	**HIGH**		NO DATA
3-Rio Grande/Río Bravo Upstream of Presidio/Ojinaga	Conventionals	Chloride			No Toxicity
	Metals	Arsenic	Copper, Lead, Nickel, Zinc	Selenium	
	Organics	Bis (2-ethyl hexyl) Phthalate			Benthics-**CONCERN**
HIGH	Level of Concern	**HIGH**	**MODERATE**	**HIGH**	Fish-**POTENTIAL CONCERN**
3a-Río Conchos Near the Mouth	Conventionals	Chloride			No Toxicity
	Metals		Zinc	Cadmium, Selenium, Zinc	
	Organics	Bis (2-ethylhexyl) Phthalate			Benthics-**CONCERN**
SLIGHT	Level of Concern	**SLIGHT**	**SLIGHT**	**HIGH**	Fish-**CONCERN**
3a.1-Río Conchos 25 km Upstream from Mouth	Metals	Arsenic	Copper, Lead, Nickel, Zinc	NO DATA	No Toxicity
LOW	Level of Concern	**MODERATE**	**LOW**		Fish-**NO CONCERN**
4-Rio Grande/Río Bravo Downstream of Presidio/Ojinaga	Conventionals	Chloride			Toxicity-Water Water Fleas
	Metals	Arsenic	Cadmium, Copper, Lead, Nickel, Zinc	Selenium, Zinc	
	Pesticides			DDE	Benthics-**POTENTIAL CONCERN**
HIGH	Level of Concern	**HIGH**	**MODERATE**	**HIGH**	Fish-**POTENTIAL CONCERN**

TABLE 57 (cont)
SUMMARY OF DATA FOR MAINSTEM AND TRIBUTARY STATIONS SAMPLED
DURING PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCES STUDY

STATION / OVERALL LEVEL OF CONCERN	TYPE	WATER	SEDIMENT	FISH TISSUE	TOXICITY & BIOLOGICAL LEVEL OF CONCERN
5-Rio Grande/Río Bravo at Santa Elena Canyon in Big Bend National Park	Conventionals	Chloride			Toxicity-Water Water Fleas
	Metals	Arsenic		Cadmium, Copper, Zinc	Benthics-**POTENTIAL CONCERN**
MODERATE	Level of Concern	**HIGH**	**SLIGHT**	**MODERATE**	Fish- **CONCERN**
6.1-International Amistad Reservoir in Rio Grande Arm	Metals	Arsenic	Arsenic, Chromium, Copper, Lead, Nickel, Zinc	Mercury	No Toxicity
HIGH	Level of Concern	**MODERATE**	**HIGH**	**MODERATE**	NO DATA
6.2-International Amistad Reservoir in Devils River Arm	Metals	Arsenic		Arsenic	No Toxicity
MODERATE	Level of Concern	**LOW**	**HIGH**	**LOW**	NO DATA
7-Rio Grande/Río Bravo Upstream of Del Rio	Metals	NO DATA	NO DATA	Copper	NO DATA
	Level of Concern			**HIGH**	
7b-San Felipe Creek 1.8 km Upstream of Mouth	Metals		Zinc	Copper, Zinc	No Toxicity
	Organics			Chloroform, Benzene	Benthics-**POTENTIAL CONCERN**
SLIGHT	Level of Concern	**SLIGHT**	**LOW**	**HIGH**	Fish-**NO CONCERN**
7b.1-San Felipe Creek at US 277 in Del Rio	Metals			NO DATA	No Toxicity
	Pesticides		Chlordane	NO DATA	
SLIGHT	Level of Concern	**SLIGHT**	**LOW**		Benthics-**NO CONCERN**
7b.2-San Felipe Creek 6.0 km Upstream of Mouth	Metals			NO DATA	No Toxicity
	Pesticides		Chlordane	NO DATA	
SLIGHT	Level of Concern	**SLIGHT**	**SLIGHT**		Benthics-**NO CONCERN**
8-Rio Grande/Río Bravo 6.4 km Downstream of Del Rio	Metals	NO DATA	NO DATA	Copper, Zinc	NO DATA
	Level of Concern			**LOW**	Fish-**INCONCLUSIVE**

TABLE 57 (cont)
SUMMARY OF DATA FOR MAINSTEM AND TRIBUTARY STATIONS SAMPLED
DURING PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCES STUDY

STATION / OVERALL LEVEL OF CONCERN	TYPE	WATER	SEDIMENT	FISH TISSUE	TOXICITY & BIOLOGICAL LEVEL OF CONCERN
9a-Arroyo el Tornillo in Piedras Negras	Conventionals	Unionized Ammonia, Chloride		NO DATA	Toxicity-Sediment Fathead Minnows
	Metals	Arsenic		NO DATA	
MODERATE	Level of Concern	**LOW**	**HIGH**		NO DATA
10- Rio Grande/Río Bravo Downstream of Eagle Pass/Piedras Negras	Metals	Arsenic		Arsenic	No Toxicity Benthics-**NO CONCERN**
MODERATE	Level of Concern	**SLIGHT**	**LOW**	**HIGH**	Fish-**NO CONCERN**
10a-Manadas Creek in Laredo	Conventionals	Chloride		NO DATA	Toxicity-Water Fathead Minnow
	Metals	Arsenic	Antimony	NO DATA	
	Pesticides		DDT	NO DATA	
HIGH	Level of Concern	**MODERATE**	**MODERATE**		NO DATA
11-Rio Grande/Río Bravo Upstream of Laredo/Nuevo Laredo	Metals	NO DATA	NO DATA	Arsenic, Copper, Mercury, Zinc	NO DATA
	Level of Concern			**HIGH**	
11a-Zacate Creek in Laredo	Metals	Arsenic		NO DATA	No Toxicity
LOW	Level of Concern	**LOW**	**LOW**		NO DAT
11b-Chacon Creek in Laredo	Conventionals	Chloride		NO DATA	Toxicity-Water Water Fleas
	Metals	Arsenic		NO DATA	
	Pesticides		DDT	NO DATA	
MODERATE	Level of Concern	**MODERATE**	**MODERATE**		NO DATA
11b.1-Laredo Zacate Creek WWTP	Metals	Arsenic	NO DATA	NO DATA	Toxicity-Water Water Fleas
	Level of Concern	**MODERATE**			NO DATA

TABLE 57 (cont)
SUMMARY OF DATA FOR MAINSTEM AND TRIBUTARY STATIONS SAMPLED
DURING PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCES STUDY

STATION / OVERALL LEVEL OF CONCERN	TYPE	WATER	SEDIMENT	FISH TISSUE	TOXICITY & BIOLOGICAL LEVEL OF CONCERN
11b.2-Laredo Southside WWTP	Metals	Arsenic, Zinc	NO DATA	NO DATA	No Toxicity
	Organics	Bromodi-chloromethane, Chloroform, Dibromodi-chloromethane	NO DATA	NO DATA	
	Level of Concern	**LOW**			NO DATA
11b.3-Manhole 115 of Riverside Collection System, Nuevo Laredo	Conventionals	Unionized Ammonia, Chloride	NO DATA	NO DATA	Toxicity-Water Water Fleas
	Metals	Arsenic	NO DATA	NO DATA	
	Organics	Toluene, Xylene, 1,4-dichlorobenzene	NO DATA	NO DATA	
	Level of Concern	**HIGH**			NO DATA
11c-Arroyo el Coyote in Nuevo Laredo	Conventionals	Unionized Ammonia, Chloride		NO DATA	Toxicity-Water Water Fleas & Fathead Minnows
	Metals	Arsenic	Silver	NO DATA	
	Organics	Chloroform		NO DATA	
HIGH	Level of Concern	**HIGH**	**HIGH**		NO DATA
12-Rio Grande/Río Bravo 13.2 km Downstream of Laredo/ Nuevo Laredo	Metals	Arsenic	Silver		No Toxicity Benthics-**POTENTIAL CONCERN**
SLIGHT	Level of Concern	**LOW**	**LOW**	**SLIGHT**	Fish-**POTENTIAL CONCERN**
12.1-Rio Grande/Río Bravo 25 km Downstream of Laredo/ Nuevo Laredo	Metals	Arsenic	Copper, Lead, Nickel, Zinc		No Toxicity
	Organics	N-nitrosodi-n-propylamine			Benthics-**POTENTIAL CONCERN**
HIGH	Level of Concern	**HIGH**	**MODERATE**	**SLIGHT**	Fish-**POTENTIAL CONCERN**

TABLE 57 (cont)
SUMMARY OF DATA FOR MAINSTEM AND TRIBUTARY STATIONS SAMPLED
DURING PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCES STUDY

STATION / OVERALL LEVEL OF CONCERN	TYPE	WATER	SEDIMENT	FISH TISSUE	TOXICITY & BIOLOGICAL LEVEL OF CONCERN
12.2-International Falcon Reservoir-Headwaters	Metals	Arsenic	Copper, Lead, Nickel, Zinc	Lead, Zinc	No Toxicity
MODERATE	Level of Concern	**SLIGHT**	**HIGH**	**MODERATE**	NO DATA
12.3-International Falcon Reservoir-Near Dam	Metals	Arsenic			No Toxicity
SLIGHT	Level of Concern	**MODERATE**	**SLIGHT**	**SLIGHT**	NO DATA
12d-Arroyo los Olmos Near Rio Grande City	Conventionals	Chloride		NO DATA	No Toxicity
	Metals	Arsenic		NO DATA	
	Pesticides		DDE	NO DATA	
MODERATE	Level of Concern	**MODERATE**	**MODERATE**		NO DATA
13-Rio Grande/Río Bravo at SH 886 Near Los Ebanos	Metals	Arsenic	Silver		No Toxicity
SLIGHT	Level of Concern	**MODERATE**	**LOW**	**SLIGHT**	Fish-**POTENTIAL CONCERN**
14-Rio Grande/Río Bravo Downstream of Anzalduas Dam	Metals	Arsenic	Copper, Lead, Nickel, Silver, Zinc		No Toxicity Benthics-**POTENTIAL CONCERN**
SLIGHT	Level of Concern	**MODERATE**	**MODERATE**	**SLIGHT**	Fish-**POTENTIAL CONCERN**
15-Rio Grande/Río Bravo at US 281 in Hidalgo/Reynosa	Metals	Arsenic	Silver	Lead	No Toxicity
LOW	Level of Concern	**HIGH**	**SLIGHT**	**LOW**	Fish- **CONCERN**
15a-El Anhelo Drain in Reynosa	Conventionals	Unionized Ammonia, Chloride		NO DATA	Toxicity-Water Water Fleas & Toxicity-Water and Sediment Fathead Minnows
	Metals	Arsenic	Silver	NO DATA	
HIGH	Level of Concern	**HIGH**	**MODERATE**		NO DATA

TABLE 57 (cont)
SUMMARY OF DATA FOR MAINSTEM AND TRIBUTARY STATIONS SAMPLED
DURING PHASE 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCES STUDY

STATION / OVERALL LEVEL OF CONCERN	TYPE	WATER	SEDIMENT	FISH TISSUE	TOXICITY & BIOLOGICAL LEVEL OF CONCERN
16-Rio Grande/Río Bravo Downstream of el Anhelo Drain	Metals	Arsenic	Copper, Nickel, Silver, Zinc	Copper, Zinc	No Toxicity
	Pesticides			Chlordane	Benthics-**NO CONCERN**
MODERATE	Level of Concern	**LOW**	**HIGH**	**LOW**	Fish-**NO CONCERN**
17-Rio Grande/Río Bravo Downstream of San Benito	Metals	Arsenic	Lead, Nickel, Silver, Zinc	Copper	No Toxicity
LOW	Level of Concern	**MODERATE**	**MODERATE**	**LOW**	Fish-**POTENTIAL CONCERN**
18-Rio Grande/Río Bravo Downstream of US 83/77 Brownsville/ Matamoros	Metals	Arsenic	Silver, Zinc		No Toxicity
	Organics			Aroclor 1260	Benthics-**CONCERN**
LOW	Level of Concern	**SLIGHT**	**LOW**	**MODERATE**	Fish-**POTENTIAL CONCERN**

CHAPTER 9

POTENTIAL CONCERNS TO HUMAN HEALTH AND THE AQUATIC ENVIRONMENT

HUMAN HEALTH

Water

Human health criteria relate to potential effects of regular long-term consumption of fish and/or untreated drinking water. Five toxic substances were found at levels exceeding human health criteria; arsenic, bromodichloromethane, dibromochloromethane, bis (2-ethylhexyl) phthalate, and n-nitrosodi-n-propylamine (APPENDIX J). Only arsenic and n-nitrosodi-n-propylamine were found in the mainstem. N-nitrosodi-n-propylamine, found at one station downstream of Laredo, exceeded the criterion for the consumption of fish and water (Table 58). N-nitrosodi-n-propylamine is a manmade chemical, which may have originated from an unauthorized discharge or in one of the wastewater treatment plant discharges, although it was not detected in any of the Laredo/Nuevo Laredo tributaries. N-nitrosodi-n-propylamine does not persist in water suggesting a recent release or discharge (University of Virginia Database 1989).

Bis (2-ethylhexyl) phthalate exceeded the human health criteria for water and fish at the site closest to the Rio Grande/Río Bravo confluence. Bromodichloromethane and dibromochloromethane were both detected in the Laredo Southside WWTP effluent. Both concentrations exceeded the human health criteria for water and fish.

Arsenic exceeded both human health criteria at 33 of the 37 stations sampled. Low levels of arsenic are found in water, soil, food, and air because it occurs naturally in the environment. Its presence in the aquatic environment is primarily due to its use as a pesticide/herbicide, and from coal burning power plant emissions, smelters, mine tailing runoff, industrial/ municipal wastewater, and erosion. Arsenic is not broken down or destroyed in the environment but is converted to various forms by natural chemical or bacteriological action. There are many forms of arsenic, but it was not possible to determine what forms were present at the time Phase 2 samples were collected. Arsenic is a carcinogen that persists in water and tends to bioaccumulate in fish tissue (Eisler 1988; US Dept Health and Human Services 1993a).

Fish

In the mainstem, edible tissue criteria were exceeded for arsenic, mercury, chlordane, and DDE (Table 59). These contaminants were found at elevated levels in only one or two of the 33 samples. These exceedances indicate only the potential for possible human health effects. Pesticides were detected in samples containing only one fish each. The fish analyed were carp and a carp sucker. Mercury and arsenic were also detected in samples with only one fish each but were found in largemouth bass.

TABLE 58
CONTAMINANTS IN WATER THAT EXCEEDED HUMAN HEALTH CRITERIA IN PHASE 2 OR THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

Contaminant	Human Health Criteria Exceeded (# of Times)
! Arsenic	! Water and Fish (33) ! Fish Only (33)
! Bromodichloromethane	! Water and Fish (1)
! Dibromochloromethane	! Water and Fish (1)
! Bis (2-ethylhexyl)phthalate	! Water and Fish (1)
! N-nitrosodi-n-propylamine	! Water and Fish (1)

TABLE 59
CONTAMINANTS IN WATER THAT EXCEEDED EDIBLE FISH TISSUE CRITERIA IN PHASE 2 OR THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

Contaminant	Edible Tissue Criteria Exceeded (# of Times)
! Arsenic	! USEPA Edible Tissue (2)
! Mercury	! USFDA Action Level (1)
! Chlordane	! USEPA Edible Tissue (1)
! DDE	! USEPA Edible Tissue (2)

Aquatic Environment

Water

Chloride and unionized ammonia were the only substances found in the Rio Grande/Río Bravo that exceeded criteria for the protection of aquatic life. Both occurred at concentrations that exceeded acute and chronic aquatic life criteria, and were commonly associated with ambient water toxicity to fathead minnows and water fleas (Table 60). The majority of toxic effects by unionized ammonia and chloride were seen in samples from tributaries that were associated with treated or untreated wastewater. A number of factors affect the toxicity of unionized ammonia to aquatic life: pH, DO, temperature, salinity, presence of other toxicants, chronic exposure to sublethal concentrations, and consistency of exposure (Rand 1985). Ammonia can be toxic to fish under certain conditions and impact can be related to the ability of a stream to eliminate ammonia from water (Lewis *et al*. 1980).

Toxic effects of water on fathead minnows were observed in one treated wastewater discharge (El Paso Haskell Street WWTP, which contained the highest ammonia nitrogen concentration recorded in the survey), and three Mexican tributaries (Ciudad Juárez Wastewater Canal, Arroyo el Coyote, and el Anhelo Drain). All four sites had unionized ammonia concentrations that exceeded aquatic life criteria (Table 48).

Toxic effects of water from mainstem sites were observed at Stations 4 and 5. These stations downstream of Presidio/Ojinaga and in Big Bend National Park, were mainly affected by elevated total dissolved solids and chloride concentrations. The highest salinity observed in the study was in the Rio Grande/Río Bravo between El Paso/Ciudad Juárez and Presidio/Ojinaga. Under normal circumstances inflow from the Río Conchos contributes enough freshwater to reduce salinity downstream of Presidio. When samples were collected in August and December 1995, however, there was little inflow from the Río Conchos. Salinity, total dissolved solids (TDS), and chloride tend to increase during the off season, September through March, when irrigation and upstream reservoir releases are at a minimum. Irrigation return flows and wastewater containing elevated chloride and TDS are the main source of flow from September to March (Miyamoto *et al*. 1995).

No metals, organics, or pesticides in water exceeded acute or chronic aquatic life criteria. Several were greater than state and/or national 85th percentiles at only one to three stations. These contaminants generally were found at stations dominated by untreated wastewater. Arsenic, on the other hand, exceeded state and/or national 85th percentiles 29 of the 33 times it was detected. Although arsenic may have contributed to the toxicity of water to fathead minnows and water fleas, it did not appear to be the main factor.

TABLE 60
CONTAMINANTS IN WATER THAT EXCEEDED AQUATIC LIFE CRITERIA IN PHASE 2 OR THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

Contaminant	Aquatic Life Criteria Exceeded (# of Times)
! Unionized Ammonia	! Aquatic Life Acute (4) ! Aquatic Life Chronic (10)
! Chloride	! Aquatic Life Acute (3) ! Aquatic Life Chronic (17)

Sediment

Many of the contaminants, natural and/or manmade (metals, pesticides, organics, and inorganics), introduced to surface waters will eventually accumulate in sediment. Information suggests that even in areas where surface water quality criteria are met, organisms in or on sediment can be adversely impacted by contaminants in sediment. Surface water quality criteria, developed to protect organisms inhabiting the water column, were not derived to protect benthic organisms (Rand 1995). The bioavailablity of organic contaminants in sediment is thought to be dependent upon the amount of organic carbon present and metals dependent on the presence of acid volatile sulfides; increases in organic carbon and acid volatile sulfides concentrations cause bioavailability of a contaminant to decrease (Pesch *et al*. 1995).

Metals were the most common contaminant found in sediment. The most frequently occurring were arsenic, chromium, copper, lead, nickel, and zinc. Arsenic, chromium and nickel are highly toxic to aquatic life. Although these metals were found at numerous stations, toxic effects of sediment were seen at only one mainstem station (Station 2) and four tributary stations (Stations 2a, 9a, 11c, and 15a). There were no obvious causes of sediment toxicity.

TABLE 61
CONTAMINANTS IN SEDIMENT THAT EXCEEDED SCREENING LEVELS IN PHASE 2 OR THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

Contaminant	Sediment Screening Level Exceeded (# of Times)
! Antimony	! 85th Percentile (1)
! Arsenic	! 85th percentile (1)
! Copper	! Molar SEM/AVS Ratio (12) ! 85th percentile (1)
! Lead	! Molar SEM/AVS Ratio (12)
! Nickel	! Molar SEM/AVS Ratio (13) ! 85th percentile (1)
! Silver	! 85th percentile (10)
! Zinc	! Molar SEM/AVS Ratio (16)
! Chlordane	! Sediment Quality Criteria (1)
! DDE	! Sediment Quality Criteria (8)
! DDT	! Sediment Quality Criteria (2)

COMPARISON OF DATA FROM PHASES 1 AND 2 OF THE RIO GRANDE/RIO BRAVO TOXIC SUBSTANCE STUDY

Metals were the most common contaminant found in water and sediment (mainstem and tributaries). PCBs were found in tissue in the Del Rio/Ciudad Acuña area in Phase 1, but only at Station 18 near Brownsville/Matamoros in a single tissue sample in Phase 2. The majority of organics were found in tributaries in both studies. DDE, DDT, and chlordane were the only pesticides to exceed screening/criteria levels in Phase 2 (both mainstem and tributaries). In Phase 1 DDE, DDT, lindane, dieldrin, and chlordane exceeded screening levels.

The differences in the types and concentrations of toxic substances found in Phases 1 and 2 are not surprising. Water samples, unless collected as a composite over time, give only a relative indication of what water quality was at the time of collection. Sediment and tissue samples are better indicators of existing conditions. Toxic substances tend to accumulate in sediment and tissue over time, while concentrations in flowing water are dynamic and constantly change. Therefore, sediment and fish tissue data should be regarded as the most meaningful basis for comparing conditions during the respective phases of the study.

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APPENDIX A
ANALYTICAL METHODS USED BY THE TEXAS DEPARTMENT
OF HEALTH ENVIRONMENTAL CHEMISTRY LABORATORY

Analysis	Matrix	Preparation/Digestion/ Extraction Method	Analytical Method	Method Description
		CONVENTIONALS		
GRAIN SIZE ANALYSIS	sediment			fraction separation and gravimetric determination
LIPID CONTENT	tissue	sample ground	AOAC 15th ed. 964.12	digestion
ACID VOLATILE SULIFIDE	sediment	sample screened	SM 9030A	distillation, titrimetric
AMMONIA	water	sample filtered	EPA 350.1	colorimetric, automated phenate
CHLORIDE	water	sample filtered	EPA 300.0	ion chromatograph
CYANIDE	water	distillation	EPA 335.2	total, spectrophotometric
	sediment	sample screened	EPA 335.2	total, spectrophotometric
	tissue		EPA 335.2	total, spectrophotometric
NITRATE NITROGEN	water	sample filtered	EPA 353.2	colorimetric, automated, cadmium reduction
ORTHO-PHOSPHORUS	water		EPA 365.1	colorimetric, ascorbic acid, single reagent
PHENOLICS RECOVERABLE	water	distillation/extraction with chloroform	EPA 420.1	spectrophotometric, manual 4-AAP with distillation
	sediment	sample screened	EPA 420.1	spectrophotometric, manual 4-AAP with distillation
	tissue		EPA 420.1	spectrophotometric, manual 4-AAP with distillation
SULFATE	water	sample filtered	EPA 300.0	ion chromatograph
TOTAL DISSOLVED SOLIDS	water	sample filtered	EPA 160.1	residue, filterable, gravimetric, dried @ 180EC
TOTAL HARDNESS	water	sample filtered	EPA 130.1	

APPENDIX A (cont)
ANALYTICAL METHODS USED BY THE TEXAS DEPARTMENT
OF HEALTH ENVIRONMENTAL CHEMISTRY LABORATORY

Analysis	Matrix	Preparation/Digestion/ Extraction Method	Analytical Method	Method Description
TOTAL KJELDAHL NITROGEN	water		EPA 351.2	colorimetric, automated phenate
TOTAL ORGANIC CARBON	water		EPA 415.1	combustion or oxidation
	sediment	sample screened, dried	EPA 415.1	combustion or oxidation
TOTAL PHOSPHORUS	water		EPA 365.4	colorimetric, automated, block digester, AAII
TOTAL SUSPENDED SOLIDS	water		EPA 160.2	residue, non-filterable, gravimetric, dried @ 103-105EC
TURBIDITY	water		EPA 180.1	nephelometric
		METALS		
ALUMINUM	water		EPA 200.7	ICP
	sediment	EPA 3050A	EPA 200.7	ICP
	tissue	EPA 200.3	EPA 200.7	ICP
ANTIMONY	water	EPA 3005A	EPA 204.2	GFAA
	tissue	EPA 200.3	EPA 204.2	GFAA
ARSENIC	water	SM 3113B	EPA 206.2	GFAA
	sediment	SM 3114C	SM 3114C	hydride
	tissue	SM 3114C	SM 3114C	hydride
BERYLLIUM	water		EPA 200.7	ICP
	sediment	EPA 3050A	EPA 200.7	ICP
	tissue	EPA 200.3	EPA 200.7	ICP
CADMIUM	water		EPA 213.2	GFAA
	sediment	EPA 3050A	EPA 213.2	GFAA
	tissue	EPA 200.3	EPA 213.2	GFAA
CHROMIUM	water		EPA 200.7	ICP
	sediment	EPA 3050A	EPA 200.7	ICP
	tissue	EPA 200.3	EPA 200.7	ICP

APPENDIX A (cont)
ANALYTICAL METHODS USED BY THE TEXAS DEPARTMENT
OF HEALTH ENVIRONMENTAL CHEMISTRY LABORATORY

Analysis	Matrix	Preparation/Digestion/ Extraction Method	Analytical Method	Method Description
COPPER	water		EPA 200.7	ICP
	sediment	EPA 3050A	EPA 200.7	ICP
	tissue	EPA 200.3	EPA 200.7	ICP
LEAD	water		EPA 239.2	GFAA
	sediment	EPA 3050A	EPA 239.2	GFAA
	tissue	EPA 200.3	EPA 239.2	GFAA
MERCURY	water	EPA 245.1	EPA 245.1	manual cold vapor
	sediment	EPA 245.1	EPA 245.1	manual cold vapor
	tissue	EPA 245.6	EPA 245.6	manual cold vapor
NICKEL	water		EPA 200.7	ICP
	sediment	EPA 3050A	EPA 200.7	ICP
	tissue	EPA 200.3	EPA 200.7	ICP
SELENIUM	water	SM 3113B	EPA 270.2	GFAA
	sediment	SM 3114C	SM 3114C	hydride
	tissue	SM 3114C	SM 3114C	hydride
SILVER	water		EPA 200.7	ICP
	sediment	EPA 3050A	EPA 200.7	ICP
	tissue	EPA 200.3	EPA 200.7	ICP
THALLIUM	water		EPA 279.2	GFAA
	sediment	EPA 3050A	EPA 279.2	GFAA
	tissue	EPA 200.3	EPA 279.2	GFAA
ZINC	water		EPA 200.7	ICP
	sediment	EPA 3050A	EPA 200.7	ICP
	tissue	EPA 200.3	EPA 200.7	ICP
		ORGANICS		
VOLATILE ORGANICS	water	EPA 5030, purge & trap	EPA 8260	GC/MS

APPENDIX A (cont)
ANALYTICAL METHODS USED BY THE TEXAS DEPARTMENT
OF HEALTH ENVIRONMENTAL CHEMISTRY LABORATORY

Analysis	Matrix	Preparation/Digestion/ Extraction Method	Analytical Method	Method Description
		ORGANICS		
VOLATILE ORGANICS (cont)	sediment	EPA 5030, methanol extraction, purge & trap	EPA 8260A	GC/MS
	tissue	EPA Region VII Lab sonication	EPA 8260A	GC/MS
SEMIVOLATILE ORGANICS	water	EPA 3520, continuous liquid/liquid	EPA 8270A	GC/MS
	sediment	EPA 3540B, soxhlet extraction	EPA 8270A	GC/MS
	tissue	EPA 3540B, soxhlet extraction; EPA 3640, GPC cleanup	EPA 8270B	GC/MS
INSECTICIDES	water	EPA 3510B, separatory funnel	EPA 8081	GC-ECD
	sediment	EPA 3540B, soxhlet extraction; EPA 3620, cleanup florisil fractionation	EPA 8081	GC-ECD
	tissue	USFDA PAM Method 211, blender extraction; EPA 3640, GPC cleanup; EPA 3620, cleanup florisil fractionation	EPA 8081	GC-ECD
HERBICIDES	water	EPA 3510, separatory funnel, diazomethane esterification	EPA 8151	GC-ECD
	sediment	EPA 8150, modified, shaker, separatory funnel, diazomethane esterification	EPA 8151	GC-ECD
CARBAMATES	water	dilution, direct injection	EPA 531	HPLC post column derivatization
PCB's	water	EPA 3510B, separatory funnel	EPA 8081	
	sediment	EPA 3540B, soxhlet extraction; EPA 3620, cleanup florisil fractionation	EPA 8081	GC capillary column
	tissue	USFDA PAM Method 211, blender extraction; EPA 3640, GPC cleanup; EPA 3620, cleanup florisil fractionation	EPA 8081	GC capillary column

Methods used in Phase 2 of the Rio Grande/Río Bravo Toxic Substance Study verfied 2/3/97 by L.Mohrmann, Texas Department of Health, Bureau of Laboratories, Environmental Sciences Division, Austin, TX.

APPENDIX B
DEFINITION OF TERMS

Acute Exposure: High concentrations over a short period of time.

Alkalinity: A measure of the acid-neutralizing capacity of water. Bicarbonate, carbonate and hydroxide are the primary cause of alkalinity in natural waters. Concentrations are expressed as mg/L of $CaCO_3$. [2]

Ambient: Environmental or surrounding conditions. [5]

Ammonia-Nitrogen (NH_3-N): Ammonia, naturally occurring surface and wastewaters, is produced by the break down of compounds containing organic nitrogen. [2]

Anaerobic: Absence of oxygen.

Anthropogenic: Impacts on nature (sources of pollution) that are related to or the result of human influence.

Aquatic Benthic Macroinvertebrates: Organisms lacking a backbone and living in water. Includes insects, crayfish, worms. [5]

Bioaccumulation: The buildup (absorption) of a chemical in plants and animals due to long-term or repeated exposure. [5]

Bioassay: The use of living organisms to measure the effect of a substance, factor or condition by comparing before and after data. [1]

Bioconcentration: The accumulation of a chemical in the tissue of an organism to levels that are greater than the surrounding environment in which the organism lives. Movement of a substance from the surrounding environment (abiotic) into a living organism via passive absorption. [5]

Biomass: The amount of living material in a given area. [1]

Bloom: The accelerated growth of algae and/or higher aquatic plants in a body of water. This is often related to pollutants that increase the rate of growth. [1]

Carcinogen: Any substance capable of producing cancer or a chemcial which causes or induces cancer. [5]

Chloride (Cl^-): One of the major inorganic ions in water and wastewater. Concentrations can be increased by industrial processes. High chloride concentrations can affect metallic objects and growing plants. [2]

Chlorophyll *a*: Photosynthetic pigment which is found in all green plants. The concentration of chlorophyll *a* is used to estimate phytoplankton biomass (all phytoplankton in a given area) in surface water. [1]

Chronic Exposure: Sublethal concentrations over a long period of time.

Conductivity: A measure of the electrical current carrying capacity, in Fmhos/cm, of 1 cm^3 of water at 25 EC. Dissolved substances in water dissociate into ions with the ability to conduct electrical current. [2]

Contact Recreation: Recreational activities involving a significant risk of ingestion of water, including wading by children, swimming, water skiing, diving and surfing. [3]

Contaminant: Any physical, chemical or biological substance or matter that has an adverse affect on water, air and soil. [1]

Criteria: Water quality conditions which are to be met in order to support and protect desired uses. [3]

Cubic Foot Per Second (ft^3/s)(cfs): A rate of flow were a 1 cubic foot volume of water passes a given point in 1 second.

Cubic Meter Per Second (m^3/s)(cms): A rate of flow were a 1 cubic meter volume of water passes a given point in 1 second.

Degredation: Chemical or biological breakdown of a complex compound to simpler compounds. [5]

Dissolved Oxygen (DO): The oxygen freely available in water. Dissolved oxygen is vital to fish and other aquatic life and for the prevention of odors. Traditionally, the level of dissolved oxygen has been accepted as the single most important indicator of a water body's ability to support desirable aquatic life. [1]

Ecological Impact: The effect that a man-made or natural activity has on living organisms and their abiotic (non-living) environment.[1]

Effluent: Wastewater-treated or untreated-that flows out of a treatment plant or industrial outfall (point source), prior to entering a water body. [1,3]

Elutriate: The liquid portion remaining after solids settle. The liquid portion or eluate is used to test the toxicity of sediment to aquatic organisms.

Equilibrium Partitioning (EqP): Is a method for generalizing sediment criteria that focuses on the chemical interaction between sediments and contaminants. [7]

Eutrophic: Refers to shallow, murky bodies of water that have excessive concentrations of plant nutirents resulting in increased algal production. [1]

Fecal Coliform Bacteria: Bacteria found in the intestinal tracts of mammals. Organisms used as an indicator of pollution and possible presence of waterborne pathogens. [1]

Human Health Criteria (freshwater): (1) water and fish-freshwater criteria to prevent contamination of drinking water, fish and other aquatic life to ensure safety for human consumption, and (2) fish only freshwater criteria to prevent contamination of fish and other aquatic life to ensure safety for human consumption. Water and fish criteria apply to water bodies designated as public water supplies and fish criteria apply to water bodies not designated as public water supplies. [3]

Intolerant Organism: Organisms that are sensitive to degradation in water quality and habitat. Sensitive organisms are usually driven from an area or killed as the result of some contaminant, especially organic pollution. [7]

Invertivore: Organisms which feed on invertebrates (insects, worms, crustaceans, etc.).

Fg/L: Micrograms per liter.

mg/L: Milligrams per liter, essentially equal to ppm (parts per million).

MGD: million gallons per day.

Mutagen: An substance that causes a permanent genetic change in a cell that does occur normally. [5]

Nitrate-Nitrogen (NO_3-N): A compound containing nitrogen which can exist as a dissolved gas in water. Excessive amounts can have harmful effects on humans and animals (> 10 mg/L). [1,2]

Nitrification: The process where ammonia in water and wastewater is oxidized to nitrite and then to nitrate by bacterial and chemical reactions. [1]

Nitrite-Nitrogen (NO_2-N): An intermediate oxidation state in the nitrification process (ammonia, nitrite, nitrate). [1]

Nonpoint Source: Pollution sources which are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outfall. The pollutants are generally carried off the land by stormwater runoff. The commonly used categories for nonpoint sources are: agriculture, forestry, urban, mining, construction, dams and channels, land disposal and saltwater intrusion.[1]

Nutrient: Any substance used by living things to promote growth. The term is generally applied to nitrogen and phosphorus in water and wastewater, but is also applied to other essential and trace elements. [1]

Omnivore: Organisms which feed on plant and animal material.

Orthophosphate (O-P): Nearly all phosphorus in water exists as phosphate. The most important form of inorganic phosphorous is orthophosphate, making up 90% of the total. Orthophosphate, the only form of soluble inorganic phosphorus that can be directly utilized, is the least abundant of any nutrient and is commonly the limiting factor. [2,4]

Outfall: A designated point of effluent discharge into receiving waters. [8]

pH: The hydrogen-ion activity of water caused by the break down of water molecules and presence of dissolved acids and bases. [2]

Pheophytin *a*: An important degradation product of chlorophyll *a*, interferes with the measurement of chlorophyll *a*. Pheophytin *a* can cause an over or under estimation of chlorophyll *a*. Pheophytin *a* is used to determine a more accurate measure of chlorophyll *a*. [2]

Phosphorus (P): Essential to the growth of organisms and can be the nutrient that limits the primary productivity of water. In excessive amounts, from wastewater, agricultural drainage and certain industrial wastes, it also contributes to the eutrophication of lakes and other water bodies. [1]

Piscivore: Organism which feeds on fish.

Point Source: A specific location from which pollutants are discharged. It can also be defined as a single identifiable source of pollution (eg. pipe or ship). [1]

Receiving Water: A river, stream, lake or other body of surface water into which wastewater or treated effluent is discharged. [1]

Reservoir: Any natural or artificial holding area used to store, regulate or control water. [1]

Riparian: Living or located along the bank of a river; ex: riparian vegetation.

River Basin: The land area drained by a river and its tributaries.[1]

Run-Off: The part of precipitation or irrigation water that runs off land into streams and other surface water. [1]

Sulfate (SO_4^-): Sulfates are derived from rocks and soils containing gypsum, iron sulfides and other sulfur compounds. Sulfates are widely distributed in nature. [2]

Segment: Waters designated by the State, which include most rivers and their major tributaries, major reservoirs and lakes and marine waters. Segmented waters have designated physical boundaries, specific uses and numerical physiochemical criteria (Ex: DO, temperature, fecal coliform, chloride, sulfate). [5]

Teratogen: Any substance capable of producing structural abnormalities of prenatal origin. [5]

Texas Surface Water Quality Standards (TSWQS): The designation of water bodies for desirable uses and the narrative and numerical criteria deemed necessary to protect those uses. [3]

Tolerant Organism: Organisms that have the capacity to grow and thrive when subjected to unfavorable environmental factors. [7]

Total Dissolved Solids (TDS): The amount of material (inorganic salts and small amounts of organic material) dissolved in water. [3]

Total Hardness: The sum of the calcium and magnesium concentrations, expressed as calcium carbonate in mg/L. [2]

Total Organic Carbon (TOC): The sum of the organic components of water and sediment; dissolved organic carbon (DOC), particulate organic carbon (POC) and suspended organic carbon. [7]

Total Suspended Solids (TSS): A measure of the insoluble suspended solids in water, both organic and inorganic. [1,3]

Toxic: Harmful, poisonous. [5]

Toxicity: The ability of a substance to cause adverse effects; the specific quantity of a substance which may be, under certain conditions, to do damage to a specific living organism. [5]

Trophic Level: Organisms are divided by feeding groups or trophic levels. For example; producers (plants), herbivores (plant eaters), carnivores (meat eaters), and omnivores (varied diet).

Volatile: Capable of vaporizing or evaporating easily. [5]

Volatile Suspended Solids (VSS): The portion of the TSS that is lost after ignition. This represents the organic part of the TSS. [2]

Wastewater Treatment Plant (WWTP): A facility containing a series of screens, basins and other treatment processes that remove pollutants from wastewater. [1]

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[1] USEPA 1988 (Definitions taken all or in part)
[2] APHA 1989
[3] Texas Water Code, Chapter 307, July 1995
[4] Wetzel 1983
[5] EXTOXNET-Extension Toxicology Network, September 1993, Oregon State University
[6] Canter 1985
[7] USEPA 1994

APPENDIX C
ADDITIONAL FLOW INFORMATION

The following is information relating to the flow conditions during Phase 2 of the Rio Grande Toxic Substance Study. The purpose is to illustrate typical flow conditions in the areas where Phase 2 samples were collected. Samples were to be collected under low flow conditions. The figures represent flow in the river the month prior to sampling from 1989 to 1993 and 1995. On a few figures, high flow years obscured the graph; therefore a year may have been omitted from the graphs but the data is included in the table. The majority of samples were collected under low or normal flow conditions. Due to the complexity of water usage from the Rio Grande/Río Bravo, it can be difficult to determine when low flow is going to occur. In several cases flow was low to normal when samples were collected but may have been high the week before. The only sites affected by high flow during Phase 2 were Station 14 (Anzalduas Dam) and Station 15 (US 281 at Hidalgo/Reynosa).

IBWC DAILY AVERAGE FLOW DATA (CFS) ˜

YEAR	1989	1990	1991	1992	1993	1995	7Q2
EL PASO							
November 5- December 3							
Min	111	127	140	161	142	1.4	56.6
Max	166	231	209	248	217	175	
Mean	135	164	172	208	186	25	
Median	134	163	168	207	187	3.2	
PRESIDIO-UPSTREAM							
November 3-December 6							
Min	123	271	255	245	260	265	0.0
Max	168	427	332	309	360	565	
Mean	151	344	286	280	300	374.7	
Median	153	344	282	280	301	333.5	
RIO CONCHOS							
November 3-December 6							
Min	271	151	150	191	456	No Data-	
Max	770	3500	203	618	516	Very	
Mean	371	1698	173	465	490	Low	
Median	311	1320	168	477	491	Flow	
PRESIDIO-DOWNSTREAM							
November 3-December 6							
Min	416	551	434	385	745	295	172.3
Max	1060	4630	569	851	1070	586	
Mean	542	1834	496	712	864	412	
Median	469	927	493	777	878	394	

IBWC DAILY AVERAGE FLOW DATA (CFS) (cont)˜

YEAR	1989	1990	1991	1992	1993	1995	7Q2
SANTA ELENA CANYON							
November 3-December 8							
Min	461	618	569	473	710	329	163.6
Max	1030	4170	731	901	964	470	
Mean	584	1776	652	658	845	399	
Median	535	1020	675	625	873	396	
DEL RIO							
April 10-May 17							
Min	2210	4410	3050	2210	2030	1330	629.3
Max	8360	9990	3530	9990	5470	7940	
Mean	4243	6262	3255	5637	4207	4207	
Median	2480	4945	3250	4325	4500	4500	
EAGLE PASS							
April 11-May 19							
Min	2240	4450	3330	3010	1850	1229	672.3
Max	9290	32600	4240	10700	5230	7911	
Mean	4430	7074	3613	6014	3942	4000	
Median	2790	5010	3570	5620	4770	2289	
LAREDO							
May 4-June 11							
Min	1090	2970	3280	2970	5010	1462	782.3
Max	5710	10700	8580	15000	6890	8899	
Mean	2782	5861	4201	803	5522	3118	
Median	2890	5230	3960	7880	5440	1646	
RIO GRANDE CITY							
June 8-July 13							
Min							
Max	212	3480	494	1400	1440	1229	314.9
Mean	9710	13000	8190	10900	10700	3673	
Median	4366	8442	2476	4026	4599	2451	
	4445	8670	1990	2855	4590	2609	
ANZALDUAS DAM							
June 8-July 13							
Min							
Max	689	220	120	175	184	766	230.1
Mean	2750	1710	2280	2020	1620	3023	
Median	1330	968	907	856	842	1946	
	1285	986	712	819	720	2027	
SAN BENITO							
June 8-July 15							
Min	47.7	221	23.7	544	170	24	90.6
Max	1650	2090	4240	7560	6460	932	
Mean	581	702	928	3743	1068	390	
Median	468	607	633	2500	544	383	

YEAR	1989	1990	1991	1992	1993	1995	7Q2
BROWNSVILLE							
June 8-July 16							
Min	1.1	25.8	10.6	646	0.7	0.4	25.1
Max	9400	1090	5053	7310	7730	565	
Mean	1232	286	872	3727	1205	173	
Median	305	217	434	2640	431	122	

˜ Data represents flow conditions one month prior to sampling; (1) four years prior to Phase 2 sampling, and (2) for the actual Phase 2 sampling. This information is given as an indicator of whether or not low flow conditions existed at the time of each sampling event.

7Q2 = The lowest 7-day average flow that would be expected to occur every two years. Used to determine allowable discharge load to a stream, and is based on historical data (TNRCC 1995). 7Q2 flows based on 20 to 30 years of IBWC data; calculated by Karen Visnovsky, TNRCC Toxicity Evaluation Team.

APPENDIX D

SUMMARY OF AMBIENT WATER TOXICITY DATA
FOR FATHEAD MINNOWS (*Pimephales promelas*), **MAINSTEM SITES**

Station	Control (%)	Site (%)	Sign. Effect *	Control (%)	Site (%)	Sign. Effect *
	WATER			SEDIMENT		
1	3	7	NO	7	7	NO
1.1	3	7	NO	7	0	NO
2	3	3	NO	7	**100**	**YES**
3	3	3	NO	7	10	NO
4	3	7	NO	7	3	NO
5	3	7	NO	7	3	NO
6.1	7	0	NO	3	7	NO
6.2	7	3	NO	3	0	NO
10	7	0	NO	3	7	NO
12	7	10	NO	7	10	NO
12.1	7	3	NO	7	3	NO
12.2	7	7	NO	7	3	NO
12.3	7	7	NO	7	3	NO
13	3	0	NO	3	0	NO
14	3	3	NO	3	0	NO
15	3	7	NO	3	3	NO
16	3	7	NO	3	0	NO
17	3	10	NO	3	3	NO
18	3	0	NO	3	7	NO

***** Significantly different (P > 0.95) from the control.
Significant effects for *P. promelas* include number of dead embryos (unhatched) and abnormal growth or swimming behaviors of larvae.
-Bioassay results taken from EPA Lab Reports

APPENDIX D (cont)
SUMMARY OF AMBIENT WATER TOXICITY DATA
FOR FATHEAD MINNOWS (*Pimephales promelas)*, **TRIBUTARY SITES**

STATION	**Control (%)**	**Site (%)**	**Sign. Effect ***	**Control (%)**	**Site (%)**	**Sign. Effect ***
	WATER			**SEDIMENT**		
0.5	3	10	NO	7	10	NO
1a	3	**100**	**YES**	-	-	-
2a	3	**100**	**YES**	7	**70**	**YES**
3a	3	3	NO	7	3	NO
3a.1	7	0	NO	7	10	NO
5a	-	-	-	-	-	-
7b	7	10	NO	3	0	NO
7b.1	7	3	NO	3	7	NO
7b.2	7	0	NO	3	3	NO
9a	7	10	NO	**3**	**87**	**YES**
10a	7	7	NO	7	3	NO
11a	7	7	NO	7	3	NO
11b	7	0	NO	7	0	NO
11b.1	7	3	NO			
11b.2	7	7	NO			
11b.3	7	10	NO			
11c	**7**	**100**	**YES**	**7**	**100**	**YES**
12d	7	10	NO	3	7	NO
15a	**7**	**100**	**YES**	**3**	**20**	**YES**

***** Significantly different (P > 0.95) from the control.
-Significant effects for *P. promelas* include number of dead embryos (unhatched) and abnormal growth or swimming behaviors of larvae.
-Bioassay results taken from EPA Lab Reports

APPENDIX D (cont)
SUMMARY OF AMBIENT WATER TOXICITY DATA FOR
WATER FLEAS (*Ceriodaphnia dubia)*, **TRIBUTARY SITES**

WATER

Station	Control Mortality (%)	Site Mortality (%)	Control YPF	Site YPF	Sign. Effect *
0.5	0	0	18.4	19.8	NO
1a	0	**100**	18.4	-	**YES**
2a	0	**100**	18.4	-	**YES**
3a	0	0	18.6	17.6	NO
3a.1	0	0	16.3	20.1	NO
5a	-	-	-	-	-
7b	10	10	18.4	19.4	NO
7b.1	10	0	18.4	17.4	NO
7b.2	10	10	18.4	15.3	NO
9a	10	0	18.4	19.3	NO
10a	0	**100**	20.1	-	**YES**
11a	0	0	20.1	18.1	NO
11b	0	**50**	20.1	0.1	**YES**
11b.1	0	**100**	20.1	-	**YES**
11b.2	0	0	20.1	16.5	NO
11b.3	0	**100**	20.1	-	**YES**
11c	0	**100**	20.1	-	**YES**
12d	0	20	19.2	18.0	NO
15a	0	**100**	19.2	-	**YES**

***** Significantly different (P > 0.95) from the control.
YPF = YOUNG PER FEMALE
Significant effects for *C. dubia* include survival and number of young per female .
Bioassay results taken from EPA Lab Reports.

APPENDIX D (cont)
SUMMARY OF AMBIENT WATER TOXICITY DATA
FOR WATER FLEAS (*Ceriodaphnia dubia)*, **MAINSTEM SITES**.

WATER

Station	Control Mortality (%)	Site Mortality (%)	Control YPF	Site YPF	Sign. Effect *
1	0	0	18.4	17.1	NO
1.1	0	0	18.4	19.0	NO
2	0	0	18.4	20.3	NO
3	0	0	18.6	15.7	NO
4	0	0	18.6	13.0	**YES**
5	0	0	18.6	13.9	**YES**
6.1	10	10	18.4	17.0	NO
6.2	10	10	18.4	17.3	NO
10	10	10	18.4	19.8	NO
12	0	0	20.1	18.7	NO
12.1	0	10	20.1	19.6	NO
12.2	0	0	20.1	20.8	NO
12.3	0	0	19.2	21.3	NO
13	0	10	19.2	19.0	NO
14	0	10	19.2	20.2	NO
15	0	10	19.2	19.7	NO
16	0	0	19.2	17.8	NO
17	0	0	19.2	22.0	NO
18	0	10	19.2	22.4	NO

***** Significantly different (P > 0.95) from the control.
YPF = YOUNG PER FEMALE
-Significant effects for *C. dubia* include survival and number of young per female.
-Bioassay results taken from EPA Lab Reports.

APPENDIX D (cont)
SUMMARY OF AMBIENT WATER TOXICITY DATA
FOR WATER FLEAS (*Ceriodaphnia dubia)*, **MAINSTEM SITES**.

SEDIMENT

Station	Control Mortality (%)	Site Mortality (%)	Control YPF	Site YPF	Sign. Effect *
1	10	0	18.1	19.5	NO
1.1	10	0	18.1	18.8	NO
2	10	0	18.1	19.1	NO
3	10	0	18.1	19.9	NO
4	10	0	18.1	19.2	NO
5	10	0	18.1	17.0	NO
6.1	0	0	19.7	19.6	NO
6.2	0	20	19.7	20.6	NO
10	0	0	19.7	20.4	NO
12	10	0	18.7	19.6	NO
12.1	10	0	18.7	20.6	NO
12.2	10	0	18.7	21.4	NO
12.3	10	10	18.7	19.9	NO
13	0	0	20.9	19.7	NO
14	0	0	20.9	21.5	NO
15	0	0	20.9	21.3	NO
16	0	0	20.9	19.2	NO
17	0	0	20.9	22.0	NO
18	0	0	20.9	19.5	NO

***** Significantly different (P > 0.95) from the control.
YPF = YOUNG PER FEMALE
-Significant effects for *C. dubia* include survival and number of young per female
-Bioassay results taken from EPA Lab Reports.

APPENDIX D (cont)
SUMMARY OF AMBIENT WATER TOXICITY DATA
FOR WATER FLEAS (*Ceriodaphnia dubia)*, **TRIBUTARY SITES**

SEDIMENT

Station	Control Mortality (%)	Site Mortality (%)	Control YPF	Site YPF	Sign. Effect *
0.5	10	0	18.1	21.4	NO
1a	-	-	-	-	-
2a	10	0	18.1	21.0	NO
3a	10	0	18.1	17.7	NO
3a.1	0	10	16.3	16.4	NO
5a	-	-	-	-	-
7b	0	10	19.7	18.8	NO
7b.1	0	0	19.7	18.3	NO
7b.2	0	0	19.7	20.2	NO
9a	0	20	19.7	18.4	NO
10a	10	10	18.7	17.0	NO
11a	10	0	18.7	20.2	NO
11b	10	0	18.7	18.0	NO
11c	10	**100**	18.7	-	**YES**
12d	0	10	20.9	19.7	NO
15a	0	0	20.9	22.5	NO

***** Significantly different (P > 0.95) from the control.
YPF = YOUNG PER FEMALE
-Significant effects for *C. dubia* include survival and number of young per female
-Bioassay results taken from EPA Lab Reports.

APPENDIX E.1
ORGANICS AND INORGANICS DETECTED IN WATER
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
El Paso/Ciudad Juárez Reach

STATION	**0.5a**	**1**	**1.1**	**1a**	**2**	**2a**	**2.1**	**2.2**	**2.3**
CONVENTIONALS (mg/L)	TRIB	MAIN	MAIN	WWTP	MAIN	TRIB	MAIN	MAIN	MAIN
unionized ammonia (NH_3)	0.002	0.001	0.0024	**0.043**	**0.069**	**0.030**	**0.057**	**0.056**	**0.053**
chloride	**475**	**346**	**301**	**248**	**297**	**296**	**273**	**248**	**389**
DISSOLVED METALS (Fg/L)								SALINITY ONLY	
aluminum	Ž	Ž	g	Ž	Ž	Ž			
antimony	Ž	Ž	Ž	g	Ž	g			
arsenic	**4.7**	**4.7**	**9.0**	**6.4**	**10.1**	**5.8**			
chromium	g	g	g	g	g	3.0			
copper	**6.5**	**5.5**	**5.2**	g	g	g			
nickel	**7.3**	g	g	4.6	g	**8.5**			
selenium	1.6	g	1.9	1.3	1.9	g			
thallium	g	4.2	g	g	g	g			
zinc	Ž	Ž	Ž	Ž	Ž	Ž			
PHENOLS AND CRESOLS (Fg/L)									
phenol (C_6H_5OH) single compound	g	g	g	g	g	**14**			
phenolics recoverable	g	g	**24**	20	g	23			
HALOGENATED ALIPHATICS (Fg/L)									
chloroform	g	g	g	24	g	g			
MONOCYCLIC AROMATICS (Fg/L)									
1,4-dichlorobenzene	g	g	g	2.0	g	g			

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit
Ž	= detected but could not be quantified reliably

APPENDIX E.2
ORGANICS AND INORGANICS DETECTED IN WATER
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
Piedras Negras/Ojinaga-Big Bend National Park

STATION	3	3a	3a.1	4	5	5a	6	6a
Date	120595	120595	120595	120595	120695	120695	051595	051595
CONVENTIONALS (mg/L)	MAIN	TRIB	TRIB	MAIN	MAIN	TRIB	MAIN	TRIB
unionized ammonia (NH_3)	0.005	0.0001	0.003	0.003	0.0008	NOT SAMPLED	g	g
chloride	**559**	**394**	**136**	**523**	**527**		g	**913**
DISSOLVED METALS (Fg/L)							SALINITY ONLY	
aluminum	ž	—	ž	ž	—			
antimony	ž	ž	—	ž	ž			
arsenic	**7.7**	g	**11.0**	**7.1**	**6.9**			
copper	g	g	2.8	g	g			
selenium	1.2	g	g	0.90	1.0			
thallium	2.9	6.3	g	1.3	4.9			
zinc	ž	—	ž	ž	ž			
PHTHALATE ESTERS (Fg/L)								
bis (2-ethylhexyl) phthalate	**6.2**	**25**	g	g	g			

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit
ž	= detected but could not be quantified reliably

APPENDIX E.3
ORGANICS AND INORGANICS DETECTED IN WATER
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
International Amistad Reservoir-Eagle Pass/Piedras Negras Reach

STATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
CONVENTIONALS (mg/L)	MAIN	MAIN	TRIB	TRIB	TRIB	TRIB	MAIN
unionized ammonia (NH_3)	0.004	0.002	0.0004	0.0007	0.0007	**0.149**	0.006
chloride	54	120	21	21	21	**501**	159
DISSOLVED METALS (Fg/L)							
arsenic	**4.8**	**4.5**	g	g	g	**5.3**	**4.8**
cadmium	0.10	g	g	g	g	g	g
copper	g	g	g	g	g	g	1.1
Lead	ž	ž	ž	ž	ž	—	ž

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit
ž	= detected but could not be quantified reliably

APPENDIX E.4
ORGANICS AND INORGANICS DETECTED IN WATER
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

STATION	**10a**	**11a**	**11b**	**11b.1**	**11b.2**	**11b.3**
Date	060695	060695	060695	060695	060695	060895
CONVENTIONALS (mg/L)	TRIB	TRIB	TRIB	WWTP	WWTP	TRIB
unionized ammonia (NH_3)	0.002	0.002	0.003	g	g	**0.195**
chloride	**935**	180	**923**	210	164	**251**
DISSOLVED METALS (Fg/L)						
aluminum	g	g	g	12	14	12
arsenic	**6.3**	**5.4**	**4.7**	**2.0**	**2.4**	**2.2**
cadmium	0.20	g	g	g	g	g
zinc	8.0	g	4.0	15.0	**21.0**	6.0
HALOGENATED ALIPHATICS (Fg/L)						
bromodichloromethane	g	g	g	g	**20**	g
chloroform	g	g	g	3.2	**38**	2.0
dibromochloromethane	g	g	g	g	**4.4**	g
MONOCYCLIC AROMATICS (Fg/L)						
toluene	g	g	g	g	g	**11**
xylene	g	g	g	g	g	**12**
1,4-dichlorobenzene	g	g	g	2.6	g	**6.8**

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit
ž	= detected but could not be quantified reliably

APPENDIX E.4 (cont)
ORGANICS AND INORGANICS DETECTED IN WATER
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

STATION	**11c**	**12**	**12.1**	**12.2**	**12.3**
CONVENTIONALS (mg/L)	TRIB	MAIN	MAIN	MAIN	MAIN
unionized ammonia (NH_3)	**0.282**	0.017	0.015	0.002	0.001
chloride	**424**	152	154	86	163
DISSOLVED METALS (Fg/L)					
aluminum	10	g	g	g	g
antimony	7.6	6.8	4.2	5.0	4.8
arsenic	**3.0**	**3.8**	**4.2**	**4.0**	**5.4**
lead	g	g	1.2	1.1	1.4
zinc	g	g	g	5.0	g
HALOGENATED ALIPHATICS (Fg/L)					
chloroform	**21**	g	g	g	g
NITROSAMINES AND OTHER N COMPOUNDS (Fg/L)					
n-nitrosodi-n-propylamine	g	g	**9.7**	g	g

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit

APPENDIX E.5
ORGANICS AND INORGANICS DETECTED IN WATER
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
Below International Falcon Reservoir-Brownsville/Matamoros Reach

STATION	12d	13	14	15	15a	16	17	18
Date	071195	071195	071295	071295	071095	071395	071095	071095
CONVENTIONALS (mg/L)	TRIB	MAIN	MAIN	MAIN	TRIB	MAIN	MAIN	MAIN
unionized ammonia (NH_3)	0.004	0.002	0.0005	0.001	**0.396**	0.007	0.002	0.003
chloride	**1845**	158	202	186	**497**	167	185	190
DISSOLVED METAL (Fg/L)								
aluminum	g	77	g	9.0	50	g	g	9.0
arsenic	**10.8**	**3.9**	**3.9**	**4.5**	**4.5**	**3.5**	**4.6**	**4.0**
thallium	3.6	g	g	g	3.9	g	3.2	2.8
zinc	g	g	g	g	g	g	9.0	g

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit

APPENDIX E.1
ORGANICS AND INORGANICS IN WATER
El Paso/Ciudad Juárez Reach

LOCATION	**0.5a**	**1**	**1.1**	**1a**	**2**	**2a**	**2.1**	**2.2**	**2.3**
Date	120295	120295	120295	120295	120395	120395	120395	120395	120395
CONVENTIONALS(mg/L)	TRIB	MAIN	MAIN	WWTP	MAIN	TRIB	MAIN	MAIN	MAIN
water temperature (EC)	13.3	9.8	13.8	26.4	15.1	12.2	12.5	12.6	13.1
pH (su)	8.0	8.1	8.3	6.5	8.4	8.1	8.0	8.0	8.0
dissolved oxygen (mg/L)	8.9	9.7	10.7	5.8	7.9	0.4	8.8	7.8	7.6
specific conductance (Fmhos/cm)	3060	2500	2070	1540	2130	2190	1900	2370	2350
ammonia (NH_3-N)	0.09	0.05	0.05	21.7	1.1	1.1	2.6	2.5	2.3
unionized ammonia (NH_3)	0.002	0.001	0.002	0.043	0.069	0.030	0.057	0.056	0.053
nitrate	0.44	1.1	1.6	0.10	1.9	0.01	2.3	1.9	2.0
nitrite	0.03	0.06	0.05	0.33	0.12	< 0.01	0.09	0.09	0.09
TKN	0.70	0.80	1.0	28.5	1.9	22.3	4.2	3.4	3.5
total phosphorus	0.10	0.14	0.26	1.6	0.55	5.4	0.71	0.86	0.80
orthophosphorus	0.05	0.07	0.20	1.3	0.30	4.8	0.65	0.73	0.74
chloride	475	346	301	248	297	296	273	248	389
sulfate	646	497	471	170	456	454	355	170	421
total dissolved solids	2160	1600	1500	905	1460	1450	1340	905	1590
total hardness	550	472	458	142	405	424	355	142	445
total organic carbon	5	5	4	16	7	7	7	16	7
total suspended solids	34	33	32	10	32	32	47	10	41
total alkalinity	319	254	250	251	245	391	244	261	260
turbidity (jtu)	14.7	10.6	5.6	3.3	7.9	8.5	8.1	3.3	9.8
flow (cfs)	40.7	175.6	180.2	66.5	144.2	nm/fd	nm/fd	nm/fd	nm/fd
DISSOLVED METALS (Fg/L)									
aluminum	**7.7Ó**	**11.7Ó**	< 4.7**Ó**	**19.1Ó**	**4.8Ó**	**5.3Ó**			
antimony	**4.7Ó**	**6.2Ó**	**1.7Ó**	< 1.2**Ó**	**8.6Ó**	< 1.2**Ó**			
arsenic	**4.7Ó**	**4.7Ó**	**9.0Ó**	**6.4Ó**	**10.1Ó**	**5.8Ó**			
beryllium	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40			

APPENDIX E.1 (cont)
ORGANICS AND INORGANICS IN WATER
El Paso/Ciudad Juárez Reach

LOCATION	0.5a	1	1.1	1a	2	2a	2.1	2.2	2.3
Dissolved Metals (cont)									
cadmium	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.10			
chromium	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4	**3.0**			
copper	**6.5**	**5.5**	**5.2**	< 5.2	< 5.2	< 5.2			
lead	< 2.0	< 2.0	< 2.0	< 1.0	< 1.0	< 1.0			
mercury	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13			
nickel	**7.3**	< 3.2	< 3.2	**4.6**	< 3.2	**8.5**			
selenium	**1.6**	< 0.6	**1.9**	**1.3**	**1.9**	< 0.60			
silver	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1			
thallium	< 1.0	**4.2**	< 1.0	< 2.0	< 1.0	< 2.0			
zinc	**42.7Ó**	**2.9Ó**	**5.3Ó**	**20.9Ó**	**5.3Ó**	**17.7Ó**			
OTHER INORGANICS (mg/L)									
cyanide	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02			
PHENOLS AND CRESOLS (Fg/L)								SALINITY ONLY	
parachlorometa cresol	nr	nr	nr	nr	nr	nr			
pentachlorophenol	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
phenol (C_6H_5OH) single compound	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	**14**			
phenolics recoverable	< 5.0	~	**24**	**20**	~	**23**			
2-chlorophenol	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
2-nitrophenol	< 11	< 11	< 11	< 11	< 11	< 11			
2,4-dichlorophenol	< 11	< 11	< 11	< 11	< 11	< 11			
2,4-dimethylphenol	< 11	< 11	< 11	< 11	< 11	< 11			
2,4-dinitrophenol	< 21	< 21	< 21	< 21	< 21	< 21			
2,4,6-trichlorophenol	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
4-nitrophenol	< 21	< 21	< 21	< 21	< 21	< 21			
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr			

LOCATION	0.5a	1	1.1	1a	2	2a	2.1	2.2	2.3
ETHERS (Fg/L)								SALINITY ONLY	
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr			
bis (2-chloroethyoxy) methane	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
bis (2-chloroethyl) ether	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
bis (2-chloroisopropyl)ether	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr			
4-bromophenyl phenyl ether	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
4-chlorophenyl phenyl ether	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
HALOGENATED ALIPHATICS (Fg/L)									
bromodichloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
bromoform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
carbon tetrachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
chloroethane	< 5.0C	< 5.0C	< 5.0C	< 5.0C	< 5.0C	< 25C			
chloroform	< 2.0	< 2.0	< 2.0	**24**	< 2.0	< 10			
dibromochloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
dichlorodifluormethane	< 5.0C	< 5.0C	< 5.0C	< 5.0C	< 5.0C	< 25C			
hexachlorobutadiene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 11			
hexachlorocyclopentadiene	< 21	< 21	< 21	< 21	< 21	< 21			
hexachloroethane	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
methyl bromide	nr	nr	nr	nr	nr	nr			
methyl chloride	nr	nr	nr	nr	nr	nr			
methylene chloride	nr	nr	nr	nr	nr	nr			
tetrachloroethylene	nr	nr	nr	nr	nr	nr			
trichloroethylene	nr	nr	nr	nr	nr	nr			
trichlorofluoromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
vinyl chloride	< 5.0C	< 5.0C	< 5.0C	< 5.0C	< 5.0C	< 25C			

