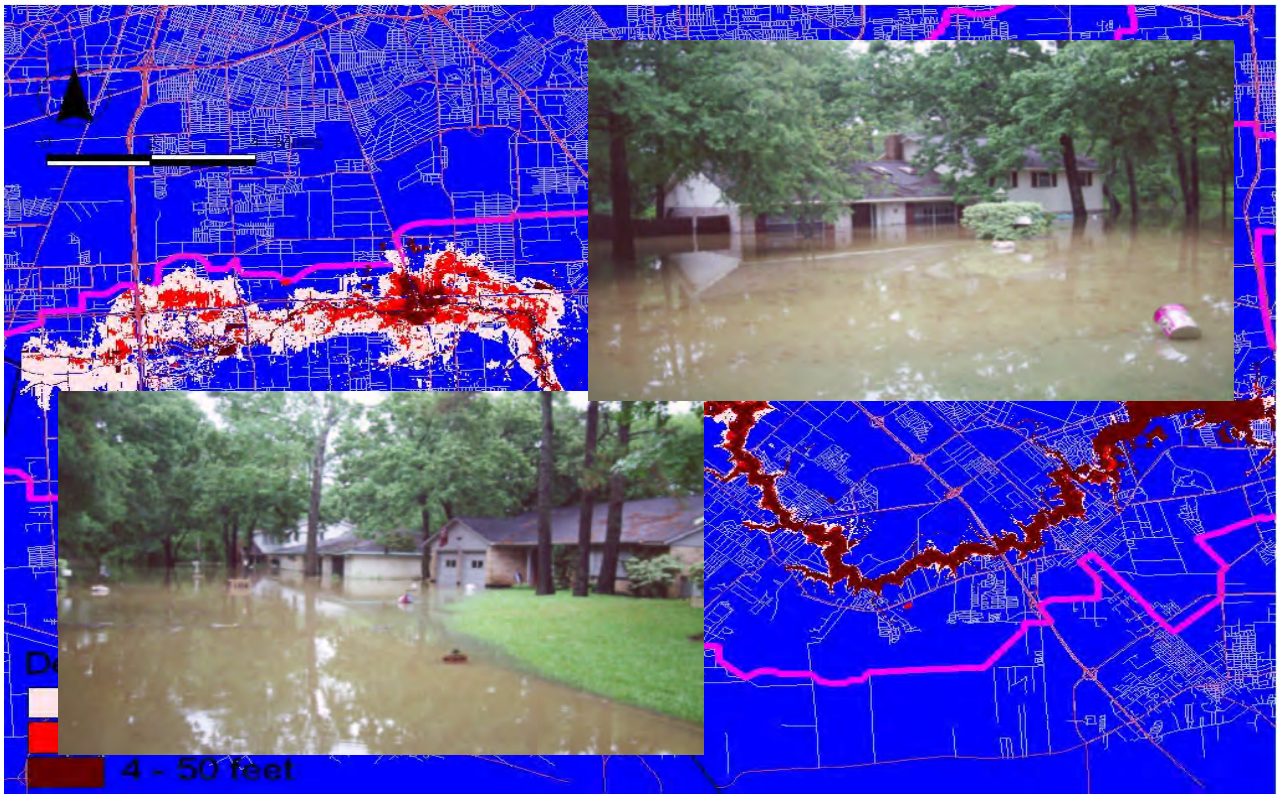
U.S. Army Corps
of Engineers

Galveston District
Southwestern Division

Final
Supplemental Environmental Impact Statement
for the
Clear Creek General Reevaluation Study
Brazoria, Fort Bend, Galveston,
and Harris Counties, Texas



APPENDICES VOLUME II (C–N)

October 2012

Main Report

Appendix Volume I

Appendix Volume II

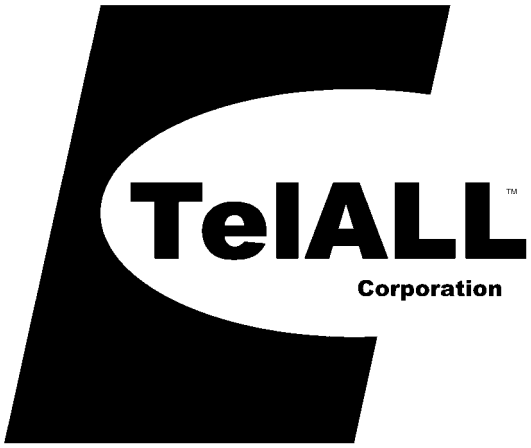
Appendix Volume III

Appendix C

HTRW and Oil/Gas Wells & Pipelines

Appendix C-1

TelALL Report Summary and Collated Tables and Maps



Environmental Data Search

for the site

Loop 8, Brazoria County Area, TX

performed for

PBS&J

4/4/2008

PBJA6877

Preface

This document of environmental concerns near Loop 8, Brazoria County Area, TX reports findings of the TelALL data search, prepared on the request of PBS&J.

TelALL Corporation (TelALL) has designed this document to comply with the AAI and ASTM standard E 1527 - 05 (Accuracy and Completeness) and has used all available resources, but makes no claim to the entirety or accuracy of the cited government, state, or tribal records. Our databases are updated at least every 90 days or as soon as possible after publication by the referenced agencies. The following fields of governmental, state, and tribal databases may not represent all known, unknown, or potential sources of contamination to the referenced site. Many different variables effect the outcome of the following document. TelALL maintains extremely high standards, and stringent procedures that are used to search the referenced data. However, TelALL reserves the right at any time to amend any information related to this report.

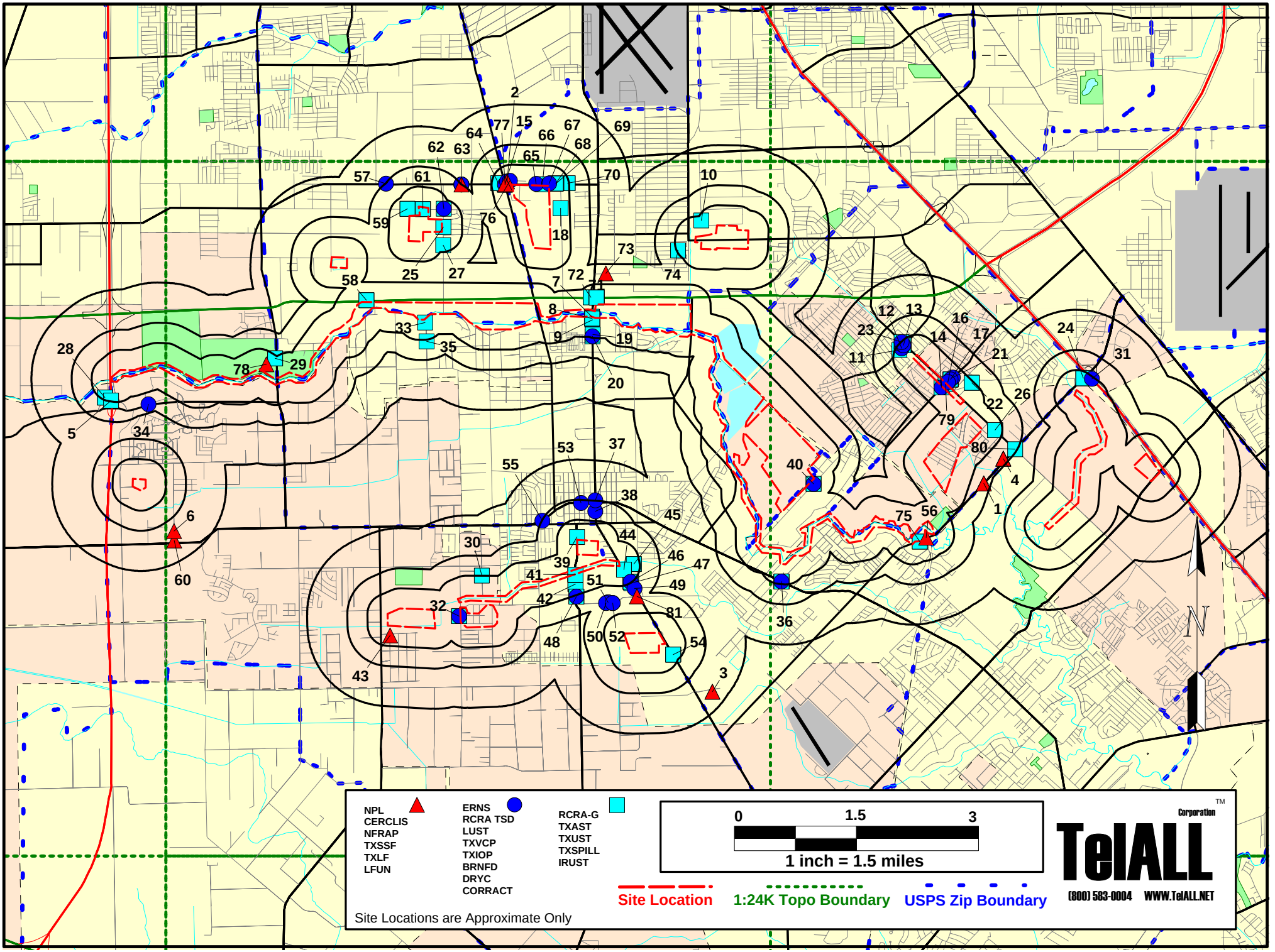
If there is a need for further information regarding this report, or for any customer support please call TelALL at 800 583-0004 for assistance.

This report is divided into the following components:

MAP	Identified geocodeable findings relative to this data search.
SUMMARY 1	Sorting of the identified sites by distance from the subject site.
FINAL	A description of each database and a detailed explanation of findings.

Sources

Database	Acronym	Last Updated	Minimum Search Distance	Findings
National Priority List	NPL	03/2008	1	2
Comprehensive Environmental Response, Compensation, and Liability Information System	CERCLIS	03/2008	0.5	5
No Further Remedial Action Planned	NFRAP	03/2008	0.5	8
Resource Conservation and Recovery Information System - Treatment Storage or Disposal	RCRA TSD	03/2008	1	1
Corrective Action	CORRACT	03/2008	1	1
Resource Conservation and Recovery Information System - Generators	RCRA-G	03/2008	0.25	9
Emergency Response Notification System	ERNS	01/2008	0.25	4
Texas Voluntary Cleanup Program	TXVCP	03/2008	0.5	4
Innocent Owner/Operator Program	TXIOP	03/2008	0.5	2
Texas State Superfund	TXSSF	01/2008	1	4
TCEQ Solid Waste Facilities	TXLF	02/2008	1	3
Unauthorized and Unpermitted Landfill Sites	LFUN	02/2008	0.5	0
Leaking Underground Storage Tanks	TXLUST	01/2008	0.5	23
Texas Underground Storage Tanks	TXUST	01/2008	0.25	99
Texas Above Ground Storage Tanks	TXAST	01/2008	0.25	17
Texas Spills List	TXSPILL	02/2008	0.25	7
Brownfield	BRNFD	03/2008	0.5	0
Dry Cleaner	DRYC	02/2008	0.5	3
Indian Reservation Underground Storage Tanks	IRUST	02/2008	0.25	0


NPL
CERCLIS
NFRAP
TXSSF
TXLF
LFUN
ERNS
RCRA TSD
LUST
TXVCP
TXIOP
BRNFD
DRYC
CORRACT
RCRA-G
TXAST
TXUST
TXSPILL
IRUST
0
1.5
3
1 inch = 1.5 miles
Site Location
1:24K Topo Boundary
USPS Zip Boundary
Site Locations are Approximate Only
N
TelALL
Corporation
(800) 583-0004
WWW.TelALL.NET

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	IRUST				NO FINDINGS WITHIN 1/4 MILE.
	BRNFD				NO FINDINGS WITHIN 1/2 MILE.
	LFUN				NO FINDINGS WITHIN 1/2 MILE.
	TXSSF	1		FRIENDSWOOD	DIXIE OIL PROCESSORS
	NPL	1	2505 CHOATE RD	FRIENDSWOOD	DIXIE OIL PROCESSORS, INC.
	CERCLIS	1	2505 CHOATE RD	FRIENDSWOOD	DIXIE OIL PROCESSORS, INC.
	TXSSF	2		HOUSTON	GULF METALS INDUSTRIES
	TXVCP	2	6712 TELEAN	HOUSTON	GULF METALS
	CERCLIS	3	3300 INDUSTIRAL BLVD.	PEARLAND	JAMES BARR FACILITY
	TXSSF	3		PEARLAND	JAMES BAR FACILITY
	CERCLIS	4	2501 DIXIE FARM ROAD	FRIENDSWOOD	BRIO REFINING, INC.
	TXSSF	4		FRIENDSWOOD	BRIO REFINING
	NPL	4	2501 DIXIE FARM ROAD	FRIENDSWOOD	BRIO REFINING, INC.
	CERCLIS	4	DIXIE FARM RD/EAST BY BEAMER RD	FRIENDSWOOD	BRIO SOUTH WELLS
	TXAST	5	HWY 288 AT MCHARD RD	HOUSTON	HELDENFELDS CONSTRUCTION SITE
	TXLF	6	0.5 MILE ON COUNTY ROAD 93 FROM IN	BRAZORIA	BILLY E GRAPPE LANDFILL
	TXUST	7	1014 N MAIN	PEARLAND	ELWYN J COLE
	TXUST	8	1021 N MAIN	PEARLAND	BELL BOTTOM FOUNDATION
	TXUST	8	1021 N MAIN	PEARLAND	BELL BOTTOM FOUNDATION
	TXUST	8	1021 N MAIN	PEARLAND	BELL BOTTOM FOUNDATION
	TXUST	8	1021 N MAIN	PEARLAND	BELL BOTTOM FOUNDATION
	TXUST	9	1028 N MAIN ST	PEARLAND	RACETRAC 588
	TXUST	9	1028 N MAIN ST	PEARLAND	RACETRAC 588
	TXUST	9	1028 N MAIN ST	PEARLAND	RACETRAC 588
	TXUST	10	10425 MOERS	HOUSTON	J E TITUS
	RCRA-G	11	10806 HUGHES RD	HOUSTON	BELL CLEANERS
	DRYC	12	10835 HUGHES RD	HOUSTON	STAR CLEANERS
	TXLUST	13	10840 HUGHES RD	HOUSTON	MOBIL 12AJ4
	TXLUST	13	10840 HUGHES RD	HOUSTON	SHELL OIL
	TXUST	13	10840 HUGHES RD	HOUSTON	HUGHES ROAD TEXACO
	TXUST	13	10840 HUGHES RD	HOUSTON	HUGHES ROAD TEXACO
	TXUST	13	10840 HUGHES RD	HOUSTON	HUGHES ROAD TEXACO
	TXUST	13	10840 HUGHES RD	HOUSTON	HUGHES ROAD TEXACO
	TXUST	13	10840 HUGHES RD	HOUSTON	HUGHES ROAD TEXACO
	TXSPILL	13	10840 HUGHES RD	HOUSTON	MOBIL OIL CORPORATION
	TXUST	14	10855 SCARSDALE BLVD	HOUSTON	JACKS GROCERY 13
	RCRA-G	14	10855 SCARSDALE & BEAMER	HOUSTON	CHEVRON USA INC #158761
	TXSPILL	14	10855 SCRARSDALE AND BEAMER	HOUSTON	CHEVRON
	TXUST	14	10855 SCARSDALE BLVD	HOUSTON	JACKS GROCERY 13
	TXUST	14	10855 SCARSDALE BLVD	HOUSTON	JACKS GROCERY 13
	TXLUST	14	10855 SCARSDALE	HOUSTON	CHEVRON 60158761
	TXUST	14	10855 SCARSDALE BLVD	HOUSTON	JACKS GROCERY 13
	TXUST	14	10855 SCARSDALE BLVD	HOUSTON	JACKS GROCERY 13
	TXUST	14	10855 SCARSDALE BLVD	HOUSTON	JACKS GROCERY 13
	TXLUST	15	10900 MYKAWA	HOUSTON	HANDI STOP 71 DIAMOND SHAMROC
	TXUST	15	10900 MYKAWA RD	HOUSTON	HANDI STOP 71
	TXUST	15	10900 MYKAWA RD	HOUSTON	HANDI STOP 71
	TXUST	15	10900 MYKAWA RD	HOUSTON	HANDI STOP 71
	TXUST	15	10900 MYKAWA RD	HOUSTON	HANDI STOP 71
	ERNS	16	10935 SCARSDALE BLVD	HOUSTON	TBT CLINIC

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXUST	17	10999 SCARSDALE BLVD	HOUSTON	SCARSDALE SHELL
	TXUST	17	10999 SCARSDALE BLVD	HOUSTON	SCARSDALE SHELL
	TXUST	17	10999 SCARSDALE BLVD	HOUSTON	SCARSDALE SHELL
	TXLUST	17	10999 SCARSDALE RD	HOUSTON	TEXACO SS
	TXUST	17	10999 SCARSDALE BLVD	HOUSTON	SCARSDALE SHELL
	TXUST	18	11007 FORBES	HOUSTON	FORBES WORK CENTER
	RCRA-G	19	1118 N MAIN SUITE 2F	PEARLAND	HYPER PRODUCTS
	TXUST	20	1120 N MAIN ST	PEARLAND	A & T AUTO CARE
	TXLUST	20	1120 N MAIN ST	PEARLAND	A & T AUTO CARE
	DRYC	21	11202 SCARSDALE BLVD	HOUSTON	DRY CLEAN SUPER CENTER
	RCRA-G	22	11800 ASTORIA BLVD	HOUSTON	MEMORIAL HERMANN SOUTHWEST
	TXUST	22	11800 ASTORIA	HOUSTON	MEMORIAL HOSPITAL SYSTEM SE U
	TXIOP	23	12050 BEAMER ROAD	HOUSTON	HANDI STOP #83 (PHILLIPS 66)
	TXUST	23	12050 BEAMER RD	HOUSTON	HANDI STOP 83
	TXUST	24	1212 DIXIE FARM RD	HOUSTON	RACEWAY 763
	TXUST	24	1212 DIXIE FARM RD	HOUSTON	RACEWAY 763
	TXUST	24	1212 DIXIE FARM RD	HOUSTON	RACEWAY 763
	TXAST	25	13600 S WAYSIDE	HOUSTON	BROOKS PRODUCTS
	TXUST	25	13600 S WAYSIDE	HOUSTON	BROOKS PRODUCTS
	RCRA-G	26	13735 BEAMER RD	HOUSTON	SAN JACINTO COLLEGE
	TXUST	26	13735 BEAMER RD	HOUSTON	SAN JACINTO COLLEGE S CAMPUS
	TXUST	26	13735 BEAMER RD	HOUSTON	SAN JACINTO COLLEGE S CAMPUS
	TXUST	26	13735 BEAMER RD	HOUSTON	SAN JACINTO COLLEGE S CAMPUS
	TXUST	27	13820 S WAYSIDE	HOUSTON	MOBILE STEEL CORP
	TXUST	28	14770 S HIGHWAY 288	PEARLAND	STROUHAL TIRE & RECAPPING PLAN
	TXAST	28	14770 S HIGHWAY 288	PEARLAND	STROUHAL TIRE & RECAPPING PLAN
	TXAST	28	14770 S HIGHWAY 288	PEARLAND	STROUHAL TIRE & RECAPPING PLAN
	TXUST	29	15050 CULLEN BLVD	HOUSTON	TOM BASS III PARK
	TXUST	29	15050 CULLEN BLVD	HOUSTON	TOM BASS III PARK
	TXUST	30	15134 WAGON TRAIL RD	PEARLAND	ELLIS AUTOMOTIVE
	TXLUST	31	15711 GULF FWY	HOUSTON	CLEAR LAKE DODGE
	TXUST	32	15910 HARKEY RD	PEARLAND	TUBOSCOPE PEARLAND INSPECTIO
	TXUST	32	15910 HARKEY RD	PEARLAND	TUBOSCOPE PEARLAND INSPECTIO
	TXUST	32	15910 HARKEY RD	PEARLAND	TUBOSCOPE PEARLAND INSPECTIO
	TXLUST	32	15910 HARKEY RD	PEARLAND	AMF TUBOSCOPE INC
	RCRA-G	33	1617 GARDEN RD	PEARLAND	COASTAL CONTRACTORS INC
	DRYC	34	1801 COUNTRY PLACE PKWY STE 105	PEARLAND	SILVERLINE DRY CLEANERS
	RCRA-G	35	2005 GARDEN ROAD	PEARLAND	DAVIS-LYNCH INC
	TXUST	36	2112 E BROADWAY ST	PEARLAND	HANDI PLUS 7336
	TXUST	36	2112 E BROADWAY ST	PEARLAND	HANDI PLUS 7336
	TXUST	36	2112 E BROADWAY ST	PEARLAND	HANDI PLUS 7336
	TXLUST	36	2112 E BROADWAY	PEARLAND	COASTAL MART NO 336
	TXUST	36	2112 E BROADWAY ST	PEARLAND	HANDI PLUS 7336
	TXLUST	37	2340 N MAIN	PEARLAND	GAS N GO
	TXLUST	38	2502 S MAIN	PEARLAND	FINA SERVICE STATION
	TXUST	39	2703 VETERANS DR	PEARLAND	PEARLAND POLICE DEPT
	TXUST	40	2801 COUNTRY CLUB RD	PEARLAND	GOLFCREST COUNTRY CLUB
	TXLUST	40	2801 COUNTRY CLUB DR	PEARLAND	GOLFCREST COUNTRY CLUB MAINT
	TXUST	40	2801 COUNTRY CLUB RD	PEARLAND	GOLFCREST COUNTRY CLUB
	TXUST	41	3141 PEARLAND SITES RD	PEARLAND	AUSTIN BRIDGE CO PEARLAND YD
	TXAST	41	3141 VETERANS DR	PEARLAND	AUSTIN BRIDGE & ROAD-PEARLAND

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXUST	41	3141 PEARLAND SITES RD	PEARLAND	AUSTIN BRIDGE CO PEARLAND YD
	TXAST	41	3141 VETERANS DR	PEARLAND	AUSTIN BRIDGE & ROAD-PEARLAND
	TXAST	41	3141 VETERANS DR	PEARLAND	AUSTIN BRIDGE & ROAD-PEARLAND
	TXUST	41	3141 PEARLAND SITES RD	PEARLAND	AUSTIN BRIDGE CO PEARLAND YD
	TXUST	41	3141 PEARLAND SITES RD	PEARLAND	AUSTIN BRIDGE CO PEARLAND YD
	TXAST	42	3201 VETERANS DR	PEARLAND	GATE CONCRETE PRODUCTS
	TXAST	42	3201 VETERANS DR	PEARLAND	GATE CONCRETE PRODUCTS
	TXAST	42	3201 VETERANS DR	PEARLAND	GATE CONCRETE PRODUCTS
	NFRAP	43	3202 SKYLARK	PEARLAND	YATES RESIDENCE SITE
	TXAST	44	3225 S MAIN	PEARLAND	LOGTECH WIRELINE SERVICES
	TXUST	44	3225 S MAIN	PEARLAND	LOGTECH WIRELINE SERVICES
	TXUST	45	3319 INDUSTRIAL DR	PEARLAND	CRC WIRELINE
	TXUST	45	3319 INDUSTRIAL DR	PEARLAND	CRC WIRELINE
	TXLUST	46	3401 S MAIN	PEARLAND	DRESSER INDUSTRIES
	TXUST	46	3401 S MAIN	PEARLAND	DRESSER INDUSTRIES
	RCRA-G	46	3401 S MAIN ST	PEARLAND	BAKER HUGHES INCORPORATED
	TXUST	46	3401 S MAIN	PEARLAND	DRESSER INDUSTRIES
	TXUST	46	3401 S MAIN	PEARLAND	DRESSER INDUSTRIES
	TXUST	47	3404 S MAIN	PEARLAND	THE CAR SPOT
	TXUST	48	3415 VETERANS DR	PEARLAND	CORNER MARKET 2
	TXUST	48	3415 VETERANS DR	PEARLAND	CORNER MARKET 2
	TXLUST	48	3415 VETERANS DR	PEARLAND	CORNER MARKET II
	TXLUST	49	3501 S MAIN	PEARLAND	Y & S FOOD MART
	TXLUST	50	3808 MAGNOLIA	PEARLAND	WHITING OILFIELD RENTAL INC
	TXVCP	51	3810 MAGNOLIA STREET	PEARLAND	PEARLAND MANUFACTURING (WEAT
	TXLUST	51	3810 MAGNOLIA RD	PEARLAND	CHANCE COLLAR CO
	TXLUST	52	3901 MAGNOLIA	PEARLAND	MIDWEST STEEL
	TXVCP	52	3901 MAGNOLIA STREET	PEARLAND	MIDWEST CORPORATION - STEEL DI
	TXLUST	53	4408 W BROADWAY	PEARLAND	WINVERS LUG A JUG
	TXUST	54	4453 S MAIN ST	PEARLAND	SEVEN CROWN GROCERY 3
	TXUST	54	4453 S MAIN ST	PEARLAND	SEVEN CROWN GROCERY 3
	TXUST	54	4453 S MAIN ST	PEARLAND	SEVEN CROWN GROCERY 3
	TXUST	54	4453 S MAIN ST	PEARLAND	SEVEN CROWN GROCERY 3
	TXLUST	55	4805 W BROADWAY	PEARLAND	BRAZORIA COUNTY DRAINAGE DIST
	NFRAP	56	500 DIXIE FARM ROAD	PEARLAND	HILL SAND COMPANY SITE
	TXLUST	57	5301 ALMEDA GENOA	HOUSTON	HARRIS COUNTY FLOOD CONTL DIS
	TXUST	58	5404 S SAM HOUSTON PKWY E	HOUSTON	BELTWAY FOOD MART
	TXUST	58	5404 S SAM HOUSTON PKWY E	HOUSTON	BELTWAY FOOD MART
	TXAST	59	5550 ALLISON RD	HOUSTON	CHERRY STABILIZED PLANT 2
	TXAST	59	5550 ALLISON RD	HOUSTON	CHERRY STABILIZED PLANT 2
	TXLF	60	5602 SMITH MILLER RD, PEARLAND, TX	BRAZORIA	JACK SHELTON LANDFILL
	TXAST	61	5720 ALLISON	HOUSTON	SHOP FACILITY
	TXAST	61	5720 ALLISON	HOUSTON	SHOP FACILITY
	TXAST	61	5720 ALLISON	HOUSTON	SHOP FACILITY
	TXLUST	62	5902 ALLISON RD	HOUSTON	CRANE RENTAL
	TXUST	62	5902 ALLISON RD	HOUSTON	CRANE RENTAL DIV INC
	RCRA TSD	63	6121 ALMEDA GENOA RD	HOUSTON	ASHLAND INC
	CORRACT	63	6121 ALMEDA GENOA RD	HOUSTON	ASHLAND INC
	TXVCP	63	6121 ALMEDA-GENOA ROAD	HOUSTON	ASHLAND SPECIALTY CHEMICAL CO
	NFRAP	63	6121 ALMEDA - GENOA ROAD	HOUSTON	DREW CHEMICAL CORP.
	TXUST	64	6617 ALMEDA GENOA RD	HOUSTON	V & J FOOD MART

Distance/Direction	Database	Site Number	Address	City/State	Site Name
	TXUST	64	6617 ALMEDA GENOA RD	HOUSTON	V & J FOOD MART
	ERNS	65	7100 ALMEDA-GEONA	HOUSTON	EXXON PIPELINE
	TXUST	66	7150 ALMEDA GENOA RD	HOUSTON	WHITE MANUFACTURING
	ERNS	67	7231 ALMEDA GENOA	HOUSTON	
	TXUST	68	7401 ALMEDA GENOA RD	HOUSTON	OKAY GAS & FOOD MARKET
	TXUST	68	7401 ALMEDA GENOA RD	HOUSTON	OKAY GAS & FOOD MARKET
	TXUST	68	7401 ALMEDA GENOA RD	HOUSTON	OKAY GAS & FOOD MARKET
	TXUST	68	7401 ALMEDA GENOA RD	HOUSTON	OKAY GAS & FOOD MARKET
	TXUST	69	7402 ALMEDA-GENOA	HOUSTON	WYDOWN CO
	TXUST	70	7440 ALMEDA GENOA	HOUSTON	ROBERT TREVINO
	TXUST	70	7440 ALMEDA GENOA	HOUSTON	ROBERT TREVINO
	TXUST	71	7745 S SAM HOUSTON PKWY	HOUSTON	HANDI STOP 93
	TXUST	71	7745 S SAM HOUSTON PKWY	HOUSTON	HANDI STOP 93
	TXUST	71	7745 S SAM HOUSTON PKWY	HOUSTON	HANDI STOP 93
	TXUST	71	7745 S SAM HOUSTON PKWY	HOUSTON	HANDI STOP 93
	TXUST	72	7805 S SAM HOUSTON PKWY E	HOUSTON	EXXON 60336
	TXUST	72	7805 S SAM HOUSTON PKWY E	HOUSTON	EXXON 60336
	NFRAP	73	7901 LETTIE ROAD	HOUSTON	LETTIE STREET SITE
	TXSPILL	74	8422 SPRINGTIME LN	HOUSTON	ENERGY DEVELOPMENT COMPLEX
	TXUST	75	911 DIXIE FARM RD	HOUSTON	HPD FIRE STATION 93
	TXUST	75	911 DIXIE FARM RD	HOUSTON	HPD FIRE STATION 93
	TXIOP	76	ADJACENT TO 6712 TELEAN STREET	HOUSTON	RRWT PROPERTY
	NFRAP	77	ALMEDA-GENOA RD & MYKOWA RD.	HOUSTON	ALMEDA-GENOA ROAD SITE
	TXLF	78	AT FM 518 AND FELLOWS ROAD INTERS	HARRIS	GEORGE R MOODY LANDFILL
	TXSPILL	79	CORNER OF SCARSDALE & BEAMER, H	HOUSTON	TEXACO
	TXSPILL	80	DIXIE FARM RD AT BEAMER, HOUSTON	HOUSTON	EXXON
	NFRAP	81	MAGNOLIA ST OFF TELEPHONE RD	PEARLAND	MAGNOLIA ROAD SITE
Site Location Unknown					
	TXAST	unknown	KNAPP RD	PEARLAND	PRIDE PETROLEUM SERVICES
	TXUST	unknown	LOTS 28-35 BLK 4 HWY 3	PEARLAND	2200 TO 2234 MAIN STREET
	TXUST	unknown	LOTS 28-35 BLK 4 HWY 3	PEARLAND	2200 TO 2234 MAIN STREET
	TXUST	unknown	LOTS 28-35 BLK 4 HWY 3	PEARLAND	2200 TO 2234 MAIN STREET
	TXUST	unknown	LOTS 28-35 BLK 4 HWY 3	PEARLAND	2200 TO 2234 MAIN STREET
	TXUST	unknown	RT 3	PEARLAND	M T FERNANDEZ PAINT & DEC
	TXSPILL	unknown	0.25 MILES NE OF STATE HIGHWAY 35 O	PEARLAND	HILL SAND COMPANY INC
	TXSPILL	unknown	0.25 MILES NE OF STATE HIGHWAY 35 O	PEARLAND	HILL SAND COMPANY INC
	RCRA-G	unknown	16255 S OAKS RD	HOUSTON	TEXACO STATION
	TXLUST	unknown	3236 MAIN ST	PEARLAND	HOMCO FACILITY
	TXUST	unknown	3426 MAIN ST	PEARLAND	QUICK STUFF 7752
	TXUST	unknown	3426 MAIN ST	PEARLAND	QUICK STUFF 7752
	ERNS	unknown	BEMAR ROAD AT HALL RD & SCARSDAL	HOUSTON	
	NFRAP	unknown	HWY 35	PEARLAND	HASTINGS RADIO CHEMICAL SITE (O
	CERCLIS	unknown	HWY 35	PEARLAND	HASTINGS RADIO CHEMICAL (ONSIT
	NFRAP	unknown	LETTIE STREET	HOUSTON (PEARLAN	CAT FORD ROAD

CLEAR CREEK SUMMARY OF VOLUNTARY CLEANUP PROGRAM SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
2	-95.304453	29.621372	TXVCP	Gulf Metals	6712 Telean	Houston	TX	77075	VCP ID: 1430 - Date app. received: 12/31/2001. Phase: Remediation. Certificate Type: L (C is conditional / F is Final). Facility Type: Landfill. Site Acres: 16 Contaminant type: VOCs, SVOCs, Metals, Solvents, Pesticides. The type of media affected: Soils/Groundwater/Surface Water/Sediment. Institutional Control/Remedy: Unknown/Unknown Applicant name: Gulf Metals Industries/Crain, Caton & James The Consultant/Attorney is Crain, Caton & James (tel) 713-752-8628 EPA ID: TXD980623722
51	-95.283562	29.545641	TXVCP	Pearland Manufacturing (Weatherford US)	3810 Magnolia Street	Pearland	TX	77584	VCP ID: 1053 - Date app. received: 9/20/1999. Phase: Withdrawal. The certificate type is unknown. Facility Type: Oilfield Drilling Pipe Facility. Site Acres: 10 Contaminant type: TPH, BTEX. The type of media affected: Soils/Groundwater. Institutional Control/Remedy: Unknown/Unknown Applicant name: Weatherford US, LP The Consultant/Attorney is Brown and Caldwell (tel) 713-646-1137 EPA ID: TXD987986171 Solid Waste registration number: 34943 LPST ID: 92992
52	-95.282605	29.545522	TXVCP	Midwest Corporation - Steel Division	3901 Magnolia Street	Pearland	TX		VCP ID: 0214 - Date app. received: 3/29/1996. Phase: Conditional. Certificate Type: C (C is conditional / F is Final). Facility Type: Used Railroad Products Warehouse. Site Acres: 15 Contaminant type: Metal, TPH. The type of media affected: Soils. Institutional Control/Remedy: Non-Residential, no gw use, O&M cover system/Unknown Applicant name: LinGo Properties, Inc. The Consultant/Attorney is PSI (tel) 901-365-9255
63	-95.313885	29.620829	TXVCP	Ashland Specialty Chemical Company	6121 Almeda-Genoa Road	Houston	TX	77048	VCP ID: 1412 - Date app. received: 11/26/2001. Phase: Investigation. The certificate type is unknown. Facility Type: Water Treatment Products Manufacturing. Site Acres: 6.93 Contaminant type: VOCs. The type of media affected: Groundwater. Institutional Control/Remedy: Unknown/Unknown Applicant name: Ashland, Inc. The Consultant/Attorney is URS Corporation (tel) 972-980-4961 EPA ID: TXD079388955 Solid Waste registration number: 32135

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
7	-95.286922	29.59704	TXUST	ELWYN J C	1014 N MAI	PEARLAND	TX	77581	Facility ID number 0043714, TCEQ unit ID number 00115221, tank ID number 1,date installed (MMDDYYYY) 01011976, total capacity in gallons: 0002000 Tank is currently perm. in place. Tank compartments: Compartment A: Diesel. Capacity 0002000 gal The tank construction is of steel. The owner of the facility is ELWYN J COLE, the telephone number listed for the owner is 713-485-2277.
8	-95.286858	29.59671	TXUST	BELL BOTT	1021 N MAI	PEARLAND	TX	77581	Facility ID number 0012072, TCEQ unit ID number 00031545, tank ID number 4,date installed (MMDDYYYY) 01011966, total capacity in gallons: 0004000 Tank is currently out of use. Tank compartments: Compartment A: Gasoline. Capacity 0004000 gal The tank construction is of steel. The owner of the facility is BELL BOTTOM FOUNDATION CO, the telephone number listed for the owner is 713-485-2791.
8	-95.286858	29.59671	TXUST	BELL BOTT	1021 N MAI	PEARLAND	TX	77581	Facility ID number 0012072, TCEQ unit ID number 00031546, tank ID number 1,date installed (MMDDYYYY) 01011966, total capacity in gallons: 0001000 Tank is currently out of use. Tank compartments: Compartment A: Gasoline. Capacity 0001000 gal The tank construction is of steel. The owner of the facility is BELL BOTTOM FOUNDATION CO, the telephone number listed for the owner is 713-485-2791.
8	-95.286858	29.59671	TXUST	BELL BOTT	1021 N MAI	PEARLAND	TX	77581	Facility ID number 0012072, TCEQ unit ID number 00031547, tank ID number 3,date installed (MMDDYYYY) 01011966, total capacity in gallons: 0002000 Tank is currently out of use. Tank compartments: Compartment A: Gasoline. Capacity 0002000 gal The tank construction is of steel. The owner of the facility is BELL BOTTOM FOUNDATION CO, the telephone number listed for the owner is 713-485-2791.
8	-95.286858	29.59671	TXUST	BELL BOTT	1021 N MAI	PEARLAND	TX	77581	Facility ID number 0012072, TCEQ unit ID number 00031548, tank ID number 2,date installed (MMDDYYYY) 01011966, total capacity in gallons: 0001000 Tank is currently out of use. Tank compartments: Compartment A: Gasoline. Capacity 0001000 gal The tank construction is of steel. The owner of the facility is BELL BOTTOM FOUNDATION CO, the telephone number listed for the owner is 713-485-2791.
9	-95.286795	29.59649	TXUST	RACETRAC	1028 N MAI	PEARLAND	TX	77581	Facility ID number 0070061, TCEQ unit ID number 00184710, tank ID number 3,date installed (MMDDYYYY) 06171997, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0012000 gal The tank construction is of composite - double wall. The owner of the facility is RACETRAC PETROLEUM INC, the telephone number listed for the owner is 800-388-8035.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
9	-95.286795	29.59649	TXUST	RACETRAC	1028 N MAI	PEARLAND	TX	77581	Facility ID number 0070061, TCEQ unit ID number 00184711, tank ID number 2,date installed (MMDDYYYY) 06171997, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0012000 gal The tank construction is of composite - double wall. The owner of the facility is RACETRAC PETROLEUM INC, the telephone number listed for the owner is 800-388-8035.
9	-95.286795	29.59649	TXUST	RACETRAC	1028 N MAI	PEARLAND	TX	77581	Facility ID number 0070061, TCEQ unit ID number 00184712, tank ID number 1,date installed (MMDDYYYY) 06171997, total capacity in gallons: 0015000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0015000 gal The tank construction is of composite - double wall. The owner of the facility is RACETRAC PETROLEUM INC, the telephone number listed for the owner is 800-388-8035.
10	-95.264275	29.614356	TXUST	J E TITUS	10425 MOE	HOUSTON	TX	77075	Facility ID number 0020167, TCEQ unit ID number 00051870, tank ID number 1,date installed (MMDDYYYY) 01011976, total capacity in gallons: 0001000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0001000 gal The tank construction is of steel. The owner of the facility is J E TITUS COMPANY, the telephone number listed for the owner is 7139911100.
13	-95.222485	29.5919	TXUST	HUGHES R	10840 HUC	HOUSTON	TX	77089	Facility ID number 0017642, TCEQ unit ID number 00045219, tank ID number 3,date installed (MMDDYYYY) 06011979, total capacity in gallons: 0008000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0008000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is TJHP INC, the telephone number listed for the owner is 281-484-0106.
13	-95.222485	29.5919	TXUST	HUGHES R	10840 HUC	HOUSTON	TX	77089	Facility ID number 0017642, TCEQ unit ID number 00045220, tank ID number 3,date installed (MMDDYYYY) Unknown, total capacity in gallons: 0001000 Tank is currently removed from ground. Tank compartments: Compartment A: Used Oil. Capacity 0001000 gal The tank construction is of steel. The owner of the facility is TJHP INC, the telephone number listed for the owner is 281-484-0106.
13	-95.222485	29.5919	TXUST	HUGHES R	10840 HUC	HOUSTON	TX	77089	Facility ID number 0017642, TCEQ unit ID number 00045221, tank ID number 1,date installed (MMDDYYYY) 01011979, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is TJHP INC, the telephone number listed for the owner is 281-484-0106.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
13	-95.222485	29.5919	TXUST	HUGHES R	10840 HUC	HOUSTON	TX	77089	Facility ID number 0017642, TCEQ unit ID number 00045222, tank ID number 2,date installed (MMDDYYYY) 01011979, total capacity in gallons: 0008000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0008000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is TJHP INC, the telephone number listed for the owner is 281-484-0106.
13	-95.222485	29.5919	TXUST	HUGHES R	10840 HUC	HOUSTON	TX	77089	Facility ID number 0017642, TCEQ unit ID number 00045223, tank ID number 3A,date installed (MMDDYYYY) 06011979, total capacity in gallons: 0000550 Tank is currently removed from ground. Tank compartments: Compartment A: Used Oil. Capacity 0000550 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is TJHP INC, the telephone number listed for the owner is 281-484-0106.
14	-95.214591	29.584324	TXUST	JACKS GR(	10855 SCA	HOUSTON	TX	77089	Facility ID number 0029174, TCEQ unit ID number 00076837, tank ID number 1,date installed (MMDDYYYY) 01011982, total capacity in gallons: 0011627 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0011627 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is JACKS GROCERY INC, the telephone number listed for the owner is 281-464-3579.
14	-95.214591	29.584324	TXUST	JACKS GR(	10855 SCA	HOUSTON	TX	77089	Facility ID number 0029174, TCEQ unit ID number 00076838, tank ID number 4,date installed (MMDDYYYY) 01011982, total capacity in gallons: 0011627 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0011627 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is JACKS GROCERY INC, the telephone number listed for the owner is 281-464-3579.
14	-95.214591	29.584324	TXUST	JACKS GR(	10855 SCA	HOUSTON	TX	77089	Facility ID number 0029174, TCEQ unit ID number 00076839, tank ID number 3,date installed (MMDDYYYY) 01011982, total capacity in gallons: 0011627 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0011627 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is JACKS GROCERY INC, the telephone number listed for the owner is 281-464-3579.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
14	-95.214591	29.584324	TXUST	JACKS GR(	10855 SCA	HOUSTON	TX	77089	Facility ID number 0029174, TCEQ unit ID number 00076840, tank ID number 2,date installed (MMDDYYYY) 01011982, total capacity in gallons: 0011627 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0011627 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is JACKS GROCERY INC, the telephone number listed for the owner is 281-464-3579.
14	-95.214591	29.584324	TXUST	JACKS GR(	10855 SCA	HOUSTON	TX	77089	Facility ID number 0029174, TCEQ unit ID number 00205826, tank ID number 5,date installed (MMDDYYYY) 05262005, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0012000 gal The tank construction is of composite - single wall. The owner of the facility is JACKS GROCERY INC, the telephone number listed for the owner is 281-464-3579.
14	-95.214591	29.584324	TXUST	JACKS GR(	10855 SCA	HOUSTON	TX	77089	Facility ID number 0029174, TCEQ unit ID number 00205827, tank ID number 6,date installed (MMDDYYYY) 05262005, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity: 0006000 gal, Comp. B: Diesel. Capacity: 0006000 gal The tank construction is of composite - single wall. The owner of the facility is JACKS GROCERY INC, the telephone number listed for the owner is 281-464-3579.
15	-95.304896	29.620822	TXUST	HANDI STC	10900 MYK	HOUSTON	TX	77048	Facility ID number 0039700, TCEQ unit ID number 00104987, tank ID number 4,date installed (MMDDYYYY) 01011978, total capacity in gallons: 0008000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0008000 gal The tank construction is of composite - single wall. The owner of the facility is TRISTAR CONVENIENCE STORES INC, the telephone number listed for the owner is 713-776-1515.
15	-95.304896	29.620822	TXUST	HANDI STC	10900 MYK	HOUSTON	TX	77048	Facility ID number 0039700, TCEQ unit ID number 00104988, tank ID number 1,date installed (MMDDYYYY) 01011978, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0012000 gal The tank construction is of composite - single wall. The owner of the facility is TRISTAR CONVENIENCE STORES INC, the telephone number listed for the owner is 713-776-1515.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
15	-95.304896	29.620822	TXUST	HANDI STC	10900 MYK	HOUSTON	TX	77048	Facility ID number 0039700, TCEQ unit ID number 00104989, tank ID number 3,date installed (MMDDYYYY) 01011978, total capacity in gallons: 0008000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0008000 gal The tank construction is of composite - single wall. The owner of the facility is TRISTAR CONVENIENCE STORES INC, the telephone number listed for the owner is 713-776-1515.
15	-95.304896	29.620822	TXUST	HANDI STC	10900 MYK	HOUSTON	TX	77048	Facility ID number 0039700, TCEQ unit ID number 00104990, tank ID number 2,date installed (MMDDYYYY) 01011978, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0012000 gal The tank construction is of composite - single wall. The owner of the facility is TRISTAR CONVENIENCE STORES INC, the telephone number listed for the owner is 713-776-1515.
17	-95.212725	29.585763	TXUST	SCARSDAL	10999 SCA	HOUSTON	TX	77089	Facility ID number 0023129, TCEQ unit ID number 00059361, tank ID number 1,date installed (MMDDYYYY) 01011984, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is ADICO ENTERPRISES INC, the telephone number listed for the owner is 713-943-1991.
17	-95.212725	29.585763	TXUST	SCARSDAL	10999 SCA	HOUSTON	TX	77089	Facility ID number 0023129, TCEQ unit ID number 00059362, tank ID number 2,date installed (MMDDYYYY) 01011984, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is ADICO ENTERPRISES INC, the telephone number listed for the owner is 713-943-1991.
17	-95.212725	29.585763	TXUST	SCARSDAL	10999 SCA	HOUSTON	TX	77089	Facility ID number 0023129, TCEQ unit ID number 00059363, tank ID number 4,date installed (MMDDYYYY) 01011984, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Diesel. Capacity 0010000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is ADICO ENTERPRISES INC, the telephone number listed for the owner is 713-943-1991.
17	-95.212725	29.585763	TXUST	SCARSDAL	10999 SCA	HOUSTON	TX	77089	Facility ID number 0023129, TCEQ unit ID number 00059364, tank ID number 3,date installed (MMDDYYYY) 01011984, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is ADICO ENTERPRISES INC, the telephone number listed for the owner is 713-943-1991.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
18	-95.293377	29.616572	TXUST	FORBES W	11007 FOR	HOUSTON	TX	77075	Facility ID number 0019170, TCEQ unit ID number 00049840, tank ID number 1,date installed (MMDDYYYY) 01011974, total capacity in gallons: 0008000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0008000 gal The tank construction is of steel - single wall. The owner of the facility is SOUTHWESTERN BELL TELEPHONE LP, the telephone number listed for the owner is 214-464-1477.
20	-95.286795	29.593518	TXUST	A & T AUTC	1120 N MAI	PEARLAND	TX	77581	Facility ID number 0031734, TCEQ unit ID number 00083379, tank ID number 1,date installed (MMDDYYYY) 01011985, total capacity in gallons: 0000500 Tank is currently removed from ground. Tank compartments: Compartment A: Used Oil. Capacity 0000500 gal The tank construction is of concrete. The owner of the facility is A & T AUTO CARE, the telephone number listed for the owner is 713-240-8282.
22	-95.208346	29.58516	TXUST	MEMORIAL	11800 AST	HOUSTON	TX	77089	Facility ID number 0043920, TCEQ unit ID number 00115654, tank ID number 1,date installed (MMDDYYYY) 01011986, total capacity in gallons: 0001000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0001000 gal The tank construction is of fiberglass-reinforced plastic (FRP). The owner of the facility is MEMORIAL HERMANN HOSPITAL SYSTEM, the telephone number listed for the owner is 281-929-4181.
23	-95.222869	29.592481	TXUST	HANDI STC	12050 BEA	HOUSTON	TX	77089	Facility ID number 0035233, TCEQ unit ID number 00093195, tank ID number 1,date installed (MMDDYYYY) 01011981, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0012000 gal The tank construction is of composite - single wall. The owner of the facility is TRISTAR CONVENIENCE STORES INC, the telephone number listed for the owner is 713-776-1515.
24	-95.185281	29.585973	TXUST	RACEWAY	1212 DIXIE	HOUSTON	TX	77089	Facility ID number 0076681, TCEQ unit ID number 00203559, tank ID number 1,date installed (MMDDYYYY) 03252004, total capacity in gallons: 0015000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0015000 gal The tank construction is of composite - double wall. The owner of the facility is RACETRAC PETROLEUM INC, the telephone number listed for the owner is 800-388-8035.
24	-95.185281	29.585973	TXUST	RACEWAY	1212 DIXIE	HOUSTON	TX	77089	Facility ID number 0076681, TCEQ unit ID number 00203560, tank ID number 2,date installed (MMDDYYYY) 03252004, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0012000 gal The tank construction is of composite - double wall. The owner of the facility is RACETRAC PETROLEUM INC, the telephone number listed for the owner is 800-388-8035.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
24	-95.185281	29.585973	TXUST	RACEWAY	1212 DIXIE	HOUSTON	TX	77089	Facility ID number 0076681, TCEQ unit ID number 00203561, tank ID number 3,date installed (MMDDYYYY) 03252004, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0012000 gal The tank construction is of composite - double wall. The owner of the facility is RACETRAC PETROLEUM INC, the telephone number listed for the owner is 800-388-8035.
25	-95.31761	29.613185	TXUST	BROOKS PI	13600 S W/	HOUSTON	TX	77048	Facility ID number 0021454, TCEQ unit ID number 00055125, tank ID number 1,date installed (MMDDYYYY) 01011979, total capacity in gallons: 0012000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0012000 gal The tank construction is of steel. The owner of the facility is OLDCASTLE PRECAST INC, the telephone number listed for the owner is 713-991-2400.
26	-95.203538	29.576628	TXUST	SAN JACIN	13735 BEA	HOUSTON	TX	77089	Facility ID number 0020596, TCEQ unit ID number 00052948, tank ID number 1,date installed (MMDDYYYY) 01011981, total capacity in gallons: 0001000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0001000 gal The tank construction is of steel - single wall. The owner of the facility is SAN JACINTO COLLEGE DISTRICT, the telephone number listed for the owner is 281-998-6120.
26	-95.203538	29.576628	TXUST	SAN JACIN	13735 BEA	HOUSTON	TX	77089	Facility ID number 0020596, TCEQ unit ID number 00052949, tank ID number 3,date installed (MMDDYYYY) 01011981, total capacity in gallons: 0001000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0001000 gal The tank construction is of steel - single wall. The owner of the facility is SAN JACINTO COLLEGE DISTRICT, the telephone number listed for the owner is 281-998-6120.
26	-95.203538	29.576628	TXUST	SAN JACIN	13735 BEA	HOUSTON	TX	77089	Facility ID number 0020596, TCEQ unit ID number 00052950, tank ID number 2,date installed (MMDDYYYY) 01011981, total capacity in gallons: 0001000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0001000 gal The tank construction is of steel - single wall. The owner of the facility is SAN JACINTO COLLEGE DISTRICT, the telephone number listed for the owner is 281-998-6120.
27	-95.317664	29.609911	TXUST	MOBILE ST	13820 S W/	HOUSTON	TX	77048	Facility ID number 0015530, TCEQ unit ID number 00039801, tank ID number 1,date installed (MMDDYYYY) 01011983, total capacity in gallons: 0002000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0002000 gal The tank construction is of steel. The owner of the facility is MOBILE STEEL CORP, the telephone number listed for the owner is 7139910450.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
28	-95.387619	29.5825	TXUST	STROUHAL	14770 S HI(	PEARLAND	TX	77584	Facility ID number 0014074, TCEQ unit ID number 00036253, tank ID number 1,date installed (MMDDYYYY) 01011985, total capacity in gallons: 0000550 Tank is currently removed from ground. Tank compartments: Compartment A: Used Oil. Capacity 0000550 gal The tank construction is of steel. The owner of the facility is STROUHAL TIRE & RECAPPING PLANT, the telephone number listed for the owner is 7134361331.
29	-95.352419	29.589548	TXUST	TOM BASS	15050 CUL	HOUSTON	TX	77047	Facility ID number 0046557, TCEQ unit ID number 00121840, tank ID number 1,date installed (MMDDYYYY) 07011988, total capacity in gallons: 0006000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0006000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is HARRIS COUNTY, the telephone number listed for the owner is 713-440-4800.
29	-95.352419	29.589548	TXUST	TOM BASS	15050 CUL	HOUSTON	TX	77047	Facility ID number 0046557, TCEQ unit ID number 00121841, tank ID number 2,date installed (MMDDYYYY) 07011988, total capacity in gallons: 0006000 Tank is currently in use. Tank compartments: Compartment A: Diesel. Capacity 0006000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is HARRIS COUNTY, the telephone number listed for the owner is 713-440-4800.
30	-95.309664	29.550454	TXUST	ELLIS AUT(	15134 WA(	PEARLAND	TX	77581	Facility ID number 0012542, TCEQ unit ID number 00032695, tank ID number 1,date installed (MMDDYYYY) 01011981, total capacity in gallons: 0000500 Tank is currently removed from ground. Tank compartments: Compartment A: Used Oil. Capacity 0000500 gal The tank construction is of steel. The owner of the facility is ELLIS AUTOMOTIVE, the telephone number listed for the owner is 7134858075.
32	-95.314364	29.54317	TXUST	TUBOSCOF	15910 HAR	PEARLAND	TX	77584	Facility ID number 0041896, TCEQ unit ID number 00110848, tank ID number 1,date installed (MMDDYYYY) 01011978, total capacity in gallons: 0004000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0004000 gal The tank construction is of steel. The owner of the facility is NATIONAL OILWELL VARCO LP, the telephone number listed for the owner is 806-661-4005.
32	-95.314364	29.54317	TXUST	TUBOSCOF	15910 HAR	PEARLAND	TX	77584	Facility ID number 0041896, TCEQ unit ID number 00110849, tank ID number 3,date installed (MMDDYYYY) 01011978, total capacity in gallons: 0002000 Tank is currently removed from ground. Tank compartments: Compartment A: New Oil. Capacity 0002000 gal The tank construction is of steel. The owner of the facility is NATIONAL OILWELL VARCO LP, the telephone number listed for the owner is 806-661-4005.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
32	-95.314364	29.54317	TXUST	TUBOSCOF	15910 HAR	PEARLAND	TX	77584	Facility ID number 0041896, TCEQ unit ID number 00110850, tank ID number 2,date installed (MMDDYYYY) 01011978, total capacity in gallons: 0002000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0002000 gal The tank construction is of steel. The owner of the facility is NATIONAL OILWELL VARCO LP, the telephone number listed for the owner is 806-661-4005.
36	-95.247696	29.549382	TXUST	HANDI PLU	2112 E BRC	PEARLAND	TX	77581	Facility ID number 0027885, TCEQ unit ID number 00072971, tank ID number 1,date installed (MMDDYYYY) 01011984, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of steel - single wall. The owner of the facility is SUSSER PETROLEUM COMPANY LLC, the telephone number listed for the owner is 361-852-2266.
36	-95.247696	29.549382	TXUST	HANDI PLU	2112 E BRC	PEARLAND	TX	77581	Facility ID number 0027885, TCEQ unit ID number 00072972, tank ID number 2,date installed (MMDDYYYY) 01011984, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of steel - single wall. The owner of the facility is SUSSER PETROLEUM COMPANY LLC, the telephone number listed for the owner is 361-852-2266.
36	-95.247696	29.549382	TXUST	HANDI PLU	2112 E BRC	PEARLAND	TX	77581	Facility ID number 0027885, TCEQ unit ID number 00072973, tank ID number 3,date installed (MMDDYYYY) 01011984, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of steel - single wall. The owner of the facility is SUSSER PETROLEUM COMPANY LLC, the telephone number listed for the owner is 361-852-2266.
36	-95.247696	29.549382	TXUST	HANDI PLU	2112 E BRC	PEARLAND	TX	77581	Facility ID number 0027885, TCEQ unit ID number 00173834, tank ID number 4,date installed (MMDDYYYY) 01011984, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of steel - single wall. The owner of the facility is SUSSER PETROLEUM COMPANY LLC, the telephone number listed for the owner is 361-852-2266.
39	-95.289996	29.557404	TXUST	PEARLAND	2703 VETE	PEARLAND	TX	77584	Facility ID number 0045071, TCEQ unit ID number 00118005, tank ID number 1,date installed (MMDDYYYY) 04011987, total capacity in gallons: 0010000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is CITY OF PEARLAND, the telephone number listed for the owner is 281-652-1916.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
40	-95.241057	29.566947	TXUST	GOLFCRES	2801	COUI PEARLAND	TX	77581	Facility ID number 0038426, TCEQ unit ID number 00101257, tank ID number 1,date installed (MMDDYYYY) 01011974, total capacity in gallons: 0002000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0002000 gal The tank construction is of steel. The owner of the facility is GOLFCREST COUNTRY CLUB, the telephone number listed for the owner is 7134854323.
40	-95.241057	29.566947	TXUST	GOLFCRES	2801	COUI PEARLAND	TX	77581	Facility ID number 0038426, TCEQ unit ID number 00101258, tank ID number 2,date installed (MMDDYYYY) 01011971, total capacity in gallons: 0000000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0000000 gal The tank construction is of steel. The owner of the facility is GOLFCREST COUNTRY CLUB, the telephone number listed for the owner is 7134854323.
41	-95.290295	29.550604	TXUST	AUSTIN BR	3141	PEAR PEARLAND	TX	77581	Facility ID number 0004588, TCEQ unit ID number 00011116, tank ID number 4,date installed (MMDDYYYY) 01011979, total capacity in gallons: 0012000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0012000 gal The tank construction is of steel. The owner of the facility is AUSTIN BRIDGE & ROAD INC, the telephone number listed for the owner is 214-443-5609.
41	-95.290295	29.550604	TXUST	AUSTIN BR	3141	PEAR PEARLAND	TX	77581	Facility ID number 0004588, TCEQ unit ID number 00011117, tank ID number 3,date installed (MMDDYYYY) 01011979, total capacity in gallons: 0012000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0012000 gal The tank construction is of steel. The owner of the facility is AUSTIN BRIDGE & ROAD INC, the telephone number listed for the owner is 214-443-5609.
41	-95.290295	29.550604	TXUST	AUSTIN BR	3141	PEAR PEARLAND	TX	77581	Facility ID number 0004588, TCEQ unit ID number 00011118, tank ID number 2,date installed (MMDDYYYY) 01011979, total capacity in gallons: 0012000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0012000 gal The tank construction is of steel. The owner of the facility is AUSTIN BRIDGE & ROAD INC, the telephone number listed for the owner is 214-443-5609.
41	-95.290295	29.550604	TXUST	AUSTIN BR	3141	PEAR PEARLAND	TX	77581	Facility ID number 0004588, TCEQ unit ID number 00011119, tank ID number 1,date installed (MMDDYYYY) 01011979, total capacity in gallons: 0012000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0012000 gal The tank construction is of steel. The owner of the facility is AUSTIN BRIDGE & ROAD INC, the telephone number listed for the owner is 214-443-5609.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
44	-95.28028	29.551529	TXUST	LOGTECH \	3225 S MAI	PEARLAND	TX	77581	Facility ID number 0049020, TCEQ unit ID number 00127396, tank ID number 1,date installed (MMDDYYYY) 01011980, total capacity in gallons: 0004000 Tank is currently removed from ground. Tank compartments: Compartment A: New Oil. Capacity 0004000 gal The tank construction is of steel. The owner of the facility is LEE OIL CO INC, the telephone number listed for the owner is 281-331-3445.
45	-95.278229	29.55254	TXUST	CRC WIREI	3319 INDU	PEARLAND	TX	77581	Facility ID number 0009584, TCEQ unit ID number 00025391, tank ID number 1,date installed (MMDDYYYY) 01011976, total capacity in gallons: 0006000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0006000 gal The tank construction is of steel. The owner of the facility is WOLFF WILLIAM E, the telephone number listed for the owner is 713-331-8204.
45	-95.278229	29.55254	TXUST	CRC WIREI	3319 INDU	PEARLAND	TX	77581	Facility ID number 0009584, TCEQ unit ID number 00025392, tank ID number 2,date installed (MMDDYYYY) 01011976, total capacity in gallons: 0006000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0006000 gal The tank construction is of steel. The owner of the facility is WOLFF WILLIAM E, the telephone number listed for the owner is 713-331-8204.
46	-95.278913	29.549328	TXUST	DRESSER I	3401 S MAI	PEARLAND	TX	77581	Facility ID number 0038305, TCEQ unit ID number 00100952, tank ID number 1,date installed (MMDDYYYY) Unknown, total capacity in gallons: 0006000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0006000 gal The tank construction is of steel. The owner of the facility is ATLAS WIRELINE SERVICES, the telephone number listed for the owner is 7134850318.
46	-95.278913	29.549328	TXUST	DRESSER I	3401 S MAI	PEARLAND	TX	77581	Facility ID number 0038305, TCEQ unit ID number 00100953, tank ID number 2,date installed (MMDDYYYY) Unknown, total capacity in gallons: 0006000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0006000 gal The tank construction is of steel. The owner of the facility is ATLAS WIRELINE SERVICES, the telephone number listed for the owner is 7134850318.
46	-95.278913	29.549328	TXUST	DRESSER I	3401 S MAI	PEARLAND	TX	77581	Facility ID number 0038305, TCEQ unit ID number 00100954, tank ID number 3,date installed (MMDDYYYY) Unknown, total capacity in gallons: 0000500 Tank is currently removed from ground. Tank compartments: Compartment A: Used Oil. Capacity 0000500 gal The tank construction is of steel - single wall. The owner of the facility is ATLAS WIRELINE SERVICES, the telephone number listed for the owner is 7134850318.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
47	-95.278776	29.54909	TXUST	THE CAR S	3404 S MAI	PEARLAND	TX	77581	Facility ID number 0066639, TCEQ unit ID number 00174147, tank ID number 1,date installed (MMDDYYYY) Unknown, total capacity in gallons: 0006000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0006000 gal The tank construction is of nonmetallic flexible piping. The owner of the facility is COAMERICA BANK TEXAS, the telephone number listed for the owner is 214-589-4703.
48	-95.290125	29.546682	TXUST	CORNER M	3415 VETE	PEARLAND	TX	77584	Facility ID number 0068753, TCEQ unit ID number 00180885, tank ID number 1,date installed (MMDDYYYY) 03141996, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of nonmetallic flexible piping - double wall. The owner of the facility is AL-AMYN CORP DBA CORNER MKT II, the telephone number listed for the owner is 281-997-0110.
48	-95.290125	29.546682	TXUST	CORNER M	3415 VETE	PEARLAND	TX	77584	Facility ID number 0068753, TCEQ unit ID number 00180886, tank ID number 2,date installed (MMDDYYYY) 03141996, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of nonmetallic flexible piping - double wall. The owner of the facility is AL-AMYN CORP DBA CORNER MKT II, the telephone number listed for the owner is 281-997-0110.
54	-95.270113	29.536241	TXUST	SEVEN CR(	4453 S MAI	PEARLAND	TX	77581	Facility ID number 0038906, TCEQ unit ID number 00102765, tank ID number 3,date installed (MMDDYYYY) 08311987, total capacity in gallons: 0006000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0006000 gal The tank construction is of steel - single wall. The owner of the facility is THO LAM, the telephone number listed for the owner is 281-992-1792.
54	-95.270113	29.536241	TXUST	SEVEN CR(	4453 S MAI	PEARLAND	TX	77581	Facility ID number 0038906, TCEQ unit ID number 00102766, tank ID number 2,date installed (MMDDYYYY) 08311987, total capacity in gallons: 0008000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0008000 gal The tank construction is of steel - single wall. The owner of the facility is THO LAM, the telephone number listed for the owner is 281-992-1792.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
54	-95.270113	29.536241	TXUST	SEVEN CR(	4453 S MAI	PEARLAND	TX	77581	Facility ID number 0038906, TCEQ unit ID number 00102767, tank ID number 1,date installed (MMDDYYYY) 08311987, total capacity in gallons: 0008000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0008000 gal The tank construction is of steel - single wall. The owner of the facility is THO LAM, the telephone number listed for the owner is 281-992-1792.
54	-95.270113	29.536241	TXUST	SEVEN CR(	4453 S MAI	PEARLAND	TX	77581	Facility ID number 0038906, TCEQ unit ID number 00102768, tank ID number 4,date installed (MMDDYYYY) 08311987, total capacity in gallons: 0006000 Tank is currently in use. Tank compartments: Compartment A: Diesel. Capacity 0006000 gal The tank construction is of steel - single wall. The owner of the facility is THO LAM, the telephone number listed for the owner is 281-992-1792.
58	-95.333533	29.600011	TXUST	BELTWAY I	5404 S SAM	HOUSTON	TX	77053	Facility ID number 0075471, TCEQ unit ID number 00200755, tank ID number 1,date installed (MMDDYYYY) 06012002, total capacity in gallons: 0020000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity: 0012000 gal, Comp. B: Gasoline. Capacity: 0008000 gal The tank construction is of composite - factory-built nonmetallic jacket The owner of the facility is HOUSTON WEST TRAVEL CENTER INC, the telephone number listed for the owner is 713-433-9100.
58	-95.333533	29.600011	TXUST	BELTWAY I	5404 S SAM	HOUSTON	TX	77053	Facility ID number 0075471, TCEQ unit ID number 00200756, tank ID number 2,date installed (MMDDYYYY) 06012002, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Diesel. Capacity 0012000 gal The tank construction is of composite - factory-built nonmetallic jacket The owner of the facility is HOUSTON WEST TRAVEL CENTER INC, the telephone number listed for the owner is 713-433-9100.
62	-95.317538	29.616484	TXUST	CRANE REI	5902 ALLIS	HOUSTON	TX	77048	Facility ID number 0054543, TCEQ unit ID number 00133419, tank ID number 1,date installed (MMDDYYYY) 09011984, total capacity in gallons: 0004000 Tank is currently removed from ground. Tank compartments: Compartment A: Diesel. Capacity 0004000 gal The tank construction is of steel - single wall. The owner of the facility is DALE H MANHART, the telephone number listed for the owner is 713-485-0009.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
64	-95.306265	29.621067	TXUST	V & J FOOD	6617 ALME	HOUSTON	TX	77048	Facility ID number 0072962, TCEQ unit ID number 00193628, tank ID number 1,date installed (MMDDYYYY) 06021999, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity: 0000000 gal, Comp. B: Diesel. Capacity: 0000000 gal The tank construction is of composite. The owner of the facility is V & J ENTERPRISES INC, the telephone number listed for the owner is 713-987-2437.
64	-95.306265	29.621067	TXUST	V & J FOOD	6617 ALME	HOUSTON	TX	77048	Facility ID number 0072962, TCEQ unit ID number 00198770, tank ID number 2,date installed (MMDDYYYY) 06021999, total capacity in gallons: 0016000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity: 0008000 gal, Comp. B: Diesel. Capacity: 0008000 gal The tank construction is of composite - single wall. The owner of the facility is V & J ENTERPRISES INC, the telephone number listed for the owner is 713-987-2437.
66	-95.297135	29.620888	TXUST	WHITE MAI	7150 ALME	HOUSTON	TX	77075	Facility ID number 0041033, TCEQ unit ID number 00108737, tank ID number 1,date installed (MMDDYYYY) 01011974, total capacity in gallons: 0002000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0002000 gal The tank construction is of steel. The owner of the facility is WHITE MANUFACTURING COMPANY, the telephone number listed for the owner is 713-991-5111.
68	-95.294388	29.621008	TXUST	OKAY GAS	7401 ALME	HOUSTON	TX	77075	Facility ID number 0058512, TCEQ unit ID number 00139572, tank ID number 1,date installed (MMDDYYYY) 01011986, total capacity in gallons: 0006000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0006000 gal The tank construction is of steel - single wall. The owner of the facility is YOUNG BUSINESS CORPORATION, the telephone number listed for the owner is 713-991-7260.
68	-95.294388	29.621008	TXUST	OKAY GAS	7401 ALME	HOUSTON	TX	77075	Facility ID number 0058512, TCEQ unit ID number 00139573, tank ID number 4,date installed (MMDDYYYY) 01011986, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Diesel. Capacity 0010000 gal The tank construction is of steel - single wall. The owner of the facility is YOUNG BUSINESS CORPORATION, the telephone number listed for the owner is 713-991-7260.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
68	-95.294388	29.621008	TXUST	OKAY GAS	7401 ALME	HOUSTON	TX	77075	Facility ID number 0058512, TCEQ unit ID number 00139574, tank ID number 3,date installed (MMDDYYYY) 01011986, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of steel - single wall. The owner of the facility is YOUNG BUSINESS CORPORATION, the telephone number listed for the owner is 713-991-7260.
68	-95.294388	29.621008	TXUST	OKAY GAS	7401 ALME	HOUSTON	TX	77075	Facility ID number 0058512, TCEQ unit ID number 00139575, tank ID number 2,date installed (MMDDYYYY) 01011986, total capacity in gallons: 0010000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0010000 gal The tank construction is of steel - single wall. The owner of the facility is YOUNG BUSINESS CORPORATION, the telephone number listed for the owner is 713-991-7260.
69	-95.294251	29.621067	TXUST	WYDOWN (	7402 ALME	HOUSTON	TX	77075	Facility ID number 0019565, TCEQ unit ID number 00050351, tank ID number 1,date installed (MMDDYYYY) 12311977, total capacity in gallons: 0003992 Tank is currently in use. Tank compartments: Compartment A: Diesel. Capacity 0003992 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is SOUTHWESTERN BELL TELEPHONE LP, the telephone number listed for the owner is 214-464-1477.
70	-95.291917	29.621067	TXUST	ROBERT TI	7440 ALME	HOUSTON	TX	77075	Facility ID number 0057725, TCEQ unit ID number 00138244, tank ID number 2,date installed (MMDDYYYY) 00000000, total capacity in gallons: 0008000 Tank is currently removed from ground. Tank compartments: Compartment A: New Oil. Capacity 0008000 gal The tank construction is of steel - single wall. The owner of the facility is TREVINO ROBERT, the telephone number listed for the owner is 7139917463.
70	-95.291917	29.621067	TXUST	ROBERT TI	7440 ALME	HOUSTON	TX	77075	Facility ID number 0057725, TCEQ unit ID number 00138245, tank ID number 1,date installed (MMDDYYYY) 00000000, total capacity in gallons: 0002000 Tank is currently removed from ground. Tank compartments: Compartment A: New Oil. Capacity 0002000 gal The tank construction is of steel - single wall. The owner of the facility is TREVINO ROBERT, the telephone number listed for the owner is 7139917463.
71	-95.285944	29.600479	TXUST	HANDI STC	7745 S SAM	HOUSTON	TX	77035	Facility ID number 0075260, TCEQ unit ID number 00200210, tank ID number 1,date installed (MMDDYYYY) 05202002, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0012000 gal The tank construction is of composite - single wall. The owner of the facility is D & D INTERNATIONAL INC, the telephone number listed for the owner is 713-776-1515.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
71	-95.285944	29.600479	TXUST	HANDI STC	7745 S SAM	HOUSTON	TX	77035	Facility ID number 0075260, TCEQ unit ID number 00200211, tank ID number 2,date installed (MMDDYYYY) 05202002, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0012000 gal The tank construction is of composite - single wall. The owner of the facility is D & D INTERNATIONAL INC, the telephone number listed for the owner is 713-776-1515.
71	-95.285944	29.600479	TXUST	HANDI STC	7745 S SAM	HOUSTON	TX	77035	Facility ID number 0075260, TCEQ unit ID number 00200212, tank ID number 3,date installed (MMDDYYYY) 05202002, total capacity in gallons: 0012000 Tank is currently in use. Tank compartments: Compartment A: Diesel. Capacity 0012000 gal The tank construction is of composite - single wall. The owner of the facility is D & D INTERNATIONAL INC, the telephone number listed for the owner is 713-776-1515.
71	-95.285944	29.600479	TXUST	HANDI STC	7745 S SAM	HOUSTON	TX	77035	Facility ID number 0075260, TCEQ unit ID number 00200213, tank ID number 4,date installed (MMDDYYYY) 05202002, total capacity in gallons: 0020000 Tank is currently in use. Tank compartments: Compartment A: Diesel. Capacity 0020000 gal The tank construction is of composite - single wall. The owner of the facility is D & D INTERNATIONAL INC, the telephone number listed for the owner is 713-776-1515.
72	-95.287111	29.600539	TXUST	EXXON 603	7805 S SAM	HOUSTON	TX	77075	Facility ID number 0073962, TCEQ unit ID number 00196356, tank ID number 1,date installed (MMDDYYYY) 07202000, total capacity in gallons: 0015000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0015000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - double wall. The owner of the facility is EXXON MOBIL CORPORATION, the telephone number listed for the owner is 800-253-8054.
72	-95.287111	29.600539	TXUST	EXXON 603	7805 S SAM	HOUSTON	TX	77075	Facility ID number 0073962, TCEQ unit ID number 00196357, tank ID number 2,date installed (MMDDYYYY) 07202000, total capacity in gallons: 0015000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0015000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - double wall. The owner of the facility is EXXON MOBIL CORPORATION, the telephone number listed for the owner is 800-253-8054.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
75	-95.219095	29.556569	TXUST	HPD FIRE S	911 DIXIE I	HOUSTON	TX	77089	Facility ID number 0070635, TCEQ unit ID number 00186466, tank ID number 1,date installed (MMDDYYYY) 10281997, total capacity in gallons: 0001000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0001000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is CITY OF HOUSTON, the telephone number listed for the owner is 713-247-2564.
75	-95.219095	29.556569	TXUST	HPD FIRE S	911 DIXIE I	HOUSTON	TX	77089	Facility ID number 0070635, TCEQ unit ID number 00186467, tank ID number 2,date installed (MMDDYYYY) 10281997, total capacity in gallons: 0001000 Tank is currently in use. Tank compartments: Compartment A: Diesel. Capacity 0001000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - single wall. The owner of the facility is CITY OF HOUSTON, the telephone number listed for the owner is 713-247-2564.
83			TXUST	2200 TO 22	LOTS 28-3	PEARLAND	TX	77581	Facility ID number 0060456, TCEQ unit ID number 00142173, tank ID number 3,date installed (MMDDYYYY) 01011928, total capacity in gallons: 0000500 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0000500 gal The tank construction is of steel - single wall. The owner of the facility is OBLINGER JOHN CURTIS, the telephone number listed for the owner is 713-367-7819.
83			TXUST	2200 TO 22	LOTS 28-3	PEARLAND	TX	77581	Facility ID number 0060456, TCEQ unit ID number 00142174, tank ID number 4,date installed (MMDDYYYY) 01011928, total capacity in gallons: 0000500 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0000500 gal The tank construction is of steel - single wall. The owner of the facility is OBLINGER JOHN CURTIS, the telephone number listed for the owner is 713-367-7819.
83			TXUST	2200 TO 22	LOTS 28-3	PEARLAND	TX	77581	Facility ID number 0060456, TCEQ unit ID number 00142175, tank ID number 1,date installed (MMDDYYYY) 01011928, total capacity in gallons: 0000500 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0000500 gal The tank construction is of steel - single wall. The owner of the facility is OBLINGER JOHN CURTIS, the telephone number listed for the owner is 713-367-7819.
83			TXUST	2200 TO 22	LOTS 28-3	PEARLAND	TX	77581	Facility ID number 0060456, TCEQ unit ID number 00142176, tank ID number 2,date installed (MMDDYYYY) 01011928, total capacity in gallons: 0000500 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0000500 gal The tank construction is of steel - single wall. The owner of the facility is OBLINGER JOHN CURTIS, the telephone number listed for the owner is 713-367-7819.

CLEAR CREEK SUMMARY OF UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
84			TXUST	M T FERNA	RT 3	PEARLAND	TX	77581	Facility ID number 0004257, TCEQ unit ID number 00010373, tank ID number 1,date installed (MMDDYYYY) 01011979, total capacity in gallons: 0004000 Tank is currently removed from ground. Tank compartments: Compartment A: Gasoline. Capacity 0004000 gal The tank construction is of fiberglass-reinforced plastic (FRP). The owner of the facility is M T FERNANDEZ PAINT & DEC INC, the telephone number listed for the owner is 7134851912.
88			TXUST	QUICK STU	3426 MAIN	PEARLAND	TX	77581	Facility ID number 0076746, TCEQ unit ID number 00203733, tank ID number 1,date installed (MMDDYYYY) 07162004, total capacity in gallons: 0020000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity 0020000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - double wall. The owner of the facility is JACK IN THE BOX EASTERN DIVISION LP, the telephone number listed for the owner is 847-888-0276.
88			TXUST	QUICK STU	3426 MAIN	PEARLAND	TX	77581	Facility ID number 0076746, TCEQ unit ID number 00203734, tank ID number 2,date installed (MMDDYYYY) 07162004, total capacity in gallons: 0020000 Tank is currently in use. Tank compartments: Compartment A: Gasoline. Capacity: 0012000 gal, Comp. B: Diesel. Capacity: 0008000 gal The tank construction is of fiberglass-reinforced plastic (FRP) - double wall. The owner of the facility is JACK IN THE BOX EASTERN DIVISION LP, the telephone number listed for the owner is 847-888-0276.

CLEAR CREEK SUMMARY OF STATE SUPERFUND SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
1	-95.205879	29.567044	TXSSF	Dixie Oil Processors		Friendswood	TX	77546	Site Type: Fed - Site Status: active - EPA ID TXD089793046 On Dixie Farm Road in southern Harris County, Texas. The site is about 1.5 miles southwest of Interstate Highway 45 South (Gulf Freeway) at the Ellington Field exit. Mud Gulley (a stream) borders the site to the west. Surface drainage from the site is to the southwest into Mud Gulley. Soils on the Dixie site consist of surface clay ranging in thickness from twelve to twenty feet across the site. Below this zone is a fairly uniform zone of sandfilled channels. This zone is approximately 25 feet thick. Below the sand channel zone is a clay rich zone of thickness with an average thickness of five feet.
2	-95.304453	29.621372	TXSSF	Gulf Metals Industries		Houston	TX	77052	Site Type: State - Site Status: deleted - EPA ID TXD980623722 The Gulf Metals Industries landfill site is located on Telean Street, northeast of the intersection of Mykawa Road and Almeda-Genoa Road in Houston. The approximately 16-acre site was operated as a sand and gravel pit in the 1940s and 1950s. From the 1950s to the mid-1960s, the site was used as an open dump. From 1965 through 1967, the site was operated as a commercial landfill for the disposal of metal slag and other foundry debris, including furnace sand and refractory brick.
3	-95.261987	29.52956	TXSSF	James Bar Facility		Pearland	TX	77581	Site Type: State - Site Status: proposed - EPA ID TXSFN0605176 The James Barr Facility site is located in the 3300 block of Industrial Drive in the southern part of Pearland in Brazoria County. The site occupies two acres, and is bounded on the west by businesses along Industrial Drive, to the south by industrial businesses, areas of sand mining and oil field production facilities, and on the east by at least four sand pits filled with water. The property on the east side also contains an adult care center. A residential subdivision is being established about a quarter mile to a half mile to the north of the site. The facility was used as a storage site for hazardous waste transported in by vacuum trucks and unloaded into various above ground storage tanks located on the property.
4	-95.201837	29.5715	TXSSF	Brio Refining		Friendswood	TX	77546	Site Type: Fed - Site Status: active - EPA ID TXD980625453 The Brio Refining, Inc. site is located at 2501 Dixie Farm Road in southern Harris County, Texas. The site is about I.5 miles southwest of Interstate Highway 45 south (Gulf Freeway) at the Ellington Field exit. Mud Gulley (a stream) borders the site to the west. Surface drainage from the site is to the southwest into Mud Gulley.Soils on the Brio site consist of surface clay ranging in thickness from twelve to twenty feet across the site. The uppermost water-bearing zone is the stratum referred to above as the sand channel zone, and is found at depths ranging from 14.5'-21.5' and extending to depths of 40'-45'. The direction of flow is toward Mud Gulley (southwest).

CLEAR CREEK SUMMARY OF SPILL SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
13	-95.22249	29.5919	TXSPILL	MOBIL OIL CORPORATION	10840 Hughes Rd	Houston	TX	77089-4654	Date of Spill: 5/28/87 - Material Spilled: GASOLINE. Amount of material spilled: UNKNOWN. class of spill: oil - medium. The cleanup status is: . Media affected: YES (A = Air, L = Land, N/A = none, W = Water). The basin where the spill occured: SAN JACINTO.
14	-95.21459	29.584324	TXSPILL	CHEVRON	10855 SCRARSDALE AND BEAMER	HOUSTON	TX	77210	Date of Spill: 3/2/93 - Notification Date: 3/4/93. Material Spilled: GASOLINE. Amount of material spilled: UNK LBS. class of spill: oil - minor. The cleanup status is: complete . The type of media affected is not specified. The basin where the spill occured: NONE.
74	-95.26909	29.608993	TXSPILL	ENERGY DEVELOPMENT COMPLEX	8422 Springtime Ln	Houston	TX	77075-4744	Date of Spill: 7/18/94 - Notification Date: 7/27/94. Material Spilled: TRANSFORMER OIL PCB 93 PPM. Amount of material spilled: 1 GAL. class of spill: oil - minor. The cleanup status is: complete . Media affected: L (A = Air, L = Land, N/A = none, W = Water).
79	-95.21377	29.584914	TXSPILL	TEXACO	CORNER OF SCARSDALE & BEAMER, HOUSTON	HOUSTON	TX		Date of Spill: 11/28/86 - Material Spilled: GASOLINE - UNPB'D. Amount of material spilled: 20000 GAL. class of spill: oil - major. The cleanup status is: . Media affected: YES (A = Air, L = Land, N/A = none, W = Water). The basin where the spill occured: SAN JACINTO.
80	-95.19939	29.573205	TXSPILL	EXXON	DIXIE FARM RD AT BEAMER, Houston	Houston	TX	77034	Date of Spill: 10/5/98 - Notification Date: 10/5/98. Material Spilled: USED OIL. Amount of material spilled: 2 gal. class of spill: oil - minor. The cleanup status is: complete . Media affected: L&W (A = Air, L = Land, N/A = none, W = Water).
85			TXSPILL	HILL SAND COMPANY INC	0.25 MILES NE OF STATE HIGHWAY 35 ON DIXIE FARM ROAD IN BRAZORIA COUNTY	PEARLAND	TX	77581	Date of Spill: 4/16/2006 - Notification Date: 4/16/2006. Material Spilled: Other material - Amount Spilled: 0.00 . Spill Class: 005 / Hazardous Material Minor - Cleanup Status: Closed. Media Affected: WASTE - Area Affected: BRAZORIA.
85			TXSPILL	HILL SAND COMPANY INC	0.25 MILES NE OF STATE HIGHWAY 35 ON DIXIE FARM ROAD IN BRAZORIA COUNTY	PEARLAND	TX	77581	Date of Spill: 4/21/2006 - Notification Date: 4/21/2006. Material Spilled: Other - Amount Spilled: 0.00 . Spill Class: 005 / Hazardous Material Minor - Cleanup Status: Open. Media Affected: WASTE - Area Affected: BRAZORIA.