APPENDIX E.1 (cont)
ORGANICS AND INORGANICS IN WATER
El Paso/Ciudad Juárez Reach

LOCATION	0.5a	1	1.1	1a	2	2a	2.1	2.2	2.3
Halogenated Aliphatics (cont)								SALINITY ONLY	
1,1-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr			
1,1,1-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
1,1,2-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
1,1,2,2-tetrachloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
1,2-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
1,2-dichloropropane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr			
1,3-cis-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
1,3-trans-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/L)									
acenaphthene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
acenaphthylene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
anthracene/phenanthrene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
benzo (a) anthracene 1,2-benzanthracene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
benzo (b) fluoroanthene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
benzo (GHI) perylene 1,12-benzoperylene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
benzo (k) fluoranthene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
benzo-a-pyrene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
chrysene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
fluoranthene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
fluorene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
indeno (1,2,3-CD) pyrene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			

APPENDIX E.1 (cont)
ORGANICS AND INORGANICS IN WATER
El Paso/Ciudad Juárez Reach

LOCATION	0.5a	1	1.1	1a	2	2a	2.1	2.2	2.3
Polycyclic Aromatic Hydrocarbons (cont)								SALINITY ONLY	
naphthalene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 5.3			
pyrene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr			
MONOCYCLIC AROMATICS (Fg/L)									
benzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
chlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
ethylbenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
hexachlorobenzene	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02			
nitrobenzene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
styrene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
toluene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
xylene	< 5.0	< 4.0	< 4.0	< 4.0	< 4.0	< 20			
1,2-dichlorobenzene	< 2.0	< 2.0	< 2.0	**1.7 Î**	< 2.0	< 10			
1,2,4-trichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
1,3-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 10			
1,4-dichlorobenzene	< 2.0	< 2.0	< 2.0	**2.0**	< 2.0	< 10			
2,4-dinitrotoluene	< 11	< 11	< 11	< 11	< 11	< 11			
2,6-dinitrotoluene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
NITROSAMINES AND OTHER N COMPOUNDS (Fg/L)									
acrylonitrile	< 10	< 10	< 10	< 10	< 10	< 50			
benzidine	ND	ND	ND	ND	ND	ND			
n-nitrosodi-n-propylamine	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
n-nitrosodimethylamine	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
n-nitrosodiphenylamine	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			

APPENDIX E.1 (cont)
ORGANICS AND INORGANICS IN WATER
El Paso/Ciudad Juárez Reach

LOCATION	0.5a	1	1.1	1a	2	2a	2.1	2.2	2.3
Nitrosamines and Other N Compounds (cont)								SALINITY ONLY	
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr			
3,3-dichlorobenzidine	< 21	< 21	< 21	< 21	< 21	< 21			
PESTICIDES (Fg/L)									
acrolein	nr	nr	nr	nr	nr	nr			
aldicarb	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
aldrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
alpha benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04			
atrazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
beta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04			
carbaryl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
carbofuran	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
chlordane	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
chlorfenvinphos	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
chlorothalonil	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04			
chlorpyrifos	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60			
chlorsulfuron	nr	nr	nr	nr	nr	nr			
DDD	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15			
DDE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
DDT	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15			
delta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04			
demeton	nr	nr	nr	nr	nr	nr			
diazinon	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30			
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr			
dicamba	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
2,4-dichlorophenoxyacetic acid (2,4-D)	< 20	< 20	< 20	< 20	< 20	< 20			

APPENDIX E.1 (cont)
ORGANICS AND INORGANICS IN WATER
El Paso/Ciudad Juárez Reach

LOCATION	0.5a	1	1.1	1a	2	2a	2.1	2.2	2.3
Pesticides (cont)									
dicofol (kelthane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
dicrotophos	nr	nr	nr	nr	nr	nr			
dieldrin	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
dinoseb	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
endosulfan alpha	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
endosulfan beta	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
endosulfan sulfate	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
endrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
endrin aldehyde	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
fenthion (baytex)	nr	nr	nr	nr	nr	nr			
gamma-bhc (lindane)	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04			
guthion	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0		SALINITY ONLY	
heptachlor	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02			
heptachlor epoxide	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06			
isophorone	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
malathion	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40			
metsulfuron	nr	nr	nr	nr	nr	nr			
methomyl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
methoxychlor	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50			
metolachlor	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60			
mirex	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
parathion	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25			
picloram	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0			
prometon	nr	nr	nr	nr	nr	nr			
simazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr			

APPENDIX E.2
ORGANICS AND INORGANICS IN WATER
Presidio/Ojinaga-Big Bend Reach

LOCATION	0.5a	1	1.1	1a	2	2a	2.1	2.2	2.3
Pesticides (cont)								SALINITY ONLY	
toxaphene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
2,4,5-TP (silvex)	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
PCBs and RELATED COMPOUNDS (Fg/L)									
aroclor 1016	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1221	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1232	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1242	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1248	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1254	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1260	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
2-chloronaphthalene	< 5.3	< 5.3	< 5.4	< 5.4	< 5.4	< 5.3			
PHTHALATE ESTERS (Fg/L)									
bis (2-ethylhexyl) phthalate	**9.4 Ð**	< 5.3	< 5.4	< 5.4	< 5.3	**8.7 Ð**			
di-n-butyl phthalate	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
di-n-octyl phthalate	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
dimethyl phthalate	< 11	< 11	< 11	< 11	< 11	< 11			
n-butyl benzyl phthalate	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			
diethyl phthalate	< 5.3	< 5.3	< 5.4	< 5.4	< 5.3	< 5.3			

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error
C = presence not determined due to presence of CO_2

Î = reported below quantitation limit
Ï = detected in lab blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
Ó = detected in field blank
• = daily average flow
e = equipment failure

Ž = flow estimate
fd = flow detected
nm = not measured
bold = values detected
b = container broken in shipping
] = QC not within required limits

APPENDIX E.2
ORGANICS AND INORGANICS IN WATER
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a	6	6a
Date	120595	120595	120595	120595	120695	120695	051595	051595
CONVENTIONALS (mg/L)	MAIN	TRIB	TRIB	MAIN	MAIN	TRIB	MAIN	TRIB
water temperature (EC)	11.1	15.7	27.1	13.4	14.6	DRY CREEK	25.7	25.3
pH (su)	8.6	7.7	8.1	8.2	8.5		e	e
dissolved oxygen (mg/L)	8.2	9.1	8.0	11.4	11.0		11.0	9.5
specific conductance (Fmhos/cm)	3020	3360	1862	3010	2940		850	3610
ammonia (NH_3-N)	0.07	< 0.01	0.04	0.09	< 0.01		na	0.07
unionized ammonia (NH_3)	0.005	0.0001	0.003	0.003	0.0008		-	-
nitrate	3.5	0.27	0.18	2.90	1.0		na	na
nitrite	0.16	< 0.01	< 0.01	0.13	0.07		na	na
TKN	1.0	0.40	0.60	0.61	1.1		na	na
total phosphorus	0.89	0.05	0.03	0.70	0.22		na	na
orthophosphorus	0.77	< 0.01	0.01	1.0	0.10		na	na
chloride	559	394	136	523	527		79	913
sulfate	536	1050	635	593	580		195	545
total dissolved solids	2045	2545	1290	2100	2010		568	2385
total hardness	594	737	366	621	582		240	753
total organic carbon	6	3	4	6	7		na	na
total suspended solids	127	26	10	50	28		na	na
total alkalinity	256	290	149	260	211		na	na
turbidity (jtu)	91.2	20.6	12	31.0	11.8		6.0	1.0
flow (cfs)	283	17.0	0.22	295	329		292	76.6
DISSOLVED METALS (Fg/L)								
aluminum	**5.4 Ó**	< 4.7Ó	**9.6 Ó**	**5.2 Ó**	< 4.7Ó			
antimony	**5.4 Ó**	**3.4 Ó**	< 3.0Ó	**1.5 Ó**	**5.4 Ó**			
arsenic	**7.7**	< 0.9	**11.0**	**7.1**	**6.9**			
beryllium	< 0.40	< 0.40	< 0.60	< 0.40	< 0.40			

APPENDIX E.2 (cont)
ORGANICS AND INORGANICS IN WATER
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a	6	6a
Dissolved Metals (cont)								
cadmium	< 0.40	< 0.40	< 0.10	< 0.40	< 0.40			
chromium	< 1.4	< 1.4	< 2.0	< 1.4	< 1.4			
copper	< 5.2	< 5.2	**2.8**	< 5.2	< 5.2			
lead	< 2.0	< 2.0	< 1.2	< 2.0	< 2.0			
mercury	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13			
nickel	< 3.2	< 3.2	< 5.0	< 3.2	< 3.2			
selenium	**1.2**	< 0.6	< 2.6	**0.90**	**1.0**			
silver	< 5.1	< 5.1	< 7.0	< 5.1	< 5.1			
thallium	**2.9**	**6.3**	< 2.7	**1.3**	**4.9**			
zinc	**3.4 Ó**	< 2.2**Ó**	**10.6Ó**	**2.5 Ó**	**2.8 Ó**			
OTHER INORGANICS (mg/L)								
cyanide	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	DRY CREEK	SALINITY ONLY	
PHENOLS AND CRESOLS (Fg/L)								
parachlorometa cresol	nr	nr	nr	nr	nr			
pentachlorophenol	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
phenol (C_6H_5OH) single compound	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
phenolics recoverable	˜	˜	< 5.0	˜	˜			
2-chlorophenol	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
2-nitrophenol	< 11	< 11	< 11	< 11	< 11			
2,4-dichlorophenol	< 11	< 11	< 11	< 11	< 11			
2,4-dimethylphenol	< 11	< 11	< 11	< 11	< 11			
2,4-dinitrophenol	< 22	< 21	< 21	< 22	< 22			
2,4,6-trichlorophenol	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
4-nitrophenol	< 22	< 21	< 21	< 22	< 21			
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr			

APPENDIX E.2 (cont)
ORGANICS AND INORGANICS IN WATER
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a	6	6a
ETHERS (Fg/L)						DRY CREEK	SALINITY ONLY	
bis (chloromethyl) ether	nr	nr	nr	nr	nr			
bis (2-chloroethyoxy) methane	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
bis (2-chloroethyl) ether	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
bis (2-chloroisopropyl)ether	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr			
4-bromophenyl phenyl ether	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
4-chlorophenyl phenyl ether	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
HALOGENATED ALIPHATICS (Fg/L)								
bromodichloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
bromoform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
carbon tetrachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
chloroethane	< 5.0C	< 5.0C	< 5.0C	< 5.0C	< 5.0C			
chloroform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
dibromochloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
dichlorodifluormethane	< 5.0C	< 5.0C	< 5.0C	< 5.0C	< 5.0C			
hexachlorobutadiene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
hexachlorocyclopentadiene	< 22	< 21	< 21	< 22	< 21			
hexachloroethane	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
methyl bromide	nr	nr	nr	nr	nr			
methyl chloride	nr	nr	nr	nr	nr			
methylene chloride	nr	nr	nr	< 2.0	nr			
tetrachloroethylene	nr	nr	nr	nr	nr			
trichloroethylene	nr	nr	nr	nr	nr			
trichlorofluoromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
vinyl chloride	< 5.0C	< 5.0C	< 5.0C	< 5.0C	< 5.0C			

APPENDIX E.2 (cont)
ORGANICS AND INORGANICS IN WATER
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a	6	6a
Halogenated Aliphatics (cont)						DRY CREEK	SALINITY ONLY	
1,1-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
1,1-dichloroethylene	nr	nr	nr	nr	nr			
1,1,1-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
1,1,2-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
1,1,2,2-tetrachloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
1,2-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
1,2-dichloropropane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr			
1,3-cis-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
1,3-trans-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/L)								
acenaphthene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
acenaphthylene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
anthracene/phenanthrene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
benzo (a) anthracene 1,2-benzanthracene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
benzo (b) fluoroanthene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
benzo (GHI) perylene 1,12-benzoperylene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
benzo (k) fluoranthene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
benzo-a-pyrene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
chrysene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
fluoranthene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
fluorene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
indeno (1,2,3-CD) pyrene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			

APPENDIX E.2 (cont)
ORGANICS AND INORGANICS IN WATER
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a	6	6a
Polycyclic Aromatic Hydrocarbons (cont)						DRY CREEK	SALINITY ONLY	
naphthalene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
pyrene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr			
MONOCYCLIC AROMATICS (Fg/L)								
benzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
chlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
ethylbenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
hexachlorobenzene	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02			
nitrobenzene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
styrene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
toluene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
xylene	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0			
1,2-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
1,2,4-trichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
1,3-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
1,4-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
2,4-dinitrotoluene	< 11	< 11	< 11	< 11	< 11			
2,6-dinitrotoluene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
NITROSAMINES AND OTHER N COMPOUNDS (Fg/L)								
acrylonitrile	< 10	< 10	< 10	< 10	< 10			
benzidine	ND	ND	ND	ND	ND			
n-nitrosodi-n-propylamine	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
n-nitrosodimethylamine	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
n-nitrosodiphenylamine	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			

APPENDIX E.2 (cont)
ORGANICS AND INORGANICS IN WATER
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a	6	6a
Nitrosamines and Other N Compounds (cont)						DRY CREEK	SALINITY ONLY	
1,2-diphenylhydrazine	nr	nr	nr	nr	nr			
3,3-dichlorobenzidine	< 22	< 21	< 21	< 22	< 21			
PESTICIDES (Fg/L)								
acrolein	nr	nr	nr	nr	nr			
aldicarb	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
aldrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
alpha benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04			
atrazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
beta benzene hexchloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04			
carbaryl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
carbofuran	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
chlordane	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
chlorfenvinphos	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
chlorothalonil	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04			
chlorpyrifos	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60			
chlorsulfuron	nr	nr	nr	nr	nr			
DDD	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15			
DDE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
DDT	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15			
delta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04			
demeton	nr	nr	nr	nr	nr			
diazinon	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30			
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr			
dicamba	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
2,4-dichlorophenoxyacetic acid (2,4-D)	< 20	< 20	< 20	< 20	< 20			

APPENDIX E.2 (cont)
ORGANICS AND INORGANICS IN WATER
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a	6	6a
Pesticides (cont)						DRY CREEK	SALINITY ONLY	
dicofol (kelthane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0			
dicrotophos	nr	nr	nr	nr	nr			
dieldrin	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10			
dinoseb	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
endosulfan alpha	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
endosulfan beta	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
endosulfan sulfate	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
endrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
endrin aldehyde	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
fenthion (baytex)	nr	nr	nr	nr	nr			
gamma-bhc (lindane)	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04			
guthion	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0			
heptachlor	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02			
heptachlor epoxide	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06			
isophorone	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
malathion	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40			
metsulfuron	nr	nr	nr	nr	nr			
methomyl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
methoxychlor	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50			
metolachlor	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60			
mirex	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20			
parathion	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25			
picloram	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0			
prometon	nr	nr	nr	nr	nr			
simazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr			

APPENDIX E.2 (cont)
ORGANICS AND INORGANICS IN WATER
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a	6	6a
Pesticides (cont)						DRY CREEK	SALINITY ONLY	
toxaphene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
2,4,5-TP (silvex)	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0			
PCBs and RELATED COMPOUNDS (Fg/L)								
aroclor 1016	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1221	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1232	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1242	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1248	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1254	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
aroclor 1260	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0			
2-chloronaphthalene	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
PHTHALATE ESTERS (Fg/L)								
bis (2-ethylhexyl) phthalate	**6.2**	**25**	< 5.3	< 5.6	< 5.3			
di-n-butyl phthalate	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
di-n-octyl phthalate	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
dimethyl phthalate	< 11	< 11	< 11	< 11	< 11			
n-butyl benzyl phthalate	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			
diethyl phthalate	< 5.6	< 5.3	< 5.3	< 5.6	< 5.3			

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error
C = presence not determined due to presence of CO_2
• = daily average flow
Î = reported below quantitation limit
Ï = detected in lab blank
Đ = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
Ó = detected in field blank
e = equipment failure
Ž = flow estimate
fd = flow detected
nm = not measured
bold = values detected
b = container broken in shipping
] = QC not within required limits

APPENDIX E.3
ORGANICS AND INORGANICS IN WATER
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
Date	051595	051595	051695	051695	051695	051795	051795
CONVENTIONALS (mg/L)	MAIN	MAIN	TRIB	TRIB	TRIB	TRIB	MAIN
water temperature (EC)	24.3	23.9	23.6	24.8	24.3	28.5	25.1
pH (su)	8.2	8.3	7.9	7.8	7.8	7.6	8.5
dissolved oxygen (mg/L)	8.3	8.1	7.6	9.0	9.1	3.2	7.6
specific conductance (Fmhos/cm)	1197	962	525	519	516	3030	1359
ammonia (NH_3-N)	0.05	0.02	0.01	0.02	< 0.02	5.3	0.20
unionized ammonia (NH_3)	0.004	0.002	0.0004	0.0007	0.0007	0.149	0.006
nitrate	0.36	0.58	1.7	1.7	1.8	0.17	0.55
nitrite	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.06	0.01
TKN	0.40	0.30	0.20	0.10	0.20	8.3	0.30
total phosphorus	0.01	0.02	0.04	0.03	0.03	1.1	0.15
orthophosphorus	< 0.01	< 0.01	< 0.01	0.02	< 0.01	0.77	0.03
chloride	54	120	21	21	21	501	159
sulfate	87	194	27	23	24	297	256
total dissolved solids	282	620	279	282	269	1691	772
total hardness	106	268	753	238	231	765	309
total organic carbon	2.0	2.0	1.0	1.0	1.0	13	3.0
total suspended solids	1.0	1.0	14	10	2.0	15	17.0
total alkalinity	50	141	203	202	203	374	132
turbidity (jtu)	0.5X	1.3X	7.0X	7.0X	1.3X	3.0X	1.5X
flow (cfs)	reservoir	reservoir	61.1	nm	72.7	0.46	1356.1
DISSOLVED METALS (Fg/L)							
aluminum	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
antimony	**7.5 Ó**	**6.4 Ó**	**3.7Ó**	**6.8 Ó**	**6.8 Ó**	**6.5 Ó**	**7.0 Ó**
arsenic	**4.8**	**4.5**	< 1.8	< 1.8	< 1.8	**5.3**	**4.8**

APPENDIX E.3 (cont)
ORGANICS AND INORGANICS IN WATER
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
Dissolved Metals (cont)							
beryllium	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
cadmium	**0.10**	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chromium	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
copper	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	**1.1**
lead	**0.70 Ó**	**1.1 Ó**	**1.4 Ó**	**1.3 Ó**	**1.2 Ó**	< 1.5Ó	**1.1 Ó**
mercury	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13
nickel	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
selenium	< 2.6	< 2.6	< 2.6	< 2.6	< 2.6	< 2.6	< 2.6
silver	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
thallium	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9
zinc	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
OTHER INORGANICS (mg/L)							
cyanide	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
PHENOLS AND CRESOLS (Fg/L)							
parachlorometa cresol	nr	nr	nr	nr	nr	nr	nr
pentachlorophenol	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
phenol (C_6H_5OH) single compound	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.5]
phenolics recoverable	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2-chlorophenol	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.5]
2-nitrophenol	< 13	< 11	< 11	< 11X	< 28X	< 11]	< 11]
2,4-dichlorophenol	< 13	< 11	< 11	< 11X	< 28X	< 11]	< 11]
2,4-dimethylphenol	< 13	< 11	< 11	< 11X	< 28X	< 11]	< 11]
2,4-dinitrophenol	< 26	< 22	< 22	< 21X	< 28X	< 21]	< 22]
2,4,6-trichlorophenol	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.5]
4-nitrophenol	< 26	< 22	< 22	< 21X	< 56X	< 21]	< 21]
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr	nr

APPENDIX E.3 (cont)
ORGANICS AND INORGANICS IN WATER
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.2	7b	7b.1	7b.2	9a	10
ETHERS (Fg/L)							
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
bis (2-chloroethyl) ether	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
bis (2-chloroisopropyl)ether	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
4-chlorophenyl phenyl ether	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
HALOGENATED ALIPHATICS (Fg/L)							
bromodichloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
bromoform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
carbon tetrachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
chloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
chloroform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
dibromochloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
dichlorodifluormethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
hexachlorobutadiene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
hexachlorocyclopentadiene	< 26	< 22	< 22	< 21X	< 56X	< 21]	< 21]
hexachloroethane	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
methyl bromide	nr	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr	nr
methylene chloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
tetrachloroethylene	nr	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
vinyl chloride	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Halogenated Aliphatics (cont)							

APPENDIX E.3 (cont)
ORGANICS AND INORGANICS IN WATER
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
1,1-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1,2-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1,2,2-tetrachloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-dichloropropane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 2.0	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,3-trans-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/L)							
acenaphthene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
acenaphthylene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
anthracene/phenanthrene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
benzo (a) anthracene 1,2-benzanthracene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
benzo (b) fluoroanthene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
benzo (GHI) perylene 1,12-benzoperylene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
benzo (k) fluoranthene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
benzo-a-pyrene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
chrysene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
fluoranthene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
fluorene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
indeno (1,2,3-CD) pyrene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
Polycyclic Aromatic Hydrocarbons (cont)							

APPENDIX E.3 (cont)
ORGANICS AND INORGANICS IN WATER
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
naphthalene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
pyrene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/L)							
benzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
chlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
ethylbenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
hexachlorobenzene	< 0.02	< 0.02	< 0.20	< 0.02	< 0.02	< 0.02	< 0.02
nitrobenzene	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
styrene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
toluene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	0.4Î	< 2.0
xylene	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
1,2-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2,4-trichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,3-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,4-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
2,4-dinitrotoluene	< 13	< 11	< 11	< 11X	< 28X	< 11]	< 11]
2,6-dinitrotoluene	< 6.5	< 5.5	< 5.4	< 5.4X	< 5.4X	< 5.4]	< 5.3]
NITROSAMINES AND OTHER N COMPOUNDS (Fg/L)							
acrylonitrile	< 10	< 10	< 10	< 10	< 10	< 10	< 10
benzidine	ND	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 6.5	< 5.5	< 5.4	< 5.4X	< 5.4X	< 5.4]	< 5.5]
n-nitrosodimethylamine	< 6.5	< 5.5	< 5.4	< 5.4X	< 5.4X	< 5.4]	< 5.5]
n-nitrosodiphenylamine	< 6.5	< 5.5	< 5.4	< 5.4X	< 5.4X	< 5.4]	< 5.5]
Nitrosamines and Other N Compounds (cont)							

APPENDIX E.3 (cont)
ORGANICS AND INORGANICS IN WATER
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 26	< 22	< 22	< 21X	< 56X	< 21]	< 22]
PESTICIDES (Fg/L)							
acrolein	nr	nr	nr	nr	nr	nr	nr
aldicarb	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
aldrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
alpha benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
atrazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
beta benzene hexchloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
carbaryl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
carbofuran	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
chlordane	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
chlorfenvinphos	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chlorothalonil	< 0.04	< 0.04	< 0.04	<0.04	< 0.04	< 0.04	< 0.04
chlorpyrifos	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
chlorsulfuron	nr	nr	nr	nr	nr	nr	nr
DDD	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
DDE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
DDT	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
delta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
demeton	nr	nr	nr	nr	nr	nr	nr
diazinon	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr	nr
dicamba	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,4-dichlorophenoxyacetic acid (2,4-D)	< 20	< 20	< 20	< 20	< 20	< 20	< 20
Pesticides (cont)							
dicofol (kelthane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

APPENDIX E.3 (cont)
ORGANICS AND INORGANICS IN WATER
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
dicrotophos	nr	nr	nr	nr	nr	nr	nr
dieldrin	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
dinoseb	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
endosulfan alpha	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan beta	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan sulfate	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endrin aldehyde	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
fenthion (baytex)	nr	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
guthion	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
heptachlor	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
heptachlor epoxide	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
isophorone	< 6.5	< 5.5	< 14	< 14**X**	< 14**X**	< 5.4 **]**	< 5.3 **]**
malathion	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
metsulfuron	nr	nr	nr	nr	nr	nr	nr
methomyl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
methoxychlor	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
metolachlor	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
mirex	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
parathion	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
picloram	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
prometon	nr	nr	nr	nr	nr	nr	nr
simazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Pesticides (cont)							
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr	nr
toxaphene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

APPENDIX E.3 (cont)
ORGANICS AND INORGANICS IN WATER
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.2	7b	7b.1	7b.2	9a	10
2,4,5-TP (silvex)	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
PCBs and RELATED COMPOUNDS (Fg/L)							
aroclor 1016	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1221	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1232	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1242	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1248	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1254	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1260	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-chloronaphthalene	< 6.5	5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
PHTHALATE ESTERS (Fg/L)							
bis (2-ethylhexyl) phthalate	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	**6.8**]	< 5.3]
di-n-butyl phthalate	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
di-n-octyl phthalate	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
dimethyl phthalate	< 13	< 11	< 11	< 11X	< 28X	< 11]	< 11]
n-butyl benzyl phthalate	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]
diethyl phthalate	< 6.5	< 5.5	< 5.4	< 5.4X	< 14X	< 5.4]	< 5.3]

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error
C = presence not determined due to presence of CO_2

Î = reported below quantitation limit
Ï = detected in lab blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
Ó = detected in field blank
• = daily average flow
e = equipment failure

Ž = flow estimate
fd = flow detected
nm = not measured
bold = values detected
b = container broken in shipping
] = QC not within required limits

APPENDIX E.4
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	**10a**	**11a**	**11b**	**11b.1**	**11b.2**	**11b.3**
Date	060695	060695	060695	060695	060695	060895
CONVENTIONALS (mg/L)	TRIB	TRIB	TRIB	WWTP	WWTP	TRIB
water temperature (EC)	25.8	27.4	31.4	nm	nm	29.8
pH (su)	7.3	7.9	7.8	nm	nm	7.4
dissolved oxygen (mg/L)	3.4	7.0	9.2	nm	nm	9.2
specific cnductance (Fmhos/cm)	6950	1780	5390	nm	nm	1660
ammonia (NH_3-N)	0.17	0.04	0.05	8.1	0.05	10.0
unionized ammonia (NH_3)	0.002	0.002	0.003	-	-	0.195
nitrate	0.13	0.56	0.10	3.6	2.4	< 0.01
nitrite	0.02	0.01	0.10	0.45	< 0.01	< 0.01
TKN	1.5	0.90	2.5	11.2	0.90	14.3
total phosphorus	0.16	0.07	0.27	1.4	2.3	1.9
orthophosphorus	0.04	0.02	0.03	1.1	2.2	1.5
chloride	935	180	923	210	164	251
sulfate	297	2610	320	1736	318	244
total dissolved solids	5900	909	4180	965	769	1150
total hardness	171	330	1126	336	312	399
total organic carbon	15	4	22	15	4	20
total suspended solids	22	25	95	12	57	43
total alkalinity	340	133	270	171	134	214
turbidity (jtu)	17.4	19.5	0.50	4.5	30.0	33.0
flow (cfs)	0.18	0.25	0.71	15.2	2.0	22.6
DISSOLVED METALS (Fg/L)						
aluminum	< 8.0	< 8.0	< 8.0	**12**	**14**	**12**
antimony	**36.4 Ó**	**9.7 Ó**	**6.9 Ó**	**8.7 Ó**	**6.6 Ó**	**4.7 Ó**
arsenic	**6.3**	**5.4**	**4.7**	**2.0**	**2.4**	**2.2**
beryllium	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60

APPENDIX E.4 (cont)
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	10a	11a	11b	11b.1	11b.2	11b.3
Dissolved Metals (cont)						
cadmium	**0.20**	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chromium	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
copper	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
lead	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
mercury	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13
nickel	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
selenium	< 2.6	< 2.6	< 2.6	< 2.6	< 2.6	< 2.6
silver	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
thallium	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9
zinc	**8.0**	< 3.0	**4.0**	**15.0**	**21.0**	**6.0**
OTHER INORGANICS						
cyanide (mg/L)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
PHENOLS AND CRESOLS (Fg/L)						
parachlorometa cresol	nr	nr	nr	nr	nr	nr
pentachlorophenol	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
phenol (C_6H_5OH) single compound	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6**X**
phenolics recoverable	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2-chlorophenol	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6**X**
2-nitrophenol	< 13**X**	< 11**X**	< 14**X**	< 14**X**	< 11**X**	< 11**X**
2,4-dichlorophenol	< 13**X**	< 11**X**	< 11**X**	< 14**X**	< 11**X**	< 11**X**
2,4-dimethylphenol	< 13**X**	< 11**X**	< 14**X**	< 14**X**	< 11**X**	< 11**X**
2,4-dinitrophenol	< 25**X**	< 22**X**	< 27**X**	< 27**X**	< 21**X**	< 22**X**
2,4,6-trichlorophenol	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6**X**
4-nitrophenol	< 25**X**	< 22**X**	< 27**X**	< 27**X**	< 21**X**	< 22**X**
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr

APPENDIX E.4 (cont)
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	**10a**	**11a**	**11b**	**11b.1**	**11b.2**	**11b.3**
ETHERS (Fg/L)						
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6**X**
bis (2-chloroethyl) ether	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6**X**
bis (2-chloroisopropyl)ether	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6**X**
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6**X**
4-chlorophenyl phenyl ether	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6**X**
HALOGENATED ALIPHATICS (Fg/L)						
bromodichloromethane	< 2.0	< 2.0	< 2.0	**0.50 Î**	**20**	< 2.0
bromoform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
carbon tetrachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
chloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
chloroform	< 2.0	< 2.0	< 2.0	**3.2**	**38**	**2.0**
dibromochloromethane	< 2.0	< 2.0	< 2.0	< 2.0	**4.4**	< 2.0
dichlorodifluormethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
hexachlorobutadiene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
hexachlorocyclopentadiene	< 25**X**	< 22**X**	< 27**X**	< 27**X**	< 21**X**	< 22**X**
hexachloroethane	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6**X**
methyl bromide	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr
methylene chloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	3.0
tetrachloroethylene	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
vinyl chloride	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

APPENDIX E.4 (cont)
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	10a	11a	11b	11b.1	11b.2	11b.3
Halogenated Aliphatics (cont)						
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1,2-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1,2,2-tetrachloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-dichloropropane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,3-trans-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/L)						
acenaphthene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
acenaphthylene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
anthracene/phenanthrene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
benzo (a) anthracene 1,2-benzanthracene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
benzo (b) fluoroanthene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
benzo (GHI) perylene 1,12-benzoperylene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
benzo (k) fluoranthene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
benzo-a-pyrene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
chrysene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
fluoranthene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
fluorene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
indeno (1,2,3-CD) pyrene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
naphthalene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
pyrene	< 6.4X	< 5.6X	< 6.8X	< 6.9X	< 5.4X	< 5.6
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr

APPENDIX E.4 (cont)
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	**10a**	**11a**	**11b**	**11b.1**	**11b.2**	**11b.3**
MONOCYCLIC AROMATICS (Fg/L)						
benzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	5.5
chlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
ethylbenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	1.9
hexachlorobenzene	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
nitrobenzene	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6
styrene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
toluene	< 2.0	< 2.0	< 2.0	**0.70 Î**	< 2.0	**11**
xylene	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	**12**
1,2-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2,4-trichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,3-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,4-dichlorobenzene	< 2.0	< 2.0	< 2.0	**2.6**	< 2.0	**6.8**
2,4-dinitrotoluene	< 13	< 11	< 14	< 14	< 11	< 11
2,6-dinitrotoluene	< 6.4	< 5.6	< 6.8	< 6.9	< 5.4	< 5.6
NITROSAMINES AND OTHER N COMPOUNDS (Fg/L)						
acrylonitrile	< 10	< 10	< 10	< 10	< 10	< 10
benzidine	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6
n-nitrosodimethylamine	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6
n-nitrosodiphenylamine	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 25**X**	< 22**X**	< 27**X**	< 27**X**	< 21**X**	< 22

APPENDIX E.4 (cont)
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	10a	11a	11b	11b.1	11b.2	11b.3
PESTICIDES (Fg/L)						
acrolein	nr	nr	nr	nr	nr	nr
aldicarb	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
aldrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
alpha benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
atrazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
beta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
carbaryl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
carbofuran	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
chlordane	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
chlorfenvinphos	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chlorothalonil	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
chlorpyrifos	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
chlorsulfuron	nr	nr	nr	nr	nr	nr
DDD	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
DDE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
DDT	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
delta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
demeton	nr	nr	nr	nr	nr	nr
diazinon	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr
dicamba	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,4-dichlorophenoxyacetic acid (2,4-D)	< 20	< 20	< 20	< 20	< 20	< 20
dicofol (kelthane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
dicrotophos	nr	nr	nr	nr	nr	nr
dieldrin	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10

APPENDIX E.4 (cont)
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	**10a**	**11a**	**11b**	**11b.1**	**11b.2**	**11b.3**
Pesticides (cont)						
dinoseb	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
endosulfan alpha	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan beta	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan sulfate	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endrin aldehyde	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
fenthion (baytex)	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
guthion	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
heptachlor	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
heptachlor epoxide	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
isophorone	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6**X**
malathion	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
metsulfuron	nr	nr	nr	nr	nr	nr
methomyl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
methoxychlor	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
metolachlor	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
mirex	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
parathion	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
picloram	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
prometon	nr	nr	nr	nr	nr	nr
simazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr
toxaphene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2,4,5-TP (silvex)	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

APPENDIX E.4 (cont)
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	**10a**	**11a**	**11b**	**11b.1**	**11b.2**	**11b.3**
PCBs and RELATED COMPOUNDS (Fg/L)						
aroclor 1016	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1221	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1232	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PCBs and Related Compounds (Fg/L)						
aroclor 1242	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1248	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1254	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1260	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-chloronaphthalene	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6
PHTHALATE ESTERS (Fg/L)						
bis (2-ethylhexyl) phthalate	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	**13 Ï**
di-n-butyl phthalate	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6
di-n-octyl phthalate	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6
dimethyl phthalate	< 13**X**	< 11**X**	< 14**X**	< 14**X**	< 11**X**	< 11
n-butyl benzyl phthalate	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6
diethyl phthalate	< 6.4**X**	< 5.6**X**	< 6.8**X**	< 6.9**X**	< 5.4**X**	< 5.6

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error
C = presence not determined due to presence of CO_2

Î = reported below quantitation limit
Ï = detected in lab blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
Ó = detected in field blank
• = daily average flow
e = equipment failure

Ž = flow estimate
fd = flow detected
nm = not measured
bold = values detected
b = container broken in shipping
] = QC not within required limits

APPENDIX E.4 (cont)
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	**11c**	**12**	**12.1**	**12.2**	**12.3**
Date	06/08/95	060795	060595	060595	060595
CONVENTIONALS (mg/L)	TRIB	MAIN	MAIN	MAIN	MAIN
water temperature (EC)	29.6	29.0	28.3	27.7	27.5
pH (su)	7.3	8.1	7.9	7.9	7.9
dissolved oxygen (mg/L)	1.3	6.3	4.9	7.8	6.9
specific conductance (Fmhos/cm)	2420	1129	1130	772	1187
ammonia (NH_3-N)	18.4	0.20	0.28	0.03	0.02
unionized ammonia (NH_3)	0.282	0.017	0.015	0.002	0.001
nitrate	< 0.01	0.55	0.68	0.93	0.01
nitrite	< 0.01	0.03	0.07	0.08	< 0.01
TKN	26.4	1.1	1.0	1.1	1.4
total phosphorus	3.6	0.41	0.19	0.17	0.02
orthophosphorus	3.2	0.05	0.10	0.05	0.01
chloride	424	152	154	86	163
sulfate	528	252	250	169	269
total dissolved solids	1610	773	770	476	759
total hardness	464	312	323	225	272
total organic carbon	36	4	5	8	7
total suspended solids	69	57	42	74	18
total alkalinity	250	144	145	110	105
turbidity (jtu)	33	30	21	45	7.5
flow (cfs)	4.2	1568 •	1610.3	reservoir	reservoir
DISSOLVED METALS (Fg/L)					
aluminum	**10**	< 8.0	< 8.0	< 8.0	< 8.0
antimony	**7.6Ó**	**6.8Ó**	**4.2Ó**	**5.0Ó**	**4.8Ó**
arsenic	**3.0**	**3.8**	**4.2**	**4.0**	**5.4**
beryllium	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60

APPENDIX E.4(cont).
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	**11c**	**12**	**12.1**	**12.2**	**12.3**
Dissolved Metals (cont)					
cadmium	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chromium	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
copper	< 7.0	< 1.5	< 7.0	< 7.0	< 7.0
lead	< 1.5	< 1.5	**1.2**	**1.1**	**1.4**
mercury	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13
nickel	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
selenium	< 2.6	< 2.6	< 2.6	< 2.6	< 2.6
silver	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
thallium	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9
zinc	< 3.0	< 3.0	< 3.0	**5.0**	< 3.0
OTHER INORGANICS (mg/L)					
cyanide	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
PHENOLS AND CRESOLS (Fg/L)					
parachlorometa cresol	nr	nr	nr	nr	nr
pentachlorophenol	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
phenol (C_6H_5OH) single compound	**12X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
phenolics recoverable	< 5.0**X**	< 5.0	< 5.0	< 5.0	< 5.0**X**
2-chlorophenol	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
2-nitrophenol	< 11**X**	< 11	< 11	< 11	< 12**X**
2,4-dichlorophenol	< 11**X**	< 11	< 11	< 11	< 12**X**
2,4-dimethylphenol	< 11**X**	< 11	< 11	< 11	< 12**X**
2,4-dinitrophenol	< 22**X**	< 22	< 22	< 22	< 24**X**
2,4,6-trichlorophenol	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
4-nitrophenol	< 22**X**	< 22	< 22	< 22	< 24**X**
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr

APPENDIX E.4(cont).
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	**11c**	**12**	**12.1**	**12.2**	**12.3**
ETHERS (Fg/L)					
bis (chloromethyl) ether	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 5.5**X**
bis (2-chloroethyl) ether	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
bis (2-chloroisopropyl)ether	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
4-chlorophenyl phenyl ether	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
HALOGENATED ALIPHATICS (Fg/L)					
bromodichloromethane	< 2.0	< 5.5	< 2.0	< 2.0	< 2.0
bromoform	< 2.0	b	< 2.0	< 2.0	< 2.0
carbon tetrachloride	< 2.0	b	< 2.0	< 2.0	< 2.0
chloroethane	< 5.0	b	< 5.0	< 5.0	< 5.0
chloroform	**21**	b	< 2.0	< 2.0	< 2.0
dibromochloromethane	< 2.0	b	< 2.0	< 2.0	< 2.0
dichlorodifluormethane	< 5.0	b	< 5.0	< 5.0	< 5.0
hexachlorobutadiene	< 2.0	< 11	< 2.0	< 2.0	< 2.0
hexachlorocyclopentadiene	< 22**X**	< 22	< 22	< 22	< 24**X**
hexachloroethane	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
methyl bromide	nr	b	nr	nr	nr
methyl chloride	nr	b	nr	nr	nr
methylene chloride	**1.8 Î**	b	< 2.0	< 2.0	< 2.0
tetrachloroethylene	nr	b	nr	nr	nr
trichloroethylene	nr	b	nr	nr	nr
trichlorofluoromethane	< 2.0	b	< 2.0	< 2.0	< 2.0
vinyl chloride	< 5.0	b	< 5.0	< 5.0	< 5.0
1,1-dichloroethane	< 2.0	b	< 2.0	< 2.0	< 2.0

APPENDIX E.4(cont).
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	**11c**	**12**	**12.1**	**12.2**	**12.3**
Halogenated Aliphatics (cont)					
1,1-dichloroethylene	nr	b	nr	nr	nr
1,1,1-trichloroethane	< 2.0	b	< 2.0	< 2.0	< 2.0
1,1,2-trichloroethane	< 2.0	b	< 2.0	< 2.0	< 2.0
1,1,2,2-tetrachloroethane	< 2.0	b	< 2.0	< 2.0	< 2.0
1,2-dichloroethane	< 2.0	b	< 2.0	< 2.0	< 2.0
1,2-dichloropropane	< 2.0	b	< 2.0	< 2.0	< 2.0
1,2-trans-dichloroethylene	nr	b	nr	nr	nr
1,3-cis-dichloropropene	< 2.0	b	< 2.0	< 2.0	< 2.0
1,3-trans-dichloropropene	< 2.0	b	< 2.0	< 2.0	< 2.0
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/L)					
acenaphthene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
acenaphthylene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
anthracene/phenanthrene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
benzo (a) anthracene 1,2-benzanthracene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
benzo (b) fluoroanthene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
benzo (GHI) perylene 1,12-benzoperylene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
benzo (k) fluoranthene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
benzo-a-pyrene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
chrysene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
fluoranthene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
fluorene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
indeno (1,2,3-CD) pyrene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
naphthalene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
pyrene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr

APPENDIX E.4(cont).
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	11c	12	12.1	12.2	12.3
MONOCYCLIC AROMATICS (Fg/L)					
benzene	< 2.0	b	< 2.0	< 2.0	< 2.0
chlorobenzene	< 2.0	b	< 2.0	< 2.0	< 2.0
ethylbenzene	< 2.0	b	< 2.0	< 2.0	< 2.0
hexachlorobenzene	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
nitrobenzene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
styrene	< 2.0	b	< 2.0	< 2.0	< 2.0
toluene	< 2.0	b	< 2.0	< 2.0	< 2.0
xylene	< 6.0	b	< 6.0	< 6.0	< 6.0
1,2-dichlorobenzene	< 2.0	< 5.5	< 2.0	< 2.0	< 2.0
1,2,4-trichlorobenzene	< 2.0	< 5.5	< 2.0	< 2.0	< 2.0
1,3-dichlorobenzene	< 2.0	< 5.5	< 2.0	< 2.0	< 2.0
1,4-dichlorobenzene	5.5	< 5.5	< 2.0	< 2.0	< 2.0
2,4-dinitrotoluene	< 11**X**	< 11	< 11	< 11	< 12**X**
2,6-dinitrotoluene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
NITROSAMINES AND OTHER N COMPOUNDS (Fg/L)					
acrylonitrile	< 10	b	< 10	< 10	< 10
benzidine	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 5.5**X**	< 5.5	**9.7**	< 5.5	< 6.1**X**
n-nitrosodimethylamine	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
n-nitrosodiphenylamine	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
1,2-diphenylhydrazine	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 22**X**	< 22	< 22	< 22	< 24**X**
PESTICIDES (Fg/L)					
acrolein	nr	nr	nr	nr	nr
aldicarb	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

APPENDIX E.4(cont).
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	11c	12	12.1	12.2	12.3
Pesticides (cont)					
aldrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
alpha benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
atrazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
beta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
carbaryl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
carbofuran	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
chlordane	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
chlorfenvinphos	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chlorothalonil	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
chlorpyrifos	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
chlorsulfuron	nr	nr	nr	nr	nr
DDD	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
DDE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
DDT	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
delta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
demeton	nr	nr	nr	nr	nr
diazinon	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr
dicamba	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,4-dichlorophenoxyacetic acid (2,4-D)	< 20	< 20	< 20	< 20	< 20
dicofol (kelthane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
dicrotophos	nr	nr	nr	nr	nr
dieldrin	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
dinoseb	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
endosulfan alpha	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan beta	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20

APPENDIX E.4(cont).
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	11c	12	12.1	12.2	12.3
Pesticides (cont)					
endosulfan sulfate	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endrin aldehyde	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
fenthion (baytex)	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
guthion	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
heptachlor	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
heptachlor epoxide	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
isophorone	< 5.3**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
malathion	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
metsulfuron	nr	nr	nr	nr	nr
methomyl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
methoxychlor	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
metolachlor	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
mirex	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
parathion	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
picloram	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
prometon	nr	nr	nr	nr	nr
simazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr
toxaphene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2,4,5-TP (silvex)	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
PCBs and RELATED COMPOUNDS (Fg/L)					
aroclor 1016	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1221	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

APPENDIX E.4(cont).
ORGANICS AND INORGANICS IN WATER
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

LOCATION	11c	12	12.1	12.2	12.3
PCBs and Related Compounds (cont)					
aroclor 1232	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1242	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1248	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1254	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1260	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-chloronaphthalene	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
PHTHALATE ESTERS (Fg/L)					
bis (2-ethylhexyl) phthalate	**15 ÏX**	< 5.5	**22 Ï**	< 5.5	< 6.1**X**
di-n-butyl phthalate	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
di-n-octyl phthalate	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
dimethyl phthalate	< 11**X**	< 11	< 11	< 11	< 12**X**
n-butyl benzyl phthalate	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**
diethyl phthalate	< 5.5**X**	< 5.5	< 5.5	< 5.5	< 6.1**X**

nr = not reported by laboratory	Î = reported below quantitation limit	Ž = flow estimate
na = not analyzed	Ï = detected in lab blank	fd = flow detected
ND = not detected	Ð = common lab contaminant	nm = not measured
* = no reportable data	Ñ = possible contamination	**bold** = values detected
X = exceeded hold time	Ò = degraded PCB pattern	b = container broken in shipping
˜ = lab error	Ó = detected in field blank	] = QC not within required limits
C = presence not determined due to presence of CO_2	• = daily average flow	
	e = equipment failure	

APPENDIX E.5
ORGANICS AND INORGANICS IN WATER
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	**12d**	**13**	**14**	**15**	**15a**	**16**	**17**	**18**
Date	071195	071195	071295	071295	071095	071395	071095	071095
CONVENTIONALS (mg/L)	TRIB	MAIN	MAIN	MAIN	TRIB	MAIN	MAIN	MAIN
water temperature (EC)	29.8	29.7	30.7	31.3	30.1	31.6	32.7	31.9
pH (su)	7.7	7.6	7.8	8.1	7.6	7.9	8.3	8.2
dissolved oxygen (mg/L)	9.6	5.8	8.2	8.6	0.40	7.8	10.2	7.0
specific conductance (Fmhos/cm)	9040	1191	1252	1338	2610	1205	1305	1318
ammonia (NH_3-N)	0.10	0.06	0.01	0.01	12.7	0.11	0.01	< 0.02
unionized ammonia (NH_3)	0.004	0.002	0.0005	0.001	0.396	0.007	0.002	0.003
nitrate	0.60	0.36	0.02	0.33	0.16	0.58	0.29	0.03
nitrite	0.01	0.04	0.49	0.02	0.02	0.03	0.02	< 0.01
TKN	1.6	0.60	0.60	0.60	23	0.60	0.80	0.70
total phosphorus	0.16	0.10	0.04	0.04	4.3	0.10	0.10	0.11
orthophosphorus	0.02	0.05	0.02	0.01	3.9	0.05	0.10	0.02
chloride	1845	158	202	186	497	167	185	190
sulfate	1523	257	289	268	403	265	284	295
total dissolved solids	5125	758	820	878	786	1697	846	845
total hardness	793	271	299	309	492	245	298	281
total organic carbon	8	4	4	4	47	4	6	8
total suspended solids	50	48	9	12	35	16	29	55
total alkalinity	199	100	111	113	286	99	108	111
turbidity (jtu)	28	27.3	6.0	7.0	55.8	9.5	16.6	24.5
flow (cfs)	1.5	295	2352	2250	20Ž	nm	343	365
DISSOLVED METAL (Fg/L)								
aluminum	< 8.0	**77**	< 8.0	**9.0**	**50**	< 8.0	< 8.0	**9.0**
antimony	**6.7 Ó**	**1.2 Ó**	**2.3 Ó**	**5.5 Ó**	< 5.9Ó	**3.9 Ó**	**7.1 Ó**	< 1.0Ó
arsenic	**10.8**	**3.9**	**3.9**	**4.5**	**4.5**	**3.5**	**4.6**	**4.0**
beryllium	< 0.60	< 0.60	< 0.60	< 0.60	< 1.0	< 0.60	< 0.60	< 0.60

APPENDIX E.5 (cont).
ORGANICS AND INORGANICS IN WATER
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	**12d**	**13**	**14**	**15**	**15a**	**16**	**17**	**18**
Dissolved Metals (cont)								
cadmium	< 0.05	< 0.05	< 0.05	< 0.05	< 2.0	< 0.05	< 0.05	< 0.05
chromium	< 2.0	< 2.0	< 2.0	< 2.0	< 20	< 2.0	< 2.0	< 2.0
copper	< 7.0	< 7.0	< 7.0	< 7.0	< 20	< 7.0	< 7.0	< 7.0
lead	< 2.3	< 2.3	< 2.3	< 2.3	< 4.5	< 2.3	< 2.3	< 2.3
mercury	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13
nickel	< 5.0	< 5.0	< 5.0	< 5.0	< 20	< 5.0	< 5.0	< 5.0
selenium	< 2.6	< 2.6	< 2.6	< 2.6	< 2.6	< 2.6	< 2.6	< 2.6
silver	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0
thallium	**3.6**	< 2.7	< 2.7	< 2.7	**3.9**	< 2.7	**3.2**	**2.8**
zinc	< 3.0	< 3.0	< 3.0	< 3.0	< 20	< 3.0	**9.0**	< 3.0
OTHER INORGANICS								
cyanide (mg/L)	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
PHENOLS AND CRESOLS (Fg/L)								
parachlorometa cresol	nr	nr	nr	nr	nr	nr	nr	nr
pentachlorophenol	< 2.0]	< 2.0]	< 2.0]	< 2.0]	< 2.0]	< 2.0]	< 2.0]	< 2.0]
phenol (C_6H_5OH) single compound	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
phenolics recoverable	na	na	na	na	na	na	na	na
2-chlorophenol	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
2-nitrophenol	< 11	< 11	< 14X	< 12	< 12X	< 11X	< 11X	< 11X
2,4-dichlorophenol	< 11	< 11	< 14X	< 12	< 12X	< 11X	< 11X	< 11X
2,4-dimethylphenol	< 11	< 11	< 14X	< 12	< 12X	< 11X	< 11X	< 11X
2,4-dinitrophenol	< 21	< 22	< 28X	< 25	< 24X	< 21X	< 22X	< 21X
2,4,6-trichlorophenol	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
4-nitrophenol	< 21	< 22	< 28X	< 25	< 24X	< 21X	< 22X	< 21X
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX E.5 (cont).
ORGANICS AND INORGANICS IN WATER
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	12d	13	14	15	15a	16	17	18
ETHERS (Fg/L)								
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
bis (2-chloroethyl) ether	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
bis (2-chloroisopropyl)ether	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
4-chlorophenyl phenyl ether	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
HALOGENATED ALIPHATICS (Fg/L)								
bromodichloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
bromoform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
carbon tetrachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
chloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0]	< 5.0]	< 5.0	< 5.0
chloroform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
dibromochloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
dichlorodifluormethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0]	< 5.0]	< 5.0	< 5.0
hexachlorobutadiene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
hexachlorocyclopentadiene	< 21	< 22	< 28X	< 25	< 24X	< 21X	< 22X	< 21X
hexachloroethane	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
methyl bromide	nr	nr	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr	nr	nr
methylene chloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
tetrachloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
vinyl chloride	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0]	< 5.0]	< 5.0	< 5.0

APPENDIX E.5 (cont).
ORGANICS AND INORGANICS IN WATER
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	12d	13	14	15	15a	16	17	18
Halogenated Aliphatics (cont)								
1,1-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
1,1,2-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
1,1,2,2-tetrachloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
1,2-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
1,2-dichloropropane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
1,3-trans-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0]	< 2.0]	< 2.0	< 2.0
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/L)								
acenaphthene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
acenaphthylene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
anthracene/phenanthrene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
benzo (a) anthracene 1,2-benzanthracene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
benzo (b) fluoroanthene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
benzo (GHI) perylene 1,12-benzoperylene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
benzo (k) fluoranthene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
benzo-a-pyrene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
chrysene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
fluoranthene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
fluorene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
indeno (1,2,3-CD) pyrene	< 5.3	< 5.5	< 6.9X	< 6.2	< 5.9X	< 5.3X	< 5.4X	< 5.4X
naphthalene	< 2.0	< 2.0	< 2.0	< 2.0	< 5.9]	< 2.0]	< 2.0	< 2.0

APPENDIX E.5 (cont).
ORGANICS AND INORGANICS IN WATER
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	12d	13	14	15	15a	16	17	18
Polycyclic Aromatic Hydrocarbons (cont)								
pyrene	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/L)								
benzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0**]**	< 2.0**]**	< 2.0	< 2.0
chlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0**]**	< 2.0**]**	< 2.0	< 2.0
ethylbenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0**]**	< 2.0**]**	< 2.0	< 2.0
hexachlorobenzene	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
nitrobenzene	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
styrene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0**]**	< 2.0**]**	< 2.0	< 2.0
toluene	< 2.0	< 2.0	< 2.0	< 2.0	1.5**Î]**	< 2.0**]**	< 2.0	< 2.0
xylene	< 6.0	< 6.0	< 6.0	< 6.0	1.5**Î]**	< 6.0**]**	< 6.0	1.3 **Ð**
1,2-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	1.0**Î]**	< 2.0**]**	< 2.0	< 2.0
1,2,4-trichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0**]**	< 2.0**]**	< 2.0	< 2.0
1,3-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0**]**	< 2.0**]**	< 2.0	< 2.0
1,4-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	**2.8]**	< 2.0**]**	< 2.0	< 2.0
2,4-dinitrotoluene	< 11	< 11	< 14**X**	< 12	< 12**X**	< 11**X**	< 11**X**	< 11**X**
2,6-dinitrotoluene	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
NITROSAMINES AND OTHER N COMPOUNDS (Fg/L)								
acrylonitrile	< 10	< 10	< 10	< 10	< 10**]**	< 10**]**	< 10	< 10
benzidine	ND	ND	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
n-nitrosodimethylamine	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
n-nitrosodiphenylamine	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX E.5 (cont).
ORGANICS AND INORGANICS IN WATER
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	**12d**	**13**	**14**	**15**	**15a**	**16**	**17**	**18**
Nitrosamines and Other N Compounds (cont)								
3,3-dichlorobenzidine	< 21	< 22	< 28**X**	< 25	< 24**X**	< 21**X**	< 22**X**	< 21**X**
PESTICIDES (Fg/L)								
acrolein	nr	nr	nr	nr	nr	nr	nr	nr
aldicarb	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
aldrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
alpha benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
atrazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
beta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
carbaryl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
carbofuran	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
chlordane	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
chlorfenvinphos	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chlorothalonil	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
chlorpyrifos	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
chlorsulfuron	nr	nr	nr	nr	nr	nr	nr	nr
DDD	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
DDE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
DDT	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
delta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
demeton	nr	nr	nr	nr	nr	nr	nr	nr
diazinon	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr	nr	nr
dicamba	< 1.0 **]**	< 1.0 **]**	< 1.0 **]**	< 1.0 **]**	< 1.0 **]**	< 1.0 **]**	< 1.0 **]**	< 1.0 **]**
2,4-dichlorophenoxyacetic acid (2,4-D)	< 20 **]**	< 20 **]**	< 20 **]**	< 20 **]**	< 20 **]**	< 20 **]**	< 20 **]**	< 20 **]**
dicofol (kelthane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

APPENDIX E.5 (cont).
ORGANICS AND INORGANICS IN WATER
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	12d	13	14	15	15a	16	17	18
Pesticides (cont)								
dicrotophos	nr	nr	nr	nr	nr	nr	nr	nr
dieldrin	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
dinoseb	< 1.0]	< 1.0]	< 1.0]	< 1.0]	< 1.0]	< 1.0]	< 1.0]	< 1.0]
endosulfan alpha	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan beta	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan sulfate	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endrin aldehyde	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
fenthion (baytex)	nr	nr	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
guthion	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
heptachlor	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
heptachlor epoxide	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
isophorone	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
malathion	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
metsulfuron	nr	nr	nr	nr	nr	nr	nr	nr
methomyl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
methoxychlor	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
metolachlor	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
mirex	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
parathion	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
picloram	< 3.0]	< 3.0]	< 3.0]	< 3.0]	< 3.0]	< 3.0]	< 3.0]	< 3.0]
prometon	nr	nr	nr	nr	nr	nr	nr	nr
simazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr	nr	nr
toxaphene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

APPENDIX E.5 (cont).
ORGANICS AND INORGANICS IN WATER
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	12d	13	14	15	15a	16	17	18
Pesticides (cont)								
2,4,5-TP (silvex)	< 5.0 **]**	< 5.0 **]**	< 5.0 **]**	< 5.0 **]**	< 5.0 **]**	< 5.0 **]**	< 5.0 **]**	< 5.0 **]**
PCBs and RELATED COMPOUNDS (Fg/L)								
aroclor 1016	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1221	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1232	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1242	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1248	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1254	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1260	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-chloronaphthalene	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
PHTHALATE ESTERS (Fg/L)								
bis (2-ethylhexyl) phthalate	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
di-n-butyl phthalate	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
di-n-octyl phthalate	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 11**X**	< 11**X**	< 11**X**
dimethyl phthalate	< 11	< 11	< 14**X**	< 12	< 12**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
n-butyl benzyl phthalate	< 5.3	< 5.5	< 6.9**X**	< 6.2	< 5.9**X**	< 5.3**X**	< 5.4**X**	< 5.4**X**
diethyl phthalate	< 5.3	< 5.5	< 6.9**X**	< 6.2	**5.1 Î X**	< 5.3**X**	< 5.4**X**	< 5.4**X**

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error
C = presence not determined due to presence of CO_2

Î = reported below quantitation limit
Ï = detected in lab blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
Ó = detected in field blank
• = daily average flow
e = equipment failure

Ž = flow estimate
fd = flow detected
nm = not measured
bold = values detected
b = container broken in shipping
] = QC not within required limits

APPENDIX F.1
ORGANICS AND INORGANICS DETECTED IN SEDIMENT
AND VALUES THAT EXCEEDED SCREENING CONCENTRATIONS
El Paso/Ciudad Juárez Reach

STATION	0.5a	1	1.1	2	2a
METALS (mg/kg)					
aluminum	9280	5510	3700	8250	22600
arsenic	6.1	**1.9**	**3.3**	**4.7**	**14.3**
beryllium	0.48	0.30	0.21	0.48	1.1
cadmium •	**0.34**	**0.13**	0.18	0.37	1.2
chromium •	g	g	g	0.68	14.4
copper •	**16.6**	**7.9**	**12.2**	**26.7**	**92.4**
lead •	**16.1**	**9.4**	**12.5**	**19.7**	44.2
mercury •	0.04	0.02	0.05	0.03	0.51
nickel •	**8.1**	**6.0**	**4.6**	**8.4**	16.8
selenium	0.16	0.11	0.11	0.23	0.91
silver	g	g	g	g	**3.6**
thallium	g	g	g	0.20	0.36
zinc •	**39.7**	**23.7**	**24.6**	**44.7**	218
PESTICIDES (mg/kg)					
alpha benzene hexachloride	g	g	g	0.003	g
DDE •	0.0061	g	g	0.0036	0.0262
PHTHALATE ESTERS (mg/kg)					
bis (2-ethylhexyl) phthalate	g	g	g	0.80	39

• = Some screening levels for metals-in-sediment are site-specific, based on local AVS concentrations See page 20 for additional information and APPENDIX I.3 for site specific screening levels and APPENDIX J for a summary of screening level exceedances.

• = Some screening levels for organics-in-sediment are site-specific, based on local TOC concentrations; therefore, concentrations which exceed screening levels will vary. See APPENDIX I.3 for site specific screening levels and APPENDIX J for a summary of screening level exceedances.

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit

APPENDIX F.1
ORGANICS AND INORGANICS DETECTED IN SEDIMENT
AND VALUES THAT EXCEEDED SCREENING CONCENTRATIONS
El Paso/Ciudad Juárez Reach

STATION	3	3a	3a.1	4	5
METALS (mg/kg)					
aluminum	11400	7650	2900	10500	13900
antimony	g	g	0.99	g	g
arsenic	**7.0**	8.0	**8.2**	**7.2**	4.9
beryllium	0.59	0.40	0.21	0.61	0.69
cadmium •	0.14	0.25	0.14	**0.69**	0.28
chromium •	g	g	**3.8**	g	g
copper •	**10.3**	7.2	**3.3**	**8.4**	10.3
lead •	**12.3**	12.0	**11.5**	**19.0**	13.5
mercury •	0.03	0.02	0.02	0.03	0.03
nickel •	**11.9**	9.4	**4.4**	**10.1**	12.0
selenium	0.28	0.25	0.12	0.21	0.37
thallium	0.61	0.33	g	g	g
zinc •	**43.6**	**40.1**	**23.0**	**68.2**	51.6
PESTICIDES (mg/kg)					
p,p' DDE •	g	0.0037	g	g	g

• = Some screening levels for metals-in-sediment are site-specific, based on local AVS concentrations See page 20 for additional information and APPENDIX I.3 for site specific screening levels and APPENDIX J for a summary of screening level exceedances.

• = Some screening levels for organics-in-sediment are site-specific, based on local TOC concentrations; therefore, concentrations which exceed screening levels will vary. See APPENDIX I.3 for site specific screening levels and APPENDIX J for a summary of screening level exceedances.

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit

APPENDIX F.3
ORGANICS AND INORGANICS DETECTED IN SEDIMENT
AND VALUES THAT EXCEEDED SCREENING CONCENTRATIONS
International Amistad Reservoir-Eagle Pass/Piedras Negras Reach

STATION	6.1	6.2	7b	7b.1	7b.2	9a	10
METALS (mg/kg)							
aluminum	27100	21100	6950	6860	6270	19400	10500
antimony	1.8	0.90	0.66	1.1	1.6	1.7	0.97
arsenic	**12.1**	14.6	3.9	7.0	4.2	6.0	5.9
beryllium	1.2	0.91	0.38	0.42	0.3	0.90	0.45
cadmium •	0.26	0.36	0.20	0.24	0.40	0.75	0.23
chromium •	**19.1**	15.5	6.7	11.4	7.0	19.1	10.4
copper •	**12.4**	11.7	5.6	5.6	6.8	24.0	5.7
lead •	**15.9**	15.5	11.4	10.8	22.8	40.1	8.8
mercury •	0.05	g	0.03	g	0.03	0.31	0.02
nickel •	**18.5**	15.0	6.5	8.3	5.7	16.2	9.1
selenium	0.59	0.79	0.19	0.20	0.47	g	0.21
thallium	0.75	0.74	0.88	1.1	0.29	0.89	0.16
zinc •	**59.2**	46.1	**33.2**	23.4	34.9	167	37.8
PESTICIDES (mg/kg)							
chlordane •	g	g	g	**0.068**	**0.033**	g	g
p,p' DDE •	g	Ž	Ž	Ž	g	0.012	Ž

• = Some screening levels for metals-in-sediment are site-specific, based on local AVS concentrations See page 20 for additional information and APPENDIX I.3 for site specific screening levels and APPENDIX J for a summary of screening level exceedances.

• = Some screening levels for organics-in-sediment are site-specific, based on local TOC concentrations; therefore, concentrations which exceed screening levels will vary. See APPENDIX I.3 for site specific screening levels and APPENDIX J for a summary of screening level exceedances.