CLEAR CREEK SUMMARY OF LEAKING UNDERGROUND STORAGE TANK SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
13	-95.222485	29.5919	TXLUST	MOBIL 12AJ4	10840 HUGHES RD	HOUSTON	TX	77089	Leaking petroleum storage tank identification number (LPSTID) 091323 The subject tank release was reported on 5/28/1987; PRIORITY: 4.1 - GW IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS, STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0017642 PRP info: MOBIL OIL CORP, 4200 SINGLETON BLVD, DALLAS TX 75212 Contact: F BRUCE MORLOCK Tel: 214/905-0506
13	-95.222485	29.5919	TXLUST	SHELL OIL	10840 HUGHES RD	HOUSTON	TX	77089	Leaking petroleum storage tank identification number (LPSTID) 112521 The subject tank release was reported on 6/12/1997, PRIORITY: 4.2 - NO GW IMPACT, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0017642 PRP info: MOTIVA ENTERPRISES SHELL, 16800 GREENSPOINT DR STE 215 S, HOUSTON TX 77060 Contact: JOLENE FERGUSON Tel: 281/836-1485
14	-95.214591	29.584324	TXLUST	CHEVRON 60158761	10855 SCARSDALE	HOUSTON	TX	77089	Leaking petroleum storage tank identification number (LPSTID) 110565. The subject tank release was reported on 3/11/1996, PRIORITY: 4.1 - GW IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED; Facility ID #0029174 PRP info: CHEVRON PRODUCTS CO, PO BOX 4256, HOUSTON TX 77210 Contact: JEFFREY DOWNING Tel: 713/219-5210
15	-95.304896	29.620822	TXLUST	HANDI STOP 71 DIAMOND SHAMROCK	10900 MYKAWA	HOUSTON	TX	77075	Leaking petroleum storage tank identification number (LPSTID) 112481. The subject tank release was reported on 7/17/1997; PRIORITY: 4.1 - GW IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0039700 PRP info: DIAMOND SHAMROCK, PO BOX 696000, SAN ANTONIO TX 78269 Contact: C SHAY WIDEMAN Tel: 210/592-4663
17	-95.212725	29.585763	TXLUST	TEXACO SS	10999 SCARSDALE RD	HOUSTON	TX	77089	Leaking petroleum storage tank identification number (LPSTID) 091172. The subject tank release was reported on 12/2/1986; PRIORITY: 4.1 - GW IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED; Facility ID #0023129 PRP info: STAR ENTERPRISE, 110 CYPRESS STATION DR STE 255, HOUSTON TX 77090 Contact: KYLE LANDRENEAU Tel: 281/586-3613
20	-95.286795	29.593518	TXLUST	A & T AUTO CARE	1120 N MAIN ST	PEARLAND	TX	77581	Leaking petroleum storage tank identification number (LPSTID) 109346 The subject tank release was reported on 5/22/1995; PRIORITY: 4.2 - NO GW IMPACT, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0031734 PRP info: COMERICA BANK TEXAS, PO BOX 650282, DALLAS TX 75265 Contact: STEWART BUL Tel: 214/589-4709
31	-95.183503	29.585859	TXLUST	CLEAR LAKE DODGE	15711 GULF FWY	HOUSTON	TX	77598	Leaking petroleum storage tank identification number (LPSTID) 108246 The subject tank release was reported on 7/1/1994, PRIORITY: 4.2 - NO GW IMPACT, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0044601 PRP info: CLEAR LAKE DODGE, 15711 GULF FWY, WEBSTER TX 77598 Contact: W HARRY BUESCHER Tel: 713/481-1000
32	-95.314364	29.54317	TXLUST	AMF TUBOSCOPE INC	15910 HARKEY RD	PEARLAND	TX	77584	Leaking petroleum storage tank identification number (LPSTID) 092245 The subject tank release was reported on 10/26/1988; PRIORITY: 4A - SOIL CONTAMINATION ONLY, REQUIRES FULL SITE ASSESSMENT & RAP; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0041896 PRP info: TUBOSCOPE INC, PO BOX 808, HOUSTON TX 77001 Contact: BOB BALLARD Tel: 713/799-5100
36	-95.247696	29.549382	TXLUST	COASTAL MART NO 336	2112 E BROADWAY	PEARLAND	TX	77581	Leaking petroleum storage tank identification number (LPSTID) 091762. The subject tank release was reported on 3/16/1988; PRIORITY: 4.1 - GW IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED; Facilty ID #0027885 PRP info: COASTAL MART INC, P O BOX 2511, HOUSTON TX 77252 Contact: DAVID W ZUVANICH Tel: 713/420-3414
37	-95.286202	29.564004	TXLUST	GAS N GO	2340 N MAIN	PEARLAND	TX	77581	Leaking petroleum storage tank identification number (LPSTID) 110116. The subject tank release was reported on 1/2/1996; PRIORITY: 4.1 - GW IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED; Facility ID #0041977 PRP info: VIRANI MANSOOR, 5011 MEADOW LANDING CT, SUGAR LAND TX 77479 Contact: MANSOOR VIRANI Tel: 281/565-1477
38	-95.286202	29.562021	TXLUST	FINA SERVICE STATION	2502 S MAIN	PEARLAND	TX	77581	Leaking petroleum storage tank identification number (LPSTID) 117141. The subject tank release was reported on 3/12/2007; PRIORITY: 4.0 - NO RECEPTIVE IMPACT TO GROUNDWATER OR SOIL.; STATUS: 6P - FINAL CONCURRENCE PENDING DOCUMENTATION OF WELL PLUGGING; Facility ID #0064591 PRP info: HOLMES HARRY JR, PO BOX 22374, HOUSTON TX 77227 Contact: HARRY HOLMES Tel: /-
40	-95.241057	29.566947	TXLUST	GOLFCREST COUNTRY CLUB MAINTENANCE	2801 COUNTRY CLUB DR	PEARLAND	TX	77581	Leaking petroleum storage tank identificaton number (LPSTID) 103195. The subject tank release was reported on 7/15/1992; PRIORITY: 5 - MINOR SOIL CONTAMINATION-DOES NOT REQUIRE A RAP; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0038426 PRP info: GOLFCREST COUNTRY CLUB, PO BOX 35, PEARLAND TX 77588 Contact: TIM MORRIS Tel: 713/485-4323
46	-95.278913	29.549328	TXLUST	DRESSER INDUSTRIES	3401 S MAIN	PEARLAND	TX	77581	Leaking petroleum storage tank identfication number (LPSTID) 092493 The subject tank release was reported on 1/11/1989; PRIORITY: 2A - GROUNDWATER OTHER THAN 1B, SITE CHARACTERIZATION INCOMPLETE; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0038305 PRP info: ATLAS WIRELINE, PO BOX 1407, HOUSTON TX 77251 Contact: BOB CHAUVIN Tel: 713/972-6653
48	-95.290125	29.546682	TXLUST	CORNER MARKET II	3415 VETERANS DR	PEARLAND	TX	77584	Leaking petroleum storage tank identification number (LPSTID) 115583 The subject tank release was reported on 11/22/2002, PRIORITY: 4.1 - GW IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6P - FINAL CONCURRENCE PENDING DOCUMENTATION OF WELL PLUGGING, Facility ID #0068753 PRP info: AL AMYN CORP, 3415 VETERANS DR, PEARLAND TX 77584 Contact: SHAWN KURJEE Tel: 281/997-0110
49	-95.278092	29.548139	TXLUST	Y & S FOOD MART	3501 S MAIN	PEARLAND	TX	77581	Leaking petroleum storage tank identification number (LPSTID) 115469 The subject tank release was reported on 6/11/2002; PRIORITY: 4.2 - NO GW IMPACT, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED; Facility ID #0061469 PRP info: GBAK PROPERTIES INC, 1111 WILLCREST GREEN DR STE 350 A, HOUSTON TX 77042 Contact: ASLAM KAPADIA Tel: 713/256-6774
50	-95.283972	29.545522	TXLUST	WHITING OILFIELD RENTAL INC	3808 MAGNOLIA	PEARLAND	TX	77581	Leaking petroleum storage tank identification number (LPSTID) 099814. The subject tank release was reported on 9/18/1991; PRIORITY: 4A - SOIL CONTAMINATION ONLY, REQUIRES FULL SITE ASSESSMENT & RAP; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED; Facility ID #0024160 PRP info: OIL FILED RENTAL, PO BOX 1331, HOUSTON TX 77251 Contact: LARRY DAVIES Tel: 713/672-1601
51	-95.283562	29.545641	TXLUST	CHANCE COLLAR CO	3810 MAGNOLIA RD	PEARLAND	TX	77581	Leaking petroleum storage tank identification number (LPSTID) 092992. The subject tank release was reported on 5/23/1989; PRIORITY: 4.2 - NO GW IMPACT, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED; Facility ID #0016550 PRP info: CHANCE COLLAR CO, 3810 MAGNOLIA RD, PEARLAND TX 77581 Contact: Tel: 713/485-3264
52	-95.282605	29.545522	TXLUST	MIDWEST STEEL	3901 MAGNOLIA	PEARLAND	TX	77581	Leaking petroleum storage tank identificaton number (LPSTID) 100374 The subject tank release was reported on 11/7/1991; PRIORITY: 6 - MINOR SOIL CONTAMINATION-NO REMEDIAL ACTION REQUIRED; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED; Facility ID #0016872 PRP info: MIDWEST STEEL, 3901 MAGNOLIA, PEARLAND TX 77581 Contact: DAVID HAYNES Tel: 713/485-9633
53	-95.28916	29.563515	TXLUST	WINVERS LUG A JUG	4408 W BROADWAY	PEARLAND	TX	77581	Leaking petroleum storage tank identification number (LPSTID) 098660 The subject tank release was reported on 4/18/1991; PRIORITY: 4.1 - GW IMPACTED, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0011588 PRP info: LUG A JUG, 4408 W BROADWAY, PEARLAND TX 77581 Contact: MARSHA EBELING Tel: 281/485-4506
55	-95.297155	29.560334	TXLUST	BRAZORIA COUNTY DRAINAGE DISTRICT 4	4805 W BROADWAY	PEARLAND	TX	77581	Leaking petroleum storage tank identification number (LPSTID) 104900 The subject tank release was reported on 10/29/1992, PRIORITY: 5 - MINOR SOIL CONTAMINATION-DOES NOT REQUIRE A RAP; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED; Facility ID #0050037 PRP info: BRAZORIA COUNTY DRAINAGE, 4805 W BROADWAY, PEARLAND TX 77581 Contact: LLOYD J YOST Tel: 713/485-1434
57	-95.32949	29.620977	TXLUST	HARRIS COUNTY FLOOD CONTL DIST	5301 ALMEDA GENOA	HOUSTON	TX	77048	Leaking petroleum storage tank identification number (LPSTID) 101838 The subject tank release was reported on 3/10/1992, PRIORITY: 4.2 - NO GW IMPACT, NO APPARENT THREATS OR IMPACTS TO RECEPTORS, STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED; Facility ID #0022949 PRP info: HARRIS COUNTY FLOOD CONTROL, 1001 PRESTON AVE, HOUSTON TX 77002 Contact: JACK PEPAS Tel: 713/755-7003
62	-95.317538	29.616484	TXLUST	CRANE RENTAL	5902 ALLISON RD	HOUSTON	TX	77048	Leaking petroleum storage tank identificaton number (LPSTID) 107464 The subject tank release was reported on 12/20/1993; PRIORITY: 4.2 - NO GW IMPACT, NO APPARENT THREATS OR IMPACTS TO RECEPTORS, STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0054543 PRP info: CRANE RENTAL, 5902 ALLISON RD, HOUSTON TX 77048 Contact: HERSCHEL CRONIN Tel: 713/991-6180
87			TXLUST	HOMCO FACILITY	3236 MAIN ST	PEARLAND	TX	77588	Leaking petroleum storage tank identificaton number (LPSTID) 093855 The subject tank release was reported on 10/25/1989, PRIORITY: 4.2 - NO GW IMPACT, NO APPARENT THREATS OR IMPACTS TO RECEPTORS; STATUS: 6A - FINAL CONCURRENCE ISSUED, CASE CLOSED, Facility ID #0049372 PRP info: WEATHERFORD ENTERRA, PO BOX 2010, PEARLAND TX 77588 Contact: LESA GRIFFIN Tel: 713/485-3462

CLEAR CREEK SUMMARY OF LANDFILL SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
6	-95.373323	29.558466	TXLF	BILLY E GRAPPE LANDFILL	0.5 MILE ON COUNTY ROAD 93 FROM INTERSECTION OF COUNTY ROAD 93 AND COUNTY ROAD 92, PEARLAND, TX	BRAZORIA	TX		Site ID: 1455 - Permit app. received date: 9-APR-1981.'Facility type: SANITARY LANDFILL FOR BRUSH AND/OR CONSTRUCTION-DEMOLITION MATERIAL, MONTHLY COVER REQUIRED. 'Site status: CLOSED, Permit status: WITHDRAWN, Business type: INDIVIDUAL, Permitted acreage: .05, Population served: 100, Area served: Unknown. 'Tons per day: 100, Yards per day: Unknown, Estimated closing date: 4/1/1986.
60	-95.373273	29.556766	TXLF	JACK SHELTON LANDFILL	5602 SMITH MILLER RD, PEARLAND, TX	BRAZORIA	TX		Site ID: 1065 - Permit app. received date: 1-APR-1977. 'Facility type: MISCELLANEOUS SOLID WASTE PROCESSING FACILITY. 'Site status: CLOSED, Permit status: DENIED, Business type: INDIVIDUAL, Permitted acreage: 16.63, Population served: 5000, Area served: BRAZORIA CO.'Tons per day: 150, Yards per day: Unknown, Estimated closing date: 4/1/1983.
78	-95.354229	29.58846	TXLF	GEORGE R MOODY LANDFILL	AT FM 518 AND FELLOWS ROAD INTERSECTION 1.4 MILE N OF HOUSTON CITY LIMITS, HOUSTON, TX	HARRIS	TX		Site ID: 1267 - Permit app. received date: 31-OCT-1978. 'Facility type: SANITARY LANDFILL, DAILY COVER REQUIRED(POPULATION EQUIVALENT SERVED EXCEEDS 5,000 PEOPLE). 'Site status: NOT CONSTRUCTED, Permit status: WITHDRAWN, Business type: 03, Permitted acreage: 45.72, Population served: 400000, Area served: HOUSTON.'Tons per day: 1000, Yards per day: Unknown, Estimated closing date: 11/1/1982.

CLEAR CREEK SUMMARY OF INNOCENT OWNER/OPERATOR PROGRAM

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
23	-95.222869	29.592481	TXIOP	Handi Stop #83 (Phillips 66)	12050 Beamer Road	Houston	TX	77089	IOP ID: 0512 - Phase: Withdrawal. 'Applicant interest: Owner. Property use: Gas Station/Food Mart. Contaminant category: VOCs. Media affected: Groundwater. A cerificate has not been issued.
76	-95.303859	29.621515	TXIOP	RRWT Property	Adjacent to 6712 Telean Street	Houston	TX	77075	IOP ID: 0343 - Phase: Withdrawal. 'Applicant interest: Owner. Property use: Vacant Property. Contaminant category: Metals, Pesticides. Media affected: Soils/Groundwater. A certificate has not been issued.

CLEAR CREEK SUMMARY OF ABOVEGROUND STORAGE TANKS

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
5	-95.386352	29.581959	TXAST	HELDENFELDS CONSTRUCTION SITE	HWY 288 AT MCHARD RD	HOUSTON	TX		Facility ID number 0050855, TCEQ unit ID number 00156097, tank ID number 1, tank installed (MMDDYY) 01011988, tank capacity in gallons: 0008000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Unknown, The owner of the facility is H & W PETROLEUM COMPANY INC, the telephone number listed for the owner is 713-672-0893
25	-95.31761	29.613185	TXAST	BROOKS PRODUCTS	13600 S WAYSIDE	HOUSTON	TX	77048	Facility ID number 0021454, TCEQ unit ID number 00152450, tank ID number 1, tank installed (MMDDYY) 01011989, tank capacity in gallons: 0006000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Concrete; The owner of the facility is OLDCASTLE PRECAST INC, the telephone number listed for the owner is 713-991-2400
28	-95.387619	29.5825	TXAST	STROUHAL TIRE & RECAPPING PLANT	14770 S HIGHWAY 288	PEARLAND	TX	77584	Facility ID number 0014074, TCEQ unit ID number 00151687, tank ID number A, tank installed (MMDDYY) 01011988, tank capacity in gallons: 0002000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Concrete; The owner of the facility is STROUHAL TIRE & RECAPPING PLANT, the telephone number listed for the owner is 7134361331
28	-95.387619	29.5825	TXAST	STROUHAL TIRE & RECAPPING PLANT	14770 S HIGHWAY 288	PEARLAND	TX	77584	Facility ID number 0014074, TCEQ unit ID number 00151688, tank ID number B, tank installed (MMDDYY) 01011985, tank capacity in gallons: 0002000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Concrete; The owner of the facility is STROUHAL TIRE & RECAPPING PLANT, the telephone number listed for the owner is 7134361331
41	-95.290295	29.550604	TXAST	AUSTIN BRIDGE & ROAD-PEARLAND	3141 VETERANS DR	PEARLAND	TX		Facility ID number 0059785, TCEQ unit ID number 00164438, tank ID number 3, tank installed (MMDDYY) 08311989, tank capacity in gallons: 0010000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Unknown; The owner of the facility is AUSTIN BRIDGE & ROAD INC, the telephone number listed for the owner is 214-443-5609
41	-95.290295	29.550604	TXAST	AUSTIN BRIDGE & ROAD-PEARLAND	3141 VETERANS DR	PEARLAND	TX		Facility ID number 0059785, TCEQ unit ID number 00164439, tank ID number TSF104, tank installed (MMDDYY) 08311989, tank capacity in gallons: 0002000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Unknown; The owner of the facility is AUSTIN BRIDGE & ROAD INC, the telephone number listed for the owner is 214-443-5609
41	-95.290295	29.550604	TXAST	AUSTIN BRIDGE & ROAD-PEARLAND	3141 VETERANS DR	PEARLAND	TX		Facility ID number 0059785, TCEQ unit ID number 00164440, tank ID number TSF105, tank installed (MMDDYY) 08311989, tank capacity in gallons: 0010000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Unknown; The owner of the facility is AUSTIN BRIDGE & ROAD INC, the telephone number listed for the owner is 214-443-5609
42	-95.290295	29.548939	TXAST	GATE CONCRETE PRODUCTS	3201 VETERANS DR	PEARLAND	TX	77584	Facility ID number 0059354, TCEQ unit ID number 00164137, tank ID number 2, tank installed (MMDDYY) 01011976, tank capacity in gallons: 0002000; Tank is currently in use - substance stored: Gasoline; Tank material of construction is Steel; The tanks containment consists of: Unknown; The owner of the facility is GATE CONCRETE PRODUCTS CO, the telephone number listed for the owner is 713-485-3273
42	-95.290295	29.548939	TXAST	GATE CONCRETE PRODUCTS	3201 VETERANS DR	PEARLAND	TX	77584	Facility ID number 0059354, TCEQ unit ID number 00164138, tank ID number 1, tank installed (MMDDYY) 01011976, tank capacity in gallons: 0002000; Tank is currently in use - substance stored: Gasoline; Tank material of construction is Steel; The tanks containment consists of: Concrete; The owner of the facility is GATE CONCRETE PRODUCTS CO, the telephone number listed for the owner is 713-485-3273
42	-95.290295	29.548939	TXAST	GATE CONCRETE PRODUCTS	3201 VETERANS DR	PEARLAND	TX	77584	Facility ID number 0059354, TCEQ unit ID number 00164139, tank ID number 3, tank installed (MMDDYY) 01011979, tank capacity in gallons: 0001600; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Concrete; The owner of the facility is GATE CONCRETE PRODUCTS CO, the telephone number listed for the owner is 713-485-3273
44	-95.28028	29.551529	TXAST	LOGTECH WIRELINE SERVICES	3225 S MAIN	PEARLAND	TX	77581	Facility ID number 0049020, TCEQ unit ID number 00175160, tank ID number 1, tank installed (MMDDYY) 09011995, tank capacity in gallons: 0002000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Unknown; The owner of the facility is LEE OIL CO INC, the telephone number listed for the owner is 281-331-3445
59	-95.325037	29.61645	TXAST	CHERRY STABILIZED PLANT 2	5550 ALLISON RD	HOUSTON	TX	77048	Facility ID number 0078076, TCEQ unit ID number 00206924, tank ID number 1, tank installed (MMDDYY) 04062006, tank capacity in gallons: 0005000; Tank is currently in use - substance stored: Diesel; Tank material of construction is Steel; The tanks containment consists of: Unknown; The owner of the facility is CHERRY CRUSHED CONCRETE INC, the telephone number listed for the owner is 713-436-0990
59	-95.325037	29.61645	TXAST	CHERRY STABILIZED PLANT 2	5550 ALLISON RD	HOUSTON	TX	77048	Facility ID number 0078076, TCEQ unit ID number 00206925, tank ID number 2, tank installed (MMDDYY) 07172006, tank capacity in gallons: 0003000; Tank is currently in use - substance stored: Diesel; Tank material of construction is Steel; The tanks containment consists of: Unknown; The owner of the facility is CHERRY CRUSHED CONCRETE INC, the telephone number listed for the owner is 713-436-0990
61	-95.321858	29.616425	TXAST	SHOP FACILITY	5720 ALLISON	HOUSTON	TX	77048	Facility ID number 0061768, TCEQ unit ID number 00165551, tank ID number 3, tank installed (MMDDYY) 01011987, tank capacity in gallons: 0003000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Concrete; The owner of the facility is KINSEL INDUSTRIES INC, the telephone number listed for the owner is 713-641-5111
61	-95.321858	29.616425	TXAST	SHOP FACILITY	5720 ALLISON	HOUSTON	TX	77048	Facility ID number 0061768, TCEQ unit ID number 00165552, tank ID number 1, tank installed (MMDDYY) 01011987, tank capacity in gallons: 0003000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Concrete; The owner of the facility is KINSEL INDUSTRIES INC, the telephone number listed for the owner is 713-641-5111
61	-95.321858	29.616425	TXAST	SHOP FACILITY	5720 ALLISON	HOUSTON	TX	77048	Facility ID number 0061768, TCEQ unit ID number 00165553, tank ID number 2, tank installed (MMDDYY) 01011987, tank capacity in gallons: 0003000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Concrete; The owner of the facility is KINSEL INDUSTRIES INC, the telephone number listed for the owner is 713-641-5111
82			TXAST	PRIDE PETROLEUM SERVICES	KNAPP RD	PEARLAND	TX	77581	Facility ID number 0068189, TCEQ unit ID number 00178526, tank ID number 1, tank installed (MMDDYY) 04011993, tank capacity in gallons: 0010000; Tank is currently out of use; Tank material of construction is Steel; The tanks containment consists of: Concrete; The owner of the facility is ADA RESOURCES INC, the telephone number listed for the owner is 713-640-0130

CLEAR CREEK SUMMARY OF RCRA-TREATMENT, STORAGE AND DISPOSAL SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
63	-95.313885	29.620829	RCRA TSD	ASHLAND INC	6121 ALMEDA GENOA RD	HOUSTON	TX	77048	Site EPA ID: TXD079388955 Date of starting activities 11/29/2005 TSD Activities: - TSD type undefined by EPA Contact Information: PETER J STEIK, 6121 ALMEDA GENOA RD HOUSTON, TX, 77048; tel. 713-991-3722 EX - NAIC Code 325998

CLEAR CREEK SUMMARY OF NPL SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
1	-95.205879	29.567044	NPL	DIXIE OIL PROCESSORS, INC.	2505 CHOATE RD	FRIENDSWOOD	TX	77546	EPA ID NUMBER TXD089793046 Status: Deleted. Dates are given (YYYYMMDD).
4	-95.201837	29.5715	NPL	BRIO REFINING, INC.	2501 DIXIE FARM ROAD	FRIENDSWOOD	TX	77089	EPA ID NUMBER TXD980625453 Status: Deleted. Dates are given (YYYYMMDD).

CLEAR CREEK SUMMARY OF RCRA-GENERATOR SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
11	-95.223337	29.591053	RCRA-G	BELL CLEANERS	10806 HUGHES RD	HOUSTON	TX	77089	Site EPA ID: TXR000071704 - Type of site: Conditionally Exempt Small Quantity Generator 'No NAIC (North American Industrial Classification) Codes are available for the site.
14	-95.214591	29.584324	RCRA-G	CHEVRON USA INC #158761	10855 SCARSDALE & E	HOUSTON	TX	77089	Site EPA ID: TXD988046306 - Type of site: Small Quantity Generator 'Contact Information: HOWARD J O DONNELL, 1301 MCKINNEY STREET HOUSTON, TX, 77010; tel. 7137543656'No NAIC (North American Industrial Classification) Codes are available for the site.
19	-95.286732	29.593849	RCRA-G	HYPER PRODUCTS	1118 N MAIN SUITE 2F	PEARLAND	TX	77581	Site EPA ID: TXR000003566 - Type of site: Conditionally Exempt Small Quantity Generator 'Contact Information: ROBERT G ESTERLEIN, PO BOX 448 PEARLAND, TX, 775880448; tel. 7139978428 'No NAIC (North American Industrial Classification) Codes are available for the site.
22	-95.208346	29.58516	RCRA-G	MEMORIAL HERMANN SOUT	11800 ASTORIA BLVD	HOUSTON	TX	77089	Site EPA ID: TX0000050385 - Type of site: Conditionally Exempt Small Quantity Generator 'Contact Information: JAMES RICK GATES, 11800 ASTORIA BLVD HOUSTON, TX, 77089; tel. 713-929-4172 NAIC Code 62211
26	-95.203538	29.576628	RCRA-G	SAN JACINTO COLLEGE	13735 BEAMER RD	HOUSTON	TX	77089	Site EPA ID: TXD988043659 - Type of site: Conditionally Exempt Small Quantity Generator 'Contact Information: GINGER LAMBERT, 4624 FAIRMONT PARKWAY SUITE 207 PASADENA, TX, 77504; tel. 713-998-6183 'No NAIC (North American Industrial Classification) Codes are available for the site.
33	-95.321404	29.595997	RCRA-G	COASTAL CONTRACTORS IN	1617 GARDEN RD	PEARLAND	TX	77581	Site EPA ID: TXD988023438 - Type of site: Transporter 'Contact Information: BETTY STONEMAN, 1617 GARDEN RD PEARLAND, TX, 77581; tel. 281-471-6606 NAIC Code 48411
35	-95.32109	29.592618	RCRA-G	DAVIS-LYNCH INC	2005 GARDEN ROAD	PEARLAND	TX	77581	Site EPA ID: TXD008065898 - Type of site: Small Quantity Generator 'Contact Information: ASHOK DAMERA, PO BOX 262326 HOUSTON, TX, 77207; tel. 281-485-8301 NAIC Code 333132
46	-95.278913	29.549328	RCRA-G	BAKER HUGHES INCORPOR	3401 S MAIN ST	PEARLAND	TX	77581	Site EPA ID: TXD083582940 - Type of site: Small Quantity Generator 'Contact Information: IRA HUBBARD, 3401 S MAIN ST PEARLAND, TX, 77581; tel. 713-485-8311 NAIC Code 213112
86			RCRA-G	TEXACO STATION	16255 S OAKS RD	HOUSTON	TX	77053	Site EPA ID: TX0001011659 - Type of site: Conditionally Exempt Small Quantity Generator 'Contact Information: DARVIN E MAYO, 333 RESEARCH COURT NORCROSS, GA, 30092; tel. 4044535442 No NAIC Codes are available for this site.

CLEAR CREEK SUMMARY OF NFRAP SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
43	-95.32865	29.539699	NFRAP	YATES RESIDENCE SITE	3202 SKYLARK	PEARLAND	TX	77584	EPA ID NUMBER: TXD981058993, Status: Not on the NPL. 'Institutional/Engineering Controls: Unknown/Unknown
56	-95.217798	29.557271	NFRAP	HILL SAND COMPANY SITE	500 DIXIE FARM ROAD	PEARLAND	TX	77581	EPA ID NUMBER: TXD981147176, Status: Not on the NPL. 'Institutional/Engineering Controls: Unknown/Unknown
63	-95.313885	29.620829	NFRAP	DREW CHEMICAL CORP.	6121 ALMEDA - GENOA ROAD	HOUSTON	TX	77048	EPA ID NUMBER: TXD079388955, Status: Not on the NPL. 'Institutional/Engineering Controls: Unknown/Unknown
73	-95.284022	29.604837	NFRAP	LETTIE STREET SITE	7901 LETTIE ROAD	HOUSTON	TX	77601	EPA ID NUMBER: TXD981154834, Status: Not on the NPL. 'Institutional/Engineering Controls: Unknown/Unknown
77	-95.304855	29.620887	NFRAP	ALMEDA-GENOA ROAD SITE	ALMEDA-GENOA RD & MYKOWA RD.	HOUSTON	TX	77075	EPA ID NUMBER: TXD980623722, Status: Not on the NPL. 'Institutional/Engineering Controls: Access Restriction, Fencing/Unknown.
81	-95.277583	29.546704	NFRAP	MAGNOLIA ROAD SITE	MAGNOLIA ST OFF TELEPHONE RD	PEARLAND	TX	77581	EPA ID NUMBER: TXD981155955, Status: Not on the NPL. 'Institutional/Engineering Controls: Unknown/Unknown
90			NFRAP	HASTINGS RADIO CHEMICAL SITE (OFFSITE)	HWY 35	PEARLAND	TX	77581	EPA ID NUMBER: TXD982289738, Status: Not on the NPL. 'Institutional/Engineering Controls: Access Restriction, Fencing/Discharge, Excavation, Storage - Temporary
91			NFRAP	CAT FORD ROAD	LETTIE STREET	PEARLAND	TX	77075	EPA ID NUMBER: TXD982311557, Status: Not on the NPL. 'Institutional/Engineering Controls: Unknown/Disposal, Other, (N.O.S.)

CLEAR CREEK SUMMARY OF ERNS SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
16	-95.213294	29.585268	ERNS	TBT CLINIC	10935 SCARSDALE BLVD	HOUSTON	TX	77089	NRC ID: 849112 Date of occurence: 9/17/2007 3:45:00 PM Type of incident: FIXED Type of medium affected: OTHER Type of material spilled: MERCURY.
65	-95.298439	29.620948	ERNS	EXXON PIPELINE	7100 ALMEDA-GEONA	HOUSTON	TX		ERNS ID NUMBER 203141 ,ON 2/7/1991 60 BBL OF OIL: CRUDE, WAS REPORTED AS RELEASED. '8" PIPELINE / TRACK HOE HIT THE LINE
67	-95.295761	29.621008	ERNS		7231 ALMEDA GENOA	HOUSTON	TX		ERNS ID NUMBER 71596 ,ON 12/24/1988 0 UNK OF NATURAL GAS, WAS REPORTED AS RELEASED. 'METER SET/RAN OVER BY CAR CAUSING FIRE
89			ERNS		BEMAR ROAD AT HALL RD & SCARSDALE RD	HOUSTON	TX		ERNS ID NUMBER 276389 ,ON 7/18/1992 0 UNK OF UNKNOWN OIL, WAS REPORTED AS RELEASED. 'OIL IN DITCH/UNKNOWN OIL IN DITCH/UNKNOWN'OIL

CLEAR CREEK SUMMARY OF DRY CLEANER SITES

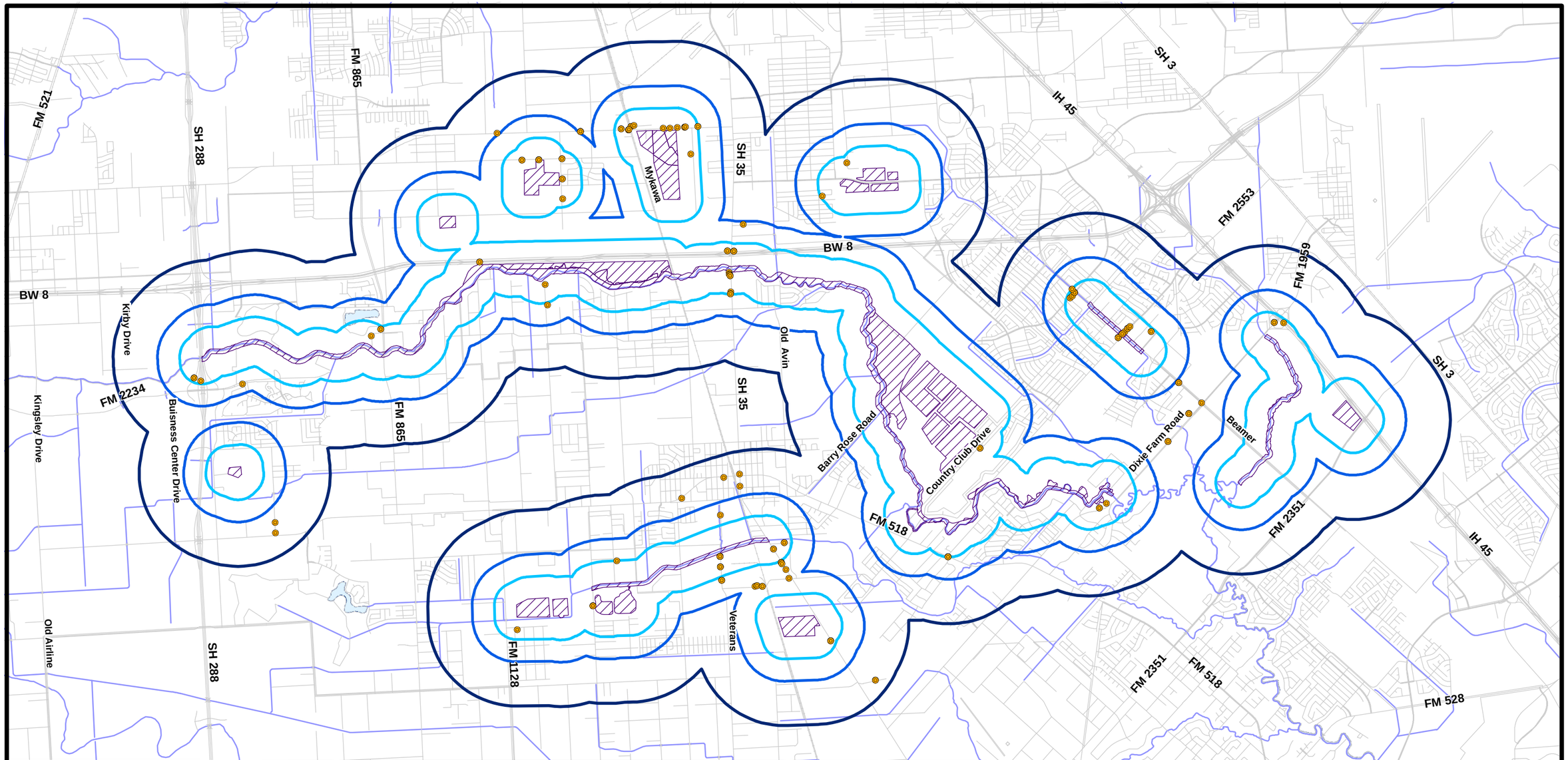
Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
12	-95.22285	29.59137	DRYC	STAR CLEANERS	10835 HUGHES RD	HOUSTON	TX	77089	Regulated Entity ID: RN102292950. Customer ID: CN602476202. Owner: STAR CLEANERS. 'Dry Cleaner Type: FACIL. Uses Perchloroethylene: YES.
21	-95.212269	29.586092	DRYC	DRY CLEAN SUPER CENTER	11202 SCARSDALE BLVD	HOUSTON	TX	77089	Regulated Entity ID: RN104000294. Customer ID: CN602762593. Owner: DRY CLEAN SUPER CENTER. 'Dry Cleaner Type: FACIL. Uses Perchloroethylene: YES.
34	-95.378613	29.581278	DRYC	SILVERLINE DRY CLEANERS	1801 COUNTRY PLACE PKWY STE 105	PEARLAND	TX	77584	Regulated Entity ID: RN104992243. Customer ID: CN602461998. Owner: SILVERLINE DRY CLEANERS. Dry Cleaner Type: Drop Station

CLEAR CREEK
SUMMARY OF CORRACT SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
63	-95.3139	29.62083	CORRAC	ASHLAND IN	6121 ALMEDA GENOA	HOUSTOI	TX	77048	Site EPA ID: TXD079388955 Date of starting activities (m/d/y) 11/29/2005 'TSD type undefined by EPA 'Contact Information: PETER J STEIK, 6121 ALMEDA GENOA RD HOUSTON, TX, 77048; tel. 713-991-3722 EX NAIC Code: 325998

CLEAR CREEK SUMMARY OF CERCLIS SITES

Map ID	Longitude	Latitude	Database	Site Name	Address	City	State	Zip	Comments
1	-95.205879	29.567044	CERCLIS	DIXIE OIL PROCESSORS, INC.	2505 CHOATE RD	FRIENDSWOOD	TX	77546	EPA ID NUMBER: TXD089793046, Status: Deleted from the Final NPL. 'Institutional/Engineering Controls: Access Restriction, Fencing/Disposal, Incineration, Other, (N.O.S.), Residuals Disposal, Surface Drainage Control
3	-95.261987	29.52956	CERCLIS	JAMES BARR FACILITY	3300 INDUSTIRAL BLVD.	PEARLAND	TX	77581	EPA ID NUMBER: TXSFN0605176, Status: Not on the NPL.'Institutional/Engineering Controls: Unknown/Unknown
4	-95.201837	29.5715	CERCLIS	BRIO REFINING, INC.	2501 DIXIE FARM ROAD	FRIENDSWOOD	TX	77089	EPA ID NUMBER: TXD980625453, Status: Deleted from the Final NPL. 'Institutional/Engineering Controls: Access Restriction, Fencing, Swim Restriction/Biorem. (In-Situ), Biorem. Treatment, (N.O.S.), Cap, Discharge, Incineration, Monitoring, Natural Attenuation, Pump & Treat, Slurry Wall,Storage - Temporary
4	-95.201837	29.5715	CERCLIS	BRIO SOUTH WELLS	DIXIE FARM RD/EAST BY BEAMER RD	FRIENDSWOOD	TX	77546	EPA ID NUMBER: TXD987998309, Status: Not on the NPL. 'Institutional/Engineering Controls: Unknown/Unknown
90			CERCLIS	HASTINGS RADIO CHEMICAL (ONSITE)	HWY 35	PEARLAND	TX	77581	EPA ID NUMBER: TXD980878672, Status: Not on the NPL. 'Institutional/Engineering Controls: Access Restriction, Fencing/Disposal, Dust Suppression, Storage - Temporary



- Hazmat Sites
- Project Features
- Quarter Mile Extents of Project Features
- Half Mile Extents of Project Features
- One Mile Extents of Project Features

N W E S

0 3,000 6,000 12,000 Feet

Figure 1
Hazmat Sites
Clear Creek Project

Prepared for: USACE	
Job No.: 044188600	Scale: 1 inch = 6,000 feet
Prepared by: 18827	Date: 5/14/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/044188600/figures/oil_gas/hazmat.mxd

Appendix C-2

Oil and Gas Well and Pipeline Tables and Maps

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
205	Canceled Location	201							-95.30624611000	29.60200579000
209	Canceled Location	201							-95.29574396000	29.60362518000
2	Dry Hole	039							-95.26698326000	29.54249609000
3	Dry Hole	039							-95.25580465000	29.54982380000
4	Dry Hole	039							-95.24328856000	29.55182251000
9	Dry Hole	039							-95.26091973000	29.55787842000
17	Dry Hole	167							-95.20183782000	29.55918799000
27	Dry Hole	167							-95.20048025000	29.56231839000
37	Dry Hole	201							-95.21429569000	29.56473182000
45	Dry Hole	20131933	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	3823	00000000	19930723	00650	-95.20068892000	29.56527189000
56	Dry Hole	039							-95.37724210000	29.57173116000
59	Dry Hole	20105813	EXXON CORP.	SCOTT, GEO. A & BEAMER LOUISE S.	27	00000000	00000000	06047	-95.18233899000	29.56660436000
74	Dry Hole	20132318	MARALO, INC.	KIESLING & DIXON	1	00000000	19930810	08400	-95.16863909000	29.56723565000
108	Dry Hole	201							-95.20818408000	29.57039684000
129	Dry Hole	20105921							-95.21415731000	29.57244464000
150	Dry Hole	20130836	EXXON CORP.	WEBSTER FIELD UNIT	2134	00000000	19780304	00000	-95.18945902000	29.57365824000
160	Dry Hole	20131485	EXXON CORP.	WEST PRODUCTION CO. A/C 2	40	19821104	19940325	04409	-95.18395591000	29.57481236000
162	Dry Hole	039							-95.26052377000	29.57766489000
194	Dry Hole	039							-95.30332686000	29.59365000000
195	Dry Hole	039							-95.31609428000	29.59501856000
196	Dry Hole	201							-95.31095722000	29.59637908000
197	Dry Hole	201							-95.30903355000	29.59653286000
198	Dry Hole	201							-95.26094085000	29.59701364000
199	Dry Hole	201							-95.33056303000	29.60030855000
200	Dry Hole	201							-95.27279070000	29.59878732000
201	Dry Hole	201							-95.30033578000	29.60042603000
202	Dry Hole	201							-95.28086047000	29.60037304000
203	Dry Hole	201							-95.30909103000	29.60168346000
204	Dry Hole	201							-95.31748618000	29.60223138000
206	Dry Hole	201							-95.30259679000	29.60230323000
207	Dry Hole	201							-95.30392868000	29.60256456000
208	Dry Hole	201							-95.31108334000	29.60277642000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
210	Dry Hole	20131562	MCCARTER, A. NELSON	ARNOLD, DANIEL TRUSTEE	1	00000000	19830607	00000	-95.29526048000	29.60466405000
211	Dry Hole	201							-95.29479124000	29.60466429000
212	Dry Hole	201							-95.30023101000	29.60486231000
213	Dry Hole	201							-95.29632009000	29.60488563000
217	Dry Hole	201							-95.29703074000	29.60734723000
218	Dry Hole	201							-95.29641455000	29.60789504000
219	Dry Hole	20131157	CHAPMAN OIL	DUNBAR	1	00000000	19810509	00000	-95.31673313000	29.60851392000
220	Dry Hole	201							-95.29669945000	29.60801100000
222	Dry Hole	20130989	MCDRILLING COMPANY, INC	HAAS, JENNIE F.	1	00000000	19790922	00000	-95.29479502000	29.60824861000
226	Dry Hole	201							-95.29380109000	29.60931013000
227	Dry Hole	201							-95.29381701000	29.60952161000
228	Dry Hole	201							-95.25513843000	29.60922546000
229	Dry Hole	201							-95.30285454000	29.61070619000
233	Dry Hole	201							-95.29933852000	29.61147354000
234	Dry Hole	201							-95.29940479000	29.61169163000
236	Dry Hole	201							-95.31717114000	29.61236560000
240	Dry Hole	201							-95.30320930000	29.61230663000
243	Dry Hole	201							-95.29949230000	29.61242076000
254	Dry Hole	201							-95.30334712000	29.61342997000
262	Dry Hole	201							-95.25333010000	29.61325620000
264	Dry Hole	20130229							-95.29602873000	29.61447875000
271	Dry Hole	201							-95.30373645000	29.61550393000
277	Dry Hole	20107759							-95.29496397000	29.61568558000
278	Dry Hole	20131514	MCCARTER, W.B. JR. INC.	BARLOW, J.O.	1	00000000	19830224	04805	-95.29758395000	29.61635552000
282	Dry Hole	20131680	MCCARTER, NELSON A.	MENDLESOHN-RYEMON	1	00000000	19840201	04800	-95.29983477000	29.61700496000
285	Dry Hole	20182941			1	00000000	19900209	05665	-95.30302881000	29.61801228000
182	Gas Well	20132601	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1011	20000924	00000000	05680	-95.18229719000	29.58126861000
193	Gas Well	201							-95.18781294000	29.58573797000
258	Gas Well	20180131	SMITH, L. C.	FORBES, E. E.	3	19641130	00000000	04570	-95.29394065000	29.61386307000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
91	Horizontal Drainhole	20131725	EXXON CORP.	SCOTT, GEO A.&BEAMER, LOUISE S.	87	00000000	00000000	06190	-95.18373735000	29.56855304000
133	njection/Disposal Well	20105774	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1301D	20040720	00000000	06150	-95.16819238000	29.57137948000
1	Oil Well	039							-95.27273894000	29.54096259000
39	Oil Well	20131707	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2785	20010328	00000000	06123	-95.18486980000	29.56411994000
42	Oil Well	20132030	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	5009	19970421	00000000	06100	-95.18545282000	29.56443672000
49	Oil Well	20130572	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2752	00000000	00000000	00000	-95.18499588000	29.56520891000
50	Oil Well	20132121	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	5019	20010829	00000000	06110	-95.17409166000	29.56520000000
51	Oil Well	20132135	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2409	19880613	00000000	06106	-95.17098857000	29.56530842000
57	Oil Well	20105811	EXXON CORP.	SCOTT, GEO. A & BEAMER LOUISE S.	29	00000000	00000000	06041	-95.18556917000	29.56644755000
58	Oil Well	20131281	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2773	20051028	00000000	06102	-95.18774981000	29.56658948000
64	Oil Well	20131993	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	5004	19960326	00000000	06135	-95.17612563000	29.56679348000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
65	Oil Well	20130468	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2744	20020626	00000000	06135	-95.17485675000	29.56680036000
68	Oil Well	20130582	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2751	20010321	00000000	06100	-95.18366695000	29.56713279000
69	Oil Well	20131652	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2783	19940617	00000000	06120	-95.18237680000	29.56714451000
72	Oil Well	20131742	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2788	19971208	00000000	06115	-95.17668583000	29.56713998000
80	Oil Well	20131234	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2772	19940228	00000000	06127	-95.17741579000	29.56769270000
83	Oil Well	20131138	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2771	20000613	00000000	06106	-95.18238025000	29.56803883000
85	Oil Well	20131956	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1836	19971020	00000000	06152	-95.16660210000	29.56774552000
87	Oil Well	20132071	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	5011	20010103	00000000	06100	-95.18919291000	29.56841321000
88	Oil Well	20131891	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2310	19860617	00000000	06121	-95.17570314000	29.56809215000
92	Oil Well	20132108	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2315	19970604	00000000	06100	-95.17224715000	29.56824325000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
94	Oil Well	20132024	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2314	19990928	00000000	06100	-95.17538578000	29.56841250000
97	Oil Well	20130575	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2307	20010830	00000000	06100	-95.17295182000	29.56854580000
99	Oil Well	20132492	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2318	20010810	00000000	06170	-95.17849357000	29.56880211000
101	Oil Well	20105814	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2726	20000306	00000000	06100	-95.18501394000	29.56907049000
109	Oil Well	20132021	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	5006	19991013	00000000	06100	-95.18907310000	29.57006577000
113	Oil Well	20132004	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2313	19930420	00000000	06100	-95.17719495000	29.57005909000
114	Oil Well	20130536	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1317	19760902	00000000	06172	-95.16812193000	29.56983255000
115	Oil Well	20131423	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2779	20020814	00000000	06102	-95.18357683000	29.57031311000
118	Oil Well	20131104	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2769	19951026	00000000	06100	-95.18577220000	29.57066696000
130	Oil Well	20130623	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2130	19991115	00000000	06100	-95.18902960000	29.57180205000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
131	Oil Well	20105747	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2306	20000622	00000000	09000	-95.17976682000	29.57159028000
132	Oil Well	20131284	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1320	19980904	00000000	06100	-95.16869882000	29.57136357000
135	Oil Well	20132242	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1845	19991214	00000000	06100	-95.17239043000	29.57157146000
137	Oil Well	20131286	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2139	20000925	00000000	06600	-95.18698474000	29.57234982000
139	Oil Well	20131540	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1829	00000000	00000000	06100	-95.17699461000	29.57211242000
140	Oil Well	20130629	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2132	20010114	00000000	06110	-95.18826244000	29.57249533000
144	Oil Well	20130399	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1314	19850725	00000000	06101	-95.16876695000	29.57224672000
145	Oil Well	20130428	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1316	20000413	00000000	06020	-95.16675378000	29.57226951000
151	Oil Well	20130847	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2134A	20000704	00000000	06150	-95.18793107000	29.57362425000
153	Oil Well	20105755	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1817	20000526	00000000	06045	-95.17767778000	29.57350666000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
161	Oil Well	20105756	EXXON CORP.	KIESLING,A.E. & DIXON,T.K. A/C#1	16	00000000	00000000	06040	-95.17948095000	29.57471321000
165	Oil Well	20132488	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1246	20020605	00000000	06140	-95.17788851000	29.57551723000
168	Oil Well	20130419	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	604	20001102	00000000	06021	-95.17032540000	29.57545278000
171	Oil Well	20132133	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1329	19890602	00000000	06112	-95.17686024000	29.57625347000
175	Oil Well	20131571	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1245	20000810	00000000	07800	-95.17871542000	29.57700955000
230	Oil Well	201							-95.29777627000	29.61077043000
232	Oil Well	20105536	ISLAND EXPLORATION	RYEMAN, J.	2	00000000	00000000	00000	-95.29400205000	29.61108741000
238	Oil Well	20131305	SMITH, L C PRODUCTION	ODEN, SYDNOR	1	19821210	00000000	04543	-95.29232035000	29.61192808000
244	Oil Well	201							-95.29657204000	29.61243343000
245	Oil Well	20105539	ISLAND EXPLORATION	RYEMAN, J.	1	00000000	00000000	00000	-95.29396876000	29.61242440000
252	Oil Well	20181333	ALEXANDER, JOHN	IRVIN, W. H.	4	00000000	00000000	00000	-95.29939929000	29.61330464000
257	Oil Well	201							-95.29188567000	29.61371406000
260	Oil Well	201							-95.29409938000	29.61392825000
261	Oil Well	20105528							-95.29939976000	29.61447273000
270	Oil Well	20105532							-95.29954830000	29.61537167000
273	Oil Well	20105531							-95.29658053000	29.61548884000
46	Oil/Gas Well	20130581	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2753	20000613	00000000	06182	-95.17301450000	29.56451437000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
104	Oil/Gas Well	20105810	EXXON CORP.	SCOTT, GEO. A & BEAMER LOUISE S.	30	00000000	00000000	06044	-95.18172696000	29.56942760000
107	Oil/Gas Well	20105750	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2303	19960308	00000000	06045	-95.17689649000	29.56942006000
116	Oil/Gas Well	20131211	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2309	19980825	00000000	06126	-95.17832970000	29.57026918000
125	Oil/Gas Well	20105748	EXXON MOBIL CORPORATION	OWENS, J. D.	5	00000000	00000000	06044	-95.17922133000	29.57108624000
146	Oil/Gas Well	20105749	EXXON CORP.	OWENS, J. D.	4	00000000	00000000	06034	-95.18153230000	29.57278537000
149	Oil/Gas Well	20132120	EXXON MOBIL CORPORATION	KIESLING, A. E. & DIXON, T. K.	40	20011027	00000000	06100	-95.17673061000	29.57299358000
154	Oil/Gas Well	20105777	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1310	19940420	00000000	06050	-95.17348614000	29.57384983000
155	Oil/Gas Well	20105772	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	602	20001127	00000000	06041	-95.16968382000	29.57386797000
158	Oil/Gas Well	20105914	EXXON MOBIL CORPORATION	OLCOTT GU 2	1	19630324	00000000	00000	-95.20327835000	29.57510708000
169	Oil/Gas Well	20105792	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2208I	19871113	00000000	06047	-95.18607629000	29.57602538000
170	Oil/Gas Well	20105773	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	501	20010313	00000000	00000	-95.17190263000	29.57603412000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
173	Oil/Gas Well	20105788	HUMBLE OIL & REFINING CO.	WEST PRODUCTION COMPANY A/C #7	12	00000000	00000000	06044	-95.17784145000	29.57679316000
174	Oil/Gas Well	20107771	EXXON MOBIL CORPORATION	KIESLING, A.E. & DIXON, T.K.A/C1	20	00000000	00000000	08200	-95.18296925000	29.57701513000
176	Oil/Gas Well	20105758	EXXON CORP.	KIESLING,A.E. & DIXON,T.K. A/C#1	14	00000000	00000000	06074	-95.18360665000	29.57771771000
177	Oil/Gas Well	20105789	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1111	19870507	00000000	06044	-95.17951173000	29.57824825000
178	Oil/Gas Well	20105759	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1713	20010502	00000000	06100	-95.18612854000	29.57935907000
180	Oil/Gas Well	20105790	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1010	19971208	00000000	06044	-95.18186719000	29.57970375000
183	Oil/Gas Well	20105791	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIG	909	19991013	00000000	06033	-95.18427993000	29.58135956000
184	Oil/Gas Well	20130008	HUMBLE OIL & REFINING CO.	FRIENDSWOOD UNIT 36	1	00000000	00000000	08012	-95.18390026000	29.58184908000
187	Oil/Gas Well	20105955	EXXON CORP.	WEST PRODUCTION COMPANY A/C #3	18	00000000	00000000	06046	-95.18051819000	29.58261693000
189	Oil/Gas Well	20130921	EXXON MOBIL CORPORATION	WEST PRODUCTION CO. A/C 3	29	19970820	00000000	08121	-95.18252470000	29.58328219000
191	Oil/Gas Well	20105952	EXXON MOBIL CORPORATION	WEST PRODUCTION COMPANY A/C #3	23	00000000	00000000	06044	-95.18526004000	29.58430339000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
255	Oil/Gas Well	201							-95.29659776000	29.61327837000
267	Oil/Gas Well	201							-95.29311082000	29.61487917000
274	Oil/Gas Well	20180123	BOCK, NORMAN A.		1	19640900	00000000	00000	-95.29405693000	29.61555689000
8	Permitted Location	03932820		TRAINING WELL					-95.28427543000	29.55844683000
31	Permitted Location	201							-95.19085653000	29.56282267000
122	Permitted Location	20132019	EXXON CORP.	WEBSTER FIELD UNIT	1840	00000000	00000000	00000	-95.17120722000	29.57071992000
163	Permitted Location	201							-95.18564874000	29.57565030000
250	Permitted Location	201							-95.29869649000	29.61288342000
251	Permitted Location	201							-95.29423287000	29.61278625000
263	Permitted Location	201							-95.29187685000	29.61435445000
279	Permitted Location	201							-95.29313366000	29.61635911000
284	Permitted Location	20131703	GREAT WESTERN MINERALS INC.	MAINLAND	1	00000000	00000000	00000	-95.29392061000	29.61703935000
66	Plugged Gas Well	20130922	EXXON CORP.	WEBSTER FIELD UNIT	1825	19790111	19810317	01400	-95.16878279000	29.56663284000
221	Plugged Gas Well	20130477	MCCARTER, A. NELSON	PLATT	1	19760808	19930930	05500	-95.29995804000	29.60815119000
225	Plugged Gas Well	20130516	MCCARTER, A. NELSON	PLATT	2	19760419	19930927	04867	-95.29986865000	29.60928784000
239	Plugged Gas Well	201							-95.30347582000	29.61230204000
241	Plugged Gas Well	20180368	MCCARTER, A. NELSON, INC.	IRWIN, H. W. -A-	1	19790727	19800507	03158	-95.29849110000	29.61228685000
242	Plugged Gas Well	201							-95.30283780000	29.61248888000
248	Plugged Gas Well	20130859	MCCARTER, A. NELSON, INC.	BARLOW, JOE	1	19780627	19800508	04600	-95.29321999000	29.61258954000
256	Plugged Gas Well	201							-95.30180847000	29.61384465000
269	Plugged Gas Well	20131009	ACCO OIL & GAS COMPANY	SIADOUS ESTATE	6	19800323	19840330	05750	-95.30398455000	29.61535498000
10	Plugged Oil Well	20105866	EXXON CORP.	WEBSTER FIELD UNIT	3820	00000000	00000000	06048	-95.19282954000	29.55655564000
14	Plugged Oil Well	20105876	EXXON CORP.	GRAY, E. A. GDN.	8	00000000	19801017	06039	-95.18928785000	29.55794944000
15	Plugged Oil Well	16781033		GRAY, E. A., GDN.					-95.19433386000	29.55847282000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
16	Plugged Oil Well	201							-95.19198758000	29.55849525000
18	Plugged Oil Well	167							-95.19465311000	29.55902259000
19	Plugged Oil Well	20105868	EXXON CORP.	GRAY, E. A., GDN.	16	00000000	00000000	00000	-95.19826125000	29.55999664000
20	Plugged Oil Well	20105874	EXXON CORP.	GRAY, E. A. GDN.	10	00000000	19801020	06052	-95.19393308000	29.56007921000
21	Plugged Oil Well	20105890	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	3905	00000000	19951010	06041	-95.18660927000	29.56024211000
23	Plugged Oil Well	20105881	EXXON CORP.	WEBSTER FIELD UNIT	3803	00000000	00000000	06080	-95.19247589000	29.56141208000
25	Plugged Oil Well	20105873	EXXON CORP.	WEBSTER FIELD UNIT	3811	00000000	00000000	06040	-95.19676336000	29.56180517000
29	Plugged Oil Well	20105894	EXXON CORP.	SETTEGAST, J. J. JR. TR.	1	00000000	19931015	06040	-95.18786814000	29.56226697000
30	Plugged Oil Well	039							-95.25876841000	29.56428097000
32	Plugged Oil Well	20105880	EXXON CORP.	GRAY, E. A., GDN.	4	00000000	00000000	06079	-95.19542321000	29.56307962000
33	Plugged Oil Well	20105869	EXXON CORP.	GRAY, E. A. GDN.	15	00000000	00000000	00000	-95.20255323000	29.56342659000
34	Plugged Oil Well	20105823	EXXON CORP.	SCOTT, GEO. A & BEAMER LOUISE S.	17	00000000	19861205	06045	-95.18390455000	29.56297759000
35	Plugged Oil Well	20105861	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	3801	19900719	20070102	06013	-95.19011713000	29.56355510000
38	Plugged Oil Well	20181649	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2701	19851119	19860425	05970	-95.18620043000	29.56412004000
47	Plugged Oil Well	201							-95.20445666000	29.56544022000
48	Plugged Oil Well	201							-95.19829114000	29.56550045000
52	Plugged Oil Well	20105746	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2401	00000000	20010209	06089	-95.17053266000	29.56530076000
54	Plugged Oil Well	20105871	EXXON CORP.	GRAY, E. A. GDN.	13	00000000	00000000	06056	-95.20276507000	29.56661316000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
61	Plugged Oil Well	20131528	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2408I	19940724	19960610	06100	-95.17060392000	29.56640184000
67	Plugged Oil Well	20105752	EXXON CORP.	OWENS, J. D.	1	00000000	20071116	06049	-95.17286183000	29.56681397000
71	Plugged Oil Well	20105878	EXXON CORP.	GRAY, E. A., GDN.	6	00000000	00000000	00000	-95.20138455000	29.56782625000
73	Plugged Oil Well	20105820	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2720	00000000	19970430	06042	-95.19034298000	29.56757697000
76	Plugged Oil Well	20105922	WEST EAST GAS CO.	TINKLER, W. F.	1	00000000	19850814	05984	-95.20435837000	29.56835225000
78	Plugged Oil Well	20182952			1	00000000	19811002	06057	-95.20608114000	29.56844912000
79	Plugged Oil Well	20105771	EXXON CORP.	KIESLING,A.E. & DIXON,T.K. A/C#1	1	00000000	00000000	00000	-95.16890378000	29.56742886000
81	Plugged Oil Well	20130785	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2308	19840504	19960521	06115	-95.17492730000	29.56764080000
82	Plugged Oil Well	20105803	EXXON CORP.	SCOTT, GEO. A & BEAMER LOUISE S.	37	00000000	19871215	06062	-95.18804764000	29.56808245000
95	Plugged Oil Well	20105751	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2302	19880511	19910710	06054	-95.17500823000	29.56841266000
100	Plugged Oil Well	20105860	EXXON CORP.	JONES, J. L. SR. B-	1	00000000	19881025	06041	-95.19979197000	29.56942972000
105	Plugged Oil Well	20105770	EXXON CORP.	KIESLING,A.E. & DIXON,T.K. A/C#1	2	00000000	19871228	06050	-95.17081516000	29.56913910000
106	Plugged Oil Well	20105912	HUMBLE OIL & REFINING CO.		2	00000000	00000000	00000	-95.20427087000	29.57010494000
111	Plugged Oil Well	20105804	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2736	00000000	19800505	06082	-95.19060220000	29.57018988000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
119	Plugged Oil Well	20105782	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1302	19960326	20071022	05820	-95.16634652000	29.57021063000
123	Plugged Oil Well	20181704	EXXON CORP.	WEST PRODUCTION COMPANY A/C #2	21	00000000	00000000	00000	-95.18809166000	29.57130375000
126	Plugged Oil Well	20180382	EXXON CORP.	OLCOTT G U 2	2	19800607	19801224	06044	-95.20635905000	29.57195630000
128	Plugged Oil Well	20105911	HUMBLE OIL & REFINING CO.	MOORE, W. W.	1	00000000	19720805	06043	-95.20261602000	29.57202163000
136	Plugged Oil Well	201							-95.17485531000	29.57173805000
138	Plugged Oil Well	20105754	EXXON CORP.	KIESLING,A.E. & DIXON,T.K. A/C#1	18	00000000	20030905	06046	-95.17537563000	29.57203713000
147	Plugged Oil Well	201							-95.17062408000	29.57249819000
148	Plugged Oil Well	20105796	EXXON CORP.	WEST PRODUCTION COMPANY A/C #2	4	00000000	19821129	06039	-95.18665641000	29.57295900000
156	Plugged Oil Well	20105794	EXXON CORP.	WEST PRODUCTION COMPANY A/C #2	6	00000000	19821118	06038	-95.18388129000	29.57440772000
172	Plugged Oil Well	20105757	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1815	20000820	20010201	06040	-95.18189248000	29.57653425000
181	Plugged Oil Well	20105768	HUMBLE OIL & REFINING CO.	KIESLING,A.E. & DIXON,T.K. A/C#2	4	00000000	00000000	00000	-95.18844007000	29.58080685000
185	Plugged Oil Well	20105907	EXXON CORP.	OLCOTT GAS UNIT NO. 1	5	00000000	00000000	06044	-95.19071997000	29.58234649000
188	Plugged Oil Well	20105908	EXXON CORP.		1	00000000	20041101	06082	-95.18906835000	29.58340018000
190	Plugged Oil Well	20180378	EXXON CORP.	WEBSTER FIELD UNIT	322	19800516	19801222	06045	-95.18292307000	29.58383943000
214	Plugged Oil Well	20131523	APACHE EXPLORATION, INC. (I)	NUSSBAUM, SAM	4	19830303	19931005	04813	-95.29427904000	29.60556553000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
215	Plugged Oil Well	20131226	APACHE EXPLORATION, INC. (I)	NUSSBAUM, SAM	1	19820128	19931005	05208	-95.29353739000	29.60629800000
216	Plugged Oil Well	201							-95.30083002000	29.60697093000
223	Plugged Oil Well	201							-95.30239476000	29.60881991000
224	Plugged Oil Well	20130838	MCCARTER, A. NELSON, INC.	COASTAL RENTAL EG. CO.	1	19780522	19810714	04698	-95.29222120000	29.60897038000
231	Plugged Oil Well	20105518	ALEXANDER, JOHN	IRVIN, W. H.	7	00000000	19980521	04400	-95.29645157000	29.61075580000
235	Plugged Oil Well	20105519	ALEXANDER, JOHN	IRVIN, W. H.	6	19740114	19980528	04100	-95.29655438000	29.61170461000
237	Plugged Oil Well	20181334	ALEXANDER, JOHN	IRVIN, W. H.	5	00000000	00000000	00000	-95.29774429000	29.61195180000
247	Plugged Oil Well	201							-95.30338984000	29.61281806000
249	Plugged Oil Well	20182861			2	00000000	19860326	00000	-95.29171327000	29.61263025000
253	Plugged Oil Well	20181332	ALEXANDER, JOHN	IRVIN, W. H.	3	00000000	00000000	00000	-95.29777547000	29.61327426000
265	Plugged Oil Well	20105530	MEDALLION OIL COMPANY	RYEMON, MARY	4	00000000	19740624	04700	-95.29778045000	29.61463926000
266	Plugged Oil Well	20105533	MEDALLION OIL COMPANY	RYEMON, MARY	1	00000000	19740703	04700	-95.29657204000	29.61467639000
268	Plugged Oil Well	20181952	JONES, DOY	BLOODWORTH - KNOLL, ALFRED	1	19661029	19860320	03530	-95.29223853000	29.61491339000
272	Plugged Oil Well	20105529	MEDALLION OIL COMPANY	RYEMON, MARY	5	00000000	19740328	00000	-95.29775184000	29.61546653000
275	Plugged Oil Well	201							-95.30074625000	29.61582222000
276	Plugged Oil Well	201							-95.29191017000	29.61560058000
281	Plugged Oil Well	201							-95.30076333000	29.61678567000
22	Plugged Oil/Gas Well	20105889	EXXON CORP.	WEBSTER FIELD UNIT	3906	19391106	19830628	06037	-95.18921092000	29.56099287000
36	Plugged Oil/Gas Well	20105872	EXXON CORP.	WEBSTER FIELD UNIT	3812	19790718	19801024	06075	-95.19979514000	29.56423435000
53	Plugged Oil/Gas Well	20105837	EXXON CORP.	SCOTT, GEO. A & BEAMER LOUISE S.	3	00000000	19901016	06080	-95.18813308000	29.56587557000
63	Plugged Oil/Gas Well	20180354	EXXON CORP.	WEBSTER FIELD UNIT	1803	19790208	19810311	06054	-95.16691210000	29.56641913000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
121	Plugged Oil/Gas Well	20105764	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1808	00000000	19840614	06088	-95.17279171000	29.57044032000
127	Plugged Oil/Gas Well	20105815	EXXON CORP.	WEBSTER FIELD UNIT	2725	19941008	19950818	06054	-95.18427079000	29.57145164000
186	Plugged Oil/Gas Well	20105799	EXXON CORP.	WEST PRODUCTION COMPANY A/C 1	1	19850114	19931118	06042	-95.18670377000	29.58278474000
192	Plugged Oil/Gas Well	201							-95.18699362000	29.58507697000
246	Plugged Oil/Gas Well	20180260	JONES, DOY	ODEN, SYDNOR	1	00000000	19810820	04659	-95.29184472000	29.61244391000
283	Plugged Oil/Gas Well	201							-95.29408660000	29.61690084000
5	Sidetrack Well	20132393		ALEXANDER - GREADY					-95.24510490000	29.55427810000
6	Sidetrack Well	20132391	A-N-A OPERATING COMPANY, INC.	ALEXANDER	2	00000000	00000000	00000	-95.24320350000	29.55565610000
7	Sidetrack Well	20132364	A-N-A OPERATING COMPANY, INC.	WOODWARD	1	00000000	00000000	00000	-95.24314070000	29.55568200000
11	Sidetrack Well	201							-95.23106500000	29.55888860000
12	Sidetrack Well	20132394	A-N-A OPERATING COMPANY, INC.	ALEXANDER	3	00000000	00000000	00000	-95.25077570000	29.55963970000
13	Sidetrack Well	20132395	A-N-A OPERATING COMPANY, INC.	ALEXANDER	4	00000000	00000000	00000	-95.25073240000	29.55967950000
24	Sidetrack Well	20131089	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	3908	19810818	00000000	06194	-95.18736110000	29.56134280000
26	Sidetrack Well	20130784	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	3907	00000000	20070226	06155	-95.18381890000	29.56152810000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
28	Sidetrack Well	20131878	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	3909	20010425	00000000	06158	-95.18867520000	29.56216040000
40	Sidetrack Well	20132156	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	3825	19881118	00000000	06282	-95.18578260000	29.56429260000
41	Sidetrack Well	20132168	EXXON CORPORATION	WEBSTER FIELD UNIT	5023	00000000	19890408	06171	-95.18512730000	29.56433570000
43	Sidetrack Well	20132080	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	5012	19890816	00000000	06123	-95.18353260000	29.56449420000
44	Sidetrack Well	20132465	EXXON MOBIL CORPORATION	SCOTT, GEO. A & BEAMER, LOUISE S	125	20020411	00000000	06194	-95.18270580000	29.56467730000
55	Sidetrack Well	20132136	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1842	19880609	00000000	06140	-95.16869970000	29.56573000000
60	Sidetrack Well	20132107	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	5017	20000921	00000000	06100	-95.18310230000	29.56665950000
62	Sidetrack Well	20132051	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	3824	20011213	00000000	06187	-95.19048580000	29.56700080000
70	Sidetrack Well	20130957	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2767	19910522	00000000	06262	-95.19057930000	29.56741830000
75	Sidetrack Well	20132075	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	5010	20000114	00000000	06179	-95.18767310000	29.56783156000

Clear Creek Summary of Oil and Gas Wells within Project Area

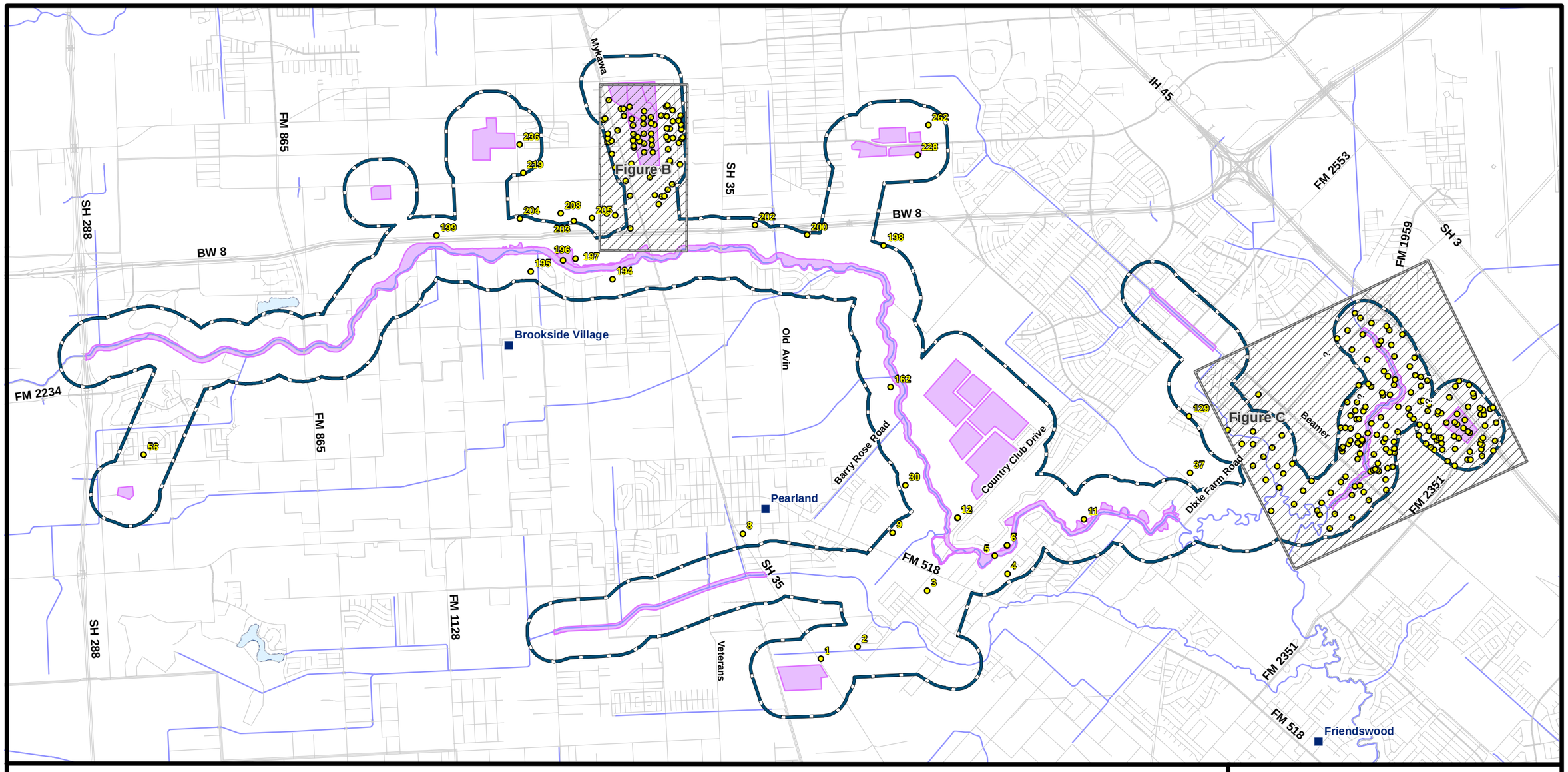
PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
77	Sidetrack Well	20130970	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2768	19990527	00000000	06290	-95.18946536000	29.56796099000
84	Sidetrack Well	20132023	EXXON MOBIL CORPORATION	BEAMER, GEO. A. SCOTT & LOUISE S	108	00000000	00000000	06100	-95.18400377000	29.56809101000
86	Sidetrack Well	20130660	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2761	19860529	19871209	06150	-95.18727590000	29.56834090000
89	Sidetrack Well	20131808	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1833	20010412	00000000	06159	-95.16873980000	29.56797060000
90	Sidetrack Well	20131615	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2142	20010125	00000000	06140	-95.18735285000	29.56850334000
93	Sidetrack Well	20131811	EXXON CORP.	WEBSTER FIELD UNIT	1327	00000000	00000000	00000	-95.16845690000	29.56819810000
96	Sidetrack Well	20131931	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2311	19991207	00000000	06119	-95.17615020000	29.56862700000
98	Sidetrack Well	20131724	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2786	19960101	19960925	06141	-95.18797840000	29.56899580000
102	Sidetrack Well	20132117	EXXON CORPORATION	WEBSTER FIELD UNIT	5018	00000000	19880109	06167	-95.18639780000	29.56933750000
103	Sidetrack Well	20131952	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1837	19980428	00000000	06238	-95.17049120000	29.56894710000
110	Sidetrack Well	20130591	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1823	19870521	19961023	06183	-95.17147680000	29.56961110000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
112	Sidetrack Well	20130658	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2762	19990810	00000000	06158	-95.18992000000	29.57019370000
117	Sidetrack Well	20132006	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1838	19860224	00000000	06198	-95.17242090000	29.57013410000
120	Sidetrack Well	20131983	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2312	19940929	00000000	06173	-95.17412560000	29.57044690000
124	Sidetrack Well	20130630	EXXON MOBIL CORPORATION	WEST PRODUCTION CO. A/C 2	33	00000000	00000000	06193	-95.18772808000	29.57130154000
134	Sidetrack Well	20130786	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1824	19871209	00000000	06133	-95.17540643000	29.57165572000
141	Sidetrack Well	20131955	EXXON CORP.	WEBSTER FIELD UNIT	1330	00000000	00000000	00000	-95.16833050000	29.57201920000
142	Sidetrack Well	20131752	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1326	20000619	00000000	06180	-95.16722330000	29.57211480000
143	Sidetrack Well	20132466	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	2317	19970106	00000000	06159	-95.17994580000	29.57253770000
152	Sidetrack Well	20132014	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1839	20010708	00000000	06123	-95.17807900000	29.57341570000
157	Sidetrack Well	20132275	EXXON CORP.	WEBSTER FIELD UNIT	2149	00000000	00000000	06167	-95.18276680000	29.57448480000
159	Sidetrack Well	20130833	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	605D	20030630	00000000	06160	-95.16978840000	29.57429160000

Clear Creek Summary of Oil and Gas Wells within Project Area

PBSJ_ID	Status/Type	API Number	OPERATOR	LEASE_NAME	WELLID	COMPLETION	PLUG_DATE	TOTAL_DEPT	LONG	LAT
164	Sidetrack Well	20130817	EXXON MOBIL CORPORATION	WEBSTER FIELD UNIT	1318I	19900711	00000000	06298	-95.17250175000	29.57534765000
166	Sidetrack Well	20132182	EXXON MOBIL CORPORATION	WEST PRODUCTION CO. A/C 2	48	20020605	00000000	06175	-95.18758467000	29.57588692000
167	Sidetrack Well	20132020	EXXON CORP.	WEBSTER FIELD UNIT	1841	00000000	00000000	00000	-95.18206700000	29.57577150000
179	Sidetrack Well	20132018	EXXON MOBIL CORPORATION	WEST PRODUCTION CO. A/C 3	44	00000000	00000000	06142	-95.17874184000	29.57942995000
259	Sidetrack Well	20181941	SMITH, L C PRODUCTION	FORBES, E. E.	2	19751002	00000000	00000	-95.29366330000	29.61386720000
280	Sidetrack Well	20131261	ACCO OIL & GAS COMPANY	COOKE	1	19820610	19870904	05257	-95.30119580000	29.61678010000



Well Locations

Project Area

Texas Cities

Project Features

Extents of Figure B and C

N W E S

0 2,500 5,000 10,000 Feet

Figure A

Well Data

Clear Creek Project

Prepared for: USACE	
Job No.: 044188600	Scale: 1 inch = 5,000 feet
Prepared by: 18827	Date: 05/14/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/044188600/figures/oil_gas/Fig_A_vr4.mxd

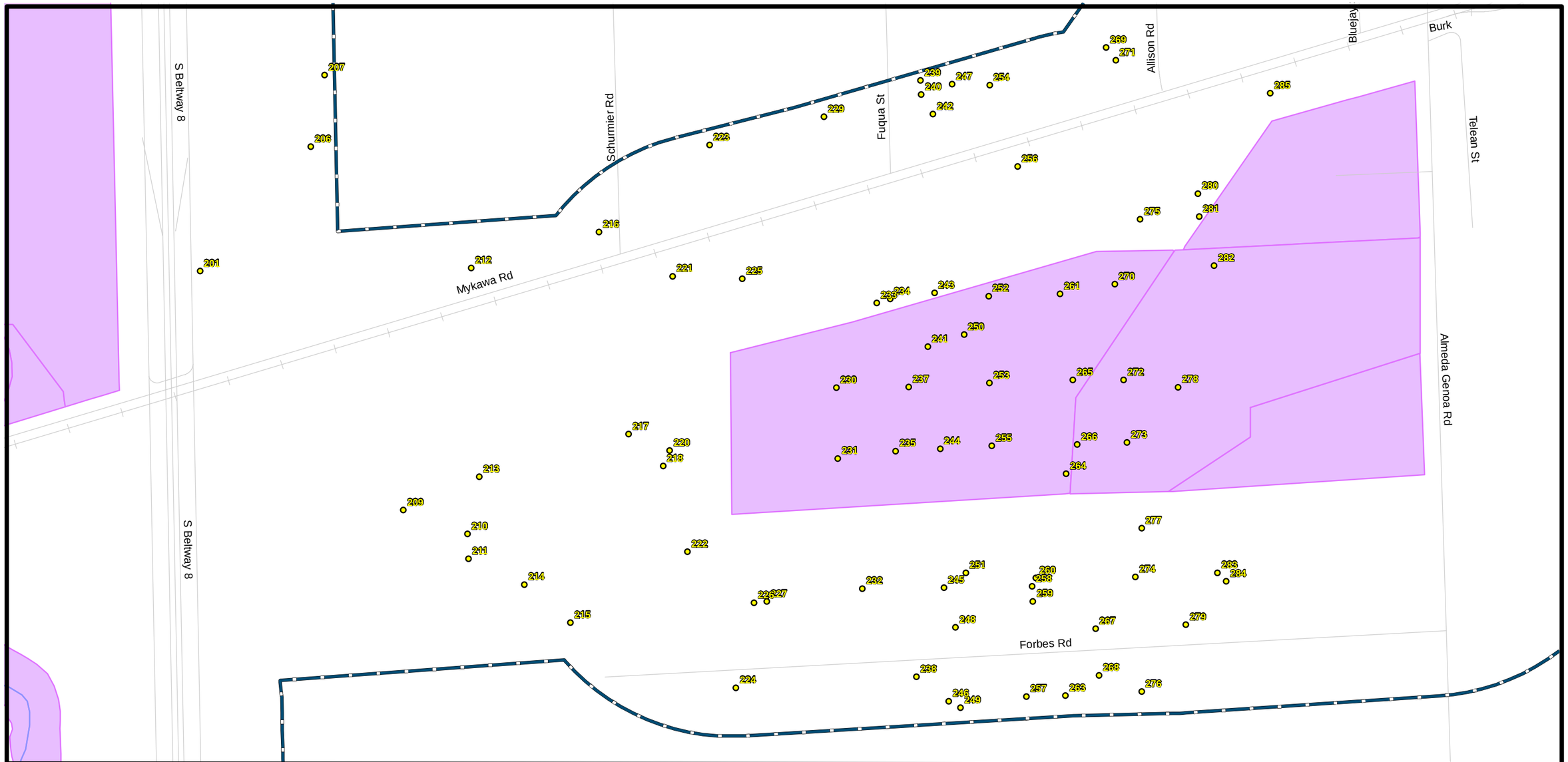


Figure B

Well Data

Clear Creek Project

Prepared for: USACE	
Job No.: 044188600	Scale: 1 inch = 600 feet
Prepared by: 18827	Date: 05/14/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/044188600/figures/oil_gas/Fig_B_vr4.mxd

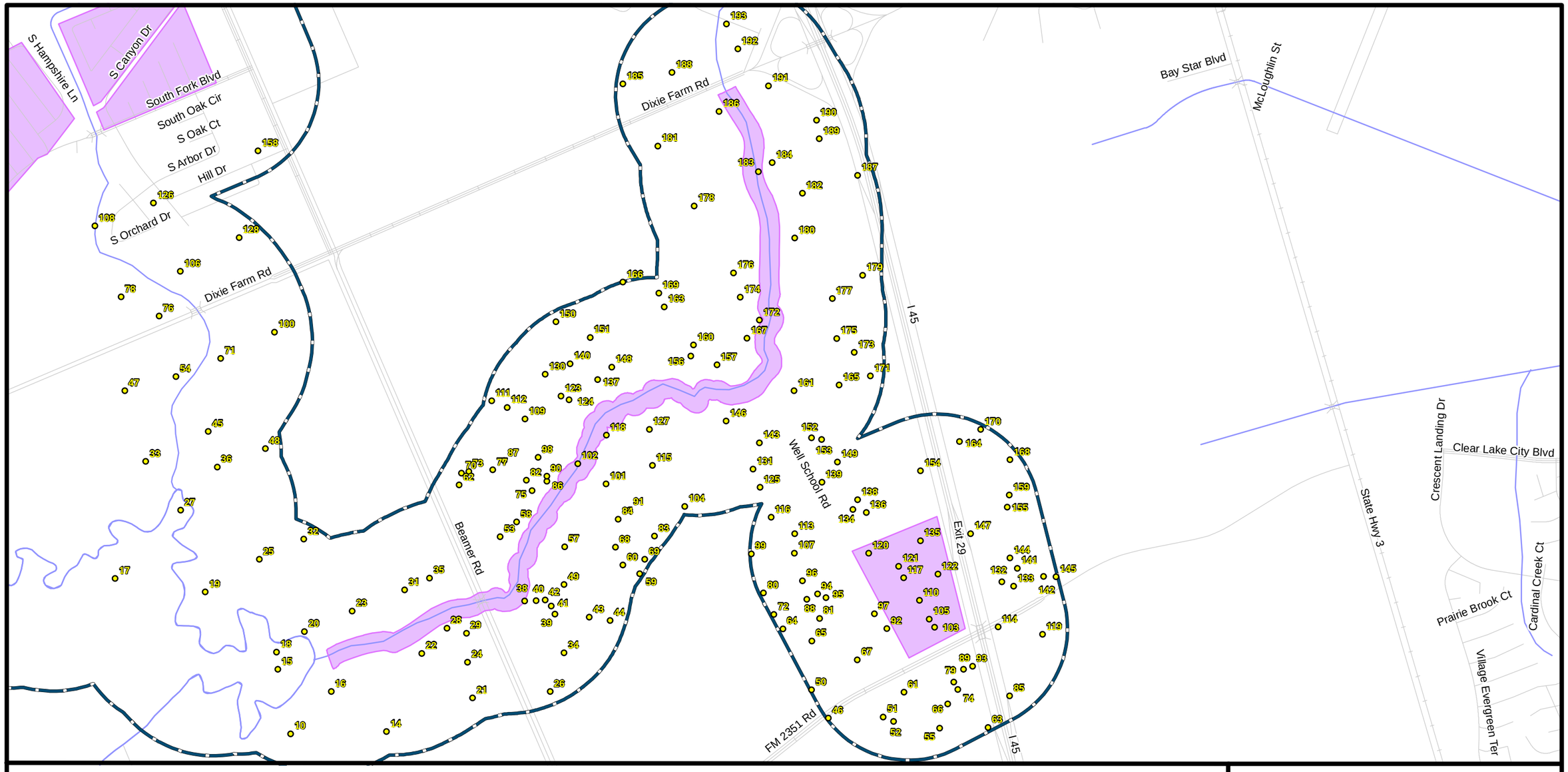


Figure C

Well Data

Clear Creek Project

Prepared for: USACE	
Job No.: 044188600	Scale: 1 inch = 1,300 feet
Prepared by: 18827	Date: 05/14/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/044188600/figures/oil_gas/Fig_C_vr4.mxd

OCT. 2007

	CLEAR CREEK CONVEYANCE							
NO.	**STATION**	**TYPE**	**REMOVE**	**NEW**	**OPER_NM**	**SYS_NM**	**DIA**	**CMDTY_DESC**
	J	*wide pipeline corridor outside conveyance limits			CONOCOPHILLIPS PIPE LINE COMPANY	SWEENY TO PASADENA	18	GASOLINE/ DISTILLATES/ NAPTHA
	H				CONOCOPHILLIPS PIPE LINE COMPANY	SWEENY TO MT BELVIEU EP SYSTEM	8.63	EP MIX/PROPANE
	G				CONOCOPHILLIPS PIPE LINE COMPANY	GULF COAST PROPANE SYSTEM	8.63	EP MIX/ PROPANE
	F				CONOCOPHILLIPS PIPE LINE COMPANY	SWEENY TO PASADENA	12.75	GASOLINE/ DISTILLATES/ NAPTHA
	E				CHEVRON PIPE LINE COMPANY	SOUTH END FEEDSTOCK SYSTEM	10.75	EP MIX/PROPANE
	D				CONOCOPHILLIPS COMPANY	PNG ROUTE Z	6.63	NATURAL GAS
	C				EQUISTAR CHEMICALS, LP	CROSS COUNTRY PIPELINE	6.63	PROPYLENE
	B				EQUISTAR CHEMICALS, LP	CROSS COUNTRY PIPELINE	8.63	ETHYLENE/ PROPYLENE
	A				TE PRODUCTS PIPELINE CO LP	P66	8.63	LIQUEFIED PETROLEUM GAS
1	319+00	under ground	300	580	SHELL PIPELINE COMPANY LP	WEST COLUMBIA - EAST HOUSTON	16	CRUDE OIL
2	319+13	ABOVE ground	320	380; 7 supports	ENTERPRISE PRODUCTS OPERATING LP	SEMINOLE	14	NATURAL GAS LIQUIDS
3	319+41	ABOVE ground	320	380; 7 supports	HOUSTON PIPE LINE COMPANY LP	3023-000	30	NATURAL GAS
4	380+00	under ground	300	580	KINDER MORGAN TEXAS PIPELINE, LP	HOUSTON SOUTH LOOP	24	NATURAL GAS
5	380+00	under ground	300	580	KINDER MORGAN TEXAS PIPELINE, LP	SOUTH HOUSTON LOOP	30	NATURAL GAS
6	381+00	under ground	300	580	SAN JACINTO GAS TRANSMISSION CO.	SAN JACINTO GAS TRANSMISSION CO.	16	NATURAL GAS
7	484+50	under ground	376	600	HOUSTON PIPE LINE COMPANY LP	3011-000	18	NATURAL GAS

1. * lines lie outside of conveyance limits, but within construction access limits.

2. overhead/above ground lines require all new supports and be 1.5' above 100-yr elevation.
3. ALL OTHER PIPELINES ARE UNDERGROUND, AND WILL BE RELOCATED BY DIRECTIONALLY DRILLED METHOD.
4. RELOCATED PL WILL BE A MINIMUM 5' BELOW convenyance element.

5. PIPELINES ARE IDENTIFIED FROM BEAMS DATABASE, AND ARE STATIONED AT APPROXIMATE LOCATIONS. NO FIELD VERIFICATION HAS BEEN PREFORMED.

MUD GULLY CONVEYANCE & DETENTION PIPELINE LIST

OCT. 2007

NO.	STATION	TYPE	REMOVE	NEW	OPER_NM	SYS_NM	DIA	CMDTY_DESC
1	between cell A & B; flow pipes will be under pls	under ground			TE PRODUCTS PIPELINE CO LP	P66	8.63	LIQUIFIED PETROLEUM GAS
2					TEXAS EASTERN TRANSMISSION, LP	LINE NO. 2-A-1	8.63	NATURAL GAS
3	vicinity	under ground			EXXONMOBIL PIPELINE COMPANY	ABANDONED SYSTEMS	12.75	CRUDE OIL
4**	cell c spillway conflict with corridor	under ground	240	360	GENESIS PIPELINE TEXAS, L.P.	CULLEN JUNCTION/WEBSTER	8.63	CRUDE OIL
5**			240	360	GENESIS PIPELINE TEXAS, L.P.	CULLEN JUNCTION/WEBSTER	12.75	CRUDE OIL
6**			240	360	EXXONMOBIL PIPELINE COMPANY	BAYTOWN - SAN ANTONIO PRDS (SAPL)	6.63	GASOLINE
7**			240	360	SEMPIPE, L.P.	TX85 SUGARLAND-GATE PLANT	8.63	CRUDE OIL

**pipeline corridor lines will require to be relocated (by dipping down) to allow spillway to connect up with Mud Gully. Discharge pipes should be able to be tunneled under without impact to lines.

1. PIPELINES ARE IDENTIFIED FROM BEAMS DATABASE, AND ARE STATIONED AT APPROXIMATE LOCATIONS. NO FIELD VERIFICATION HAS BEEN PREFORMED.

2. RELOCATED PLS WILL BE A MINIMUM 5' BELOW ELEMENTS

MARYS CREEK PIPELINE LIST

OCT. 2007

NO.	STATION	TYPE	REMOVE	NEW	OPER_NM	SYS_NM	SUBSYS_NM	DIA	CMDTY_DESC
1	98+00	ABOVE ground	75	200	HOUSTON PIPE LINE COMPANY LP	3023-000	PEARLAND-BAYTOWN 18" & 30"	30	NATURAL GAS
				4 supports					

1. OVERHEAD LINE REQUIRES RELOCATION BECAUSE OF BEING BELOW REQUIRED 100-YR ELEVATION.

2. PIPELINES ARE IDENTIFIED FROM BEAMS DATABASE, AND ARE STATIONED AT APPROXIMATE LOCATIONS.
NO FIELD VERIFICATION HAS BEEN PREFORMED.