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit
Ž	= detected but could not be quantified reliably

APPENDIX F.4
ORGANICS AND INORGANICS DETECTED IN SEDIMENT
AND VALUES THAT EXCEEDED SCREENING CONCENTRATIONS
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

STATION	**10a**	**11a**	**11b**	**11c**	**12**	**12.1**	**12.2**	**12.3**
METALS (Fg/kg)								
aluminum	12500	29700	16600	9480	13700	16300	22000	13100
antimony	15.4	0.63	g	g	g	g	g	g
arsenic	7.6	8.0	5.6	3.6	4.5	**4.4**	**4.9**	0.70
beryllium	0.56	1.1	0.64	0.49	0.55	0.63	0.82	0.55
cadmium •	0.28	0.41	0.19	0.52	0.31	0.23	0.30	0.20
chromium •	16.7	20.6	11.7	12.0	12.4	**13.7**	**16.7**	**11.3**
copper •	7.2	16.1	6.7	12.1	8.9	8.3	11.0	6.4
lead •	28.8	49.6	36.1	20.8	24.9	**20.7**	**33.9**	25.4
mercury •	0.06	0.03	0.03	0.19	0.04	0.03	0.03	0.02
nickel •	10.7	17.8	10.1	8.5	10.6	**22.7**	**13.9**	11.0
selenium	0.20	0.27	g	0.21	0.27	g	0.28	0.33
silver	g	g	g	**2.3**	**1.6**	0.90	g	g
thallium	0.17	0.64	0.35	0.19	0.45	0.36	0.31	0.58
zinc •	69.2	77.8	55.9	61.2	57.5	**50.3**	**63.6**	45.8
OTHER INORGANICS (mg/kg)								
cyanide	3.0	g	g	6.0	g	g	g	g
PESTICIDES (mg/kg)								
p,p' DDE •	g	0.0029	0.0062	0.0055	0.0034	g	0.0045	Ž
p,p' DDT •	**2.1**	g	**2.0**	g	g	g	g	g

• = Some screening levels for metals-in-sediment are site-specific, based on local AVS concentrations See page 20 for additional information and APPENDIX I.3 for site specific screening levels and APPENDIX J for a summary of screening level exceedances.

• = Some screening levels for organics-in-sediment are site-specific, based on local TOC concentrations; therefore, concentrations which exceed screening levels will vary. See APPENDIX I.3 for site specific screening levels and APPENDIX J for a summary of screening level exceedances.

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit
Ž	= detected but could not be quantified reliably

APPENDIX F.5
ORGANICS AND INORGANICS DETECTED IN SEDIMENT
AND VALUES THAT EXCEEDED SCREENING CONCENTRATIONS
Below International Falcon Reservoir-Brownsville/Matamoros Reach

STATION	12d	13	14	15	15a	16	17	18
METALS (mg/kg)								
aluminum	27900	8770	11500	2770	18400	7790	4930	15100
arsenic	9.0	5.2	**6.4**	3.9	3.6	**3.1**	**3.1**	5.4
beryllium	0.95	0.36	0.46	0.17	0.74	0.31	0.26	0.59
cadmium •	0.42	0.13	0.23	0.07	0.40	0.12	0.09	0.22
chromium •	17.0	8.1	**10.3**	3.0	16.3	**7.6**	**4.8**	**11.9**
copper •	12.7	3.7	**4.5**	0.61	14.8	**2.8**	1.8	6.5
lead •	35.8	15.9	**24.2**	9.3	26.8	**1.7**	**9.2**	18.6
mercury •	0.03	0.03	0.02	0.02	0.02	0.11	0.02	0.03
nickel •	13.0	6.0	**9.0**	2.7	11.8	**6.0**	**4.2**	8.8
selenium	0.37	0.07	g	g	0.39	g	g	g
silver	0.96	**2.6**	**2.0**	**3.3**	**2.4**	**2.5**	**3.0**	**2.7**
thallium	0.26	0.31	0.32	0.19	0.21	0.15	0.15	0.14
zinc •	81.1	28.7	**35.7**	15.5	67.7	**27.3**	**21.4**	**41.4**
PESTICIDES (mg/kg)								
p,p' DDE •	**0.025**	g	g	g	0.015	g	g	g
PHTHALATE ESTERS (mg/kg)								
bis (2-ethylhexyl) phthalate	g	g	g	g	6.1	g	g	g

• = Some screening levels for metals-in-sediment are site-specific, based on local AVS concentrations See page 20 for additional information and APPENDIX I.3 for site specific screening levels and APPENDIX J for a summary of screening level exceedances.

• = Some screening levels for organics-in-sediment are site-specific, based on local TOC concentrations; therefore, concentrations which exceed screening levels will vary. See APPENDIX I.3 for site specific screening levels and APPENDIX J for a summary of screening level exceedances.

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit

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APPENDIX F.1
ORGANICS AND INORGANICS IN SEDIMENT
El Paso/Ciudad Juárez Reach

LOCATION	**0.5a**	**1**	**1.1**	**1a**	**2**	**2a**
Date	120295	120295	120295		120395	120395
CONVENTIONALS	TRIB	MAIN	MAIN	WWTP	MAIN	TRIB
total organic carbon (mg/kg)	4590	2700	1570		5860	22700
acid volatile sulfides (mg/kg)	135	< 1	< 1		< 1	1840
clay, < 0.0039 mm (% dry weight)	2	5	5		5	3
silt, 0.0039-0.0625 mm (% dry weight)	43	13	12		23	89
sand, 0.0625-2.0 mm (% dry weight)	54	82	84		72	8
gravel, > 2.0 mm (% dry weight)	1	< 1	< 1		< 1	< 1
METALS (mg/kg)						
aluminum	**9280**	**5510**	**3700**		**8250**	**22600**
antimony	*	*	*		*	*
arsenic	**6.1**	**1.9**	**3.3**		**4.7**	**14.3**
beryllium	**0.48**	**0.30**	**0.21**		**0.48**	**1.1**
cadmium	**0.34**	**0.13**	**0.18**		**0.37**	**1.2**
chromium	< 0.66	< 0.42	< 0.41		**0.68**	**14.4**
copper	**16.6**	**7.9**	**12.2**		**26.7**	**92.4**
lead	**16.1**	**9.4**	**12.5**		**19.7**	**44.2**
mercury	**0.04**	**0.02**	**0.05**		**0.03**	**0.51**
nickel	**8.1**	**6.0**	**4.6**		**8.4**	**16.8**
selenium	**0.16**	**0.11**	**0.11**		**0.23**	**0.91**
silver	< 0.53	< 0.50	< 0.54		< 0.53	**3.6**
thallium	< 0.20	< 0.20	< 0.20		**0.20**	**0.36**
zinc	**39.7**	**23.7**	**24.6**		**44.7**	**218**
OTHER INORGANICS (mg/kg)						
cyanide	< 1.0	< 1.0	< 1.0		< 1.0	< 1.0

APPENDIX F.1 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
El Paso/Ciudad Juárez Reach

LOCATION	0.5a	1	1.1	1a	2	2a
PHENOLS AND CRESOLS (Fg/kg)						
parachlorometa cresol	nr	nr	nr		nr	nr
pentachlorophenol	< 6.3	< 5.3	< 5.4		< 6.4	< 10.5
phenol (C_6H_5OH) single compound	< 800	< 700	< 700		< 800	< 2700
phenolics recoverable	< 500	< 500	< 500		< 500	< 500
2-chlorophenol	< 800	< 700	< 700		< 800	< 2700
2-nitrophenol	< 1600	< 1300	< 1400		< 1600	< 5300
2,4-dichlorophenol	< 1600	< 1300	< 1400		< 1600	< 5300
2,4-dimethylphenol	< 1600	< 1300	< 1400		< 1600	< 5300
2,4-dinitrophenol	< 3200	< 3000	< 2800		< 3000	< 11000
2,4,6-trichlorophenol	< 800	< 700	< 700		< 800	< 2700
4-nitrophenol	< 3200	< 3000	< 2800		< 3000	< 11000
4,6-dinitro-ortho-cresol	nr	nr	nr		nr	nr
ETHERS (Fg/kg)						
bis (chloromethyl) ether	nr	nr	nr		nr	nr
bis (2-chloroethyoxy) methane	< 800	< 700	< 700		< 800	< 2700
bis (2-chloroethyl) ether	< 800	< 700	< 700		< 800	< 2700
bis (2-chloroisopropyl)ether	< 800	< 700	< 700		< 800	< 2700
2-chloroethyl vinyl ether	nr	nr	nr		nr	nr
4-bromophenyl phenyl ether	< 800	< 700	< 700		< 800	< 2700
4-chlorophenyl phenyl ether	< 800	< 700	< 700		< 800	< 2700
HALOGENATED ALIPHATICS (Fg/kg)						
bromodichloromethane	< 370	< 300	< 310		< 380	< 690
bromoform	< 370	< 300	< 310		< 380	< 690
carbon tetrachloride	< 370	< 300	< 310		< 380	< 690
chloroethane	< 920	< 750	< 760		< 940	< 1720
Halogenated Aliphatics (cont)						

APPENDIX F.1 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
El Paso/Ciudad Juárez Reach

LOCATION	**0.5a**	**1**	**1.1**	**1a**	**2**	**2a**
chloroform	< 370	< 300	< 310		< 380	< 690
dibromochloromethane	< 370	< 300	< 310		< 380	< 690
dichlorodifluormethane	< 920	< 750	< 760		< 940	< 1720
hexachlorobutadiene	< 370	< 300	< 310		< 380	< 690
hexachlorocyclopentadiene	< 3200	< 3000	< 2800		< 3000	< 11000
hexachloroethane	< 800	< 700	< 700		< 800	< 2700
methyl bromide	nr	nr	nr		nr	nr
methyl chloride	nr	nr	nr		nr	nr
methylene chloride	nr	nr	nr		nr	nr
tetrachloroethylene	nr	nr	nr		nr	nr
trichloroethylene	nr	nr	nr		nr	nr
trichlorofluoromethane	< 370	< 300	< 310		< 380	< 690
vinyl chloride	< 920	< 750	< 760		< 940	< 1720
1,1-dichloroethane	< 370	< 300	< 310		< 380	< 690
1,1-dichloroethylene	nr	nr	nr		nr	nr
1,1,1-trichloroethane	< 370	< 300	< 310		< 380	< 690
1,1,2-trichloroethane	< 370	< 300	< 310		< 380	< 690
1,1,2,2-tetrachloroethane	< 370	< 300	< 310		< 380	< 690
1,2-dichloroethane	< 370	< 300	< 310		< 380	< 690
1,2-dichloropropane	< 370	< 300	< 310		< 380	< 690
1,2-trans-dichloroethylene	nr	nr	nr		nr	nr
1,3-cis-dichloropropene	< 370	< 300	< 310		< 380	< 690
1,3-trans-dichloropropene	< 370	< 300	< 310		< 380	< 690
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/kg)						
acenaphthene	< 800	< 700	< 700		< 800	< 2700
acenaphthylene	< 800	< 700	< 700		< 800	< 2700
Polycyclic Aromatic Hydrocarbons (cont)						

APPENDIX F.1 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
El Paso/Ciudad Juárez Reach

LOCATION	0.5a	1	1.1	1a	2	2a
anthracene/phenanthrene	< 800	< 700	< 700		< 800	< 2700
benzo (a) anthracene 1,2-benzanthracene	< 800	< 700	< 700		< 800	< 2700
benzo (b) fluoroanthene	< 800	< 700	< 700		< 800	< 2700
benzo (GHI) perylene 1,12-benzoperylene	< 800	< 700	< 700		< 800	< 2700
benzo (k) fluoranthene	< 800	< 700	< 700		< 800	< 2700
benzo-a-pyrene	< 800	< 700	< 700		< 800	< 2700
chrysene	< 800	< 700	< 700		< 800	< 2700
fluoranthene	< 800	< 700	< 700		< 800	< 2700
fluorene	< 800	< 700	< 700		< 800	< 2700
indeno (1,2,3-CD) pyrene	< 800	< 700	< 700		< 800	< 2700
naphthalene	< 370	< 300	< 310		< 380	< 690
pyrene	< 800	< 700	< 700		< 800	< 2700
1,2,5,6-dibenzantracene	nr	nr	nr		nr	nr
MONOCYCLIC AROMATICS (Fg/kg)						
benzene	< 370	< 300	< 310		< 380	< 690
chlorobenzene	< 370	< 300	< 310		< 380	< 690
ethylbenzene	< 370	< 300	< 310		< 380	< 690
hexachlorobenzene	< 1.3	< 1.1	< 1.1		< 1.3	< 2.1
nitrobenzene	< 800	< 700	< 700		< 800	< 2700
styrene	< 370	< 300	< 310		< 380	< 690
toluene	< 370	< 300	< 310		< 380	< 690
xylene	< 740	< 600	< 610		< 940	< 1380
1,2-dichlorobenzene	< 370	< 300	< 310		< 380	< 690
1,2,4-trichlorobenzene	< 370	< 300	< 310		< 380	< 690
Monocyclic Aromatics (cont)						
1,3-dichlorobenzene	< 370	< 300	< 310		< 380	< 690

APPENDIX F.1 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
El Paso/Ciudad Juárez Reach

LOCATION	**0.5a**	**1**	**1.1**	**1a**	**2**	**2a**
1,4-dichlorobenzene	< 370	< 3000	< 310		< 380	< 690
2,4-dinitrotoluene	< 1600	< 1300	< 1400		< 1600	< 5300
2,6-dinitrotoluene	< 800	< 700	< 700		< 800	< 2700
NITROSAMINES AND OTHER N COMPOUNDS (Fg/kg)						
acrylonitrile	< 1840	< 1500	< 1530		< 1880	< 3450
benzidine	ND	ND	ND		ND	ND
n-nitrosodi-n-propylamine	< 800	< 700	< 700		< 800	< 690
n-nitrosodimethylamine	< 800	< 700	< 700		< 800	< 690
n-nitrosodiphenylamine	< 800	< 700	< 700		< 800	< 690
1,2-diphenylhydrazine	nr	nr	nr		nr	nr
3,3-dichlorobenzidine	< 3200	< 3000	< 2800		< 3000	< 11000
PESTICIDES (Fg/kg)						
acrolein	nr	nr	nr		nr	nr
aldicarb	nr	nr	nr		nr	nr
aldrin	< 1.3	< 1.1	< 1.1		< 1.3	< 2.1
alpha benzene hexachloride	< 1.3	< 1.1	< 1.1		**3.0**	< 2.1
atrazine	nr	nr	nr		nr	nr
beta benzene hexachloride	< 1.3	< 1.1	< 1.1		< 1.3	< 2.1
carbaryl	nr	nr	nr		nr	nr
carbofuran	nr	nr	nr		nr	nr
chlordane	< 12.5	< 10.7	< 10.8		< 12.7	< 21.1
chlorfenvinphos	nr	nr	nr		nr	nr
chlorothalonil	nr	nr	nr		nr	nr
chlorpyrifos	< 6.3	< 5.3	< 5.4		< 6.4	< 10.5

APPENDIX F.1 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
El Paso/Ciudad Juárez Reach

LOCATION	0.5a	1	1.1	1a	2	2a
Pesticides (cont)						
chlorsulfuron	nr	nr	nr		nr	nr
DDD	< 6.3	< 5.3	< 5.4		< 6.4	< 10.5
DDE	**6.1**	< 5.3	< 2.7		**3.6**	**26.2**
DDT	< 6.3	< 2.7	< 5.4		< 6.4	< 10.5
delta benzene hexachloride	< 1.3	< 1.1	< 1.1		< 1.3	< 2.1
demeton	nr	nr	nr		nr	nr
diazinon	< 6.3	< 5.3	< 5.4		< 6.4	< 10.5
dibromochloropropane (dbcp)	nr	nr	nr		nr	nr
dicamba	< 6.3	< 5.3	< 5.4		< 6.4	< 10.5
2,4-dichlorophenoxyacetic acid (2,4-D)	< 78	< 67	< 68		< 79	< 132
dicofol (kelthane)	nr	nr	nr		nr	nr
dicrotophos	nr	nr	nr		nr	nr
dieldrin	< 3.8	< 3.2	< 3.2		< 3.8	< 6.3
dinoseb	< 9.4	< 8.0	< 8.1		< 9.5	< 15.8
endosulfan alpha	< 3.1	< 2.7	< 2.7		< 3.2	< 5.3
endosulfan beta	< 3.1	< 2.7	< 2.7		< 3.2	< 5.3
endosulfan sulfate	< 6.3	< 5.3	< 5.4		< 6.4	< 10.5
endrin	< 3.8	< 3.2	< 3.2		< 3.8	< 6.3
endrin aldehyde	< 3200	ND	< 2800		ND	ND
fenthion (baytex)	nr	nr	nr		nr	nr
gamma-bhc (lindane)	< 1.3	< 1.1	< 1.1		< 1.3	< 2.1
guthion	nr	nr	nr		nr	nr
heptachlor	< 1.3	< 1.1	< 1.1		< 1.3	< 2.1
heptachlor epoxide	< 2.5	< 2.1	< 2.2		< 2.5	< 4.2
isophorone	< 800	< 700	< 700		< 800	< 2700
malathion	< 12.5	< 10.7	< 10.8		< 12.7	< 21.1

APPENDIX F.1 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
El Paso/Ciudad Juárez Reach

LOCATION	**0.5a**	**1**	**1.1**	**1a**	**2**	**2a**
Pesticides (cont)						
metsulfuron	nr	nr	nr		nr	nr
methomyl	nr	nr	nr		nr	nr
methoxychlor	< 19	< 16	< 16		< 19	< 32
metolachlor	nr	nr	nr		nr	nr
mirex	< 5.0	< 4.3	< 4.3		< 5.1	< 8.4
parathion	< 6.3	< 5.3	< 5.4		< 6.4	< 10.5
picloram	< 16	< 13	< 14		< 16	< 26
prometon	nr	nr	nr		nr	nr
simazine	nr	nr	nr		nr	nr
tetraethylpyrophosphate (tepp)	nr	nr	nr		nr	nr
toxaphene	< 63	< 53	< 54		< 64	< 105
2,4,5-TP (silvex)	< 12.5	< 10.7	< 10.8		< 12.7	< 21.1
PCBs and RELATED COMPOUNDS (Fg/kg)						
arohlor 1016	< 25	< 21	< 22		< 25	< 42
aroclor 1221	< 25	< 21	< 22		< 25	< 42
aroclor 1232	< 25	< 21	< 22		< 25	< 42
aroclor 1242	< 25	< 21	< 22		< 25	< 42
aroclor 1248	< 25	< 21	< 22		< 25	< 42
aroclor 1254	< 25	< 21	< 22		< 25	< 42
aroclor 1260	< 25	< 21	< 22		< 25	< 42
2-chloronaphthalene	< 800	< 700	< 700		< 800	< 2700
PHTHALATE ESTERS (Fg/kg)						
bis (2-ethylhexyl) phthalate	< 800	< 700	< 700		**800**	**39000**
di-n-butyl phthalate	< 800	< 700	< 700		< 800	< 2700
di-n-octyl phthalate	< 800	< 700	< 700		< 800	< 2700

APPENDIX F.1 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
El Paso/Ciudad Juárez Reach

LOCATION	0.5a	1	1.1	1a	2	2a
Phthalate Esters (cont)						
dimethyl phthalate	< 1600	< 1300	< 1400		< 1600	< 5300
n-butyl benzyl phthalate	< 800	< 700	< 700		< 800	< 2700
diethyl phthalate	< 800	< 700	< 700		< 800	< 2700

nr = not reported by laboratory
Î = reported below quantitation limit
na = not analyzed
Ï = detected in blank
ND = not detected
Ð = common lab contaminant
* = no reportable data
Ñ = possible contamination
X = exceeded hold time
Ò = degraded PCB pattern
˜ = lab error

APPENDIX F.2
ORGANICS AND INORGANICS IN SEDIMENT
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a
Date	120595	120595	080895	120595	120695	
CONVENTIONALS						
total organic carbon (mg/kg)	3880	3650	3220	3940	4440	
acid volatile sulfides (mg/kg)	< 1	18	< 1	< 1	66	
clay, < 0.0039 mm (% dry weight)	13	11	6	14	20	
silt, 0.0039-0.0625 mm (% dry weight)	42	36	16	44	57	
sand, 0.0625-2.0 mm (% dry weight)	45	52	76	41	23	
gravel, > 2.0 mm (% dry weight)	< 1	1	2	< 1	< 1	
METALS (mg/kg)						
aluminum	**11400**	**7650**	**2900**	**10500**	**13900**	
antimony	*	*	**0.99**	*	*	
arsenic	**7.0**	**8.0**	**8.2**	**7.2**	**4.9**	
beryllium	**0.59**	**0.40**	**0.21**	**0.61**	**0.69**	
cadmium	**0.14**	**0.25**	**0.14**	**0.69**	**0.28**	
chromium	< 0.58	< 0.50	**3.8**	< 0.65	< 0.49	
copper	**10.3**	**7.2**	**3.3**	**8.4**	**10.3**	
lead	**12.3**	**12.0**	**11.5**	**19.0**	**13.5**	
mercury	**0.03**	**0.02**	**0.02**	**0.03**	**0.03**	
nickel	**11.9**	**9.4**	**4.4**	**10.1**	**12.0**	
selenium	**0.28**	**0.25**	**0.12**	**0.21**	**0.37**	
silver	< 0.55	< 0.54	< 0.60	< 0.51	< 0.54	
thallium	**0.61**	**0.33**	< 0.40	< 0.18	< 0.20	
zinc	**43.6**	**40.1**	**23.0**	**68.2**	**51.6**	
OTHER INORGANICS (mg/kg)						
cyanide	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	

APPENDIX F.2 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Presidio/Ojinaga-Big Bend Reach

LOCATION	**3**	**3a**	**3a.1**	**4**	**5**	**5a**
PHENOLS AND CRESOLS (Fg/kg)						
parachlorometa cresol	nr	nr	nr	nr	nr	
pentachlorophenol	< 5.6	< 5.6	< 5.1	< 5.6	< 6.3	
phenol (C_6H_5OH) single compound	< 700	< 700	< 700	< 700	< 800	
phenolics recoverable	< 500	< 500	< 500	< 500	< 500	
2-chlorophenol	< 700	< 700	< 700	< 700	< 800	
2-nitrophenol	< 1400	< 1400	< 1300	< 1400	< 1600	
2,4-dichlorophenol	< 1400	< 1400	< 1300	< 1400	< 1600	
2,4-dimethylphenol	< 1400	< 1400	< 1300	< 1400	< 1600	
2,4-dinitrophenol	< 3000	< 3000	< 2600	< 3000	< 3000	
2,4,6-trichlorophenol	< 700	< 700	< 700	< 700	< 800	
4-nitrophenol	< 3000	< 3000	< 2600	< 3000	< 3000	
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	
ETHERS (Fg/kg)						
bis (chloromethyl) ether	nr	nr	nr	nr	nr	
bis (2-chloroethyoxy) methane	< 700	< 700	< 700	< 700	< 800	
bis (2-chloroethyl) ether	< 700	< 700	< 700	< 700	< 800	
bis (2-chloroisopropyl)ether	< 700	< 700	< 700	< 700	< 800	
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	
4-bromophenyl phenyl ether	< 700	< 700	< 700	< 700	< 800	
4-chlorophenyl phenyl ether	< 700	< 700	< 700	< 700	< 800	
HALOGENATED ALIPHATICS (Fg/kg)						
bromodichloromethane	< 320	< 320	< 280	< 320	< 370	
bromoform	< 320	< 320	< 280	< 320	< 370	
carbon tetrachloride	< 320	< 320	< 280	< 320	< 370	
chloroethane	< 810	< 790	< 700	< 810	< 920	

APPENDIX F.2 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a
Halogenated Aliphatics (cont)						
chloroform	< 320	< 320	< 280	< 320	< 370	
dibromochloromethane	< 320	< 320	< 280	< 320	< 370	
dichlorodifluormethane	< 810	< 790	< 700	< 810	< 920	
hexachlorobutadiene	< 320	< 320	< 280	< 320	< 370	
hexachlorocyclopentadiene	< 3000	< 3000	< 2600	< 3000	< 3000	
hexachloroethane	< 700	< 700	< 700	< 700	< 800	
methyl bromide	nr	nr	nr	nr	nr	
methyl chloride	nr	nr	nr	nr	nr	
methylene chloride	nr	nr	< 280	nr	nr	
tetrachloroethylene	nr	nr	nr	nr	nr	
trichloroethylene	nr	nr	nr	nr	nr	
trichlorofluoromethane	< 320	< 320	< 280	< 320	< 370	
vinyl chloride	< 810	< 790	< 700	< 810	< 920	
1,1-dichloroethane	< 320	< 320	< 280	< 320	< 370	
1,1-dichloroethylene	nr	nr	nr	nr	nr	
1,1,1-trichloroethane	< 320	< 320	< 280	< 320	< 370	
1,1,2-trichloroethane	< 320	< 320	< 280	< 320	< 370	
1,1,2,2-tetrachloroethane	< 320	< 320	< 280	< 320	< 370	
1,2-dichloroethane	< 320	< 320	< 280	< 320	< 370	
1,2-dichloropropane	< 320	< 320	< 280	< 320	< 370	
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	
1,3-cis-dichloropropene	< 320	< 320	< 280	< 320	< 370	
1,3-trans-dichloropropene	< 320	< 320	< 280	< 320	< 370	
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/kg)						
acenaphthene	< 700	< 700	< 700	< 700	< 800	
acenaphthylene	< 700	< 700	< 700	< 700	< 800	

APPENDIX F.2 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a
Polycyclic Aromatic Hydrocarbons (cont)						
anthracene/phenanthrene	< 700	< 700	< 700	< 700	< 800	
benzo (a) anthracene 1,2-benzanthracene	< 700	< 700	< 700	< 700	< 800	
benzo (b) fluoroanthene	< 700	< 700	< 700	< 700	< 800	
benzo (GHI) perylene 1,12-benzoperylene	< 700	< 700	< 700	< 700	< 800	
benzo (k) fluoranthene	< 700	< 700	< 700	< 700	< 800	
benzo-a-pyrene	< 700	< 700	< 700	< 700	< 800	
chrysene	< 700	< 700	< 700	< 700	< 800	
fluoranthene	< 700	< 700	< 700	< 700	< 800	
fluorene	< 700	< 700	< 700	< 700	< 800	
indeno (1,2,3-CD) pyrene	< 700	< 700	< 700	< 700	< 800	
naphthalene	< 320	< 320	< 280	< 320	< 370	
pyrene	< 700	< 700	< 700	< 700	< 800	
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	
MONOCYCLIC AROMATICS (Fg/kg)						
benzene	< 320	< 320	< 280	< 320	< 370	
chlorobenzene	< 320	< 320	< 280	< 320	< 370	
ethylbenzene	< 320	< 320	< 280	< 320	< 370	
hexachlorobenzene	< 1.1	< 1.1	< 1.0	< 1.1	< 1.3	
nitrobenzene	< 700	< 700	< 700	< 700	< 800	
styrene	< 320	< 320	< 280	< 320	< 370	
toluene	< 320	< 320	< 280	< 320	< 370	
xylene	< 650	< 630	< 840	< 650	< 740	
1,2-dichlorobenzene	< 320	< 320	< 280	< 320	< 370	
1,2,4-trichlorobenzene	< 320	< 320	< 280	< 320	< 370	

APPENDIX F.2 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Presidio/Ojinaga-Big Bend Reach

LOCATION	**3**	**3a**	**3a.1**	**4**	**5**	**5a**
Monocyclic Aromatics (cont)						
1,3-dichlorobenzene	< 320	< 320	< 280	< 320	< 370	
1,4-dichlorobenzene	< 320	< 320	< 280	< 320	< 370	
2,4-dinitrotoluene	< 1400	< 1400	< 1300	< 1400	< 1600	
2,6-dinitrotoluene	< 700	< 700	< 700	< 700	< 800	
NITROSAMINES AND OTHER N COMPOUNDS (Fg/kg)						
acrylonitrile	< 1610	< 1580	< 1400	< 1610	< 1840	
benzidine	ND	ND	ND	ND	ND	
n-nitrosodi-n-propylamine	< 700	< 700	< 700	< 700	< 800	
n-nitrosodimethylamine	< 700	< 700	< 700	< 700	< 800	
n-nitrosodiphenylamine	< 700	< 700	< 700	< 700	< 800	
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	
3,3-dichlorobenzidine	< 3000	< 3000	< 2600	< 3000	< 3000	
PESTICIDES (Fg/kg)						
acrolein	nr	nr	nr	nr	nr	
aldicarb	nr	nr	nr	nr	nr	
aldrin	< 1.1	< 1.1	< 1.0	< 1.1	< 1.3	
alpha benzene hexachloride	< 1.1	< 1.1	< 1.0	< 1.1	< 1.3	
atrazine	< 56	< 56	< 51	< 56	< 63	
beta benzene hexachloride	< 1.1	< 1.1	< 1.0	< 1.1	< 1.3	
carbaryl	nr	nr	nr	nr	nr	
carbofuran	nr	nr	nr	nr	nr	
chlordane	< 11	< 11	< 10	< 11	< 13	
chlorfenvinphos	nr	nr	nr	nr	nr	
chlorothalonil	nr	nr	nr	nr	nr	
chlorpyrifos	< 5.6	< 5.6	< 5.1	< 5.6	< 6.3	

APPENDIX F.2 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a
Pesticides (cont)						
chlorsulfuron	nr	nr	nr	nr	nr	
DDD	< 54.6	< 5.6	< 5.1	< 5.6	< 6.3	
DDE	< 21.8	**3.7**	< 2.5	< 2.8	< 3.1	
DDT	< 5.6	< 5.6	< 5.1	< 5.6	< 6.3	
delta benzene hexachloride	< 1.1	< 1.1	< 1.0	< 1.1	< 1.3	
demeton	nr	nr	nr	nr	nr	
diazinon	< 5.6	< 5.6	< 5.1	< 5.6	< 6.3	
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	
dicamba	< 5.6	< 5.6	< 5.1	< 5.6	< 6.3	
2,4-dichlorophenoxyacetic acid (2,4-D)	< 70	< 70	< 6.3	< 70	< 78	
dicofol (kelthane)	< 56	< 56	< 51	< 56	< 63	
dicrotophos	nr	nr	nr	nr	nr	
dieldrin	< 3.4	< 3.3	< 3.0	< 3.4	< 3.8	
dinoseb	< 8.4	< 8.3	< 7.6	< 8.4	< 9.4	
endosulfan alpha	< 2.8	< 2.8	< 2.5	< 2.8	< 3.1	
endosulfan beta	< 2.8	< 2.8	< 2.5	< 2.8	< 3.1	
endosulfan sulfate	< 5.6	< 5.6	< 5.1	< 5.6	< 6.3	
endrin	< 3.4	< 3.3	< 3.0	< 3.4	< 3.8	
endrin aldehyde	< 2.3	< 2.2	< 2.0	< 2.3	< 2.5	
fenthion (baytex)	nr	nr	nr	nr	nr	
gamma-bhc (lindane)	< 1.1	< 1.1	< 1.0	< 1.1	< 1.3	
guthion	nr	nr	nr	nr	nr	
heptachlor	< 1.1	< 1.1	< 1.0	< 1.1	< 1.3	
heptachlor epoxide	< 2.3	< 2.2	< 2.0	< 2.3	< 2.5	
isophorone	< 700	< 700	< 700	< 700	< 800	
malathion	< 11	< 11	< 10	< 11	< 13	

APPENDIX F.2 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Presidio/Ojinaga-Big Bend Reach

LOCATION	**3**	**3a**	**3a.1**	**4**	**5**	**5a**
Pesticides (cont)						
metsulfuron	nr	nr	nr	nr	nr	
methomyl	nr	nr	nr	nr	nr	
methoxychlor	< 17	< 17	< 15	< 17	< 19	
metolachlor	< 20	< 19	< 18	< 20	< 22	
mirex	< 4.5	< 4.4	< 4.0	< 4.5	< 5.0	
parathion	< 5.6	< 5.6	< 5.1	< 5.6	< 6.3	
picloram	< 14	< 14	< 13	< 14	< 16	
prometon	nr	nr	nr	nr	nr	
simazine	< 56	< 56	< 51	< 56	< 63	
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	
toxaphene	< 56	< 56	< 51	< 56	< 63	
2,4,5-TP (silvex)	< 11.3	< 11.1	< 10	< 11.3	< 12.5	
PCBs and RELATED COMPOUNDS (Fg/kg)						
aroclor 1016	< 23	< 22	< 20	< 23	< 25	
aroclor 1221	< 23	< 22	< 20	< 23	< 25	
aroclor 1232	< 23	< 22	< 20	< 23	< 25	
aroclor 1242	< 23	< 22	< 20	< 23	< 25	
aroclor 1248	< 23	< 22	< 20	< 23	< 25	
aroclor 1254	< 23	< 22	< 20	< 23	< 25	
aroclor 1260	< 23	< 22	< 20	< 23	< 25	
2-chloronaphthalene	< 700	< 700	< 700	< 700	< 800	
PHTHALATE ESTERS (Fg/kg)						
bis (2-ethylhexyl) phthalate	< 700	< 700	< 700	< 700	< 800	
di-n-butyl phthalate	< 700	< 700	< 700	< 700	< 800	
di-n-octyl phthalate	< 700	< 700	< 700	< 700	< 800	

APPENDIX F.2 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3a	3a.1	4	5	5a
Phthalate Esters (cont)						
dimethyl phthalate	< 1400	< 1400	< 1300	< 1400	< 1600	
n-butyl benzyl phthalate	< 700	< 700	< 700	< 700	< 800	
diethyl phthalate	< 700	< 700	< 700	< 700	< 800	

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error
Î = reported below quantitation limit
Ï = detected in blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern

APPENDIX F.3
ORGANICS AND INORGANICS IN SEDIMENT
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
Date	051595	051595	051695	051695	051695	051795	051795
CONVENTIONALS							
total organic carbon (mg/kg)	7400	11100	10900	4950	21000	16400	6490
acid volatile sulfides (mg/kg)	3	149	9	55	50	521	192
clay, < 0.0039 mm (% dry weight)	31	5	15	7	3	6	5
silt, 0.0039-0.0625 mm (% dry weight)	69	95	44	39	62	85	65
sand, 0.0625-2.0 mm (% dry weight)	1	< 1	41	52	35	9	30
gravel, > 2.0 mm (% dry weight)	< 1	< 1	< 1	2	1	< 1	< 1
METALS (mg/kg)							
aluminum	**27100**	**21100**	**6950**	**6860**	**6270**	**19400**	**10500**
antimony	**1.8**	**0.90**	**0.66**	**1.1**	**1.6**	**1.7**	**0.97**
arsenic	**12.1**	**14.6**	**3.9**	**7.0**	**4.2**	**6.0**	**5.9**
beryllium	**1.2**	**0.91**	**0.38**	**0.42**	**0.3**	**0.90**	**0.45**
cadmium	**0.26**	**0.36**	**0.20**	**0.24**	**0.40**	**0.75**	**0.23**
chromium	**19.1**	**15.5**	**6.7**	**11.4**	**7.0**	**19.1**	**10.4**
copper	**12.4**	**11.7**	**5.6**	**5.6**	**6.8**	**24.0**	**5.7**
lead	**15.9**	**15.5**	**11.4**	**10.8**	**22.8**	**40.1**	**8.8**
mercury	**0.05**	< 0.03	**0.03**	< 0.02	**0.03**	**0.31**	**0.02**
nickel	**18.5**	**15.0**	**6.5**	**8.3**	**5.7**	**16.2**	**9.1**
selenium	**0.59**	**0.79**	**0.19**	**0.20**	**0.47**	< 0.59	**0.21**
silver	< 0.59	< 0.60	< 0.58	< 0.58	< 0.58	< 0.59	< 0.56
thallium	**0.75**	**0.74**	**0.88**	**1.1**	**0.29**	**0.89**	**0.16**
zinc	**59.2**	**46.1**	**33.2**	**23.4**	**34.9**	**167**	**37.8**
OTHER INORGANICS							
cyanide (mg/kg)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

APPENDIX F.3 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.2	7b	7b.1	7b.2	9a	10
PHENOLS AND CRESOLS (Fg/kg)							
parachlorometa cresol	nr	nr	nr	nr	nr	nr	nr
pentachlorophenol	< 11	< 12	< 6.6	< 7.6	< 7.8	< 10	< 6.7
phenol (C_6H_5OH) single compound	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
phenolics recoverable	< 500	< 500	< 500	< 500	< 500	< 500	< 500
2-chlorophenol	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
2-nitrophenol	< 5700	< 6300	< 1600	< 3800	< 3900	< 5100**X**	< 1700
2,4-dichlorophenol	< 5700	< 6300	< 1600	< 3800	< 3900	< 5100**X**	< 1700
2,4-dimethylphenol	< 5700	< 6300	< 1600	< 3800	< 3900	< 5100**X**	< 1700
2,4-dinitrophenol	< 11000	< 13000	< 3200	< 8000	< 7800	< 10000**X**	< 3400
2,4,6-trichlorophenol	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
4-nitrophenol	< 11000	< 13000	< 3200	< 8000	< 7800	< 10000**X**	< 3400
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr	nr
ETHERS (Fg/kg)							
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
bis (2-chloroethyl) ether	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
bis (2-chloroisopropyl)ether	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
4-chlorophenyl phenyl ether	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
HALOGENATED ALIPHATICS (Fg/kg)							
bromodichloromethane	< 760 **]**	< 840 **]**	< 390 **]**	< 470 **]**	< 390 **]**	< 670 **]**	< 400 **]**
bromoform	< 760 **]**	< 840 **]**	< 390 **]**	< 470 **]**	< 390 **]**	< 670 **]**	< 400 **]**

APPENDIX F.3 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.2	7b	7b.1	7b.2	9a	10
Halogenated Aliphatics (cont)							
carbon tetrachloride	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
chloroethane	< 1900]	< 2100]	< 980]	< 1200]	< 980]	< 1700]	< 1000]
chloroform	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
dibromochloromethane	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
dichlorodifluormethane	< 1900]	< 2100]	< 980]	< 1200]	< 980]	< 1700]	< 1000]
hexachlorobutadiene	< 760	< 840	< 1600	< 470	< 390	< 670X	< 400
hexachlorocyclopentadiene	< 11000	< 13000	< 3200	< 8000	< 7800	< 10000X	< 3400
hexachloroethane	< 2900	< 3200	< 800	< 1900	< 1950	< 2600X	< 900
methyl bromide	nr	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr	nr
methylene chloride	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
tetrachloroethylene	nr	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
vinyl chloride	< 1900]	< 2100]	< 980]	< 1200]	< 980]	< 1700]	< 1000]
1,1-dichloroethane	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
1,1,2-trichloroethane	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
1,1,2,2-tetrachloroethane	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
1,2-dichloroethane	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
1,2-dichloropropane	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
1,3-trans-dichloropropene	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]

APPENDIX F.3 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/kg)							
acenaphthene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
acenaphthylene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
anthracene/phenanthrene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
benzo (a) anthracene 1,2-benzanthracene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
benzo (b) fluoroanthene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
benzo (GHI) perylene 1,12-benzoperylene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
benzo (k) fluoranthene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
benzo-a-pyrene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
chrysene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
fluoranthene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
fluorene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
indeno (1,2,3-CD) pyrene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
naphthalene	< 760 **]**	< 840 **]**	< 390 **]**	< 470 **]**	< 390 **]**	< 670 **]**	< 400 **]**
pyrene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/kg)							
benzene	< 760 **]**	< 840 **]**	< 390 **]**	< 470 **]**	< 390 **]**	< 670 **]**	< 400 **]**
chlorobenzene	< 760 **]**	< 840 **]**	< 390 **]**	< 470 **]**	< 390 **]**	< 670 **]**	< 400 **]**
ethylbenzene	< 760 **]**	< 840 **]**	< 390 **]**	< 470 **]**	< 390 **]**	< 670 **]**	< 400 **]**
hexachlorobenzene	< 2.3	< 2.4	< 1.3	< 1.5	< 1.6	< 2.1	< 1.3
nitrobenzene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
styrene	< 760 **]**	< 840 **]**	< 390 **]**	< 470 **]**	< 390 **]**	< 670 **]**	< 400 **]**
toluene	< 760 **]**	< 840 **]**	< 390 **]**	< 470 **]**	< 390 **]**	5700 **]**	< 400 **]**
xylene	< 2300 **]**	< 2500 **]**	< 1200 **]**	< 1400 **]**	< 1200 **]**	< 2000 **]**	< 1200 **]**

APPENDIX F.3 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
Monocyclic Aromatics (cont)							
1,2-dichlorobenzene	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
1,2,4-trichlorobenzene	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
1,3-dichlorobenzene	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
1,4-dichlorobenzene	< 760]	< 840]	< 390]	< 470]	< 390]	< 670]	< 400]
2,4-dinitrotoluene	< 5700	< 6300	< 1600	< 3800	< 3900	< 5100**X**	< 1700
2,6-dinitrotoluene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
NITROSAMINES AND OTHER N COMPOUNDS (Fg/kg)							
acrylonitrile	< 3800]	< 4200]	< 2000]	< 2300]	< 2000]	< 3300]	< 2000]
benzidine	< 600	ND	ND	ND	ND	ND	< 200
n-nitrosodi-n-propylamine	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
n-nitrosodimethylamine	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
n-nitrosodiphenylamine	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 11000	< 13000	< 3200	< 8000	< 7800	< 10000**X**	< 3400
PESTICIDES (Fg/kg)							
acrolein	nr	nr	nr	nr	nr	nr	nr
aldicarb	nr	nr	nr	nr	nr	nr	nr
aldrin	< 2.3	< 2.4	< 1.3	< 1.5	< 1.6	< 2.1	< 1.3
alpha benzene hexachloride	< 2.3	< 2.4	< 1.3	< 1.5	< 1.6	< 2.1	< 1.3
atrazine	< 110	< 120	< 66	< 76	< 78	< 100	< 67
beta benzene hexachloride	< 2.3	< 2.4	< 1.3	< 1.5	< 1.6	< 2.1	< 1.3
carbaryl	nr	nr	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr	nr	nr
chlordane	< 23.0	< 24.0	**11 Î**	**68**	**33**	< 21.0	< 13.0

APPENDIX F.3 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
Pesticides (cont)							
chlorfenvinphos	nr	nr	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr	nr	nr
chlorpyrifos	< 11.0	< 12.0	< 6.6	< 7.6	< 7.8	< 10.0	< 6.7
chlorsulfuron	nr	nr	nr	nr	nr	nr	nr
DDD	< 11.0	< 12.0	< 6.6	< 7.6	< 7.8	**4.0 Î**	< 6.7
DDE	< 5.7	**2.2 Î**	**1.5 Î**	**3.3 Î**	< 3.9	**12**	**3.3 Î**
DDT	< 11.0	< 12.0	**4.0 Î**	< 7.6	< 7.8	**2.7 Î**	< 6.7
delta benzene hexachloride	< 2.3	< 2.4	< 1.3	< 1.5	< 1.6	< 2.1	< 1.3
demeton	nr	nr	nr	nr	nr	nr	nr
diazinon	< 11.0	< 12.0	< 6.6	< 7.6	< 7.8	< 10.0	< 6.7
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr	nr
dicamba	< 11.0	< 12.0	< 6.6	< 7.6	< 7.8	< 10.0	< 6.7
2,4-dichlorophenoxyacetic acid (2,4-D)	< 140	< 160	< 82	< 94	< 98	< 130	< 83.0
dicofol (kelthane)	< 110	< 120	< 66	< 76	< 78	< 103	< 67.0
dicrotophos	nr	nr	nr	nr	nr	nr	nr
dieldrin	< 6.8	< 7.2	< 3.9	< 4.6	< 4.7	< 6.2	< 4.0
dinoseb	< 17.0	< 19.0	< 9.8	< 11.0	< 12.0	< 15.0	< 10.0
endosulfan alpha	< 5.7	< 6.0	< 3.3	< 3.8	< 3.9	< 5.2	< 3.4
endosulfan beta	< 5.7	< 6.0	< 3.3	< 3.8	< 3.9	< 5.2	< 3.4
endosulfan sulfate	< 11.0	< 12.0	< 6.6	< 7.6	< 7.8	< 10.3	< 6.7
endrin	< 6.8	< 7.2	< 3.9	< 4.6	< 4.7	< 6.2	< 4.0
endrin aldehyde	< 4.6	< 4.8	< 2.6	< 3.0	< 3.1	< 4.1	< 2.7
fenthion (baytex)	nr	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 2.3	< 2.4	< 1.3	< 1.5	< 1.6	< 2.1	< 1.3
guthion	nr	nr	nr	nr	nr	nr	nr

APPENDIX F.3 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
Pesticides (cont)							
heptachlor	< 2.3	< 2.4	< 1.3	< 1.5	< 1.6	< 2.1	< 1.3
heptachlor epoxide	< 4.6	< 4.8	< 2.6	< 3.0	< 3.1	< 4.1	< 2.7
isophorone	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
malathion	< 23.0	< 24.0	< 13.0	< 15.0	< 16.0	< 21.0	< 13.0
metsulfuron	nr	nr	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr	nr	nr
methoxychlor	< 34.0	< 36.0	< 20.0	< 23.0	< 24.0	< 31.0	< 20.0
metolachlor	< 40.0	< 42.0	< 23.0	< 27.0	< 27.0	< 36.0	< 23.0
mirex	< 9.1	< 9.6	< 5.2	< 6.1	< 6.3	< 8.2	< 5.4
parathion	< 11.0	< 12.0	< 6.6	< 7.6	< 7.8	< 10.0	< 6.7
picloram	< 29.0	< 31.0	< 16.0	< 19.0	< 20.0	< 26.0	< 17.0
prometon	nr	nr	nr	nr	nr	nr	nr
simazine	< 110	< 120	< 66.0	< 76.0	< 78.0	< 100	< 67.0
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr	nr
toxaphene	< 110	< 120	< 66.0	< 76.0	< 78.0	< 100	< 67.0
2,4,5-TP (silvex)	< 23.0	< 25.0	< 13.0	< 15.0	< 16.0	< 21.0	< 13.0
PCBs and RELATED COMPOUNDS (Fg/kg)							
aroclor 1016	< 46	< 48	< 26	< 30	< 31	< 41	< 27
aroclor 1221	< 46	< 48	< 26	< 30	< 31	< 41	< 27
aroclor 1232	< 46	< 48	< 26	< 30	< 31	< 41	< 27
aroclor 1242	< 46	< 48	< 26	< 30	< 31	< 41	< 27
aroclor 1248	< 46	< 48	< 26	< 30	< 31	< 41	< 27
aroclor 1254	< 46	< 48	< 130	**130 Ò**	37	< 41	< 27
aroclor 1260	< 46	< 48	< 26	< 30	< 31	< 41	< 27
2-chloronaphthalene	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900

APPENDIX F.3 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	**6.1**	**6.2**	**7b**	**7b.1**	**7b.2**	**9a**	**10**
PHTHALATE ESTERS (Fg/kg)							
bis (2-ethylhexyl) phthalate	< 2900	< 3200	**1800 Ñ**	< 1900	< 1950	**19000X**	< 900
di-n-butyl phthalate	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
di-n-octyl phthalate	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
dimethyl phthalate	< 5700	< 6300	< 1600	< 3800	< 3900	< 5100**X**	< 1700
n-butyl benzyl phthalate	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900
diethyl phthalate	< 2900	< 3200	< 800	< 1900	< 1950	< 2600**X**	< 900

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error
Î = reported below quantitation limit
Ï = detected in blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
] = analysis problem-QC results not within prescribed limits

APPENDIX F.4
ORGANICS AND INORGANICS IN SEDIMENT
Laredo/Nuevo Laredo-International Falcon Reservoir

LOCATION	**10a**	**11a**	**11b**	**11c**	**12**	**12.1**	**12.2**	**12.3**
Date	060695	060695	060695	060895	060795	060795	060595	060595
CONVENTIONALS								
total organic carbon (mg/kg)	4580	6800	4440	2500	6490	7440	4090	4100
acid volatile sulfides (mg/kg)	445	55	210	350	192	< 1	< 1	39
clay, < 0.0039 mm (% dry weight)	5	21	7	7	5	20	19	5
silt, 0.0039-0.0625 mm (% dry weight)	41	78	70	29	65	58	80	67
sand, 0.0625-2.0 mm (% dry weight)	43	1	24	64	30	22	2	27
gravel, > 2.0 mm (% dry weight)	11	< 1	< 1	< 1	< 1	< 1	< 1	< 1
METALS (Fg/kg)								
aluminum	**12500**	**29700**	**16600**	**9480**	**13700**	**16300**	**22000**	**13100**
antimony	**15.4**	**0.63**	< 0.58	< 0.54	< 0.56	< 0.54	< 0.57	< 0.58
arsenic	**7.6**	**8.0**	**5.6**	**3.6**	**4.5**	**4.4**	**4.9**	**0.70**
beryllium	**0.56**	**1.1**	**0.64**	**0.49**	**0.55**	**0.63**	**0.82**	**0.55**
cadmium	**0.28**	**0.41**	**0.19**	**0.52**	**0.31**	**0.23**	**0.30**	**0.20**
chromium	**16.7**	**20.6**	**11.7**	**12.0**	**12.4**	**13.7**	**16.7**	**11.3**
copper	**7.2**	**16.1**	**6.7**	**12.1**	**8.9**	**8.3**	**11.0**	**6.4**
lead	**28.8**	**49.6**	**36.1**	**20.8**	**24.9**	**20.7**	**33.9**	**25.4**
mercury	**0.06**	**0.03**	**0.03**	**0.19**	**0.04**	**0.03**	**0.03**	**0.02**
nickel	**10.7**	**17.8**	**10.1**	**8.5**	**10.6**	**22.7**	**13.9**	**11.0**
selenium	**0.20**	**0.27**	< 0.07	**0.21**	**0.27**	< 0.10	**0.28**	**0.33**
silver	< 0.70	< 0.68	< 0.68	**2.3**	**1.6**	**0.90**	< 0.68	< 0.68
thallium	**0.17**	**0.64**	**0.35**	**0.19**	**0.45**	**0.36**	**0.31**	**0.58**
zinc	**69.2**	**77.8**	**55.9**	**61.2**	**57.5**	**50.3**	**63.6**	**45.8**
OTHER INORGANICS (mg/kg)								
cyanide	**3.0**	< 1.0	< 1.0	**6.0**	< 1.0	< 1.0	< 1.0	< 1.0

APPENDIX F.4 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Laredo/Nuevo Laredo-International Falcon Reservoir

LOCATION	10a	11a	11b	11c	12	12.1	12.2	12.3
PHENOLS AND CRESOLS (Fg/kg)								
parachlorometa cresol	nr	nr	nr	nr	nr	nr	nr	nr
pentachlorophenol	< 7.0	< 8.5	< 8.5	< 7.0	< 7.3	< 7.4	< 8.2	< 8.2
phenol (C_6H_5OH) single compound	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
phenolics recoverable	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500
2-chlorophenol	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
2-nitrophenol	< 1800	< 4300	< 4300	< 3600X	< 1800X	< 3700	< 4100	< 4100
2,4-dichlorophenol	< 1800	< 4300	< 4300	< 1800X	< 1800X	< 3700	< 4100	< 4100
2,4-dimethylphenol	< 1800	< 4300	< 4300	< 1800X	< 1800X	< 3700	< 4100	< 4100
2,4-dinitrophenol	< 3600	< 8600	< 8600	< 3600X	< 3600X	< 7400	< 8200	< 8200
2,4,6-trichlorophenol	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
4-nitrophenol	< 3600	< 8600	< 8600	< 3600X	< 3600X	< 7400	< 8200	< 8200
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr	nr	nr
ETHERS (Fg/kg)								
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
bis (2-chloroethyl) ether	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
bis (2-chloroisopropyl)ether	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
4-chlorophenyl phenyl ether	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
HALOGENATED ALIPHATICS (Fg/kg)								
bromodichloromethane	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
bromoform	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
carbon tetrachloride	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
chloroethane	< 1100	< 1300	< 1300	< 1100]	< 1100]	< 1100]	< 1300	< 1300

APPENDIX F.4 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Laredo/Nuevo Laredo-International Falcon Reservoir

LOCATION	10a	11a	11b	11c	12	12.1	12.2	12.3
Halogenated Aliphatics (cont)								
chloroform	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
dibromochloromethane	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
dichlorodifluormethane	< 1100	< 1300	< 1300	< 1100]	< 1100]	< 1100]	< 1300	< 1300
hexachlorobutadiene	< 430	< 540	< 540	< 430X	< 450X	< 460	< 510	< 510
hexachlorocyclopentadiene	< 3600	< 8600	< 8600	< 3600X	< 3600X	< 7400	< 8200	< 8200
hexachloroethane	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
methyl bromide	nr	nr	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr	nr	nr
methylene chloride	< 430	< 540	< 540	**500 Ð]**	**500 Ð]**	**600 Î]**	< 510	< 510
tetrachloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
vinyl chloride	< 1100	< 1300	< 1300	< 1100]	< 1100]	< 1100]	< 1300	< 1300
1,1-dichloroethane	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
1,1,2-trichloroethane	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
1,1,2,2-tetrachloroethane	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
1,2-dichloroethane	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
1,2-dichloropropane	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
1,3-trans-dichloropropene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/kg)								
acenaphthene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100

APPENDIX F.4 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Laredo/Nuevo Laredo-International Falcon Reservoir

LOCATION	**10a**	**11a**	**11b**	**11c**	**12**	**12.1**	**12.2**	**12.3**
Polycyclic Aromatic Hydrocarbons (cont)								
acenaphthylene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
anthracene/phenanthrene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
benzo (a) anthracene 1,2-benzanthracene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
benzo (b) fluoroanthene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
benzo (GHI) perylene 1,12-benzoperylene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
benzo (k) fluoranthene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
benzo-a-pyrene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
chrysene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
fluoranthene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
fluorene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
indeno (1,2,3-CD) pyrene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
naphthalene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
pyrene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/kg)								
benzene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
chlorobenzene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
ethylbenzene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
hexachlorobenzene	< 1.4	< 1.7	< 1.7	< 1.4	< 1.4	< 1.4	< 1.6	< 1.6
nitrobenzene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
styrene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
toluene	< 540	600	< 540	< 430]	< 450]	< 1100]	< 1300	< 1300
xylene	< 1300	< 1600	< 1600	< 1600]	< 1300]	< 1400]	< 1500	< 1500
1,2-dichlorobenzene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510

APPENDIX F.4 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Laredo/Nuevo Laredo-International Falcon Reservoir

LOCATION	10a	11a	11b	11c	12	12.1	12.2	12.3
Monocyclic Aromatics (cont)								
1,2,4-trichlorobenzene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
1,3-dichlorobenzene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
1,4-dichlorobenzene	< 430	< 540	< 540	< 430]	< 450]	< 460]	< 510	< 510
2,4-dinitrotoluene	< 1800	< 4300	< 4300	< 1800X	< 1800X	< 3700	< 4100	< 4100
2,6-dinitrotoluene	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
NITROSAMINES AND OTHER N COMPOUNDS (Fg/kg)								
acrylonitrile	< 2100	< 2700	< 2700	< 2100]	< 2200]	< 2300]	< 2600	< 2600
benzidine	ND	ND	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
n-nitrosodimethylamine	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
n-nitrosodiphenylamine	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 3600	< 8600	< 8600	< 3600X	< 3600X	< 7400	< 8200	< 8200
PESTICIDES (Fg/kg)								
acrolein	nr	nr	nr	nr	nr	nr	nr	nr
aldicarb	nr	nr	nr	nr	nr	nr	nr	nr
aldrin	< 1.4	< 1.7	< 1.7	< 1.4	< 1.4	< 1.4	< 1.6	< 1.6
alpha benzene hexachloride	< 1.4	< 1.7	< 1.4	< 1.4	< 1.4	< 1.4	< 1.6	< 1.6
atrazine	< 70	< 85	< 85	< 70	< 70	< 70	< 82	< 82
beta benzene hexachloride	< 1.4	< 1.7	< 1.7	< 1.4	< 1.4	< 1.4	< 1.6	< 1.6
carbaryl	nr	nr	nr	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr	nr	nr	nr
chlordane	< 14.0	< 17.0	< 17.0	< 14.0	< 14.0	< 14.0	< 16.0	< 16.0
chlorfenvinphos	nr	nr	nr	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX F.4 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Laredo/Nuevo Laredo-International Falcon Reservoir

LOCATION	**10a**	**11a**	**11b**	**11c**	**12**	**12.1**	**12.2**	**12.3**
Pesticides (cont)								
chlorpyrifos	< 7.0	< 8.5	< 8.5	< 7.0	< 7.0	< 7.0	< 8.2	< 8.2
chlorsulfuron	nr	nr	nr	nr	nr	nr	nr	nr
DDD	< 7.0	< 8.5	< 8.5	< 7.0	< 7.0	< 7.0	< 8.2	< 8.2
DDE	< 3.5	**2.9**	**6.2**	**5.5**	**3.4**	< 3.5	**4.5**	**2.1 Î**
DDT	**2.1**	< 8.5	**2.0**	< 7.0	< 7.0	< 7.0	< 8.2	< 8.2
delta benzene hexachloride	< 1.4	< 1.7	< 1.7	< 1.4	< 1.4	< 1.4	< 1.6	< 1.6
demeton	nr	nr	nr	nr	nr	nr	nr	nr
diazinon	< 7.0	< 8.5	< 8.5	< 7.0	< 7.0	< 7.0	< 8.2	< 8.2
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr	nr	nr
dicamba	< 7.0	< 8.5	< 8.5	< 7.0	< 7.3	< 7.4	< 8.2	< 8.2
2,4-dichlorophenoxyacetic acid (2,4-D)	< 88	< 110	< 110	< 88	< 91	< 93	< 100	< 100
dicofol (kelthane)	< 70	< 85	< 85	< 70	< 70	< 70	< 82	< 82
dicrotophos	nr	nr	nr	nr	nr	nr	nr	nr
dieldrin	< 4.2	< 5.1	< 5.1	< 4.2	< 4.2	< 4.2	< 4.9	< 4.9
dinoseb	< 11.0	< 13.0	< 13.0	< 11.0	< 11.0	< 11	< 12	< 12
endosulfan alpha	< 3.5	< 4.3	< 4.3	< 3.5	< 3.5	< 3.5	< 4.1	< 4.1
endosulfan beta	< 3.5	< 4.3	< 4.3	< 3.5	< 3.5	< 3.5	< 4.1	< 4.1
endosulfan sulfate	< 7.0	< 8.5	< 8.5	< 7.0	< 7.0	< 7.0	< 8.2	< 8.2
endrin	< 4.2	< 5.1	< 5.1	< 4.2	< 4.2	< 4.2	< 4.9	< 4.9
endrin aldehyde	< 2.8	< 3.4	< 3.4	< 2.8	< 2.8	< 2.8	< 3.3	< 3.3
fenthion (baytex)	nr	nr	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 1.4	< 1.7	< 1.7	< 1.4	< 1.4	< 1.4	< 1.6	< 1.6
guthion	nr	nr	nr	nr	nr	nr	nr	nr
heptachlor	< 1.4	< 1.7	< 1.7	< 1.4	< 1.4	< 1.4	< 1.6	< 1.6
heptachlor epoxide	< 2.8	< 3.4	< 3.4	< 2.8	< 2.8	< 2.8	< 3.3	< 3.3
isophorone	< 900	< 2200	< 2200	< 900**X**	< 900**X**	< 1900	< 2100	< 2100

APPENDIX F.4 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Laredo/Nuevo Laredo-International Falcon Reservoir

LOCATION	**10a**	**11a**	**11b**	**11c**	**12**	**12.1**	**12.2**	**12.3**
Pesticides (cont)								
malathion	< 14.0	< 17.0	< 17.0	< 14.0	< 14.0	< 14.0	< 16.0	< 16.0
metsulfuron	nr	nr	nr	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr	nr	nr	nr
methoxychlor	< 21.0	< 26.0	< 26.0	< 21.0	< 21.0	< 21.0	< 25.0	< 25.0
metolachlor	< 25.0	< 30.0	< 30.0	< 25.0	< 25.0	< 25.0	< 29.0	< 29.0
mirex	< 5.6	< 6.8	< 6.8	< 5.6	< 5.6	< 5.6	< 6.6	< 6.6
parathion	< 7.0	< 8.5	< 8.5	< 7.0	< 7.0	< 7.0	< 8.2	< 8.2
picloram	< 18.0	< 21.0	< 21.0	< 18.0	< 18.0	< 19.0	< 20.0	< 20.0
prometon	nr	nr	nr	nr	nr	nr	nr	nr
simazine	< 70	< 85	< 85	< 70	< 70	< 70	< 82	< 82
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr	nr	nr
toxaphene	< 70	< 85	< 85	< 70	< 70	< 70	< 82	< 82
2,4,5-TP (silvex)	< 14.0	< 17.0	< 17.0	< 14.0	< 15.0	< 15.0	< 16.0	< 16.0
PCBs and RELATED COMPOUNDS (Fg/kg)								
aroclor 1016	< 28	< 34	< 34	< 28	< 28	< 28	< 33	< 33
aroclor 1221	< 28	< 34	< 34	< 28	< 28	< 28	< 33	< 33
aroclor 1232	< 28	< 34	< 34	< 28	< 28	< 28	< 33	< 33
aroclor 1242	< 28	< 34	< 34	< 28	< 28	< 28	< 33	< 33
aroclor 1248	< 28	< 34	< 34	< 28	< 28	< 28	< 33	< 33
aroclor 1254	< 28	< 34	< 34	< 28	< 28	< 28	< 33	< 33
aroclor 1260	< 28	< 34	< 34	< 28	< 28	< 28	< 33	< 33
2-chloronaphthalene	< 900	< 2200	< 2200	< 900**X**	< 900**X**	< 1900	< 2100	< 2100
PHTHALATE ESTERS (Fg/kg)								
bis (2-ethylhexyl) phthalate	< 900	< 2200	< 2200	**20000X**	**3400X**	< 1900	< 2100	< 2100
di-n-butyl phthalate	< 900	< 2200	< 2200	< 900**X**	< 900**X**	< 1900	< 2100	< 2100

APPENDIX F.4 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Laredo/Nuevo Laredo-International Falcon Reservoir

LOCATION	10a	11a	11b	11c	12	12.1	12.2	12.3
Phthalate Esters (cont)								
di-n-octyl phthalate	< 900	< 2200	< 2200	3100X	< 900X	< 1900	< 2100	< 2100
dimethyl phthalate	< 1800	< 4300	< 4300	< 1800X	< 1800X	< 3700	< 4100	< 4100
n-butyl benzyl phthalate	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100
diethyl phthalate	< 900	< 2200	< 2200	< 900X	< 900X	< 1900	< 2100	< 2100

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error

Î = reported below quantitation limit
Ï = detected in blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
] = analysis problem-QC results not within prescribed limits

APPENDIX F.5
ORGANICS AND INORGANICS IN SEDIMENT
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	**12d**	**13**	**14**	**15**	**15a**	**16**	**17**	**18**
Date	071195	071195	071295	071295	071395	071395	071095	071095
CONVENTIONALS								
total organic carbon (mg/kg)	12200	4340	4610	2920	10600	663	2070	4000
acid volatile sulfides (mg/kg)	292	65	< 1	57	132	< 1	< 1	7
clay, < 0.0039 mm (% dry weight)	28	13	13	1	5	7	3	16
silt, 0.0039-0.0625 mm (% dry weight)	69	25	46	1	70	18	7	41
sand, 0.0625-2.0 mm (% dry weight)	3	61	40	97	25	76	91	42
gravel, > 2.0 mm (% dry weight)	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
METALS (mg/kg)								
aluminum	**27900**	**8770**	**11500**	**2770**	**18400**	**7790**	**4930**	**15100**
antimony	< 0.58	< 0.58	< 0.56	< 0.55	< 0.54	< 0.55	< 0.57	< 0.54
arsenic	**9.0**	**5.2**	**6.4**	**3.9**	**3.6**	**3.1**	**3.1**	**5.4**
beryllium	**0.95**	**0.36**	**0.46**	**0.17**	**0.74**	**0.31**	**0.26**	**0.59**
cadmium	**0.42**	**0.13**	**0.23**	**0.07**	**0.40**	**0.12**	**0.09**	**0.22**
chromium	**17.0**	**8.1**	**10.3**	**3.0**	**16.3**	**7.6**	**4.8**	**11.9**
copper	**12.7**	**3.7**	**4.5**	**0.61**	**14.8**	**2.8**	**1.8**	**6.5**
lead	**35.8**	**15.9**	**24.2**	**9.3**	**26.8**	**1.7**	**9.2**	**18.6**
mercury	**0.03**	**0.03**	**0.02**	**0.02**	**0.02**	**0.11**	**0.02**	**0.03**
nickel	**13.0**	**6.0**	**9.0**	**2.7**	**11.8**	**6.0**	**4.2**	**8.8**
selenium	**0.37**	**0.07**	< 0.11	< 0.05	**0.39**	< 0.07	< 0.06	< 0.05
silver	**0.96**	**2.6**	**2.0**	**3.3**	**2.4**	**2.5**	**3.0**	**2.7**
thallium	**0.26**	**0.31**	**0.32**	**0.19**	**0.21**	**0.15**	**0.15**	**0.14**
zinc	**81.1**	**28.7**	**35.7**	**15.5**	**67.7**	**27.3**	**21.4**	**41.4**

APPENDIX F.5 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	**12d**	**13**	**14**	**15**	**15a**	**16**	**17**	**18**
OTHER INORGANICS (mg/kg)								
cyanide	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PHENOLS AND CRESOLS (Fg/kg)								
parachlorometa cresol	nr	nr	nr	nr	nr	nr	nr	nr
pentachlorophenol	< 11.0	< 6.2	< 5.8	< 4.9	< 7.7	< 5.5	< 5.1	< 5.6
phenol (C_6H_5OH) single compound	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
phenolics recoverable	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500
2-chlorophenol	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
2-nitrophenol	< 5600	< 3100	< 1400	< 1200	< 1900	< 1400	< 1300	< 1400
2,4-dichlorophenol	< 5600	< 100	< 1400	< 1200	< 1900	< 1400	< 1300	< 1400
2,4-dimethylphenol	< 5600	< 3100	< 1400	< 1200	< 1900	< 1400	< 1300	< 1400
2,4-dinitrophenol	< 11000	< 6200	< 2800	< 2400	< 3800	< 2800	< 2600	< 2800
2,4,6-trichlorophenol	< 2800	< 1600	< 700	< 600	< 100	< 700	< 700	< 700
4-nitrophenol	**1600 Î**	< 6200	< 2800	< 2400	< 3800	< 2800	< 2600	< 2800
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr	nr	nr
ETHERS (Fg/kg)								
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
bis (2-chloroethyl) ether	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
bis (2-chloroisopropyl)ether	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
4-chlorophenyl phenyl ether	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700

APPENDIX F.5 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	**12d**	**13**	**14**	**15**	**15a**	**16**	**17**	**18**
HALOGENATED ALIPHATICS (Fg/kg)								
bromodichloromethane	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
bromoform	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
carbon tetrachloride	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
chloroethane	< 1800]	< 900]	< 840]	< 680]	< 1200]	< 780]	< 700]	< 790]
chloroform	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
dibromochloromethane	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
dichlorodifluormethane	< 1800]	< 900]	< 840]	< 680]	< 1200]	< 780]	< 700]	< 790]
hexachlorobutadiene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
hexachlorocyclopentadiene	< 11000	< 6200	< 2800	< 2400	< 3800	< 2800	< 2600	< 2800
hexachloroethane	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
methyl bromide	nr	nr	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr	nr	nr
methylene chloride	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
tetrachloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
vinyl chloride	< 1800]	< 900]	< 840]	< 680]	< 1200]	< 780]	< 700]	< 790]
1,1-dichloroethane	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
1,1,2-trichloroethane	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
1,1,2,2-tetrachloroethane	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
1,2-dichloroethane	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
1,2-dichloropropane	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX F.5 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	12d	13	14	15	15a	16	17	18
Halogenated Aliphatics (cont)								
1,3-cis-dichloropropene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
1,3-trans-dichloropropene	< 730]	< 360]	< 330]	< 270]	< 480]	< 31]0	< 280]	< 320]
POLYCYCLIC AROMATIC HYDROCARBON (Fg/kg)								
acenaphthene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
acenaphthylene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
anthracene/phenanthrene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
benzo (a) anthracene 1,2-benzanthracene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
benzo (b) fluoroanthene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
benzo (GHI) perylene 1,12-benzoperylene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
benzo (k) fluoranthene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
benzo-a-pyrene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
chrysene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
fluoranthene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
fluorene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
indeno (1,2,3-CD) pyrene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
naphthalene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
pyrene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/kg)								
benzene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
chlorobenzene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
ethylbenzene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
hexachlorobenzene	< 2.2	< 1.2	< 1.2	< 0.98	< 1.5	< 1.1	< 1.0	< 1.1

APPENDIX F.5 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	12d	13	14	15	15a	16	17	18
Monocyclic Aromatics (cont)								
nitrobenzene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
styrene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
toluene	< 730]	< 900]	< 840]	< 680]	< 480]	< 780]	< 700]	< 790]
xylene	< 2200]	< 1100]	< 1000]	< 810]	< 1400]	< 930]	< 840]	< 950]
1,2-dichlorobenzene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
1,2,4-trichlorobenzene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
1,3-dichlorobenzene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
1,4-dichlorobenzene	< 730]	< 360]	< 330]	< 270]	< 480]	< 310]	< 280]	< 320]
2,4-dinitrotoluene	< 5600	< 3100	< 1400	< 1200	< 1900	< 1400	< 1300	< 1400
2,6-dinitrotoluene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
NITROSAMINES AND OTHER N COMPOUNDS (Fg/kg)								
acrylonitrile	< 3700]	< 1800]	< 1700]	< 1400]	< 2400]	< 1600]	< 1400]	< 1600]
benzidine	ND	ND	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
n-nitrosodimethylamine	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
n-nitrosodiphenylamine	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 11000	< 6200	< 2800	< 2400	< 3800	< 2800	< 2600	< 2800
PESTICIDES (Fg/kg)								
acrolein	nr	nr	nr	nr	nr	nr	nr	nr
aldicarb	nr	nr	nr	nr	nr	nr	nr	nr
aldrin	< 2.2	< 1.2	< 1.2	< 0.98	< 1.5	< 1.1	< 1.0	< 1.1
alpha benzene hexachloride	< 2.2	< 1.2	< 1.2	< 0.98	< 1.5	< 1.1	< 1.0	< 1.1
atrazine	< 110	< 62	< 58	< 49	< 77	< 55	< 51	< 56

APPENDIX F.5 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	**12d**	**13**	**14**	**15**	**15a**	**16**	**17**	**18**
Pesticides (cont)								
beta benzene hexachloride	< 2.2	< 1.2	< 1.2	< 0.98	< 1.5	< 1.1	< 1.0	< 1.1
carbaryl	nr	nr	nr	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr	nr	nr	nr
chlordane	< 22.0	< 12	< 12	< 10	< 15.0	< 11	< 10	< 11
chlorfenvinphos	nr	nr	nr	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr	nr	nr	nr
chlorpyrifos	< 11.0	< 6.2	< 5.8	< 4.9	< 7.7	< 5.5	< 5.1	< 5.6
chlorsulfuron	nr	nr	nr	nr	nr	nr	nr	nr
DDD	< 11.0	< 6.2	< 5.8	< 4.9	**1.8 Î**	< 5.5	< 5.1	< 5.6
DDE	**25.0**	< 3.1	< 2.9	< 2.5	**15.0**	< 2.8	< 2.5	< 2.8
DDT	< 11.0	< 6.2	< 5.8	< 4.9	< 7.7	< 5.5	< 5.1	< 5.6
delta benzene hexachloride	< 2.2	< 1.2	< 1.2	< 0.98	< 1.5	< 1.1	< 1.0	< 1.1
demeton	nr	nr	nr	nr	nr	nr	nr	nr
diazinon	< 11.0	< 6.2	< 5.8	< 4.9	< 7.7	< 5.5	< 5.1	< 5.6
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr	nr	nr
dicamba	< 11.0	< 6.2	< 5.8	< 4.9	< 7.7	< 5.5	< 5.1	< 5.6
2,4-dichlorophenoxyacetic acid (2,4-D)	< 140	< 77	< 73	< 62	< 96	< 69	< 63	< 70
dicofol (kelthane)	< 110	< 62	< 58	< 49	< 77	< 55	< 51	< 56
dicrotophos	nr	nr	nr	nr	nr	nr	nr	nr
dieldrin	< 6.7	< 3.7	< 3.5	< 2.9	< 4.6	< 3.3	< 3.0	< 3.3
dinoseb	< 16.0	< 9.2	< 8.7	< 7.4	< 12.0	< 8.2	< 7.6	< 8.3
endosulfan alpha	< 5.6	< 3.1	< 2.9	< 2.5	< 3.9	< 2.8	< 2.5	< 2.8
endosulfan beta	< 5.6	< 3.1	< 2.9	< 2.5	< 3.9	< 2.8	< 2.5	< 2.8
endosulfan sulfate	< 11.0	< 6.2	< 5.8	< 4.9	< 7.7	< 5.5	< 5.1	< 5.6
endrin	< 6.7	< 3.7	< 3.5	< 2.9	< 4.6	< 3.3	< 3.0	< 3.3

APPENDIX F.5 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	**12d**	**13**	**14**	**15**	**15a**	**16**	**17**	**18**
Pesticides (cont)								
endrin aldehyde	< 4.4	< 2.5	< 2.3	< 2.0	< 3.1	< 2.2	< 2.0	< 2.2
fenthion (baytex)	nr	nr	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 2.2	< 1.2	< 1.2	< 0.98	< 1.5	< 1.1	< 1.0	< 1.1
guthion	nr	nr	nr	nr	nr	nr	nr	nr
heptachlor	< 2.2	< 1.2	< 1.2	< 0.98	< 1.5	< 1.1	< 1.0	< 1.1
heptachlor epoxide	< 4.4	< 2.5	< 2.3	< 2.0	< 3.1	< 2.2	< 2.0	< 2.2
isophorone	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
malathion	< 22.0	< 12.0	< 12.0	< 10.0	< 15.0	< 11.0	< 10.0	< 11.0
metsulfuron	nr	nr	nr	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr	nr	nr	nr
methoxychlor	< 33.0	< 18.0	< 17.0	< 15.0	< 23.0	< 17.0	< 15.0	< 17.0
metolachlor	< 3.9	< 22.0	< 20.0	< 17.0	< 27.0	< 19.0	< 18.0	< 19.0
mirex	< 8.9	< 4.9	< 4.6	< 3.9	< 6.2	< 4.4	< 4.0	< 4.4
parathion	< 11.0	< 6.2	< 5.8	< 4.9	< 7.7	< 5.5	< 5.1	< 5.6
picloram	< 28.0	< 15.0	< 15.0	< 12.0	< 19.0	< 14.0	< 13.0	< 14.0
prometon	nr	nr	nr	nr	nr	nr	nr	nr
simazine	< 110	< 62	< 58	< 49	< 77	< 55	< 51	< 56
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr	nr	nr
toxaphene	< 110	< 62	< 58	< 49	< 77	< 55	< 51	< 56
2,4,5-TP (silvex)	< 22.0	< 12.0	< 12.0	< 10.0	< 15.0	< 11.0	< 10.0	< 11.0
PCBs and RELATED COMPOUNDS (Fg/kg)								
aroclor 1016	< 44	< 25	< 23	< 20	< 31	< 22	< 20	< 22
aroclor 1221	< 44	< 25	< 23	< 20	< 31	< 22	< 20	< 22
aroclor 1232	< 44	< 25	< 23	< 20	< 31	< 22	< 20	< 22
aroclor 1242	< 44	< 25	< 23	< 20	< 31	< 22	< 20	< 22

APPENDIX F.5 (cont)
ORGANICS AND INORGANICS IN SEDIMENT
Below International Falcon Reservoir-
Brownsville/Matamoros Reach

LOCATION	12d	13	14	15	15a	16	17	18
PCBs and Related Compounds (cont)								
aroclor 1248	< 44	< 25	< 23	< 20	< 31	< 22	< 20	< 22
aroclor 1254	< 44	< 25	< 23	< 20	< 31	< 22	< 20	< 22
aroclor 1260	< 44	< 25	< 23	< 20	< 31	< 22	< 20	< 22
2-chloronaphthalene	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
PHTHALATE ESTERS (Fg/kg)								
bis (2-ethylhexyl) phthalate	< 2800	< 1600	< 700	< 600	**6100**	< 700	< 700	< 700
di-n-butyl phthalate	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
di-n-octyl phthalate	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
dimethyl phthalate	< 5600	< 3100	< 1400	< 1200	< 1900	< 1400	< 1300	< 1400
n-butyl benzyl phthalate	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700
diethyl phthalate	< 2800	< 1600	< 700	< 600	< 1000	< 700	< 700	< 700

nr = not reported by laboratory	Î = reported below quantitation limit
na = not analyzed	Ï = detected in blank
ND = not detected	Ð = common lab contaminant
* = no reportable data	Ñ = possible contamination
X = exceeded hold time	Ò = degraded PCB pattern
˜ = lab error	] = analysis problem-QC results not within prescribed limits

APPENDIX G.1
ORGANICS AND INORGANICS DETECTED IN FISH TISSUE AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
El Paso/Ciudad Juárez Reach

STATION	1	1	2	2	2	2
Fish Species	CARP WHOLE	CARP FILET	BLUE CATFISH WHOLE	CHANNEL CATFISH FILET	CARP WHOLE	CARP FILET
DISSOLVED METALS (mg/kg)						
aluminum	43.8	g	3.3	g	12.6	g
antimony	0.08	0.09	0.05	0.03	0.22	0.16
cadmium	**0.06**	g	0.03	g	**0.06**	0.02
chromium	0.10	g	g	0.11	g	g
copper	**1.8**	0.63	0.29	0.23	**1.8**	0.71
lead	g	g	g	g	0.17	0.03
mercury	0.05	0.18	0.06	0.13	g	0.06
nickel	0.28	g	g	g	g	g
selenium	0.37	0.18	0.35	0.25	0.19	0.47
silver	g	g	g	g	0.13	0.40
zinc	25.4	6.4	10.7	5.1	**44.9**	7.0
PHENOLS AND CRESOLS (mg/kg)						
phenolics recoverable	g	g	g	g	0.0031	0.0035
PESTICIDES (mg/kg)						
p,p' DDE	g	g	0.150	0.058	0.075	0.080

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit

APPENDIX G.2
ORGANICS AND INORGANICS DETECTED IN FISH TISSUE
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
Presidio/Ojinaga-Big Bend Reach

STATION	3	3	3a	3a	3a
Fish Species	SMALL MOUTH BUFFALO WHOLE	CARP SUCKER FILET	FRESHWATER DRUM FILET	CARP WHOLE	CARP FILET
DISSOLVED METALS (mg/kg)					
aluminum	g	82.7	g	37.1	1.9
antimony	0.10	0.11	0.05	0.17	0.08
arsenic	g	0.06	g	g	0.09
cadmium	g	0.03	g	**0.08**	g
chromium	g	0.15	0.13	0.28	g
copper	0.43	0.54	0.37	0.52	0.63
lead	g	0.07	g	0.04	g
mercury	0.51	g	0.54	0.10	0.10
selenium	**2.3**	1.3	0.85	**0.99**	1.2
silver	g	g	0.10	g	g
zinc	3.5	12.8	3.7	**43.1**	9.4
PESTICIDES (mg/kg)					
p,p’ DDD	g	0.048	g	g	g
p,p’ DDE	0.170	**1.4**	0.018	0.170	g
p,p’ DDT	g	g	g	g	0.078
endrin	g	0.012	g	g	g

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit

APPENDIX G.2 (cont)
ORGANICS AND INORGANICS DETECTED IN FISH TISSUE
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
Presidio/Ojinaga-Big Bend Reach

STATION	4	4	4	4	5	5
Fish Species	BLUE CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET	CARP WHOLE	CARP FILET
DISSOLVED METALS (mg/kg)						
aluminum	81.0	g	70.2	g	17.1	g
antimony	0.03	0.06	0.13	0.06	0.17	0.06
arsenic	0.08	g	g	g	g	g
cadmium	0.004	g	g	g	**0.08**	g
chromium	0.09	g	g	g	0.12	g
copper	0.35	0.26	0.86	0.47	**1.4**	g
lead	0.09	g	0.04	g	0.02	g
mercury	0.26	0.30	0.24	0.24	0.32	0.42
selenium	0.26	0.20	**0.85**	2.7	0.73	1.3
silver	g	0.37	g	g	g	g
zinc	10.2	4.2	**53.5**	4.3	**87.1**	4.7
PHENOLS AND CRESOLS (mg/kg)						
phenolics recoverable	g	g	g	0.0030	0.0022	g
PESTICIDES (mg/kg)						
p,p' DDE	0.300	0.034	0.420	**0.550**	0.130	0.025
endosulfan alpha	g	0.0097	g	g	g	g

$\boxed{\mathbf{6.1}}$ = value greater than the screening value
$\boxed{1.0}$ = value less than the screening level; no screening level
$\boxed{g}$ = value less than the detection limit

APPENDIX G.3

ORGANICS AND INORGANICS DETECTED IN FISH TISSUE

AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS

International Amistad Reservoir-Eagle Pass/Piedras Negras Reach

STATION	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
Fish Species	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET
DISSOLVED METALS (mg/kg)								
aluminum	1.1	0.14	79.8	g	1.5	0.22	4.1	0.59
arsenic	g	g	0.16	g	**0.28**	g	g	0.05
cadmium	0.006	g	g	0.01	0.01	g	0.01	g
chromium	g	0.06	0.12	0.12	0.07	g	g	g
copper	0.44	0.22	0.42	0.23	0.38	0.26	0.36	0.28
mercury	**0.25**	0.28	g	g	g	0.25	0.05	g
nickel	g	g	0.23	0.16	g	g	g	0.67
selenium	0.50	0.33	0.34	0.25	0.40	g	0.20	0.24
thallium	g	0.05	0.05	0.09	g	g	0.07	0.11
zinc	15.1	5.1	5.1	5.9	14.8	8.3	8.5	9.1
MONOCYCLIC AROMATICS (mg/kg)								
toluene	g	g	0.031	g	g	g	g	g
PESTICIDES (mg/kg)								
p,p' DDD	g	Ž	0.018	g	g	g	g	g
p,p' DDE	0.038	0.0094	0.035	Ž	0.0074	g	0.025	0.0076

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit
Ž	= detected but could not be quantified reliably

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS DETECTED IN FISH TISSUE
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
International Amistad Reservoir-Eagle Pass/Piedras Negras Reach

STATION	7	7	7b	7b	7b	7b
Fish Species	CARP WHOLE	CARP FILET	SMALL MOUTH BASS WHOLE	LARGE MOUTH BASS FILET	CARP WHOLE	CARP FILET
METALS (mg/kg)						
aluminum	g	g	1.9	g	10.9	4.3
cadmium	g	0.05	g	g	g	g
chromium	g	0.06	g	g	0.07	0.05
copper	**1.7**	2.3	0.69	0.18	**1.2**	1.4
lead	0.20	0.26	0.14	0.14	0.21	0.18
mercury	0.14	0.09	0.37	0.47	g	0.04
selenium	0.62	1.3	0.30	0.37	0.37	0.24
zinc	8.4	59.2	7.4	4.1	**31.5**	45
OTHER INORGANICS (mg/kg)						
cyanide	10.3	g	g	g	g	g
HALOGENATED ALIPHATICS (mg/kg)						
chloroform	g	g	g	g	**0.050**	**0.023**
MONOCYCLIC AROMATICS (mg/kg)						
benzene	g	g	g	g	**0.027**	**0.025**
toluene	g	g	g	g	0.025	0.022
PESTICIDES (mg/kg)						
p,p' DDD	g	g	0.014	g	g	g
p,p' DDE	0.054	0.053	0.100	0.048	0.014	0.025

6.1 = value greater than the screening value
1.0 = value less than the screening level; no screening level
g = value less than the detection limit

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS DETECTED IN FISH TISSUE
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
International Amistad Reservoir-Eagle Pass/Piedras Negras Reach

STATION	8	8	9	9	10	10
Fish Species	CARP WHOLE	CARP FILET	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS FILET	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS FILET
METALS (mg/kg)						
aluminum	2.5	g	0.96	0.31	g	0.16
arsenic	g	g	g	g	g	**1.5**
chromium	0.10	g	0.15	0.08	0.23	g
copper	**1.4**	0.36	0.66	0.23	0.87	0.21
lead	0.16	0.15	g	g	0.18	g
mercury	g	0.14	0.29	0.50	0.34	0.74
nickel	g	g	g	0.75	g	g
selenium	0.38	0.21	0.28	0.25	0.43	0.32
zinc	**35.7**	6.5	12.2	5.3	10.7	6.8
PESTICIDES (mg/kg)						
p,p' DDE	ž	g	0.083	0.0052	0.073	0.017

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit
ž	= detected but could not be quantified reliably

APPENDIX G.4
ORGANICS AND INORGANICS DETECTED IN FISH TISSUE
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

STATION	11	11	12	12	12	12	12.1	12.1
Fish Species	CARP WHOLE	LARGE MOUTH BASS FILET	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS FILET
METALS (mg/kg)								
aluminum	1.2	g	0.85	g	6.9	g	g	g
arsenic	g	**0.69**	g	g	g	g	g	g
chromium	g	g	0.11	g	g	g	g	g
copper	**1.4**	0.47	0.39	0.17	0.52	0.25	0.24	0.16
mercury	0.03	**1.2**	0.51	0.73	0.12	0.12	0.27	0.54
selenium	0.48	0.34	0.54	0.29	0.33	0.12	0.44	0.22
thallium	g	g	g	g	g	0.06	0.28	g
zinc	**75.6**	4.1	10.1	4.0	14.3	7.3	10.1	4.1
OTHER ORGANICS (mg/kg)								
cyanide	g	g	g	g	g	10.3	g	3.3
MONOCYCLIC AROMATICS (mgkg)								
toluene	g	g	g	g	0.027	g	g	g
PESTICIDES (mg/kg)								
p,p' DDD	g	g	g	g	g	0.025	g	g
p,p' DDE	0.150	0.013	0.240	0.0038	0.150	0.130	0.150	0.0066
p,p' DDT	g	g	g	g	0.035	0.034	g	g
diazinon	g	g	g	g	g	g	0.025	g
dieldrin	g	g	g	g	0.0093	g	g	g

6.1 = value greater than the screening value

1.0 = value less than the screening level; no screening level

g = value less than the detection limit

APPENDIX G.4
ORGANICS AND INORGANICS DETECTED IN FISH TISSUE
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
Laredo/Nuevo Laredo-International Falcon Reservoir Reach

STATION	12.1	12.1	12.2	12.2	12.2	12.3	12.3
Fish Species	CHANNEL CATFISH WHOLE	CARP FILET	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS FILET	BLUE CATFISH WHOLE	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS FILET
METALS (mg/kg)							
aluminum	0.75	g	0.74	g	1.4	1.6	g
cadmium	g	g	g	g	g	0.004	g
chromium	0.10	g	0.11	g	g	0.04	g
copper	0.35	0.52	1.0	0.22	0.23	0.35	0.16
lead	g	g	g	g	**0.24**	g	g
mercury	0.10	0.34	0.05	0.09	0.07	g	0.11
selenium	0.27	0.35	0.34	0.36	0.11	0.37	0.32
thallium	0.06	g	g	g	g	g	g
zinc	3.2	42.8	**69.2**	g	9.2	10.5	4.2
OTHER ORGANICS (mg/kg)							
cyanide	3.2	42.8	69.2	g	g	87.8	19.9
PESTICIDES (mg/kg)							
chlordane	g	g	0.059	g	g	g	g
p,p' DDD	0.018	g	0.025	g	0.030	Ž	g
p,p' DDE	0.150	0.097	0.170	0.0096	0.180	0.120	0.0054
p,p' DDT	0.019	g	g	g	g	g	g

6.1	= value > screening value
1.0	= value < screening level; no screening level
g	= value < detection limit
Ž	= detected but could not be quantified reliably

APPENDIX G.5
ORGANICS AND INORGANICS DETECTED IN FISH TISSUE
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
Below International Falcon Reservoir-Brownsville/Matamoros Reach

STATION	13	13	14	14	14	14	15	15
Fish Species	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS FILET	LARGE MOUTH BASS WHOLE	CHANNEL CATFISH WHOLE	LARGE MOUTH BASS FILET	CHANNEL CATFISH FILET	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS FILET
METALS (mg/kg)								
aluminum	0.87	0.84	g	15.8	g	0.84	2.2	0.96
chromium	g	0.04	0.07	g	g	g	0.09	g
copper	0.29	0.41	0.25	0.43	0.15	0.26	0.63	0.27
lead	0.11	g	g	0.20	0.09	g	**0.54**	g
mercury	0.11	0.28	0.08	0.03	0.66	0.06	0.07	0.31
nickel	g	g	0.16	0.11	g	0.16	0.12	g
selenium	0.14	0.14	0.21	0.35	0.32	0.10	0.27	0.12
thallium	0.07	0.06	g	0.05	g	g	g	g
zinc	12.1	10.6	7.1	16.6	4.1	9.6	11.0	5.7
PESTICIDES (Fg/kg)								
p,p' DDE	0.0209	0.0358	0.0266	0.0725	0.0097	0.0549	g	g

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS DETECTED IN FISH TISSUE
AND VALUES THAT EXCEEDED SCREENING/CRITERIA CONCENTRATIONS
Below International Falcon Reservoir-Brownsville/Matamoros Reach

STATION	16	16	16	16	17	17	18	18
Fish Species	WHITE BASS WHOLE	WHITE BASS FILET	CARP WHOLE	CARP FILET	LARGE MOUTH BASS WHOLE	LARGE MOUTH BASS WHOLE	SNOOK WHOLE	SNOOK FILET
METALS (mg/kg)								
aluminum	g	0.81	36.1	g	1.4	g	3.9	0.87
antimony	g	g	g	g	g	0.32	0.26	0.29
arsenic	g	g	g	g	g	0.18	g	g
cadmium	g	g	0.02	g	g	g	g	g
chromium	g	0.12	0.17	g	g	g	g	g
copper	**3.7**	0.26	0.75	0.26	**2.4**	0.54	0.77	g
lead	0.11	g	0.14	g	0.14	g	g	g
mercury	0.24	0.41	0.14	0.46	0.10	0.21	0.06	0.23
nickel	0.18	0.27	0.20	0.12	0.11	g	g	g
selenium	0.37	0.31	0.16	0.12	0.23	0.30	0.29	0.24
thallium	g	g	g	g	g	g	0.07	0.09
zinc	11.8	4.9	**41.3**	14.7	10.6	7.1	7.1	3.5
PESTICIDES (mg/kg)								
chlordane	0.113	g	0.099	**0.130**	g	g	0.422	0.0424
p,p' DDE	0.170	0.092	0.270	0.098	g	g	0.362	0.054
dieldrin	g	g	g	g	g	g	0.0164	g
PCBs and RELATED COMPOUNDS (mg/kg)								
aroclor 1248	g	g	g	g	g	g	0.085	g
aroclor 1260	g	g	g	g	g	g	**0.179**	g

6.1	= value greater than the screening value
1.0	= value less than the screening level; no screening level
g	= value less than the detection limit

APPENDIX G.1
ORGANICS AND INORGANICS IN FISH TISSUE
El Paso/Ciudad Juárez Reach

LOCATION	1	1	2	2	2	2
Fish Species	CARP WHOLE	CARP FILET	CHANNEL CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET
Date	12/02/95	12/02/95	12/03/95	12/03/95	12/03/95	12/03/95
Number of Fish in Sample	2	2	3	3	1	1
CONVENTIONALS	METALS ONLY					
lipid content (%)	na	na	3.6	0.8	4.0	0.8
DISSOLVED METALS (mg/kg)						
aluminum	**43.8**	< 0.97	**3.3**	< 0.97	**12.6**	< 0.93
antimony	**0.08**	**0.09**	**0.05**	**0.03**	**0.22**	**0.16**
arsenic	< 0.05	< 0.06	< 0.05	< 0.05	< 0.05	< 0.06
beryllium	< 0.02	< 0.02	< 0.02	< 0.03	< 0.02	< 0.02
cadmium	**0.06**	< 0.004	**0.03**	< 0.004	**0.06**	**0.02**
chromium	**0.10**	< 0.09	< 0.09	**0.11**	< 0.09	< 0.09
copper	**1.8**	**0.63**	**0.29**	**0.23**	**1.8**	**0.71**
lead	< 0.02	< 0.02	< 0.02	< 0.02	**0.17**	**0.03**
mercury	**0.05**	**0.18**	**0.06**	**0.13**	< 0.03	**0.06**
nickel	**0.28**	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
selenium	**0.37**	**0.18**	**0.35**	**0.25**	**0.19**	**0.47**
silver	< 0.09	< 0.10	< 0.10	< 0.10	**0.13**	**0.40**
thallium	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
zinc	**25.4**	**6.4**	**10.7**	**5.1**	**44.9**	**7.0**
OTHER INORGANICS (mg/L)						
cyanide	- -	- -	< 1.0	< 1.0	< 1.0	< 1.0
PHENOLS AND CRESOLS (mg/kg)						
parachlorometa cresol	- -	- -	nr	nr	nr	nr
pentachlorophenol	- -	- -	< 10	< 2.0	< 10	< 2.0

APPENDIX G.1 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
El Paso/Ciudad Juárez Reach

LOCATION	1	1	2	2	2	2
Fish Species	CARP WHOLE	CARP FILET	CHANNEL CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET
PHENOLS AND CRESOLS (cont)						
phenol (C_6H_5OH) single compound	- -	- -	< 10	< 2.0	< 10	< 2.0
phenolics recoverable	- -	- -	< 0.05	< 0.50	**3.1**	**3.5**
2-chlorophenol	- -	- -	< 10	< 2.0	< 10	< 2.0
2-nitrophenol	- -	- -	< 10	< 2.0	< 10	< 2.0
2,4-dichlorophenol	- -	- -	< 10	< 2.0	< 10	< 2.0
2,4-dimethylphenol	- -	- -	< 10	< 2.0	< 10	< 2.0
2,4-dinitrophenol	- -	- -	< 10	< 4.0	< 10	< 4.0
2,4,6-trichlorophenol	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
4-nitrophenol	- -	- -	< 10	< 4.0	< 10	< 4.0
4,6-dinitro-ortho-cresol	- -	- -	nr	nr	nr	nr
ETHERS (mg/kg)						
bis (chloromethyl) ether	- -	- -	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
bis (2-chloroethyl) ether	- -	- -	< 10	< 2.0	< 10	< 2.0
bis (2-chloroisopropyl)ether	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
2-chloroethyl vinyl ether	- -	- -	nr	nr	nr	nr
4-bromophenyl phenyl ether	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
4-chlorophenyl phenyl ether	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
HALOGENATED ALIPHATICS (Fg/kg)						
bromodichloromethane	- -	- -	< 20	< 20	< 20	< 20
bromoform	- -	- -	< 20	< 20	< 20	< 20
carbon tetrachloride	- -	- -	< 20	< 20	< 20	< 20
chloroethane	- -	- -	< 100	< 98	< 100	< 100

APPENDIX G.1 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
El Paso/Ciudad Juárez Reach

LOCATION	1	1	2	2	2	2
Fish Species	CARP WHOLE	CARP FILET	CHANNEL CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET
HALOGENATED ALIPHATICS(cont)						
chloroform	- -	- -	< 20	< 20	< 20	< 20
dibromochloromethane	- -	- -	< 20	< 20	< 20	< 20
dichlorodifluormethane	- -	- -	< 50	< 49	< 50	< 50
hexachlorobutadiene (mg/kg)	- -	- -	< 10	< 2.0	< 10	< 2.0
hexachlorocyclopentadiene (mg/kg)	- -	- -	< 20	< 4.0	< 20	< 4.0
hexachloroethane (mg/kg)	- -	- -	< 10	< 2.0	< 10	< 2.0
methyl bromide	- -	- -	nr	nr	nr	nr
methyl chloride	- -	- -	nr	nr	nr	nr
methylene chloride	- -	- -	< 20	< 20	< 20	< 20
tetrachloroethylene	- -	- -	nr	nr	nr	nr
trichloroethylene	- -	- -	nr	nr	nr	nr
trichlorofluoromethane	- -	- -	< 20	< 20	< 20	< 20
vinyl chloride	- -	- -	< 50	< 49	< 50	< 50
1,1-dichloroethane	- -	- -	< 20	< 20	< 20	< 20
1,1-dichloroethylene	- -	- -	nr	nr	nr	nr
1,1,1-trichloroethane	- -	- -	< 20	< 20	< 20	< 20
1,1,2-trichloroethane	- -	- -	< 20	< 20	< 20	< 20
1,1,2,2-tetrachloroethane	- -	- -	< 20	< 20	< 20	< 20
1,2-dichloroethane	- -	- -	< 20	< 20	< 20	< 20
1,2-dichloropropane	- -	- -	< 20	< 20	< 20	< 20
1,2-trans-dichloroethylene	- -	- -	nr	nr	nr	nr
1,3-cis-dichloropropene	- -	- -	< 20	< 20	< 20	< 20
1,3-trans-dichloropropene	- -	- -	< 20	< 20	< 20	< 20

APPENDIX G.1 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
El Paso/Ciudad Juárez Reach

LOCATION	1	1	2	2	2	2
Fish Species	CARP WHOLE	CARP FILET	CHANNEL CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET
POLYCYCLIC AROMATIC HYDROCARBONS (mg/kg)						
acenaphthene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
acenaphthylene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
anthracene/phenanthrene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
benzo (a) anthracene 1,2-benzanthracene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
benzo (b) fluoroanthene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
benzo (GHI) perylene 1,12-benzoperylene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
benzo (k) fluoranthene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
benzo-a-pyrene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
chrysene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
fluoranthene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
fluorene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
indeno (1,2,3-CD) pyrene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
naphthalene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
pyrene	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
1,2,5,6-dibenzantracene	- -	- -	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/kg)						
benzene	- -	- -	< 20	< 20	< 20	< 20
chlorobenzene	- -	- -	< 20	< 20	< 20	< 20
ethylbenzene	- -	- -	< 20	< 20	< 20	< 20
hexachlorobenzene	- -	- -	< 2.0	< 2.0	< 2.0	< 2.0
nitrobenzene (mg/kg)	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
styrene	- -	- -	< 20	< 20	< 20	< 20

APPENDIX G.1 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
El Paso/Ciudad Juárez Reach

LOCATION	1	1	2	2	2	2
Fish Species	CARP WHOLE	CARP FILET	CHANNEL CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET
MONOCYCLIC AROMATICS (cont)						
toluene	- -	- -	< 20	< 20	< 20	< 20
xylene	- -	- -	< 20	< 20	< 20	< 20
1,2-dichlorobenzene	- -	- -	< 20	< 20	< 20	< 20
1,2,4-trichlorobenzene	- -	- -	< 20	< 20	< 20	< 20
1,3-dichlorobenzene	- -	- -	< 20	< 20	< 20	< 20
1,4-dichlorobenzene	- -	- -	< 20	< 20	< 20	< 20
2,4-dinitrotoluene (mg/kg)	- -	- -	< 10	< 2.0	< 10	< 2.0
2,6-dinitrotoluene (mg/kg)	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
NITROSAMINES AND OTHER N COMPOUNDS (mg/kg)						
acrylonitrile (Fg/L)	- -	- -	< 50	< 49	< 50	< 50
benzidine	- -	- -	ND	ND	ND	ND
n-nitrosodi-n-propylamine	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
n-nitrosodimethylamine	- -	- -	na	na	na	na
n-nitrosodiphenylamine	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
1,2-diphenylhydrazine	- -	- -	nr	nr	nr	nr
3,3-dichlorobenzidine	- -	- -	< 20	< 4.0	< 20	< 4.0
PESTICIDES (Fg/kg)						
acrolein	- -	- -	nr	nr	nr	nr
aldicarb	- -	- -	nr	nr	nr	nr
aldrin	- -	- -	< 2.0	< 2.0	< 2.0	< 2.0
alpha benzene hexachloride	- -	- -	< 2.0	< 2.0	< 2.0	< 2.0
atrazine	- -	- -	< 100	< 100	< 100	< 100
beta benzene hexachloride	- -	- -	< 2.0	< 2.0	< 2.0	< 2.0

APPENDIX G.1 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
El Paso/Ciudad Juárez Reach

LOCATION	1	1	2	2	2	2
Fish Species	CARP WHOLE	CARP FILET	CHANNEL CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET
PESTICIDES (cont)						
carbaryl	- -	- -	nr	nr	nr	nr
carbofuran	- -	- -	nr	nr	nr	nr
chlordane	- -	- -	< 20	< 20	< 20	< 20
chlorfenvinphos	- -	- -	nr	nr	nr	nr
chlorothalonil	- -	- -	nr	nr	nr	nr
chlorpyrifos	- -	- -	< 10	< 10	< 10	< 10
chlorsulfuron	- -	- -	nr	nr	nr	nr
DDD	- -	- -	< 10	< 10	< 10	< 10
DDE	- -	- -	**150**	**58**	**75**	**80**
DDT	- -	- -	< 10	< 10	< 10	< 10
delta benzene hexachloride	- -	- -	< 2.0	< 2.0	< 2.0	< 2.0
demeton	- -	- -	nr	nr	nr	nr
diazinon	- -	- -	< 10	< 10	< 10	< 10
dibromochloropropane (dbcp)	- -	- -	nr	nr	nr	nr
dicamba	- -	- -	nr	nr	nr	nr
2,4-dichlorophenoxyacetic acid (2,4-D)	- -	- -	nr	nr	nr	nr
dicofol (kelthane)	- -	- -	< 100	< 100	< 100	< 100
dicrotophos	- -	- -	nr	nr	nr	nr
dieldrin	- -	- -	< 6.0	< 6.0	< 6.0	< 6.0
dinoseb	- -	- -	nr	nr	nr	nr
endosulfan alpha	- -	- -	< 10	< 10	< 10	< 10
endosulfan beta	- -	- -	< 10	< 10	< 10	< 10
endosulfan sulfate	- -	- -	< 10	< 10	< 10	< 10
endrin	- -	- -	< 6.0	< 6.0	< 6.0	< 6.0

APPENDIX G.1 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
El Paso/Ciudad Juárez Reach

LOCATION	1	1	2	2	2	2
Fish Species	CARP WHOLE	CARP FILET	CHANNEL CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET
PESTICIDES (cont)						
endrin aldehyde	- -	- -	< 4.0	< 4.0	< 4.0	< 4.0
fenthion (baytex)	- -	- -	nr	nr	nr	nr
gamma-bhc (lindane)	- -	- -	< 2.0	< 2.0	< 2.0	< 2.0
guthion	- -	- -	nr	nr	nr	nr
heptachlor	- -	- -	< 2.0	< 2.0	< 2.0	< 2.0
heptachlor epoxide	- -	- -	< 4.0	< 4.0	< 4.0	< 4.0
isophorone (mg/kg)	- -	- -	< 10	< 1.0	< 10	< 1.0
malathion	- -	- -	< 20	< 20	< 20	< 20
metsulfuron	- -	- -	nr	nr	nr	nr
methomyl	- -	- -	nr	nr	nr	nr
methoxychlor	- -	- -	< 30	< 30	< 30	< 30
metolachlor	- -	- -	< 35	< 35	< 35	< 35
mirex	- -	- -	< 8.0	< 8.0	< 8.0	< 8.0
parathion	- -	- -	< 10	< 10	< 10	< 10
picloram	- -	- -	nr	nr	nr	nr
prometon	- -	- -	nr	nr	nr	nr
simazine	- -	- -	< 100	< 100	< 100	< 100
tetraethylpyrophosphate (tepp)	- -	- -	nr	nr	nr	nr
toxaphene	- -	- -	< 100	< 100	< 100	< 100
2,4,5-TP (silvex)	- -	- -	nr	nr	nr	nr
PCBs and RELATED COMPOUNDS (Fg/L)						
aroclor 1016	- -	- -	< 40	< 40	< 40	< 40
aroclor 1221	- -	- -	< 40	< 40	< 40	< 40

APPENDIX G.1 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
El Paso/Ciudad Juárez Reach

LOCATION	1	1	2	2	2	2
Fish Species	CARP WHOLE	CARP FILET	CHANNEL CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET
PCBS and RELATED COMPOUNDS (cont)						
aroclor 1232	- -	- -	< 40	< 40	< 40	< 40
aroclor 1242	- -	- -	< 40	< 40	< 40	< 40
aroclor 1248	- -	- -	< 40	< 40	< 40	< 40
aroclor 1254	- -	- -	< 40	< 40	< 40	< 40
aroclor 1260	- -	- -	< 40	< 40	< 40	< 40
2-chloronaphthalene	- -	- -	< 10	< 2.0	< 10	< 2.0
PHTHALATE ESTERS (Fg/L)						
bis (2-ethylhexyl) phthalate	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
di-n-butyl phthalate	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
di-n-octyl phthalate	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
dimethyl phthalate	- -	- -	< 10	< 2.0	< 10	< 2.0
n-butyl benzyl phthalate	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0
diethyl phthalate	- -	- -	< 5.0	< 1.0	< 5.0	< 1.0

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error
[- -] = not applicable

Î = reported below quantitation limit
Ï = detected in blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
is = insufficient sample

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3	3a	3a	3a
Fish Species	SMALL MOUTH BUFFALO WHOLE	CARP SUCKER FILET	FRESHWATER DRUM FILET	CARP WHOLE	CARP FILET
Date	120595	120595	120595	120595	120595
Number of Fish Per Samples	1	1	1	1	1
CONVENTIONALS					
lipid content (%)	na	na	6.4	1.6	0.8
DISSOLVED METALS (mg/kg)					
aluminum	< 0.96	**82.7**	< 0.92	**37.1**	**1.9**
antimony	**0.10**	**0.11**	**0.05**	**0.17**	**0.08**
arsenic	< 0.05	**0.06**	< 0.06	< 0.06	**0.09**
beryllium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
cadmium	< 0.004	**0.03**	< 0.004	**0.08**	< 0.004
chromium	< 0.09	**0.15**	**0.13**	**0.28**	< 0.09
copper	**0.43**	**0.54**	**0.37**	**0.52**	**0.63**
lead	< 0.02	**0.07**	< 0.03	**0.04**	< 0.02
mercury	**0.51**	< 0.03	**0.54**	**0.10**	**0.10**
nickel	< 0.20	< 0.20	< 0.25	< 0.20	< 0.20
selenium	**2.3**	**1.3**	**0.85**	**0.99**	**1.2**
silver	< 0.10	< 0.10	**0.10**	< 0.10	< 0.10
thallium	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
zinc	**3.5**	**12.8**	**3.7**	**43.1**	**9.4**
OTHER INORGANICS (mg/kg)					
cyanide	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PHENOLS AND CRESOLS (mg/kg)					
parachlorometa cresol	nr	nr	nr	nr	nr
pentachlorophenol	< 2.0	< 10	< 2.0	< 10	< 2.0
Phenol (C6H5OH) single compound	< 2.0	< 10	< 2.0	< 10	< 2.0

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3	3a	3a	3a
Fish Species	SMALL MOUTH BUFFALO WHOLE	CARP SUCKER FILET	FRESHWATER DRUM FILET	CARP WHOLE	CARP FILET
Phenols and Cresols (cont)					
phenolics recoverable	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-chlorophenol	< 2.0	< 10	< 2.0	< 10	< 2.0
2-nitrophenol	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dichlorophenol	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dimethylphenol	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dinitrophenol	< 4.0	< 10	< 4.0	< 10	< 4.0
2,4,6-trichlorophenol	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-nitrophenol	< 4.0	< 10	< 4.0	< 10	< 4.0
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr
ETHERS (Fg/L)					
bis (chloromethyl) ether	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
bis (2-chloroethyl) ether	< 2.0	< 10	< 2.0	< 10	< 2.0
bis (2-chloroisopropyl)ether	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-chlorophenyl phenyl ether	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
HALOGENATED ALIPHATICS (Fg/kg)					
bromodichloromethane	< 20	< 20	< 20	< 19	< 19
bromoform	< 20	< 20	< 20	< 19	< 19
carbon tetrachloride	< 20	< 20	< 20	< 19	< 19
chloroethane	< 100	< 50	< 49	< 94	< 95
chloroform	< 20	< 20	< 20	< 19	< 19
dibromochloromethane	< 20	< 20	< 20	< 19	< 19

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3	3a	3a	3a
Fish Species	SMALL MOUTH BUFFALO WHOLE	CARP SUCKER FILET	FRESHWATER DRUM FILET	CARP WHOLE	CARP FILET
Halogenated Aliphatics (cont)					
dichlorodifluormethane	< 50	< 50	< 49	< 47	< 47
hexachlorobutadiene (mg/kg)	< 2.0	< 10	< 2.0	< 10	< 2.0
hexachlorocyclopentadiene (mg/kg)	< 4.0	< 20	< 4.0	< 20	< 4.0
hexachloroethane (mg/kg)	< 2.0	< 10	< 2.0	< 10	< 2.0
methyl bromide	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr
methylene chloride	< 20	< 50	< 49	< 49	< 19
tetrachloroethylene	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr
trichlorofluoromethane	< 20	< 50	< 49	< 19	< 19
vinyl chloride	< 50	< 50	< 49	< 47	< 47
1,1-dichloroethane	< 20	< 20	< 20	< 19	< 19
1,1-dichloroethylene	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 20	< 20	< 20	< 19	< 19
1,1,2-trichloroethane	< 20	< 20	< 20	< 19	< 19
1,1,2,2-tetrachloroethane	< 20	< 20	< 20	< 19	< 19
1,2-dichloroethane	< 20	< 20	< 20	< 19	< 19
1,2-dichloropropane	< 20	< 20	< 20	< 19	< 19
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 20	< 20	< 20	< 19	< 19
1,3-trans-dichloropropene	< 20	< 20	< 20	< 19	< 19
POLYCYCLIC AROMATIC HYDROCARBONS (mg/kg)					
acenaphthene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
acenaphthylene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3	3a	3a	3a
Fish Species	SMALL MOUTH BUFFALO WHOLE	CARP SUCKER FILET	FRESHWATER DRUM FILET	CARP WHOLE	CARP FILET
Polycyclic Aromatic Hydrocarbons (cont)					
anthracene/phenanthrene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (a) anthracene 1,2-benzanthracene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (b) fluoroanthene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (GHI) perylene 1,12-benzoperylene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (k) fluoranthene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo-a-pyrene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
chrysene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluoranthene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluorene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
indeno (1,2,3-CD) pyrene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
naphthalene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
pyrene	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/kg)					
benzene	< 20	< 20	< 20	< 19	< 19
chlorobenzene	< 20	< 20	< 20	< 19	< 19
ethylbenzene	< 20	< 20	< 20	< 19	< 19
hexachlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
nitrobenzene (mg/kg)	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
styrene	< 20	< 20	< 20	< 19	< 19
toluene	< 20	< 20	< 20	< 19	< 19
xylene	< 2	< 20	< 20	< 19	< 19

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3	3a	3a	3a
Fish Species	SMALL MOUTH BUFFALO WHOLE	CARP SUCKER FILET	FRESHWATER DRUM FILET	CARP WHOLE	CARP FILET
Monocyclic Aromatics (cont)					
1,2-dichlorobenzene	< 20	< 20	< 20	< 19	< 19
1,2,4-trichlorobenzene	< 20	< 50	< 49	< 19	< 19
1,3-dichlorobenzene	< 20	< 20	< 20	< 19	< 19
1,4-dichlorobenzene	< 20	< 20	< 20	< 19	< 19
2,4-dinitrotoluene (mg/kg)	< 2.0	< 10	< 2.0	< 10	< 2.0
2,6-dinitrotoluene (mg/kg)	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
NITROSAMINES AND OTHER N COMPOUNDS (mg/kg)					
acrylonitrile (Fg/kg)	< 20	< 20	< 20	< 47	< 19
benzidine	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
n-nitrosodimethylamine	na	na	na	na	na
n-nitrosodiphenylamine	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2-diphenylhydrazine	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 4.0	< 20	< 4.0	< 20	< 4.0
PESTICIDES (Fg/kg)					
acrolein	nr	nr	nr	nr	nr
aldicarb	nr	nr	nr	nr	nr
aldrin	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
alpha benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
atrazine	< 100	< 100	< 100	< 100	< 100
beta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
carbaryl	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr
chlordane	< 20	< 20	< 20	< 20	< 20

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3	3a	3a	3a
Fish Species	SMALL MOUTH BUFFALO WHOLE	CARP SUCKER FILET	FRESHWATER DRUM FILET	CARP WHOLE	CARP FILET
Pesticides (cont)					
chlorfenvinphos	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr
chlorpyrifos	< 10	< 10	< 10	< 10	< 10
chlorsulfuron	nr	nr	nr	nr	nr
DDD	< 10	**48**	< 10	< 10	< 10
DDE	**170**	**1400**	**18**	**170**	< 5.0
DDT	< 10	< 10	< 10	< 10	**78**
delta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
demeton	nr	nr	nr	nr	nr
diazinon	< 10	< 10	< 10	< 10	< 10
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr
dicamba	nr	nr	nr	nr	nr
2,4-dichlorophenoxyacetic acid (2,4-D)	nr	nr	nr	nr	nr
dicofol (kelthane)	< 100	< 100	< 100	< 100	< 100
dicrotophos	nr	nr	nr	nr	nr
dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
dinoseb	nr	nr	nr	nr	nr
endosulfan alpha	< 10	< 10	< 10	< 10	< 10
endosulfan beta	< 10	< 10	< 10	< 10	< 10
endosulfan sulfate	< 10	< 10	< 10	< 10	< 10
endrin	< 6.0	**12**	< 6.0	< 6.0	< 6.0
endrin aldehyde	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
fenthion (baytex)	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3	3a	3a	3a
Fish Species	SMALL MOUTH BUFFALO WHOLE	CARP SUCKER FILET	FRESHWATER DRUM FILET	CARP WHOLE	CARP FILET
Pesticides (cont)					
guthion	nr	nr	nr	nr	nr
heptachlor	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
heptachlor epoxide	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
isophorone (mg/kg)	< 1.0	< 10	< 1.0	< 10	< 1.0
malathion	< 20	< 20	< 20	< 20	< 20
metsulfuron	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr
methoxychlor	< 30	< 30	< 30	< 30	< 30
metolachlor	< 35	< 35	< 35	< 35	< 35
mirex	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
parathion	< 10	< 10	< 10	< 10	< 10
picloram	nr	nr	nr	nr	nr
prometon	nr	nr	nr	nr	nr
simazine	< 100	< 100	< 100	< 100	< 100
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr
toxaphene	< 100	< 100	< 100	< 100	< 100
2,4,5-TP (silvex)	nr	nr	nr	nr	nr
PCBs and RELATED COMPOUNDS (Fg/L)					
aroclor 1016	< 40	< 40	< 40	< 40	< 40
aroclor 1221	< 40	< 40	< 40	< 40	< 40
aroclor 1232	< 40	< 40	< 40	< 40	< 40
aroclor 1242	< 40	< 40	< 40	< 40	< 40
aroclor 1248	< 40	< 40	< 40	< 40	< 40
aroclor 1254	< 40	< 40	< 40	< 40	< 40

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	3	3	3a	3a	3a
Fish Species	SMALL MOUTH BUFFALO WHOLE	CARP SUCKER FILET	FRESHWATER DRUM FILET	CARP WHOLE	CARP FILET
PCBs and RELATED COMPOUNDS (Fg/L)					
aroclor 1260	< 40	< 40	< 40	< 40	< 40
2-chloronaphthalene	< 2.0	< 10	< 2.0	< 10	< 2.0
PHTHALATE ESTERS (Fg/L)					
bis (2-ethylhexyl) phthalate	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-butyl phthalate	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-octyl phthalate	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
dimethyl phthalate	< 2.0	< 10	< 2.0	< 10	< 2.0
n-butyl benzyl phthalate	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
diethyl phthalate	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0

nr = not reported by laboratory	Î = reported below quantitation limit
na = not analyzed	Ï = detected in blank
ND = not detected	Ð = common lab contaminant
* = no reportable data	Ñ = possible contamination
X = exceeded hold time	Ò = degraded PCB pattern
˜ = lab error	is= insufficient sample

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	4	4	4	4	5	5
Fish Species	BLUE CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET	CARP WHOLE	CARP FILET
Date	12/05/95	12/05/95	12/05/95	12/05/95	12/06/95	120695
Number of Fish Per Sample	3	1	2	1	1	1
CONVENTIONALS						
lipid content (%)	2.0	1.0	1.2	0.6	0.6	0.2
DISSOLVED METALS (mg/kg)						
aluminum	**81.0**	< 0.95	70.2	< 0.94	**17.1**	< 0.96
antimony	**0.03**	**0.06**	**0.13**	**0.06**	**0.17**	**0.06**
arsenic	**0.08**	< 0.05	< 0.05	< 0.11	< 0.06	< 0.05
beryllium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
cadmium	**0.004**	< 0.004	0.03	< 0.008	**0.08**	< 0.004
chromium	**0.09**	< 0.09	< 0.09	< 0.09	**0.12**	< 0.09
copper	**0.35**	**0.26**	**0.86**	**0.47**	**1.4**	0.32
lead	**0.09**	< 0.02	**0.04**	< 0.02	**0.02**	< 0.02
mercury	**0.26**	**0.30**	**0.24**	**0.24**	**0.32**	**0.42**
nickel	< 0.21	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
selenium	**0.26**	**0.20**	**0.85**	**2.7**	**0.73**	**1.3**
silver	< 0.10	**0.37**	< 0.09	< 0.10	< 0.10	< 0.10
thallium	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
zinc	**10.2**	**4.2**	**53.5**	**4.3**	**87.1**	**4.7**
OTHER INORGANICS (mg/L)						
cyanide	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PHENOLS AND CRESOLS (mg/kg)						
parachlorometa cresol	nr	nr	nr	nr	nr	nr
pentachlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	4	4	4	4	5	5
Fish Species	BLUE CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET	CARP WHOLE	CARP FILET
Phenols and Cresols (cont)						
phenol (C_6H_5OH) single compound	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
phenolics recoverable	< 0.50	< 0.50	< 0.50	**3.0**	**2.2**	< 0.50
2-chlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2-nitrophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dichlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dimethylphenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dinitrophenol	< 10	< 4.0	< 10	< 4.0	< 10	< 4.0
2,4,6-trichlorophenol	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-nitrophenol	< 10	< 4.0	< 10	< 4.0	< 10	< 4.0
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr
ETHERS (mg/kg)						
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
bis (2-chloroethyl) ether	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
bis (2-chloroisopropyl)ether	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-chlorophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
HALOGENATED ALIPHATICS (Fg/kg)						
bromodichloromethane	< 18	< 19	< 20	< 20	< 19	< 20
bromoform	< 18	< 19	< 20	< 20	< 19	< 20
carbon tetrachloride	< 18	< 19	< 20	< 20	< 19	< 20
chloroethane	< 92	< 95	< 101	< 100	< 97	< 100

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	4	4	4	4	5	5
Fish Species	BLUE CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET	CARP WHOLE	CARP FILET
Halogenated Aliphatics (cont)						
chloroform	< 18	< 19	< 20	< 20	< 19	< 20
dibromochloromethane	< 18	< 19	< 20	< 20	< 19	< 20
dichlorodifluormethane	< 46	< 47	< 50	< 50	< 49	< 50
hexachlorobutadiene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
hexachlorocyclopentadiene (mg/kg)	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0
hexachloroethane (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
methyl bromide	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr
methylene chloride	< 18	< 19	< 20	< 20	< 19	< 20
tetrachloroethylene	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 18	< 19	< 20	< 20	< 19	< 20
vinyl chloride	< 46	< 47	< 50	< 50	< 49	< 50
1,1-dichloroethane	< 18	< 19	< 20	< 20	< 19	< 20
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 18	< 19	< 20	< 20	< 19	< 20
1,1,2-trichloroethane	< 18	< 19	< 20	< 20	< 19	< 20
1,1,2,2-tetrachloroethane	< 18	< 19	< 20	< 20	< 19	< 20
1,2-dichloroethane	< 18	< 19	< 20	< 20	< 19	< 20
1,2-dichloropropane	< 18	< 19	< 20	< 20	< 19	< 20
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 18	< 19	< 20	< 20	< 19	< 20
1,3-trans-dichloropropene	< 18	< 19	< 20	< 20	< 19	< 20

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	4	4	4	4	5	5
Fish Species	BLUE CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET	CARP WHOLE	CARP FILET
POLYCYCLIC AROMATIC HYDROCARBONS (mg/kg)						
acenaphthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
acenaphthylene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
anthracene/phenanthrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (a) anthracene 1,2-benzanthracene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (b) fluoroanthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (GHI) perylene 1,12-benzoperylene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (k) fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo-a-pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
chrysene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluorene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
indeno (1,2,3-CD) pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
naphthalene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/kg)						
benzene	< 18	< 19	< 20	< 20	< 19	< 20
chlorobenzene	< 18	< 19	< 20	< 20	< 19	< 20
ethylbenzene	< 18	< 19	< 20	< 20	< 19	< 20
hexachlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
nitrobenzene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
styrene	< 18	< 19	< 20	< 20	< 19	< 20

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	4	4	4	4	5	5
Fish Species	BLUE CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET	CARP WHOLE	CARP FILET
Monocyclic Aromatics (cont)						
toluene	< 18	< 19	< 20	< 20	< 19	< 20
xylene	< 18	< 19	< 20	< 20	< 19	< 20
1,2-dichlorobenzene	< 18	< 19	< 20	< 20	< 19	< 20
1,2,4-trichlorobenzene	< 18	< 19	< 20	< 20	< 19	< 20
1,3-dichlorobenzene	< 18	< 19	< 20	< 20	< 19	< 20
1,4-dichlorobenzene	< 18	< 19	< 20	< 20	< 19	< 20
2,4-dinitrotoluene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,6-dinitrotoluene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
NITROSAMINES AND OTHER N COMPOUNDS (mg/kg)						
acrylonitrile (Fg/L)	< 46	< 19	< 50	< 50	< 49	< 50
benzidine	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
n-nitrosodimethylamine	na	na	na	na	na	na
n-nitrosodiphenylamine	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0
PESTICIDES (Fg/kg)						
acrolein	nr	nr	nr	nr	nr	nr
aldicarb	nr	nr	nr	nr	nr	nr
aldrin	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
alpha benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
atrazine	< 100	< 100	< 100	< 100	< 100	< 100
beta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	4	4	4	4	5	5
Fish Species	BLUE CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET	CARP WHOLE	CARP FILET
Pesticides (cont)						
carbaryl	nr	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr	nr
chlordane	< 20	< 20	< 20	< 20	< 20	< 20
chlorfenvinphos	nr	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr	nr
chlorpyrifos	< 10	< 10	< 10	< 10	< 10	< 10
chlorsulfuron	nr	nr	nr	nr	nr	nr
DDD	< 10	< 10	< 10	< 10	< 10	< 10
DDE	**300**	**34**	**420**	**55**	**130**	**25**
DDT	< 10	< 10	< 10	< 10	< 10	< 10
delta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
demeton	nr	nr	nr	nr	nr	nr
diazinon	< 10	< 10	< 10	< 10	< 10	< 10
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr
dicamba	nr	nr	nr	nr	nr	nr
2,4-dichlorophenoxyacetic acid (2,4-D)	nr	nr	nr	nr	nr	nr
dicofol (kelthane)	< 100	< 100	< 100	< 100	< 100	< 100
dicrotophos	nr	nr	nr	nr	nr	nr
dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
dinoseb	nr	nr	nr	nr	nr	nr
endosulfan alpha	< 10	**9.7**	< 10	< 10	< 10	< 10
endosulfan beta	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan sulfate	< 10	< 10	< 10	< 10	< 10	< 10
endrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	4	4	4	4	5	5
Fish Species	BLUE CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET	CARP WHOLE	CARP FILET
Pesticides (cont)						
endrin aldehyde	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
fenthion (baytex)	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
guthion	nr	nr	nr	nr	nr	nr
heptachlor	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
heptachlor epoxide	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
isophorone (mg/kg)	< 10	< 1.0	< 10	< 1.0	< 10	< 1.0
malathion	< 20	< 20	< 20	< 20	< 20	< 20
metsulfuron	nr	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr	nr
methoxychlor	< 30	< 30	< 30	< 30	< 30	< 30
metolachlor	< 35	< 35	< 35	< 35	< 35	< 35
mirex	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
parathion	< 10	< 10	< 10	< 10	< 10	< 10
picloram	nr	nr	nr	nr	nr	nr
prometon	nr	nr	nr	nr	nr	nr
simazine	< 100	< 100	< 100	< 100	< 100	< 100
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr
toxaphene	< 100	< 100	< 100	< 100	< 100	< 100
2,4,5-TP (silvex)	nr	nr	nr	nr	nr	nr
PCBs and RELATED COMPOUNDS (Fg/L)						
aroclor 1016	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1221	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1232	< 40	< 40	< 40	< 40	< 40	< 40

APPENDIX G.2
ORGANICS AND INORGANICS IN FISH TISSUE
Presidio/Ojinaga-Big Bend Reach

LOCATION	4	4	4	4	5	5
Fish Species	BLUE CATFISH WHOLE	BLUE CATFISH FILET	CARP WHOLE	CARP FILET	CARP WHOLE	CARP FILET
PCBs and Related Compounds (cont)						
aroclor 1242	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1248	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1254	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1260	< 40	< 40	< 40	< 40	< 40	< 40
2-chloronaphthalene	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
PHTHALATE ESTERS (Fg/L)						
bis (2-ethylhexyl) phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-butyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-octyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
dimethyl phthalate	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
n-butyl benzyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
diethyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error
Î = reported below quantitation limit
Ï = detected in blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
is= insufficient sample