	TURKEY CREEK PIPELINE LIST							
								OCT. 2007
NO.	STATION	TYPE	REMOVE	NEW	OPER_NM	SYS_NM	DIA	CMDTY_DESC
1	115+51	ABOVE ground	ok		TEXAS PETROLEUM INVESTMENT CO.	FRIENDSWOOD GL SYSTEM	2.38	NATURAL GAS
2	97+29	UNDER GROUND	280	500	"SEMPIPE, L.P."	FRIENDSWOOD CRUDE GATHERING	3.5	CRUDE OIL
3	93+97	UNDER GROUND	280	500	EXXON MOBIL CORPORATION	FRIENDSWOOD IP (375 PSI) GGS	10.75	NATURAL GAS
4	93+39	ABOVE ground	ok		EXXON MOBIL CORPORATION	FRIENDSWOOD HP GGS	8.63	NATURAL GAS
5	93+39	UNDER GROUND	280	500	EXXON MOBIL CORPORATION	FRIENDSWOOD HP GGS	8.63	NATURAL GAS
6	86+29	UNDER GROUND	280	500	EXXON MOBIL CORPORATION	HASTINGS LP GGS	20	NATURAL GAS
7	85+20	UNDER GROUND	280	500	EXXON MOBIL CORPORATION	FRIENDSWOOD GAS LIFT SYSTEM	6.63	NATURAL GAS
8	82+00**	UNDER GROUND	280	500	EXXON MOBIL CORPORATION	FRIENDSWOOD GAS LIFT SYSTEM	14	NATURAL GAS
9	79+60	UNDER GROUND	280	500	"EQUISTAR CHEMICALS, LP"	CROSS COUNTRY PIPELINE	8.63	ETHYLENE
10	79+60	UNDER GROUND	280	500	"EQUISTAR CHEMICALS, LP"	CROSS COUNTRY PIPELINE	6.63	PROPYLENE
11	78+00	ABOVE ground	ol		EXXON MOBIL CORPORATION	FRIENDSWOOD HP GGS	6.63	NATURAL GAS
12	77+90	UNDER GROUND	280	500	EXXON MOBIL CORPORATION	FRIENDSWOOD GAS LIFT SYSTEM	6.63	NATURAL GAS
13	76+10	UNDER GROUND	280	500	EXXON MOBIL CORPORATION	FRIENDSWOOD HP GGS	8.63	NATURAL GAS
14	76+05	UNDER GROUND	280	500	EXXON MOBIL CORPORATION	FRIENDSWOOD IP (375 PSI) GGS	12.75	NATURAL GAS

	TURKEY CREEK PIPELINE LIST							
								OCT. 2007
NO.	STATION	TYPE	REMOVE	NEW	OPER_NM	SYS_NM	DIA	CMDTY_DESC
15	73+30	UNDER GROUND	280	500	"SEMPIPE, L.P."	FRIENDSWOOD CRUDE GATHERING	6.63	CRUDE OIL
16	55+80	UNDER GROUND	280	500	"SEMPIPE, L.P."	FRIENDSWOOD CRUDE GATHERING	3.5	CRUDE OIL
17	55+80	UNDER GROUND	280	500	"SEMPIPE, L.P."	FRIENDSWOOD CRUDE GATHERING	6.63	CRUDE OIL
18	51+13 TO 52+06	UNDER GROUND	280	500	EXXON MOBIL CORPORATION	FRIENDSWOOD GAS LIFT SYSTEM	14	NATURAL GAS
19	51+13 TO 52+06	UNDER GROUND	280	500	EXXONMOBIL PIPELINE COMPANY	CORPUS CHRISTI-MT BELVIEU DILUTE PROPY	8.63	DILUTE PROPYLENE
20	51+13 TO 52+06	UNDER GROUND	280	500	EXXONMOBIL PIPELINE COMPANY	MT BELVIEU - VICTORIA/GREENLAKE CHEM GR	0	CHEMICAL GRADE PROPYLENE
21	51+13 TO 52+06	UNDER GROUND	280	500	EXXONMOBIL PIPELINE COMPANY	IDLE SECTIONS	14	LIQUIFIED PETROLEUM GAS
22	51+13 TO 52+06	UNDER GROUND	280	500	EXXONMOBIL PIPELINE COMPANY	BAYTOWN - SAN ANTONIO PRDS (SAPL)	6.63	GASOLINE
23	51+13 TO 52+06	UNDER GROUND	280	500	EXXONMOBIL PIPELINE COMPANY	MT BELVIEU - VICTORIA/GREENLAKE CHEM GR	0	CHEMICAL GRADE PROPYLENE
24	51+13 TO 52+06	UNDER GROUND	280	500	KINDER MORGAN TEJAS PIPELINE, LP	TGPL MUSTANG	30	NATURAL GAS
25	44+51 TO 46+71	UNDER GROUND	280	500	"EL PASO FIELD SERVICES, L.P."	15	20	NATURAL GAS
26	44+51 TO 46+71	UNDER GROUND	280	500	"EQUISTAR CHEMICALS, LP"	MT BELVIEU TO CHOCOLATE BAYOU	6.63	ETHYLENE
27	44+51 TO 46+71	UNDER GROUND	280	500	"EQUISTAR CHEMICALS, LP"	MT BELVIEU TO CHOCOLATE BAYOU	8.63	NATURAL GAS LIQUIDS

TURKEY CREEK PIPELINE LIST

OCT. 2007

NO.	STATION	TYPE	REMOVE	NEW	OPER_NM	SYS_NM	DIA	CMDTY_DESC
28	44+51 TO 46+71	UNDER GROUND	280	500	CHEVRON PIPE LINE COMPANY	GULF COAST ETHYLENE SYSTEM	12.75	ETHYLENE
29	44+51 TO 46+71	UNDER GROUND	280	500	ENTERPRISE PRODUCTS OPERATING LP	3053	30	NATURAL GAS
30	44+51 TO 46+71	UNDER GROUND	280	500	"TEPPCO CRUDE PIPELINE, L. P."	NORTH DEAN RGP	6.63	NATURAL GAS LIQUIDS
31	27+70	UNDER GROUND	280	500	EXXON MOBIL CORPORATION	FRIENDSWOOD HP GGS	6.63	NATURAL GAS
32	21+00	ABOVE ground	210	250; 4 supports	EXXON MOBIL CORPORATION	FRIENDSWOOD IP (375 PSI) GGS	2.38	NATURAL GAS
33	20+10	ABOVE ground	ok		EXXON MOBIL CORPORATION	FRIENDSWOOD GAS LIFT SYSTEM	4.5	NATURAL GAS
34	17+65 TO 18+10	UNDER GROUND	280	500	"GENESIS PIPELINE TEXAS, L.P."	CULLEN JUNCTION/WEBSTER	8.63	CRUDE OIL
35	17+65 TO 18+10	UNDER GROUND	280	500	"GENESIS PIPELINE TEXAS, L.P."	CULLEN JUNCTION/WEBSTER	12.75	CRUDE OIL
36	17+65 TO 18+10	UNDER GROUND	280	500	"SEMPIPE, L.P."	FRIENDSWOOD-WEBSTER	12.75	CRUDE OIL
37	17+65 TO 18+10	UNDER GROUND	280	500	"SEMPIPE, L.P."	TX1A GATE PLANT-WEBSTER	8.63	CRUDE OIL
38	10+34	UNDER GROUND	280	500	"SEMPIPE, L.P."	FRIENDSWOOD CRUDE GATHERING	10.75	CRUDE OIL

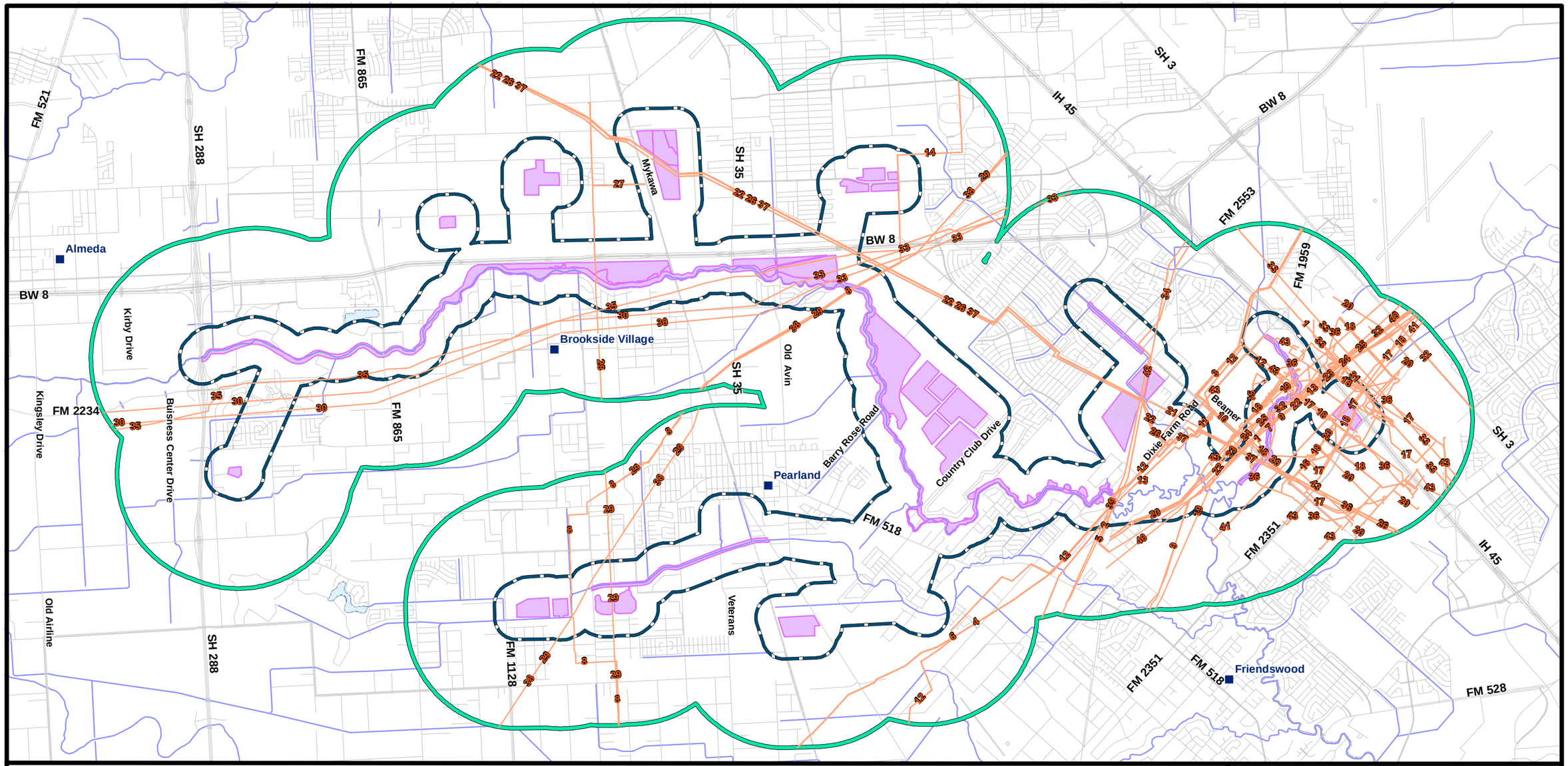
1. OVERHEAD PIPELINES ARE ASSUMED TO BE ACCEPTABLE, WITH MORE OF THE PIPE BEING EXPOSED. EXPOSED PIPE ASSUMED TO BE "WRAPPED" FOR PROTECTION.

2. ALL OTHER PIPELINES ARE UNDERGROUND, AND WILL BE RELOCATED BY DIRECTIONALLY DRILLED METHOD.

3. RELOCATED PL WILL BE A MINIMUM 10' BELOW CONVEYANCE ELEMENTS.

4. PIPELINES ARE IDENTIFIED FROM BEAMS DATABASE, AND ARE STATIONED AT APPROXIMATE LOCATIONS. NO FIELD VERIFICATION HAS BEEN PERFORMED.

** PIPELINE CROSSES CHANNEL, LOCATION UNDETERMINED.



Pipeline within 1 mile of Project Area

Project Area

1 mile extent of Project Area

Texas Cities

Project Features

N W E S

0 3,000 6,000 12,000 Feet

Figure D

Pipeline Data

Clear Creek Project

Prepared for: USACE	
Job No.: 044188600	Scale: 1 inch = 6,000 feet
Prepared by: 18827	Date: 05/14/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/044188600/figures/oil_gas/Fig_D_vr2.mxd

Appendix D

Agency Correspondence

Appendix D-1

Protected Species Correspondence

Harris-Brazoria-Galveston-CE

PBS&J

An employee-owned company

RECEIVED
JAN 02 2002
USFWS ClearLake ES

December 31, 2001

U.S. Fish and Wildlife Service
Division of Ecological Services
Attn: Carlos Mendoza
17629 El Camino Real, Suite 211
Houston, Texas 77058

RE: Clear Creek Flood Control Project
PBS&J Job Number 440909

Dear Mr. Mendoza:

PBS&J has contracted with the Galveston District of the U.S. Army Corps of Engineers (Galveston District) to collect the initial data for the Clear Creek Flood Control Project (project) located in Brazoria, Galveston, Fort Bend, and Harris Counties, Texas. The Galveston District is engaged in a complete re-evaluation of flood damage reduction measures for Clear Creek. The local sponsors of the project are Brazoria Drainage District No. 4, Galveston County, and Harris County Flood Control District. This federally funded flood control plan was developed many years ago and included deepening and widening Clear Creek to reduce flooding that has impacted area residents for over thirty years. Alternatives that may be considered include floodwater detention areas, bypass channels, and channelizing portions of Clear Creek. Non-structural alternatives are also being considered including purchasing and raising structures of frequently flooded homeowners.

PBS&J is collecting data for the preparation of the Affected Environment portion of an Environmental Impact Statement for the project. The level of detail for our assessment will be as necessary to describe existing conditions and to provide analysis of future conditions due to project impacts. The project study area encompasses the entire Clear Creek Watershed, to include Clear Lake, Clear Creek, and all tributaries, and the surrounding riparian and upland environments.

PBS&J is submitting this information letter to request a list of threatened and endangered species, which should be addressed for the project, and any particular areas of concern you may have. We are also requesting concurrence on the need for a Biological Assessment to be prepared or not as required by Section 7 of the Endangered Species Act. Please call Andy Labay or me at (512) 327-6840 if you have any questions or need additional information.

Sincerely,
PBS&J

Kari A. Jecker
Ecologist

A review of U.S. Fish and Wildlife Service files and your project information indicate that no federally listed or proposed threatened or endangered species are likely to occur at the project site. The project site is not located within officially designated critical habitat.

This review does not constitute our approval for wetlands, sensitive habitats, migratory birds or any other environmental requirements.

Approved M M Morgan

Date 1/22/2002

Clear Lake Ecological Services Field Office
U.S. Fish and Wildlife Service
17629 El Camino Real, Suite 211
Houston, Texas 77058-3051

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

September 24, 2007

RECEIVED
SEP 25 2007
CLEAR LAKE ES
HOUSTON, TEXAS

REPLY TO THE ATTENTION OF

Environmental Section

Mr. Steve Parris
U. S. Fish and Wildlife Service
Field Supervisor Ecological Services
17629 El Camino Real, Suite 211
Houston, TX 77058

Dear Mr. Parris:

The U. S. Army Corps of Engineers will prepare an Environmental Impact Statement (EIS) to address proposed actions to manage flooding of Clear Creek which is south of Houston, Texas and located in parts of Brazoria, Fort Bend, Harris and Galveston counties (see attached figure). Flooding along Clear Creek has been a concern for over 30 years. Floodwaters in 1973, 1976, 1979, 1989, 1994, and 2001 caused substantial damage to residences along the creek and recent flooding has resulted in the buyout of approximately 300 flood-prone homes along the creek. In 1968, Congress authorized the Clear Creek Flood Control Project and plans were formulated in the 1980s, which included deepening, widening, and realigning the creek channel. Due to concerns regarding its design, the U.S. Army Corps of Engineers, Galveston District (USACE) has reconsidered flood control options in the watershed.

Flood control options being considered include both flood conveyance and detention features on Clear Creek and a few of its tributaries. Approximately 15 miles of flood conveyance will be proposed for Clear Creek and shorter flood conveyance will be constructed on Mud Gully, Turkey Creek and Mary's Creek, all tributaries to Clear Creek. Offline detention features will be proposed for portions of Clear Creek, Mary's Creek and Mud Gully. Inline detention will be proposed for some reaches of Clear Creek. All structural components of the plan will occur upstream of the Dixie Farm Road area, although benefits will occur throughout the entire watershed. The proposed project is not expected to change freshwater inflow into Clear Lake or Galveston Bay.

To ensure compliance with the requirements of Section 7 of the Endangered Species Act, a list of proposed threatened or endangered species, their critical habitat, and species proposed for listing that may be found in the Clear Creek study area is requested.

Your assistance with our coordination responsibilities is appreciated. If you have any questions, please contact Ms. Andrea Catanzaro at 409.766.6346 or by email at andrea.catanzaro@SWG02.usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Branch

Enclosure

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051

February 2007

This responds to your request for threatened and endangered species information in the Clear Lake Ecological Services Field Office's area of responsibility. According to Section 7(a)(2) of the Endangered Species Act and the implementing regulations, it is the responsibility of each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any federally listed species. Therefore, we are providing information to assist you in meeting your obligations under the Endangered Species Act.

A county by county listing of federally listed threatened and endangered species that occur within this office's work area can be found at http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm. You should use the county by county listing and other current species information to determine whether suitable habitat for a listed species is present at your project site. If suitable habitat is present, a qualified individual should conduct surveys to determine whether a listed species is present.

After completing a habitat evaluation and/or any necessary surveys, you should evaluate the project for potential effects to listed species and make one of the following determinations:

No effect – the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Is not likely to adversely affect – the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. You should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation you used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect – adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires formal Section 7 consultation with this office.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

TAKE PRIDE IN AMERICA

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Endangered Species Act requirements for your projects at http://endangered.fws.gov/consultations/s7hndbk/s7hndbk.htm.

If we can further assist you in understanding your obligations under the Endangered Species Act, please contact Kathy Nemec, Edith Erfling, or Catherine Yeargan at 281/286-8282.

Sincerely,

Stephen D. Parris

Stephen D. Parris
Field Supervisor, Clear Lake Field Office

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Brazoria

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Brazoria County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
bald eagle	*Haliaeetus leucocephalus*	Birds	DM				P
brown pelican	*Pelecanus occidentalis*	Birds	DM, E				P
green sea turtle	*Chelonia mydas*	Reptiles	E, T				P
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E				P
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E				P
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E				P
loggerhead sea turtle	*Caretta caretta*	Reptiles	T				P
piping Plover	*Charadrius melodus*	Birds	E, T				P
whooping crane	*Grus americana*	Birds	E, EXPN				P

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Fort Bend

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Fort Bend County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
bald eagle	*Haliaeetus leucocephalus*	Birds	DM				P
sharpnose Shiner	*Notropis oxyrhynchus*	Fishes	C	No Image			P
Texas prairie dawn-flower	*Hymenoxys texana*	Flowering Plants	E				P
whooping crane	*Grus americana*	Birds	E, EXPN				P

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Galveston

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Galveston County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
Attwater's greater prairie-chicken	*Tympanuchus cupido attwateri*	Birds	E				P
bald eagle	*Haliaeetus leucocephalus*	Birds	DM				P
brown pelican	*Pelecanus occidentalis*	Birds	DM, E				P
Eskimo curlew	*Numenius borealis*	Birds	E				P
green sea turtle	*Chelonia mydas*	Reptiles	E, T				P
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E				P
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E				P
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E				P
loggerhead sea turtle	*Caretta caretta*	Reptiles	T				P
piping Plover	*Charadrius melodus*	Birds	E, T				P

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Harris

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Harris County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
bald eagle	*Haliaeetus leucocephalus*	Birds	DM				P
Texas prairie dawn-flower	*Hymenoxys texana*	Flowering Plants	E				P

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

September 24, 2007

REPLY TO THE ATTENTION OF

Environmental Section

Mr. David Bernhart
Assistant Regional Administrator
for Protected Resources
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, Florida 33701

Dear Mr. Bernhart:

The U. S. Army Corps of Engineers will prepare an Environmental Impact Statement (EIS) to address proposed actions to manage flooding of Clear Creek which is south of Houston, Texas and located in parts of Brazoria, Fort Bend, Harris and Galveston counties (see attached figure). Flooding along Clear Creek has been a concern for over 30 years. Floodwaters in 1973, 1976, 1979, 1989, 1994, and 2001 caused substantial damage to residences along the creek and recent flooding has resulted in the buyout of approximately 300 flood-prone homes along the creek. In 1968, Congress authorized the Clear Creek Flood Control Project and plans were formulated in the 1980s, which included deepening, widening, and realigning the creek channel. Due to concerns regarding its design, the U.S. Army Corps of Engineers, Galveston District (USACE) has reconsidered flood control options in the watershed.

Flood control options being considered include both flood conveyance and detention features on Clear Creek and a few of its tributaries. Approximately 15 miles of flood conveyance will be proposed for Clear Creek and shorter flood conveyance will be constructed on Mud Gully, Turkey Creek and Mary's Creek, all tributaries to Clear Creek. Offline detention features will be proposed for portions of Clear Creek, Mary's Creek and Mud Gully. Inline detention will be proposed for some reaches of Clear Creek. All structural components of the plan will occur upstream of the Dixie Farm Road area, although benefits will occur throughout the entire watershed. The proposed project is not expected to change freshwater inflow into Clear Lake or Galveston Bay.

To ensure compliance with the requirements of Section 7 of the Endangered Species Act, a list of proposed threatened or endangered species, their critical habitat, and species proposed for listing that may be found in the Clear Creek study area is requested.

CATANZARO/6346
24 SEP 2007

Your assistance with our coordination responsibilities is appreciated. If you have any questions, please contact Ms. Andrea Catanzaro at 409.766.6346 or by email at andrea.catanzaro@SWG02.usace.army.mil.

MURPHY
PE-PR
9/24

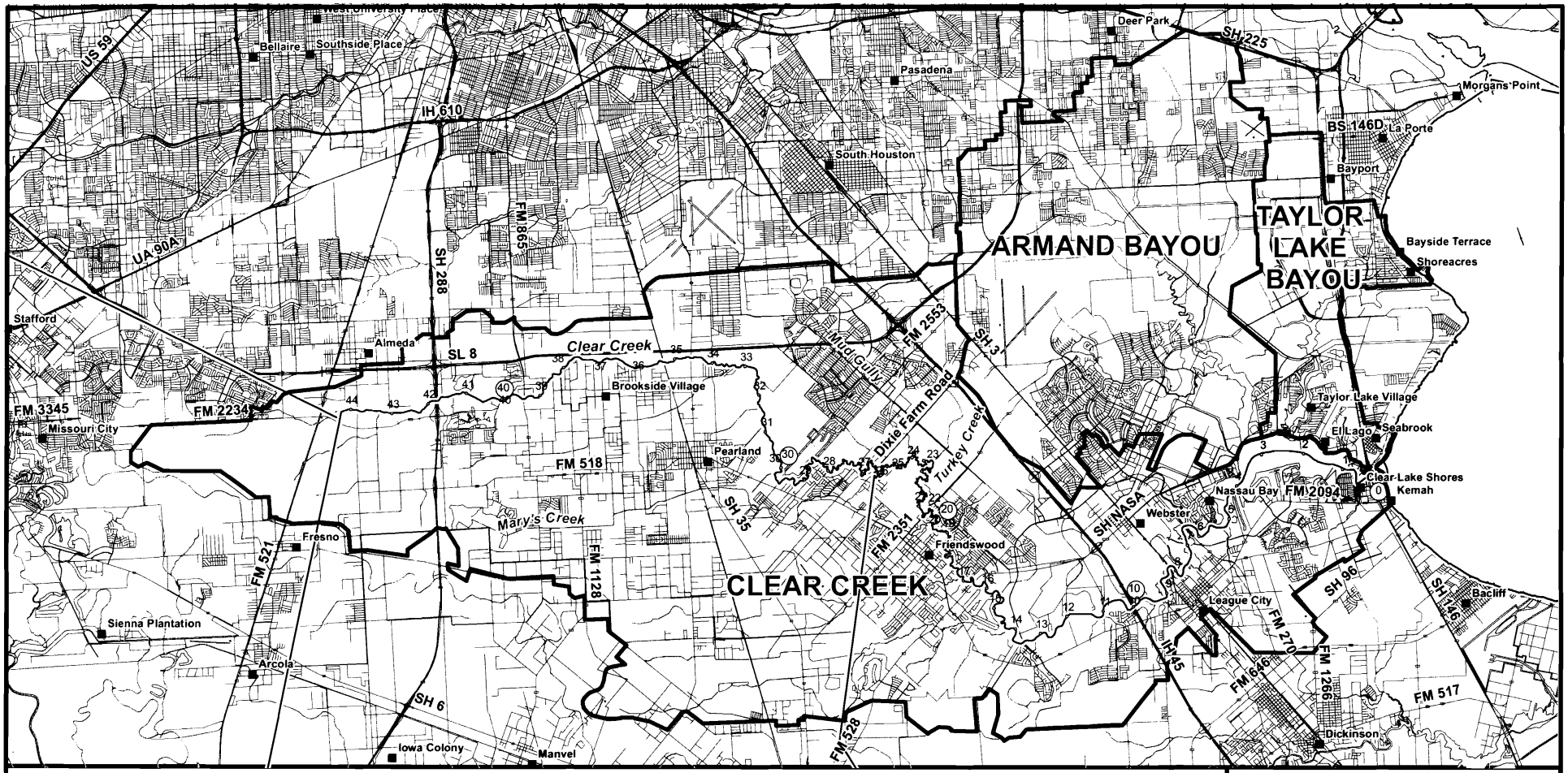
Sincerely,

Carolyn Murphy
Chief, Environmental Branch

Enclosure

Copy Furnished:

Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, TX 77551



PBSJ
6504 Bridge Point Pkwy, Ste. 200
Austin, Texas 78730
Phone: (512) 329-8342 Fax: (512) 327-2453

Study Area

Clear Creek Flood Control Project

Prepared for: USACE	
Job No.: 41886.00	Scale: 1in = 12,500ft
Prepared by: A.Christiansen	Date: 8/30/2007
File:N:/44188600/projects/study_area_vr2.mxd	

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Ave. South
St. Petersburg, FL 33701
(727) 824-5312, FAX (727) 824-5309
http://sero.nmfs.noaa.gov

F/SER3:TM

OCT - 2 2007

Ms. Carolyn Murphy
Chief, Environmental Branch
Department of the Army
Galveston District, Corps of Engineers
P.O. Box 1229
Galveston, TX 77553-1229

Dear Ms. Murphy:

This correspondence responds to the Department of the Army's letter dated September 24, 2007, regarding an Environmental Impact Statement to address proposed actions to manage flooding of Clear Creek which is south of Houston, Texas, and located in parts of Brazoria, Fort Bend, Harris and Galveston counties.

As requested, enclosed is a list of federally-protected species under the jurisdiction of the National Marine Fisheries Service for the state of Texas.

We look forward to continued cooperation with the Army in conserving our endangered and threatened resources. If you have any questions regarding the ESA consultation process, please contact Mr. Robert Hoffman, fishery biologist, at (727) 824-5312, or by e-mail at Robert.Hoffman@noaa.gov.

Sincerely,

David M. Bernhart
Assistant Regional Administrator
Protected Resources Division

Enclosure

File: 1514-22.F.1.TX

Endangered and Threatened Species and Critical Habitats
under the Jurisdiction of the NOAA Fisheries Service

Texas

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaengliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Threatened[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened	07/28/78
Fish			
smalltooth sawfish	*Pristis pectinata*	Endangered	04/01/03

Designated Critical Habitat
None

Species Proposed for Listing
None

Proposed Critical Habitat
None

[1] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered

Texas

Candidate Species[2]	Scientific Name
none	

Species of Concern[3]	Scientific Name
Fish	
dusky shark	*Carcharhinus obscurus*
largetooth sawfish	*Pristis pristis*
night shark	*Carcharhinus signatus*
saltmarsh topminnow	*Fundulus jenkinsi*
sand tiger shark	*Carcharias taurus*
speckled hind	*Epinephelus drummondhayi*
Warsaw grouper	*Epinephelus nigritus*
white marlin	*Tetrapturus albidus*
Invertebrates	
ivory bush coral	*Oculina varicosa*

[2] The Candidate Species List has been renamed the Species of Concern List. The term "candidate species" is limited to species that are the subject of a petition to list and for which NOAA Fisheries Service has determined that listing may be warranted (69 FR 19975).

[3] Species of Concern are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided.

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

January 26, 2009

REPLY TO THE ATTENTION OF
Environmental Section

Mr. Steve Parris
U.S. Fish and Wildlife Service
17629 El Camino Real, Suite 211
Houston, Texas 77058

Dear Mr. Parris:

This letter is in regard to the Clear Creek General Reevaluation Study, Brazoria, Fort Bend, Harris and Galveston Counties, Texas. The study addresses proposed flood risk management measures consisting of numerous conveyance and detention features on the main stem of Clear Creek and several tributaries to reduce flood damages in the upper extent of the Clear Creek watershed while preventing induced damages downstream. The plan also utilizes environmental features to reduce impacts while increasing acceptability of the project by the surrounding communities.

A number of threatened or endangered species were identified by your office and the National Marine Fisheries Service, and are addressed in the attached Biological Assessment (BA), which will be included as an appendix to the DEIS when it is released for review. Please review the enclosed BA for the proposed work.

It is our conclusion as documented in the BA that the project will have no effect on any federally-listed threatened or endangered species in the project area. I am hereby requesting your written concurrence, pursuant to 50 CFR 402.13, that the proposed action will have no effect on listed species or critical habitat under your jurisdiction.

We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act. Should you need additional information or have any questions please call Ms. Andrea Catanzaro at (409) 766-6346.

Sincerely,

Carolyn Murphy

Carolyn Murphy,
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

January 26, 2009

REPLY TO THE ATTENTION OF
Environmental Section

David M. Bernhart
Assistant RA for Protected Resources
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, Florida 33701

Dear Mr. Bernhart:

This letter is in regard to the Clear Creek General Reevaluation Study, Brazoria, Fort Bend, Harris and Galveston Counties, Texas. The study addresses proposed flood risk management measures consisting of numerous conveyance and detention features on the main stem of Clear Creek and several tributaries to reduce flood damages in the upper extent of the Clear Creek watershed while preventing induced damages downstream. The plan also utilizes environmental features to reduce impacts while increasing acceptability of the project by the surrounding communities.

A number of threatened or endangered species were identified by your office and the U.S. Fish and Wildlife Service, and are addressed in the attached Biological Assessment (BA), which will be included as an appendix to the DEIS when it is released for review. Please review the enclosed BA for the proposed work.

It is our conclusion as documented in the BA that the project will have no effect on any federally-listed threatened or endangered species in the project area. I am hereby requesting your written concurrence, pursuant to 50 CFR 402.13, that the proposed action will have no effect on listed species or critical habitat under your jurisdiction.

We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act. Should you need additional information or have any questions please call Ms. Andrea Catanzaro at (409) 766-6346.

Sincerely,

Carolyn Murphy

Carolyn Murphy,
Chief, Environmental Section

Enclosures
Copy Furnished (See Page 2)

CF:

Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551

Appendix D-2

Cultural Resources Correspondence

TEXAS HISTORICAL COMMISSION

The State Agency for Historic Preservation

RICK PERRY, GOVERNOR

JOHN L. NAU, III, CHAIRMAN

F. LAWERENCE OAKS, EXECUTIVE DIRECTOR

April 8, 2008

Jerry Androy
Corps of Engineers Galveston District
Regulatory Branch, CESWG-PE-PR
PO Box 1229
Galveston, Texas 77553-1229

Re: Project Review under the National Historic Preservation Act
Interim Report: Archeological Reconnaissance and Survey for the Clear Creek Flood Damage Reduction Project, Brazoria and Harris Counties, Texas
(COE-VD)

Dear Mr. Androy:

Thank you for providing our agency the above interim report. This letter serves as comment on the report and associated undertaking from the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission. The review staff has completed its review.

We concur with the conclusions of the interim report. We concur that 41HR162, -163, -164, -191, -192, and -1034 should all be considered not eligible for the National Register of Historic Places. More testing is needed at 41HR161. We look forward to reviewing a full draft report

It is our understanding that more work is needed in project areas not currently accessible. The next report of survey should state if buildings, bridges, or other structures over fifty years old could be affected anywhere in the project area, and provide, at minimum, photographs of such older structures.

We look forward to receiving a draft survey report. Thank you for your cooperation in this state review process, and for your efforts to preserve the irreplaceable heritage of Texas. **If you have any questions concerning our review or if we may be of further assistance, please contact Mr. Ed Baker at 512/463-5866.**

Sincerely,

for
F. Lawerence Oaks, Sate Historic Preservation Officer
FLO/elb

cc: Carolyn Murphy, COE Galveston; Karl Kibler, Prewitt and Associates, Austin

Appendix D-3

Prime Farmlands Correspondence

Bulger, Angela G

From: Killian, James P
Sent: Friday, April 11, 2008 1:57 PM
To: Kiniry, Laurie - Temple, TX
Cc: andrea.catanzaro@usace.army.mil; Bulger, Angela G
Subject: FW: Prime Farmlands Correspondence
Attachments: ccreek.pdf; prime_farmland_prj_feat_vr2 (2).pdf; project_features_map_JKillian.pdf

April 11, 2008

Ms. Laurie Kiniry
Natural Resources Conservation Service
101 South Main Street
Temple, TX 76501

Dear Ms. Kiniry,

On behalf of the USACE, please find attached the farmland conversion impact rating form AD 1006 for the proposed Clear Creek Flood Damage Reduction Project located immediately southeast of Houston, Texas. Also attached are two of our figures displaying the project features with designated prime farmland areas by soil series and feature type (drainage ways, placement areas including sand pits, detention ponds, and mitigation areas). If you have any questions, please contact me or Angela Bulger.

Sincerely,

James P. Killian, PG
Senior Geologist
PBS&J
6504 Bridge Point Parkway, Suite 200
Austin, Texas 78730
(512) 342-3359 Direct
(512) 925-0460 Cell
(512) 327-6840 Receptionist
(512) 327-2453 FAX
jpkillian@pbsj.com

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 4/7/08
Name Of Project Clear Creek Flood Damage Reduction Project	Federal Agency Involved USACE
Proposed Land Use flood control	County And State Brazoria, Harris, and Galveston Countis, Texas
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☐	No ☐	Acres Irrigated	Average Farm Size
Major Crop*(s)*	Farmable Land In Govt. Jurisdiction Acres: %		Amount Of Farmland As Defined in FPPA Acres: %	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System		Date Land Evaluation Returned By NRCS	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	675.9	630.8	386.7	373.4
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	675.9	630.8	386.7	373.4
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	0	0	0	0
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)* — Maximum Points				
1. Area In Nonurban Use	5	5	5	5
2. Perimeter In Nonurban Use	5	5	5	5
3. Percent Of Site Being Farmed	10	15	15	15
4. Protection Provided By State And Local Government	20	20	20	20
5. Distance From Urban Builtup Area	5	5	5	5
6. Distance To Urban Support Services	5	5	5	5
7. Size Of Present Farm Unit Compared To Average	5	5	5	5
8. Creation Of Nonfarmable Farmland	0	5	5	5
9. Availability Of Farm Support Services	5	5	5	5
10. On-Farm Investments	5	5	5	5
11. Effects Of Conversion On Farm Support Services	5	5	5	5
12. Compatibility With Existing Agricultural Use	5	5	5	5
TOTAL SITE ASSESSMENT POINTS (160)	75	85	85	85
PART VII *(To be completed by Federal Agency)*				
Relative Value Of Farmland *(From Part V)* (100)	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)* (160)	75	85	85	85
TOTAL POINTS *(Total of above 2 lines)* (260)	75	85	85	85

Site Selected: A,B,C,and D	Date Of Selection 4/7/08	Was A Local Site Assessment Used? Yes ☐ No ■

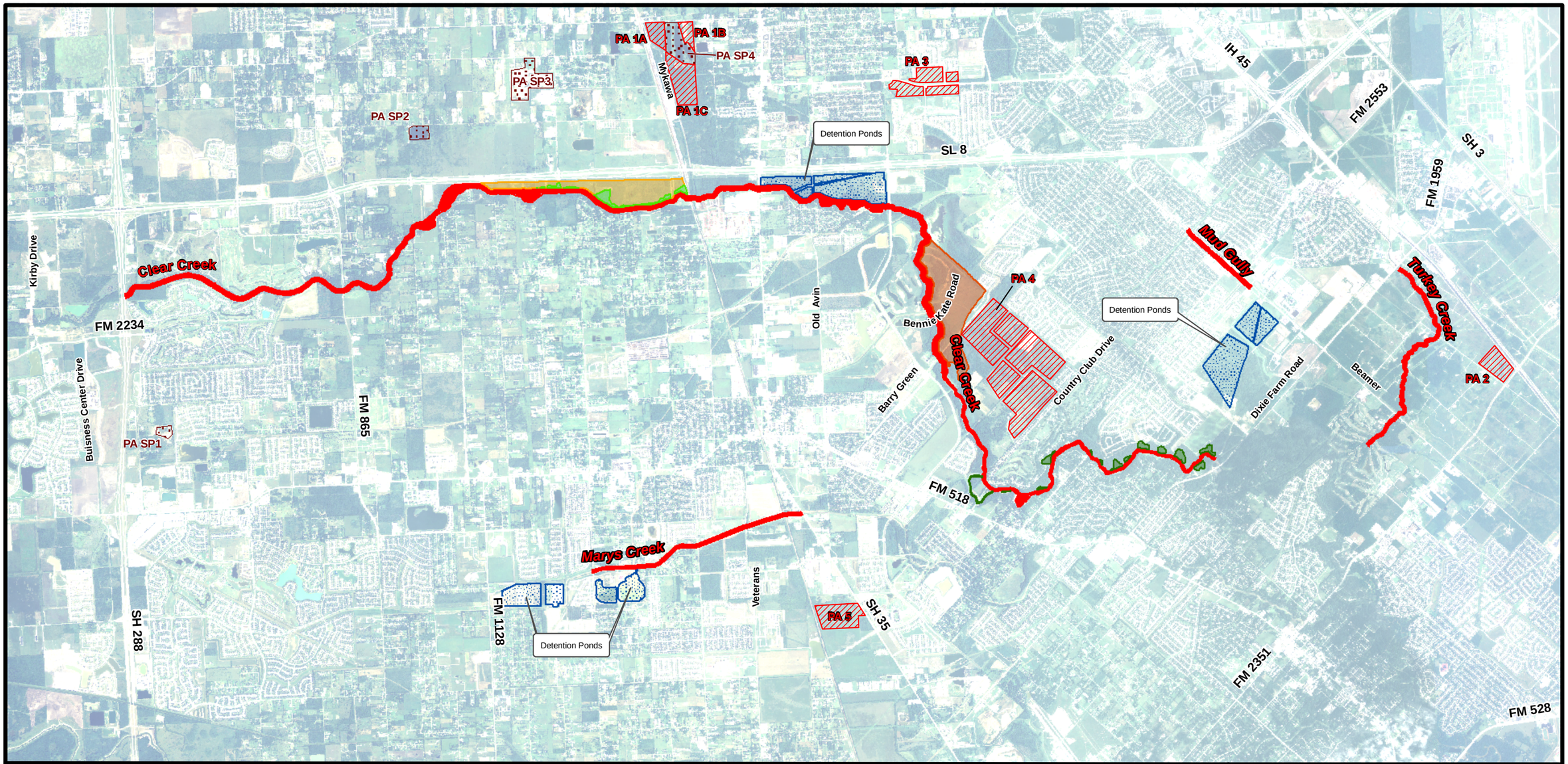
Reason For Selection: Proposed channel improvement for flood control.

Site A: Total of (4) drainage ways; Clear Creek, Mary's Creek, Turkey Creek and Mud Gully.

Site B: Placement Areas including sand pits.

Site C: Detention Ponds

Site D: Mitigation Areas



Key

- Conveyance and Protected Riparian Habitat Corridor (A)
- Detention Ponds (C)
- Placement Areas (B)
- Sand Pit Placement Areas (B)

Mitigation Areas (D):

- Forest, A1
- Forest, C1
- Prairie, A1b
- Prairie, X1b

0 5,000 10,000 Feet

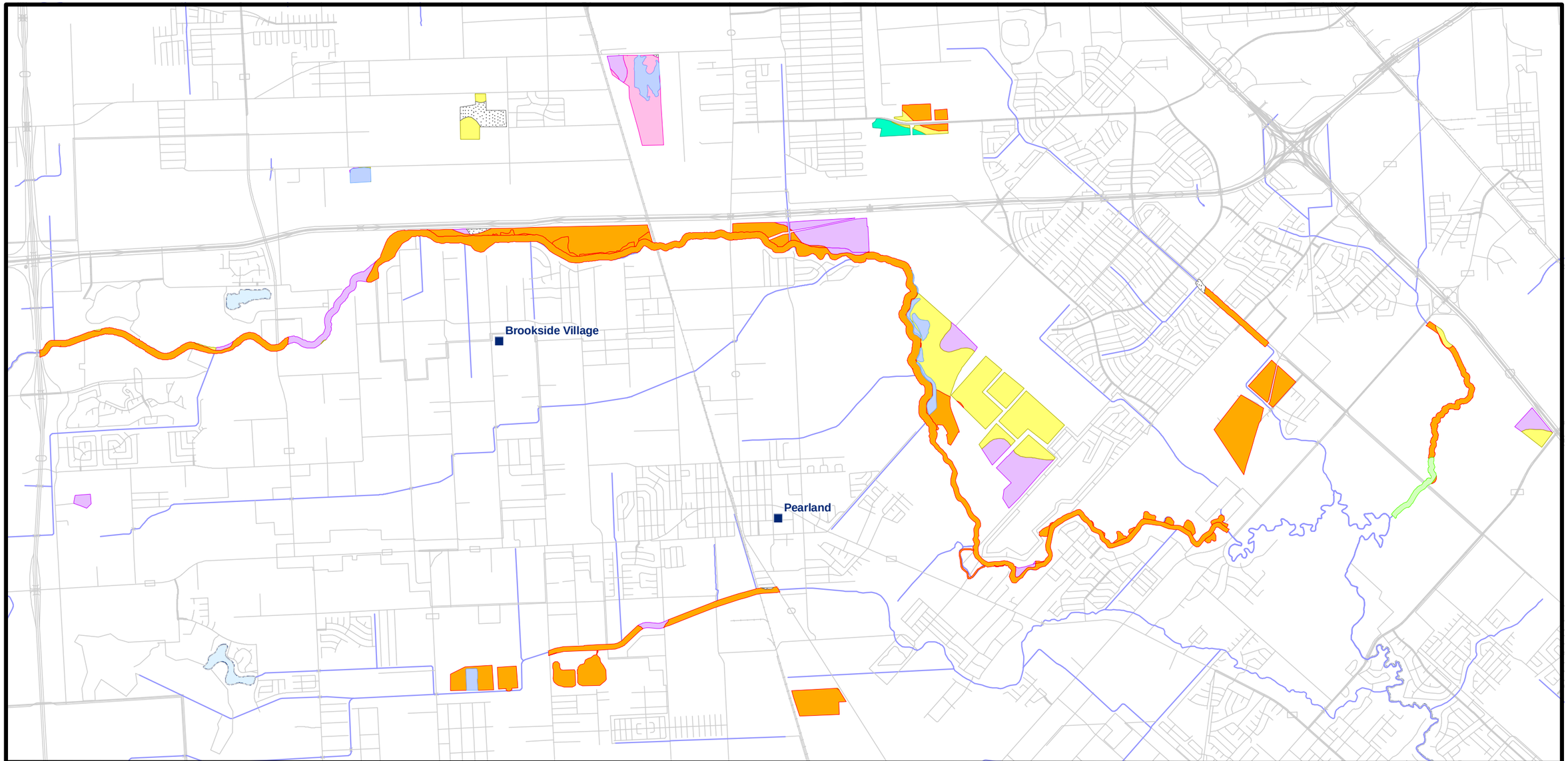
N W E S

Project Area

Clear Creek Project

Prepared for: USACE Galveston	
Job No.: 044188600	Scale: 1inch equals 5,000 feet
Prepared by: A. Christiansen	Date: 04/07/2008

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/044188600/figures/study_prj_area/project_features_map_JKillian.mxd



Prime Farmland:

- LAKE CHARLES CLAY, 1 TO 3 PERCENT SLOPES
- LAKE CHARLES CLAY, 0 TO 1 PERCENT SLOPES
- BERNARD-EDNA COMPLEX
- BERNARD CLAY LOAM

Prime Farmland when Drained:

- GESSNER COMPLEX
- ARIS-GESSNER COMPLEX

Not Prime Farmland:

- WATER
- LAKE CHARLES-URBAN LAND COMPLEX
- EDNA FINE SANDY LOAM
- BERNARD-URBAN LAND COMPLEX

N W E S

0 0.5 1 2 Miles

PBS&J
6504 Bridge Point Pkwy, Ste. 200
Austin, Texas 78730
Phone: (512) 329-8342 Fax: (512) 327-2453

Figure XX

Prime Farmland within Project Features Clear Creek Flood Control Project

Prepared for: USACE	
Job No.: 441886.00	Scale: 1inch = 12,000 feet
Prepared by: C. W/RC/A.C.	Date: 4/04/2008

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/044188600/figures/prime_farmland_prj_feat_vr2.mxd

United States Department of Agriculture
NRCS
Natural Resources Conservation Service

101 S. Main Street
Temple, TX 76501-6624
Phone: 254-742-9861
FAX: 254-742-9859

April 24, 2008

PBS&J
6504 Bridge Point Parkway, Suite 220.
Austin, Texas 78730-5091

Attention: James P. Killian, PG, Senior Geologist

Subject: LNU--Farmland Protection
Proposed Clear Creek Flood Damage Reduction Project
Brazoria, Harris, and Galveston Counties, Texas

We have reviewed the information provided concerning the proposed Clear Creek Flood Damage Reduction Project in Brazoria County, Harris, and Galveston Counties, Texas, as outlined in your email of April 11, 2008. This is part of the National Environmental Policy Act (NEPA) evaluation for the U.S. Army Corps of Engineers. We have evaluated the proposed area as required by the Farmland Protection Policy Act (FPPA).