APPENDIX G.3
ORGANICS AND INORGANICS IN FISH TISSUE
Amistad International Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET
Date	05/15/95	05/15/95	05/15/95	05/15/95	05/15/95	05/15/95	05/15/95	05/15/95
Number of Fish Per Sample	1	1	1	1	2	3	1	1
CONVENTIONAL								
lipid content (%)	0.80	< 0.10	is	is	0.4	0.6	2.5	1.6
DISSOLVED METALS (mg/kg)								
aluminum	**1.1**	**0.14**	**79.8**	< 0.77	**1.5**	**0.22**	**4.1**	**0.59**
antimony	< 0.16	< 0.16	< 0.16	< 0.19	< 0.15	< 0.15	< 0.16	< 0.16
arsenic	< 0.54	< 0.11	**0.16**	< 0.58	**0.28**	< 0.10	< 0.06	**0.05**
beryllium	< 0.12	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cadmium	**0.006**	< 0.004	< 0.02	**0.01**	**0.01**	< 0.004	**0.01**	< 0.004
chromium	< 0.04	**0.06**	**0.12**	**0.12**	**0.07**	< 0.04	< 0.07	< 0.04
copper	**0.44**	**0.22**	**0.42**	**0.23**	**0.38**	**0.26**	**0.36**	**0.28**
lead	< 0.11	< 0.11	< 0.11	< 0.11	< 0.11	< 0.11	< 0.11	< 0.11
mercury	**0.25**	**0.28**	< 0.04	< 0.03	0.19	**0.25**	**0.05**	< 0.04
nickel	< 0.10	< 0.10	**0.23**	**0.16**	< 0.10	< 0.09	< 0.10	**0.67**
selenium	**0.50**	**0.33**	**0.34**	**0.25**	**0.40**	< 0.13	**0.20**	**0.24**
silver	< 0.14	< 0.14	< 0.14	< 0.14	< 0.13	< 0.13	< 0.13	< 0.14
thallium	< 0.06	**0.05**	**0.05**	**0.09**	< 0.05	< 0.10	**0.07**	**0.11**
zinc	**15.1**	**5.1**	**5.1**	**5.9**	**14.8**	**8.3**	**8.5**	**9.1**
OTHER INORGANICS (mg/kg)								
cyanide	< 1.0	< 1.0	is	is	< 1.0	< 1.0	< 1.0	< 1.0
PHENOLS AND CRESOLS (mg/kg)								
parachlorometa cresol	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET
Phenols and Cresols (cont)								
pentachlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
phenol (C_6H_5OH) single compound	< 10	< 2.0	is	is	< 10	< 2.0	< 10	< 2.0
phenolics recoverable	< 0.50	< 0.50	is	is	< 0.50	< 0.50	< 0.50	< 0.50
2-chlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2-nitrophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dichlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dimethylphenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dinitrophenol	< 10	< 4.0	< 10	< 4.0	< 20	< 4.0	< 20	< 2.0
2,4,6-trichlorophenol	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-nitrophenol	< 10	< 4.0	< 20	< 4.0	< 20	< 4.0	< 20	< 2.0
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr	nr	nr
ETHERS (mg/kg)								
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
bis (2-chloroethyl) ether	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
bis (2-chloroisopropyl)ether	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-chlorophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
HALOGENATED ALIPHATICS (Fg/kg)								
bromodichloromethane	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
bromoform	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET
Halogenated Aliphatics (cont)								
carbon tetrachloride	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
chloroethane	< 34	< 97	< 45	< 49	< 46	< 36	< 45	< 46
chloroform	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
dibromochloromethane	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
dichlorodifluormethane	< 34	< 97	< 45	< 49	< 46	< 36	< 45	< 46
hexachlorobutadiene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
hexachlorocyclopentadiene (mg/kg)	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0
hexachloroethane (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
methyl bromide	nr	nr	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr	nr	nr
methylene chloride	< 14	< 39	< 18	< 30	< 18	< 14	< 18	< 18
tetrachloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 14	< 39	< 90	< 19	< 18	< 14	< 18	< 18
vinyl chloride	< 34	< 97	< 45	< 49	< 46	< 36	< 45	< 46
1,1-dichloroethane	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
1,1,2-trichloroethane	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
1,1,2,2-tetrachloroethane	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
1,2-dichloroethane	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
1,2-dichloropropane	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET
Halogenated Aliphatics (cont)								
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
1,3-trans-dichloropropene	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
POLYCYCLIC AROMATIC HYDROCARBONS (mg/kg)								
acenaphthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
acenaphthylene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
anthracene/phenanthrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (a) anthracene 1,2-benzanthracene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (b) fluoroanthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (GHI) perylene 1,12-benzoperylene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (k) fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo-a-pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
chrysene	< 5.0	< 1.0	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluorene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
indeno (1,2,3-CD) pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
naphthalene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET
MONOCYCLIC AROMATICS (Fg/kg)								
benzene	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
chlorobenzene	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
ethylbenzene	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
hexachlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
nitrobenzene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
styrene	< 14	< 39	< 18	< 19	< 18	< 14	< 18	< 18
toluene	< 14	< 39	**31**	< 19	< 18	< 14	< 18	< 18
xylene	< 27	< 77	< 36	< 19	< 18	< 14	< 18	< 18
1,2-dichlorobenzene	< 14	< 39	< 45	< 19	< 18	< 14	< 18	< 18
1,2,4-trichlorobenzene	< 14	< 39	< 45	< 19	< 18	< 14	< 18	< 18
1,3-dichlorobenzene	< 14	< 39	< 45	< 19	< 18	< 14	< 18	< 18
1,4-dichlorobenzene	< 14	< 39	< 45	< 19	< 18	< 14	< 18	< 18
2,4-dinitrotoluene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,6-dinitrotoluene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
NITROSAMINES AND OTHER N COMPOUNDS (mg/kg)								
acrylonitrile (Fg/kg)	< 68	< 193	< 90	< 97	< 91	< 71	< 89	< 91
benzidine	ND	ND	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
n-nitrosodimethylamine	na	na	na	na	na	na	na	na
n-nitrosodiphenylamine	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET
PESTICIDES (Fg/kg)								
acrolein	nr	nr	nr	nr	nr	nr	nr	nr
aldicarb	nr	nr	nr	nr	nr	nr	nr	nr
aldrin	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
alpha benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
atrazine	nr	nr	nr	nr	nr	nr	nr	nr
beta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
carbaryl	nr	nr	nr	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr	nr	nr	nr
chlordane	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
chlorfenvinphos	nr	nr	nr	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr	nr	nr	nr
chlorpyrifos	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
chlorsulfuron	nr	nr	nr	nr	nr	nr	nr	nr
DDD	< 10	**9.6**	**18**	< 10	< 10	< 10	< 10	< 10
DDE	**38**	**9.4**	**35**	**4.4**	**7.4**	< 5.0	**25**	**7.6**
DDT	< 10	< 10	**7.8**	< 10	< 10	< 10	< 10	< 10
delta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
demeton	nr	nr	nr	nr	nr	nr	nr	nr
diazinon	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr	nr	nr
dicamba	nr	nr	nr	nr	nr	nr	nr	nr
2,4-dichlorophenoxyacetic acid (2,4-D)	nr	nr	nr	nr	nr	nr	nr	nr
dicofol (kelthane)	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET
Pesticides (cont)								
dicrotophos	nr	nr	nr	nr	nr	nr	nr	nr
dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
dinoseb	nr	nr	nr	nr	nr	nr	nr	nr
endosulfan alpha	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan beta	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan sulfate	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
endrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
endrin aldehyde	ND	ND	ND	ND	< 4.0	ND	ND	ND
fenthion (baytex)	nr	nr	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
guthion	nr	nr	nr	nr	nr	nr	nr	nr
heptachlor	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
heptachlor epoxide	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
isophorone (mg/kg)	< 10	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 5.0
malathion	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
metsulfuron	nr	nr	nr	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr	nr	nr	nr
methoxychlor	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30
metolachlor	nr	nr	nr	< 35	< 35	< 35	< 35	< 35
mirex	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
parathion	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
picloram	nr	nr	nr	nr	nr	nr	nr	nr
prometon	nr	nr	nr	nr	nr	nr	nr	nr
simazine	nr	nr	nr	< 100	nr	nr	nr	nr

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	6.1	6.1	6.1	6.1	6.2	6.2	6.2	6.2
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET
Pesticides (cont)								
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr	nr	nr
toxaphene	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
2,4,5-TP (silvex)	nr	nr	nr	nr	nr	nr	nr	nr
PCBs and RELATED COMPOUNDS (µg/kg)								
aroclor 1016	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1221	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1232	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1242	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1248	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1254	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1260	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
2-chloronaphthalene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
PHTHALATE ESTERS (mg/kg)								
bis (2-ethylhexyl) phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-butyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-octyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
dimethyl phthalate	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
n-butyl benzyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
diethyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0

APPENDIX G.3
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	7	7	7b	7b	7b	7b
Fish Species	CARP WHOLE	CARP FILET	SMALL-MOUTH BASS WHOLE	SMALL-MOUTH BASS FILET	CARP WHOLE	CARP FILET
Date	05/17/95	05/17/95	05/18/95	05/18/95	05/18/95	05/18/95
Number of Fish Per Sample	1	1	2	2	1	1
CONVENTIONAL						
lipid content (%)	4.4	1.6	10.4	1.6	6.0	9.6
METALS (mg/kg)						
aluminum	< 1.0	< 1.0	**1.9**	< 0.93	**10.9**	**4.3**
antimony	< 0.24	< 0.24	< 0.22	0.23	< 0.24	< 0.24
arsenic	< 0.06	< 0.06	< 0.06	< 0.06	< 0.05	< 0.05
beryllium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cadmium	< 0.02	**0.05**	< 0.01	< 0.01	< 0.02	< 0.02
chromium	< 0.04	**0.06**	< 0.04	< 0.04	**0.07**	**0.05**
copper	**1.7**	**2.3**	**0.69**	**0.18**	**1.2**	**1.4**
lead	**0.20**	**0.26**	**0.14**	**0.14**	**0.21**	**0.18**
mercury	**0.14**	**0.09**	**0.37**	**0.47**	< 0.03	**0.04**
nickel	< 0.10	< 0.10	< 0.09	< 0.09	< 0.10	< 0.10
selenium	**0.62**	**1.3**	**0.30**	**0.37**	**0.37**	**0.24**
silver	< 0.14	< 0.14	< 0.13	< 0.13	< 0.14	< 0.14
thallium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
zinc	**8.4**	**59.2**	**7.4**	**4.1**	**31.5**	**45**
OTHER INORGANICS (mg/kg)						
cyanide	**10.3**	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PHENOLS AND CRESOLS (mg/kg)						
parachlorometa cresol	nr	nr	nr	nr	nr	nr

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	7	7	7b	7b	7b	7b
Fish Species	CARP WHOLE	CARP FILET	SMALL-MOUTH BASS WHOLE	SMALL-MOUTH BASS FILET	CARP WHOLE	CARP FILET
Phenols and Cresols (cont)						
pentachlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
phenol (C_6H_5OH) single compound	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
phenolics recoverable	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-chlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2-nitrophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dichlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dimethylphenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dinitrophenol	< 10	< 4.0	< 10	< 4.0	< 10	< 4.0
2,4,6-trichlorophenol	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-nitrophenol	< 10	< 4.0	< 10	< 4.0	< 10	< 4.0
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr
ETHERS (mg/kg)						
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
bis (2-chloroethyl) ether	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
bis (2-chloroisopropyl)ether	< 5.0	< 10	< 5.0	< 10	< 5.0	< 1.0
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 5.0	< 10	< 5.0	< 10	< 5.0	< 1.0
4-chlorophenyl phenyl ether	< 5.0	< 10	< 5.0	< 1.0	< 5.0	< 1.0
HALOGENATED ALIPHATICS (Fg/kg)						
bromodichloromethane	< 20	< 20	< 20	< 18	< 17	< 20
bromoform	< 20	< 20	20	< 18	< 17	< 20

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	7	7	7b	7b	7b	7b
Fish Species	CARP WHOLE	CARP FILET	SMALL-MOUTH BASS WHOLE	SMALL-MOUTH BASS FILET	CARP WHOLE	CARP FILET
Halogenated Aliphatics (cont)						
carbon tetrachloride	< 20	< 20	< 20	< 18	< 17	< 20
chloroethane	< 50	< 50	< 51	< 45	< 43	< 50
chloroform	< 20	< 20	< 20	< 18	**50**	**23**
dibromochloromethane	< 20	< 20	< 20	< 18	< 17	< 20
dichlorodifluormethane	< 50	< 50	< 51	< 45	< 43	< 50
hexachlorobutadiene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
hexachlorocyclopentadiene (mg/kg)	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0
hexachloroethane (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
methyl bromide	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr
methylene chloride	< 20	< 20	< 20	< 18	< 17	< 20
tetrachloroethylene	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 20	< 20	< 20	< 18	< 17	< 99
vinyl chloride	< 50	< 50	< 51	< 45	< 43	< 50
1,1-dichloroethane	< 20	< 20	< 20	< 18	< 17	< 20
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 20	< 20	< 20	< 18	< 17	< 20
1,1,2-trichloroethane	< 20	< 20	< 20	< 18	< 17	< 20
1,1,2,2-tetrachloroethane	< 20	< 20	< 20	< 18	< 17	< 20
1,2-dichloroethane	< 20	< 20	< 20	< 18	< 17	< 20
1,2-dichloropropane	< 20	< 20	< 20	< 18	< 17	< 20

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	7	7	7b	7b	7b	7b
Fish Species	CARP WHOLE	CARP FILET	SMALL-MOUTH BASS WHOLE	SMALL-MOUTH BASS FILET	CARP WHOLE	CARP FILET
Halogenated Aliphatics (cont)						
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 20	< 20	< 20	< 18	< 17	< 20
1,3-trans-dichloropropene	< 20	< 20	< 20	< 187	< 17	< 20
POLYCYCLIC AROMATIC HYDROCARBONS (mg/kg)						
acenaphthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
acenaphthylene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
anthracene/phenanthrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (a) anthracene 1,2-benzanthracene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (b) fluoroanthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (GHI) perylene 1,12-benzoperylene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (k) fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo-a-pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
chrysene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluorene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
indeno (1,2,3-CD) pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
naphthalene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	7	7	7b	7b	7b	7b
Fish Species	CARP WHOLE	CARP FILET	SMALL-MOUTH BASS WHOLE	SMALL-MOUTH BASS FILET	CARP WHOLE	CARP FILET
MONOCYCLIC AROMATICS (Fg/kg)						
benzene	< 20	< 20	< 20	< 18	**27**	**25**
chlorobenzene	< 20	< 20	< 20	< 18	< 17	< 20
ethylbenzene	< 20	< 20	< 20	< 18	< 17	< 20
hexachlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
nitrobenzene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
styrene	< 20	< 20	< 20	< 18	< 17	< 20
toluene	< 20	< 20	< 20	< 18	**25**	**22**
xylene	< 20	< 20	< 20	< 18	< 17	< 40
1,2-dichlorobenzene	< 20	< 50	< 51	< 45	< 43	< 20
1,2,4-trichlorobenzene	< 20	< 50	< 51	< 45	< 43	< 50
1,3-dichlorobenzene	< 20	< 50	< 51	< 45	< 43	< 50
1,4-dichlorobenzene	< 20	< 50	< 51	< 45	< 43	< 50
2,4-dinitrotoluene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,6-dinitrotoluene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
NITROSAMINES AND OTHER N COMPOUNDS (mg/kg)						
acrylonitrile (Fg/kg)	< 100	< 100	< 102	< 89	< 87	< 99
benzidine	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
nitrosodimethylamine	na	na	na	na	na	na
n-nitrosodiphenylamine	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	7	7	7b	7b	7b	7b
Fish Species	CARP WHOLE	CARP FILET	SMALL-MOUTH BASS WHOLE	SMALL-MOUTH BASS FILET	CARP WHOLE	CARP FILET
PESTICIDES (Fg/kg)						
acrolein	nr	nr	nr	nr	nr	nr
aldicarb	nr	nr	nr	nr	nr	nr
aldrin	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
alpha benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
atrazine	< 100	< 100	< 100	< 100	< 100	< 100
beta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
carbaryl	nr	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr	nr
chlordane	< 20	< 20	< 20	< 20	< 20	< 20
chlorfenvinphos	nr	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr	nr
chlorpyrifos	< 10	< 10	< 10	< 10	< 10	< 10
chlorsulfuron	nr	nr	nr	nr	nr	nr
DDD	< 10	< 10	**14**	< 10	< 10	< 10
DDE	**54**	**53**	**100**	**48**	**14**	**25**
DDT	< 10	< 10	< 10	< 10	< 10	< 10
delta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
demeton	nr	nr	nr	nr	nr	nr
diazinon	< 10	< 10	< 10	< 10	< 10	< 10
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr
dicamba	nr	nr	nr	nr	nr	nr
2,4-dichlorophenoxyacetic acid (2,4-D)	nr	nr	nr	nr	nr	nr
dicofol (kelthane)	nr	nr	nr	nr	nr	< 100

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	7	7	7b	7b	7b	7b
Fish Species	CARP WHOLE	CARP FILET	SMALL-MOUTH BASS WHOLE	SMALL-MOUTH BASS FILET	CARP WHOLE	CARP FILET
Pesticides (cont)						
dicrotophos	nr	nr	nr	nr	nr	nr
dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
dinoseb	nr	nr	nr	nr	nr	nr
endosulfan alpha	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan beta	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan sulfate	< 10	< 10	< 10	< 10	< 10	< 10
endrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
endrin aldehyde	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
fenthion (baytex)	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
guthion	nr	nr	nr	nr	nr	nr
heptachlor	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
heptachlor epoxide	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
isophorone (mg/kg)	< 10	< 1.0	< 10	< 1.0	< 10	< 1.0
malathion	< 20	< 20	< 20	< 20	< 20	< 20
metsulfuron	nr	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr	nr
methoxychlor	< 30	< 30	< 30	< 30	< 30	< 30
metolachlor	< 35	< 35	< 35	< 35	< 35	< 35
mirex	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
parathion	< 10	< 10	< 10	< 10	< 10	< 10
picloram	nr	nr	nr	nr	nr	nr
prometon	nr	nr	nr	nr	nr	nr

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	7	7	7b	7b	7b	7b
Fish Species	CARP WHOLE	CARP FILET	SMALL-MOUTH BASS WHOLE	SMALL-MOUTH BASS FILET	CARP WHOLE	CARP FILET
Pesticides (cont)						
simazine	< 100	< 100	< 100	< 100	< 100	< 100
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr
toxaphene	< 100	< 100	< 100	< 100	< 100	< 100
2,4,5-TP (silvex)	nr	nr	nr	nr	nr	nr
PCBs and RELATED COMPOUNDS (Fg/kg)						
aroclor 1016	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1221	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1232	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1242	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1248	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1254	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1260	< 40	< 40	< 40	< 40	< 40	< 40
2-chloronaphthalene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
PHTHALATE ESTERS (mg/kg)						
bis (2-ethylhexyl) phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-butyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-octyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
dimethyl phthalate	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
n-butyl benzyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
diethyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0

APPENDIX G.3
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	8	8	9	9	10	10
Fish Species	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Date	05/18/95	05/18/95	05/17/95	05/17/95	05/17/95	05/17/95
Number of Fish Per Sample	1	1	1	1	1	1
CONVENTIONAL						
lipid content (%)	3.2	0.4	2.8	is	1.2	0.4
METALS (mg/kg)						
aluminum	**2.5**	< 0.90	**0.96**	**0.31**	< 0.96	**0.16**
antimony	< 0.24	< 0.24	< 0.15	< 0.16	< 0.23	< 0.16
arsenic	< 0.06	< 0.06	< 0.06	< 0.05	< 0.06	**1.5**
beryllium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cadmium	< 0.02	< 0.02	< 0.006	< 0.004	< 0.02	< 0.004
chromium	**0.10**	< 0.04	**0.15**	**0.08**	**0.23**	< 0.04
copper	**1.4**	**0.36**	**0.66**	**0.23**	**0.87**	**0.21**
lead	**0.16**	**0.15**	< 0.11	< 0.11	**0.18**	< 0.11
mercury	< 0.04	0.14	0.29	**0.50**	**0.34**	**0.74**
nickel	< 0.10	< 0.10	< 0.10	**0.75**	< 0.27	< 0.10
selenium	**0.38**	**0.21**	**0.28**	**0.25**	0.43	**0.32**
silver	< 0.14	< 0.14	< 0.13	< 0.14	< 0.14	< 0.13
thallium	< 0.05	< 0.05	0.06	0.06	< 0.05	< 0.05
zinc	**35.7**	**6.5**	**12.2**	**5.3**	**10.7**	**6.8**
OTHER INORGANICS (mg/kg)						
cyanide	< 1.0	< 1.0	< 1.0	is	< 1.0	< 1.0
PHENOLS AND CRESOLS (mg/kg)						
parachlorometa cresol	nr	nr	nr	nr	nr	nr

ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	8	8	9	9	10	10
Fish Species	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Phenols and Cresols (cont)						
pentachlorophenol	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
phenol (C_6H_5OH) single compound	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
phenolics recoverable	< 0.50	< 0.50	< 0.50	is	< 0.50	< 0.50
2-chlorophenol	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
2-nitrophenol	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dichlorophenol	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dimethylphenol	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dinitrophenol	< 4.0	< 4.0	< 10	< 4.0	< 10	< 4.0
2,4,6-trichlorophenol	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-nitrophenol	< 4.0	< 4.0	< 10	< 4.0	< 10	< 4.0
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr
ETHERS (mg/kg)						
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
bis (2-chloroethyl) ether	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
bis (2-chloroisopropyl)ether	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-chlorophenyl phenyl ether	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
HALOGENATED ALIPHATICS (Fg/kg)						
bromodichloromethane	< 17	< 19	< 18	< 19	< 20	< 20
bromoform	< 17	< 19	< 18	< 19	< 20	< 20

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	8	8	9	9	10	10
Fish Species	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Halogenated Aliphatics (cont)						
carbon tetrachloride	< 17	< 19	< 18	< 19	< 20	< 20
chloroethane	< 41	< 47	< 46	< 48	< 51	< 50
chloroform	< 17	< 19	< 18	< 19	< 20	< 20
dibromochloromethane	< 17	< 19	< 18	< 19	< 20	< 20
dichlorodifluormethane	< 41	< 47	< 46	< 48	< 51	< 50
hexachlorobutadiene (mg/kg)	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
hexachlorocyclopentadiene (mg/kg)	< 4.0	< 4.0	< 20	< 4.0	< 20	< 4.0
hexachloroethane (mg/kg)	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
methyl bromide	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr
methylene chloride	< 17	< 19	< 18	< 19	< 20	< 20
tetrachloroethylene	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 17	< 19	< 18	< 19	< 20	< 100
vinyl chloride	< 41	< 47	< 46	< 48	< 51	< 50
1,1-dichloroethane	< 17	< 19	< 18	< 19	< 20	< 20
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 17	< 19	< 18	< 19	< 20	< 20
1,1,2-trichloroethane	< 17	< 19	< 18	< 19	< 20	< 20
1,1,2,2-tetrachloroethane	< 17	< 19	< 18	< 19	< 20	< 20
1,2-dichloroethane	< 17	< 19	< 18	< 19	< 20	< 20
1,2-dichloropropane	< 17	< 19	< 18	< 19	< 20	< 20

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	8	8	9	9	10	10
Fish Species	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Halogenated Aliphatics (cont)						
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 17	< 19	< 18	< 19	< 20	< 20
1,3-trans-dichloropropene	< 17	< 19	< 18	< 19	< 20	< 20
POLYCYCLIC AROMATIC HYDROCARBONS (mg/kg)						
acenaphthene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
acenaphthylene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
anthracene/phenanthrene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (a) anthracene 1,2-benzanthracene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (b) fluoroanthene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (GHI) perylene 1,12-benzoperylene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (k) fluoranthene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo-a-pyrene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
chrysene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluoranthene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluorene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
indeno (1,2,3-CD) pyrene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
naphthalene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
pyrene	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	8	8	9	9	10	10
Fish Species	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
MONOCYCLIC AROMATICS (Fg/kg)						
benzene	< 17	< 19	< 18	< 19	< 20	< 20
chlorobenzene	< 17	< 19	< 18	< 19	< 20	< 20
ethylbenzene	< 17	< 19	< 18	< 19	< 20	< 20
hexachlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
nitrobenzene (mg/kg)	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
styrene	< 17	< 19	< 18	< 19	< 20	< 20
toluene	< 17	< 19	< 18	< 19	< 20	< 20
xylene	< 17	< 19	< 18	< 19	< 20	< 20
1,2-dichlorobenzene	< 17	< 19	< 18	< 19	< 20	< 20
1,2,4-trichlorobenzene	< 17	< 19	< 18	< 19	< 20	< 20
1,3-dichlorobenzene	< 17	< 19	< 18	< 19	< 20	< 20
1,4-dichlorobenzene	< 17	< 19	< 18	< 19	< 20	< 20
2,4-dinitrotoluene (mg/kg)	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
2,6-dinitrotoluene (mg/kg)	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
NITROSAMINES AND OTHER N COMPOUNDS (mg/kg)						
acrylonitrile (Fg/kg)	< 83	< 93	< 92	< 97	< 101	< 100
benzidine	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
n-nitrosodimethylamine	na*	na*	na*	na*	na*	na*
n-nitrosodiphenylamine	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 4.0	< 4.0	< 20	< 4.0	< 20	< 4.0

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	8	8	9	9	10	10
Fish Species	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
PESTICIDES (Fg/kg)						
acrolein	nr	nr	nr	nr	nr	nr
aldicarb	nr	nr	nr	nr	nr	nr
aldrin	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
alpha benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
atrazine	< 100	< 100	< 100	< 100	nr	nr
beta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
carbaryl	nr	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr	nr
chlordane	< 20	< 20	< 20	< 20	< 20	< 20
chlorfenvinphos	nr	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr	nr
chlorpyrifos	< 10	< 10	< 10	< 10	< 10	< 10
chlorsulfuron	nr	nr	nr	nr	nr	nr
DDD	< 10	< 10	< 10	< 10	< 10	< 10
DDE	**4.7**	< 5.0	**83**	**5.2**	**73**	**17**
DDT	< 10	< 10	< 10	< 10	< 10	< 10
delta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
demeton	nr	nr	nr	nr	nr	nr
diazinon	< 10	< 10	< 10	< 10	< 10	< 10
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr
dicamba	nr	nr	nr	nr	nr	nr
2,4-dichlorophenoxyacetic acid (2,4-D)	nr	nr	nr	nr	nr	nr
dicofol (kelthane)	nr	< 100	nr	nr	nr	nr

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	8	8	9	9	10	10
Fish Species	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Pesticides (cont)						
dicrotophos	nr	nr	nr	nr	nr	nr
dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
dinoseb	nr	nr	nr	nr	nr	nr
endosulfan alpha	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan beta	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan sulfate	< 10	< 10	< 10	< 10	< 10	< 10
endrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
endrin aldehyde	ND	< 4.0	ND	ND	ND	ND
fenthion (baytex)	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
guthion	nr	nr	nr	nr	nr	nr
heptachlor	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
heptachlor epoxide	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
isophorone (mg/kg)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
malathion	< 20	< 20	< 20	< 20	< 20	< 20
metsulfuron	nr	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr	nr
methoxychlor	< 30	< 30	< 30	< 30	< 30	< 30
metolachlor	nr	< 35	nr	nr	nr	nr
mirex	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
parathion	< 10	< 10	< 10	< 10	< 10	< 10
picloram	nr	nr	nr	nr	nr	nr
prometon	nr	nr	nr	nr	nr	nr

APPENDIX G.3 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
International Amistad Reservoir-
Eagle Pass/Piedras Negras Reach

LOCATION	8	8	9	9	10	10
Fish Species	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Pesticides (cont)						
simazine	nr	< 100	nr	nr	nr	nr
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr
toxaphene	< 100	< 100	< 100	< 100	< 100	< 100
2,4,5-TP (silvex)	nr	nr	nr	nr	nr	nr
PCBs and RELATED COMPOUNDS (Fg/kg)						
aroclor 1016	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1221	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1232	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1242	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1248	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1254	< 40	< 40	**120**	< 40	< 40	< 40
aroclor 1260	< 40	< 40	< 40	< 40	< 40	< 40
2-chloronaphthalene (mg/kg)	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
PHTHALATE ESTERS (mg/kg)						
bis (2-ethylhexyl) phthalate	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-butyl phthalate	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-octyl phthalate	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
dimethyl phthalate	< 2.0	< 2.0	< 10	< 2.0	< 10	< 2.0
n-butyl benzyl phthalate	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
diethyl phthalate	< 1.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0

APPENDIX G.4
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	11	11	12	12	12	12	12.1	12.1
Fish Species	CARP WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Date	06/08/95	06/08/95	06/07/95	06/07/95	06/07/95	06/07/95	06/07/95	06/07/95
Number of Fish Per Sample	1	1	2	2	3	2	2	2
CONVENTIONALS								
lipid content (%)	6.0	0.1	0.8	2.4	6.0	10.0	0.8	0.1
METALS (mg/kg)								
aluminum	**1.2**	< 0.79	**0.85**	< 0.77	**6.9**	< 0.74	< 0.77	< 0.80
antimony	< 0.20	< 0.20	< 0.19	< 0.19	< 0.20	< 0.19	< 0.19	< 0.20
arsenic	< 0.05	**0.69**	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
beryllium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cadmium	< 0.01	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
chromium	< 0.04	< 0.04	**0.11**	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
copper	**1.4**	**0.47**	**0.39**	**0.17**	**0.52**	**0.25**	**0.24**	**0.16**
lead	< 0.11	< 0.11	< 0.11	< 0.11	< 0.11	< 0.11	< 0.11	< 0.11
mercury	**0.03**	**1.2**	**0.51**	**0.73**	**0.12**	**0.12**	**0.27**	**0.54**
nickel	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.09	< 0.10	< 0.10
selenium	**0.48**	**0.34**	**0.54**	**0.29**	**0.33**	**0.12**	**0.44**	**0.22**
silver	< 0.14	< 0.14	< 0.13	< 0.13	< 0.14	< 0.13	< 0.13	< 0.14
thallium	< 0.05	< 0.05	< 0.04	< 0.04	< 0.05	0.06	0.28	< 0.05
zinc	**75.6**	**4.1**	**10.1**	**4.0**	**14.3**	**7.3**	**10.1**	**4.1**
OTHER INORGANICS (mg/kg)								
cyanide	< 1.0	11.2	< 1.0	< 1.0	< 1.0	**10.3**	< 1.0	**3.3**
PHENOLS AND CRESOLS (mg/kg)								
parachlorometa cresol	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	11	11	12	12	12	12	12.1	12.1
Fish Species	CARP WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Phenols and Cresols (cont)								
pentachlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
phenol (C_6H_5OH) single compound	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	**1.1**
phenolics recoverable	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-chlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2-nitrophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dichlorophenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dimethylphenol	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,4-dinitrophenol	< 10	< 4.0	< 10	< 4.0	< 10	< 4.0	< 10	< 4.0
2,4,6-trichlorophenol	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-nitrophenol	< 10	< 4.0	< 10	< 4.0	< 10	< 2.0	< 10	< 4.0
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr	nr	nr
ETHERS (Fg/L)								
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
bis (2-chloroethyl) ether	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
bis (2-chloroisopropyl)ether	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
4-chlorophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
HALOGENATED ALIPHATICS (Fg/kg)								
bromodichloromethane	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
bromoform	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	11	11	12	12	12	12	12.1	12.1
Fish Species	CARP WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Halogenated Aliphatics (cont)								
carbon tetrachloride	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
chloroethane	< 49	< 38	< 49	< 46	< 49	< 50	< 49	< 48
chloroform	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
dibromochloromethane	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
dichlorodifluormethane	< 49	< 38	< 49	< 46	< 49	< 50	< 49	< 48
hexachlorobutadiene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
hexachlorocyclopentadiene (mg/kg)	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0
hexachloroethane (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
methyl bromide	nr	nr	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr	nr	nr
methylene chloride	< 49	< 15	< 49	< 46	< 49	< 20	**26**	< 19
tetrachloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 98	< 15	< 98	< 91	< 98	< 100	< 98	< 96
vinyl chloride	< 49	< 38	< 49	< 46	< 49	< 50	< 49	< 48
1,1-dichloroethane	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
1,1,2-trichloroethane	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
1,1,2,2-tetrachloroethane	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
1,2-dichloroethane	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
1,2-dichloropropane	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	11	11	12	12	12	12	12.1	12.1
Fish Species	CARP WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Halogenated Aliphatics (cont)								
1,3-trans-dichloropropene	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
POLYCYCLIC AROMATIC HYDROCARBONS (mg/kg)								
acenaphthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
acenaphthylene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
anthracene/phenanthrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (a) anthracene 1,2-benzanthracene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (b) fluoroanthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (GHI) perylene 1,12-benzoperylene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo (k) fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
benzo-a-pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
chrysene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
fluorene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
indeno (1,2,3-CD) pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
naphthalene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fgkg)								
benzene	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
chlorobenzene	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	11	11	12	12	12	12	12.1	12.1
Fish Species	CARP WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Monocyclic Aromatics (cont)								
ethylbenzene	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
hexachlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
nitrobenzene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
styrene	< 20	< 15	< 20	< 18	< 20	< 20	< 20	< 19
toluene	< 20	< 15	< 20	< 18	**27**	< 20	< 20	< 19
xylene	< 20	< 15	< 39	< 36	< 39	< 40	< 39	< 39
1,2-dichlorobenzene	< 49	< 15	< 49	< 46	< 49	< 50	< 49	< 48
1,2,4-trichlorobenzene	< 49	< 15	< 49	< 46	< 49	< 50	< 49	< 48
1,3-dichlorobenzene	< 49	< 15	< 49	< 46	< 49	< 50	< 49	< 48
1,4-dichlorobenzene	< 49	< 15	< 49	< 46	< 49	< 50	< 49	< 48
2,4-dinitrotoluene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
2,6-dinitrotoluene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
NITROSAMINES AND OTHER N COMPOUNDS (mg/kg)								
acrylonitrile (Fg/kg)	< 98	< 75	< 98	< 91	< 98	< 100	< 98	< 96
benzidine	ND	ND	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
n-nitrosodimethylamine	na*	na*	na*	na*	na*	na*	na*	na*
n-nitrosodiphenylamine	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0	< 20	< 4.0
PESTICIDES (Fg/kg)								
acrolein	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	11	11	12	12	12	12	12.1	12.1
Fish Species	CARP WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Pesticides (cont)								
aldicarb	nr	nr	nr	nr	nr	nr	nr	nr
aldrin	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
alpha benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
atrazine	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
beta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
carbaryl	nr	nr	nr	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr	nr	nr	nr
chlordane	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
chlorfenvinphos	nr	nr	nr	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr	nr	nr	nr
chlorpyrifos	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
chlorsulfuron	nr	nr	nr	nr	nr	nr	nr	nr
DDD	< 10	< 10	< 10	< 10	< 10	**25**	< 10	< 10
DDE	**150**	**13**	**240**	**38**	**150**	**130**	**150**	**6.6**
DDT	< 10	< 10	< 10	< 10	**35**	**34**	< 10	< 10
delta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
demeton	nr	nr	nr	nr	nr	nr	nr	nr
diazinon	< 10	< 10	< 10	< 10	< 10	< 10	**25**	< 10
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr	nr	nr
dicamba	nr	nr	nr	nr	nr	nr	nr	nr
2,4-dichlorophenoxyacetic acid (2,4-D)	nr	nr	nr	nr	nr	nr	nr	nr
dicofol (kelthane)	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
dicrotophos	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	11	11	12	12	12	12	12.1	12.1
Fish Species	CARP WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Pesticides (cont)								
dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	**9.3**	< 6.0	< 6.0	< 6.0
dinoseb	nr	nr	nr	nr	nr	nr	nr	nr
endosulfan alpha	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan beta	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan sulfate	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
endrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
endrin aldehyde	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
fenthion (baytex)	nr	nr	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
guthion	nr	nr	nr	nr	nr	nr	nr	nr
heptachlor	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
heptachlor epoxide	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
isophorone (mg/kg)	< 10	< 1.0	< 10	< 1.0	< 10	< 1.0	< 10	< 1.0
malathion	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20
metsulfuron	nr	nr	nr	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr	nr	nr	nr
methoxychlor	< 30	< 30	< 30	< 30	< 30	< 30	< 30	< 30
metolachlor	< 35	< 35	< 35	< 35	< 35	< 35	< 35	< 35
mirex	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
parathion	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
picloram	nr	nr	nr	nr	nr	nr	nr	nr
prometon	nr	nr	nr	nr	nr	nr	nr	nr
simazine	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr	nr	nr

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	11	11	12	12	12	12	12.1	12.1
Fish Species	CARP WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH WHOLE	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Pesticides (cont)								
toxaphene	< 100	< 100	< 100	< 100	< 100	< 100	< 100	< 100
2,4,5-TP (silvex)	nr	nr	nr	nr	nr	nr	nr	nr
PCBs and RELATED COMPOUNDS (Fg/kg)								
aroclor 1016	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1221	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1232	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1242	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1248	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1254	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1260	< 40	< 40	< 40	< 40	< 40	< 40	< 40	< 40
2-chloronaphthalene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
PHTHALATE ESTERS (mg/kg)								
bis (2-ethylhexyl) phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-butyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
di-n-octyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
dimethyl phthalate	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0	< 10	< 2.0
n-butyl benzyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0
diethyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0	< 5.0	< 1.0

APPENDIX G.4
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	12.1	12.1	12.2	12.2	12.2	12.3	12.3
Fish Species	CHANNEL CATFISH WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	BLUE CATFISH WHOLE	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Date	06/07/95	06/07/95	06/05/95	06/05/95	06/05/95	06/05/95	06/05/95
Number of Fish Per Sample	1	2	2	2	1	3	3
CONVENTIONALS							
lipid content (%)	4.0	1.6	2.0	0.4	10.8	4.8	0.3
METALS (mg/kg)							
aluminum	**0.75**	< 0.79	**0.74**	< 0.80	**1.4**	**1.6**	< 0.76
antimony	< 0.18	< 0.20	< 0.18	< 0.20	< 0.22	< 0.19	< 0.19
arsenic	< 0.05	< 0.05	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
beryllium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cadmium	< 0.004	< 0.004	< 0.004	< 0.004	< 0.01	**0.004**	< 0.004
chromium	**0.10**	< 0.04	0.11	< 0.04	< 0.04	0.04	< 0.04
copper	**0.35**	**0.52**	**1.0**	**0.22**	**0.23**	**0.35**	**0.16**
lead	< 0.10	0.11	< 0.10	< 0.11	**0.24**	< 0.11	< 0.11
mercury	**0.10**	**0.34**	**0.05**	**0.09**	**0.07**	< 0.04	**0.11**
nickel	< 0.09	< 0.10	< 0.09	< 0.10	< 0.09	< 0.10	< 0.09
selenium	**0.27**	**0.35**	**0.34**	**0.36**	**0.11**	**0.37**	**0.32**
silver	< 0.13	< 0.14	< 0.13	< 0.14	< 0.13	< 0.14	< 0.13
thallium	**0.06**	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.06
zinc	**3.2**	**42.8**	**69.2**	< 1.0	**9.2**	**10.5**	**4.2**
OTHER INORGANICS (mg/kg)							
cyanide	**3.2**	**42.8**	**69.2**	< 1.0	< 1.0	**87.8**	**19.9**
PHENOLS AND CRESOLS (mg/kg)							
parachlorometa cresol	nr	nr	nr	nr	nr	nr	nr
pentachlorophenol	< 10	< 2.0	< 10	< 2.0	< 50	< 10	< 10

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	12.1	12.1	12.2	12.2	12.2	12.3	12.3
Fish Species	CHANNEL CATFISH WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	BLUE CATFISH WHOLE	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Phenols and Cresols (cont)							
phenol (C_6H_5OH) single compound	< 10	< 2.0	< 10	< 2.0	< 50	< 10	< 10
phenolics recoverable	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-chlorophenol	< 10	< 2.0	< 10	< 2.0	< 50	< 10	< 10
2-nitrophenol	< 10	< 2.0	< 10	< 4.0	< 50	< 20	< 10
2,4-dichlorophenol	< 10	< 2.0	< 10	< 2.0	< 50	< 20	< 10
2,4-dimethylphenol	< 10	< 2.0	< 10	< 2.0	< 50	< 20	< 10
2,4-dinitrophenol	< 10	< 4.0	< 10	< 4.0	< 100	< 20	< 10
2,4,6-trichlorophenol	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
4-nitrophenol	< 10	< 4.0	< 10	< 4.0	< 100	< 20	< 10
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr	nr
ETHERS (Fg/L)							
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
bis (2-chloroethyl) ether	< 10	< 2.0	< 10	< 2.0	< 50	< 10	< 10
bis (2-chloroisopropyl)ether	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
4-chlorophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
HALOGENATED ALIPHATICS (Fg/kg)							
bromodichloromethane	< 19	< 19	< 19	< 20	< 17	< 20	< 19
bromoform	< 19	< 19	< 19	< 20	< 17	< 20	< 19

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	12.1	12.1	12.2	12.2	12.2	12.3	12.3
Fish Species	CHANNEL CATFISH WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	BLUE CATFISH WHOLE	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Halogenated Aliphatics (cont)							
carbon tetrachloride	< 19	< 19	< 19	< 20	< 17	< 20	< 19
chloroethane	< 48	< 48	< 48	< 49	< 44	< 50	< 49
chloroform	< 19	< 19	< 19	< 20	< 17	< 20	< 19
dibromochloromethane	< 19	< 19	< 19	< 20	< 17	< 20	< 19
dichlorodifluormethane	< 48	< 48	< 48	< 49	< 44	< 50	< 49
hexachlorobutadiene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 50	< 10	< 10
hexachlorocyclopentadiene (mg/kg)	< 20	< 4.0	< 20	< 4.0	< 100	< 20	< 20
hexachloroethane (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 50	< 10	< 10
methyl bromide	nr	nr	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr	nr	nr
methylene chloride	< 19	< 19	< 19	< 49	**66**	< 20	< 19
tetrachloroethylene	nr	nr	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr	nr	nr
trichlorofluoromethane	< 19	< 96	< 96	< 98	**93**	< 101	< 97
vinyl chloride	< 48	< 48	< 48	< 49	< 44	< 50	< 49
1,1-dichloroethane	< 19	< 19	< 19	< 20	< 17	< 20	< 19
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 19	< 19	< 19	< 20	< 17	< 20	< 19
1,1,2-trichloroethane	< 19	< 19	< 19	< 20	< 17	< 20	< 19
1,1,2,2-tetrachloroethane	< 19	< 19	< 19	< 20	< 17	< 20	< 19
1,2-dichloroethane	< 19	< 19	< 19	< 20	< 17	< 20	< 19
1,2-dichloropropane	< 19	< 19	< 19	< 20	< 17	< 20	< 19
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr	nr

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	12.1	12.1	12.2	12.2	12.2	12.3	12.3
Fish Species	CHANNEL CATFISH WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	BLUE CATFISH WHOLE	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Halogenated Aliphatics (cont)							
1,3-cis-dichloropropene	< 19	< 19	< 19	< 20	< 17	< 20	< 19
1,3-trans-dichloropropene	< 19	< 19	< 19	< 20	< 17	< 20	< 19
POLYCYCLIC AROMATIC HYDROCARBONS (mg/kg)							
acenaphthene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
acenaphthylene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
anthracene/phenanthrene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
benzo (a) anthracene 1,2-benzanthracene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
benzo (b) fluoroanthene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
benzo (GHI) perylene 1,12-benzoperylene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
benzo (k) fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
benzo-a-pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
chrysene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
fluorene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
indeno (1,2,3-CD) pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
naphthalene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
pyrene	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fgkg)							
benzene	< 19	< 19	< 19	< 20	< 17	< 20	< 19

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	12.1	12.1	12.2	12.2	12.2	12.3	12.3
Fish Species	CHANNEL CATFISH WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	BLUE CATFISH WHOLE	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Monocyclic Aromatics (cont)							
chlorobenzene	< 19	< 19	< 19	< 20	< 17	< 20	< 19
ethylbenzene	< 19	< 19	< 19	< 20	< 17	< 20	< 19
hexachlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
nitrobenzene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
styrene	< 19	< 19	< 19	< 20	< 17	< 20	< 19
toluene	< 19	< 19	< 19	< 17	< 20	< 20	< 19
xylene	< 19	< 19	< 19	< 17	< 20	< 20	< 19
1,2-dichlorobenzene	< 19	< 48	< 48	< 44	< 50	< 50	< 49
1,2,4-trichlorobenzene	< 19	< 48	< 48	< 44	< 50	< 50	< 49
1,3-dichlorobenzene	< 19	< 48	< 48	< 44	< 50	< 50	< 49
1,4-dichlorobenzene	< 19	< 48	< 48	< 44	< 50	< 50	< 49
2,4-dinitrotoluene (mg/kg)	< 10	< 2.0	< 10	< 50	< 10	< 10	< 10
2,6-dinitrotoluene (mg/kg)	< 5.0	< 1.0	< 5.0	< 25	< 5.0	< 5.0	< 5.0
NITROSAMINES AND OTHER N COMPOUNDS (mg/kg)							
acrylonitrile (Fg/kg)	< 96	< 96	< 96	< 87	< 101	< 101	< 97
benzidine	ND	ND	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
n-nitrosodimethylamine	na*	na*	na*	na*	na*	na*	na*
n-nitrosodiphenylamine	< 5.0	< 1.0	< 5.0	< 25	< 5.0	< 5.0	< 5.0
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 20	< 4.0	< 20	< 100	< 20	< 20	< 20

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	12.1	12.1	12.2	12.2	12.2	12.3	12.3
Fish Species	CHANNEL CATFISH WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	BLUE CATFISH WHOLE	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
PESTICIDES (Fg/kg)							
acrolein	nr	nr	nr	nr	nr	nr	nr
aldicarb	nr	nr	nr	nr	nr	nr	nr
aldrin	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
alpha benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
atrazine	< 100	< 100	< 100	< 100	< 100	< 100	< 100
beta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
carbaryl	nr	nr	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr	nr	nr
chlordane	< 20	< 20	**59**	< 20	< 20	< 20	< 20
chlorfenvinphos	nr	nr	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr	nr	nr
chlorpyrifos	< 10	< 10	< 10	< 10	< 10	< 10	< 10
chlorsulfuron	nr	nr	nr	nr	nr	nr	nr
DDD	**18**	< 10	**25**	< 10	**30**	**9.7**	< 10
DDE	**150**	**97**	**170**	**9.6**	**180**	**120**	**5.4**
DDT	**19**	< 10	< 10	< 10	< 10	< 10	< 10
delta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
demeton	nr	nr	nr	nr	nr	nr	nr
diazinon	< 10	< 10	< 10	< 10	< 10	< 10	< 10
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr	nr
dicamba	nr	nr	nr	nr	nr	nr	nr
2,4-dichlorophenoxyacetic acid (2,4-D)	nr	nr	nr	nr	nr	nr	nr
dicofol (kelthane)	< 100	< 100	< 100	< 100	< 100	< 100	< 100
dicrotophos	nr	nr	nr	nr	nr	nr	nr

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	12.1	12.1	12.2	12.2	12.2	12.3	12.3
Fish Species	CHANNEL CATFISH WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	BLUE CATFISH WHOLE	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Pesticides (cont)							
dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
dinoseb	nr	nr	nr	nr	nr	nr	nr
endosulfan alpha	< 10	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan beta	< 10	< 10	< 10	< 10	< 10	< 10	< 10
endosulfan sulfate	< 10	< 10	< 10	< 10	< 10	< 10	< 10
endrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0
endrin aldehyde	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
fenthion (baytex)	nr	nr	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
guthion	nr	nr	nr	nr	nr	nr	nr
heptachlor	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
heptachlor epoxide	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
isophorone (mg/kg)	< 10	< 1.0	< 10	< 1.0	< 25	< 5.0	< 10
malathion	< 20	< 20	< 20	< 20	< 20	< 20	< 20
metsulfuron	nr	nr	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr	nr	nr
methoxychlor	< 30	< 30	< 30	< 30	< 30	< 30	< 30
metolachlor	< 35	< 35	< 35	< 35	< 35	< 35	< 35
mirex	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
parathion	< 10	< 10	< 10	< 10	< 10	< 10	< 10
picloram	nr	nr	nr	nr	nr	nr	nr
prometon	nr	nr	nr	nr	nr	nr	nr
simazine	< 100	< 100	< 100	< 100	< 100	< 100	< 100
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr	nr

APPENDIX G.4 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Laredo/Nuevo Laredo-Falcon International Reservoir Reach

LOCATION	12.1	12.1	12.2	12.2	12.2	12.3	12.3
Fish Species	CHANNEL CATFISH WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	BLUE CATFISH WHOLE	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Pesticides (cont)							
toxaphene	< 100	< 100	< 100	< 100	< 100	< 100	< 100
2,4,5-TP (silvex)	nr	nr	nr	nr	nr	nr	nr
PCBs and RELATED COMPOUNDS (Fg/kg)							
aroclor 1016	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1221	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1232	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1242	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1248	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1254	< 40	< 40	< 40	< 40	< 40	< 40	< 40
aroclor 1260	< 40	< 40	< 40	< 40	< 40	< 40	< 40
2-chloronaphthalene (mg/kg)	< 10	< 2.0	< 10	< 2.0	< 50	< 10	< 10
PHTHALATE ESTERS (mg/kg)							
bis (2-ethylhexyl) phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
di-n-butyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
di-n-octyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
dimethyl phthalate	< 10	< 2.0	< 10	< 2.0	< 50	< 10	< 10
n-butyl benzyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0
diethyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	< 25	< 5.0	< 5.0

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
= exceeded hold time
= lab error
= reported below quantitation limit
= detected in blank
= common lab contaminant
= possible contamination
= degraded PCB pattern
is= insufficient sample

APPENDIX G.5
ORGANICS AND INORGANICS IN FISH TISSUE
Below Falcon International Reservoir-Brownsville/Matamoros

LOCATION	13	13	14	14	14	14	15	15
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	CHANNEL CATFISH WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Date	07/11/95	07/11/95	07/12/95	07/12/95	07/12/95	07/12/95	07/12/95	07/12/95
Number of Fish Per Sample	3	2	1	1	1	1	1	1
CONVENTIONALS							**9METALS ONLY9**	
lipid content (%)	0.4	0.4	is	3.6	0.3	is	na	na
METALS (mg/kg)								
aluminum	**0.87**	**0.84**	< 0.78	**15.8**	< 0.76	**0.84**	**2.2**	**0.96**
antimony	< 0.24	< 0.24	< 0.24	< 0.24	< 0.23	< 0.23	< 0.23	< 0.24
arsenic	< 0.06	< 0.06	< 0.05	< 0.05	< 0.06	< 0.06	< 0.05	< 0.05
beryllium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cadmium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
chromium	< 0.04	**0.04**	**0.07**	< 0.04	< 0.04	< 0.04	**0.09**	< 0.04
copper	**0.29**	**0.41**	**0.25**	**0.43**	**0.15**	**0.26**	**0.63**	**0.27**
lead	**0.11**	< 0.09	< 0.09	**0.20**	**0.09**	< 0.08	**0.54**	< 0.09
mercury	**0.11**	**0.28**	**0.08**	**0.03**	**0.66**	**0.06**	**0.07**	**0.31**
nickel	< 0.10	< 0.10	**0.16**	**0.11**	< 0.10	**0.16**	**0.12**	< 0.10
selenium	**0.14**	**0.14**	**0.21**	**0.35**	**0.32**	**0.10**	**0.27**	**0.12**
silver	< 0.14	< 0.14	< 0.14	< 0.14	< 0.13	< 0.13	< 0.14	< 0.14
thallium	**0.07**	**0.06**	< 0.05	**0.05**	< 0.05	< 0.05	< 0.05	< 0.05
zinc	**12.1**	**10.6**	**7.1**	**16.6**	**4.1**	**9.6**	**11.0**	**5.7**
OTHER INORGANICS (mg/kg)								
cyanide	< 1.0	< 1.0	is	2.0	2.0	is	- -	- -
PHENOLS AND CRESOLS (mg/kg)								
parachlorometa cresol	nr	nr	nr	nr	nr	nr	- -	- -
pentachlorophenol	< 10	< 2.0	< 10	< 10	< 2.0	< 2.0	- -	- -

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	13	13	14	14	14	14	15	15
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	CHANNEL CATFISH WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Phenols and Cresols (cont)								
phenol (C_6H_5OH) single compound	< 10	< 2.0	< 10	< 10	< 2.0	< 2.0	- -	- -
phenolics recoverable	< 0.50	< 0.50	is	< 0.50	< 0.50	is	- -	- -
2-chlorophenol	< 10	< 2.0	< 10	< 10	< 2.0	< 2.0	- -	- -
2-nitrophenol	< 10	< 2.0	< 10	< 10	< 2.0	< 2.0	- -	- -
2,4-dichlorophenol	< 10	< 2.0	< 10	< 10	< 2.0	< 2.0	- -	- -
2,4-dimethylphenol	< 10	< 2.0	< 10	< 10	< 2.0	< 2.0	- -	- -
2,4-dinitrophenol	< 10	< 4.0	< 10	< 10	< 4.0	< 4.0	- -	- -
2,4,6-trichlorophenol	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
4-nitrophenol	< 10	< 4.0	< 10	< 10	< 4.0	< 4.0	- -	- -
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr	nr	- -	- -
ETHERS (Fg/L)								
bis (chloromethyl) ether	nr	nr	nr	nr	nr	nr	- -	- -
bis (2-chloroethyoxy) methane	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
bis (2-chloroethyl) ether	< 10	< 2.0	< 10	< 10	< 2.0	< 2.0	- -	- -
bis (2-chloroisopropyl)ether	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr	nr	- -	- -
4-bromophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
4-chlorophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
HALOGENATED ALIPHATICS (Fg/kg)								
bromodichloromethane	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
bromoform	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
carbon tetrachloride	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	13	13	14	14	14	14	15	15
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	CHANNEL CATFISH WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Halogenated Aliphatics (cont)								
chloroethane	< 50	< 50	< 50	< 50	< 50	< 50	- -	- -
chloroform	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
dibromochloromethane	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
dichlorodifluormethane	< 50	< 50	< 50	< 50	< 50	< 50	- -	- -
hexachlorobutadiene (mg/kg)	< 10	< 2.0	< 10	< 10	< 2.0	< 2.0	- -	- -
hexachlorocyclopentadiene (mg/kg)	< 20	< 4.0	< 20	< 20	< 4.0	< 4.0	- -	- -
hexachloroethane (mg/kg)	< 10	< 2.0	< 20	< 20	< 4.0	< 4.0	- -	- -
methyl bromide	nr	nr	nr	nr	nr	nr	- -	- -
methyl chloride	nr	nr	nr	nr	nr	nr	- -	- -
methylene chloride	< 50	< 50	< 50	< 50	< 50	< 50	- -	- -
tetrachloroethylene	nr	nr	nr	nr	nr	nr	- -	- -
trichloroethylene	nr	nr	nr	nr	nr	nr	- -	- -
trichlorofluoromethane	< 100	< 100	< 100	< 100	< 100	< 100	- -	- -
vinyl chloride	< 50	< 50	< 50	< 50	< 50	< 50	- -	- -
1,1-dichloroethane	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
1,1-dichloroethylene	nr	nr	nr	nr	nr	nr	- -	- -
1,1,1-trichloroethane	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
1,1,2-trichloroethane	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
1,1,2,2-tetrachloroethane	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
1,2-dichloroethane	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
1,2-dichloropropane	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr	nr	- -	- -
1,3-cis-dichloropropene	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	13	13	14	14	14	14	15	15
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	CHANNEL CATFISH WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Halogenated Aliphatics (cont)								
1,3-trans-dichloropropene	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
POLYCYCLIC AROMATIC HYDROCARBONS(mg/kg)								
acenaphthene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
acenaphthylene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
anthracene/phenanthrene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
benzo (a) anthracene 1,2-benzanthracene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
benzo (b) fluoroanthene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
benzo (GHI) perylene 1,12-benzoperylene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
benzo (k) fluoranthene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
benzo-a-pyrene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
chrysene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
fluoranthene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
fluorene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
indeno (1,2,3-CD) pyrene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
naphthalene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
pyrene	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr	nr	- -	- -
MONOCYCLIC AROMATICS (Fgkg)								
benzene	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
chlorobenzene	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
ethylbenzene	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	13	13	14	14	14	14	15	15
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	CHANNEL CATFISH WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Monocyclic Aromatics (cont)								
hexachlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -
nitrobenzene (mg/kg)	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
styrene	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
toluene	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
xylene	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
1,2-dichlorobenzene	< 50	< 50	< 50	< 50	< 50	< 50	- -	- -
1,2,4-trichlorobenzene	< 50	< 50	< 50	< 50	< 50	< 50	- -	- -
1,3-dichlorobenzene	< 50	< 50	< 50	< 50	< 50	< 50	- -	- -
1,4-dichlorobenzene	< 50	< 50	< 50	< 50	< 50	< 50	- -	- -
2,4-dinitrotoluene (mg/kg)	< 10	< 4.0	< 10	< 10	< 2.0	< 2.0	- -	- -
2,6-dinitrotoluene (mg/kg)	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
NITROSAMINES AND OTHER N COMPOUNDS (mg/kg)								
acrylonitrile (Fg/kg)	< 100	< 100	< 100	< 100	< 100	< 100	- -	- -
benzidine	ND	ND	ND	ND	ND	ND	- -	- -
n-nitrosodi-n-propylamine	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
n-nitrosodimethylamine	na	na	na	na	na	na	- -	- -
n-nitrosodiphenylamine	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
1,2-diphenylhydrazine	nr	nr	nr	nr	nr	nr	- -	- -
3,3-dichlorobenzidine	< 20	< 4.0	< 20	< 20	< 4.0	< 4.0	- -	- -
PESTICIDES (Fg/kg)								
acrolein	nr	nr	nr	nr	nr	nr	- -	- -
aldicarb	nr	nr	nr	nr	nr	nr	- -	- -

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	13	13	14	14	14	14	15	15
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	CHANNEL CATFISH WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Pesticides (cont)								
aldrin	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -
alpha benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -
atrazine	< 100	< 100	< 100	< 100	< 100	< 100	- -	- -
beta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -
carbaryl	nr	nr	nr	nr	nr	nr	- -	- -
carbofuran	nr	nr	nr	nr	nr	nr	- -	- -
chlordane	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
chlorfenvinphos	nr	nr	nr	nr	nr	nr	- -	- -
chlorothalonil	nr	nr	nr	nr	nr	nr	- -	- -
chlorpyrifos	< 10	< 10	< 10	< 10	< 10	< 10	- -	- -
chlorsulfuron	nr	nr	nr	nr	nr	nr	- -	- -
DDD	< 10	< 10	< 10	< 10	< 10	< 10	- -	- -
DDE	**20.9**	**35.8**	**26.6**	**72.5**	**9.7**	**54.9**	- -	- -
DDT	< 10	< 10	< 10	< 10	< 10	< 10	- -	- -
delta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -
demeton	nr	nr	nr	nr	nr	nr	- -	- -
diazinon	< 10	< 10	< 10	< 10	< 10	< 10	- -	- -
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr	nr	- -	- -
dicamba	nr	nr	nr	nr	nr	nr	- -	- -
2,4-dichlorophenoxyacetic acid (2,4-D)	nr	nr	nr	nr	nr	nr	- -	- -
dicofol (kelthane)	< 100	< 100	< 100	< 100	< 100	< 100	- -	- -
dicrotophos	nr	nr	nr	nr	nr	nr	- -	- -
dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	- -	- -
dinoseb	nr	nr	nr	nr	nr	nr	- -	- -

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	13	13	14	14	14	14	15	15
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	CHANNEL CATFISH WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
Pesticides (cont)								
endosulfan alpha	< 10	< 10	< 10	< 10	< 10	< 10	- -	- -
endosulfan beta	< 10	< 10	< 10	< 10	< 10	< 10	- -	- -
endosulfan sulfate	< 10	< 10	< 10	< 10	< 10	< 10	- -	- -
endrin	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	< 6.0	- -	- -
endrin aldehyde	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	- -	- -
fenthion (baytex)	nr	nr	nr	nr	nr	nr	- -	- -
gamma-bhc (lindane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -
guthion	nr	nr	nr	nr	nr	nr	- -	- -
heptachlor	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -
heptachlor epoxide	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	- -	- -
isophorone (mg/kg)	< 10	< 1.0	< 10	< 10	< 1.0	< 1.0	- -	- -
malathion	< 20	< 20	< 20	< 20	< 20	< 20	- -	- -
metsulfuron	nr	nr	nr	nr	nr	nr	- -	- -
methomyl	nr	nr	nr	nr	nr	nr	- -	- -
methoxychlor	< 30	< 30	< 30	< 30	< 30	< 30	- -	- -
metolachlor	< 35	< 35	< 35	< 35	< 35	< 35	- -	- -
mirex	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	- -	- -
parathion	< 10	< 10	< 10	< 10	< 10	< 10	- -	- -
picloram	nr	nr	nr	nr	nr	nr	- -	- -
prometon	nr	nr	nr	nr	nr	nr	- -	- -
simazine	< 100	< 100	< 100	< 100	< 100	< 100	- -	- -
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr	nr	- -	- -
toxaphene	< 100	< 100	< 100	< 100	< 100	< 100	- -	- -
2,4,5-TP (silvex)	nr	nr	nr	nr	nr	nr	- -	- -

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	13	13	14	14	14	14	15	15
Fish Species	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	LARGE-MOUTH BASS WHOLE	CHANNEL CATFISH WHOLE	LARGE-MOUTH BASS FILET	CHANNEL CATFISH FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET
PCBs and RELATED COMPOUNDS (Fg/kg)								
aroclor 1016	< 40	< 40	< 40	< 40	< 40	< 40	- -	- -
aroclor 1221	< 40	< 40	< 40	< 40	< 40	< 40	- -	- -
aroclor 1232	< 40	< 40	< 40	< 40	< 40	< 40	- -	- -
aroclor 1242	< 40	< 40	< 40	< 40	< 40	< 40	- -	- -
aroclor 1248	< 40	< 40	< 40	< 40	< 40	< 40	- -	- -
aroclor 1254	< 40	< 40	< 40	< 40	< 40	< 40	- -	- -
aroclor 1260	< 40	< 40	< 40	< 40	< 40	< 40	- -	- -
2-chloronaphthalene (mg/kg)	< 10	< 2.0	< 10	< 10	< 2.0	< 2.0	- -	- -
PHTHALATE ESTERS (mg/kg)								
bis (2-ethylhexyl) phthalate	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
di-n-butyl phthalate	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
di-n-octyl phthalate	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
dimethyl phthalate	< 10	< 2.0	< 10	< 10	< 2.0	< 2.0	- -	- -
n-butyl benzyl phthalate	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -
diethyl phthalate	< 5.0	< 1.0	< 5.0	< 5.0	< 1.0	< 1.0	- -	- -

nr = not reported by laboratory	Î = reported below quantitation limit
na = not analyzed	Ï = detected in blank
ND = not detected	Ð = common lab contaminant
* = no reportable data	Ñ = possible contamination
X = exceeded hold time	Ò = degraded PCB pattern
˜ = lab error	is= insufficient sample
bold= values detected	[- -] = Not Applicable