The proposed project does contain soils classified as Important Farmland at each of the four categories of sites: creek channels, spoil placement areas and sand pits, detention ponds, and mitigation areas. We have completed Parts II, IV, and V of the Farmland Conversion Impact Rating form (AD-1006) that you provided to us. Each of the sites had a combined score of over 160 points. Please refer to the FPPA Rule 401.24, sec. 658.4 for guidance on sites receiving scores totaling 160 points or more.

We have attached the completed AD-1006 form for this project. Thank you for the resource materials you submitted to help in our evaluation. If you have any questions please call Laurie Kiniry at (254) 742-9861, Fax (254)-742-9859.

Sincerely,

Laurie Kiniry

Laurie N. Kiniry
Soil Scientist

Enclosure

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 4/7/08
Name Of Project Clear Creek Flood Damage Reduction Project	Federal Agency Involved USACE
Proposed Land Use flood control	County And State Brazoria, Harris, and Galveston Countis, Texas
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 4/11/08

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply – do not complete additional parts of this form).*	Yes	No	Acres Irrigated	Average Farm Size
	☑	☐	B: 17,138 H: 7,295	B: 250 H: 124

Major Crop(s)	Farmable Land In Govt. Jurisdiction	Amount Of Farmland As Defined in FPPA
Grain Sorghum	Acres: B: 752,100 84% H: 820,200 74%	Acres: B: 709,538 79% H: 769,800 69%

Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By NRCS
LESA	none	4/24/08

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	675.9	630.8	386.7	373.4
B. Total Acres To Be Converted Indirectly				
C. Total Acres In Site	675.9	630.8	386.7	373.4
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland	671.9	190	386.7	232.4
B. Total Acres Statewide And Local Important Farmland	4.0	413	0	112.3
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted	.04	.04	.02	.02
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value	12	16	12	16
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	ø 100	ø 83	ø 100	ø 89

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use		5	5	5	5
2. Perimeter In Nonurban Use		5	5	5	5
3. Percent Of Site Being Farmed		10	15	15	15
4. Protection Provided By State And Local Government		20	20	20	20
5. Distance From Urban Builtup Area		5	5	5	5
6. Distance To Urban Support Services		5	5	5	5
7. Size Of Present Farm Unit Compared To Average		5	5	5	5
8. Creation Of Nonfarmable Farmland		0	5	5	5
9. Availability Of Farm Support Services		5	5	5	5
10. On-Farm Investments		5	5	5	5
11. Effects Of Conversion On Farm Support Services		5	5	5	5
12. Compatibility With Existing Agricultural Use		5	5	5	5
TOTAL SITE ASSESSMENT POINTS	160	75	85	85	85
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	ø 100	ø 83	ø 100	ø 89
Total Site Assessment *(From Part VI above or a local site assessment)*	160	75	85	85	85
TOTAL POINTS *(Total of above 2 lines)*	260	~~75~~ 175	~~85~~ 168	~~85~~ 185	~~85~~ 174

Site Selected: A,B,C,and D	Date Of Selection 4/7/08	Was A Local Site Assessment Used? Yes ☐ No ■

Reason For Selection: Proposed channel improvement for flood control.

Site A: Total of (4) drainage ways; Clear Creek, Mary's Creek, Turkey Creek and Mud Gully.

Site B: Placement Areas including sand pits.

Site C: Detention Ponds

Site D: Mitigation Areas

(See Instructions on reverse side)

Form AD-1006 (10-83)

This form was electronically produced by National Production Services Staff

B= Brazoria County
H= Harris County

Bulger, Angela G

From: Bulger, Angela G
Sent: Friday, December 05, 2008 4:56 PM
To: Kiniry, Laurie - Temple, TX
Cc: Catanzaro, Andrea SWG
Subject: USACE Requested Revision to Natural Resource Conservation Service (NRCS) LNU-Farmland Protection; Proposed Clear Creek Flood Risk Management Project; Brazoria, Harris and Galveston Counties, Texas
Attachments: AD1006.pdf; Figure 2.pdf; Figure 1r.pdf

Dear Ms. Kiniry,

I am submitting this revised information on behalf of the U.S Army Corps of Engineers (USACE) for the above referenced Clear Creek Flood Risk Management Project. This information is being submitted because of new project information that has become available since the last AD-1006 form was submitted in April, 2008. Attached is the revised completed form AD-1006 for your review and completion.

The Clear Creek General Reevaluation Study is a flood damage reduction project that includes conveyance and detention features and mitigation areas (Figure 1). Previously, placement areas were included in the analysis. However, it has come to the attention of the USACE that several of the proposed placement areas have undergone development and are no longer available for placement of material. Therefore, until new placement areas are identified during final planning stages, they are omitted from consideration.

A review of information available online indicated that the majority of the project footprint (including the entire conveyance feature) occurs in areas identified as Urban that are exempt from the Farmland Protection Policy Act. Exempt urban areas were identified using the NRCS USDA Web Soil Survey available online at http://websoilsurvey.nrcs.usda.gov, accessed 25 November, 2008 (Figure 2).

Three project features occur within non-exempt areas. These features are included on the revised form AD-1006. Two of the features are mitigation sites that would be ecologically enhanced for wet coastal prairie or forest community and protected from future development or agricultural use. The third site is a detention feature adjacent to Mud Gully. It should be noted that approximately 88 percent of this site occurs in an area that was previously a residential neighborhood that was evacuated and demolished over 20 years ago as part of the clean up for a Superfund Site. Since that time, the area has been allowed to revegetate.

The USACE appreciates your timely review of this important flood risk management project located along Clear Creek, and we look forward to your concurrence with these proposed prime farmland impacts. Please contact me at your earliest convenience if you have any questions concerning this proposed project or the scoring provided on the AD-1006. I can be reached at 512-342-3388. Thank you for your input and assistance last month with this project. I appreciate your time.

Sincerely,

Angela G. Bulger
PBS&J
Project Manager
Central Sciences & Planning Division
6504 Bridge Point Parkway, Suite 200
Austin, TX 78730
Phone: 512-342-3388
Fax: 512-327-2453
agbulger@pbsj.com

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request
Name Of Project: Clear Creek General Reevaluation Study	Federal Agency Involved: USACE, Galveston District
Proposed Land Use: Flood Damage Reduction	County And State: Harris and Brazoria Counties, Texas
PART II *(To be completed by NRCS)*	Date Request Received By NRCS

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).* Yes ☐ No ☐		Acres Irrigated	Average Farm Size
Major Crop*(s)*	Farmable Land In Govt. Jurisdiction Acres: %	Amount Of Farmland As Defined in FPPA Acres: %	
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By NRCS	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	46.0	31.0	120.0	
B. Total Acres To Be Converted Indirectly	171.0	0.0	0.0	
C. Total Acres In Site	217.0	31.0	120.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*	0	0	0	0

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Nonurban Use	15	2	6	3	
2. Perimeter In Nonurban Use	10	6	3	0	
3. Percent Of Site Being Farmed	20	4	0	0	
4. Protection Provided By State And Local Government	20	0	0	0	
5. Distance From Urban Builtup Area	15	0	0	0	
6. Distance To Urban Support Services	15	0	0	0	
7. Size Of Present Farm Unit Compared To Average	10	10	0	9	
8. Creation Of Nonfarmable Farmland	10	0	0	0	
9. Availability Of Farm Support Services	5	3	3	3	
10. On-Farm Investments	20	1	0	1	
11. Effects Of Conversion On Farm Support Services	10	0	0	0	
12. Compatibility With Existing Agricultural Use	10	0	0	0	
TOTAL SITE ASSESSMENT POINTS	160	26	12	16	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	26	12	16	0
TOTAL POINTS *(Total of above 2 lines)*	260	26	12	16	0

Site Selected: A, B, C	Date Of Selection 11/25/08	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

Site A: 217 acre mitigation area X1.

Site B: 31 acre mitigation area C1.

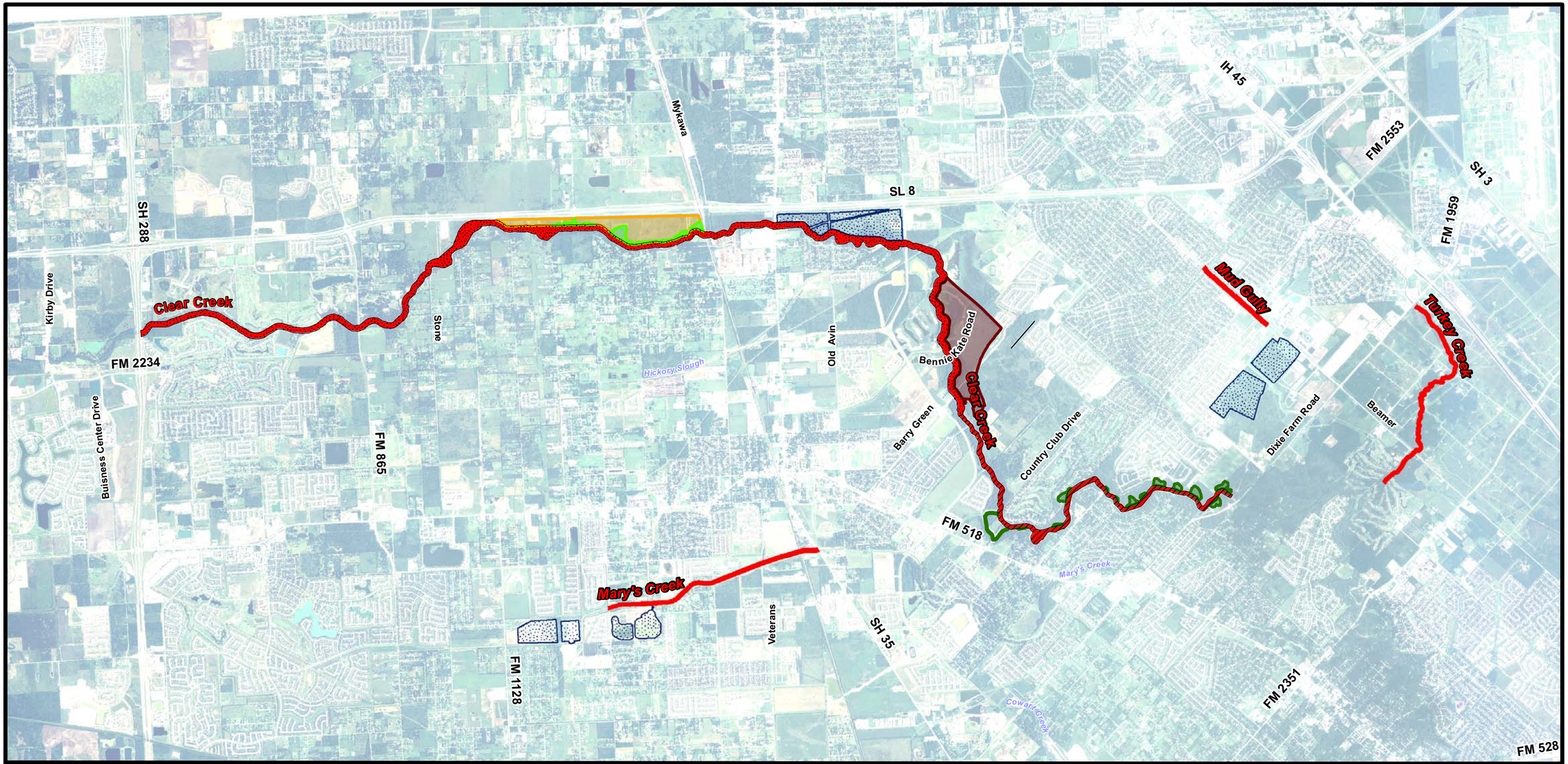
Site C: 120 acre storm water detention area (Mud Gully Detention).

(See Instructions on reverse side)

This form was electronically produced by National Production Services Staff

Clear Form

Form AD-1006 (10-83)



Key

- Conveyance and Protected Riparian Habitat Corridor
- Detention Ponds
- Super C(d) Mainstem Measure
- C5(d) Mainstem Measure

Mitigation Features:

- Floodplain Forest A1
- Floodplain Forest C1
- Wet Coastal Prairie A1b
- Wet Coastal Prairie X1b

N W E S

0 5,000 10,000 Feet

Figure 1

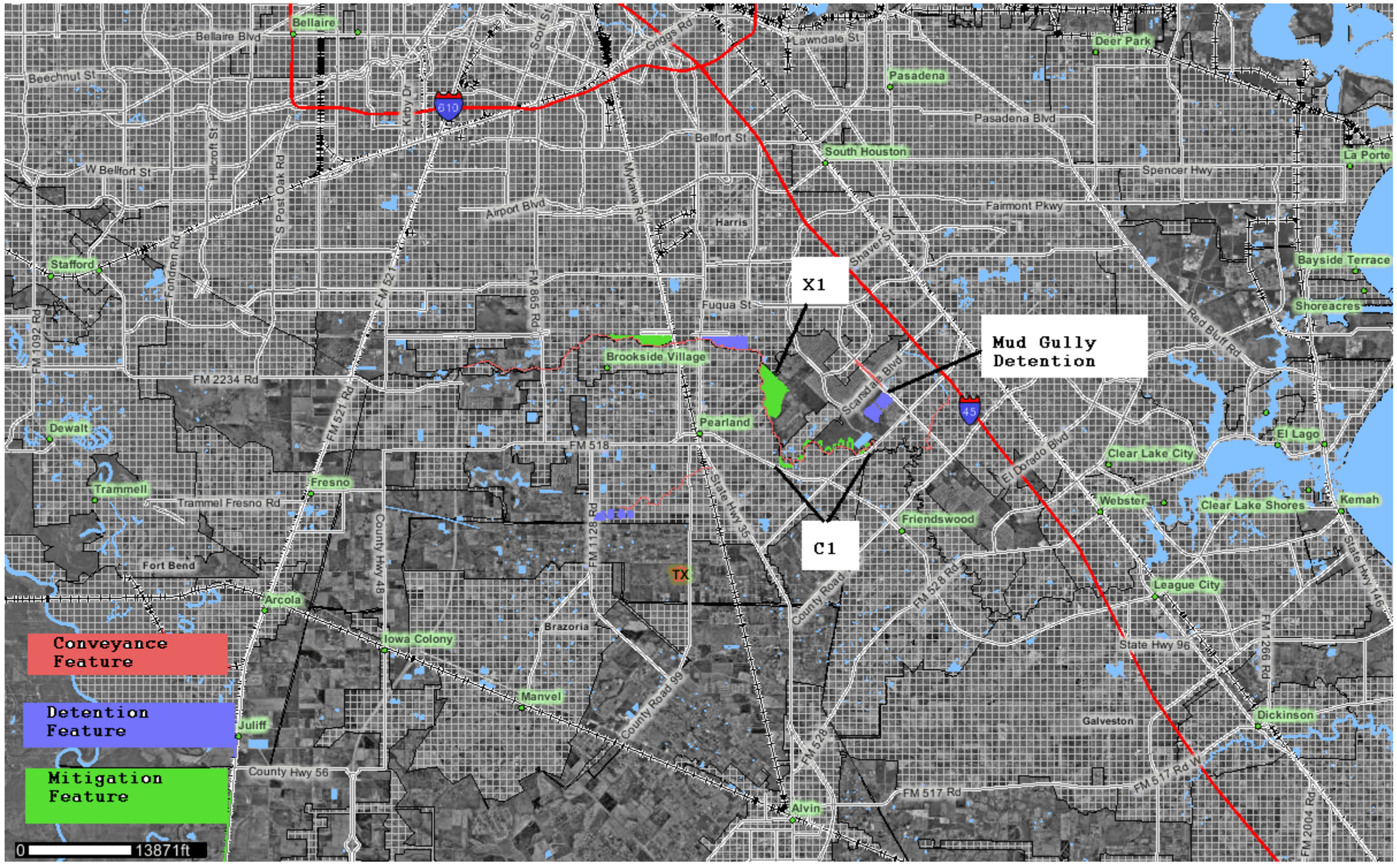
Project Features of the GRP Alternative

Clear Creek Project

Prepared for: USACE	
Job No.: 100002202	Scale: 1in = 5000 ft
Prepared by: AC/DR	Date: 12/05/2008

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/100002202/project_features_vr6.mxd

Clear Creek Project - Project Features in Exempt and Non-Exempt Areas



Source: Survey Staff, NRCS, USDoA. Web Soil Survey. Availablbe online at http://websoilsurvey.nrcs.usda.gov/accessed 25 November, 2008.

Appendix D-4

General Correspondence

The following informational request letter, dated June 1, 2001, was sent to the following State and Federal agencies:

Mr. Rusty Swafford	NMFS, Habitat Conservation Division
Mr. Eddie Seidensticker	NRCS
Mr. Mark Fisher	TNRCC, Water Planning and Assessment
Mr. Jarrett O. Woodrow	TPWD
Mr. Carlos Mendoza	USFWS
Mr. Gary D. McMahan	Texas GLO

Responses that were received in response to these letters also follow.

BAKER/3037
1 Jun 2001

June 1, 2001

Environmental Section

MURPHY
PE-PR

Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551

MAIL

Dear Mr. Swafford:

The Galveston District is currently studying flood reduction and environmental restoration opportunities within the Clear Creek Watershed, in Brazoria, Galveston, and Harris Counties, Texas. Priority has been given in the study to identifying measures for flood damage reduction that would provide environmental restoration benefits. Such measures could include expanding the floodplain and returning the natural vegetation to slow the flow of water and provide additional storage capacity. Additional opportunities for environmental restoration not associated with flood damage reduction measures are also being explored.

To increase the effectiveness of our study we are requesting your assistance in identifying specific flood reduction measures that would provide environmental restoration benefits and any additional environmental restoration opportunities that you see in the watershed. You may provide your suggestions by letter, e-mail, or telephonically to Mr. John Baker at (409) 766-3037, e-mail: john.c.baker@swg02.usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051
281/286-8282 / (FAX) 281/488-5882

June 15, 2001

John Baker
Galveston District, Army Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553

Dear Mr. Baker:

This letter is in response to your letter of June 1, 2001, requesting our assistance in identifying specific flood reduction measures that would provide environmental benefits in the Clear Creek Watershed, located in Harris, Brazoria and Galveston Counties, Texas.

On May 15, 2001, Ms. Brown and Mr. Baker, (Corps of Engineers), Mr. Kocurek (Clear Creek Drainage District), Mr. McCullough (Harris County Drainage District), Mr. Yost and Mr. Brennan (Brazoria County Drainage District), and Mr. Morgan (U.S. Fish and Wildlife Service) (Service) reconnoitered the portion of Clear Creek, from FM 2351 (Stream Mile 21.0) to the Fort Bend County line (Stream Mile 44.5), and discussed the following, proposed and on-going actions, to reduce flooding:

1) Clear Creek and Brazoria Drainage Districts have maintained Clear Creek and its 3 tributaries-Mary's (Stream Mile 20.0)-Chigger (Stream Mile 14.7)-Cowards (Stream Mile 17.7) by de-snagging, channel armoring, constructing high-flow channels, and detention ponds. If development continues in the flood plain (i.e. Forests of Friendswood, Silver Lake and Scarsdale Sections), flooding will increase. The Service recommends that the County and State leadership officials explore regulatory measures to limit future development in the flood plain.

2) There is a proliferation of detention pond construction as a means of solving flood problems within the flood plain. Examples include: Clear Creek Stream Mile 33.0 for SH 35, Clear Creek Stream Mile 32.5 for future development, and the aforementioned subdivisions of Friendswood (Steam Mile 21.5), Silver Lake (Stream Mile 29.5), and Scarsdale (Stream Mile 30.0). In addition, the roadbed for Pearland Parkway is in place, removing viable flood plain areas that would also result in construction of yet another detention pond.

3) We understand a golf course is planned for the east side of the Scarsdale to Beltway 8 section of Clear Creek (Stream Mile 30.0 to Stream Mile 33.0), and also a large development for the west side of Clear Creek in the same area. This area was leveed as a rice field reservoir, and portions have become wetlands. The Service recommends that these areas be restored to the flood plain by

removing the streamside spoil banks. This will provide increased retention, and also provide fish and wildlife habitat, and recreational opportunities in its restored state.

4) Between Stream Mile 26.5 to 30.0, there are areas with development on one side (some overgrown banks), while the other side is undeveloped, disturbed, and tallow infested. Between Stream Mile 21.5 and 26.5, there are remnant channels, backwater areas, and oxbows which are also blocked by spoil banks. The Service recommends removal of the spoil banks to allow the rapid storage of flood waters and the subsequent slow runoff of retained flood waters. These areas can later be planted with native tree species.

5) A particularly large (high) spoil bank (200-feet by 300-feet) used as a maintenance berm is located at Stream Mile 30.2. This could be removed to expand the flood plain.

The U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department, in conjunction with the Texas A & M Extension Service are preparing maps of those areas of the Clear Creek watershed considered as valuable native fish and wildlife habitat. We recommend these areas be avoided by future structural flood control features, including detention ponds.

If you have any questions or if we can be of further assistance, please contact Mike Morgan at 281/286-8282.

Sincerely,

Carlos H. Mendoza
Project Leader, Clear Lake ES Field Office

cc: TPWD, Attn: W. Woodrow
1322 Space Park Drive; B 180
Nassau Bay, Texas 77058

PBS&J
1880 S. Dairy Ashford, Suite 300
Houston, Texas 77077-4760

The following letter, dated December 2, 2008, was sent to the following recipients:

Ms. Sharon Parish, Section Chief	EPA, Marine and Wetlands Section
Ms. Helen E. Drummond	Galveston Bay Estuary Program
Mr. Steve Parris	USFWS
Ms. Jody Henneke	Texas GLO, Coastal Resources Program
Mr. Donald Gohmert	USDA, NRCS
Ms. L'Oreal W. Stepney	TCEQ
Mr. Rusty Swafford	NMFS, Habitat Conservation Division
Ms. Rebecca Hensley	TPWD, Coastal Fisheries Division

Letters received in response to these letters also follow.

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 2, 2008

REPLY TO THE ATTENTION OF

Environmental Branch

Ms. Sharon Parrish, Section Chief
Marine and Wetlands Section
Ecosystems Protection Branch
USEPA REGION 6
6WQEM
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Dear Ms. Parrish:

The Galveston District, Corps of Engineers and our non-federal sponsors, the Harris County Flood Control District, Brazoria County Drainage District #4, and Galveston County, would like to invite your agency to participate as a cooperating agency in the development of an Environmental Impact Statement (EIS) for the Clear Creek General Reevaluation Study. Flood risk management measures consisting of numerous conveyance and detention features on the main stem of Clear Creek and several tributaries are being proposed to reduce flood damages in the upper extent of the Clear Creek watershed while preventing induced damages downstream. The plan also utilizes environmental features to reduce impacts while increasing acceptability of the project by the surrounding communities. Environmental affects are being analyzed for floodplain forest (including Clear Creek, its tributaries and the adjacent riparian and coastal flatwood environments) and wet coastal prairie located within the floodplain of the Clear Creek watershed. The Draft EIS is currently scheduled for publication in the summer of 2009.

We are required by the Council on Environmental Quality (CEQ) Regulations for Implementing the National Environmental Policy Act (NEPA) (40 CFR Part 1501.6) and subsequent policy guidance to invite all agencies with "jurisdiction by law" or who have "special expertise with respect to any environmental issue" to participate in the preparation of our National Environmental Policy Act (NEPA) documents as cooperating agencies. Previously, we understood that inviting your participation in our Clear Creek Interagency Coordinating Team informally accomplished the substance of this requirement. However, we are now required to send a written request to each agency to participate as a cooperating agency; those that agree will be identified on the cover page of the Clear Creek EIS.

We request that you provide a written response to this invitation. For non-federal agencies which agree to become a cooperating agency, we will develop a memorandum of agreement to formalize expected roles and responsibilities. If you should have any questions regarding this request, please contact Andrea Catanzaro of my staff at (409) 766-6346.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Buddy Garcia, *Chairman*
Larry R. Soward, *Commissioner*
Bryan W. Shaw, Ph.D., *Commissioner*
Mark R. Vickery, P.G., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

December 15, 2008

Ms. Carolyn Murphy
Chief, Environmental Section
Galveston District
U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Re: Clear Creek General Reevaluation Environmental Impact Study

Dear Ms. Murphy:

The Texas Commission on Environmental Quality (TCEQ) has received your December 2, 2008 invitation to participate as a cooperating agency in the development of an Environmental Impact Study (EIS) for the Clear Creek General Reevaluation Study. As your letter points out the Texas Commission on Environmental Quality (TCEQ) has been participating in the evaluation of options for this project as part of the Interagency Coordination Team. The TCEQ will continue to provide input, review, and comments on portions of the document that are relevant to our Section 401 Water Quality Certification evaluation. Mr. Gregg Easley of the TCEQ Water Quality Assessment Section has been assigned to this task.

The TCEQ appreciates the opportunity to play a part in the Clear Creek General Reevaluation EIS process and looks forward to continuing in this role. If you have any questions or need further clarification, please contact Mr. Easley by e-mail at *geasley@tceq.state.tx.us* or by telephone at (512) 239-4539.

Sincerely,

L'Oreal W. Stepney, P.E., Director
Water Quality Division

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051
281/286-8282 / (FAX) 281/488-5882

December 19, 2008

Carolyn Murphy
Chief, Environmental Section
Galveston District, Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Dear Ms. Murphy:

Thanks you for your letter dated December 2, 2008 requesting a written response to an invitation to participate as a cooperating agency in the development of an Environmental Impact Statement for the Clear Creek General Reevaluation Study. The U.S. Fish and Wildlife Service would welcome the opportunity to participate in and provide guidance through the Clear Creek Interagency Coordination Team, but is not able to be a cooperating agency at this time.

If you have any questions, or need additional information, please contact Donna Anderson at 281/286-8282.

Sincerely,

for Stephen D. Parris
Field Supervisor, Clear Lake ES Field Office

TAKE PRIDE IN AMERICA

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF
Environmental Section

May 12, 2010

Ms. Teresa Bruner
Southwest Region Regional Administrator
Federal Aviation Administration
Southwest Region
2601 Meacham Boulevard
Fort Worth, TX 76137-4298

Dear Ms. Bruner:

The US Army Corps of Engineers, Galveston District, with the Harris County Flood Control District (HCFCD), Brazoria County Drainage District #4 and Galveston County (acting as the non-Federal sponsors), have undertaken a study to re-evaluate the Clear Creek Flood Risk Management Project, as authorized by Congress in the Flood Control Act of 1968. Clear Creek is located south of the City of Houston and is included in parts of Harris, Galveston, Brazoria, and Fort Bend counties. A preliminary draft supplemental environmental impact statement has identified a Preferred Alternative that includes conveyance and mitigation measures on or adjacent to Clear Creek from SH 288 to Dixie Farm Road, and on portions of three tributaries: Mud Gully, Turkey Creek, and Mary's Creek. Included with this letter is a figure showing the perimeters around the air operations area (AOA) of 5,000 feet, 10,000 feet, and 5 miles surrounding the five airports (Ellington Field, Houston-Southwest, La Porte Municipal, William P. Hobby, and Pearland Regional) that are located within or near the study area (Figure 1).

Upon review of FAA AC 150/5200-33, we have determined that certain conveyance and mitigation features of the Preferred Alternative occur within 10,000-foot and/or 5-mile perimeter of the Houston P. Hobby Airport, Ellington Field Airport, and Pearland Regional Airport. These conveyance and mitigation features involve preserving and rehabilitating 184 acres of existing floodplain forest and re-establishing 33 acres of previously existing floodplain forest within the riparian corridor of Clear Creek. However, the proposed features would not result in a net change of current land use in and around the AOAs for these airports, as no habitat would be created where it does not or did not exist when these airports were established. Thus, the proposed project is not expected to introduce new hazardous wildlife attractants. Neither the La Porte Municipal Airport nor the Houston-Southwest Airport includes any of the project features within the AOA perimeters.

Based upon this information presented above, we are requesting written confirmation from the Federal Aviation Administration that the Clear Creek Flood Risk Management Project would not increase the bird strike hazard at Houston P. Hobby Airport, Ellington Field Airport, and Pearland Regional Airport. If you have any questions regarding the project, please contact Ms. Andrea Catanzaro at (409) 766-6346.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

December 15, 2010

Environmental Section

David M. Bernhart
Assistant RA for Protected Resources
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, FL 33701

Dear Mr. Bernhart:

Enclosed please find a paper copy and CD of the Draft Environmental Impact Statement (DEIS) for the Proposed Freeport Harbor Channel Improvement Project, Brazoria County, Texas. This draft report is provided for your agency review pursuant to coordination required under the Endangered Species Act. DEIS Sections 3.15, 4.13 and Appendix I (Draft Biological Assessment) provide information specifically related to existing endangered species in the project area and potential project impacts.

We have prepared a Biological Assessment (BA) for the proposed work as listed species are present within the project area. A description of the proposed project is provided in the BA. We have concluded that the proposed project is likely to adversely affect the federally-listed endangered Hawksbill, Kemp's ridley and Loggerhead sea turtles, the threatened Green sea turtle, and may affect but is not likely to adversely affect the threatened Leatherback sea turtle. The likelihood of adverse effects (incidental take) of sea turtles due to hopper dredging activities would be greatly reduced by implementation and adherence to conservation measures. Adverse effects are not expected to jeopardize the continued survival or recovery of the species. The proposed project will have no effect on federally-listed endangered whales or the endangered Smalltooth sawfish.

Since the proposed project may affect Federally-listed species, we request initiation of formal consultation pursuant to 50 CFR 402.14, to evaluate the effects of the proposed project on threatened and endangered sea turtles. In accordance with Section 402.14(g)(5), we also request that a draft biological opinion be prepared.

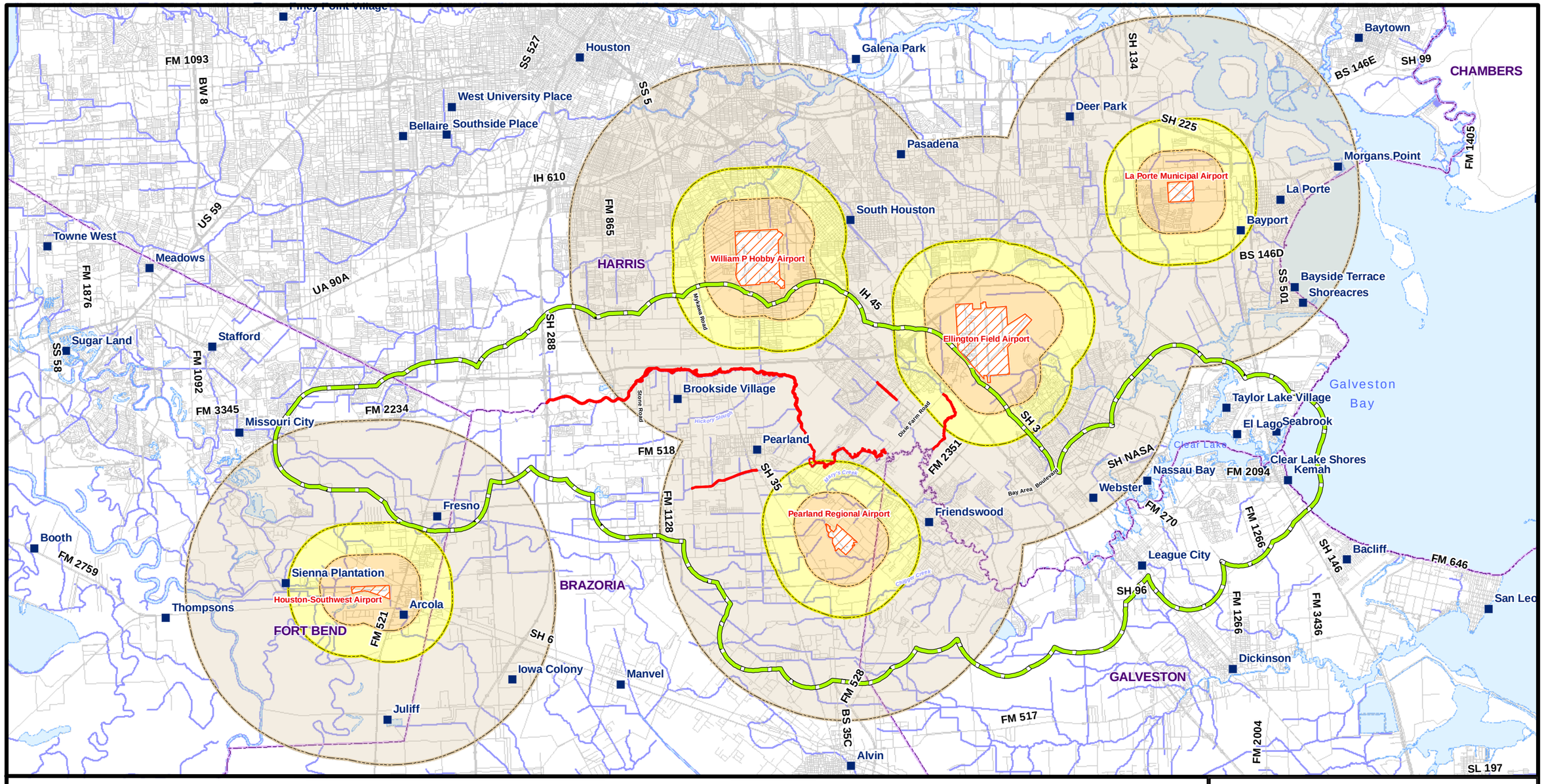
We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act. Should you require any additional information during review of the enclosed BA, please call Ms. Janelle Stokes at 409/766-3039.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

CF:
Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551



PBS&J • Engineering • Environmental Consulting • Sur

Figure 1

Airport Locations FAA AOA

Clear Creek Flood Risk Management Project

File: L:\projects\hc1\usace\galv\100013748\cad\figure1_faa.pdf

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF

December 14, 2011

Environmental Section

SUBJECT: Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement for the Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas

Dear Sir or Madam:

Enclosed please find a CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review pursuant to coordination required under the National Environmental Policy Act.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 7, 2011

Environmental Section

SUBJECT: Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement for the Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas

U.S. Environmental Protection Agency
Office of Federal Activities - Room 7241
EIS Filing - Mail Code 2252-A
Ariel Rios Building, South Oval Lobby
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Dear Sir or Madam:

One paper copy and three electronic copies (as pdfs on CDs) of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas are enclosed. This draft report, prepared in accordance with the National Environmental Policy Act (NEP A) of 1969, Section 102(2)(c) as amended and as implemented by the Council on Environmental Quality (40 CFR Parts 1500-1508) is hereby submitted for filing on December 16, 2011. The deadline for submitting comments is January 30, 2012.

Please provide any comments or questions to Ms. Andrea Catanzaro at the letterhead address, or you may reach her by telephone at 409-766-6346.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Jeff Riley
U.S. Environmental Protection Agency
Region 6
1445 Ross Avenue, Suite 1200, Mail Code 6 PD
Dallas, Texas 75202-2733

Dear Mr. Riley:

Enclosed please find a CD copy of the Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review of the Draft General Conformity Determination (DGCD) in accordance with the Clean Air Act. The DGCD and air emission estimates are provided in Appendix H of the DSEIS.

A Notice of Availability for the DGRR, DSEIS and DGCD has been issued to the public for review and comment. The U.S. Army Corps of Engineers, Galveston District will accept written public comments on the DSEIS and the DGCD from December 16, 2011 through January 30, 2012.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Mike Jansky
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Mail Code 6 ENXP
Dallas, Texas 75202-2733

Dear Mr. Jansky:

Enclosed please find a paper copy and CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review. This draft report was prepared in accordance with the National Environmental Policy Act of 1969, as amended, and as implemented by the Council on Environmental Quality (40 CFR Parts 1500-1508).

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Ms. Barbara Keeler
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Dear Ms. Keeler:

Enclosed please find a CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review. This draft report was prepared in accordance with the National Environmental Policy Act of 1969, as amended, and as implemented by the Council on Environmental Quality (40 CFR Parts 1500-1508).

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Jim Herrington
U.S. Environmental Protection Agency
720 East Blackland Road
Temple, Texas 76502

Dear Mr. Herrington:

Enclosed please find a paper copy and CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review. This draft report was prepared in accordance with the National Environmental Policy Act of 1969, as amended, and as implemented by the Council on Environmental Quality (40 CFR Parts 1500-1508).

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Scott Alford
USDA - Natural Resources Conservation Service
7705 West Bay Road
Baytown, Texas 77523

Dear Mr. Alford:

Enclosed please find a paper copy and CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review pursuant to coordination required under the National Environmental Policy Act.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 14, 2011

REPLY TO THE ATTENTION OF
Environmental Section

Edith Erfling
U.S. Fish and Wildlife Service
Clear Lake Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058

Dear Ms. Erfling:

Enclosed please find a CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review pursuant to coordination required under the Endangered Species Act. DSEIS Sections 3.11, 4.11 and Appendix E (Draft Biological Assessment) provide information specifically related to existing endangered species in the project area and potential project impacts. A paper copy and CD of the DSEIS are also being sent to Ms. Donna Anderson for review and comment in accordance with the National Environmental Policy Act.

We have prepared a Biological Assessment (BA) for the proposed work as listed species and their critical habitat are located within the study area counties. We have concluded that the proposed project will have no effect on federally listed threatened or endangered species or their critical habitat.

We are hereby requesting your written concurrence, pursuant to the informal consultation procedures prescribed in 50 CFR 402.13, that the proposed action will have no effect on federally-listed species or designated critical habitat. We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 14, 2011

REPLY TO THE ATTENTION OF
Environmental Section

Donna Anderson
U.S. Fish and Wildlife Service
Clear Lake Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058

Dear Ms. Anderson:

Enclosed please find a paper copy and CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review pursuant to coordination required under the National Environmental Policy Act. A CD is also being sent to Ms. Edith Erfling of your office for review and comment on the DSEIS in accordance with the Endangered Species Act.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 14, 2011

Environmental Section

Robert Hansen
Texas Commission on Environmental Quality
1200 Park 35 Circle, Mail Code 148
Austin, Texas 78753

Dear Mr. Hansen:

Enclosed please find a paper copy and CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review pursuant to coordination required under the National Environmental Policy Act.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 14, 2011

REPLY TO THE ATTENTION OF

Environmental Section

Susana M. Hildebrande, P.E.
Texas Commission on Environmental Quality
P.O. Box 13087, Mail Code 168
Austin, Texas 78711-3087

Dear Ms. Hildebrande:

Enclosed please find a CD copy of the Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review of the Draft General Conformity Determination (DGCD) in accordance with the Clean Air Act. The DGCD and air emission estimates are provided in Appendix H of the DSEIS.

A Notice of Availability for the DGRR, DSEIS and DGCD has been issued to the public for review and comment. The U.S. Army Corps of Engineers, Galveston District will accept written public comments on the DSEIS and the DGCD from December 16, 2011 through January 30, 2012.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF

December 14, 2011

Environmental Section

Mr. Charles Maguire
Director, Water Quality
Texas Commission on Environmental Quality
12100 Park 35 Circle, Mail Code 150
Austin, Texas 78753

Dear Mr. Maguire:

Enclosed please find a paper copy and CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review under Section 401 of the Clean Water Act. The U.S. Army Corps of Engineers is requesting a Section 401 State Water Quality Certification from Texas for this action. The Section 404(b)(1) is provided in Appendix L of the DSEIS.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF
Environmental Section

December 14, 2011

Kate Zultner
Texas General Land Office
Coastal Management Program
P.O. Box 12873
Austin, Texas 78701-2873

Dear Ms. Zultner:

Enclosed please find a CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your review of the Consistency Determination pursuant to §506.20, Consistency Determination for Federal Agency Activities and Development Projects of the Texas Coastal Management Program.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

CF:
Sheri Land
Texas General Land Office
Coastal Management Program
P.O. Box 12873
Austin, Texas 78701-2873

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Tom Calnan
Coastal Resources
P.O. Box 12873
Austin, Texas 78711-2873

Dear Mr. Calnan:

Enclosed please find a paper copy and CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review pursuant to coordination required under the National Environmental Policy Act.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO
ATTENTION OF

Environmental Section

December 14, 2011

Rebecca Hensley
Habitat Regional Director
Texas Parks and Wildlife Department
1502 FM 517 E.
Dickinson, Texas 77539-8687

Dear Ms. Hensley:

Enclosed please find a paper copy and CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review pursuant to coordination required under the National Environmental Policy Act.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE
ATTENTION OF

December 14, 2011

Environmental Section

David M. Bernhart
Assistant for Protected Resources
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, FL 33701

Dear Mr. Bernhart:

Enclosed please find a CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This draft report is provided for your agency review pursuant to coordination required under the Endangered Species Act. DSEIS Sections 3.11, 4.11 and Appendix E (Draft Biological Assessment) provide information specifically related to existing endangered species in the project area and potential project impacts.

We have prepared a Biological Assessment (BA) for the proposed work as listed species and their critical habitat are located within the study area counties. We have concluded that the proposed project will have no effect on federally listed threatened or endangered species or their critical habitat.

We are hereby requesting your written concurrence, pursuant to the informal consultation procedures prescribed in 50 CFR 402.13, that the proposed action will have no effect on federally-listed species or designated critical habitat. We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act.

The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO ATTENTION OF

December 14, 2011

Environmental Section

Miles Croom
Assistant Regional Administrator
National Marine Fisheries Service
Habitat Conservation Division
263 13th Avenue South
St. Petersburg, Florida 33701-5511

Dear Mr. Croom:

Enclosed please find a CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This DSEIS serves to initiate Essential Fish Habitat (EFH) consultation under the Magnuson-Stevens Fishery Conservation and Management Act. Sections 3.10.2.2 and 4.10.2.2 of the DSEIS provide information regarding the existing environment and potential EFH impacts, respectively.

The results of your review and concurrence with the evaluation of EFH are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO ATTENTION OF

December 14, 2011

Environmental Section

Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551-5997

Dear Mr. Swafford:

Enclosed please find a CD of the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. This DSEIS serves to initiate Essential Fish Habitat (EFH) consultation under the Magnuson-Stevens Fishery Conservation and Management Act. Sections 3.10.2.2 and 4.10.2.2 of the DSEIS provide information regarding the existing environment and potential EFH impacts, respectively.

The results of your review and concurrence with the evaluation of EFH are requested by January 30, 2012. I would appreciate your timely review of these documents. If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Stimley-Blue Ridge Library
7007 W. Fuqua Drive
Missouri City, Texas 77489

Dear Sir or Madame,

Please make the enclosed documents (hard-copy and CD) available for public review through January 30, 2012. This request is being made to meet National Environmental Policy Act regulations for public availability of Environmental Impact Statements (50 CFR Part 1506.6).

If you have any questions, please feel free to contact Ms. Andrea Catanzaro at the Galveston District, U.S. Army Corps of Engineers (409-766-6346).

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Pearland Library
3522 Liberty Drive
Pearland, Texas 77581

Dear Sir or Madame,

Please make the enclosed documents (hard-copy and CD) available for public review through January 30, 2012. This request is being made to meet National Environmental Policy Act regulations for public availability of Environmental Impact Statements (50 CFR Part 1506.6).