APPENDIX G.5
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	16	16	16	16	17	17	18	18
Fish Species	WHITE BASS WHOLE	WHITE BASS FILET	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	SNOOK WHOLE	SNOOK FILET
Date	07/13/95	07/13/95	07/13/95	07/13/95	07/10/95	07/10/95	07/10/95	07/10/95
Number of Fish Per Sample	1	1	1	1	1	1	1	1
CONVENTIONALS					**9 METALS ONLY 9**			
lipid content (%)	4.0	0.8	5.6	0.8	na	na	38.8	2.0
METALS (mg/kg)								
aluminum	< 0.79	**0.81**	**36.1**	< 0.79	**1.4**	< 0.77	**3.9**	**0.87**
antimony	< 0.24	< 0.23	< 0.23	< 0.24	< 0.24	**0.32**	**0.26**	**0.29**
arsenic	< 0.06	< 0.05	< 0.05	< 0.06	< 0.06	**0.18**	< 0.12	< 0.06
beryllium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cadmium	< 0.02	< 0.02	**0.02**	< 0.02	< 0.02	< 0.02	< 0.03	< 0.02
chromium	< 0.04	**0.12**	**0.17**	< 0.04	< 0.06	< 0.04	< 0.04	< 0.04
copper	**3.7**	**0.26**	**0.75**	**0.26**	**2.4**	**0.54**	**0.77**	< 0.14
lead	**0.11**	< 0.08	**0.14**	< 0.09	**0.14**	< 0.09	< 0.08	< 0.09
mercury	**0.24**	**0.41**	**0.14**	**0.46**	**0.10**	**0.21**	**0.06**	**0.23**
nickel	**0.18**	**0.27**	**0.20**	**0.12**	**0.11**	< 0.10	< 0.09	< 0.10
selenium	**0.37**	**0.31**	**0.16**	**0.12**	**0.23**	**0.30**	**0.29**	**0.24**
silver	< 0.14	< 0.13	< 0.1	< 0.14	< 0.14	< 0.13	< 0.13	< 0.14
thallium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.08	< 0.05	0.07	0.09
zinc	**11.8**	**4.9**	**41.3**	**14.7**	**10.6**	**7.1**	**7.1**	**3.5**
OTHER INORGANICS (mg/kg)								
cyanide	< 1.0	< 1.0	< 1.0	< 1.0	- -	- -	< 1.0	< 1.0
PHENOLS AND CRESOLS (mg/kg)								
parachlorometa cresol	nr	nr	nr	nr	- -	- -	nr	nr
pentachlorophenol	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	16	16	16	16	17	17	18	18
Fish Species	WHITE BASS WHOLE	WHITE BASS FILET	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	SNOOK WHOLE	SNOOK FILET
Phenols and Cresols (cont)								
phenol (C_6H_5OH) single compound	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	**1.0 Î**
phenolics recoverable	< 0.50	< 0.50	< 0.50	< 0.50	- -	- -	< 0.50	< 0.50
2-chlorophenol	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0
2-nitrophenol	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0
2,4-dichlorophenol	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0
2,4-dimethylphenol	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0
2,4-dinitrophenol	< 10	< 4.0	< 10	< 4.0	- -	- -	< 8.0	< 4.0
2,4,6-trichlorophenol	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 4.0
4-nitrophenol	< 10	< 2.0	< 10	< 4.0	- -	- -	< 8.0	< 4.0
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	- -	- -	nr	nr
ETHERS (Fg/L)								
bis (chloromethyl) ether	nr	nr	nr	nr	- -	- -	nr	nr
bis (2-chloroethyoxy) methane	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
bis (2-chloroethyl) ether	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0
bis (2-chloroisopropyl)ether	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
2-chloroethyl vinyl ether	nr	nr	nr	nr	- -	- -	nr	nr
4-bromophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
4-chlorophenyl phenyl ether	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
HALOGENATED ALIPHATICS (Fg/kg)								
bromodichloromethane	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
bromoform	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
carbon tetrachloride	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	16	16	16	16	17	17	18	18
Fish Species	WHITE BASS WHOLE	WHITE BASS FILET	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	SNOOK WHOLE	SNOOK FILET
Halogenated Aliphatics (cont)								
chloroethane	< 50	< 50	< 45	< 50	- -	- -	< 181	< 50
chloroform	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
dibromochloromethane	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
dichlorodifluormethane	< 50	< 50	< 45	< 50	- -	- -	< 90	< 50
hexachlorobutadiene (mg/kg)	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0
hexachlorocyclopentadiene (mg/kg)	< 20	< 4.0	< 20	< 4.0	- -	- -	< 8.0	< 2.0
hexachloroethane (mg/kg)	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0
methyl bromide	nr	nr	nr	nr	- -	- -	nr	nr
methyl chloride	nr	nr	nr	nr	- -	- -	nr	nr
methylene chloride	< 50	< 50	< 45	< 50	- -	- -	< 36	< 50
tetrachloroethylene	nr	nr	nr	nr	- -	- -	nr	nr
trichloroethylene	nr	nr	nr	nr	- -	- -	nr	nr
trichlorofluoromethane	< 100	< 100	< 89	< 100	- -	- -	< 36	< 100
vinyl chloride	< 50	< 50	< 45	< 50	- -	- -	< 90	< 50
1,1-dichloroethane	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
1,1-dichloroethylene	nr	nr	nr	nr	- -	- -	nr	nr
1,1,1-trichloroethane	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
1,1,2-trichloroethane	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
1,1,2,2-tetrachloroethane	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
1,2-dichloroethane	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
1,2-dichloropropane	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
1,2-trans-dichloroethylene	nr	nr	nr	nr	- -	- -	nr	nr
1,3-cis-dichloropropene	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	16	16	16	16	17	17	18	18
Fish Species	WHITE BASS WHOLE	WHITE BASS FILET	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	SNOOK WHOLE	SNOOK FILET
Halogenated Aliphatics (cont)								
1,3-trans-dichloropropene	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
POLYCYCLIC AROMATIC HYDROCARBONS (mg/kg)								
acenaphthene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 5.0	< 1.0
acenaphthylene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 5.0	< 1.0
anthracene/phenanthrene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
benzo (a) anthracene 1,2-benzanthracene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
benzo (b) fluoroanthene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
benzo (GHI) perylene 1,12-benzoperylene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
benzo (k) fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
benzo-a-pyrene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
chrysene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
fluoranthene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
fluorene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
indeno (1,2,3-CD) pyrene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
naphthalene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
pyrene	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
1,2,5,6-dibenzantracene	nr	nr	nr	nr	- -	- -	nr	nr
MONOCYCLIC AROMATICS (Fgkg)								
benzene	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
chlorobenzene	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
ethylbenzene	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	16	16	16	16	17	17	18	18
Fish Species	WHITE BASS WHOLE	WHITE BASS FILET	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	SNOOK WHOLE	SNOOK FILET
Monocyclic Aromatics (cont)								
hexachlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -	< 2.0	< 2.0
nitrobenzene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
styrene	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
toluene	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
xylene	< 20	< 20	< 18	< 20	- -	- -	< 36	< 20
1,2-dichlorobenzene	< 50	< 50	< 45	< 50	- -	- -	< 36	< 50
1,2,4-trichlorobenzene	< 50	< 50	< 45	< 50	- -	- -	< 36	< 50
1,3-dichlorobenzene	< 50	< 50	< 45	< 50	- -	- -	< 36	< 50
1,4-dichlorobenzene	< 50	< 50	< 45	< 50	- -	- -	< 36	< 50
2,4-dinitrotoluene (mg/kg)	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0
2,6-dinitrotoluene (mg/kg)	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
NITROSAMINES AND OTHER N COMPOUNDS (mg/kg)								
acrylonitrile (Fg/kg)	< 100	< 100	< 89	< 100	- -	- -	< 90	< 100
benzidine	ND	ND	ND	ND	- -	- -	ND	ND
n-nitrosodi-n-propylamine	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
n-nitrosodimethylamine	na	na	na	na	- -	- -	na	na
n-nitrosodiphenylamine	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
1,2-diphenylhydrazine	nr	nr	nr	nr	- -	- -	nr	nr
3,3-dichlorobenzidine	< 20	< 4.0	< 20	< 4.0	- -	- -	< 8.0	< 4.0
PESTICIDES (Fg/kg)								
acrolein	nr	nr	nr	nr	- -	- -	nr	nr
aldicarb	nr	nr	nr	nr	- -	- -	nr	nr

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	16	16	16	16	17	17	18	18
Fish Species	WHITE BASS WHOLE	WHITE BASS FILET	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	SNOOK WHOLE	SNOOK FILET
Pesticides (cont)								
aldrin	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -	< 2.0	< 2.0
alpha benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -	< 2.0	< 2.0
atrazine	< 100	< 100	< 100	< 100	- -	- -	< 100	< 100
beta benzene hexachloride	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -	< 2.0	< 2.0
carbaryl	nr	nr	nr	nr	- -	- -	nr	nr
carbofuran	nr	nr	nr	nr	- -	- -	nr	nr
chlordane	**113**	< 20	**99**	**130**	- -	- -	**421.8**	**42.4**
chlorfenvinphos	nr	nr	nr	nr	- -	- -	nr	nr
chlorothalonil	nr	nr	nr	nr	- -	- -	nr	nr
chlorpyrifos	< 10	< 10	< 10	< 10	- -	- -	< 10	< 10
chlorsulfuron	nr	nr	nr	nr	- -	- -	nr	nr
DDD	< 10	< 10	< 10	< 10	- -	- -	< 10	< 10
DDE	**170**	**92.4**	**270**	**98**	- -	- -	**362**	**53.5**
DDT	< 10	< 10	< 10	< 10	- -	- -	< 10	< 10
delta benzene hexachloride	< 10	< 10	< 10	< 10	- -	- -	< 10	< 10
demeton	nr	nr	nr	nr	- -	- -	nr	nr
diazinon	< 10	< 10	< 10	< 10	- -	- -	< 10	< 10
dibromochloropropane (dbcp)	nr	nr	nr	nr	- -	- -	nr	nr
dicamba	nr	nr	nr	nr	- -	- -	nr	nr
2,4-dichlorophenoxyacetic acid (2,4-D)	nr	nr	nr	nr	- -	- -	nr	nr
dicofol (kelthane)	< 100	< 100	< 100	< 100	- -	- -	< 100	< 100
dicrotophos	nr	nr	nr	nr	- -	- -	nr	nr
dieldrin	< 6.0	< 6.0	< 6.0	< 6.0	- -	- -	**16.4**	< 6.0
dinoseb	nr	nr	nr	nr	- -	- -	nr	nr

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	16	16	16	16	17	17	18	18
Fish Species	WHITE BASS WHOLE	WHITE BASS FILET	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	SNOOK WHOLE	SNOOK FILET
Pesticides (cont)								
endosulfan alpha	< 10	< 10	< 10	< 10	- -	- -	< 10	< 10
endosulfan beta	< 10	< 10	< 10	< 10	- -	- -	< 10	< 10
endosulfan sulfate	< 10	< 10	< 10	< 10	- -	- -	< 10	< 10
endrin	< 6.0	< 6.0	< 6.0	< 6.0	- -	- -	< 6.0	< 6.0
endrin aldehyde	< 4.0	< 4.0	< 4.0	< 4.0	- -	- -	< 4.0	< 4.0
fenthion (baytex)	nr	nr	nr	nr	- -	- -	nr	nr
gamma-bhc (lindane)	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -	< 2.0	< 2.0
guthion	nr	nr	nr	nr	- -	- -	nr	nr
heptachlor	< 2.0	< 2.0	< 2.0	< 2.0	- -	- -	< 2.0	< 2.0
heptachlor epoxide	< 4.0	< 4.0	< 4.0	< 4.0	- -	- -	< 4.0	< 4.0
isophorone (mg/kg)	< 10	< 1.0	< 10	< 1.0	- -	- -	< 2.0	< 1.0
malathion	< 20	< 20	< 20	< 20	- -	- -	< 20	< 20
metsulfuron	nr	nr	nr	nr	- -	- -	nr	nr
methomyl	nr	nr	nr	nr	- -	- -	nr	nr
methoxychlor	< 30	< 30	< 30	< 30	- -	- -	< 30	< 30
metolachlor	< 35	< 35	< 35	< 35	- -	- -	< 35	< 35
mirex	< 8.0	< 8.0	< 8.0	< 8.0	- -	- -	< 8.0	< 8.0
parathion	< 10	< 10	< 10	< 10	- -	- -	< 10	< 10
picloram	nr	nr	nr	nr	- -	- -	nr	nr
prometon	nr	nr	nr	nr	- -	- -	nr	nr
simazine	< 100	< 100	< 100	< 100	- -	- -	< 100	< 100
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	- -	- -	nr	nr
toxaphene	< 100	< 100	< 100	< 100	- -	- -	< 100	< 100
2,4,5-TP (silvex)	nr	nr	nr	nr	- -	- -	nr	nr

APPENDIX G.5 (cont)
ORGANICS AND INORGANICS IN FISH TISSUE
Below International Falcon Reservoir-Brownsville/Matamoros

LOCATION	16	16	16	16	17	17	18	18
Fish Species	WHITE BASS WHOLE	WHITE BASS FILET	CARP WHOLE	CARP FILET	LARGE-MOUTH BASS WHOLE	LARGE-MOUTH BASS FILET	SNOOK WHOLE	SNOOK FILET
PCBs and RELATED COMPOUNDS (Fg/kg)								
aroclor 1016	< 40	< 40	< 40	< 40	- -	- -	< 40	< 40
aroclor 1221	< 40	< 40	< 40	< 40	- -	- -	< 40	< 40
aroclor 1232	< 40	< 40	< 40	< 40	- -	- -	< 40	< 40
aroclor 1242	< 40	< 40	< 40	< 40	- -	- -	< 40	< 40
aroclor 1248	< 40	< 40	< 40	< 40	- -	- -	**84.8**	< 40
aroclor 1254	< 40	< 40	< 40	< 40	- -	- -	< 40	< 40
aroclor 1260	< 40	< 40	< 40	< 40	- -	- -	**178.9**	< 40
2-chloronaphthalene (mg/kg)	< 20	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0
PHTHALATE ESTERS (mg/kg)								
bis (2-ethylhexyl) phthalate	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
di-n-butyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
di-n-octyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
dimethyl phthalate	< 10	< 2.0	< 10	< 2.0	- -	- -	< 4.0	< 2.0
n-butyl benzyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0
diethyl phthalate	< 5.0	< 1.0	< 5.0	< 1.0	- -	- -	< 2.0	< 1.0

nr = not reported by laboratory
na = not analyzed
ND = not detected
* = no reportable data
X = exceeded hold time
˜ = lab error
bold = values detected
Î = reported below quantitation limit
Ï = detected in blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
is= insufficient sample
[- -] = Not Applicable

APPENDIX H
QUANTITATIVE BIOLOGICAL CRITERIA FOR EVALUATING AQUATIC
LIFE USE SUBCATEGORIES USING BENTHIC MACROINVERTEBRATE DATA
(modified from Twidwell and Davis 1989)

Quantitative Biological Criteria for Evaluating Aquatic Life Use Subcategories			**Aquatic Life Use Subcategories**			
			Exceptional	**High**	**Intermediate**	**Limited**
Benthic Macroinvertebrates		**Score**	**4**	**3**	**2**	**1**
		Species Richness	> 30	21-30	11-20	0-10
		Standing Crop No. of Individuals/m^2	400-1,000	300-399 or 1,001-1,499	200-299 or 1,500-2,000	< 200 or > 2,000
		EPT Index	> 10	7-10	3-6	0-2
		Diversity Index	≥ 3.5	2.5-3.49	1.5-2.49	< 1.5
		Equitability	> 0.80	0.65-0.80	0.50-0.64	< 0.50
	Community Trophic Strucure	**Number of Functional Feeding Groups Represented**[1]	> 5	> 4	> 3	< 3
		Prevalence of the Most Abundant Group (% of community)	< 30	30-50	51-75	> 75
		Cumulative Prevalence of FPOM Collectors (% of community)[2]	< 75	< 80	< 85	> 85
Mean Point Score Ranges[3]			> 3.5	2.5-3.5	1.5-2.49	< 1.5

Footnotes:

[1]Based on six major functional feeding groups (grazers, gatherers, filterers, miners, shredders, predators)

[2]Sum of the prevalence of three functional feeding groups that ustilize fine particulate organic matter (FPOM) as their primary food source (gatherers, filterers and miners)

[3]**Mean Point Score** (MPS) = mean of six scores (score for richness + score for standing crop + score for EPT + score for diversity + score for equitability + lowest of 3 scores for community trophic structure divided by 6).

APPENDIX H.1
SUMMARY OF BENTHIC MACROINVERTEBRATE
COLLECTIONS FROM EL PASO/CIUDAD JUAREZ, DECEMBER 2-3, 1995

STATION	1				2									
TAXON	**METHOD/SAMPLE NUMBER**				**METHOD/SAMPLE NUMBER**									
	Snag 1 No.in Sample	Snag 1 No./m^2	Snag 2 No.in Sample	Snag 2 No./m^2	Surber 1 No.in Sample	Surber 1 No./m^2	Surber 2 No.in Sample	Surber 2 No./m^2	Surber 3 No.in Sample	Surber 3 No./m^2	Snag 1 No in Sample	Snag 1 No./m^2	Snag2 No in Sample	Snag 2 No./m^2
Baetis sp.	16	201	64	861		0		0	1	11		0	2	31
Heptagenia sp.	1	13		0		0		0		0		0		0
Tricorythodes sp.	20	252	128	1723	1	11	1	11		0	13	362	10	154
Paraleptophlebia sp.		0		0		0		0		0		0	1	15
Cheumatopsyche sp.		0		0		0		0		0	2	56		0
Smicridea sp.	442	5560	1132	15237	1	11		0	8	86	136	3789	109	1676
Chimarra sp.		0		0		0		0	1	11		0		
Hydroptila sp.	20	252	18	242		0		0		0		0	2	31
Ithytrichia sp.		0		0		0		0		0		0	8	123
Petrophila sp.		0		0		0		0		0		0	1	15
Heterelmis sp.		0		0		0		0		0		0	28	431
Microcylloepus sp.		0		0		0		0		0		0	120	1846
Neoelmis sp.		0		0		0		0		0		0	2	31
Hydroscapha sp.		0		0	1	11		0	1	11		0		
Helicus sp.		0		0		0		0		0		0	3	46
Argia sp.		0		0		0		0	1	11		0	2	31

APPENDIX H.1 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE
COLLECTIONS FROM EL PASO/CIUDAD JUAREZ, DECEMBER 2-3, 1995

STATION	1				2									
TAXON	**METHOD/SAMPLE NUMBER**				**METHOD/SAMPLE NUMBER**									
	Snag 1 No.in Sample	Snag 1 No./m^2	Snag 2 No.in Sample	Snag 2 No./m^2	Surber 1 No.in Sample	Surber 1 No./m^2	Surber 2 No.in Sample	Surber 2 No./m^2	Surber 3 No.in Sample	Surber 3 No./m^2	Snag 1 No in Sample	Snag 1 No./m^2	Snag2 No in Sample	Snag 2 No./m^2
Enallagma sp.		0	1	14		0		0		0	2	56	3	46
Hetaerina sp.		0		0		0		0	1	11		0		
Chironomus sp.		0		0	1	11	1	11		0	2	56	1	15
Dicrotendipes sp.	7	88	3	40		0		0		0	13	362	704	10828
Chaetocladius sp.		0		0	1	11		0		0		0		
Cricotopus sp.	350	4403	414	5572		0	4	43	18	194	191	5321	384	5906
Psectrocladius sp.	2	25		0		0		0		0		0		0
Larsia sp.		0	3	40		0		0		0	2	56	1	15
Pentaneura sp.	9	113	18	242		0		0		0	10	279	4	62
Orthocladius sp.	367	4617	167	2248	9	97	15	162	11	118	62	1727	198	3045
Thienemanniella sp.	76	956	29	390		0		0		0	5	139	14	215
Polypedilum sp.	10	126	9	121		0		0		0	5	139	3	46
Cladotanytarsus sp.		0	6	81		0		0		0	1	28	12	185
Rheotanytarsus sp.	7	88	5	67		0		0		0	5	139	5	77
Tanytarsus sp.	2	25		0		0		0		0		0	3	46
Stenochironomus sp.		0		0		0		0		0	1	28	5	77

APPENDIX H.1 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE
COLLECTIONS FROM EL PASO/CIUDAD JUAREZ, DECEMBER 2-3, 1995

STATION	1				2									
TAXON	**METHOD/SAMPLE NUMBER**				**METHOD/SAMPLE NUMBER**									
	Snag 1 No.in Sample	Snag 1 No./m^2	Snag 2 No.in Sample	Snag 2 No./m^2	Surber 1 No.in Sample	Surber 1 No./m^2	Surber 2 No.in Sample	Surber 2 No./m^2	Surber 3 No.in Sample	Surber 3 No./m^2	Snag 1 No in Sample	Snag 1 No./m^2	Snag2 No in Sample	Snag 2 No./m^2
Diamesa sp.	10	126	11	148		0		0		0		0	1	15
Culicoides sp.		0	1	14		0		0		0		0	10	154
Simulium sp.	492	6189	333	4482	1	11	1	11		0		0		
Hemerodromia sp.	6	76	18	242		0		0		0	19	529	16	246
Nemotelus sp.	1	13		0		0		0		0		0		
Hydracarina	1	13	4	54		0		0		0	1	28	1	15
Hirudinea		0		0		0		0		0		0		
Oligochaeta	124	1560	54	727	1	11	1	11	1	11	54	1504	48	738
Dugesia sp.		0		0	1	11		0		0		0		
Nematoda		0		0		0		0	1	11		0		
Total	1963	24695	2418	32546	16	172	23	248	43	463	524	14599	1701	26161

APPENDIX H.2
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS
FROM PRESIDIO/OJINAGA-BIG BEND NATIONAL PARK, DECEMBER 4-5, 1995

STATION	3						3a			
	METHOD/SAMPLE NUMBER						METHOD/SAMPLE NUMBER			
TAXON	Surber 1 No in Sample	Surber 1 No./m²	Surber 2 No in Sample	Surber 2 No./m²	Surber 3 No in Sample	Surber 3 No./m²	Surber 1 No in Sample	Surber 1 No./m²	Surber 2 No in Sample	Surber 2 No./m²
Baetis sp.	1	11	2	22	8	86		0		0
Tricorythodes sp.		0		0		0		0		0
Choroterpes sp.	7	75	10	108	16	172	2	22	1	11
Paraleptophlebia sp.		0		0		0		0		0
Thraulodes sp.	3	32		0		0		0		0
Traverella sp.	1	11		0	2	22		0		0
Cheumatopsyche sp.	3	32	7	75	10	108		0		0
Smicridea sp.		0		0	1	11		0		0
Hydroptila sp.		0		0		0		0		0
Ithytrichia sp.		0		0		0		0		0
Mayatrichia sp.		0		0		0		0		0
Nectopsyche sp.	1	11	4	43		0		0		0
Corydalus cornutus		0		0		0		0		0
Petrophila sp.		0		0		0		0		0
Heterelmis sp.		0		0		0		0		0
Microcylloepus sp.		0		0		0		0		0
Stenelmis sp.		0		0		0		0		0
Helophorus sp.		0		0	1	11		0		0
Argia sp.		0		0		0	2	22		0
Hetaerina sp.		0		0	1	11		0		0
Dromogomphus sp.		0		0		0		0		0
Ambrysus sp.		0		0		0		0		0
Salda sp.		0		0	1	11		0		0
Dicrotendipes sp.		0		0		0	2	22	1	11
Cricotopus sp.	1	11		0	1	11		0		0
Metriocnemus sp.		0		0		0		0		0

APPENDIX H.2 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS
FROM PRESIDIO/OJINAGA-BIG BEND NATIONAL PARK, DECEMBER 4-5, 1995

STATION	3						3a			
	METHOD/SAMPLE NUMBER						METHOD/SAMPLE NUMBER			
TAXON	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2
Parakiefferiella sp.		0	2	22		0		0		0
Larsia sp.		0		0		0		0		0
Pentaneura sp.		0		0		0		0		0
Thienemannimyia sp.		0		0	1	11	1	11		0
Orthocladius sp.	58	6241	40	431	35	377	1	11		0
Thienemanniella sp.		0		0		0		0		0
Polypedilum sp.		0	2	22	1	11		0		0
Cladotanytarsus sp.		0		0		0	1	11		0
Rheotanytarsus sp.		0		0		0		0		0
Tanytarsus sp.		0		0		0	1	11		0
Cryptochironomus sp.		0		0		0		0		0
Stenochironomus sp.		0		0		0		0		0
Culicoides sp.		0		0		0		0		0
Simulium sp.	275	2960	341	3670	78	840		0		0
Tabanus sp.		0		0		0		0		0
Hemerodromia sp.		0		0		0		0		0
Corbicula fluminea		0		0		0		0		0
Sphaerium sp.		0		0		0		0		0
Hydracarina		0		0		0		0		0
Oligochaeta		0		0		0		0		0
Total	350	3767	408	4392	156	1679	10	108	2	22

APPENDIX H.2 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS
FROM PRESIDIO/OJINAGA-BIG BEND NATIONAL PARK, DECEMBER 4-5, 1995

STATION	3a						4			
	METHOD/SAMPLE NUMBER						**METHOD/SAMPLE NUMBER**			
TAXON	Surber 3 No in Sample	Surber 3 No./m^2	Snag 1 No in Sample	Snag 1 No./m^2	Snag 2 No in Sample	Snag 2 No./m^2	Surber 1 No. in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2
Baetis sp.		0	45	580	1	13		0	2	22
Tricorythodes sp.		0	11	142	1	13		0	2	22
Choroterpes sp.		0		0		0	2	22	4	43
Paraleptophlebia sp.		0		0		0		0		0
Thraulodes sp.		0		0		0	5	54		0
Traverella sp.		0		0		0	5	54	12	129
Cheumatopsyche sp.		0		0		0	44	474	56	603
Smicridea sp.		0	87	1121		0	156	1679	128	1378
Hydroptila sp.		0		0	1	13		0	5	54
Ithytrichia sp.		0		0		0	9	97	2	22
Mayatrichia sp.		0		0		0		0		0
Nectopsyche sp.		0		0		0	2	22		0
Corydalus cornutus		0		0		0		0		0
Petrophila sp.		0	5	65		0	2	22		0
Heterelmis sp.		0	4	52		0	4	43		0
Microcylloepus sp.		0	71	915	2	26		0	1	11
Stenelmis sp.		0		0		0	1	11		0
Helophorus sp.		0		0		0		0		0
Argia sp.		0		0		0	8	86		0
Hetaerina sp.		0		0		0		0		0
Dromogomphus sp.		0		0		0	1	11		0
Ambrysus sp.		0		0		0	6	65	1	11
Salda sp.		0		0		0		0		0
Dicrotendipes sp.	27	291	522	6729	172	2195		0		0
Cricotopus sp.		0	92	1186	67	855		0		0

APPENDIX H.2 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS
FROM PRESIDIO/OJINAGA-BIG BEND NATIONAL PARK, DECEMBER 4-5, 1995

STATION	3a						4			
	METHOD/SAMPLE NUMBER						**METHOD/SAMPLE NUMBER**			
TAXON	Surber 3 No in Sample	Surber 3 No./m^2	Snag 1 No in Sample	Snag 1 No./m^2	Snag 2 No in Sample	Snag 2 No./m^2	Surber 1 No. in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2
Metriocnemus sp.		0		0		0	1	11		0
Parakiefferiella sp.		0		0		0		0		0
Larsia sp.		0		0		0		0		0
Pentaneura sp.		0	6	77	2	26		0		0
Thienemannimyia sp.		0	16	206	27	345	1	11		0
Orthocladius sp.	2	22	445	5736	91	1161	26	280	29	312
Thienemanniella sp.		0	52	670	24	306		0		0
Polypedilum sp.		0	13	168		0	2	22	2	22
Cladotanytarsus sp.		0		0	4	51		0		0
Rheotanytarsus sp.		0	24	309	4	51		0		0
Tanytarsus sp.	1	11	61	786	73	931	1	11	2	22
Cryptochironomus sp.		0		0	1	13		0		0
Stenochironomus sp.		0	3	39		0		0		0
Culicoides sp.		0		0	1	13		0		0
Simulium sp.		0	59	761	1	13	8	86	6	65
Tabanus sp.		0		0		0	1	11		0
Hemerodromia sp.		0		0		0		0	1	11
Corbicula fluminea	3	32		0		0		0		0
Sphaerium sp.		0		0		0	28	301	3	32
Hydracarina		0		0	1	13		0		0
Oligochaeta		0	2	26	1	13		0	1	11
Total	33	355	1518	19567	474	6048	313	3369	257	2766

APPENDIX H.2 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS
FROM PRESIDIO/OJINAGA-BIG BEND NATIONAL PARK, DECEMBER 4-5, 1995

STATION	4		5					
	METHOD/SAMPLE NUMBER		**METHOD/SAMPLE NUMBER**					
TAXON	Surber 3 No.in Sample	Surber 3 No./m^2	Surber 1 No.in Sample	Surber 1 No./m^2	Surber 2 No.in Sample	Surber 2 No./m^2	Surber 3 No.in Sample	Surber 3 No./m^2
Baetis sp.	1	11	9	97	8	86	6	65
Tricorythodes sp.	6	65	11	118	9	97	2	22
Choroterpes sp.	5	54	7	75	4	43	1	11
Paraleptophlebia sp.		0		0	1	11		0
Thraulodes sp.		0	5	54	3	32	2	22
Traverella sp.		0	5	54	8	86	1	11
Cheumatopsyche sp.	66	710	8	86	17	183	130	140
Smicridea sp.	265	2852	4	43	13	140		0
Hydroptila sp.	4	43		0		0		0
Ithytrichia sp.	1	11		0		0		0
Mayatrichia sp.		0		0	1	11		0
Nectopsyche sp.	1	11		0		0		0
Corydalus cornutus		0		0	1	11		0
Petrophila sp.		0		0		0		0
Heterelmis sp.	1	11		0		0		0
Microcylloepus sp.	1	11		0		0		0
Stenelmis sp.		0		0		0		0
Helophorus sp.		0		0		0		0
Argia sp.	6	65	1	11		0	1	11
Hetaerina sp.		0		0		0		0
Dromogomphus sp.	2	22	1	11		0		0
Ambrysus sp.		0		0		0		0
Salda sp.		0		0		0		0
Dicrotendipes sp.	3	32	2	22		0		0
Cricotopus sp.		0		0		0		0
Metriocnemus sp.		0		0		0		0

APPENDIX H.2 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS
FROM PRESIDIO/OJINAGA-BIG BEND NATIONAL PARK, DECEMBER 4-5, 1995

STATION	4		5					
	METHOD/SAMPLE NUMBER		**METHOD/SAMPLE NUMBER**					
TAXON	Surber 3 No.in Sample	Surber 3 No./m^2	Surber 1 No.in Sample	Surber 1 No./m^2	Surber 2 No.in Sample	Surber 2 No./m^2	Surber 3 No.in Sample	Surber 3 No./m^2
Parakiefferiella sp.		0		0		0		0
Larsia sp.	4	43		0	1	11	2	22
Pentaneura sp.		0		0		0		0
Thienemannimyia sp.	1	11		0		0		0
Orthocladius sp.	60	646		0	14	151	2	22
Thienemanniella sp.		0		0		0		0
Polypedilum sp.	9	97	14	151	14	151	6	65
Cladotanytarsus sp.		0		0		0		0
Rheotanytarsus sp.		0		0		0		0
Tanytarsus sp.	13	140	7	75	5	54	1	11
Cryptochironomus sp.		0		0	1	11		0
Stenochironomus sp.		0		0		0		0
Culicoides sp.		0		0		0		0
Simulium sp.	2	22	5	54	13	140	1	11
Tabanus sp.		0		0		0		0
Hemerodromia sp.		0		0		0		0
Corbicula fluminea		0		0		0		0
Sphaerium sp.		0		0		0		0
Hydracarina		0		0		0		0
Oligochaeta		0		0		0		0
Total	451	4855	79	850	113	1216	38	409

APPENDIX H.3
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS FROM
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS, MAY 15-17, 1995

STATION	7b				7b.1					
	METHOD/SAMPLE NUMBER				**METHOD/SAMPLE NUMBER**					
TAXON	Snag 1 No in Sample	Snag 1 No./m^2	Snag 2 No in Sample	Snag 2 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No. in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2
Baetis sp.	1	11	2	24	1	11	8	86	5	54
Dactylobaetis sp.										
Tricorythodes sp.	930	10593	505	6075			1	11	1	11
Thraulodes sp.									1	11
Traverella sp.										
Cheumatopsyche sp.									4	43
Atopsyche sp.									1	11
Hydropsyche sp.										
Smicridea sp.			1	12						
Helicopsyche sp.					5	54	5	54	5	54
Alisotrichia sp.									2	21
Hydroptila sp.	11	125	16	192	5	54	9	97	45	484
Leucotrichia sp.									5	54
Mayatrichia sp.	1	11								
Oxyethira sp.	5	57					2	21		
Stactobiella sp.							1	11	4	43
Nectopsyche sp.					2	21	1	11		
Oecetis sp.										
Polycentropus sp.	18	205	2	24						
Polyplectropus sp.	46	524	29	349	6	64	17	183	17	183
Protoptila sp.										
Crambus sp.					1	11				
Paraponyx sp.					2	21	5	54	2	21
Petrophila sp.	19	216	3	36	4	43	13	140	18	194
Ancyronyx sp.									1	11
Elisianus sp.					7	75	4	43	14	151

APPENDIX H.3 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS FROM
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS, MAY 15-17, 1995

STATION	7b				7b.1					
	METHOD/SAMPLE NUMBER				METHOD/SAMPLE NUMBER					
TAXON	Snag 1 No in Sample	Snag 1 No./m^2	Snag 2 No in Sample	Snag 2 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No. in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2
Heterelmis sp.	2	23								
Hexacylloepus sp.	1	11					1	11	1	11
Microcylloepus sp.	151	1720	36	433	4	43	6	64	10	108
Neoelmis sp.							1	11	5	54
Stenelmis sp.	6	68	1	12						
Psephenus sp.					14	151	18	194	19	204
Gyretes sp.	15	171								
Gyrinus sp.	1	11								
Lutrochus sp.	10	114	1	12						
Argia sp.									1	11
Enallagma sp.	1	11	1	12						
Hetaerina sp.	2	23								
Brechmorhoga sp.										
Erpetogomphus sp.					1	11	2	21	1	11
Ambrysus sp.					1	11	5	54	8	86
Cryphocricos sp.					2	21	1	11	3	32
Limnocoris sp.										
Pelocoris sp.										
Rhagovelia sp.										
Dicrotendipes sp.	156	1777	42	505			4	43		
Rheocricotopus sp.					4	43	13	140	15	161
Acricotopus sp.									2	21
Cricotopus sp.	25	285	10	120						
Labrundinia sp.	8	91								
Larsia sp.	2	23								
Pentaneura sp.	11	125	1	12			2	21	1	11

APPENDIX H.3 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS FROM
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS, MAY 15-17, 1995

STATION	7b				7b.1					
	METHOD/SAMPLE NUMBER				**METHOD/SAMPLE NUMBER**					
TAXON	Snag 1 No in Sample	Snag 1 No./m^2	Snag 2 No in Sample	Snag 2 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No. in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2
Thienemannimyia sp.	1	11	5	60						
Corynoneura sp.										
Orthocladius sp.	72	820	32	385	1	11	7	75	3	32
Pseudosmittia sp.							1	11		
Thienemanniella sp.	6	68	6	72	1	11	1	11	1	11
Tvetenia sp.							1	11		
Polypedilum sp.	4	45	2	24	1	11	1	11		
Cladotanytarsus sp.	2	23								
Rheotanytarus sp.	5	57	5	60			3	32	3	32
Tanytarsus sp.	4	45	6	72						
Cryptochironomus sp.	1	11								
Nilothauma sp.	16	182	18	216						
Phaenopsectra sp.							1	11		
Psuedochironomus sp.	5	57	6	72			1	11	15	161
Stenochironomus sp.	29	330	8	96						
Bezzia sp.	72	820	17	204						
Culicoides sp.	43	490	11	132						
Dasyhelea sp.					1	11				
Simulium sp.							4	43	1	11
Atherix sp.										
Hemerodromia sp.	4	45	1	12			1	11	1	11
Pericoma sp.										
Hyallela azteca	2	23			68	732	49	527	49	527
Ostracoda			1	12						
Corbicula fluminea										
Elimia sp.					52	560	276	2971	276	2971

APPENDIX H.3 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS FROM
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS, MAY 15-17, 1995

STATION	7b				7b.1					
	METHOD/SAMPLE NUMBER				**METHOD/SAMPLE NUMBER**					
TAXON	Snag 1 No in Sample	Snag 1 No./m^2	Snag 2 No in Sample	Snag 2 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No. in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2
Ferrisia rivularis							18	194		
Melanoides tuberculata					42	452	7	75		
Sphaerium sp.									64	689
Hydracarina							7	75	3	32
Hirudinea									1	11
Oligochaeta	188	2141	48	577	6	64	11	118	8	86
Dugesia sp.	3	34			4	43	3	32	31	334
Nematoda										
Total	1879	21402	816	9816	235	2529	332	3574	696	7492

APPENDIX H.3 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS FROM
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS, MAY 15-17, 1995

STATION	7b.2						10					
	METHOD/SAMPLE NUMBER						**METHOD/SAMPLE NUMBER**					
METHOD	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 1 No./m^2
Baetis sp.					1	11	42	452	5	54	3	32
Dactylobaetis sp.	2	21					8	86	13	140	2	21
Tricorythodes sp.	1	11	6	64	8	86	25	269	5	54	8	86
Thraulodes sp.							3	32	2	21	2	21
Traverella sp.							3	32	1	11	1	11
Cheumatopsyche sp.			1	11			34	366	5	54	2	21
Atopsyche sp.												
Hydropsyche sp.							3	32	3	32		
Smicridea sp.							32	344	8	86	5	54
Helicopsyche sp.	14	151	1	11	8	86	7	75	2	21		
Alisotrichia sp.					10	108	1	11				
Hydroptila sp.			9	97			89	958	40	430	75	807
Leucotrichia sp.												
Mayatrichia sp.									1	11		
Oxyethira sp.					1	11						
Stactobiella sp.			3	32	3	32	48	517	25	269	13	140

APPENDIX H.3 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS FROM
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS, MAY 15-17, 1995

STATION	7b.2						10					
	METHOD/SAMPLE NUMBER						**METHOD/SAMPLE NUMBER**					
METHOD	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 1 No./m^2
Nectopsyche sp.			8	86	9	97						
Oecetis sp.			1	11	1	11	8	86			2	21
Polycentropus sp.												
Polyplectropus sp.	1	11	1	11								
Protoptila sp.							9	97	4	43	3	32
Crambus sp.	2	21									1	11
Paraponyx sp.												
Petrophila sp.	2	21	9	97	3	32	13	140	8	86	7	75
Ancyronyx sp.			1	11								
Elsianus sp.	2	21	1	11	1	11	2	21	10	108	3	32
Heterelmis sp.												
Hexacylloepus sp.	1	11										
Microcylloepus sp.	4	43	4	43	10	108	2	21			4	43
Neoelmis sp.	**1**	**11**	**2**	**21**	**2**	**21**						
Stenelmis sp.							8	86	9	97	2	21
Psephenus sp.	17	183	5	54	1	11	10	108	6	64	4	43

APPENDIX H.3 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS FROM
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS, MAY 15-17, 1995

STATION	7b.2						10					
	METHOD/SAMPLE NUMBER						**METHOD/SAMPLE NUMBER**					
METHOD	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 1 No./m^2
Gyretes sp.												
Gyrinus sp.												
Lutrochus sp.												
Argia sp.	1	11			1	11						
Enallagma sp.												
Hetaerina sp.			2	21	3	32						
Brechmorhoga sp.	1	11										
Erpetogomphus sp.					1	11	1	11				
Ambrysus sp.	2	21			1	11	1	11	1	11		
Cryphocricos sp.	1	11	2	21			3	32	4	43	3	32
Limnocoris sp.			1	11	2	21			2	21		
Pelocoris sp.							4	43				
Rhagovelia sp.	1	11					1	11				
Dicrotendipes sp.			1	11								
Rheocricotopus sp.			11	118	16	172						
Acricotopus sp.												

APPENDIX H.3 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS FROM
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS, MAY 15-17, 1995

STATION	7b.2						10					
	METHOD/SAMPLE NUMBER						**METHOD/SAMPLE NUMBER**					
METHOD	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 1 No./m^2
Cricotopus sp.											4	43
Labrundinia sp.											1	11
Larsia sp.												
Pentaneura sp.					3	32						
Thienemannimyia sp.												
Corynoneura sp.							1	11				
Orthocladius sp.			3	32	16	172	11	118	14	151	19	204
Pseudosmittia sp.												
Thienemanniella sp.							10	108	2	21	2	21
Polypedilum sp.			4	32	1	11	61	657	11	118	46	495
Cladotanytarsus sp.												
Rheotanytarsus sp.			6	64	17	183	17	183	2	21	9	97
Tanytarsus sp.												
Cryptochironomus sp.					1	11						
Nilothauma sp.												
Phaenopsectra sp.												

APPENDIX H.3 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS FROM
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS, MAY 15-17, 1995

STATION	7b.2						10					
	METHOD/SAMPLE NUMBER						METHOD/SAMPLE NUMBER					
METHOD	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 1 No./m^2
Psuedochironomus sp.			4	43	1	11	1	11	1	11	6	64
Stenochironomus sp.												
Bezzia sp.												
Culicoides sp.												
Dasyhelea sp.												
Simulium sp.	1	11										
Atherix sp.			1	11								
Hemerodromia sp.					3	32						
Pericoma sp.												
Hyallela azteca	47	506	38	409	28	301						
Ostracoda												
Corbicula fluminea	5	54	5	54	13	140	57	613	21	226	4	43
Elimia sp.	14	151	9	97	5	54						
Ferrisia rivularis	2	21			5	54						
Melanoides tuberculata	74	796	102	1098	230	2476						
Sphaerium sp.												

APPENDIX H.3 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS FROM
INTERNATIONAL AMISTAD RESERVOIR-EAGLE PASS/PIEDRAS NEGRAS, MAY 15-17, 1995

STATION	7b.2						10					
	METHOD/SAMPLE NUMBER						**METHOD/SAMPLE NUMBER**					
METHOD	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 1 No./m^2
Hydracarina			1	11	1	11	1	11				
Hirudinea							14	151				
Oligochaeta	12	129	1	11	13	140	12	129	65	700	8	86
Dugesia sp.	25	269	8	86	24	258	83	893	84	904	22	237
Nematoda									2	21		
Total	233	2508	251	2702	444	4779	625	6727	356	3831	261	2809

APPENDIX H.4
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS
FROM LAREDO/NUEVO LAREDO-INTERNATIONAL FALCON RESERVOIR, JULY 1995

STATION	12				12.1							
	METHOD/SAMPLE NUMBER				**METHOD/SAMPLE NUMBER**							
TAXON	Snag 1 No in Sample	Snag 1 No./m^2	Snag 2 No in Sample	Snag 2 No./m^2	Surber 1 No.in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Snag 1 No in Sample	Snag 1 No./m^2	Snag 2 No in Sample	Snag 2 No./m^2
Baetis sp.	1	11	1	11		0		0		0		0
Tricorythodes sp.	2	22	14	151	2	22	67	721	53	570	12	129
Thraulodes sp.	1	11	6	65	8	86.1	2	22	5	54		0
Traverella sp.		0	1	11	1	11		0	3	32		0
Smicridea sp.		0	2	22	1	11	1	11	1	11	4	43
Nectopsyche sp.	2	22	6	65	4	43	6	65	2	22		0
Culoptila sp.		0		0		0	1	11		0		0
Petrophila sp.		0		0		0		0	1	11	1	11
Heterelmis sp.		0	1	11		0		0		0		0
Microcylloepus sp.		0		0		0		0	1	11		0
Stenelmis sp.		0	2	22		0	9	97	1	11		0
Argia sp.		0		0		0	2	22	9	65	1	11
Cryphocricos sp.		0		0		0	1	10.8	6	0	2	22
Dicrotendipes sp.		0		0		0		0		0		0
Cricotopus sp.		0		0		0	1	11	1	11		0
Orthocladius sp.		0	1	11	2	22	3	32		0		0

APPENDIX H.4 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE COLLECTIONS
FROM LAREDO/NUEVO LAREDO-INTERNATIONAL FALCON RESERVOIR, JULY 1995

STATION	12				12.1							
	METHOD/SAMPLE NUMBER				**METHOD/SAMPLE NUMBER**							
TAXON	Snag 1 No in Sample	Snag 1 No./m^2	Snag 2 No in Sample	Snag 2 No./m^2	Surber 1 No.in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Snag 1 No in Sample	Snag 1 No./m^2	Snag 2 No in Sample	Snag 2 No./m^2
Thienemanniella sp.	1	11		0	1	11		0	4	43	4	43
Polypedilum sp.	25	269	16	172	37	398	26	280	4	43	2	22
Rheotanytarsus sp.		0	1	11		0	2	22	24	258	19	205
Simulium sp.		0	2	22		0	1	11	2	22	1	11
Hemerodromia sp.		0	1	11		0		0	1	11	11	118
Corbicula fluminea		0	1	11		0	3	32		0		0
Elimia sp.		0		0		0	1	11	5	54		0
Ferrisia rivularis	3	32		0		0	45	484	1	11		0
Melanoides tuberculata									98	1054	19	205
Hirudinea	2	22	6	65		0	4	43	15	161	1	11
Oligochaeta	4	43	3	32	7	75	16	172	26	280		0
Dugesia sp.		0		0		0	10	108	18	194	5	54
Nematoda		0		0		0		0	1	11		0
Total	41	441	64	689	63	678	201	2164	282	3035	82	883

APPENDIX H.5
SUMMARY OF BENTHIC MACROINVERTEBRATE
COLLECTIONS FROM BELOW INTERNATIONAL FALCON
RESERVOIR-BROWNSVILLE/MATAMOROS, JUNE 10-13, 1995

STATION	14						16			
	METHOD/SAMPLE NUMBER						**METHOD/SAMPLE NUMBER**			
TAXON	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2	Snag 1 No. in Sample	Snag 1 No./m^2	Snag 2 No.in Sample	Snag 2 No./m^2
Baetis sp.	9	97	9	97	3	32	1315	23788	305	4278
Caenis sp.		0	1	11		0		0		0
Stenonema sp.		0		0		0	1	18		0
Tricorythodes sp.	23	248	15	161	16	172	422	7634	117	1641
Traverella sp.		0		0		0	6	109	1	14
Smicridea sp.	357	3843	336	3617	132	1421	1682	30427	35	491
Helicopsyche sp.	1	11		0		0		0		0
Hydroptila sp.	88	947	62	667	217	2336	61	1103	7	98
Ithytrichia sp.	1	11		0		0		0		0
Oxyethira sp.		0	1	11		0		0		0
Nectopsyche sp.	1	11		0	1	11	2	36		0
Neureclipsis sp.		0		0		0		0		0
Crambus sp.		0		0		0	1	18	1	14
Petrophila sp.	30	323	3	32	5	54		0		0
Heterelmis sp.	1	11		0		0		0		0
Hexacylloepus sp.		0	1	11		0		0		0
Microcylloepus sp.	2	22	8	86	2	32	6	109	1	14
Neoelmis sp.		0	3	32	1	11		0		0
Stenelmis sp.	5	54	1	11	3	32		0		0
Psephenus sp.		0		0		0		0		0
Berosus sp.	1	11	2	22	3	32		0		0
Gyretes sp.		0		0		0	9	163	1	14
Lutrochus sp.		0		0		0		0	1	14
Argia sp.	2	22		0		0		0		0
Enallagma sp.		0		0		0	1	18		0

APPENDIX H.5 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE
COLLECTIONS FROM BELOW INTERNATIONAL FALCON
RESERVOIR-BROWNSVILLE/MATAMOROS, JUNE 10-13, 1995

STATION	14						16			
	METHOD/SAMPLE NUMBER						**METHOD/SAMPLE NUMBER**			
TAXON	Surber 1 No in Sample	Surber 1 No./m²	Surber 2 No in Sample	Surber 2 No./m²	Surber 3 No in Sample	Surber 3 No./m²	Snag 1 No. in Sample	Snag 1 No./m²	Snag 2 No.in Sample	Snag 2 No./m²
Hetaerina sp.		0		0		0	1	18		0
Trepobates sp.		0		0		0		0		0
Rhagovelia sp.		0		0		0	1	18		0
Dicrotendipes sp.	307	3305	96	1033	127	1367	275	4975	75	1052
Glyptotendipes sp.		0		0		0		0		0
Parachironomus sp.		0		0		0		0		0
Cricotopus sp.		0		0	54	581	9	163	1	14
Labrundinia sp.		0		0		0		0	1	14
Larsia sp.	1	11	1	0		0		0		0
Thienemannimyia sp.		0		0		0		0	3	42
Orthocladius sp.	223	2400	632	6803	209	2250	125	2261	21	295
Nanocladius sp.		0		0		0		0		0
Thienemanniella sp.		0	2	21.5		0	9	163	7	98.2
Polypedilum sp.	19	205	26	280	2	22	122	2207	28	393
Cladotanytarsus sp.		0		0		0		0		0
Rheotanytarsus sp.	1	11	2	22		0	13	235	1	14
Tanytarsus sp.	2	22		0		0	5	91		0
Stenochironomus sp.	1	11		0		0	10	181		0
Bezzia sp.		0	1	11		0	1	18		0
Forcipomyia sp.		0		0		0	2	36	191	2679
Palpomyia sp.		0	6	65	2	22		0		0
Simulium sp.		0	1	11		0	6	109	1	14
Limonia sp.		0		0		0	6	109		0
Hemerodromia sp.		0		0		0	3	54		0
Muscidae		0	4	43		0		0		0

APPENDIX H.5 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE
COLLECTIONS FROM BELOW INTERNATIONAL FALCON
RESERVOIR-BROWNSVILLE/MATAMOROS, JUNE 10-13, 1995

STATION	14						16			
	METHOD/SAMPLE NUMBER						**METHOD/SAMPLE NUMBER**			
TAXON	Surber 1 No in Sample	Surber 1 No./m^2	Surber 2 No in Sample	Surber 2 No./m^2	Surber 3 No in Sample	Surber 3 No./m^2	Snag 1 No. in Sample	Snag 1 No./m^2	Snag 2 No.in Sample	Snag 2 No./m^2
Gammarus sp.		0	2	22		0		0		0
Hyallela azteca	1	11		0		0	1	18		0
Ostracoda		0		0		0		0	6	84
Macrobrachium carcinus		0		0	1	11		0		0
Corbicula fluminea	12	129	39	420	53	570		0		0
Melanoides tuberculata	323	3477	181	1948	155	1668		0		0
Hydracarina		0		0	1	11	1	18		0
Oligochaeta	1300	13993	2302	24779	796	8568	533	9642	285	3997
Dugesia sp.	2	22		0	2	22	28	507	2	28
Nematoda	1	11	1	11		0		0		0
Total	2714	29213	3738	40236	1785	19214	4657	84245	1091	15301

APPENDIX H.5 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE
COLLECTIONS FROM BELOW INTERNATIONAL FALCON
RESERVOIR-BROWNSVILLE/MATAMOROS, JULY 10-13, 1995

STATION	18							
	METHOD/SAMPLE NUMBER							
TAXON	Snag 1 Woody No.in Sample	Snag 1 Woody No./m^2	Snag 2 Woody No.in Sample	Snag 2 Woody No./m^2	Snag 1 Cane No.in Sample	Snag 1 Cane No./m^2	Snag 2 Cane No. in Sample	Snag 2 Cane No./m^2
Baetis sp.		0		0		0		0
Caenis sp.		0		0		0		0
Stenonema sp.		0		0		0		0
Tricorythodes sp.		0		0		0		0
Traverella sp.		0		0		0		0
Smicridea sp.	1	30		0		0		0
Helicopsyche sp.		0		0		0		0
Hydroptila sp.		0		0		0		0
Ithytrichia sp.		0		0		0		0
Oxyethira sp.		0		0		0		0
Nectopsyche sp.		0		0		0		0
Neureclipsis sp.	2	60	4	103		0		0
Crambus sp.		0		0		0		0
Petrophila sp.		0		0		0		0
Heterelmis sp.		0		0		0		0
Hexacylloepus sp.		0		0		0		0
Microcylloepus sp.		0		0	1	10		0
Neoelmis sp.		0		0		0		0
Stenelmis sp.		0		0		0		0
Psephenus sp.		0		0		0		0
Berosus sp.		0		0		0	1	9
Gyretes sp.		0		0		0		0
Lutrochus sp.		0		0		0		0
Argia sp.		0		0		0		0

APPENDIX H.5 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE
COLLECTIONS FROM BELOW INTERNATIONAL FALCON
RESERVOIR-BROWNSVILLE/MATAMOROS, JULY 10-13, 1995

STATION	18							
	METHOD/SAMPLE NUMBER							
TAXON	Snag 1 Woody No.in Sample	Snag 1 Woody No./m²	Snag 2 Woody No.in Sample	Snag 2 Woody No./m²	Snag 1 Cane No.in Sample	Snag 1 Cane No./m²	Snag 2 Cane No. in Sample	Snag 2 Cane No./m²
Enallagma sp.		0		0	1	10		0
Hetaerina sp.		0		0		0		0
Trepobates sp.		0		0	1	10		0
Rhagovelia sp.		0		0		0		0
Dicrotendipes sp.	1	30	7	179		0	1	9
Glyptotendipes sp.		0	1	26	1	10		0
Parachironomus sp.	7	208	26	667	8	79		0
Cricotopus sp.		0		0		0		0
Lamrundinia sp.		0		0		0		0
Larsia sp.		0		0		0	1	9
Thienemannimyia sp.		0		0		0		0
Orthocladius sp.		0		0		0		0
Nanocladius sp.		0	4	103	2	20		0
Thienemanniella sp.		0		0		0		0
Polypedilum sp.		0		0	6	59	5	44
Cladotanytarsus sp.		0	1	26		0		0
Rheotanytarsus sp.		0		0		0		0
Tanytarsus sp.		0	4	103		0	1	9
Stenochironomus sp.		0		0		0		0
Bezzia sp.		0		0		0		0
Forcipomyia sp.		0		0		0		0
Palpomyia sp.		0		0		0		0
Simulium sp.		0		0		0		0
Limonia sp.		0		0		0		0

APPENDIX H.5 (cont)
SUMMARY OF BENTHIC MACROINVERTEBRATE
COLLECTIONS FROM BELOW INTERNATIONAL FALCON
RESERVOIR-BROWNSVILLE/MATAMOROS, JULY 10-13, 1995

STATION	18							
	METHOD/SAMPLE NUMBER							
TAXON	Snag 1 Woody No.in Sample	Snag 1 Woody No./m^2	Snag 2 Woody No.in Sample	Snag 2 Woody No./m^2	Snag 1 Cane No.in Sample	Snag 1 Cane No./m^2	Snag 2 Cane No. in Sample	Snag 2 Cane No./m^2
Hemerodromia sp.		0		0		0		0
Muscidae		0		0		0		0
Gammarus sp.		0		0		0		0
Hyallela azteca		0		0		0		0
Ostracoda		0		0		0		0
Macrobrachium carcinus		0		0		0		0
Corbicula fluminea		0		0		0		0
Melanoides tuberculata		0		0		0		0
Hydracarina		0		0		0		0
Oligochaeta	6	179	251	6436	9	89	1	9
Dugesia sp.		0		0		0		0
Nematoda		0		0		0		0
Total	17	506	298	7641	29	285	10	87

APPENDIX H.6
FISH COMMUNITY DATA-EL PASO/CUIDAD JUÁREZ TO BIG BEND NATIONAL PARK

[- -] = Not Applicable

Scientific Name	Common Name	Trophic Level	Tolerance	Stations						
				1	**2**	**3**	**3a**	**3a.1**	**4**	**5**
Cyprinus carpio	common carp	O	T	9	51	13	9	- -	5	5
Ictalurus punctatus	channel catfish	O	T	2	5	- -	- -	8	2	- -
Ictalurus lupus	headwater catfish	O	INT	- -	5	- -	- -	- -	4	- -
Pylodictis olivaris	flathead catfish	P	INT	- -	- -	- -	1	- -	- -	- -
Dorosoma petenense	threadfin shad	O	INT	- -	- -	- -	- -	- -	1	- -
Dorosoma cepedianum	gizzard shad	O	T	11	2	16	33	25	23	- -
Moxostoma congestum	gray redhorse	IF	INT	- -	8	1	- -	- -	- -	- -
Moxostoma austrinum	Mexican redhorse	IF	INT	- -	- -	- -	- -	1	- -	- -
Astyanax mexicanus	Mexican tetra	IF	INT	- -	- -	1	- -	9	- -	- -
Lepisoteus osseus	longnose gar	P	T	- -	- -	- -	- -	1	- -	- -
Tilapia aurea	blue tilapia	O	T	- -	- -	- -	- -	2	- -	- -
Carpiodes carpio	river carpsucker	O	T	- -	- -	1	- -	- -	- -	- -
Cycleptus elongatus	blue sucker	IF	I	- -	- -	5	- -	- -	- -	10
Ictiobus bubalus	smallmouth buffalo	P	INT	- -	- -	1	- -	- -	1	- -
Micropterus salmoides	largemouth bass	P	INT	- -	1	- -	- -	- -	- -	- -
Lepomis megalotis	longear sunfish	IF	INT	- -	1	- -	2	34	- -	- -
Lepomis cyanellus	green sunfish	P	T	- -	- -	- -	1	52	- -	- -
Lepomis sp.	sunfish hybrid	IF	UNK	- -	- -	- -	- -	4	- -	- -
Aplodinotus grunniens	freshwater drum	P	T	- -	- -	- -	1	- -	1	- -
Cyprinella lutrensis	red shiner	IF	T	8	- -	- -	- -	2	1	- -
Notropis braytoni	Tamaulipas shiner	IF	INT	- -	- -	- -	- -	1	- -	- -
Pimephales promelas	fathed minnow	O	T	- -	- -	- -	- -	- -	- -	- -
Pimephales vigilax	bullhead minnow	IF	INT	2	- -	- -	- -	3	- -	- -
Gambusia affinis	mosquitofish	IF	T	2	- -	- -	3	2	- -	- -
Total # Individuals	- -	- -	- -	**34**	**73**	**38**	**50**	**144**	**38**	**15**
Total # Species	- -	- -	- -	6	7	7	7	13	8	2
# Tolerant Species	- -	- -	- -	**5**	**3**	**3**	**5**	**7**	**5**	**1**
# Intermediate Species	- -	- -	- -	1	4	3	2	6	3	0
# Intolerant Species	- -	- -	- -	**0**	**0**	**1**	**0**	**0**	**0**	**1**

APPENDIX H.7
FISH COMMUNITY DATA-INTERNATIONAL AMISTAD RESERVOIR TO EAGLE PASS/PIEDRAS NEGRAS

[- -] = Not Applicable

Scientific Name	Common Name	Trophic Level	Tolerance	Station						
				6.1	**6.2**	**7**	**7b**	**8**	**9**	**10**
Cyprinus carpio	common carp	O	T	1	- -	4	13	5	1	1
Ictalurus punctatus	channel catfish	O	T	2	2	- -	- -	- -	1	- -
Ictalurus furcatus	blue catfish	P	INT	- -	- -	- -	1	- -	- -	- -
Pylodictis olivaris	flathead catfish	P	INT	- -	- -	- -	1	1	- -	- -
Dorosoma cepedianum	gizzard shad	O	T	26	14	- -	21	- -	2	15
Moxostoma congestum	gray redhorse	IF	INT	- -	- -	1	1	1	4	- -
Astyanax mexicanus	Mexican tetra	IF	INT	- -	- -	- -	1	2	- -	4
Lepisosteus oculatus	spotted gar	P	T	- -	- -	- -	4	- -	- -	- -
Lepisosteus osseus	longnose gar	P	T	- -	- -	- -	3	3	- -	- -
Cichlasoma cyanoguttatum	Rio Grande cichlid	IF	T	- -	- -	- -	- -	- -	1	- -
Tilapia aurea	blue tilapia	O	T	- -	2	- -	5	- -	- -	- -
Percina macrolepida	big scale log perch	IF	I	- -	- -	- -	1	- -	- -	- -
Micropterus salmoides	largemouth bass	P	INT	3	6	1	2	- -	4	2
Micropterus dolomieu	smallmouth bass	P	I	- -	- -	1	1	- -	- -	- -
Lepomis megalotis	longear sunfish	IF	INT	- -	- -	- -	2	- -	- -	- -
Lepomis macrochirus	bluegill sunfish	IF	T	- -	- -	1	- -	- -	- -	- -
Lepomis sp.	sunfish hybrid	IF	UNK	- -	- -	- -	1	2	10	3
Lepomis auritus	redbreast sunfish	IF	INT	9	10	1	- -	- -	3	5
Pogonias cromis	black drum	IF	INT	- -	1	- -	- -	- -	- -	- -
Cyprinella venusta	blacktail shiner	IF	INT	- -	- -	- -	1	96	6	50
Cyprinella lutrensis	red shiner	IF	T	- -	- -	- -	- -	2	- -	34
Notropis amabalis	Texas shiner	IF	INT	- -	- -	- -	1	7	- -	1
Pimephales promelas	bullhead minnow	IF	INT	- -	- -	- -	- -	- -	- -	1
Menidia beryllina	inland silverside	IF	INT	- -	- -	- -	- -	1	- -	1
Total # Individuals	- -	- -	- -	**41**	**35**	**9**	**59**	**120**	**32**	**117**
Total # Species	- -	- -	- -	5	6	6	16	10	9	11
# Tolerant Species	- -	- -	- -	**3**	**3**	**2**	**5**	**3**	**4**	**3**
# Intermediate Species	- -	- -	- -	2	3	3	8	6	4	7
# Intolerant Species	- -	- -	- -	**0**	**0**	**1**	**2**	**0**	**0**	**0**

APPENDIX H.8
FISH COMMUNITY DATA-LAREDO/NUEVO LAREDO TO INTERNATIONAL FALCON RESERVOIR

[- -] = Not Applicable

Scientific Name	Common Name	Trophic Level	Tolerance	Station				
				11	**12**	**12.1**	**12.2**	**12.3**
Cyprinus carpio	common carp	O	T	1	4	3	2	1
Ictalurus punctatus	channel catfish	O	T	- -	5	1	- -	- -
Ictalurus furcatus	blue catfish	P	INT	- -	1	- -	1	- -
Pylodictis olivaris	flathead catfish	P	INT	1	- -	- -	- -	- -
Dorosoma petenense	threadfin shad	O	INT	- -	- -	3	- -	112+
Dorosoma cepedianum	gizzard shad	O	T	15	12	9	2	9
Ictiobus bubalus	smallmouth buffalo	O	INT	1	- -	- -	- -	- -
Astyanax mexicanus	Mexican tetra	IF	INT	4	- -	- -	- -	- -
Cichlasoma cyanoguttatum	Rio Grande cichlid	IF	T	1	- -	1	- -	- -
Tilapia aurea	blue tilapia	O	T	2	- -	1	1	- -
Morone chrysops	white bass	P	INT	- -	- -	- -	2	- -
Micropterus salmoides	largemouth bass	P	INT	2	4	4	15	10
Pomoxis nigromaculatus	black crappie	P	INT	- -	- -	- -	- -	1
Lepomis megalotis	longear sunfish	IF	INT	- -	1	- -	- -	1
Lepomis macrochirus	bluegill sunfish	IF	T	3	- -	3	- -	- -
Lepomis microlophus	redear sunfish	IF	INT	- -	- -	- -	- -	6
Lepomis auritus	redbreast sunfish	IF	INT	- -	- -	- -	- -	1
Aplodinotus grunniens	freshwater drum	P	T	- -	- -	1	- -	- -
Cyprinella venusta	blacktail shiner	IF	INT	24	- -	- -	1	- -
Cyprinella lutrensis	red shiner	IF	INT	3	- -	- -	- -	- -
Total # Individuals	- -	- -	- -	**57**	**27**	**26**	**24**	**141**
Total # Species	- -	- -	- -	11	6	9	7	8
# Tolerant Species	- -	- -	- -	**5**	**3**	**7**	**3**	**2**
# Intermediate Species	- -	- -	- -	6	3	2	4	6
# Intolerant Species	- -	- -	- -	**0**	**0**	**0**	**0**	**0**

APPENDIX H.9
FISH COMMUNITY DATA-BELOW INTERNATIONAL FALCON RESERVOIR TO BROWNSVILLE/MATAMOROS

[- -] = Not Applicable

Scientific Name	Common Name	Trophic Level	Tolerance	Station					
				13	**14**	**15**	**16**	**17**	**18**
Cyprinus carpio	common carp	O	T	- -	- -	2	2	1	3
Ictalurus punctatus	channel catfish	O	T	- -	7		2	1	1
Dorosoma cepedianum	gizzard shad	O	T	31	14	19	18	9	1
Carpiodes carpio	river carpsucker	O	T	- -	6	- -	7	- -	- -
Ictiobus bubalus	smallmouth buffalo	O	INT	- -	2	- -	- -	- -	- -
Lepisosteus oculatus	spotted gar	P	T	- -	- -	- -	1	- -	- -
Morone chrysops	white bass	P	INT	- -	- -	- -	3	- -	- -
Micropterus salmoides	largemouth bass	P	INT	5	2	2	1	3	1
Lepomis macrochirus	bluegill sunfish	IF	T	- -	- -	1	- -	- -	- -
Aplodinotus grunniens	freshwater drum	P	T	- -	- -	- -	1	- -	- -
Centropomus undecimalis	snook	P	I	- -	- -	- -	- -	1	3
Gobiomorus dormitor	bigmouth sleeper	IF	INT	- -	6	10	3	- -	11
Mugil cephalus	stripped mullet	O	T	- -	- -	- -	- -	8	6
Agonostomus monticola	mountain mullet	O	INT	- -	4	- -	1	- -	- -
Total # Individuals	- -	- -	- -	**36**	**31**	**34**	**39**	**23**	**26**
Total # Species	- -	- -	- -	2	7	5	10	6	7
# Tolerant Species	- -	- -	- -	**1**	**3**	**3**	**6**	**4**	**4**
# Intermediate Species	- -	- -	- -	1	4	2	4	1	2
# Intolerant Species	- -	- -	- -	**0**	**0**	**0**	**0**	**1**	**1**

TROPHIC LEVEL	TOLERANCE RATING
I = INVERTIVORE	IT = INTOLERANT
P = PISCIVORE	INT = INTERMEDIATE
O = OMNIOVRE	I = INTOLERANT
	UNK = UNKNOWN

APPENDIX I.1
SITE SPECIFIC AQUATIC LIFE CRITERIA
CONCENTRATIONS FOR DISSOLVED METALS IN WATER Î

STATIONS	**Cadmium** (Fg/L)		**Chromium** (Fg/L)		**Copper** (Fg/L)		**Lead** (Fg/L)		**Nickel** (Fg/L)		**Zinc** (Fg/L)		***HARDNESS*** (mg/L)
	ACUTE	CHRONIC	ACUTE	CHRONIC	ACUTE	CHRONIC	ACUTE	CHRONIC	ACUTE	CHRONIC	ACUTE	CHRONIC	
EL PASO REACH													
0.5a					96	55			715	667	496	449	550
1					83	48					436	395	472
1.1					81	47					425	385	458
1a									128	212	158	143	142
2											383	398	405
2a			5669	676					514	535	347	360	424
PRESIDIO REACH													
3											529	480	594
3a.1					65	39					351	318	366
4											550	498	621
5											521	471	582
DEL RIO/EAGLE PASS REACH													
6.1	36	1.2											106
10					56	34							
LAREDO REACH													
10a	62	2									184	167	171
11b											910	825	1126
11b.1											327	296	336
11b.2											307	278	312

APPENDIX I.1
SITE SPECIFIC AQUATIC LIFE CRITERIA
CONCENTRATIONS FOR DISSOLVED METALS IN WATER Î

STATIONS	**Cadmium** (Fg/L)		**Chromium** (Fg/L)		**Copper** (Fg/L)		**Lead** (Fg/L)		**Nickel** (Fg/L)		**Zinc** (Fg/L)		***HARDNESS*** (mg/L)
	ACUTE	CHRONIC	ACUTE	CHRONIC	ACUTE	CHRONIC	ACUTE	CHRONIC	ACUTE	CHRONIC	ACUTE	CHRONIC	
LAREDO REACH													
11b.3											378	342	399
12.1							363	14					323
12.2							229	9			233	211	225
12.3							292	11					272
BROWNSVILLE REACH													
17											295	267	298

Equations for Calculating Aquatic Life Protection Criteria for Specific Metals
(All values calculated in Fg/L)(Hardness concentrations are input as mg/L)

Cadmium (d)	$e^{(1.128[\ln(hardness)] - 1.6774}$	$e^{(0.7852[\ln(hardness)] - 3.490}$
Chromium (Tri)(d)	$e^{(0.8190)(\ln(hardness)) + 3.688}$	$e^{(0.8190)(\ln(hardness)) + 1.561}$
Copper (d)	$e^{(0.9422[\ln(hardness)] - 1.3844}$	$e^{(0.8545[\ln(hardness)] - 1.386}$
Lead (d)	$e^{(1.273 [\ln(hardness)] - 1.460}$	$e^{(1.273 [\ln(hardness)] - 4.705}$
Nickel (d)	$e^{(0.8460[\ln(hardness)] + 3.3612}$	$e^{(0.8460[\ln(hardness)] + 1.1645}$
Zinc (d)	$e^{(0.8473[\ln(hardness)] + 0.8604}$	$e^{(0.8473[\ln(hardness)] + 0.7614}$

Î Texas Surface Water Quality Standards

APPENDIX I.2
SITE SPECIFIC ACUTE AND CHRONIC UNIONIZED AMMONIA CRITERIA
(Based on pH and Temperature at Site)

STATIONS	NH_3-N Concentrations	Unionized Ammonia (NH_3) Concentrations	USEPA Acute	USEPA Chronic
EL PASO REACH				
0.5a	0.09	0.0021	0.134	0.026
1	0.05	0.0011	0.1056	0.0203
1.1	0.05	0.0024	0.1393	0.0268
1a	**21.7**	**0.043**	**0.042**	**0.002**
2	**1.1**	**0.0691**	0.1524	**0.0293**
2a	**1.1**	**0.0297**	0.1247	**0.0240**
2.1	**2.6**	**0.0573**	0.1272	**0.0245**
2.2	**2.5**	**0.0555**	0.1281	**0.0246**
2.3	**2.3**	**0.0530**	0.1326	**0.0255**
PRESIDIO REACH				
3	0.07	0.0052	0.1156	0.0222
3a	< 0.01	0.0001	0.1322	0.0254
3a.1	0.04	0.0031	0.3019	0.0411
4	0.09	0.0033	0.1355	0.0261
5	< 0.01	0.0008	0.1472	0.0283
DEL RIO/EAGLE PASS REACH				
6.1	0.05	0.0039	0.2876	0.0411
6.2	0.02	0.0019	0.2798	0.0411
7b	0.01	0.0004	0.2603	0.0390
7b.1	0.02	0.0007	0.2662	0.0367
7b.2	< 0.02	0.0007	0.2572	0.0367
9a	**5.3**	**0.1485**	0.2314	**0.0272**
10	0.20	0.0061	0.3019	0.0411

APPENDIX I.2
SITE SPECIFIC ACUTE AND CHRONIC UNIONIZED AMMONIA CRITERIA
(Based on pH and Temperature at Site)

STATIONS	NH_3-N Concentrations	Unionized Ammonia (NH_3) Concentrations	USEPA Acute	USEPA Chronic
LAREDO REACH				
10a	0.17	0.0020	0.1671	0.0136
11a	0.04	0.0020	0.2867	0.0390
11b	0.05	0.0026	0.4200	0.0808
11b.3	**10.0**	**0.1950**	**0.1887**	**0.0172**
11c	**18.4**	**0.2824**	**0.1671**	**0.0136**
12	0.20	0.0172	0.3019	0.0411
12.1	0.28	0.0150	0.2867	0.0390
12.2	0.03	0.0015	0.2867	0.0390
12.3	0.02	0.0010	0.2867	0.0390
BROWNSVILLE REACH				
12d	0.10	0.0038	0.2514	0.0342
13	0.06	0.0018	0.2314	0.0272
14	0.01	0.0005	0.4001	0.0770
15	0.01	0.0010	0.4665	0.0897
15a	**12.7**	**0.3960**	**0.3291**	**0.0547**
16	0.11	0.0073	0.4523	0.0870
17	0.01	0.0016	0.5139	0.0988
18	< 0.02	0.0025	0.4862	0.0935

APPENDIX I.3
SITE SPECIFIC SEDIMENT QUALITY CRITERIA FOR ORGANICS (mg/kg)
(for screening purposes only; used to compare with actual site concentrations)

STATIONS	***ORGANICS***					***Total Organic Carbon (mg/kg)***
	Bis 2-ethyl hexyl	**Alpha BHC**	**Chlordane**	**DDT**	**DDE**	
Octanol/Water Coefficient (Kow)	8.2493	4.259	6.602	6.7945	5.996	
EL PASO REACH						
0.5a					0.0036	4590
2	31212	0.007			0.0046	5860
2a	121000				0.018	22700
PRESIDIO REACH						
3a					0.003	3650
DEL RIO/EAGLE PASS						
7b.1			0.066			4950
7b.2			0.280			21000
9a					0.013	16400
LAREDO REACH						
10a				0.02		4580
11a					0.0053	6800
11b				0.02	0.0035	4440
11c					0.002	2500
12					0.005	6490
12.2					0.003	4090
BROWNSVILLE REACH						
12d					0.01	12200
15a		56500			0.008	10600

See Chapter 3, page 20 for additional information on sediment screening levels.

APPENDIX I.3 (cont)
METALS IN SEDIMENT DATA CONVERTED TO MICROMOLES/KG
FOR SEM/AVS RATIO CALCULATION FOR PHASE 2

STATIONS	***METALS (Fmoles/kg)***							***Acid Volatile Sulfides (Fmoles/kg)***	**3SEM**
	Cadmium	**Copper**	**Lead**	**Mercury**	**Nickel**	**Silver**	**Zinc**		
Molecular Weight	112.4	63.5	207.2	200.6	58.7	107.9	65.4	32.1	
EL PASO REACH									
0.5a	3.0	261	77.7	0.02	138		607	2065	1087
1	1.2	124	45.4	0.10	102		363	31.2	635.7
1.1	1.6	192	60.3	0.25	78.4		376	31.2	708.6
2	3.3	420	95.1	0.15	143		684	31.2	1345.6
2a	10.7	1454	213	2.5	286	33.4	3335	28147	5301.2
PRESIDIO REACH									
3	1.2	162	59.4	0.15	203		667	31.2	1092.8
3a	2.2	113	57.9	0.10	160		613	275	946.2
3a.1	1.2	51.9	55.5	0.10	75		352	31.2	535.7
4	307	132	91.7	0.15	172		1043	31.2	2281.6
5	2.5	162	65.2	0.15	204		789	1010	1222.9
DEL RIO/EAGLE PASS									
6.1	2.3	195	767	0.25	315		906	45.9	2185.6
6.2	3.2	184	74.8		256		705	2279	1223
7b	1.8	88.1	55	0.15	111		508	138	764.1
7b.1	2.1	88.1	52.1		141		358	841	641.3
7b.2	3.6	107	110	0.15	97		534	765	851.8
9a	6.7	378	194	1.5	276		2555	16251	3411.2
10	2.0	89.7	42.5	0.10	155		578	5987	867.3

APPENDIX I.3 (cont)
METALS IN SEDIMENT DATA CONVERTED TO MICROMOLES/KG
FOR SEM/AVS RATIO CALCULATION FOR PHASE 2

STATIONS	***METALS (Fmoles/kg)***							***Acid Volatile Sulfides (Fmoles/kg)***	**3SEM**
	Cadmium	**Copper**	**Lead**	**Mercury**	**Nickel**	**Silver**	**Zinc**		
Molecular Weight	112.4	63.5	207.2	200.6	58.7	107.9	65.4	32.1	
LAREDO REACH									
10a	2.5	113	139	0.30	182		1059	13880	1495.8
11a	3.6	253	239	0.15	303		1791	1716	2589.8
11b	1.7	105	174	0.15	172		855	6550	1307.9
11c	4.6	296	100	0.95	145	21.3	936	10917	1482.6
12	2.8	140	120	0.15	181	14.8	880	5989	1324
12.1	2.0	131	99.9	0.15	387	8.3	769	31.2	1389.1
12.2	2.7	173	164	0.15	237		973	31.2	1549.9
12.3	1.8	101	123	0.10	187		701	1216	1114
BROWNSVILLE REACH									
12d	5.5	200	173	0.15	221	8.9	1241	9108	1840.7
13	1.2	58.2	250	0.15	102	26.9	439	2027	850.6
14	2.0	70.8	117	0.10	153	18.5	546	31.2	888.9
15	0.62	9.6	45	0.10	46	30.6	237	1778	338.3
15a	3.6	232	129	0.10	201	22.2	1036	4117	1601.7
16	1.1	44.1	8.2	0.55	102	23.2	418	31.2	574
17	0.80	28.3	44.4	0.10	71.6	27.8	327	31.2	472.2
18	2.0	102	89.8	0.15	150	25.0	633	218	977

3SEM = sum of the simultaneously extracted metals in Fmoles/kg

APPENDIX I.3 (cont)
SITE SPECIFIC SCREENING LEVELS FOR THE
BIOAVAILABILITY OF METALS IN SEDIMENT
(based on the molar SEM/AVS ratio)

STATIONS	**SEM/AVS RATIOS**							
	Cadmium	**Copper**	**Lead**	**Mercury**	**Nickel**	**Silver**	**Zinc**	**ΣSEM/AVS**
EL PASO REACH								
0.5a	1.5	126	37.6	0.01	66.8	0.03	294	0.53
1	38.5	4.0	1.5	0.003	3.3		11.6	20.4
1.1	0.04	6.5	1.9	0.01	2.5		12.1	22.7
2	0.11	3.0	3.0	0.005	4.6		22	43.1
2a	0.0004	0.05	0.007	0.000	0.01		0.12	0.19
PRESIDIO REACH								
3	0.04	5.2	1.9	0.004	6.5		21.4	35
3a	0.01	0.41	0.21	0.0004	0.58		2.2	3.4
3a.1	0.04	1.7	1.8	0.003	2.4		11.3	17.2
4	9.8	4.2	2.9	0.005	5.5		33.4	73.1
5	0.002	0.16	0.06	0.0001	0.20		0.78	1.2
DEL RIO/EAGLE PASS								
6.1	0.05	4.2	1.7	0.005	6.9		19.7	47.6
6.2	0.001	0.08	0.03		0.11		0.31	0.54
7b	0.01	0.64	0.40	0.001	0.80		3.7	5.5
7b.1	0.002	0.10	0.06		0.17		0.43	0.76
7b.2	0.005	0.14	0.14	0.0002	0.13		0.70	1.1
9a	0.0004	0.02	0.01	0.0001	0.02		0.16	0.20
10	0.0003	0.01	0.01	0.0000	0.03		0.10	0.14

APPENDIX I.3 (cont)
SITE SPECIFIC SCREENING LEVELS FOR THE
BIOAVAILABILITY OF METALS IN SEDIMENT
(based on the molar SEM/AVS ratio)

STATIONS	**SEM/AVS RATIOS**							
	Cadmium	**Copper**	**Lead**	**Mercury**	**Nickel**	**Silver**	**Zinc**	**3SEM/AVS**
LAREDO REACH								
10a	0.0002	0.01	0.01	0.0000	0.01		0.08	0.11
11a	0.002	0.15	0.14	0.0000	0.18		1.0	1.5
11b	0.002	0.02	0.03	0.0000	0.03		0.13	0.20
11c	0.0004	0.03	0.01	0.0000	0.02	0.002	0.08	0.16
12	0.0005	0.02	0.02	0.0000	0.03	0.002	0.15	0.22
12.1	0.06	4.2	3.2	0.005	12.4	0.27	24.6	44.5
12.2	0.09	5.5	5.2	0.005	7.6		31.2	49.7
12.3	0.001	0.08	0.10	0.0000	0.15		0.58	0.92
BROWNSVILLE REACH								
12d	0.001	0.02	0.02	0.0000	0.02	0.001	0.14	0.20
13	0.001	0.03	0.12	0.0000	0.05	0.013	0.22	0.42
14	0.06	2.3	3.7	0.003	4.9	0.590	17.5	28.5
15	0.0003	0.005	0.03	0.0000	0.03	0.02	0.13	0.19
15a	0.001	0.006	0.03	0.0000	0.05	0.005	0.25	0.39
16	0.04	1.4	0.26	0.02	3.3	0.740	13.4	18.4
17	0.03	0.91	1.4	0.003	2.3	0.890	10.5	15.1
18	0.009	0.47	0.41	0.001	0.69	0.115	2.9	4.5

Note: These values are ratios and not concentrations; values > 1 indicate metals may be bioavailable; values < 1 indicate metals may not be bioavailable. The ratios are based on site concentrations.

3SEM (sum of the simultaneously extracted metals)/AVS Ratio. SEM/AVS Ratios are based on the total SEM for a site compared to the site AVS.

See Chapter 3, page 20 for additional information on sediment screening levels.

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
El Paso/Ciudad Juárez

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
0.5a	***Chloride***	water	aquatic life chronic	2.1 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.2 x 26.1 x 3.4 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Cadmium***	sediment	molar SEM/AVS ratio	1.5	< 1.0
- -	***Copper***	water	state 85th percentile	1.3 x	5.0 Fg/L
		sediment	molar SEM/AVS ratio	126	< 1.0
- -	***Lead***	sediment	molar SEM/AVS ratio	37.6	< 1.0
- -	***Nickel***	water	state 85th percentile	1.5 x	5.0 Fg/L
		sediment	molar SEM/AVS ratio	66.8	< 1.0
- -	***Zinc***	sediment	molar SEM/AVS ratio	294	< 1.0
- -	***DDE***	sediment	sediment quality criteria	1.7 x	0.0036 mg/kg
1	***Chloride***	water	aquatic life chronic	1.5 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.2 x 26.1 x 3.4 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Cadmium***	sediment	molar SEM/AVS ratio	38.5	< 1.0
		tissue (carp-whole)	USFWS 85th percentile	1.2 x	0.05 mg/kg
- -	***Copper***	water	state 85th percentile	1.1 x	5.0 Fg/L
		sediment	molar SEM/AVS ratio	4.0	< 1.0
		tissue (carp-whole)	USFWS 85th percentile	1.8 x	1.0 mg/kg
- -	***Lead***	sediment	molar SEM/AVS ratio	1.5	< 1.0
- -	***Nickel***	sediment	molar SEM/AVS ratio	3.3	< 1.0
- -	***Zinc***	sediment	molar SEM/AVS ratio	11.6	< 1.0

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
El Paso/Ciudad Juárez

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
1.1	***Chloride***	water	aquatic life chronic	1.3 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	2.3 x 50 x 6.4 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Copper***	water	state 85th percentile	1.0 x	5.0 Fg/L
		sediment	molar SEM/AVS ratio	6.5	< 1.0
- -	***Lead***	sediment	molar SEM/AVS ratio	1.9	< 1.0
- -	***Nickel***	sediment	molar SEM/AVS ratio	2.5	< 1.0
- -	***Zinc***	sediment	molar SEM/AVS ratio	12.1	< 1.0
- -	***Phenolics Recoverable***	water	national 85th percentile	1.0 x	24 Fg/L
1a	***Unionized Ammonia***	water	aquatic life acute aquatic life chronic	1.0 x 21.5 x	0.042 mg/L 0.002 mg/L
- -	***Chloride***	water	aquatic life chronic	1.1 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.6 x 35.6 x 4.6 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
2	***Unionized Ammonia***	water	aquatic life chronic	2.4 x	0.029 mg/L
- -	***Chloride***	water	aquatic life chronic	1.3 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile national 85th percentile human health-water & fish human health-fish	2.5 x 1.0 x 56.1 x 7.2 x	4.0 Fg/L 10 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Cadmium***	tissue (carp-whole)	USFW 85th percentile	1.2 x	0.05 mg/kg
- -	***Copper***	sediment	molar SEM/AVS ratio	3.0	< 1.0
- -	***Copper***	tissue (carp-whole)	USFWS 85th percentile	1.8 x	1.0 mg/kg
- -	***Lead***	sediment	molar SEM/AVS ratio	3.0	< 1.0
- -	***Nickel***	sediment	molar SEM/AVS ratio	4.6	< 1.0

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
El Paso/Ciudad Juárez

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
2	***Zinc***	sediment	molar SEM/AVS ratio	22	< 1.0
- -	- -	tissue (carp-whole)	national 85th percentile USFWS 85th percentile	1.6 x 1.3 x	28 mg/kg 34.2 mg/kg
2.1	***Unionized Ammonia***	water	aquatic life chronic	2.3 x	0.024 mg/L
- -	***Chloride***	water	aquatic life chronic	1.2 x	230 mg/L
2.2	***Unionized Ammonia***	water	aquatic life chronic	2.3 x	0.025 mg/L
- -	***Chloride***	water	aquatic life chronic	1.1 x	230 mg/L
2.3	***Unionized Ammonia***	water	aquatic life chronic	2.1 x	0.025 mg/L
- -	***Chloride***	water	aquatic life chronic	1.7 x	230 mg/L
2a	***Unionized Ammonia***	water	aquatic life chronic	1.2 x	0.029 mg/L
- -	***Chloride***	water	aquatic life chronic	1.3 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.5 x 32.2 x 4.1 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
		sediment	national 85th percentile	1.0 x	14 mg/kg
- -	***Copper***	sediment	national 85th percentile	1.2 x	52 mg/kg
- -	***Nickel***	water	state 85th percentile	1.5 x	5.0 mg/kg
- -	***Silver***	sediment	national 85th percentile state 85th percentile	1.2 x 2.3 x	3.0 mg/kg 1.6 mg/kg
- -	***Phenol Single Compound***	water	national 85th percentile state 85th percentile	1.1 x 2.3 x	13 Fg/L 6.0 Fg/L
- -	***DDE***	sediment	sediment quality criteria	1.5 x	0.018 mg/kg

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
Presidio/Ojinaga-Big Bend National Park

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
3	***Chloride***	water	aquatic life chronic	2.4 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.9 x 42.8 x 5.5 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Copper***	sediment	molar SEM/AVS ratio	5.2	< 1.0
- -	***Lead***	sediment	molar SEM/AVS ratio	1.9	< 1.0
- -	***Nickel***	sediment	molar SEM/AVS ratio	6.5	< 1.0
- -	***Selenium***	tissue (small mouth buffalo-whole)	national 85th percentile TDH screening level predator protection limit	2.8 x 1.2 x 4.6 x	0.83 mg/kg 2.0 mg/kg 0.5 mg/kg
- -	***Zinc***	sediment	molar SEM/AVS ratio	21.4	< 1.0
- -	***DDE***	tissue (carpsucker-filet)	EPA edible tissue	4.4 x	0.32 mg/kg
- -	***Bis (2-ethylhexyl) phthalate***	water	national 85th percentile state 85th percentile	1.2 x 1.1 x	5.0 Fg/L 5.5 Fg/L
3a	***Chloride***	water	aquatic life chronic	1.7 x	230 mg/kg
- -	***Cadmium***	tissue (carp-whole)	USFWS 85th percentile	1.3 x	0.05 mg/kg
- -	***Selenium***	tissue (carp-whole)	national 85th percentile predator protection limit	1.2 x 2.0 x	3.5 mg/kg 0.5 mg/kg
- -	***Zinc***	sediment	molar SEM/AVS ratio	2.2	< 1.0
		tissue (carp-whole)	national 85th percentile USFWS 85th percentile	1.5 x 1.3 x	28 mg/kg 34.2 mg/kg
- -	***DDE***	sediment	sediment quality criteria	1.2 x	0.003 mg/kg
- -	***Bis (2-ethylhexyl) phthalate***	water	national 85th percentile state 85th percentile human health-water & fish	5.0 x 4.5 x 1.4 x	5.0 Fg/L 5.5 Fg/L 18 Fg/L
3a.1	***Arsenic***	water	national 85th percentile state 85th percentile human health-water & fish human health-fish	1.1 x 2.8 x 61.1 x 7.9 x	10 Fg/L 4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Copper***	sediment	molar SEM/AVS ratio	1.7	< 1.0

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
Presidio/Ojinaga-Big Bend National Park

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
3a.1	***Lead***	sediment	molar SEM/AVS ratio	1.8	< 1.0
- -	***Nickel***	sediment	molar SEM/AVS ratio	2.4	< 1.0
- -	***Zinc***	sediment	molar SEM/AVS ratio	11.3	< 1.0
4	***Chloride***	water	aquatic life chronic	2.3 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.8 x 39.4 x 5.1 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Cadmium***	sediment	molar SEM/AVS ratio	9.8	< 1.0
- -	***Copper***	sediment	molar SEM/AVS ratio	4.2	< 1.0
- -	***Lead***	sediment	molar SEM/AVS ratio	2.9	< 1.0
- -	***Nickel***	sediment	molar SEM/AVS ratio	5.5	< 1.0
- -	***Selenium***	tissue (carp-whole)	national 85th percentile predator protection limit	1.0 x 1.7 x	0.83 mg/kg 0.5 mg/kg
- -	***Zinc***	sediment	molar SEM/AVS ratio	33.4	< 1.0
		tissue (carp-whole)	USFWS 85th percentile	1.6 x	34.2 mg/kg
- -	***DDE***	tissue (carp-filet)	EPA edible tissue	1.7 x	0.32 mg/kg
5	***Chloride***	water	aquatic life chronic	2.3 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.7 x 38.3 x 4.9 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Cadmium***	tissue (carp-whole)	USFWS 85th percentile	1.3 x	0.05 mg/kg
- -	***Copper***	tissue (carp-whole)	USFWS 85th percentile	1.4 x	1.0 mg/kg
- -	***Zinc***	tissue (carp-whole)	national 85th percentile USFWS 85th percentile	3.1 x 2.5 x	28 mg/kg 34.2 mg/kg

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
International Amistad Reservoir-Eagle Pass/Piedras Negras

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
6.1	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.2 x 26.7 x 3.4 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Copper***	sediment	molar SEM/AVS ratio	4.2	< 1.0
- -	***Lead***	sediment	molar SEM/AVS ratio	1.7	< 1.0
- -	***Mercury***	tissue (bass-whole)	predator protection limit	2.5 x	0.1 mg/kg
- -	***Nickel***	sediment	molar SEM/AVS ratio	6.9	< 1.0
- -	***Zinc***	sediment	molar SEM/AVS ratio	19.7	< 1.0
6.2	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.1 x 25 x 3.2 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
		sediment	national 85th percentile	1.0 x	14 mg/kg
		tissue (bass-whole)	national 85th percentile	1.4 x	0.20 mg/kg
6a	***Chloride***	water	aquatic life acute aquatic life chronic	1.1 x 4.0 x	860 mg/L 230 mg/L
7	***Copper***	tissue (carp-whole)	USFWS 85th percentile	1.7 x	1.0 mg/kg
7b	***Copper***	tissue (carp-whole)	USFWS 85th percentile	1.2 x	1.0 mg/kg
- -	***Zinc***	tissue (carp-whole)	national 85th percentile	1.1 x	28 mg/kg
- -	***Chloroform***	tissue (carp-filet) tissue (carp-whole)	state 85th percentile state 85th percentile	2.3x 5.0 x	0.01 mg/kg 0.01 mg/kg
- -	***Benzene***	tissue (carp-filet) tissue (carp-whole)	state 85th percentile state 85th percentile	2.5 x 2.7 x	0.01 mg/kg 0.01 mg/kg
7b.1	***Chlordane***	sediment	sediment quality criteria	1.0 x	0.066 mg/kg

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
International Amistad Reservoir-Eagle Pass/Piedras Negras

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
8	***Copper***	tissue (carp-whole)	USFWS 85th percentile	1.4 x	1.0 mg/kg
- -	***Zinc***	tissue (carp-whole)	national 85th percentile USFWS 85th percentile	1.3 x 1.0 x	28 mg/kg 34.2 mg/kg
9a	***Unionized Ammonia***	water	aquatic life chronic	5.5 x	0.027 mg/L
	Chloride	water	aquatic life chronic	2.2 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.3 x 29.4 x 3.8 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
10	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.2 x 26.7 x 3.4 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
		tissue (bass-filet)	EPA edible tissue	24.2 x	0.062 mg/kg

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
Laredo/Nuevo Laredo-International Falcon Reservoir

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
10a	***Chloride***	water	aquatic life acute aquatic life chronic	1.1 x 4.1 x	860 mg/L 230 mg/L
- -	***Antimony***	sediment	national 85th percentile	1.9 x	8.0 mg/kg
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.6 x 35 x 4.5 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***DDT***	sediment	sediment quality criteria	105 x	0.02 mg/kg
11	***Arsenic***	tissue(bass-filet)	EPA edible tissue	11.1 x	0.062 mg/kg
- -	***Copper***	tissue (carp-whole)	USFWS 85th percentile	1.4 x	0.5 mg/kg
- -	***Mercury***	tissue (bass-filet)	USFDA action level state 85th percentile	1.2 x 1.2 x	1.0 mg/kg 1.0 mg/kg
- -	***Zinc***	tissue (carp-whole)	national 85th percentile USFWS 85th percentile	2.7 x 2.2 x	28 mg/kg 34.2 mg/kg
11a	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.4 x 30 x 3.9 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
11b	***Chloride***	water	aquatic life acute aquatic life chronic	1.1 x 4.0 x	860 mg/L 230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.2 x 26.1 x 3.6 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***DDT***	sediment	sediment quality criteria	100 x	0.02 mg/kg
- -	***DDE***	sediment	sediment quality criteria	1.8 x	0.0035 mg/kg
11b.1	***Arsenic***	water	human health-water & fish human health-fish	11.1 x 1.4 x	0.18 Fg/L 1.4 Fg/L
11b.2	***Arsenic***	water	human health-water & fish human health-fish	13.3 x 1.7 x	0.18 Fg/L 1.4 Fg/L
- -	***Zinc***	water	state 85th percentile	1.0 x	21 Fg/L
- -	***Bromodichloro-methane***	water	national 85th percentile human health-water & fish	2.0 x 7.4 x	10 Fg/L 2.7 Fg/L

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
Laredo/Nuevo Laredo-International Falcon Reservoir

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
11b.2	***Chloroform***	water	national 85th percentile state 85th percentile	3.2 x 1.6 x	12 Fg/L 24 Fg/L
- -	***Dibromochloromethane***	water	human health-water & fish	1.1 x	2.7 Fg/L
11b.3	***Unionized Ammonia***	water	aquatic life acute aquatic life chronic	1.0 x 11.3 x	0.189 mg/L 0.017 mg/L
- -	***Chloride***	water	aquatic life chronic	1.1 x	230 mg/L
- -	***Arsenic***	water	human health-water & fish human health-fish	12.2 x 1.6 x	0.18 Fg/L 1.4 Fg/L
- -	***Toluene***	water	state 85th percentile	4.4 x	2.5 Fg/L
- -	***Xylene***	water	state 85th percentile	4.0 x	3.0 Fg/L
- -	***1,4-dichlorobenzene***	water	state 85th percentile	2.5 x	2.75 Fg/L
11c	***Unionized Ammonia***	water	aquatic life acute aquatic life chronic	1.7 x 20.8 x	0.167 mg/L 0.14 mg/L
- -	***Chloride***	water	aquatic life chronic	1.8 x	230 mg/L
- -	***Arsenic***	water	human health-water & fish human health-fish	16.7 x 2.1 x	0.18 Fg/L 1.4 Fg/L
- -	***Silver***	sediment	state 85th percentile	1.4 x	1.6 mg/kg
- -	***DDE***	sediment	sediment quality criteria	2.8 x	0.002 mg/kg
- -	***Chloroform***	water	national 85th percentile	1.8 x	12 Fg/L
12	***Arsenic***	water	human health-water & fish human health-fish	21.1 x 2.7 x	0.18 Fg/L 1.4 Fg/L
- -	***Silver***	sediment	state 85th percentile	1.0 x	1.6 mg/kg
12.1	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.1 x 23.3 x 3.0 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Copper***	sediment	molar SEM/AVS ratio	4.2	< 1.0
- -	***Lead***	sediment	molar SEM/AVS ratio	3.2	< 1.0
- -	***Nickel***	sediment	molar SEM/AVS ratio	12.4	< 1.0

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
Laredo/Nuevo Laredo-International Falcon Reservoir

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
12.1	***Zinc***	sediment	molar SEM/AVS ratio	24.6	< 1.0
- -	***N-nitrosodi-n-propylamine***	water	human health-water & fish	194 x	0.05 Fg/L
12.2	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.0 x 22.2 x 2.9 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Copper***	sediment	molar SEM/AVS ratio	5.5	< 1.0
- -	***Lead***	sediment	molar SEM/AVS ratio	5.2	< 1.0
		tissue (catfish-whole)	USFWS 85th percentile	1.1 x	0.22 mg/kg
- -	***Nickel***	sediment	molar SEM/AVS ratio	7.6	< 1.0
- -	***Zinc***	sediment	molar SEM/AVS ratio	31.2	< 1.0
		tissue (bass-whole)	national 85th percentile USFWS 85th percentile	2.5 x 2.0 x	28 mg/kg 34.2 mg/kg
- -	***DDE***	sediment	sediment quality criteria	1.5 x	0.003 mg/kg
12.3	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.4 x 30 x 3.9 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
Below International Falcon Reservoir-Brownsville/Matamoros

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
12d	***Chloride***	water	aquatic life acute aquatic life chronic	2.1 x 8.0 x	860 mg/L 230 mg/L
- -	***Arsenic***	water	national 85th percentile state 85th percentile human health-water & fish human health-fish	1.1 x 2.7 x 60 x 7.7 x	10 Fg/L 4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***DDE***	sediment	sediment quality criteria	2.5 x	0.01 mg/kg
13	***Arsenic***	water	human health-water & fish human health-fish	21.7 x 2.8 x	0.18 Fg/L 1.4 Fg/L
- -	***Silver***	sediment	state 85th percentile	1.6 x	1.6 mg/kg
14	***Arsenic***	water	human health-water & fish human health-fish	21.7 x 2.8 x	0.18 Fg/L 1.4 Fg/L
- -	***Copper***	sediment	molar SEM/AVS ratio	2.3	< 1.0
- -	***Lead***	sediment	molar SEM/AVS ratio	3.7	< 1.0
- -	***Nickel***	sediment	molar SEM/AVS ratio	4.9	< 1.0
- -	***Silver***	sediment	state 85th percentile	1.3 x	1.6 mg/kg
- -	***Zinc***	sediment	molar SEM/AVS ratio	17.5	< 1.0
15	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.1 x 25 x 3.2 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Lead***	tissue (bass whole)	USFWS 85th percentile	2.5 x	0.22 mg/kg
- -	***Silver***	sediment	national 85th percentile state 85th percentile	1.1 x 1.6 x	3.0 mg/kg 1.6 mg/kg
15a	***Unionized Ammonia***	water	aquatic life acute aquatic life chronic	1.2 x 7.2 x	0.329 mg/L 0.055 mg/L
- -	***Chloride***	water	aquatic life chronic	2.2 x	230 mg/L
- -	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.1 x 25 x 3.2 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Silver***	sediment	state 85th percentile	1.5 x	1.6 mg/kg
- -	***DDE***	sediment	sediment quality criteria	1.9 x	0.008 mg/kg

APPENDIX J
SUMMARY OF CRITERIA/SCREENING LEVEL EXCEEDANCES
Below International Falcon Reservoir-Brownsville/Matamoros

Station	Parameter	Matrix	Criteria/Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
16	***Arsenic***	water	human health-water & fish human health-fish	19.4 x 2.5 x	0.18 Fg/L 1.4 Fg/L
- -	***Copper***	sediment	molar SEM/AVS ratio	1.4	< 1.0
		tissue (bass-whole)	national 85th percentile USFWS 85th percentile	1.7 x 3.7 x	2.2 mg/kg 1.0 mg/kg
- -	***Nickel***	sediment	molar SEM/AVS ratio	3.3	< 1.0
- -	***Silver***	sediment	state 85th percentile	1.6 x	1.6 mg/kg
- -	***Zinc***	sediment	molar SEM/AVS ratio	13.4	< 1.0
		tissue (carp-whole)	national 85th percentile	1.5 x	28 mg/kg
- -	***Chlordane***	tissue (carp-filet)	EPA edible tissue	1.6 x	0.083 mg/kg
17	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.2 x 25.6 x 3.3 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Copper***	tissue (bass-whole)	national 85th percentile USFWS 85th percentile	1.1 x 2.4 x	2.2 mg/kg 1.0 mg/kg
- -	***Lead***	sediment	molar SEM/AVS ratio	1.4	< 1.0
- -	***Nickel***	sediment	molar SEM/AVS ratio	2.3	< 1.0
- -	***Silver***	sediment	national 85th percentile state 85th percentile	1.0 x 1.9 x	3.0 mg/kg 1.6 mg/kg
- -	***Zinc***	sediment	molar SEM/AVS ratio	10.5	< 1.0
18	***Arsenic***	water	state 85th percentile human health-water & fish human health-fish	1.0 x 2.2 x 2.9 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	***Silver***	sediment	state 85th percentile	1.7 x	1.6 mg/l
- -	***Zinc***	sediment	molar SEM/AVS ratio	2.9	< 1.0
- -	***Aroclor 1260***	tissue (snook-whole)	predator protection limit	1.8 x	< 0.1 mg/kg

APPENDIX J
SUMMARY OF SCREENING LEVEL EXCEEDANCES
(Listed by Parameter)

Parameter	**Station**	**Matrix**	**Screening Level Exceeded**	**Exceedance Factor**	**Criteria/ Screening Level**
Unionized Ammonia	1a	water	aquatic life acute aquatic life chronic	1.0 x 21.5 x	0.042 mg/L 0.002 mg/L
- -	2	water	aquatic life chronic	2.4 x	0.029 mg/L
- -	2a	water	aquatic life chronic	1.2 x	0.029 mg/L
- -	2.1	water	aquatic life chronic	2.3 x	0.024 mg/l
- -	2.2	water	aquatic life chronic	2.3 x	0.025 mg/L
- -	2.3	water	aquatic life chronic	2.1 x	0.025 mg/L
- -	9a	water	aquatic life chronic	5.5 x	0.027 mg/L
- -	11b.3	water	aquatic life acute aquatic life chronic	1.0 x 11.3 x	0.189 mg/L 0.017 mg/L
- -	11c	water	aquatic life acute aquatic life chronic	1.7 x 20.8 x	0.167 mg/L 0.14 mg/L
- -	15a	water	aquatic life acute aquatic life chronic	1.2 x 7.2 x	0.329 mg/L 0.055 mg/L
Chloride	0.5a	water	aquatic life chronic	2.1 x	230 mg/L
- -	1	water	aquatic life chronic	1.5 x	230 mg/L
- -	1.1	water	aquatic life chronic	1.3 x	230 mg/L
- -	1a	water	aquatic life chronic	1.1 x	230 mg/L
- -	2	water	aquatic life chronic	1.3 x	230 mg/L
- -	2.1	water	aquatic life chronic	1.2 x	230 mg/L
- -	2.2	water	aquatic life chronic	1.1 x	230 mg/L
- -	2.3	water	aquatic life chronic	1.7 x	230 mg/L
- -	2a	water	aquatic life chronic	1.3 x	230 mg/L
- -	3	water	aquatic life chronic	2.4 x	230 mg/L
- -	3a	water	aquatic life chronic	1.7 x	230 mg/L
- -	4	water	aquatic life chronic	2.3 x	230 mg/L
- -	5	water	aquatic life chronic	2.3 x	230 mg/L
- -	6a	water	aquatic life acute aquatic life chronic	1.1 x 4.0 x	860 mg/L 230 mg/L

APPENDIX J (cont)
SUMMARY OF SCREENING LEVEL EXCEEDANCES
(Listed by Parameter)

Parameter	Station	Matrix	Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
Chloride	9a	water	aquatic life chronic	2.2 x	230 mg/L
- -	10a	water	aquatic life acute	1.1 x	860 mg/L
			aquatic life chronic	4.1 x	230 mg/L
- -	11b	water	aquatic life acute	1.1 x	860 mg/L
			aquatic life chronic	4.0 x	230 mg/L
- -	11b.3	water	aquatic life chronic	1.1 x	230 mg/L
- -	11c	water	aquatic life chronic	1.8 x	230 mg/L
- -	12d	water	aquatic life acute	2.1 x	860 mg/L
			aquatic life chronic	8.0 x	230 mg/L
- -	15a	water	aquatic life chronic	2.2 x	230 mg/L
Antimony	10a	sediment	national 85th percentile	1.9 x	8.0 mg/kg
Arsenic	0.5a	water	state 85th percentile	1.2 x	4.0 Fg/L
			human health-water & fish	26.1 x	0.18 Fg/L
			human health-fish	3.4 x	1.4 Fg/L
- -	1	water	state 85th percentile	1.2 x	4.0 Fg/L
			human health-water & fish	26.1 x	0.18 Fg/L
			human health-fish	3.4 x	1.4 Fg/L
- -	1.1	water	state 85th percentile	2.3 x	4.0 Fg/L
			human health-water & fish	50 x	0.18 Fg/L
			human health-fish	6.4 x	1.4 Fg/L
- -	1a	water	state 85th percentile	1.6 x	4.0 Fg/L
			human health-water & fish	35.6 x	0.18 Fg/L
			human health-fish	4.6 x	1.4 Fg/L
- -	2	water	state 85th percentile	2.5 x	4.0 Fg/L
			national 85th percentile	1.0 x	10 Fg/L
			human health-water & fish	56.1 x	0.18 Fg/L
			human health-fish	7.2 x	1.4 Fg/L
- -	2a	water	state 85th percentile	1.5 x	4.0 Fg/L
			human health-water & fish	32.2 x	0.18 Fg/L
			human health-fish	4.1 x	1.4 Fg/L
		sediment	national 85th percentile	1.0 x	14 mg/kg
- -	3	water	state 85th percentile	1.9 x	4.0 Fg/L
			human health-water & fish	42.8 x	0.18 Fg/L
			human health-fish	5.5 x	1.4 Fg/L

APPENDIX J (cont)
SUMMARY OF SCREENING LEVEL EXCEEDANCES
(Listed by Parameter)

Parameter	Station	Matrix	Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
Arsenic	3a.1	water	national 85th percentile state 85th percentile human health-water & fish human health-fish	1.1 x 2.8 x 61.1 x 7.9 x	10 Fg/L 4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	4	water	state 85th percentile human health-water & fish human health-fish	1.8 x 39.4 x 5.1 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	5	water	state 85th percentile human health-water & fish human health-fish	1.7 x 38.3 x 4.9 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	6.1	water	state 85th percentile human health-water & fish human health-fish	1.2 x 26.7 x 3.4 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	6.2	water	state 85th percentile human health-water & fish human health-fish	1.1 x 25 x 3.2 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
		sediment	national 85th percentile	1.0 x	14 mg/kg
		tissue (bass- whole)	national 85th percentile	1.4 x	0.20 mg/kg
- -	9a	water	state 85th percentile human health-water & fish human health-fish	1.3 x 29.4 x 3.8 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	10	water	state 85th percentile human health-water & fish human health-fish	1.2 x 26.7 x 3.4 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
		tissue (bass-filet)	EPA edible tissue	24.2 x	0.062 mg/kg
- -	10a	water	state 85th percentile human health-water & fish human health-fish	1.6 x 35 x 4.5 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	11	tissue (bass-filet)	EPA edible tissue	11.1 x	0.062 mg/kg
- -	11a	water	state 85th percentile human health-water & fish human health-fish	1.4 x 30 x 3.9 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	11b	water	state 85th percentile human health-water & fish human health-fish	1.2 x 26.1 x 3.6 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L

APPENDIX J (cont)
SUMMARY OF SCREENING LEVEL EXCEEDANCES
(Listed by Parameter)

Parameter	Station	Matrix	Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
Arsenic	11b.1	water	human health-water & fish human health-fish	11.1 x 1.4 x	0.18 Fg/L 1.4 Fg/L
- -	11b.2	water	human health-water & fish human health-fish	13.3 x 1.7 x	0.18 Fg/L 1.4 Fg/L
- -	11b.3	water	human health-water & fish human health-fish	12.2 x 1.6 x	0.18 Fg/L 1.4 Fg/L
- -	11c	water	human health-water & fish human health-fish	16.7 x 2.1 x	0.18 Fg/L 1.4 Fg/L
- -	12	water	human health-water & fish human health-fish	21.1 x 2.7 x	0.18 Fg/L 1.4 Fg/L
- -	12.1	water	state 85th percentile human health-water & fish human health-fish	1.1 x 23.3 x 3.0 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
		sediment	molar SEM/AVS ratio	1.9	< 1.0
- -	12.2	water	state 85th percentile human health-water & fish human health-fish	1.0 x 22.2 x 2.9 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	12.3	water	state 85th percentile human health-water & fish human health-fish	1.4 x 30 x 3.9 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	12d	water	national 85th percentile state 85th percentile human health-water & fish human health-fish	1.1 x 2.7 x 60 x 7.7 x	10 Fg/L 4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	13	water	human health-water & fish human health-fish	21.7 x 2.8 x	0.18 Fg/L 1.4 Fg/L
- -	14	water	human health-water & fish human health-fish	21.7 x 2.8 x	0.18 Fg/L 1.4 Fg/L
- -	15	water	state 85th percentile human health-water & fish human health-fish	1.1 x 25 x 3.2 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	15a	water	state 85th percentile human health-water & fish human health-fish	1.1 x 25 x 3.2 x	4.0 Fg/L 0.18 Fg/L 1.4 Fg/L
- -	16	water	human health-water & fish human health-fish	19.4 x 2.5 x	0.18 Fg/L 1.4 Fg/L

APPENDIX J (cont)
SUMMARY OF SCREENING LEVEL EXCEEDANCES
(Listed by Parameter)

Parameter	Station	Matrix	Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
Arsenic	17	water	state 85th percentile	1.2 x	4.0 Fg/L
			human health-water & fish	25.6 x	0.18 Fg/L
			human health-fish	3.3 x	1.4 Fg/L
	18	water	state 85th percentile	1.0 x	4.0 Fg/L
			human health-water & fish	2.2 x	0.18 Fg/L
			human health-fish	2.9 x	1.4 Fg/L
Cadmium	0.5a	sediment	molar SEM/AVS ratio	1.5	< 1.0
- -	1	sediment	molar SEM/AVS ratio	38.5	< 1.0
		tissue (carp-whole)	USFWS 85th percentile	1.2 x	0.05 mg/kg
- -	2	tissue (carp-whole)	USFWS 85th percentile	1.2 x	0.05 mg/kg
- -	3a	tissue (carp-whole)	USFWS 85th percentile	1.3 x	0.05 mg/kg
- -	4	sediment	molar SEM/AVS ratio	9.8	< 1.0
- -	5	tissue (carp-whole)	USFWS 85th percentile	1.3 x	0.05 Fg/L
Chromium	7	tissue (carp-whole)	USFWS 85th percentile	1.7 x	1.0 mg/kg
- -	8	tissue (carp-whole)	USFWS 85th percentile	1.4 x	1.0 mg/kg
Copper	0.5a	water	state 85th percentile	1.3 x	5.0 Fg/L
		sediment	molar SEM/AVS ratio	126	< 1.0
- -	1	water	state 85th percentile	1.1 x	5.0 Fg/L
		sediment	molar SEM/AVS ratio	4.0	< 1.0
		tissue (carp-whole)	USFWS 85th percentile	1.8 x	1.0 mg/kg
- -	1.1	water	state 85th percentile	1.0 x	5.0 Fg/L
		sediment	molar SEM/AVS ratio	6.5	< 1.0
- -	2	sediment	molar SEM/AVS ratio	3.0	< 1.0
		tissue (carp-whole)	USFWS 85th percentile	1.8 x	1.0 mg/kg
- -	2a	sediment	national 85th percentile	1.8 x	77.2 mg/kg
- -	3	sediment	molar SEM/AVS ratio	5.2	< 1.0
	3a.1	sediment	molar SEM/AVS ratio	1.7	< 1.0

APPENDIX J (cont)
SUMMARY OF SCREENING LEVEL EXCEEDANCES
(Listed by Parameter)

Parameter	Station	Matrix	Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
Copper	4	sediment	molar SEM/AVS ratio	4.2	< 1.0
- -	5	tissue (carp-whole)	USFWS 85th percentile	1.4 x	1.0 mg/kg
- -	6.1	sediment	molar SEM/AVS ratio	4.2	< 1.0
- -	7	tissue (carp-whole)	USFWS 85th percentile	1.7 x	1.0 mg/kg
- -	7b	tissue (carp-whole)	USFWS 85th percentile	1.2 x	1.0 mg/kg
- -	8	tissue (carp-whole)	USFWS 85th percentile	1.4 x	1.0 mg/kg
- -	11	tissue (carp-whole)	USFWS 85th percentile	1.4 x	0.5 mg/kg
- -	12.1	sediment	molar SEM/AVS ratio	4.2	< 1.0
- -	12.2	sediment	molar SEM/AVS ratio	5.5	< 1.0
- -	14	sediment	molar SEM/AVS ratio	2.3	< 1.0
- -	16	sediment	molar SEM/AVS ratio	1.4	< 1.0
		tissue (bass-whole)	national 85th percentile USFWS 85th percentile	1.7 x 3.7 x	2.3 mg/kg 1.0 mg/kg
- -	17	tissue (bass-whole)	national 85th percentile USFWS 85th percentile	1.1 x 2.4 x	2.2 mg/kg 1.0 mg/kg
Lead	0.5a	sediment	molar SEM/AVS ratio	37.6	< 1.0
- -	1	sediment	molar SEM/AVS ratio	1.5	< 1.0
- -	1.1	sediment	molar SEM/AVS ratio	1.9	< 1.0
- -	2	sediment	molar SEM/AVS ratio	3.0	< 1.0
- -	3	sediment	molar SEM/AVS ratio	1.9	< 1.0
- -	3a.1	sediment	molar SEM/AVS ratio	1.8	< 1.0
- -	4	sediment	molar SEM/AVS ratio	2.9	< 1.0
- -	6.1	sediment	molar SEM/AVS ratio	1.7	< 1.0
- -	12.1	sediment	molar SEM/AVS ratio	3.2	< 1.0
- -	12.2	sediment	molar SEM/AVS ratio	5.2	< 1.0
		tissue (catfish-whole)	USFWS 85th percentile	1.1 x	0.22 mg/kg
- -	14	sediment	molar SEM/AVS ratio	3.7	< 1.0
- -	15	tissue (bass-whole)	USFWS 85th percentile	2.5 x	0.22 mg/kg

APPENDIX J (cont)
SUMMARY OF SCREENING LEVEL EXCEEDANCES
(Listed by Parameter)

Parameter	Station	Matrix	Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
Lead	17	sediment	molar SEM/AVS ratio	1.4	< 1.0
Mercury	6.1	tissue (bass-whole)	predator protection limit	2.5 x	0.1 mg/kg
	11	tissue (bass-filet)	USFDA action level state 85th percentile	1.2 x 1.2 x	1.0 mg/kg 1.0 mg/kg
Nickel	0.5a	water	state 85th percentile	1.5 x	5.0 Fg/L
		sediment	molar SEM/AVS ratio	66.8	< 1.0
- -	1	sediment	molar SEM/AVS Ratio	3.3	< 1.0
- -	1.1	sediment	molar SEM/AVS Ratio	2.5	< 1.0
- -	2	sediment	molar SEM/AVS Ratio	4.6	< 1.0
- -	2a	water	state 85th percentile	1.5 x	5.0 mg/kg
- -	3	sediment	molar SEM/AVS Ratio	6.5	< 1.0
- -	3a.1	sediment	molar SEM/AVS Ratio	2.4	< 1.0
- -	4	sediment	molar SEM/AVS Ratio	5.5	< 1.0
- -	6.1	sediment	molar SEM/AVS Ratio	6.9	< 1.0
- -	12.1	sediment	molar SEM/AVS Ratio	12.4	< 1.0
- -	12.2	sediment	molar SEM/AVS Ratio	7.6	< 1.0
- -	14	sediment	molar SEM/AVS Ratio	4.9	< 1.0
- -	16	sediment	molar SEM/AVS Ratio	3.3	< 1.0
- -	17	sediment	molar SEM/AVS Ratio	2.3	< 1.0
Selenium	3	tissue (small mouth buffalo-whole)	national 85th percentile TDH screening level predator protection limit	2.8 x 1.2 x 4.6 x	0.83 mg/kg 2.0 mg/kg 0.5 mg/kg
- -	3a	tissue (carp-whole)	national 85th percentile predator protection limit	1.2 x 2.0 x	3.5 mg/kg 0.5 mg/kg
- -	4	tissue (carp-whole)	national 85th percentile predator protection limit	1.0 x 1.7 x	0.83 mg/kg 0.5 mg/kg
Silver	2a	sediment	national 85th percentile state 85th percentile	1.2 x 2.3 x	3.0 mg/kg 1.6 mg/kg
- -	11c	sediment	state 85th percentile	1.4 x	1.6 mg/kg
- -	12	sediment	state 85th percentile	1.0 x	1.6 mg/kg

APPENDIX J (cont)
SUMMARY OF SCREENING LEVEL EXCEEDANCES
(Listed by Parameter)

Parameter	Station	Matrix	Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
Silver	13	sediment	state 85th percentile	1.6 x	1.6 mg/kg
- -	14	sediment	state 85th percentile	1.3 x	1.6 mg/kg
- -	15	sediment	national 85th percentile state 85th percentile	1.1 x 1.6 x	3.0 mg/kg 1.6 mg/kg
- -	15a	sediment	state 85th percentile	1.5 x	1.6 mg/kg
- -	16	sediment	state 85th percentile	1.6 x	1.6 mg/kg
- -	17	sediment	national 85th percentile state 85th percentile	1.0 x 1.9 x	1.6 mg/kg
- -	18	sediment	state 85th percentile	1.7 x	1.6 mg/kg
Zinc	0.5a	sediment	molar SEM/AVS ratio	294	< 1.0
- -	1	sediment	molar SEM/AVS Ratio	11.6	< 1.0
- -	1.1	sediment	molar SEM/AVS Ratio	12.1	< 1.0
- -	2	tissue (carp-whole)	national 85th percentile USFWS 85th percentile	1.6 x 1.3 x	28 mg/kg 34.2 mg/kg
		sediment	molar SEM/AVS Ratio	22	< 1.0
- -	3	sediment	molar SEM/AVS Ratio	21.4	< 1.0
- -	3a	sediment	molar SEM/AVS Ratio	2.2	< 1.0
		tissue (carp-whole)	national 85th percentile USFWS 85th percentile	1.5 x 1.3 x	28 mg/kg 34.2 mg/kg
- -	3a.1	sediment	molar SEM/AVS Ratio	11.3	< 1.0
- -	4	sediment	molar SEM/AVS Ratio	33.4	< 1.0
		tissue (carp-whole)	USFWS 85th percentile	1.6 x	34.2 mg/kg
- -	5	tissue (carp-whole)	national 85th percentile USFWS 85th percentile	3.1 x 2.5 x	28 mg/kg 34.2 mg/kg
- -	6.1	sediment	molar SEM/AVS Ratio	19.7	< 1.0
- -	7b	sediment	molar SEM/AVS Ratio	3.7	< 1.0
- -	8	tissue (carp-whole)	national 85th percentile USFWS 85th percentile	1.3 x 1.0 x	28 mg/kg 34.2 mg/kg
- -	11	tissue (carp-whole)	national 85th percentile USFWS 85th percentile	2.7 x 2.2 x	28 mg/kg 34.2 mg/kg

APPENDIX J (cont)
SUMMARY OF SCREENING LEVEL EXCEEDANCES
(Listed by Parameter)

Parameter	Station	Matrix	Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
Zinc	11b.2	water	state 85th percentile	1.0 x	21 Fg/L
- -	12.1	sediment	molar SEM/AVS Ratio	24.6	< 1.0
- -	12.2	sediment	molar SEM/AVS Ratio	31.2	< 1.0
		tissue (bass-whole)	national 85th percentile USFWS 85th percentile	2.5 x 2.0 x	28 mg/kg 34.2 mg/kg
- -	14	sediment	molar SEM/AVS Ratio	17.5	< 1.0
- -	16	sediment	molar SEM/AVS Ratio	13.4	< 1.0
		tissue (carp-whole)	national 85th percentile	1.5 x	28 mg/kg
- -	17	sediment	molar SEM/AVS Ratio	10.5	< 1.0
- -	18	sediment	molar SEM/AVS Ratio	2.9	< 1.0
Phenol Single Compound	2a	water	national 85th percentile state 85th percentile	1.1 x 2.3 x	13 Fg/L 6.0 Fg/L
Phenolics Recoverable	1.1	water	national 85th percentile	1.0 x	24 Fg/L
Bromodichloromethane	11b.2	water	national 85th percentile human health-water & fish	2.0 x 7.4 x	10 Fg/L 2.7 Fg/L
Chloroform	7b	tissue (carp-filet) tissue (carp-whole)	state 85th percentile state 85th percentile	2.3 x 5.0 x	0.01 mg/kg 0.01 mg/kg
- -	11b.2	water	national 85th percentile state 85th percentile	3.2 x 1.6 x	12 Fg/L 24 Fg/L
- -	11c	water	national 85th percentile	1.8 x	12 Fg/L
Dibromochloromethane	11b.2	water	human health-water & fish	1.1 x	2.7 Fg/L
Benzene	7b	tissue (carp-filet) tissue (carp-whole)	state 85th percentile state 85th percentile	2.5 x 2.7 x	0.01 mg/kg 0.01 mg/kg
Toluene	11b.3	water	state 85th percentile	4.4 x	2.5 Fg/L
Xylene	11b.3	water	state 85th percentile	4.0 x	3.0 Fg/L
1,4-dichlorobenzene	11b.3	water	state 85th percentile	2.5 x	2.75 Fg/L
Bis (2-ethylhexyl) phthalate	3	water	national 85th percentile state 85th percentile	1.2 x 1.1 x	5.0 Fg/L 5.5 Fg/L
- -	3a	water	national 85th percentile state 85th percentile human health-water & fish	5.0 x 4.5 x 1.4 x	5.0 Fg/L 5.5 Fg/L 18 Fg/L

APPENDIX J (cont)
SUMMARY OF SCREENING LEVEL EXCEEDANCES
(Listed by Parameter)

Parameter	Station	Matrix	Screening Level Exceeded	Exceedance Factor	Criteria/ Screening Level
N-nitrosodi-n-propylamine	12.1	water	human health-water & fish	194 x	0.05 Fg/L
Chlordane	7b.1	sediment	sediment quality crtieria	1.0 x	0.066 mg/kg
- -	16	tissue (carp-filet)	EPA edible tissue	1.7 x	0.083 mg/kg
DDE	0.5a	sediment	sediment quality criteria	1.7 x	0.0036mg/kg
- -	2a	sediment	sediment quality criteria	1.5 x	0.018 mg/kg
- -	3	tissue (carp sucker)	EPA edible tissue	4.4 x	0.32 mg/kg
- -	3a	sediment	sediment quality criteria	1.2 x	0.003 mg/kg
- -	4	tissue (carp-filet)	EPA edible tissue	1.7 x	0.32 mg/kg
- -	11b	sediment	sediment quality criteria	1.8 x	0.0035mg/kg
- -	11c	sediment	sediment qualtiy criteria	2.8 x	0.002 mg/kg
- -	12.2	sediment	sediment quality criteria	1.5 x	0.003 mg/kg
- -	12d	sediment	aquatic life threshold	1.3 x	8.5 mg/kg
- -	15a	sediment	sediment quality criteria	1.9 x	0.008 mg/kg
DDT	10a	sediment	sediment quality criteria	105 x	0.02 mg/kg
- -	11b	sediment	sediment quality criteria	100 x	0.02 mg/kg
Aroclor 1260	18	tissue (snook-whole)	predator protection limit	1.8 x	< 0.1 mg/kg

APPENDIX K
SITE RANKING

The following information was used to calculate the site ranks. Tributary and mainstem sites were calculated separately. This section also includes result tables for the ranking of sites by (1) water, sediment, fish tissue and toxicity data; (2) water, sediment, fish tissue, toxicity data and biological community data; (3) water only (includes chemical and toxicity data); (4) sediment only (includes chemical and toxicity data); and (5) fish tissue only.