If you have any questions, please feel free to contact Ms. Andrea Catanzaro at the Galveston District, U.S. Army Corps of Engineers (409-766-6346).

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF
Environmental Section

December 14, 2011

Greg Burns
Evelyn Meador Library
2400 North Meyer Road
Seabrook, Texas 77586

Dear Mr. Burns,

Please make the enclosed documents (hard-copy and CD) available for public review through January 30, 2012. This request is being made to meet National Environmental Policy Act regulations for public availability of Environmental Impact Statements (50 CFR Part 1506.6).

If you have any questions, please feel free to contact Ms. Andrea Catanzaro at the Galveston District, U.S. Army Corps of Engineers (409-766-6346).

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mary Booker Perroni
Friendswood Public Library
416 South Friendswood Drive
Friendswood, TX 77546

Dear Ms. Perroni,

Please make the enclosed documents (hard-copy and CD) available for public review through January 30, 2012. This request is being made to meet National Environmental Policy Act regulations for public availability of Environmental Impact Statements (50 CFR Part 1506.6).

If you have any questions, please feel free to contact Ms. Andrea Catanzaro at the Galveston District, U.S. Army Corps of Engineers (409-766-6346).

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

John Augelli
Rosenberg Library
2310 Sealy St.
Galveston, TX 77550

Dear Mr. Augelli,

Please make the enclosed documents (hard-copy and CD) available for public review through January 30, 2012. This request is being made to meet National Environmental Policy Act regulations for public availability of Environmental Impact Statements (50 CFR Part 1506.6).

If you have any questions, please feel free to contact Ms. Andrea Catanzaro at the Galveston District, U.S. Army Corps of Engineers (409-766-6346).

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Karen Akkerman
Clear Lake City-County
Freeman Branch Library
16616 Diana Lane
Houston, Texas 77062

Dear Ms. Akkerman,

Please make the enclosed documents (hard-copy and CD) available for public review through January 30, 2012. This request is being made to meet National Environmental Policy Act regulations for public availability of Environmental Impact Statements (50 CFR Part 1506.6).

If you have any questions, please feel free to contact Ms. Andrea Catanzaro at the Galveston District, U.S. Army Corps of Engineers (409-766-6346).

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

City of League City
Helen Hall Library
100 W. Walker Street
League City, Texas 77573

Dear Sir or Madame

Please make the enclosed documents (hard-copy and CD) available for public review through January 30, 2012. This request is being made to meet National Environmental Policy Act regulations for public availability of Environmental Impact Statements (50 CFR Part 1506.6).

If you have any questions, please feel free to contact Ms. Andrea Catanzaro at the Galveston District, U.S. Army Corps of Engineers (409-766-6346).

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Cindy Page
Government Documents Librarian
Houston Public Library
500 McKinney Street
Houston, Texas 77002

Dear Ms. Page,

Please make the enclosed documents (hard-copy and CD) available for public review through January 30, 2012. This request is being made to meet National Environmental Policy Act regulations for public availability of Environmental Impact Statements (50 CFR Part 1506.6).

If you have any questions, please feel free to contact Ms. Andrea Catanzaro at the Galveston District, U.S. Army Corps of Engineers (409-766-6346).

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Jerry Measells
Brazoria Library
620 South Brooks
Brazoria, TX 77422

Dear Mr. Measells,

Please make the enclosed documents (hard-copy and CD) available for public review through January 30, 2012. This request is being made to meet National Environmental Policy Act regulations for public availability of Environmental Impact Statements (50 CFR Part 1506.6).

If you have any questions, please feel free to contact Ms. Andrea Catanzaro at the Galveston District, U.S. Army Corps of Engineers (409-766-6346).

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosures

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Carlos Bullock
Alabama-Coushatta Tribe of Texas
571 State Park Road 56
Livingston, TX 77351

Dear Mr. Bullock:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Anthony Street
Tonkawa Tribe of Indians of Oklahoma
1 Rush Buffalo Road
Tonkawa, OK 74653-4449

Dear Mr. Street:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Dr. Richard L. Allen
Cherokee Nation of Oklahoma
P.O. Box 948
Talequah, OK 74465

Dear Mr. Allen:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Terry Cole
Tribal Historic Preservation Officer
Choctaw Nation of Oklahoma
P. O. Drawer 1210
Durant, Oklahoma 74702-1210

Dear Mr. Cole:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Earl Barby, Jr.
Tribal Historic Preservation Officer
Tunica-Biloxi Indian Tribe of Louisiana
P.O. Box 331
Marksville, Louisiana 71351

Dear Mr. Barby:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Juan Garza
Kickapoo Traditional Tribe of Texas
HC 1 Box 9700
Eagle Pass, TX 78852

Dear Mr. Garza:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Stratford Williams
Vice President
Wichita and Affiliated Tribes
P.O. Box 729
Anadarko, OK 73005

Dear Mr. Williams:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Ms. Holly Houghten, Jr.
Interim Tribal Historic Preservation Officer
Mescalero Apache Tribe
P.O. Box 227
Mescalero, NM 88340

Dear Ms. Houghten:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Ms. Augustine Asbury
Alabama-Quassarte Tribal Town
P.O. Box 187
Wetumka, OK 74883

Dear Ms. Asbury:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF December 14, 2011

Environmental Section

Mr. Robert Cast
Tribal Historic Preservation Officer
Caddo Indian Tribe of Oklahoma
P.O. Box 487
Binger, OK 73009

Dear Mr. Cast:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Bryant Celestine
Alabama-Coushatta Tribe of Texas
571 State Park Road 56
Livingston, TX 77351

Dear Mr. Celestine:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Michael Burgess
Tribal Administrator
Commanche Indian Tribe
P.O. Box 908
Lawton, OK 73502

Dear Mr. Burgess:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Ms. Tamara Francis
NAGPRA Coordinator
Delaware Tribe of Western Oklahoma
P.O. Box 825
Anadarko, OK 73005

Dear Ms. Francis:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

REPLY TO THE ATTENTION OF Environmental Section

December 14, 2011

Mr. Curtis Munoz
Environmental Officer
Kiowa Tribe of Oklahoma
P.O. Box 369
Carnegie, OK 73015

Dear Mr. Munoz:

The Corps of Engineers, Galveston District, in cooperation with the Harris County Flood Control District, Galveston County, and Brazoria County Drainage District #4, has prepared a Draft General Reevaluation Report (DGRR) and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas.

The tentatively proposed project includes both conveyance and in-line detention measures along the main stem of Clear Creek and conveyance along three of its tributaries (Mary's Creek, Mud Gully and Turkey Creek). Excavated material from construction and maintenance activities would be placed in upland confined placement areas. As part of the environmentally sensitive design, the tentatively proposed project encompasses measures to avoid and minimize impacts to habitat including preserving and rehabilitating 122 acres of floodplain forest, and reestablishing 33 acres of floodplain forest. Compensation for unavoidable construction impacts would consist of rehabilitating an additional 31 acres of floodplain forest.

Copies of the DGRR and DSEIS are provided on the enclosed CD for your review. The results of your review are requested by January 30, 2012. I would appreciate your timely review of these documents.

If you have any questions, or if you would like additional copies, please contact Ms. Andrea Catanzaro at the letterhead address, by telephone at 409-766-6346, or by email at andrea.catanzaro@usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Section

Enclosure

Appendix D-5

Planning Aid Letter from USFWS

United States Department of the Interior
FISH AND WILDLIFE SERVICE

Division of Ecological Services
17629 El Camino Real, Suite #211
Houston, Texas 77058-3051
281/286-8282 / (FAX) 281/488-5882

May 3, 2002

Colonel Leonard D. Waterworth
Attn: Carolyn Murphy
Chief, Environmental Branch
U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, TX 77553

Dear Colonel Waterworth:

This letter is a planning aid report for the Clear Creek Federal Flood Control Project, in response to the General Reevaluation Report (GRR) being conducted by the Galveston District, Army Corps of Engineers, and is not intended as a Fish and Wildlife Coordination Act Report.

INTRODUCTION

A structural alternative for the Clear Creek Flood Control Project was authorized and all environmental clearances were obtained in 1985. The authorized channel would have removed about 393 acres of riparian forest, 15 acres of emergent marsh, and converted a relatively pristine winding stream into a trapezoidal channel. The Fish and Wildlife Conservation Plan, in the 1982 Feasibility Report, called for the construction of 570 acres of forest and 18 acres of emergent marsh within disposal areas and parks along the stream.

The authorized project was never funded and in 1997, a less environmentally damaging project was formulated using smaller channels, less damaging design, bypassing, expanded detention basins, and buyouts. However, most of the original dredged material disposal areas and habitat compensation sites had been displaced by development. In 1997, Harris and Galveston Counties requested that the Corps stop design and wait for a reassessment of the project. The only work completed was a second outlet from Clear Lake to Galveston Bay, with flood gates.

The Galveston District Corps of Engineers has undertaken a GRR, to evaluate various alternatives for flood damage reduction. Alternatives would include buyout alternatives, ecosystem restoration, and channelization of portions of the creek. The Clear Creek GRR was in response to a grass roots organization, the Friends of Clear Creek (a committee of the Bayou Preservation Association, Inc.), who petitioned the Corps of Engineers and the local project sponsors to reevaluate the project.

Clear Creek has been included in the Water Resources Development Act as a potential Challenge 21 project. However, the Challenge 21 program has not been funded. In September 2000, the Corps of Engineers completed a portion of studies designed to yield key indicator elevations. On May 9, 2001,

the Corps held the last of three public scoping meetings to receive input from citizens. The analysis of structural data and hydrology models should yield alternatives by the end of 2002.

GENERAL DESCRIPTION OF THE STUDY AREA

The Clear Creek project area is a 44.5 mile long stream from Galveston Bay through Harris, Galveston, Brazoria, and Fort Bend Counties to Almeda School Road. It has a watershed of 260 square miles and varies in width from 2.0 miles to 13.5 miles. The creek's elevation varies from 5 feet to 70 feet. It includes both intertidal waters and fresh waters, with salinity 5 ppm to 35 ppm. Clear Creek itself confluences with Clear Lake at Stream Mile (SM) 4.5.

CORPS OF ENGINEER STREAM MILE CODE

Stream Mile	*Feature*
0.5	State Highway 146
1.5 to 4.5	Clear Lake
7.1	Farm Market 270 (Egret Bay Boulevard)
8.7	State Highway 3
10.6	Interstate 45
14	Bay Area Boulevard
21.2	Farm Market 2351
27.1	Dixie Farm Road
30.3	Country Club Drive
35.1	State Highway 35
40.0	Cullen Boulevard
42.4	State Highway 288

CLEAR CREEK HABITAT

The Clear Creek Habitats (see CD, Enclosure 1) prepared by Texas Parks and Wildlife Department, Texas Cooperative Extension Service, and U.S. Fish and Wildlife Service for the Corps of Engineers GRR, categorizes Forest, Intertidal, Sub-tidal, Submerged-aquatic bed, and Prairie habitats. The habitats are prioritized as high, medium, and low quality, and indicate boundaries and size. They are provided in digital format. The hard copy map (Figure 1) (Enclosure 2) identifies high quality native fish and wildlife habitat tracts the Service considers worthy of protection.

Five broad categories of habitat were digitized in this data. The five habitat categories are:

1. Forest - includes riparian forest, coastal flatwoods, forested wetland depressions and upland forests;

2. Coastal Tallgrass Prairie - includes remnants of the coastal tall grass prairie;

3. Intertidal - includes salt, brackish, and freshwater regularly and irregularly flooded marshes;

4. Subtidal - includes subtidal habitats that were formed by the subsidence of tidal marshes, off channel subtidal habitats, and associated tidal marsh remnants; and

5. Submerged Aquatic Vegetation - includes subtidal/ephemeral widgeon grass *Ruppia maritima* habitats.

These habitats were digitized from the year 2000 1-foot resolution orthographic photos provided by the USACE-Galveston District. Horizontal datum is NAD 1983, Texas State Plane Coordinate System, South Central Zone. Data is provided in the ArcView 3.2 files. The enclosed CD contains layer files (spa11ccws.dbf, spa11ccws.shp, spa11ccws.sbn, spallccws.sbx, and spa11ccws.shx). The CD also contains habitat.avl and priority.avl legend files, which when applied to the theme will display habitat type and priority ranking.

FOREST

In the lower reaches (below SM 12), salt marsh and sand flats transition to salt brush, which transitions to cedar elm *Ulmus crassifolia,* although willow oak *Quercus phellos* mottes are more prevalent in the brush land. This association of cedar elm near the coast is unique. Stream side back woods are dominated by water oak *Quercus nigra* and sugarberry *Celtis laevigata.* SM 12 to SM 13 transitions to more water oak, but there is also sugarberry and red oak *Quercus falcata*, slippery elm *Ulrus rubra,* and pecan *Carya illinoinsis.* The under story is predominately privet *Ligustrum spp.* and yaupon *Ilex vomitoria.* At about SM 17, green ash *Fraxinus pensylvanica.* supplements water oak as bank slopes are steeper, and elm, ash, and water oak mix with red oak, pecan, and willow oak *Quercus phellos.* In the back woods are post oak *Quercus stellata.* Between SM 17 and SM 33 is elm and ash along the stream, and red oak further back. One large area from SM 21 to SM 24 has loblolly pine *Pinus taeda*, red oak, and willow oak. Further above SM 34 are largely black willow *Salix nigra*, Chinese tallow *Sapium sebiferum* and sea myrtle *Baccharis halimifolia,* eastern gamagrass *Tripsacum dactyloides,* or seacoast bluestem *Schyzachrium scoparium.*

PRAIRIE

This report and data is separate from Dr. John Jacob's (Texas Cooperative Extension Service) data to CE, which will indicate a much larger area of prairie in the watershed. Little native prairie exists within the 100 year flood plain because of extensive land utilization and agriculture practices. Protection from natural fires may have altered the natural succession on abandoned crop land. This has resulted in a scrub/shrub community dominated by sea myrtle *Myrica cerfera* and eastern baccharis *Baccharis halimifolia.* There are a few prairie remnants, dominated by coastal prairie grasses such as little bluestem *Schyzachrium scoparium.*, Indian grass *Sorghastrum nutans*, switchgrass *Panicum virgatum*, eastern gamagrass *Tripsacum dactyloides*, brownseed paspalum *Paspalum plicatum,* and rarely big bluestem *Andropogon gerardii.*

INTERTIDAL, SUBTIDAL and AQUATIC BED

Salt marsh, SM 0.5 to SM1.5, dominated by *Spartina spp.* occurs at the very lower reaches of Clear Creek and into the back water areas near Kemah and Seabrook. There is no salt water wedge in Clear Lake. From SM 1.5 to SM 12.5, there are stands of arrowhead *Sagittaria lancifolia.*, common reed *Phragmites australis,* cattails *Typha spp.*, as well as smartweeds *Polygonum spp.*, and even widgeon grass *Ruppia maritima.* Numerous mud flats and sand flats need to accrete before marsh can form. These are areas where significant restoration can be accomplished, and of which, some in the previous plan were beneficial uses sites. The restoration specifics will be discussed in subsequent reports.

STREAM FAUNA

The invertebrate stream fauna, fishes, herpetofauna, birds and mammals of the Clear Creek watershed have been described in detail by the Fish and Wildlife Service in previous reports (September 1982), (July 1987), (October 1989), (July 1991), (December 1992), (February 1993), and other position letters.

ENDANGERED AND THREATENED SPECIES

A review of U.S. Fish and Wildlife Service files for the project indicates that no federally listed or proposed threatened or endangered species are likely to occur at the project nor does any officially designated critical habitat occur at the project site.

OPPORTUNITIES AND PROBLEMS

On September 26, 2001, at the Corp's Jadwin Building, Galveston, Texas, a meeting of all resource agencies, which included the Corps Clear Creek Project Team, (engineers, hydrologists and archeologists), provided John Baker, Environmental Project Officer, with some conceptual restoration projects and their potential locations, without regard to right-of-ways or ownership. The conceptual projects list should be used by USACE, in the future, to determine restoration project possibilities.

Suggestions included projects such as: preservation of prairie pothole complexes; wetland preservation; restore natural flow regime through removal of dredged material banks from SM 26-33; construct high water bypass to oxbows; restore marshlands from SM 13 to Seabrook; set aside riparian buffer from FM 288 to origin; restore delta marsh, restore natural flood plain on tributaries, moist soil impoundments on main stream and tributaries; create habitat in association with detention ponds; submerged vegetation in conjunction with marsh vegetation; restoration of coastal prairie; construct wetlands for water treatment in connection with sewage treatment plants; and construction of step pools and fishery habitat in the main stem and tributaries. We encourage the Corps to continue to promote the dialog on ecological restoration that was initiated at the September 26, 2001 meeting.

In addition, two restoration opportunities exist at many stream-side locations along Clear Creek. The first opportunity is the restoration of native riparian vegetation buffers where riparian corridor is

dominated by the exotic Chinese tallow *Sapium sebiferum*. The second opportunity is the removal of large stream-side maintenance banks to reconnect Clear Creek to its flood plain. This re-connection would restore the ecological, water quality, and flood control functions of these flood plains.

RECOMMENDATIONS

1. Clear Creek and Brazoria Drainage Districts have maintained Clear Creek and its three tributaries - Mary's (SM 20.0), Chigger (SM 14.7), and Cowards (SM 17.7), by de-snagging, channel armoring, constructing high-flow channels, and detention ponds. If development continues in the flood plain (i.e. Forests of Friendswood, Silver Lake, and Scarsdale Sections), flooding will increase.

The Service recommends that the County and State leadership officials explore regulatory measures to limit future development in the flood plain.

2. There is a proliferation of detention pond construction as a means of solving flood problems within the flood plain. Examples include: Clear Creek SM 33.0 for SH 35, Clear Creek SM 32.5 for future development, and the aforementioned subdivisions of Friendswood (SM 21.5), Silver Lake (SM 29.5), and Scarsdale (SM 30.0). In addition, the roadbed for Pearland Parkway is in place, removing viable flood plain areas that would also result in construction of yet another detention pond. We understand a golf course is planned for the east side of the Scarsdale to Beltway 8 section of Clear Creek (SM 30.0 to SM 33.0), and also a large development for the west side of Clear Creek in the same area. This area was leveed as a rice field reservoir, and portions have become wetlands.

The Service recommends that these areas be restored to the flood plain by removing the levees and east stream side spoil banks from SM 30.0 to SM33. This will provide a stream corridor with increased retention, and also provide fish and wildlife habitat, and recreational opportunities in its restored state.

3. Between SM 26.5 to 30.0, are areas with development on one side (some overgrown banks), while the other side is undeveloped, disturbed, and tallow infested. Between SM 21.5 and

SM 26.5, are remnant channels, backwater areas, and oxbows which are also blocked by spoil banks. A particularly large (high) spoil bank (200-feet by 300-feet) used as a maintenance berm is located at SM 30.2. This could be removed to expand the flood plain.

The Service recommends removal of the spoil banks to allow the rapid storage of flood waters and the subsequent slow runoff of retained flood waters. These areas can later be planted with native tree species.

4. This planning aid letter's chief recommendation to the Corps of Engineers.

We recommend the areas identified herein and classified as "High Quality" be avoided by future structural flood control features, including detention ponds, and that habitats classified low and medium quality be utilized for restoration and mitigation.

We appreciate the opportunity to provide input to this study and will provide you with a Fish and Wildlife Coordination Act Report after an array of alternatives are available for review. We, as well as other state and federal resource agencies, look forward to working with the Corps, to produce a project that reduces flood damages, as well as maintains and improves the ecological functions provided by Clear Creek.

If you have any questions or if we can be of further assistance, please contact Mike Morgan at 281/286-8282.

Sincerely,

Brian W. Cain
for

Frederick T. Werner
Assistant Project Leader, Clear Lake ES Field Office

cc:
Environmental Protection Agency, Marine & Wetlands Section 6WQ-EM, Dallas, TX
Texas General Land Office, La Porte, TX
Coastal Permitting Assistance Office, Pat Alba, NRC, Corpus Christi, TX
National Marine Fisheries Service, Habitat Conservation Division, Galveston, TX
National Park Service, Southwest Region, Santa Fe, NM
Texas Natural Resource Conservation Commission, Watershed Management Div., Austin, TX
Texas Parks and Wildlife Department, Austin, TX
Texas Parks and Wildlife Department, Resource Protection Branch, Dickinson, TX
Texas Agriculture Extension Service, Houston, TX

Enclosures:
1. CD, Title: Clear Creek Habitats, USACE
2. Map, Title: High Quality Habitats of Clear Creek

Appendix D-6

USFWS Coordination Act Report

United States Department of the Interior
FISH AND WILDLIFE SERVICE

Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051
281/286-8282 FAX: 281/488-5882

March 10, 2011

Colonel Christopher W. Sallese
U.S. Army Corps of Engineers
Galveston District
P.O. Box 1229
Galveston, Texas 77553

Dear Colonel Sallese:

This letter transmits our final Fish and Wildlife Coordination Act Report for the Clear Creek General Re-Evaluation Study, Brazoria, Fort Bend, Galveston and Harris Counties, Texas. This final report addresses the proposed flood reduction measures and provides the U.S. Fish and Wildlife Service's recommendations for mitigation of unavoidable impacts to important fish and wildlife resources along Clear Creek and its tributaries for long-term management of mitigation sites.

We appreciate the opportunity to assist in planning this Federal Project and the efforts of your staff in considering valuable coastal habitats and the fish and wildlife resources that depend on them.

Please contact Donna Anderson at 281/286-8282 ext. 225, if you have questions or need further assistance.

Sincerely,

for

Edith Erfling
Field Supervisor, Clear Lake ES Field Office

cc:
U.S. Army Corps of Engineers, Attn: Carolyn Murphy, Galveston, TX

CLEAR CREEK GENERAL REEVALUATION STUDY, BRAZORIA, FORT BEND, GALVESTON, AND HARRIS COUNTIES, TEXAS

FISH AND WILDLIFE COORDINATION ACT REPORT

SUBMITTED TO
GALVESTON DISTRICT
U.S. ARMY CORPS OF ENGINEERS
GALVESTON, TEXAS

PREPARED BY
U.S. FISH AND WILDLIFE SERVICE, REGION 2
CLEAR LAKE ECOLOGICAL SERVICES FIELD OFFICE
HOUSTON, TEXAS

March 2011

Executive Summary

Historically, Clear Creek only experienced flooding during severe rainfall events and flood damage was usually minimal. However, increased residential and commercial development has aggravated flooding in the floodplain. Overbank flooding, eroding creek banks and the increase of impervious cover all present flood management problems that have resulted in higher and more frequent storm water flows. As a result, overbank flows have become more common, even with moderate rainfall events (Corps 2009b).

Congress authorized the Clear Creek Flood Control project in 1968. Since then, several alternatives to the original project were considered. In 1999, the U.S. Army Corps of Engineers, Galveston District (Corps) determined a general reevaluation study was required due to extensive public comments on the authorized plan, and the change in scope of the project. An initial screening of 72 alternatives began in 2002; in 2009, nine alternatives were reviewed and a Proposed Plan was formulated.

In 2001, public scoping meetings began and as a result, an interagency coordination team was developed in 2003 to analyze alternatives, identify environmental issues of concern, evaluate significant fish and wildlife resources within the project area, evaluate potential environmental impacts and evaluate mitigation measures. The Proposed Plan incorporates conveyance and in-line detention improvements on the main stem of Clear Creek, and conveyance improvements on Turkey Creek, Mud Gully, and Mary's Creek.

The Proposed Plan spans 698 acres and will permanently impact 278 acres of floodplain forest; no losses or impacts of coastal prairie or tidal marsh are anticipated. Impacts to 155 acres of floodplain forest along the Clear Creek mainstem will be avoided and minimized through rehabilitation or reestablishment of floodplain forest corridor along the low-flow channel. Mitigation for unavoidable impacts would be accomplished by reconnecting the natural low flow hydrology through 13 remnant oxbows isolated during past channelization activities to rehabilitate/reestablish 31 acres (131 AAHUs) of floodplain forest. These activities would offset negative net impacts to floodplain forest from the combined conveyance, avoidance, and minimization features of the General Reevaluation Plan (-106 AAHUs) and produce cumulative project benefits (+25AAHUs).

This U.S. Fish and Wildlife Service Coordination Act Report and comments are provided in accordance with the Fish and Wildlife Coordination Act (16 U.S.C. 661-667(e)), with the provisions of the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.), the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.) and the National Environmental Policy Act (42 U.S.C. 4321-4347).

Table of Contents

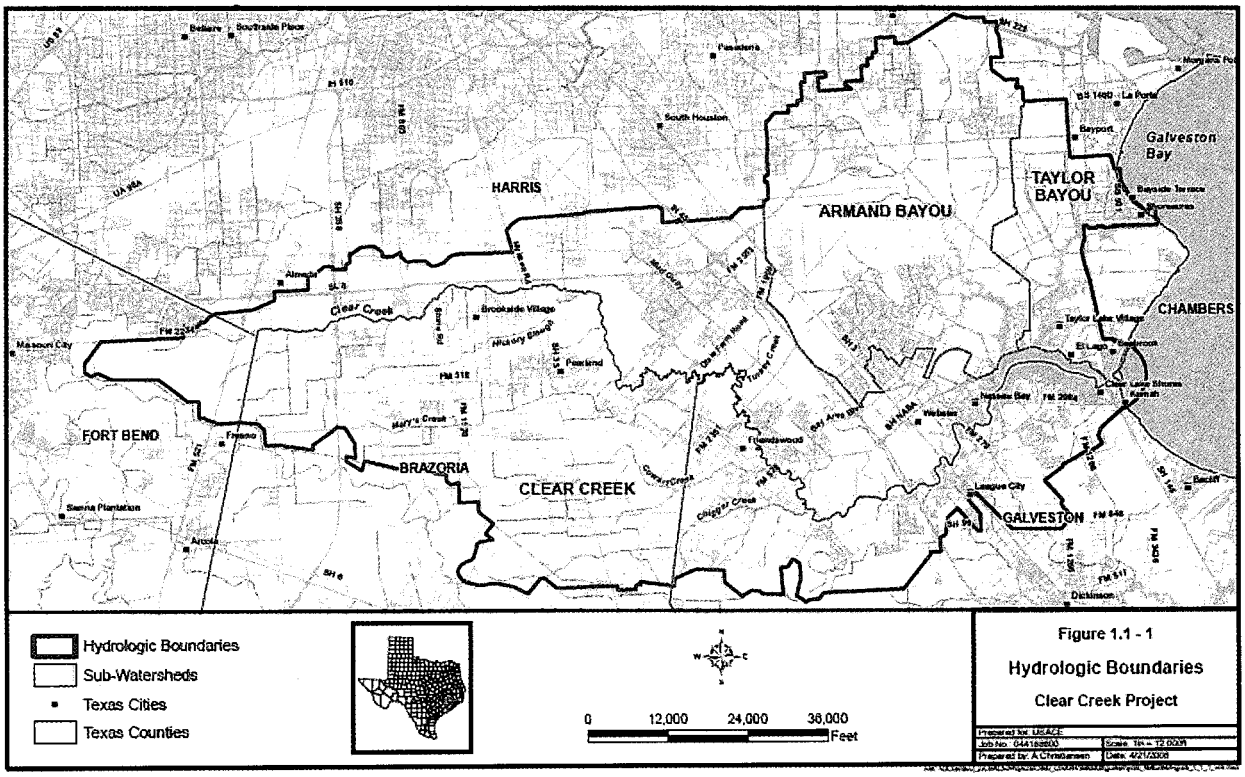
Table of Figures

List of Tables

Table of Appendices

Introduction

Clear Creek is located south of the City of Houston and traverses parts of Harris, Galveston, Brazoria and Fort Bend Counties, Texas and spans 3 watersheds (Clear Creek, Armand and Taylor Bayous) (Figure 1). The authorized project reach extends 31 miles from Clear Lake to the Fort Bend County line and has periodically flooded for over 30 years. Flood waters caused by heavy rainfall events in 1973, 1976, 1979, 1989 and 1994 caused damage to those living along the creek (Dannenbaum 1997). In 2001, heavy rains caused by Tropical Storm Allison prompted the buyout of almost 300 flood prone homes along Clear Creek. Flooding along the creek is a result of high rainfall events, and more recently by moderate rainfall events. Continued commercial and residential growth within the watershed has aggravated the flooding problem. The increase of impervious cover has reduced the watershed's natural detention capacity, resulting in increased run off, and higher and more frequent storm water flows. As a result, overbank flows have been more common even during moderate rainfall events. Recent development within the floodplain has compounded the problem by narrowing flood risk management options. Some local authorities have regulations in place to reduce the amount of development; however, these regulations are not in effect for the entire watershed and thus the risk of flooding remains.



Source: Corps 2009b

Figure 1 Clear Creek Reevaluation Study Project Area and Hydrologic Boundaries

In 1968, Congress authorized the Clear Creek Flood Control Project. This initial project proposed the enlargement of Clear Creek from Clear Lake to just west of the Fort Bend County line. This project proposed replacing almost 41 miles of existing, winding channel with a 31 mile, grass lined channel. The original authorization included directives from the Secretary of

the Army, which required review of the recommended plan during the preconstruction planning stage to identify modifications that would achieve a balance among structural modifications to the creek, floodplain regulations, and a broad program of floodplain management. Because of the requirement, subsequent Congressional actions, administrative changes, changes within the project area, and changes in the attitude of the public, a restudy was initiated in the early 1970s.

As a result of the restudy, the May 1982 Preconstruction Authorization Planning Report recommended increasing the one percent annual exceedance probability to a ten percent annual exceedance probability for a flood event. This plan included 22 miles of channel enlargement and easing of bends within the existing stream to contain floodwater and reduce the 100-year flood plain, leaving only 50 structures unprotected. To ensure upstream channel improvements would not increase the flooding problems around Clear Lake, an additional channel outlet (Second Outlet Channel and Gate Structure or Second Outlet), was incorporated into the plan. Second Outlet consists of six gated control structures with associated excavation and dredging between Clear Lake and Galveston Bay. The plan also included conveyance improvements from Mykawa Road to Clear Lake. In 1986, in a formal agreement signed by the local sponsors and the Corps, the plan called for the construction of a 14-mile reach of the project downstream from Dixie Farm Road. Construction began in the mid-1990s with modifications to two railroad bridges, and the construction of the Second Outlet between Clear Lake and Galveston Bay.

After the completion of Second Outlet in 1997, but before work could begin on the channelized portion of the creek, the Citizens Advisory Committee was formed and the committee recommended that the 14 mile reach downstream from Dixie Farm Road not be constructed. The local sponsor developed an alternative plan titled the Sponsor Proposed Alternative. The main features of this plan were to reduce bottom widths of the channel and create a bypass channel that would allow for increased capacity and avoidance of the Friendswood area channel. This plan differed enough from the authorized federal project under the existing authorization, and subsequently, Harris County Flood Control District requested a reevaluation of the project.

In 1999, the Corps initiated a second reevaluation due to concerns from the local sponsors (Harris County Flood Control District, Galveston County and the Brazoria Drainage District No. 4), and input from the public and other state and federal agencies who did not support the project due to damaging impacts to the natural resources along Clear Creek. Concerns raised by citizens, organizations and the sponsors of the project were:

- Use of outdated flood control technology. The project design was old (1960's study) and relied on conveyance measures such as trapezoidal channels without looking for other solutions to the flood problems.
- Enlargement of Clear Creek would overpower the Second Outlet at Clear Creek, especially during high tides.
- Environmentally sensitive areas identified as potential placement areas for dredged materials.
- Excessive environmental impacts along Clear Creek. The Clear Creek watershed contains some of the last remaining, natural un-channelized streambeds in the area, as well as high quality riparian habitat.

- Lack of less intrusive measures, such as buyouts, regional detention facilities, and natural corridor bypasses.

The reevaluation study, located within four counties, developed, and evaluated alternatives for flood risk management and ecosystem restoration within the Clear Creek watershed. Workshops and planning sessions resulted in the General Reevaluation Plan Alternative, which is now the Proposed Plan Alternative.

Description of the Proposed Plan and Other Alternatives

The Corps require an evaluation of economic and environmental impacts of alternatives that addresses project needs, problems, and opportunities. Present and future flood risk management needs in the Clear Creek area has driven the overall planning of structural and nonstructural measures for this project. The alternative plans described here include plans considered in the 1980's and 1990's, and led to the decision to initiate the general reevaluation study. The Corps planning process involved coordination with Federal, State and local agencies, private groups, stakeholders, environmental organizations, and the public to identify alternatives and evaluate them on their economic and environmental impacts. An inter-agency coordination team (ICT) of local stakeholder groups and state and federal natural resource agencies assisted the Corps with the development of alternatives and mitigation.

Due to several project studies beginning with the 1968 authorization and public scoping meetings in 2001, 40 separate economic reaches with 72 alternatives were analyzed. In 2007, the Corps initiated an Agency Technical Review (ATR), which by 2008 had narrowed down the alternatives to 24. A second ATR, completed in September 2009, considered structural and non-structural alternatives alone and in combination. As a result, nine alternatives were evaluated for the Clear Creek Project.

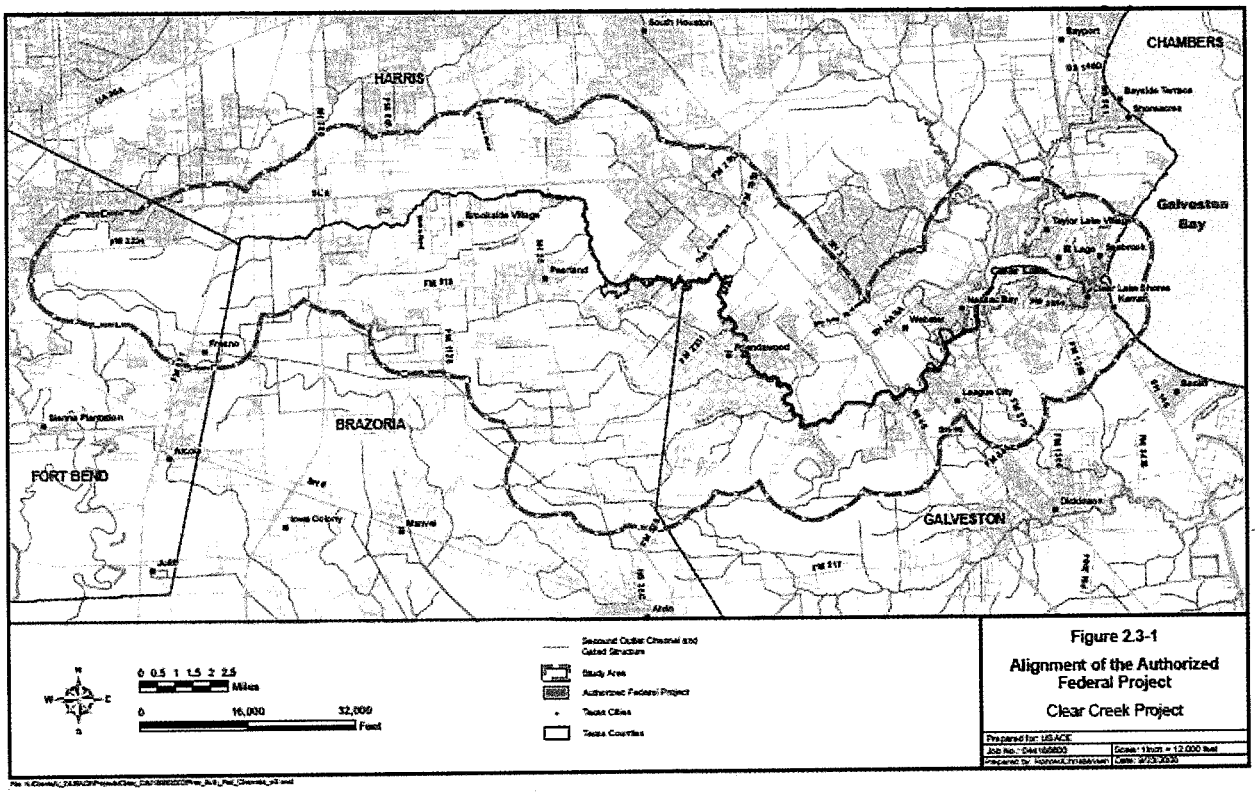
The No Action Alternative

Under this alternative, Clear Creek would remain in its current state. The extent of impervious cover will increase as development in the project area increases. This in turn would decrease the natural detention capacity of the watershed, resulting in decreases in water quality, increased flooding and accelerated habitat loss. Increased amounts of impervious cover can lead to increased velocities of run-off precipitation, and cause flooding, erosion of stream banks and bottoms, and increased sedimentation. As a result, Clear Creek would experience increased water elevations, ultimately causing flooding along the creek. While parts of the watershed have no-impact policies concerning new development, this is not the case for the entire watershed.

Second Outlet is included in the No Action Alternative even though this feature was part of the Authorized Federal Project alternative discussed below. Second Outlet, constructed prior to the initiation of this reevaluation study, was part of the mitigation plan for the Authorized Federal Project.

Authorized Federal Project Alternative

This alternative includes 22 miles of improved conveyance measures along the Clear Creek channel and requires the local sponsor to manage the 100-year floodplain (Figure 2). An additional opening was incorporated to ensure that increased flows resulting from upstream channel improvements could continue into Galveston Bay and did not contribute to flooding around Clear Lake. This opening between Clear Lake and Galveston Bay, named Second Outlet, was constructed and completed in 1997. In addition, the Corps installed floodgates at Second Outlet to insure salinities in Clear Lake did not increase due to high tides from the bay. The local sponsor, Harris County Flood Control District, and the Corps entered into a formal agreement in 1986 to construct conveyance features along a 14-mile reach down stream of Dixie Farm Road to Clear Lake. A trapezoidal earth channel with bottom widths 70 to 130 feet was designed. Agencies, local sponsors and the public voiced environmental concerns over the project, and construction of Second Outlet was the only feature to move forward under this agreement.



Source: Corps 2009

Figure 2 Alignment of the Authorized Federal Project

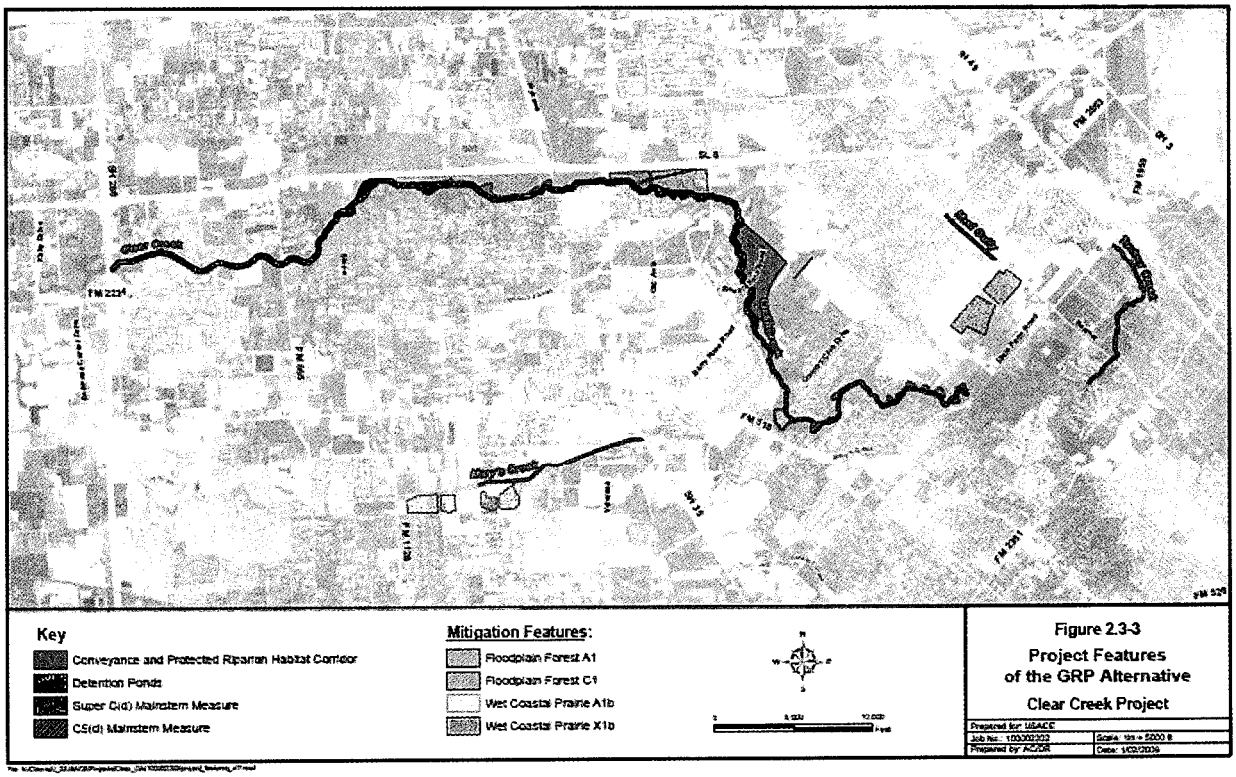
Sponsor Proposed Alternative

This plan reflected public concerns expressed with the Authorized Federal Project, and sought to reduce environmental impacts by developing a trapezoidal channel that followed the same alignment as the Authorized Federal Project, but with reduced bottom widths and the addition of

a bypass channel to avoid impacts to a natural reach of Clear Creek. This addition provided for additional flood capacity without channelizing this sensitive area of the creek.

General Reevaluation Plan Alternative (Proposed Plan Alternative)

Plan formulation included several phases (e.g. preliminary, first-added, and second added analyses, etc) of evaluating flood risk management measures to form the General Reevaluation Plan (GRP) alternative. In addition to these flood risk management measures, the project team also looked at potential wetland creation and/or rehabilitation, reestablishment of oxbows, floodplain preservation, marsh rehabilitation, step pool creation, riparian habitat preservation, wetland functions at detention facilities, and recreation. These features, incorporated into the plan where possible, were also considered during development of the mitigation plan (Figure 3).

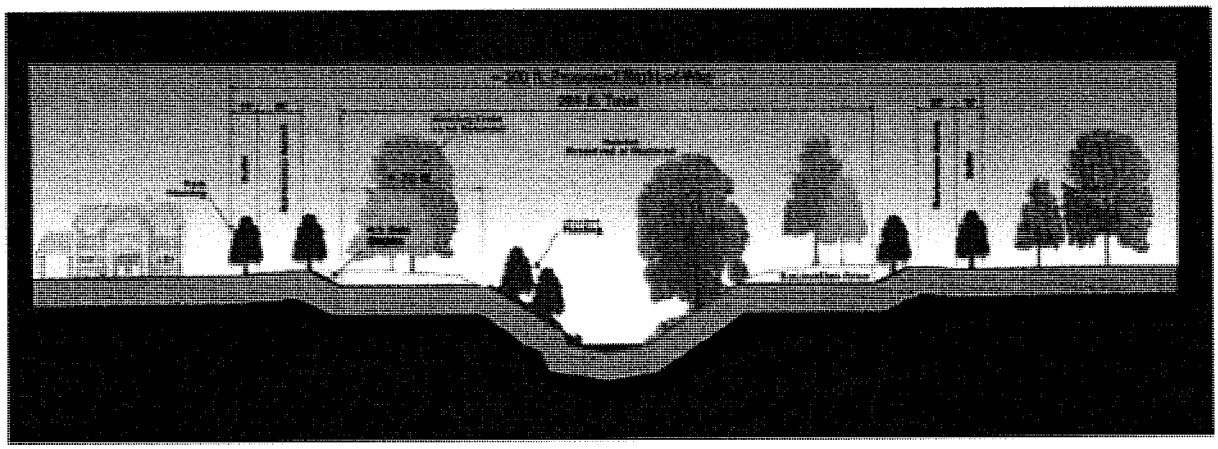


Source: Corps 2009b

Figure 3 Project Features of the GRP Alternative

Conveyance features began at State Highway (SH) 288, continued to Dixie Farm Road, and included portions of three tributaries: Mud Gully, Turkey Creek, and Mary's Creek. Mitigation for these conveyance features included preservation and/or enhancement of floodplain forest and coastal wet prairies found along Clear Creek.