Overall Ranking Data for Tributary Sites

Station	Water Score	Human Health Score u	Aquatic Life Score	Sediment Score	Fish Tissue Score	Human Health Score ˜	Water Toxicity Score	Sediment Toxicity Score	Total Site Score	Rank Score
0.5a	17.8	10	2.5	104.9	- -	- -	7	3	145.2	10.40
1a Ž	28.4	10	7.5		- -	- -	297	- -	342.9	- -
2a	19.7	10	5	20.5	- -	- -	297	90	442.2	31.6
3a	7.6	5	2.5	15.7	16.6	0	5.4	2.2	55.0	3.06
3a.1	66.1	10	0	20.3	- -	- -	0	13	109.4	7.81
7b	2.0	0	0	17.7	20.5	0	30	14.6	84.8	6.06
7b.1	2.0	0	0	15	- -	- -	5.4	11.1	33.5	2.39
7b.2	2.0	0	0	14	- -	- -	16.8	0	32.8	2.34
9a	18.3	10	5	13	- -	- -	3.0	110.6	159.9	11.42
10a	41.0	10	0	70.5	- -	- -	200	9.1	330.6	23.61
11a	34.0	10	0	14	- -	- -	10	0	68.0	4.86
11b	21.5	10	5	65.9	- -	- -	149.5	3.7	255.6	18.26
11b.1 Ž	18.1	10	0	- -	- -	- -	200	- -	228.1	- -
11b.2 Ž	17.2	20	0	- -	- -	- -	17.9	- -	55.1	- -
11b.3 Ž	21.9	10	7.5	- -	- -	- -	230	- -	269.4	- -
11c	20.2	10	7.5	19.1	- -	- -	293	283	632.8	45.20
12d	40.0	10	5	17.5	- -	- -	29.3	19.7	121.5	8.68
15a	19.4	10	7.5	19.5	- -	- -	293	17.0	366.4	26.17

Ž Water only collected at these stations. Rank Scores were used to calculate the level of concern for water quality only.
u Water Criteria
˜ Edible Fish Tissue
[- -] Not Applicable

APPENDIX K (cont)
Overall Ranking Data for Mainstem Sites

Station	Water Score	Human Health Score u	Aquatic Life Score	Sediment Score	Fish Tissue Score	Human Health Score ˜	Water Toxicity Score	Sediment Toxicity Score	Bio Score	Total Site Score	Rank Score
1	17.6	10	2.5	26.8	12.5	0	11.5	0	7.5	88.4	4.42
1.1	23.3	10	2.5	19.8	- -	- -	4	0	- -	59.6	4.26
2	26.9	10	5	27.1	16.5	0	0	93	7.5	186.1	9.30
3	24.4	10	2.5	23.8	19.6	10	15.6	3.0	7.5	116.4	5.82
4	48.8	10	2.5	26.2	18.7	10	34.1	0	5.0	155.3	7.64
5	27.3	10	2.5	10	15.9	0	25.3	6.1	7.5	104.6	5.23
6.1	31.7	10	0	26.2	16.5	0	7.6	4.5	- -	96.5	5.36
6.2	29.0	10	0	12	13.4	0	6.4	20	- -	90.8	5.04
7—	- -	- -	- -	- -	17.7	0	- -	- -	- -	17.7	- -
8—	- -	- -	- -	- -	14.35	0	- -	- -	- -	14.3	- -
9—	- -	- -	- -	- -	15.0	0	- -	- -	- -	15.0	- -
10	31.7	10	0	13	34.2	10	0	4.0	0	102.9	5.15
11—	- -	- -	- -	- -	20.3	20	- -	- -	- -	40.3	- -
12	26.1	10	0	16	10	0	7	3	2.5	74.6	3.73
12.1	116.2	15	0	27.1	10	0	12.5	0	2.5	183.3	9.17
12.2	29.2	10	0	28.2	14.8	0	0	0	- -	82.2	4.57
12.3	36.0	10	0	12	9.0	0	0	0	- -	67.0	3.72
13	26.7	10	0	15.6	9.0	0	11	0	2.5	74.8	3.74
14	25.7	10	0	22.9	10.0	0	10	0	2.5	81.1	4.10
15	30.0	10	0	14.6	11.5	0	16.5	0	2.5	85.1	4.26
16	23.4	10	0	20.9	13.3	10	11.3	8.1	0	97.0	4.85
17	31.6	10	0	20.0	12.4	0	7.0	0	2.5	83.5	4.18
18	28.2	10	0	16.9	14.8	0	4.0	4.0	7.5	85.4	4.27

— Fish tissue only collected at these stations. Rank Scores were used to calculate the level of concern for fish tissue quality only.
u Water Criteria
˜ Edible Fish Tissue
[- -] Not Applicable

APPENDIX K (cont)
Overall Ranking for Mainstem and Tributary Sites
Based on Water, Sediment, Fish Tissue, and Toxicity

Station	Total Site Score	Rank Score	Percent (%)	Rank	Level of Concern
2 ! #	186	9.30	100	1	HIGH
12.1 ! #	183.3	9.17	94.7	2	
4 ! #	155.3	7.80	89.5	3	
3 ! #	116.4	5.81	84.2	4	
6.1#	96.5	5.37	79.0	5	
5 ! #	104.6	5.23	73.7	6	MODERATE
10 ! #	102.9	5.15	68.4	7	
6.2#	90.8	5.04	63.2	8	
16 ! #	97.8	4.89	57.9	9	
12.2#	85.3	4.74	52.6	10	
1 ! #	92.6	4.42	47.4	11	LOW
18 ! #	85.4	4.27	42.1	12	
15 !	85.1	4.26	36.8	13	
1.1	59.6	4.25	31.6	14	
17 !	83.5	4.24	26.3	15	
14 !	81.1	4.14	21.1	16	SLIGHT
13 !	74.8	3.74	15.8	17	
12 ! #	74.6	3.73	10.5	18	
12.3#	67.0	3.72	5.3	19	

Station	Total Site Score	Rank Score	Percent (%)	Rank	Level of Concern
11c	632.8	45.2	100	1	HIGH
2a	442.2	31.60	92.9	2	
15a	366.4	26.17	85.7	3	
10a	330.6	23.61	78.6	4	
11b	255.6	18.26	71.4	5	MODERATE
9a	165.2	11.80	64.3	6	
0.5a	145.2	10.40	57.1	7	
12d	121.5	8.68	50	8	
3a.1 !	109.4	7.81	42.9	9	LOW
7b ! #	84.8	6.06	35.7	10	
11a	68	4.86	28.6	11	
3a ! #	55	3.06	21.4	12	SLIGHT
7b.1	33.5	2.39	14.3	13	
7b.2	32.8	2.34	7.1	14	

! Biological Data included in calculations
Fish Tissue included in calculations

*RANK = 1 WORST; 14 BEST

APPENDIX K (cont)
Water Quality Ranking for Mainstem and Tributary Sites

WATER QUALITY RANKING

Station	Total Water Site Score	Percent (%)	Rank*	Level of Concern
12.1	143.7	100	1	HIGH
4	95.4	94.7	2	HIGH
5	65.1	89.5	3	HIGH
15	56.5	84.2	4	HIGH
3	52.5	79.0	5	HIGH
6.1	49.3	73.7	6	MODERATE
17	48.6	68.4	7	MODERATE
13	47.7	63.2	8	MODERATE
12.3	46	57.9	9	MODERATE
14	45.7	52.6	10	MODERATE
6.2	45.4	47.4	11	LOW
16	44.7	42.1	12	LOW
12	43.1	36.8	13	LOW
2	41.9	31.6	14	LOW
10	41.7	26.3	15	LOW
1	41.6	21.1	16	SLIGHT
1.1	39.8	15.8	17	SLIGHT
12.2	39.2	10.5	18	SLIGHT
18	32.2	5.3	19	SLIGHT

Station	Total Water Site Score	Percent (%)	Rank*	Level of Concern
1a	342.9	100	1	HIGH
2a	331.7	94.4	2	HIGH
11c	330.7	88.9	3	HIGH
15a	319.9	83.3	4	HIGH
11b.3	269.4	77.8	5	HIGH
10a	241.6	72.2	6	MODERATE
11b.1	228.1	66.7	7	MODERATE
11b	186	61.1	8	MODERATE
12d	84.3	55.6	9	MODERATE
3a.1	76.1	50.0	10	MODERATE
11b.2	55.1	44.4	11	LOW
11a	54	38.9	12	LOW
0.5a	37.1	33.3	13	LOW
9a	36.3	27.8	14	LOW
7b	32	22.2	15	LOW
3a	20.5	16.7	16	SLIGHT
7b.2	18.8	11.1	17	SLIGHT
7b.1	7.4	5.6	18	SLIGHT

* Total site score was used as the rank score. Eight components were used to calculate the score for each site.

*RANK = 1 WORST; 14 BEST

APPENDIX K (cont)
Sediment Quality Ranking for Mainstem and Tributary Sites

SEDIMENT QUALITY RANKING

Station	Total Sediment Site Score	Percent (%)	Rank*	Level of Concern
2	120.15	100	1	HIGH
6.2	32	94.7	2	HIGH
6.1	29.6	89.5	3	HIGH
16	29.0	84.2	4	HIGH
12.2	28.2	79.0	5	HIGH
12.1	27.1	73.7	6	**MODERATE**
1	26.8	68.4	7	**MODERATE**
3	26.8	63.2	8	**MODERATE**
4	26.2	57.9	9	**MODERATE**
14	22.94	52.6	10	**MODERATE**
18	20.9	47.4	11	LOW
17	20.0	42.1	12	LOW
1.1	19.8	36.8	13	LOW
12	19.0	31.6	14	LOW
10	17.0	26.3	15	LOW
5	16.1	21.1	16	SLIGHT
13	15.6	15.8	17	SLIGHT
15	14.6	10.5	18	SLIGHT
12.3	12.0	5.3	19	SLIGHT

Station	Total Sediment Site Score	Percent (%)	Rank*	Level of Concern
11c	302.1	100	1	HIGH
9a	123.6	92.9	2	HIGH
2a	110.5	85.7	3	HIGH
0.5a	107.9	78.6	4	HIGH
10a	79.55	71.4	5	MODERATE
11b	69.6	64.3	6	MODERATE
12d	37.2	57.1	7	MODERATE
15a	36.5	50.0	8	MODERATE
3a.1	33.3	42.9	9	LOW
7b	32.3	35.7	10	LOW
7b.1	26.1	28.6	11	LOW
3a	17.9	21.4	12	SLIGHT
11a	14	7.1	13	SLIGHT
7b.2	14	7.1	13	SLIGHT

NOTE: Total site score was used as the rank score. Eight components were used to calculate the score for each site.

*RANK = 1 WORST; 14 BEST

APPENDIX K (cont)
Fish Tissue Quality Ranking for Mainstem and Tributary Sites

FISH TISSUE QUALITY RANKING

Station	Fish Tissue Score	Human Health Score	Total Tissue Site Score	Percent (%)	Rank	Level of Concern
16	39.3	10	49.3	100	1	HIGH
10	39.2	10	49.2	95.8	2	
4	18.7	10	28.7	91.7	3	
7b	43.5	0	40.3	87.5	4	
11	20.1	20	20	83.3	5	
2	39.5	0	39.5	79.2	6	
3	24.5	10	34.5	75	7	
6.1	31.5	0	31.5	70.8	8	MODERATE
3a	30.6	0	30.6	66.7	9	
6.2	30.4	0	30.4	62.5	10	
12	30	0	30	54.2	11	
12.1	30	0	30	54.2	12	
14	29	0	29	50	13	
18	22.8	0	22.8	45.8	14	SLIGHT
5	20.9	0	20.9	41.7	15	
7	17.7	0	17.7	37.5	16	
1	17.5	0	17.5	33.3	17	
12.2	16.8	0	16.8	29.2	18	
15	16.5	0	16.5	25.0	19	
17	16.4	0	16.4	20.8	20	LOW
13	16	0	16	16.7	21	
9	15.0	0	15.0	12.5	22	
8	14.4	0	14.4	8.3	23	
12.3	14	0	14	4.2	24	

NOTE: Total site score was used as the rank score. Four components were used to calculate the score for each site.

*RANK = 1 WORST; 14 BEST

APPENDIX L
QUALITY ASSURANCE MEASURES

The study was conducted in accordance with a quality assurance project plan (QAPP) approved by USEPA Region 6 (TNRCC 1995a). The QAPP describes the quality assurance procedures in detail. The following is an evaluation of specific data quality measures.

Field Blanks

One field blank per survey was analyzed at a frequency of 13.5% which equaled 5 blanks per 37 samples. Blanks were made up of type 2 deionized water provided by the TNRCC laboratory in Houston. Bottles of type 2 deionized water were carried to the field, and handled by the same protocols used for ambient water samples. Blanks were analyzed for dissolved metals, volatile organics and pesticides. Due to sampler error there was no dissolved metals blank analyzed for the Laredo/Nuevo Laredo survey. The results are included in the following table.

Field Blank Data Summary [Î]

Parameter [Ï]		**El Paso**	**Rio Conchos [Ð]**	**Del Rio**	**Laredo**	**Brownsville**
Aluminum	4 Fg/L[Ñ]	7.3 (1.8x)	9.0 (2. 25x)	ND	NS	ND
Antimony	2 Fg/L[Ñ]	15.9 (7.95x)	8.4 (4.2x)	15.4 (7.7x)	NS	8.9 (4.45x)
Lead	1 Fg/L[Ñ]	ND	ND	1.6 (1.6x)	NS	ND
Zinc	1 Fg/L[Ñ]	4.1 (4.1x)	7.2 (7.2x)	ND	NS	ND
Toluene	2 Fg/L[Ñ]	ND	1.2[Ò]	0.4[Ò]	ND	ND

Î - Concentrations of values in table are in Fg/L. Values in ( ) are the number of times the blank concentration exceeded the minimum detection limit.
Ï - Parameters that exceeded the detection limit
Ð- One Rio Conchos station was sampled in August 1995, rest sampled in December 1995
Ñ- Minimum detection limit
Ò- Detected but less than minimum detection limit
ND Not Detected
NS No Sample-sampler error

Organics were not detected in any of the blanks. Toluene was detected in two blanks but was identified as a common lab contaminant by the Texas Department of Health. Both toluene values reported were less than the detection limit of 2 Fg/L.

Four metals including aluminum, antimony, lead, and zinc were found above the detection limits. Aluminum and zinc were found in two blanks, lead in one blank while antimony was detected in all four blanks. Possible effects of aluminum, lead and zinc on analytical results were moderate. Aluminum and zinc were detected in the blank and in samples from the El Paso/Ciudad Juárez and Presidio/Ojinaga-Big Bend National Park Reaches. Lead was detected in the blank and samples from Amistad International Reservoir-Eagle Pass/Piedras Negras Reach.

Lead in water data was not included in the data analysis for the Amistad International Reservoir-Piedras Negras Reach. All ambient lead data for this reach was less than human health and aquatic life criteria. Antimony in water values were not included in the data analysis. Aluminum and zinc values eliminated from data analysis in the El Paso/Ciudad Juárez and Presidio/Ojinaga-Big Bend National Park Reaches were lower than aquatic life criteria (human health criteria were not available for these metals).

Possible sources of metals in the blanks include (1) pre-contamination of the type 2 deionized water furnished by the laboratory; (2) laboratory contamination during analysis; (3) leaching of metals from tubing, in-line filters, or from sample containers walls; (4) contamination from gloves of sample collectors; (5) atmospheric contamination; and/or (6) pre-contamination of the samples bottles pre-preserved by the supplier with metals grade nitric acid.

Precision

Data precision was evaluated using analytical data from duplicate water and sediment samples. Duplicated water samples were analyzed at a frequency of 13.5% which equaled five duplicates per 37 samples. Duplicate sediment samples were analyzed at a frequency of 15.2% which equaled five duplicates per 33 samples. Duplicates were collected, handled and preserved using standard procedures. Duplicates were analyzed for metals, volatile/semi-volatile organics and pesticides. Field duplicate water samples were collected as grab samples, and sediment duplicates were collected from a single composite. This would cause the sediment duplicates to have less variability than the water duplicates. The precision was acceptable for the purposes of this study.

Seven metals were the only parameters in water that occurred above detection limits. Coefficients of variation for duplicate samples generally exceeded the target levels. However, the precision target levels were meant for laboratory duplicates and not the field duplicates used in this study. Since field duplicates are expected to have more variability, the coefficients of variation tend to be higher than the target values.

Analytical Data-Duplicate Water Samples Summary

Parameter	Duplicates		Mean	Standard Deviation	Coefficient of Variation (%) ¯	Target Coefficient of Variation ¯
	1	2				
El Paso/Ciudad Juárez and Presidio/Ojinaga-Big Bend National Park Reaches (Station 2)						
Aluminum	4.8	11.5	8.15	3.35	41.1	± 6.0
Antimony	8.6	13.4	11.0	2.4	21.8	± 6.8
Arsenic	10.1	9.9	10.0	0.10	1.0	± 11.2
Copper	< 5.2 *	7.0	5.5	1.5	27.3	± 2.5
Selenium	1.9	1.3	1.6	0.3	18.8	± 6.8
Zinc	5.3	3.2	4.25	1.05	24.7	± 3.3

Analytical Data-Duplicate Water Samples Summary (cont)

Parameter	Duplicates 1	Duplicates 2	Mean	Standard Deviation	Coefficient of Variation (%) ˜	Target Coefficient of Variation ‒
Presidio/Ojinaga -Big Bend National Park Reach (Station 3a.1) ž						
Aluminum	9.6	< 8.0	6.8	2.8	41.2	± 6.0
Arsenic	11.0	11.2	11.1	0.10	0.9	± 11.2
Copper	2.8	< 7.0 *	4.9	2.1	42.9	± 2.5
Zinc	10.6	3.0	6.8	3.8	55.9	± 3.3
Amistad International Reservoir-Eagle Pass Piedras Negras Reach (Station 7b)						
Antimony	3.7	5.5	4.6	0.9	19.6	± 6.8
Arsenic	< 1.8 *	1.8	1.9	0.1	5.3	± 11.2
Lead	1.4	< 1.2 *	1.2	0.2	16.7	± 5.8
Laredo/Nuevo Laredo-Falcon International Reservoir Reach (Station 12.1)						
Antimony	4.2	5.5	4.85	0.65	13.4	± 6.8
Arsenic	4.2	4.0	4.1	0.65	15.9	± 11.2
Lead	1.2	< 1.5 *	1.1	0.1	9.1	± 5.8
Below Falcon International Reservoir-Brownsville/Matamoros Reach (Station 13)						
Aluminum	7.7	< 8.0 *	40.5	36.5	90.1	± 6.0
Antimony	1.2	7.1	4.15	2.95	71.1	± 6.8
Arsenic	3.9	4.7	4.3	0.40	9.3	± 11.2
Lead	< 2.7 *	2.9	1.95	0.95	48.7	± 5.8

* Detection limit used in calculation (aluminum 4 Fg/L; arsenic 2 Fg/L; copper 4 Fg/L; lead 1 Fg/L)
ž Only one station was sampled during this survey, August 1995, the remaining stations were sampled in December 1995.
‒ Target coefficients of variation are the precsion limits laboratory duplicates in the QAPP.
˜ Calculated as standard deviation/mean x 100

Analytical Data-Duplicate Sediment Samples Summary

Parameter	Duplicates 1	Duplicates 2	Mean	Standard Deviation	Coefficient of Variation (%) ¯	Target Coefficient of Variation ¯
El Paso/Ciudad Juárez and Presidio/Ojinaga-Big Bend National Park Reaches (Station 2)						
Aluminum	8250	7780	8015	235	29.3	± 6.0
Arsenic	4.7	5.0	4.85	0.15	3.1	± 11.2
Beryllium	0.48	0.42	0.45	0.03	6.7	± 10
Cadmium	0.37	0.47	0.42	0.05	11.9	± 2.6
Chromium	0.68	0.53	0.61	0.08	13.1	± 5.9
Copper	26.7	27.5	27.1	0.40	1.5	± 2.5
Lead	19.7	20.5	20.1	0.40	2.0	± 5.8
Mercury	0.03	0.05	0.04	0.01	25	± 5.4
Nickel	8.4	6.8	7.64	0.80	10.5	± 4.5
Selenium	0.23	0.30	0.265	0.035	13.2	± 6.8
Zinc	44.7	41.9	43.3	1.4	3.2	± 3.3
Presidio/Ojinaga -Big Bend National Park Reach (Station 3a.1) ž						
Aluminum	2900	3060	2980	80	2.7	± 6.0
Antimony	0.99	< 0.45 *	1.5	0.51	34	± 6.8
Arsenic	8.2	8.6	8.4	0.20	2.4	±1 1.2
Beryllium	0.21	0.22	0.215	0.005	2.3	± 10.0
Cadmium	0.14	0.12	0.13	0.01	7.7	± 2.6
Chromium	3.8	4.1	3.95	0.15	3.8	± 5.9
Copper	3.3	3.3	3.3	0	0	± 2.5
Lead	11.5	11.2	11.35	0.15	1.3	± 5.8
Mercury	0.02	0.02	0.02	0	0	± 5.4
Nickel	4.4	5.0	4.7	0.30	6.4	± 4.5
Selenium	0.12	0.13	0.125	0.005	4.0	± 6.8
Zinc	23	21.9	22.45	0.55	2.4	± 3.3

Parameter	Duplicates 1	Duplicates 2	Mean	Standard Deviation	Coefficient of Variation (%) ¯	Target Coefficient of Variation ¯
Amistad International Reservoir-Eagle Pass Piedras Negras Reach (Station 7b)						
Aluminum	6950	7090	7020	70	1.0	±6.0
Antimony	0.66	1.0	0.83	0.17	20.5	± 6.8
Arsenic	3.9	4.3	4.1	0.2	4.9	± 11.2
Beryllium	0.38	0.37	0.375	0.005	1.3	± 10.0
Cadmium	0.20	0.16	0.18	0.02	11.1	± 2.6
Chromium	6.7	7.7	7.2	0.5	6.9	± 5.9
Copper	5.6	5.2	5.4	0.2	3.7	± 2.5
Lead	11.4	11.3	11.35	0.05	0.44	± 5.8
Mercury	0.03	0.02	0.025	0.005	20	± 5.4
Nickel	6.5	7.3	6.9	0.40	5.8	± 4.5
Selenium	0.19	0.34	0.265	0.075	28.3	± 6.8
Thallium	0.88	0.29	0.585	0.295	50.4	± 10.0
Zinc	33.2	33.4	33.3	0.10	0.30	± 3.3
Laredo/Nuevo Laredo-Falcon International Reservoir Reach (Station 12.1)						
Aluminum	16300	14800	15550	750	4.8	± 6.0
Arsenic	4.4	4.8	4.6	0.2	4.3	± 11.2
Beryllium	0.63	0.60	0.615	0.015	2.4	± 10.0
Cadmium	0.23	0.24	0.235	0.005	2.1	± 2.6
Chromium	13.7	12.7	13.2	0.5	3.8	± 5.9
Copper	8.3	9.6	8.95	0.65	7.3	± 2.5
Lead	20.7	25.3	23.0	2.3	10	± 5.8
Mercury	0.03	0.03	0.03	0	0	± 5.4
Nickel	22.7	10.4	16.55	6.15	37.2	± 4.5
Silver	0.90	9.2	5.05	4.15	82.2	± 3.1
Thallium	0.36	0.39	0.375	0.015	4.0	± 10.0
Zinc	50.3	47.7	49.0	1.3	2.7	± 3.3

Parameter	Duplicates 1	Duplicates 2	Mean	Standard Deviation	Coefficient of Variation (%) ˜	Target Coefficient of Variation ¯
Below Falcon International Reservoir-Brownsville/Matamoros Reach (Station 13)						
Aluminum	8770	13900	11335	2565	22.6	± 6.0
Arsenic	5.2	5.3	5.25	0.05	0.95	± 11.2
Below Falcon International Reservoir-Brownsville/Matamoros Reach (Station 13) cont.						
Beryllium	0.36	0.51	0.435	0.075	17.2	± 10.0
Cadmium	0.13	0.18	0.155	0.025	16.1	± 2.6
Chromium	8.1	12.2	10.15	2.05	20.2	± 5.9
Copper	3.7	4.7	4.2	0.50	11.9	± 2.5
Lead	15.9	14.6	15.25	0.65	4.3	± 5.8
Mercury	0.03	0.02	0.025	0.005	20.0	± 5.4
Nickel	6.0	9.5	7.75	1.75	22.6	± 4.5
Selenium	0.07	0.17	0.45	0.28	62.2	± 6.8
Silver	2.6	4.7	3.65	1.05	28.8	± 3.1
Thallium	0.31	0.23	0.27	0.04	14.8	± 10.0
Zinc	28.7	40.3	34.5	5.8	16.8	± 3.3

* Detection limit used in calculation (aluminum 4 Fg/L; arsenic 2 Fg/L; copper 4 Fg/L; lead 1 Fg/L)
ž Only one station was sampled during this survey, August 1995, the remaining stations were sampled in December 1995.
¯ Target coefficients of variation are the precision limits for parameters set in the QAPP.
˜ Calculated as standard deviation/mean x 100

Accuracy

Laboratory blanks, spikes and quality control samples were analyzed according to USEPA requirements for accredited laboratories as described in the QAPP. Results of the laboratory quality control samples were not reported by the laboratory, but any problems were included with the analytical results sent by the laboratory. The laboratory was unable to achieve specified accuracy requirements for certain parameters. This information is included with raw data in Appendices E, F and G. Questionable data was omitted from the assessment, and is accounted for in the completeness section.

Data Completeness

A target of 90% completeness was established in the QAPP. The overall completeness for Phase 2 was 78.2%. Several factors accounted for the low overall completeness; (1) two stations were deleted from sampling (denied access to one and the other was dry); (2) the laboratory failed to report 20 of the 162 toxic chemicals requested in all media; (3) data was omitted due to laboratory contamination or failing laboratory quality assurance measures; (4) fish tissue collection was not appropriate at all stations selected in the QAPP; and (5) obtaining the appropriate number and type of fish required for tissue analysis was not always possible. All samples were collected at all stations scheduled in the QAPP with the exception of three fish tissue samples and all samples from two deleted stations. All samples shipped to the laboratory were received with the exception of one set of VOA viles.

Data Completeness Summary

	WATER		SEDIMENT		TISSUE		BENTHICS		NEKTON	
	P	***A***	**P**	***A***	**P**	***A***	**P**	***A***	**P**	***A***
(A) # of Stations	34	32	35	33	24	19	17	15	17	13
(B) # of Samples	34	32	35	33	80	66	21	19	17	13
© # of Parameters	184	163	171	149	163	142	1	1	1	1
(D) # Data Points	6256	5121	5985	4908	13040	9352	21	19	17	13
(E) # Other Stations	5	5	-	-	3	3	-	-	-	-
(F) # Samples	5	5	-	-	6	6	-	-	-	-
(G) # Parameters	4	75	-	-	14	14	-	-	-	-
(H) # Data Points	20	375	-	-	84	78	-	-	-	-
TOTAL # DATA POINTS	6273	5496	5985	4908	13124	9430	21	19	17	13

(I) Total # of data points planned = 25420

(J) Total # of data points achieved = 19866

OVERALL COMPLETENESS = (J)/(I) x 100 = 78.2 %

Comparability

Data comparability was maintained through the use of standard field and laboratory techniques described in the QAPP. Analytical methods were obtained from USEPA approved lists published in the *Federal Register*. Procedures were used consistently throughout the study with a few exceptions where conditions required slight modifications. Any modifications are described in the Methods Section. None of the modifications affected data comparability between stations. The procedures used in Phase 2 are the same as those used in Phase 1 making data from both studies comparable.

Representativeness

Station locations, collection of multi-media samples (water, sediment, fish tissue and biological) and approved field and laboratory methods were used to ensure that data was a representation of actual stream conditions. Data from Phase 1 identified areas with highest probability of contamination. This information was used to select appropriate sample sites for Phase 2.

APPENDIX M
ANALYTICAL DATA FOR WATER BLANKS

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
Date	120395	080895	051795	060695	071195
CONVENTIONALS (mg/L)					
ammonia (NH_3-N)	< 0.01	< 0.01	< 0.02	**0.04**	< 0.02
nitrate	**1.3**	**0.04**	**0.69**	**0.7**	**9.5**
nitrite	**0.02**	< 0.01	< 0.01	**0.01**	**0.27**
TKN	< 0.01	< 0.10	< 0.1	**0.1**	< 0.1
total phosphorus	< 0.01	< 0.01	< 0.01	**0.01**	**0.02**
orthophosphorus	< 1.0	< 0.01	< 0.01	**0.01**	< 0.01
chloride	< 1	< 1	< 1	< 1	**1**
sulfate	< 10	< 1	< 1	< 1	< 1
total dissolved solids	< 2	< 10	< 10	< 10	< 2
total hardness	**1**	**1**	< 2	**3**	**3**
total organic carbon	< 3	< 1	< 1	< 1	**1**
total suspended solids	< 1	< 3	< 3	< 3	< 3
total alkalinity	< 1	**1**	< 1	< 1	**1**
turbidity (jtu)	**0.2**	**1**	**0.5X**	**0.5**	< 0.1
DISSOLVED METALS (Fg/L)					
aluminum	**7.3**	**9.0**	< 8.0	ns	< 8.0
antimony	**15.9**	**8.4**	**15.4**	ns	**8.9**
arsenic	< 0.90	< 2.0	< 1.8	ns	< 1.8
beryllium	< 0.40	0.6	< 0.6	ns	< 0.6
cadmium	< 0.40	< 0.1	< 0.1	ns	< 0.05
chromium	< 1.4	< 2.0	< 2.0	ns	< 2.0
copper	< 5.2	< 7.0	< 7.0	ns	< 7.0
lead	< 1.0	< 1.2	**1.6**	ns	< 2.3
mercury	< 0.13	< 0.13	< 0.13	ns	< 0.13
nickel	< 3.2	< 5.0	< 5.0	ns	< 5.0

APPENDIX M (cont)
ANALYTICAL DATA FOR WATER BLANKS

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
DISSOLVED METALS (cont)					
selenium	< 0.60	< 2.6	< 2.6	ns	< 2.6
silver	< 5.1	< 7.0	< 7.0	ns	< 7.0
thallium	< 1.0	< 2.7	< 1.9	ns	< 2.7
zinc	**4.1**	**7.2**	< 3.0	ns	< 3.0
OTHER INORGANICS (mg/L)					
cyanide	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
PHENOLS AND CRESOLS Fg/L)					
parachlorometa cresol	nr	nr	nr	nr	nr
pentachlorophenol	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
phenol (C_6H_5OH) single compound	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
phenolics recoverable	< 5.0	< 5.0	< 5.0	< 5.0	nr
2-chlorophenol	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
2-nitrophenol	< 11	< 11	< 11	< 11	< 11
2,4-dichlorophenol	< 11	< 11	< 11	< 11	< 11
2,4-dimethylphenol	< 11	< 11	< 11	< 11	< 11
2,4-dinitrophenol	< 21	< 21	< 22	< 22	< 22
2,4,6-trichlorophenol	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
4-nitrophenol	< 21	< 21	< 22	< 22	< 22
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr
ETHERS (Fg/L)					
bis (chloromethyl) ether	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
bis (2-chloroethyl) ether	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
bis (2-chloroisopropyl)ether	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5

APPENDIX M (cont)
ANALYTICAL DATA FOR WATER BLANKS

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
ETHERS (cont)					
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
4-chlorophenyl phenyl ether	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
HALOGENATED ALIPHATICS (Fg/L)					
bromodichloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
bromoform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
carbon tetrachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
chloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
chloroform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
dibromochloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
dichlorodifluormethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
hexachlorobutadiene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
hexachlorocyclopentadiene	< 21	< 21	< 22	< 22	< 22
hexachloroethane	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
methyl bromide	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr
methylene chloride	nr	< 2.0	< 2.0	< 2.0	< 2.0
tetrachloroethylene	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr
trichlorofluoromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
vinyl chloride	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1-dichloroethylene	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1,2-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1,2,2-tetrachloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

APPENDIX M (cont)
ANALYTICAL DATA FOR WATER BLANKS

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
HALOGENATED ALIPHATICS (cont)					
1,2-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-dichloropropane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,3-trans-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/L)					
acenaphthene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
acenaphthylene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
anthracene/phenanthrene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
benzo (a) anthracene 1,2-benzanthracene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
benzo (b) fluoroanthene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
benzo (GHI) perylene 1,12-benzoperylene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
benzo (k) fluoranthene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
benzo-a-pyrene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
chrysene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
fluoranthene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
fluorene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
indeno (1,2,3-CD) pyrene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
naphthalene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
pyrene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/L)					
benzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
chlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

APPENDIX M (cont)
ANALYTICAL DATA FOR WATER BLANKS

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
MONOCYCLIC AROMATICS (Fg/L)					
ethylbenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
hexachlorobenzene	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
nitrobenzene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
styrene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
toluene	< 2.0	**1.2 Ð**	**0.4 Ð**	< 2.0	< 2.0
xylene	< 4.0	< 6.0	< 6.0	< 6.0	< 6.0
1,2-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2,4-trichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,3-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,4-dichlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
2,4-dinitrotoluene	< 11	< 11	< 11	< 11	< 11
2,6-dinitrotoluene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
NITROSAMINES AND OTHER N COMPOUNDS (Fg/L)					
acrylonitrile	< 10	< 10	< 10	< 10	< 10
benzidine	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
n-nitrosodimethylamine	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
n-nitrosodiphenylamine	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
1,2-diphenylhydrazine	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 21	< 21	< 22	< 22	< 22
PESTICIDES (Fg/L)					
acrolein	nr	nr	nr	nr	nr
aldicarb	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
aldrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
alpha benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04

APPENDIX M (cont)
ANALYTICAL DATA FOR WATER BLANKS

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
PESTICIDES (Fg/L)					
atrazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
beta benzene hexchloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
carbaryl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
carbofuran	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
chlordane	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
chlorfenvinphos	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chlorothalonil	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
chlorpyrifos	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
chlorsulfuron	nr	nr	nr	nr	nr
p,p' DDD	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
p,p' DDE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
p,p' DDT	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
delta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
demeton	nr	nr	nr	nr	nr
diazinon	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr
dicamba	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2,4-dichlorophenoxyacetic acid (2,4-D)	< 20	< 20	< 20	< 20	< 20
dicofol (kelthane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
dicrotophos	nr	nr	nr	nr	nr
dieldrin	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
dinoseb	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
endosulfan alpha	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan beta	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan sulfate	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20

APPENDIX M (cont)
ANALYTICAL DATA FOR WATER BLANKS

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
endrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
PESTICIDES (cont)					
endrin aldehyde	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
fenthion (baytex)	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
guthion	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
heptachlor	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
heptachlor epoxide	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
isophorone	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
malathion	< 0.40	< 0.4	< 0.4	< 0.4	< 0.4
metsulfuron	nr	nr	nr	nr	nr
methomyl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
methoxychlor	< 0.50	< 0.5	< 0.5	< 0.5	< 0.5
metolachlor	< 0.60	< 0.6	< 0.6	< 0.6	< 0.6
mirex	< 0.20	< 0.2	< 0.2	< 0.2	< 0.2
parathion	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
picloram	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0
prometon	nr	nr	nr	nr	nr
simazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr
toxaphene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2,4,5-TP (silvex)	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
PCBs and RELATED COMPOUNDS (Fg/L)					
aroclor 1016	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1221	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1232	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1242	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

APPENDIX M (cont)
ANALYTICAL DATA FOR WATER BLANKS

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
aroclor 1248	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
PCBS AND RELATED COMPOUNDS (cont)					
aroclor 1254	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1260	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-chloronaphthalene	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
PHTHALATE ESTERS (Fg/L)					
bis (2-ethylhexyl) phthalate	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
di-n-butyl phthalate	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
di-n-octyl phthalate	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
dimethyl phthalate	< 11	< 11	< 11	< 11	< 11
n-butyl benzyl phthalate	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5
diethyl phthalate	< 5.4	< 5.4	< 5.6	< 5.4	< 5.5

nr = not reported by laboratory	Î = reported below quantitation limit
ns = no sample	Ï = detected in lab blank
ND = not detected	Ð = common lab contaminant
bold = values detected	X = exceeded hold time

APPENDIX N
ANALYTICAL DATA FOR WATER DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
Date	120395	080895	051695	060795	071195
CONVENTIONALS (mg/L)	Sta. 2	Sta. 3a.1	Sta. 7b	Sta. 12.1	Sta. 13
ammonia (NH_3-N)	1.1	0.01	0.01	0.27	0.06
nitrate	1.9Ó	0.17	1.7	0.69	0.37Ó
nitrite	0.12	< 0.01	< 0.01	0.07	0.05
TKN	1.9	0.5	0.2	1.2	0.7
total phosphorus	0.53	0.05	0.02	0.19	0.09
orthophosphorus	0.31	< 0.01	< 0.01	0.10	0.06
chloride	296	136	21	155	164
sulfate	454	635	27	251	269
total dissolved solids	1450	1310	270	763	766
total hardness	424	366	243	319	271
total organic carbon	7	5.0	1.0	4.0	5.0
total suspended solids	32	20	12	55	47
total alkalinity	242	149	204	145	100
turbidity (jtu)	8.5	12	6.5X	22.5	29.8
DISSOLVED METALS (Fg/L)					
aluminum	**11.5Ó**	< 8.0Ó	< 8.0Ó	< 8.0Ó	< 8.0Ó
antimony	**13.4Ó**	< 3.0Ó	**5.5Ó**	**5.5Ó**	**7.1Ó**
arsenic	**9.9**	**11.2**	**1.8**	**4.0**	**4.7**
beryllium	< 0.40	< 0.60Ó	< 0.60	< 0.60	< 0.60
cadmium	< 0.40	< 0.10	< 0.10	< 0.10	< 0.05
chromium	< 1.4	< 2.0	< 2.0	< 2.0	< 2.0
copper	**7.0**	< 7.0	< 7.0	< 7.0	< 7.0
lead	< 2.0	< 1.2	< 1.2Ó	< 1.5	< 2.3
mercury	< 0.13	< 0.13	< 0.13	< 0.13	< 0.13
nickel	< 3.2	< 5.0	< 5.0	< 5.0	< 5.0

APPENDIX N (cont)
ANALYTICAL DATA FOR WATER DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
selenium	**1.3**	< 2.6	< 2.6	< 2.6	< 2.6
DISSOLVED METALS (cont)					
silver	< 5.1	< 7.0	< 7.0	< 7.0	< 7.0
thallium	< 2.0	< 2.7	< 1.9	< 1.9	**2.9**
zinc	**3.2Ó**	**3.0Ó**	< 3.0	< 3.0	< 3.0
OTHER INORGANICS (mg/L)					
cyanide	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
PHENOLS AND CRESOLS (Fg/L)					
parachlorometa cresol	nr	nr	nr	nr	nr
pentachlorophenol	< 2.0	< 2.0]	< 2.0	< 2.0]	< 2.0
phenol (C_6H_5OH) single compound	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
phenolics recoverable	< 5.0	< 5.0	< 5.0	< 5.0	na
2-chlorophenol	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
2-nitrophenol	< 11	< 11	< 11	< 11	< 11
2,4-dichlorophenol	< 11	< 11	< 11	< 11	< 11
2,4-dimethylphenol	< 11	< 11	< 11	< 11	< 11
2,4-dinitrophenol	< 21	< 21	< 22	< 22	< 21
2,4,6-trichlorophenol	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
4-nitrophenol	< 21	< 21	< 22	< 22	< 21
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr
ETHERS (Fg/L)					
bis (chloromethyl) ether	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
bis (2-chloroethyl) ether	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
bis (2-chloroisopropyl)ether	< 5.3	< 5.3	< 5.4	< 5.5	< 5.30
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
4-chlorophenyl phenyl ether	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3

APPENDIX N (cont)
ANALYTICAL DATA FOR WATER DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
HALOGENATED ALIPHATICS (Fg/L)					
bromodichloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
bromoform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
carbon tetrachloride	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
chloroethane	< 5.0C	< 5.0	< 5.0	< 5.0	< 5.0
chloroform	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
dibromochloromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
dichlorodifluormethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
hexachlorobutadiene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
hexachlorocyclopentadiene	< 21	< 21	< 22	< 22	< 21
hexachloroethane	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
methyl bromide	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr
methylene chloride	nr	< 2.0	< 2.0	< 2.0	< 2.0
tetrachloroethylene	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr
trichlorofluoromethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
vinyl chloride	< 5.0C	< 5.0	< 5.0	< 5.0	< 5.0
1,1-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1-dichloroethylene	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1,2-trichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,1,2,2-tetrachloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-dichloroethane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-dichloropropane	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

APPENDIX N (cont)
ANALYTICAL DATA FOR WATER DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
HALOGENATED ALIPHATICS (cont)					
1,3-trans-dichloropropene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/L)					
acenaphthene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
acenaphthylene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
anthracene/phenanthrene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
benzo (a) anthracene 1,2-benzanthracene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
benzo (b) fluoroanthene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
benzo (GHI) perylene 1,12-benzoperylene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
benzo (k) fluoranthene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
benzo-a-pyrene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
chrysene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
fluoranthene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
fluorene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
indeno (1,2,3-CD) pyrene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
naphthalene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
pyrene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/L)					
benzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
chlorobenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
ethylbenzene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
hexachlorobenzene	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
nitrobenzene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
styrene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0

APPENDIX N (cont)
ANALYTICAL DATA FOR WATER DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
MONOCYCLIC AROMATICS (cont)					
toluene	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
xylene	< 4.0	< 6.0	< 6.0	< 6.0	< 6.0
1,2-dichlorobenzene	< 5.3	< 2.0	< 2.0	< 2.0	< 2.0
1,2,4-trichlorobenzene	< 5.3	< 2.0	< 2.0	< 2.0	< 2.0
1,3-dichlorobenzene	< 5.3	< 2.0	< 2.0	< 2.0	< 2.0
1,4-dichlorobenzene	< 5.3	< 2.0	< 2.0	< 2.0	< 2.0
2,4-dinitrotoluene	< 11	< 11	< 11	< 11	< 11
2,6-dinitrotoluene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
NITROSAMINES AND OTHER N COMPOUNDS (Fg/L)					
acrylonitrile	< 10	< 10	< 10	< 10	< 10
benzidine	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
n-nitrosodimethylamine	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
n-nitrosodiphenylamine	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
1,2-diphenylhydrazine	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 21	< 21	< 22	< 22	< 21
PESTICIDES (Fg/L)					
acrolein	nr	nr	nr	nr	nr
aldicarb	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
aldrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
alpha benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
atrazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
beta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
carbaryl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
carbofuran	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

APPENDIX N (cont)
ANALYTICAL DATA FOR WATER DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
PESTICIDES (cont)					
chlordane	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
chlorfenvinphos	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
chlorothalonil	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
chlorpyrifos	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
chlorsulfuron	nr	nr	nr	nr	nr
p,p' DDD	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
p,p' DDE	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
p,p' DDT	< 0.15	< 0.15	< 0.15	< 0.15	< 0.15
delta benzene hexachloride	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
demeton	nr	nr	nr	nr	nr
diazinon	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr
dicamba	< 1.0	< 1.0]	< 1.0	< 1.0]	< 1.0
2,4-dichlorophenoxyacetic acid (2,4-D)	< 20	< 20]	< 20	< 20]	< 20
dicofol (kelthane)	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
dicrotophos	nr	nr	nr	nr	nr
dieldrin	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
dinoseb	< 1.0	< 1.0]	< 1.0	< 1.0]	< 1.0
endosulfan alpha	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan beta	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endosulfan sulfate	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endrin	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
endrin aldehyde	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
fenthion (baytex)	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
guthion	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0

APPENDIX N (cont)
ANALYTICAL DATA FOR WATER DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
PESTICIDES (cont)					
heptachlor	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
heptachlor epoxide	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
isophorone	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
malathion	< 0.40	< 0.40	< 0.40	< 0.40	< 0.40
metsulfuron	nr	nr	nr	nr	nr
methomyl	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
methoxychlor	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
metolachlor	< 0.60	< 0.60	< 0.60	< 0.60	< 0.60
mirex	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
parathion	< 0.25	< 0.25	< 0.25	< 0.25	< 0.25
picloram	<3.0	< 3.0]	< 3.0	< 3.0]	< 3.0
prometon	nr	nr	nr	nr	nr
simazine	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr
toxaphene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2,4,5-TP (silvex)	< 5.0	< 5.0]	< 5.0	< 5.0]	< 5.0
PCBs and RELATED COMPOUNDS (Fg/L)					
aroclor 1016	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1221	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1232	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1242	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1248	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1254	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
aroclor 1260	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-chloronaphthalene	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
bis (2-ethylhexyl) phthalate	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3

APPENDIX N (cont)
ANALYTICAL DATA FOR WATER DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
PHTHALATE ESTERS (Fg/L)					
di-n-butyl phthalate	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
di-n-octyl phthalate	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
dimethyl phthalate	< 11	< 11	< 11	< 11	< 11
n-butyl benzyl phthalate	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3
diethyl phthalate	< 5.3	< 5.3	< 5.4	< 5.5	< 5.3

nr = not reported by laboratory
na = not analyzed
ND = not detected
bold = values detected
X = exceeded hold time
] = QC not within required limits
C = presence not determined due to presence of CO_2

Î = reported below quantitation limit
Ï = detected in lab blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
Ó = detected in field blank

APPENDIX O
ANALYTICAL DATA FOR SEDIMENT DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
Date	120395	080895	051695	060795	071195
CONVENTIONALS	Sta. 2	Sta. 3a.1	Sta. 7b	Sta. 12.1	Sta. 13
total organic carbon (mg/kg)	6200	3330	13220	8480	4530
acid volatile sulfides (mg/kg)	27	1	6	10	14
clay, < 0.0039 mm (% dry weight)	4	4	6	10	12
silt, 0.0039-0.0625 mm (% dry weight)	25	9	57	68	22
Sand, 0.0625-2.0 mm (% dry weight)	71	86	37	22	66
gravel, > 2.0 mm (% dry weight)	< 1	1	< 1	< 1	< 1
METALS (mg/kg)					
aluminum	**7780**	**3060**	**7090**	**14800**	**13900**
antimony	*	< 0.45	**1.0**	< 0.54	< 0.53
arsenic	**5.0**	**8.6**	**4.3**	**4.8**	**5.3**
beryllium	**0.42**	**0.22**	**0.37**	**0.60**	**0.51**
cadmium	**0.47**	**0.12**	**0.16**	**0.24**	**0.18**
chromium	**0.53**	**4.1**	**7.7**	**12.7**	**12.2**
copper	**27.5**	**3.3**	**5.2**	**9.6**	**4.7**
lead	**20.5**	**11.2**	**11.3**	**25.3**	**14.6**
mercury	**0.05**	**0.02**	**0.02**	**0.03**	**0.02**
nickel	**6.8**	**5.0**	**7.3**	**10.4**	**9.5**
selenium	**0.13**	**0.13**	**0.34**	**0.18**	**0.17**
silver	< 0.48	< 0.60	< 0.60	**9.2**	**4.7**
thallium	< 0.19	< 0.20	**0.29**	**0.39**	**0.23**
zinc	**41.9**	**21.9**	**33.4**	**47.7**	**40.3**
OTHER INORGANICS (mg/kg)					
cyanide	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

APPENDIX O (cont)
ANALYTICAL DATA FOR SEDIMENT DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
PHENOLS AND CRESOLS (Fg/kg)					
parachlorometa cresol	nr	nr	nr	nr	nr
pentachlorophenol	< 7.3	< 5.1	< 7.0	< 7.0	< 6.2
phenol (C_6H_5OH) single compound	< 900	< 700	< 1800	< 900	< 800
phenolics recoverable	< 500	< 500	< 500	< 500	< 500
2-chlorophenol	< 900	< 700	< 1800	< 900	< 800
2-nitrophenol	< 1800	< 1300	< 3500	< 1800	< 1500
2,4-dichlorophenol	< 1800	< 1300	< 3500	< 1800	< 1500
2,4-dimethylphenol	< 1800	< 1300	< 3500	< 1800	< 1500
2,4-dinitrophenol	< 4000	< 2600	< 7000	< 3600	< 3000
2,4,6-trichlorophenol	< 900	< 700	< 1800	< 900	< 800
4-nitrophenol	< 4000	< 2600	< 7000	< 3600	< 3000
4,6-dinitro-ortho-cresol	nr	nr	nr	nr	nr
ETHERS (Fg/kg)					
bis (chloromethyl) ether	nr	nr	nr	nr	nr
bis (2-chloroethyoxy) methane	< 900	< 700	< 1800	< 900	< 800
bis (2-chloroethyl) ether	< 900	< 700	< 1800	< 900	< 800
bis (2-chloroisopropyl)ether	< 900	< 700	< 1800	< 900	< 800
2-chloroethyl vinyl ether	nr	nr	nr	nr	nr
4-bromophenyl phenyl ether	< 900	< 700	< 1800	< 900	< 800
4-chlorophenyl phenyl ether	< 900	< 700	< 1800	< 900	< 800
HALOGENATED ALIPHATICS (Fg/kg)					
bromodichloromethane	< 450	< 280	< 430]	< 430]	< 360
bromoform	< 450	< 280	< 430]	< 43]	< 360
carbon tetrachloride	< 450	< 280	< 430]	< 430]	< 360]
chloroethane	< 1110	< 710	< 1100]	< 1100]	< 900]

APPENDIX O (cont)
ANALYTICAL DATA FOR SEDIMENT DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
Halogenated Aliphatics (cont)					
chloroform	< 450	< 280	< 430]	< 430]	< 360]
dibromochloromethane	< 450	< 280	< 430]	< 430]	< 360]
dichlorodifluormethane	< 1110	< 710	< 1100]	< 1100]	< 900]
hexachlorobutadiene	< 450	< 280	< 430]	< 430]	< 360]
hexachlorocyclopentadiene	< 4000	< 2600	< 7000	< 3600	< 3000
hexachloroethane	< 900	< 700	< 1800	< 900	< 800
methyl bromide	nr	nr	nr	nr	nr
methyl chloride	nr	nr	nr	nr	nr
methylene chloride	nr	< 280	< 430]	**600 Ð]**	< 360]
tetrachloroethylene	nr	nr	nr	nr	nr
trichloroethylene	nr	nr	nr	nr	nr
trichlorofluoromethane	< 450	< 280	< 430]	< 430]	< 360]
vinyl chloride	< 1110	< 710	< 1100]	< 1100]	< 900]
1,1-dichloroethane	< 450	< 280	< 430]	< 430]	< 360]
1,1-dichloroethylene	nr	nr	nr	nr	nr
1,1,1-trichloroethane	< 450	< 280	< 430]	< 430]	< 360]
1,1,2-trichloroethane	< 450	< 280	< 430]	< 430]	< 360]
1,1,2,2-tetrachloroethane	< 450	< 280	< 430]	< 430]	< 360]
1,2-dichloroethane	< 450	< 280	< 430]	< 430]	< 360]
1,2-dichloropropane	< 450	< 280	< 430]	< 430]	< 360]
1,2-trans-dichloroethylene	nr	nr	nr	nr	nr
1,3-cis-dichloropropene	< 450	< 280	< 430]	< 430]	< 360]
1,3-trans-dichloropropene	< 450	< 280	< 430]	< 430]	< 360]
POLYCYCLIC AROMATIC HYDROCARBONS (Fg/kg)					
acenaphthene	< 900	< 700	< 1800	< 900	< 800
acenaphthylene	< 900	< 700	< 1800	< 900	< 800

APPENDIX O (cont)
ANALYTICAL DATA FOR SEDIMENT DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
Polycyclic Aromatic Hydrocarbons (cont)					
anthracene/phenanthrene	< 900	< 700	< 1800	< 900	< 800
benzo (a) anthracene 1,2-benzanthracene	< 900	< 700	< 1800	< 900	< 800
benzo (b) fluoroanthene	< 900	< 700	< 1800	< 900	< 800
benzo (GHI) perylene 1,12-benzoperylene	< 900	< 700	< 1800	< 900	< 800
benzo (k) fluoranthene	< 900	< 700	< 1800	< 900	< 800
benzo-a-pyrene	< 900	< 700	< 1800	< 900	< 800
chrysene	< 900	< 700	< 1800	< 900	< 800
fluoranthene	< 900	< 700	< 1800	< 900	< 800
fluorene	< 900	< 700	< 1800	< 900	< 800
indeno (1,2,3-CD) pyrene	< 900	< 700	< 1800	< 900	< 800
naphthalene	< 450	< 280	< 430]	< 430]	< 360]
pyrene	< 900	< 700	< 1800	< 900	< 800
1,2,5,6-dibenzantracene	nr	nr	nr	nr	nr
MONOCYCLIC AROMATICS (Fg/kg)					
benzene	< 450	< 280	< 430]	< 430]	< 360]
chlorobenzene	< 450	< 280	< 430]	< 430]	< 360]
ethylbenzene	< 450	< 280	< 430]	< 430]	< 360]
hexachlorobenzene	< 1.5	< 1.0	< 1.4	< 1.4	< 1.2
nitrobenzene	< 900	< 700	< 1800	< 900]	< 800]
styrene	< 450	< 280	< 430]	< 430]	< 360]
toluene	< 450	< 280	< 430]	**400 Î]**	< 360]
xylene	< 890	< 850	< 1300]	< 1300]	< 1100]
1,2-dichlorobenzene	< 450	< 280	< 430]	< 430]	< 360]
1,2,4-trichlorobenzene	< 450	< 280	< 430]	< 430]	< 360]
Monocyclic Aromatics (cont)					

APPENDIX O (cont)
ANALYTICAL DATA FOR SEDIMENT DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
1,3-dichlorobenzene	< 450	< 280	< 430 **]**	< 430 **]**	< 360 **]**
1,4-dichlorobenzene	< 450	< 280	< 430 **]**	< 430 **]**	< 360 **]**
2,4-dinitrotoluene	< 1800	< 1300	< 3500	< 1800	< 1500
2,6-dinitrotoluene	< 900	< 700	< 1800	< 900	< 800
NITROSAMINES AND OTHER N COMPOUNDS (Fg/kg)					
acrylonitrile	< 2230	< 1400	< 2100	< 2100	< 1800
benzidine	ND	ND	ND	ND	ND
n-nitrosodi-n-propylamine	< 900	< 700	< 1800	< 900	< 800
n-nitrosodimethylamine	< 900	< 700	< 1800	< 900	< 800
n-nitrosodiphenylamine	< 900	< 700	< 1800	< 900	< 800
1,2-diphenylhydrazine	nr	nr	nr	nr	nr
3,3-dichlorobenzidine	< 4000	< 2600	< 7000	< 3600	< 3000
PESTICIDES (Fg/kg)					
acrolein	nr	nr	nr	nr	nr
aldicarb	nr	nr	nr	nr	nr
aldrin	< 1.5	< 1.0	< 1.4	< 1.4	< 1.2
alpha benzene hexachloride	**3.2**	< 1.0	< 1.4	< 1.4	< 1.2
atrazine	nr	< 51	< 70	< 70	< 62
beta benzene hexchloride	< 1.5	< 1.0	< 1.4	< 1.4	< 1.2
carbaryl	nr	nr	nr	nr	nr
carbofuran	nr	nr	nr	nr	nr
chlordane	< 14.5	< 10	**14 Î**	< 14	< 12
chlorfenvinphos	nr	nr	nr	nr	nr
chlorothalonil	nr	nr	nr	nr	nr
chlorpyrifos	< 7.3	< 5.1	< 7.0	< 7.0	< 6.2

APPENDIX O (cont)
ANALYTICAL DATA FOR SEDIMENT DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
Pesticides (cont)					
chlorsulfuron	nr	nr	nr	nr	nr
p,p' DDD	< 7.3	< 5.1	< 7.0	< 7.0	< 6.2
p,p' DDE	4.1	< 2.5	**2.2 Î**	**2.4**	< 3.1
p,p' DDT	< 7.3	< 5.1	< 7.0	< 7.0	< 6.2
delta benzene hexachloride	< 1.5	< 1.0	< 1.4	< 1.4	< 1.2
demeton	nr	nr	nr	nr	nr
diazinon	< 7.3	< 5.1	< 7.0	< 7.0	< 6.2
dibromochloropropane (dbcp)	nr	nr	nr	nr	nr
dicamba	< 7.3	< 5.1	< 7.0	< 7.0	< 6.2
2,4-dichlorophenoxyacetic acid (2,4-D)	< 91	< 64	< 88	< 88	< 77
dicofol (kelthane)	nr	< 51	< 70	< 70	< 62
dicrotophos	nr	nr	nr	nr	nr
dieldrin	< 4.4	< 3.0	< 4.2	< 4.2	< 3.7
dinoseb	< 10.9	< 7.7	< 11	< 11	< 9.2
endosulfan alpha	< 3.6	< 2.5	< 3.5	< 3.5	< 3.1
endosulfan beta	< 3.6	< 2.5	< 3.5	< 3.5	<3.1
endosulfan sulfate	< 7.3	< 5.1	< 7.0	< 7.0	< 6.2
endrin	< 4.4	< 3.0	< 4.2	< 4.2	< 3.7
endrin aldehyde	< 4000	< 2.0	< 2.8	< 2.8	< 2.5
fenthion (baytex)	nr	nr	nr	nr	nr
gamma-bhc (lindane)	< 1.5	< 1.0	< 1.4	< 1.4	< 1.2
guthion	nr	nr	nr	nr	nr
heptachlor	< 1.5	< 1.0	< 1.4	< 1.4	< 1.2
heptachlor epoxide	< 2.9	< 2.0	< 2.8	< 2.8	< 2.5
isophorone	< 900	< 700	< 1800	< 900	< 800
malathion	< 14.5	< 10	< 14	< 14	< 12

APPENDIX O (cont)
ANALYTICAL DATA FOR SEDIMENT DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
Pesticides (cont)					
metsulfuron	nr	nr	nr	nr	nr
methomyl	nr	nr	nr	nr	nr
methoxychlor	< 22	< 15	< 21	< 21	< 18
metolachlor	nr	< 18	< 25	< 25	< 22
mirex	< 5.8	< 4.0	< 5.6	< 5.6	< 4.9
parathion	< 7.3	< 5.1	< 7.0	< 7.0	< 6.2
picloram	< 18	< 13	< 18	< 18	< 15
prometon	nr	nr	nr	nr	nr
simazine	nr	< 51	< 70	< 70	< 62
tetraethylpyrophosphate (tepp)	nr	nr	nr	nr	nr
toxaphene	< 73	< 51	< 70	< 70	< 62
2,4,5-TP (silvex)	< 14.5	< 10	< 14	< 14	< 12
PCBs and RELATED COMPOUNDS (Fg/kg)					
aroclor 1016	< 29	< 20	< 28	< 28	< 25
aroclor 1221	< 29	< 20	< 28	< 28	< 25
aroclor 1232	< 29	< 20	< 28	< 28	< 25
aroclor 1242	< 29	< 20	< 28	< 28	< 25
aroclor 1248	< 29	< 20	< 28	< 28	< 25
aroclor 1254	< 29	< 20	< 28	< 28	< 25
aroclor 1260	< 29	< 20	< 28	< 28	< 25
2-chloronaphthalene	< 900	< 700	< 1800	< 900	< 800
PHTHALATE ESTERS (Fg/kg)					
bis (2-ethylhexyl) phthalate	**900**	< 700	< 1800	**1300**	< 800
di-n-butyl phthalate	< 900	< 700	< 1800	< 900	< 800
di-n-octyl phthalate	< 900	< 700	< 1800	< 900	< 800

APPENDIX O (cont)
ANALYTICAL DATA FOR SEDIMENT DUPLICATES

LOCATION	EL PASO	RIO CONCHOS	DEL RIO	LAREDO	BROWNSVILLE
Phthalate Esters (cont)					
dimethyl phthalate	< 1800	< 1300	< 3500	< 1800	< 1500
n-butyl benzyl phthalate	< 900	< 700	< 1800	< 900	< 800
diethyl phthalate	< 900	< 700	< 800	< 900	< 800

nr = not reported by laboratory
na = not analyzed
ND = not detected
bold = values detected
X = exceeded hold time
] = QC not within required limits
*= no reportable data
Î = reported below quantitation limit
Ï = detected in lab blank
Ð = common lab contaminant
Ñ = possible contamination
Ò = degraded PCB pattern
Ó = detected in field blank

APPENDIX P

ORGANICS AND INORGANICS DETECTED IN THE RIO GRANDE AND TRIBUTARIES
(%**E** = %Exceeded; % **D** = % Detected; 12/33/**33** = # exceeded/# detected/total # samples)

PARAMETER	**MATRIX**								
	WATER	**% E**	**% D**	**SEDIMENT**	**% E**	**% D**	**TISSUE**	**% E**	**% D**
CONVENTIONALS									
unionized ammonia (NH_3)	10/38/**42**	23	90.5	ND	-	-	ND	-	-
chloride	20/40/**41**	48.8	97.6	ND	-	-	ND	-	-
METALS									
aluminum	0/13/**37**	0	35.1	0/33/**33**	0	100	0/41/**68**	0	60.3
antimony	0/9/**37**	0	24.3	1/10/**33**	3.0	30.3	0/20/**68**	0	29.4
arsenic	33/33/**37**	89.2	89.2	2/33/**33**	6.1	100	3/9/**68**	4.4	13.2
cadmium	0/2/**37**	0	5.4	3/33/**33**	9.1	100	4/18/**68**	5.9	26.5
chromium	0/1/**37**	0	2.7	0/33/**33**	0	100	6/27/**68**	8.8	39.7
copper	3/5/**37**	8.1	13.5	13/33/**33**	39.4	100	9/66/**68**	13.2	97.1
lead	0/3/**37**	0	8.1	12/26/**33**	36.4	78.8	2/22/**68**	2.9	32.3
mercury	ND	-	-	0/23/**33**	0	69.7	2/59/**68**	2.9	86.8
nickel	2/3/**37**	5.4	8.1	14/33/**33**	42.4	100	0/14/**68**	0	20.6
selenium	0/7/**37**	0	18.9	0/31/**33**	9.1	93.9	3/67/**68**	4.4	98.5
silver	ND	-	-	10/12/**33**	30.3	36.4	0/4/**68**	0	5.9
thallium	0/9/**37**	0	24.3	0/27/**33**	0	81.8	0/13/**68**	0	19.1
zinc	3/13/**37**	8.1	35.1	16/33/**33**	48.5	100	8/67/**68**	11.8	98.5
OTHER INORGANICS									
cyanide	0/0/**37**	0	0	0/2/**33**	0	6.1	0/7/**62**	0	11.3
PHENOLS AND CRESOLS									
phenol single compound	1/1/**37**	2.7	2.7	ND	-	-	ND	-	-
phenolics recoverable	1/3/**23**	4.3	13	ND	-	-	0/4/**62**	0	6.5
HALOGENATED ALIPHATICS									
bromodichloromethane	1/1/**37**	2.7	2.7	ND	-	-	ND	-	-
chloroform	2/5/**36**	5.6	13.9	ND	-	-	2/2/**62**	3.2	3.2

ORGANICS AND INORGANICS DETECTED IN THE RIO GRANDE AND TRIBUTARIES
(%**E** = %Exceeded; % **D** = % Detected; 12/33/**33** = # exceeded/# detected/total # samples)

PARAMETER	MATRIX								
	WATER	% E	% D	SEDIMENT	% E	% D	TISSUE	% E	% D
HALOGENATED ALIPHATICS									
dibromochloromethane	1/1/**36**	2.8	2.8	ND	-	-	ND	-	-
MONOCYCLIC AROMATICS									
benzene	ND	-	-	ND	-	-	2/2/**62**	3.2	3.2
toluene	1/1/**36**	2.8	2.8	ND	-	-	0/4/**62**	0	6.5
xylene	1/1/**36**	2.8	2.8	ND	-	-	ND	-	-
1,4-dichlorobenzene	1/3/**37**	2.7	8.1	ND	-	-	ND	-	-
NITROSAMINES AND OTHER N COMPOUNDS									
n-nitrosodi-n-propylamine	1/1/**37**	33.3	33.3	ND	-	-	ND	-	-
PESTICIDES									
alpha benzene hexachloride	ND	-	-	0/1/**33**	0	3.0	ND	-	-
chlordane	ND	-	-	1/2/**33**	3.0	6.1	1/6/**62**	1.6	9.7
p,p' DDD	ND	-	-	ND	-	-	0/7/**62**	0	11.3
p,p' DDE	ND	-	-	8/12/**33**	24.2	36.4	2/57/**62**	3.2	91.9
p,p' DDT	ND	-	-	2/2/**33**	6.1	6.1	0/4/**62**	0	6.5
endosulfan alpha	ND	-	-	ND	-	-	0/1/**62**	0	1.6
diazinon	ND	-	-	ND	-	-	0/1/**62**	0	1.6
dieldrin	ND	-	-	ND	-	-	0/2/**62**	0	3.2
endrin	ND	-	-	ND	-	-	0/1/**62**	0	1.6
PCBs and RELATED COMPOUNDS									
aroclor 1248	ND	-	-	ND	-	-	0/1/**62**	0	1.6
aroclor 1260	ND	-	-	ND	-	-	1/1/**62**	1.6	1.6
PHTHALATE ESTERS									
bis (2-ethylhexyl)phthalate	2/2/**37**	5.4	5.4	0/3/**33**	0	9.1	ND	-	-