This alternative went through an extensive screening process and is described in detail on pages 2-11 through 2-26 of the Supplemental Environmental Impact Statement (Corps 2010). Structural and non-structural measures were considered and the final analyses included two conveyance features along the main stem of Clear Creek, and in-line and off-line detention measures.



Source: Corps 2009b

Figure 4 Channel Design with 300 Foot Right of Way

The GRP alternative includes a series of flood risk management measures and mitigation areas, referred to as project features. Flood risk management measures include conveyance measures on or adjacent to Clear Creek from SH 288 to Bennie Kate Road {Section Super C(d)}, Bennie Kate Road to Dixie Farm Road {Section C5(d)}, and on three tributaries: Mud Gully, Turkey Creek, and Mary's Creek. Mitigation features include avoidance, minimization, and compensation for project impacts through rehabilitation and reestablishment of floodplain forest. Provided below are summary descriptions of the GRP alternative features.

Super C(d) Section Feature: This flood risk management feature provides conveyance improvement on Clear Creek from SH 288 to 4,000 feet downstream of Bennie Kate Road. The conveyance feature includes construction of 10.8 miles of a 200-foot-wide (bottom width) high-flow channel along Clear Creek in Harris and Brazoria counties. The existing Clear Creek channel would be preserved for low-flow conveyance. In addition, a 65-foot corridor of floodplain forest would be preserved and rehabilitated or reestablished.

C5(d) Section Feature: From approximately 4,000 feet downstream of Bennie Kate Road to Dixie Farm Road, this flood risk management feature provides conveyance via construction of 4.4 miles of 90-foot-wide (bottom width) high-flow channel. The existing Clear Creek channel would be preserved for low-flow conveyance. In addition, a corridor of floodplain forest would be preserved and rehabilitated.

In-Line Detention Features: These features would provide detention for up to 485 acre-feet of water within limited segments of the proposed Clear Creek conveyance measures. Construction of these features would require minor deepening of the high-flow channel in areas where the high-flow channel diverges from the low-flow channel.

Turkey Creek Conveyance Feature: This feature would provide improved conveyance via construction of a 2.4-mile earthen, grass-lined channel on Turkey Creek from Dixie Farm Road to the confluence with Clear Creek. From Dixie Farm Road to 2,000 feet downstream of Well School, the channel bottom width would be 20 feet, and the remaining channel to the confluence with Clear Creek would have a bottom width of 25 feet.

Mud Gully Conveyance Feature: The conveyance improvement would occur along 0.8 mile of Mud Gully from Sagedowne to Astoria. The proposed channel would be concrete lined with a bottom width of 45 feet. The proposed modifications for the stream are located within the median between the northbound and southbound lanes of Beamer Road.

Mary's Creek Features: Mary's Creek flood risk management measures include construction of a grass-lined trapezoidal channel along 2.1 miles of Mary's Creek. From Harkey Road to 3,940 feet upstream of McClean Road, the channel bottom width would be 15 feet, and from that point to 100 feet downstream of McClean Road, it would be 27.5 feet wide. Downstream of McClean Road to SH 35, the channel bottom width would be 35 feet.

The GRP alternative meets the criteria for the Corps' National Economic Development Plan (NED) and will package conveyance components on the Clear Creek Mainstem, Mary's Creek, Mud Gully, and Turkey Creek to reduce flood damages.

Fifty Percent Annual Exceedance Probability Nonstructural Alternative

Structures prone to flooding from the 50 percent (2-year event) Annual Exceedance Probability would be removed. Per the analysis, the most likely number of structures to be removed under this alternative is five.

Twenty Percent Annual Exceedance Probability Nonstructural Alternative

Structures prone to flooding from the 20 percent (5-year event) Annual Exceedance Probability would be removed. Per the analysis, the most likely number of structures removed under this alternative is 150.

Ten Percent Annual Exceedance Probability Nonstructural Alternative

Structures prone to flooding from the ten percent (10-year event) Annual Exceedance Probability would be removed. Per the analysis, the most likely number of structures removed under this alternative is 467.

Two additional alternatives considered combined the General Reevaluation Plan Alternative with the 20 percent and 10 percent Annual Exceedance Probability Buyout Nonstructural Alternatives. Three levels of participation in the buyout program are normally assumed; however, participation is often reduced when combined with a structural component plan such as the General Reevaluation Plan. Assumed levels of participation in the analysis of the two alternatives were 25 percent (low), 50 percent (most likely), and 75 percent (high).

General Reevaluation Plan with 20 Percent Annual Exceedance Probability Buyouts

This alternative includes the General Reevaluation Plan and additional buyouts in the 20 percent (5 year) annual exceedance probability floodplain. The most likely number of homes removed or bought out by this alternative would be 86.

General Reevaluation Plan with 10 Percent Annual Exceedance Probability Buyouts

This alternative includes the General Reevaluation Plan with additional buyouts in the 10 percent (10 year) annual exceedance probability floodplain. The most likely number of homes removed or bought out by this alternative would be 268.

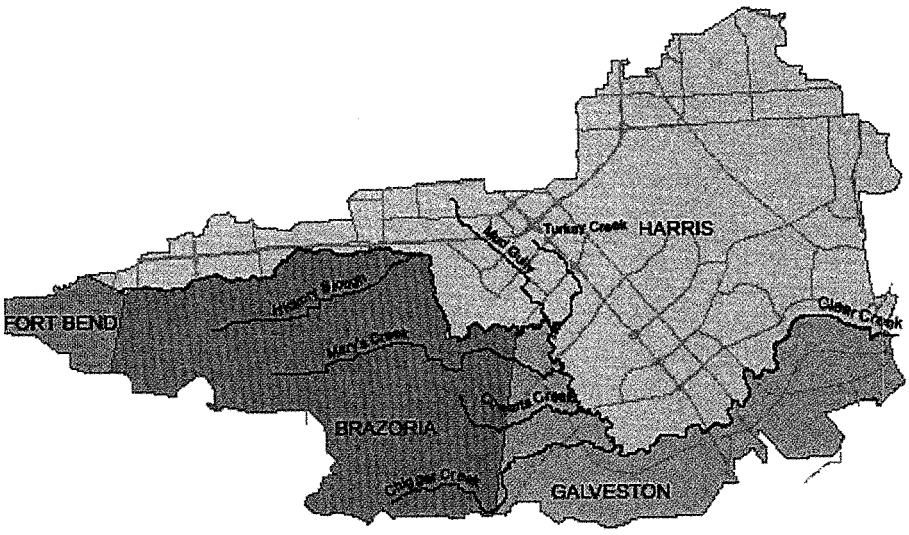
Description of Study Area

There are approximately 44.5 miles of stream that comprise the Clear Creek project area, flowing from west to east across Fort Bend, Brazoria, Harris and Galveston counties, before draining into Clear Lake and then into western Galveston Bay through natural and manmade channels. Clear Creek varies in width from two to 13.5 miles and elevations range from 5 feet to 70 feet. The Clear Creek watershed is 250 square miles and spans parts of the City of Houston and surrounding smaller cites of Pasadena, Pearland, Friendswood, Webster, and League City. Major tributaries to Clear Creek include Hickory Slough, Mud Gully and Turkey, Mary's, Cowarts and Chigger Creeks (Corps 2009b). Armand and Taylor Bayous enter the Clear Creek watershed at Clear Lake. However, neither of these bayous were included in the study area due to the small amount of flood damages associated with them. Developed portions of the study area consist of light industrial, commercial, manufacturing buildings, single-family homes, and subdivisions along the major roadways. However, portions of the project area remain undeveloped and used primarily as pastureland for livestock.

The Clear Creek watershed (Figure 5) supports floodplain forests, which include riparian corridor, bottomland, and wetlands. Lower reaches of the project support tidal marsh habitat and Clear Lake is one of the more important fish and shellfish nurseries within the Galveston Bay system (Lohse and Tyson, 1973). Wet coastal prairie is found within the project area; however, much of the upper and middle watersheds have been developed.

The Clear Creek watershed occurs within a biological transition zone between the southern mixed hardwood forest, the coastal prairie, and the coastal salt marshes. The region contains remnants of one of the few remaining native tall-grass prairies, small areas of shallow, tidal marshlands, and bottomland hardwood or riparian woodland areas. The eastern portion of the project area is defined by a flat, nearly level coastal marshland.

Tidally influenced marginal marine embayments, bordered by Galveston Bay, make up the eastern portion of the study area. Flat, nearly level coastal plain divided by a headward-eroding stream best describes the western portion of the study area. The Gulf Coastal Plain occurs inland from extensive coastal marshlands and is gently inclined Gulfward at about 5 feet or less per mile (Fisher et al., 1972). Elevations range from 70 feet in the western portion to sea level along the eastern boundary.



Source: Corps 2009b

Figure 5 Clear Creek Watershed and Tributaries Divided by County

There are active and potentially active surface faults in the area, and surface displacement can range from zero in the inactive faults to more than 12 feet for active faults. Anthropogenic activities such as groundwater, oil, and gas withdrawals have increased the frequency and activity of surface fault movement.

The study area is located in the Gulf Prairies and Marshes Vegetational Area (Gould 1975; Hatch el al. 1990). The majority of the study area is dominated by riparian corridors that follow the creeks and bayous of the Clear Creek and Clear Lake drainage systems. These riparian corridors include both tidal and non-tidal waters. Clear Lake is the downstream portion of what was formerly Clear Creek. Clear Lake exchanges water with the Galveston Bay estuary system, and the lower reaches of Clear Creek are estuarine. As far as two miles upstream of Bay Area Boulevard, Clear Creek is a tidally influenced riverine system. Salinity conditions for Clear Creek ranges from saline in Clear Lake to fresh in the upper reaches.

Clear Lake, part of the larger open bay system of Galveston Bay, is approximately 1300 acres. Galveston Bay by comparison is the second largest estuary in Texas (Armstrong, 1987). Clear Lake is a 2.0 square mile brackish, tidally influenced water body on the western side of Galveston Bay and receives fresh water inflows from Taylor and Armand Bayous, and Clear Creek. Clear Lake is shallow, averaging four to six feet deep. A tide range of 6.20 feet (mean high water) to 5.6 feet (mean low water) is typical in Clear Lake; however, tides can be influenced by storm surges affecting the Gulf of Mexico. Storm surges of greater than 10.4 feet can cause flooding along the shores of Clear Lake.

The floodplain forest and coastal prairie include nonwetland areas and wetland habitat. The National Wetlands Inventory (NWI) identifies wetlands within the 500-year floodplain. The 2006 NWI maps (USFWS, 2009) were utilized along with digitized data from aerial photos (2000, 2004, and 2009) and field verification to assist in quantifying aquatic habitats and wetlands for baseline conditions and to evaluate future conditions (Corps, 2009b). These data

are somewhat dated and likely overestimate the current acreage of waters of the U.S. due to the rapid development occurring in this region.

There are approximately 5,892 acres of waters of the U.S., including wetlands, within the 500-year floodplain. These waters of the U.S. include approximately 656.2 acres of estuarine wetlands (as unconsolidated shore/bottom and emergent wetland), 341.3 acres of lacustrine waters, 1,710.4 acres of palustrine wetlands (as emergent wetland, scrub-shrub, and forested wetlands), and approximately 225.6 acres of palustrine unconsolidated shore/bottom (Table 1). These wetlands are described following classifications of Cowardin et al. (1979). Additionally, about 391.5 acres of riverine flowing water (i.e., creeks and drainages) are located within the 500-year floodplain.

Table 1 Waters of the U.S. within the Clear Creek 500-year Floodplain

Class	Waters of the U.S. (acres)	% Waters of the U.S.	% of 500-year Floodplain
Palustrine			
Palustrine Emergent Wetland (PW)	633.5	10.8	1.5
Palustrine Forested Wetland (PF)	805.7	13.7	1.9
Palustrine Scrub-shrub (PS)	271.2	4.6	0.7
Palustrine Unconsolidated Shore/Bottom (PU)	225.6	3.8	0.5
Estuarine			
Estuarine Emergent Wetland (EE)	656.2	11.1	1.6
Other Deep-water Habitats			
Lacustrine Unconsolidated Shore/Bottom (LU)	341.27	5.8	0.8
Riverine Flowing Water (RW)	391.5	6.6	0.9
Marine and Estuarine Unconsolidated Shore/Bottom (EW)	2,566.9	43.6	6.2
Total Waters of the U.S. Within Clear Creek 500-year Floodplain	5,891.9		14.1

Source: Corps(2010)

Vegetative and Soil Communities

Floodplain Forest

The floodplain forest community is comprised of both riparian and wet flatwood forests. The riparian forests are connected to and are affected by the surface and subsurface hydrologic features of the perennial and intermittent flowing streams throughout the watershed. In return, these communities are shaped by the frequency and duration of flooding, by nutrient and sediment deposition, and by the permeability of the soils. The primary source for water for the riparian forest is the overbank flooding that occurs almost yearly, and the flooding can persist for several weeks at a time. Flood plain soils are constantly renewed by continual sedimentation. On the coastal plains, flatwoods are characterized by drained shallow depressions located between the river and its tributaries. Flatwoods can be affected by overbank flooding; however,

their dominant hydrological input comes from seasonal precipitation, high water tables and shallow overland flows.

Source: Burkes-Copes and Webb 2010

Figure 6 Clear Creek Floodplain Forest Community

In the Clear Creek floodplain forest community, canopy tree species are well represented in varying age classes from seedlings to canopy size individuals (Figure 5). Tree canopy cover is notably 80-100 percent. These communities are characterized by cedar elm (*Ulmus crassifolia* Nutt.), American elm (*Ulmus americana* L.), green ash (*Fraxinus pennsylvanica* Marsh.) and water oak (*Quercus nigra* L.) in the overstory, with shrubby vegetation such as privet (*Ligustrum spp.*), Chinese tallow (*Triadica sebifera* (L). Small), and yaupon (*Ilex vomitoria* Aiton) offering a diverse understory structure. See Appendix A for a list of tree species found in this habitat type.

Forests in the higher elevations of this same community are characterized by live oak (*Quercus virginiana* Mill.), loblolly pine (*Pinus taeda* L.) and green ash.

Coastal Prairie

The coastal prairie communities in the Clear Creek watershed are characterized as non-saline tallgrass prairie ecosystems that are situated on Vertisols and Alfisols (Burks-Copes and Web 2010). A series of ridge and swale, or pimple mounds and prairie potholes, occur within these communities. The ridge and swale complexes encourage the development of wet and dry prairie species, similar to those found in the interior tallgrass prairies to the north in the project area. The hard clay layer underneath the topsoil inhibits root formation of larger tree species. Prior to modern settlement, natural fires such as those caused by lightening, contributed to the continued growth of the native grasses, and suppressed the growth of trees and shrubs. This area typically receives 56 inches of rainfall annually.

Diamond and Smeins (1984) and Smeins et.al. (1991) believe that less than three percent of the historic coastal prairie remains in Texas due to conversion to industrial, agriculture, and residential development. Maintaining the remnant coastal prairie within the project area is a priority for the U.S. Fish and Wildlife Service (Service) and other natural resource agencies due to its scarcity. For 150 years, a trend of steady erosion and fragmentation of native prairie has led to species-poor communities that are low in endemics (McFarlane 1995).

Source: Burkes-Copes and Webb 2010

Figure 7 Typical Wet Coastal Prairie Habitat Within the Project Area

Canopy species include green ash, eastern redbud (*Cercis canadensis* L.), sweetgum (*Liquidambar styraciflua*), black gum (*Nyssa sylvatica*), eastern red cedar (*Juniperus virginiana* L.), honey locust (*Gleditsia triacanthos* L.), walnut (*Juglans* spp.), and yaupon. Common mid-story species include elephant ears (*Alocasia macrorrhizos*), Japanese honeysuckle (*Ligustrum japonicum* Thunb.), small tallow tree, greenbriar (*Smilax rotundifolia* L.), dwarf palmetto (*Sabal minor*) and southern wax myrtle (*Morella cerifera*). Common bottom story species include sea oats (*Uniola* L.), golden rod (*Oligoneuron* Small), Bermuda grass (*Cynodon dactylon*), Indiangrass (*Sorghastrum nutans* (L) Nash.), gulf cordgrass (*Spartina spartinae*), smut grass (*Sporoblus indicus*), blue grass (*Dicanthium* sp.), common rush (*Juncus effusus*), flatsedge (*Cyperus* spp.), arrowood (*Viburnum dentatum*), alligator weed *(Alternanthera philoxeroides*), and bahia grass (*Paspalum notatum*). A complete list of the wet coastal prairie species found at Clear Creek reference site is in Appendix B.

Fresh water wetlands are located among the pimple mound/prairie pothole complexes, sloughs, depressional areas such as abandoned channels, and along the streamside. Species common to these wet areas include green flatsedge (*Cyperus virens*), marsh flatsedge (*Cyperus pseudovegetus*), sharp edged flat sedge (*Cyperus haspan*), bushy bluestem (*Andropogon glomeratus*), gaping panicum (*Panicum hians*), rushes (*Juncus* spp.), swamp sunflower (*Helianthus angustifolius*), rattlesnake master (*Eryngium yuccifolium*), California bulrush

(*Scirpus califonicus*), arrowhead (*Sagittaria* spp.), spikerush (*Eleocharis* spp.), mermaidweed (*Proserpinaca hemitomon*), rattlebean (*Sesbania* spp.) beakrush (*Rhynchospora* spp.), pennywort (*Hydrocotyle bonariensis*), water primrose (*Ludwigia* spp.) and smartweed (*Polygonum* spp.).

Exotic species have invaded many of the wetland sites. Deep-rooted sedge (*Cyperus entrerianus*), bahiagrass, Brazilian vervain (*Verbena brasiliensis*), Chinese tallow, privet, Bermuda grass, spadeleaf (*Centella asiatica*), and alligator weed are common in these wetland areas.

Freshwater

The majority of the project area has undergone rapid urban development and Clear Creek and most of its tributaries have been modified extensively. Once natural sinuous streams, Clear Creek and its tributaries have undergone channelization and straightening, changing the streams' natural geomorphology. These modifications have led to the loss of in-stream and riparian habitats, although some portions of the creeks still have natural characteristics. Much of the natural riparian vegetation remains along portions of Turkey Creek while Mary's Creek has little natural riparian vegetation due to channelization. Mud Gully has received extensive straightening, channelization, and is concrete lined in segments with only sporadic riparian vegetation.

The freshwater zone of Clear Creek is typically seen upstream of Interstate Highway 45, but can vary with the amount of freshwater inflows and the tides. Tidal influence fluctuates and results in fish species having a wide range of salinity tolerance in portions of the project area. Consequently, fish that are typically considered freshwater species may be found in Clear Lake, and fish typically considered saltwater may be found upstream in Clear Creek.

Fish and Wildlife Resources

The Service has described the invertebrate stream fauna, fishes, herptofauna, birds, and mammals of the Clear Creek watershed in previous letters and reports (September 1982, July 1987, October 1988, July 1991, December 1992, February 1993, May 2002). That information is summarized below.

Fisheries

Fish communities along Clear Creek and its tributaries have been well documented since the 1970's (Service 1982). The Texas Commission on Environmental Quality (TCEQ) sampled these communities at several sites along the creek within the project area. Four samplings were conducted at a representative site at Clear Creek and SH 35 in 2002 and 2005. Early analyses determined that the fish populations were relatively healthy at the time of sampling.

TCEQ performed a habitat assessment in 2005 and found that much of the creek has a relatively unstable bottom and banks, with a very narrow riparian zone. This zone averages approximately 6.56 feet in width and 95 percent of the riparian vegetation is grasses and forbes. Stream banks were moderately unstable, only 10 to 29 percent of the substrate supported stable in-stream

habitat, and much of the substrate had signs of being frequently disturbed or removed. The TCEQ sampled Armand and Dickinson Bayous in 1992, 1993 and 2002. Due to the similarities in fauna, soils, topography, weather, vegetation, and proximity to Clear Creek, lists of the fish and shellfish found within Armand and Dickinson Bayous is included in Appendix C.

There is little information on the amount of recreational fishing that occurs within the freshwater zones of these streams (Webb 2002). In 1993, the Harris County Department of Health issued a consumptive advisory for Clear Creek for all fish species. In 2001 the ban was temporarily lifted, was reissued in 2009 and remains in effect today. Clear Lake and the nearby bayous all have high recreational use and fishing is probably common.

Benthic Macroinvertebrates

Benthic macroinvertebrate samples were taken in 1977 by the Texas Commission on Environmental Quality (then know as the Texas Department of Water Resources) at eight sites in Clear Creek, with four above the tidal reach and four in the tidal reach. Noted were low densities and diversity of benthic macroinvertebrates. Samples from the tidal reach of the creek had the fewest species (0-2 taxa). There have been no recent benthic macroinvertebrate studies; however, the benthic communities may parallel the response to the fish community changes in habitat and water quality (Corps 2009b).

The Service is not aware of any formal surveys completed for Clear Creek and the other tributaries; however, it is likely that multiple species occur (Howells et al. 1996, Corps 2009). Round pearlshell (*Glebula rotundata*) is known to occur in Mustang Bayou (Howells 2002). Other species likely to be found within the freshwater zones of the project area and commonly found in southeast Texas are the paper pond shell (*Anodonta imbecillis*), yellow sandshell (*Lampsilis teres*), and giant floater (*Anodonta grandis*). An estuarine mussel, Atlantic rangia (*Rangia cuneata*), historically found in Clear Lake (Voellinger 1987) still occurs in the brackish zones of the project area. Currently, 12 species of freshwater mussels are under review by the Service for potential listing as threatened or endangered species under the Endangered Species Act (Act).

Ditches, low gradient streams, pools, and wetlands are common places for other freshwater macroinvertebrates such as dragonflies (*Odonata*), crayfish (*Cambaridae*), caddisfly (*Trichoptera)*, snails (*Gastropoda*), true bugs (*Hemiptera*) and midge flies (*Chironomidae)*. The exotic apple snail (*Pomacea* spp.) poses a serious threat to native habitats. High flows from Tropical Storm Allison in 2001 may have contributed to the spread of the apple snail over the project area (Howells 2002).

Estuarine and Marine Resources

Clear Lake and the lower reaches of Clear Creek boast a plankton-based food chain. These microscopic plants and animals are suspended in the water column and ultimately provide food for juvenile fish of all species including menhaden (*Brevoortia patronus*) and gizzard shad (*Dorosoma cepedianum*), and various filter-feeding mollusks. The phytoplankton (microscopic plants) communities are abundant throughout the tidally influenced portions of the project area.

Texas Department of Water Resources collected over 132 species of phytoplankton in upper Galveston and Trinity Bays and a similar diversity should exist within the study area. There were 54 taxa of diatoms, 45 taxa of green algae and 14 taxa of blue-green algae dominant in the study (TDWR 1981).

Finfish and shellfish

The study area is dynamic due to its ties to the estuarine Galveston Bay and contains diverse and abundant finfish and shellfish communities. Clear Lake is one of the most important nursery habitats in Galveston Bay (Lohse and Tyson 1973, USFWS 1988). Texas Parks and Wildlife Department has identified approximately 13 species of shrimp, 17 species of crab, and over 150 finfish species in Galveston Bay (Loeffler in Green et al. 1992; McEachron et al. 1977; Parker 1965 and Sheridan et al. 1989). Galveston Bay is one of the most important nursery areas for recreational and commercially important species. Clear Lake exhibits similar salinities and species composition to that of Galveston Bay. Lohse and Tyson (1973) suggested that species composition should reflect the euryhaline (varying ranges of salinity) conditions found in Clear Lake.

Project area marshes and associated open-water habitats provide important habitat (i.e. nursery, escape cover, feeding grounds) for freshwater and estuarine-dependent fish and shellfish. Most of the economically important saltwater fishes and crustaceans harvested in Texas spawn offshore, and then use estuarine areas for nursery habitat (Herke 1995). Seasons govern the nekton use of estuaries (Day et al. 1989). Different species use the same locations in different seasons, and different life stages of the same species use different locations. Aquatic species diversity peaks in the spring and summer, and is typically low in the winter. Some marine species, which use estuaries as nursery habitat, also have estuarine-dependent life stages, typically larvae and juveniles. Larvae or juveniles can immigrate into the project area during incoming tides and take advantage of the high productivity of the estuary.

Species typical of low-salinity areas include largemouth bass (*Micropterus salmoides*), crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), gar (*Lepisosteus spatula*), and blue catfish (*Ictalurus furcatus*). Species found in higher salinity areas of the project area include Atlantic croaker (*Micropogonias undulates*), spot (*Leiostomus xanthurus*), Gulf menhaden, bay anchovy (*Anchoa mitchilli*), red drum (*Sciaenops ocellatus*), black drum (*Pogonias cromis*), southern flounder (*Paralichthys lethostigma*), blue crab (*Callinectes sapidus*), Gulf stone crab (*Menippe mercenaria*), brown shrimp (*Farfantepenaeus aztecus*), and white shrimp (*Litopenaeus setiferus*) (TCEQ 2007). Appendix C provides a list of the fish fauna that may be found in the project area, based on surveys of similar, adjacent waterbodies.

The most popular recreational finfish species in the study area is spotted seatrout (*Cynoscio nebulosus*) followed by red drum and flounder. Other common recreationally fished species include black drum, Atlantic croaker, sheepshead (*Archosargus probatocephalus*), sand seatrout (*Cynoscion arenarius*), gafftopsail catfish (*Bagre marinus*), and Gulf whiting (*Menticirrhus littoralis*). The Galveston Bay Estuary Program (1994) found that the study area had 40 percent of the private boat bay and pass fishing landings from 1981to 1991.

Historically, Galveston Bay has been the leading fisheries resource base in Texas. Shrimp, blue crabs and oysters are commercially important shellfish species and made up nearly 95 percent of the total annual bay catch. Galveston Bay provided the largest landing of white shrimp from 1993 to 1997 with over three million pounds caught per year. Brown shrimp and pink shrimp (*Litopenaeus duorarum*) accounted for 73 percent of the landings from Galveston, Matagorda and Aransas bays (Robinson et al. 1998). Osburn (et al. 1987) found that approximately 1.8 million pounds of blue crabs were harvested yearly. The eastern oyster (*Crassostrea virginica*) was the most important commercial species in the bay, with almost 3.9 million pounds harvested per year from 1920 to 1990. Lohse and Tyson (1973) indicate that eastern oysters were landed almost exclusively from Galveston Bay but are common to Clear Lake as well.

Essential Fish Habitat

In 1996, Congress established procedures for identifying Essential Fish Habitat (EFH) under amendments to the Magnuson-Stevens Fishery Conservation and Management Act and required interagency coordination to conserve federally managed species. The Corps has initiated consultation procedures with federal authorities. EHF is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" and is separated into estuarine and marine components. Substrates such as sand, mud, shell, rock and associated biological communities, sub-tidal vegetation such as seagrasses and algae, and inter-tidal vegetation such as marshes and mangroves comprise the estuarine component. The marine component is defined by the Gulf of Mexico Fisheries Management Council (GMFMC) as "all marine waters and substrates (mud, sand, shell, rock and associated biological communities) from the shoreline to the seaward limit of the Exclusive Economic Zone". The GMFMC has identified portions of the study area as EFH for adult and juvenile white shrimp, brown shrimp, red drum and Spanish mackerel (*Scomberomorus maculates*). EFH species are supported by estuarine emergent wetlands, estuarine mud, sand and shell substrates, submerged aquatic vegetation, and estuarine water column habitats within the study area.

Wildlife

Aviafuana

The study area supports abundant and diverse avifauna. Upland and riparian woodlands provide excellent habitat for resident and migratory birds and provides critical stopover habitat for neotropical songbirds during migration. Species common to the study area may include turkey vulture (*Cathartes aura*), eastern screech owl (*Megascops asio*), chuckwill's-widow (*Caprimulgus carolinensis*), red-bellied woodpecker (*Melanerpes carolinus*), American crow (*Corvus brachyrhynchos*), tufted titmouse (*Baeolophus bicolor*), northern mockingbird (*Mimus polyglottos*), cedar waxwing (*Bombycilla cedrorum*), northern cardinal (*Cardinalis cardinalis*), painted bunting (*Passerina ciris*), and American goldfinch (*Carduelis tristis*) (Lockwood and Freeman 2004; Richardson et al. 1998). Riparian corridors provide habitat for species such as black-bellied whistling-duck (*Dendrocygna autumnalis*), wood duck (*Aix sponsa*), black-crowned night heron (*Nycticorax nycticorax*), red-shouldered hawk (*Buteo lineatus*), barred owl (*Strix varia*), and belted kingfisher (*Megaceryle alcyon*) (Lockwood and Freeman 2004; Richardson et al. 1998).

Prairies and marshes provide habitat for numerous migratory avian species, waterfowl, several species of raptors, and a variety of songbirds. Texas is one of the most significant waterfowl wintering regions in North America with three to five million waterfowl annually wintering in the state (Texas Coastal Management Program 1996). Common species of prairies and marshes include greater Canada goose (*Branta canadensis*), gadwall (*Anas strepera*), northern shoveler (*Anas clypeata*), northern pintail (*Anas acuta*), northern harrier (*Circus cyaneus*), killdeer (*Charadrius vociferus*), mourning dove (*Zenaida macroura*), scissor-tailed flycatcher (*Tyrannus forficatus*), barn swallow (*Hirundo rustica*), white-crowned sparrow (*Zonotrichia leucophrys*), and meadowlarks (*Sturnella* spp.) (Lockwood and Freeman 2004; Richardson et al.1998). In the easternmost portion of the study area, estuaries, tidal flats, and bay margins provide excellent habitat for herons and egrets, shorebirds, wading birds, gulls, and terns.

All migratory birds (see Title 50 Code of Federal Regulations (CFR), Part 10, Section 10.13) are protected by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712). While MBTA permits are available to allow for the deliberate take of migratory birds for specific types of activities (see Title 50 CFR, Part 21 no permit is available for the unintentional take of migratory birds. Unintentional take often occurs when land clearing activities, etc. destroy active nests (young or eggs are present) or otherwise kill birds. This type of unintentional take may be avoided by conducting surveys to determine if active bird nests occur within the project area and then taking appropriate measures to avoid destroying the active nests. Appendix D provides recommendations to assist with compliance of the MBTA while undertaking activities associated with the Clear Creek Project.

Colonial Waterbirds

Twenty-three (23) species of cormorant, pelican, heron, egret, spoonbill, gull, tern, and skimmer regularly nest in large numbers along the Texas coast, frequently on natural and manmade bay islands. In recent years, the majority of successful Texas colonies have been located on islands wholly or partially maintained by dredged material (Glass 1994). Colonial waterbirds are an important wildlife resource on the Gulf Coast and in the project area because of their abundance, their economic significance to the tourism industry, and their status as indicators of aquatic ecosystem health. Since 1973, the Texas Colonial Waterbird Society has conducted annual censuses of all coastal Texas colonies and currently maintains a comprehensive database of annual census numbers and colony locations (TCWC 2010).

While most Texas colonies are located on small, offshore islands (TCWC 2010), one colony is located within the study area. Raley's colony (600-418) lies near Clear Creek and near Egret Bay Blvd. An average of 26 green heron nesting pairs were seen yearly at this location from 2002-2004. The colony has not been active since 2005, probably due to predator invasion or development. Waterbird experts have long concluded that successful nesting habitat must be geographically isolated and free from land-based predators (Soots and Landin 1978).

Regional waterbird population trends are a more accurate picture of waterbird population health than comparing individual colony counts from specific years, since nesting populations frequently shift locations in response to predation, habitat conditions, parasite levels, and human

disturbance. In 2009, Galveston County contained 52 known colonies with a total estimated population of 42,478 nesting pairs belonging to 21 species. Of the 52 colonies, 37 colonies have been active for the last 5 years and most nesters belong to the gull and tern families.

Mammals

Blair (1950) describes the project area as being located between the Texas and Austroriparian biotic provinces in Texas, with most of the project area located in the Texas Biotic Province and only the far eastern portion located in the Austroriparian Province. The Texas Biotic Province does not have any endemic species, but rather supports species found in the neighboring provinces. The Austroriparian species, most commonly found in the forest, bogs, and marshes and the grassland species, enter from the prairie habitats from the west. Riparian/woodland forest, estuarine/freshwater wetlands, coastal prairie, scrub/scrub, and woodland forest habitats are located within the project area.

Common Austroriparian province mammals within Texas include: Virginia opossum (*Didelphis virginiana*), eastern mole (*Scalopus aquaticus*), eastern pipistrelle (*Pipistrellus subflavus*), eastern red bat (*Lasiurus borealis*), eastern gray squirrel (*Sciurus carolinensis*), eastern flying squirrel (*Glaucomys volans*), Baird's pocket gopher (*Geomys breviceps*), white-footed mouse (*Peromyscus leucopus*), hispid cotton rat (*Sigmodon hispidus*), eastern woodrat (*Neotoma floridana*), eastern cottontail (*Sylvilagus floridanus*) and swamp rabbit (*Sylvilagus aquaticus*).

Herptofauna

At least 18 anuran species, 5 salamander and newt species, 9 lizard species, 37 snake species, and 13 turtle species are known to occur in one or more counties in the study area (Dixon 2000). Common amphibian and reptile species in the study area may include: Blanchard's cricket frog (*Acris crepitans blanchardi*), Gulf Coast toad (*Bufo nebulifer*), eastern six-lined racerunner (*Cnemidophorus sexlineatus*), Mediterranean house gecko (*Hemidactylus turcicus*), Texas ratsnake (*Elaphe obsoleta*), eastern hog-nosed snake (*Heterodon platirhinos*), several species of watersnake (*Nerodia* spp.), snapping turtle (*Chelydra serpentina*), stinkpot (*Sternotherus odoratus*), and red-eared slider (*Trachemys scripta elegans*) (Dixon 2000).

Endangered Species

A review of Service files for the project area indicates that no federally listed or proposed threatened or endangered species are likely to occur, and no officially designated critical habitat occurs in the project area. The Corps completed a biological assessment in 2009 and made a no effect determination for all listed species and their critical habitat in the project area. In December 2009, the Service initiated a status review for 12 species of freshwater mussels for potential listing as threatened or endangered species under the Act.

Methods of Study

Habitat Evaluation Procedures

During the feasibility study initiated by the Corps in 1999, the Ecosystem Assessment Team (E-Team) acquired information on the complex ecosystems of Clear Creek and their components in a variety of scales (local, regional, watershed, and system levels) to assess the conservation and management of the sensitive resources in the area and to make informed decisions. The E-Team held 10 workshops over a five-year period and made the decision to assess ecosystem benefits using a series of community based (functional) models rather than using a series of species or guild-based models. This decision was based on the meticulously studied results of the Habitat Evaluation Procedures (HEP) frameworks created by the Service (Service 1980). HEP model assessments evaluated the future changes in quantity and quality of the aquatic, wetland and terrestrial ecosystems simultaneously. Figure 7 illustrates the habitat study area used in the HEP. Habitat Suitability Index (HSI) models were developed for use in the HEP. These models are flexible and are applicable to specific level of effort determined by the user or adapted to determine a site's response to a particular design. The HSI generates an index of habitat quality for project area. The HSI model can be used for one or more cover types to reflect the critical, complex interdependencies of the species or community's present (Burkes-Copes and Webb 2010). The HSI model uses a single formula to express the relationship between quality and carrying capacity for the site, regardless of how many cover types are used within the model. The HEP multiplies the HSI by the size of the site (usually measured in acres) to form a measure of change called Habitat Units (HUs). Under the HEP, one HU is equivalent to one acre of optimum habitat. The last step is to determine the Average Annual Habitat Unit (AAHU). AAHU represents the total number of HUs gained or lost because of the proposed action, divided by the life of the action.

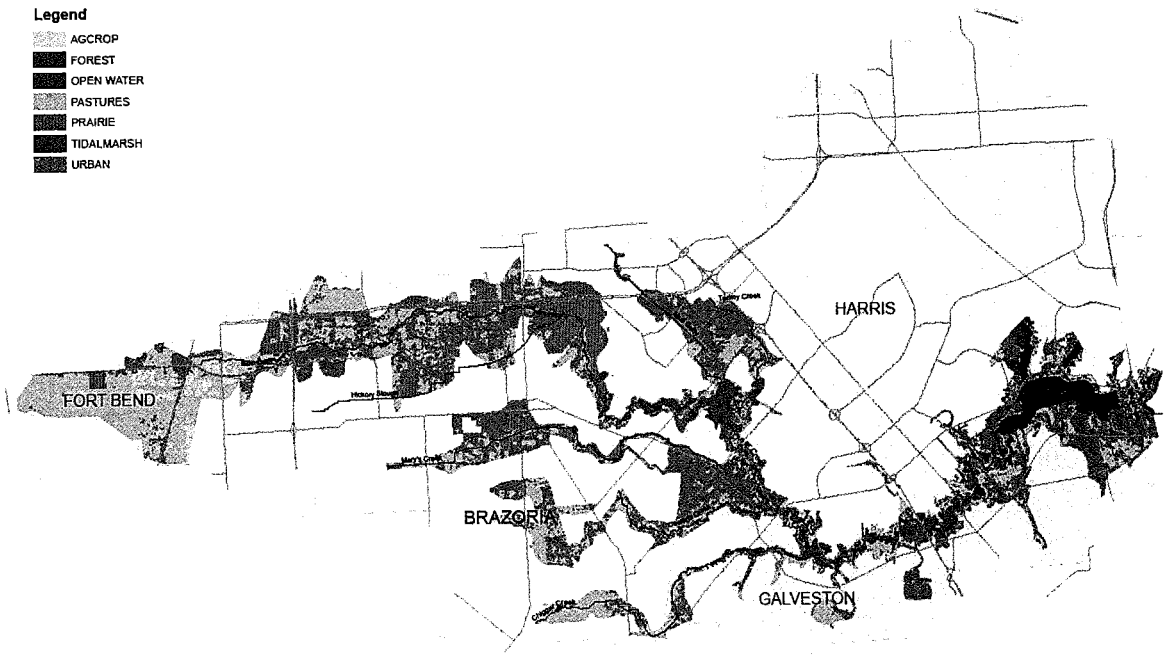
Corps 2010 details the steps involved in using the HEP process to assess the environmental impacts of the project, the model development, and the review processes. The Engineer Research and Development Center, the E-Team, an external peer review panel, and Corps Headquarters have comprehensively reviewed the models.

The E-Team identified a preferred mitigation plan for project impacts to floodplain forest and coastal wet prairie habitats along Clear Creek and developed the following goals:

1. Replace lost habitat quality on a one-to-one basis as measured by AAHUs for a minimum of 106 AAHUs of floodplain forest.
2. Replace impacted habitats with the same type of habitat (in-kind) to the extent practicable.
3. Enhance the fish and wildlife resources of Clear Creek and its' tributaries.
4. Improve water quality for resident and tourist waterborne recreation, and for fish and wildlife.
5. Preserve and protect natural and cultural resources for public education and historical appreciation purposes.

6. Increase the quantity and quality of habitat on Clear Creek and its tributaries through ecosystem restoration activities.

The E-Team identified floodplain forest and coastal prairie wetland complexes as priority ecosystems habitats. The floodplain forest includes riparian areas along Clear Creek and its tributaries, the adjacent forest woodlands and wetlands. Due to the large project area, Clear Creek, for purposes of the HEP, was divided into smaller reaches called Eco-Reaches, described in relation to vegetation/ground cover, habitat type, previous channelization efforts, and development. As noted in the Eco-Reach descriptions that follow, most of the forest community immediately within and adjacent to Clear Creek remains intact. Figure 7 illustrates the habitat types found within the study area. Coastal prairie in the project area includes undeveloped historical prairie that exhibits typical topography or prairie vegetation within the floodplain. The remaining coastal prairie located within the study area was of particular interest to the ICT due to previously identified impacts under the authorized plan that led to the reevaluation study. The E-Team defined the study area for assessment of impact and mitigation alternatives as the 500-year floodplain, to include all areas of floodplain forest and coastal prairie likely affected by the proposed project.



Source: Burkes-Copes and Webb 2010

Figure 8 Habitat Study Area Used in HEP Modeling

Table 2 indicates the projected amount of floodplain forest and coastal prairie within the project area that to be impacted even without the project. Changes are most likely due to development and erosion caused by increased flooding along the creek.

Table 2 Floodplain and Coastal Prairie Future Without Project

Habitat Type	Year					Net Change
	2000	2020	2030	2055	2070	
	Total Acres in Habitat Study Area					
Floodplain Forest	3,802	3,326	3,096	2,508	2,155	-1,647
Coastal Prairie	2,647	2,371	2,231	1,886	1,677	-970

Source: Corps (2009b)

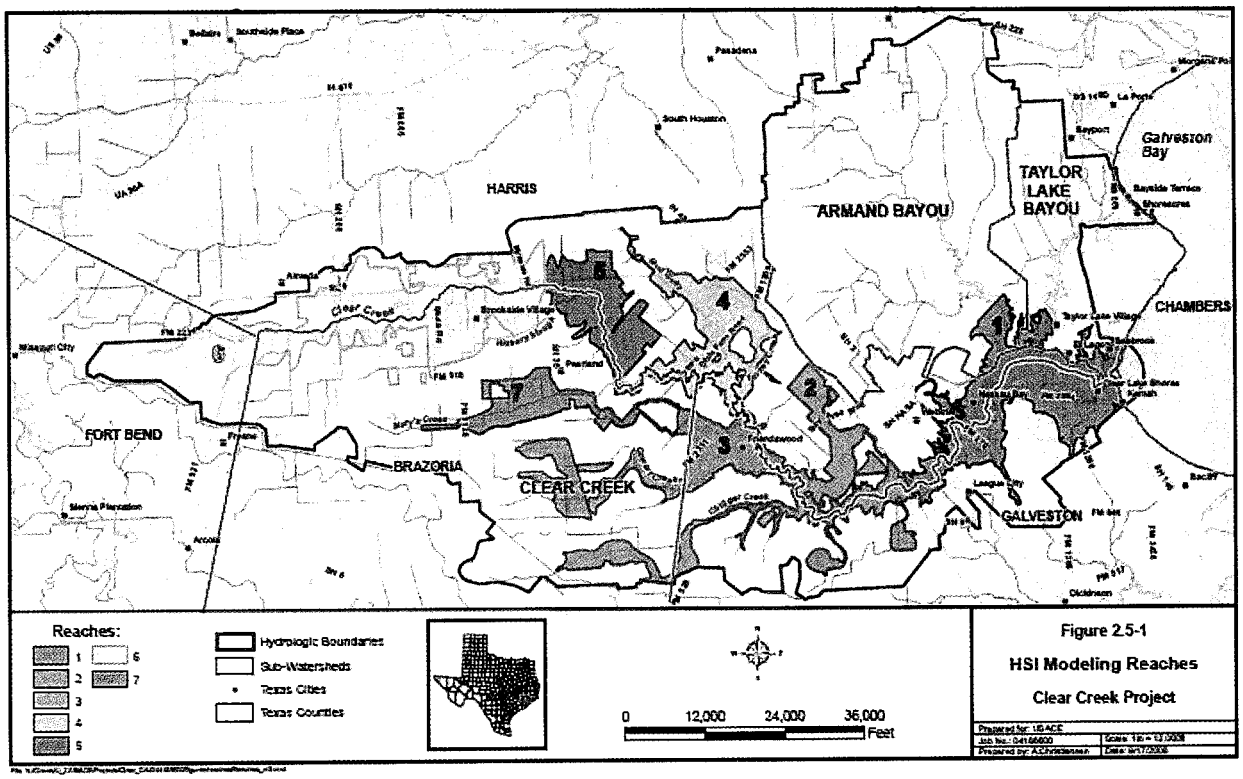
The E-Team developed a Floodplain Forest Community HSI model to identify project impacts and mitigation. This model broadly defined the floodplain forest community given a variety of project impacts, mitigation scenarios, and alternatives. This model did not capture the full range of plant and wildlife species and physical characteristics of the project area. However, it was a tool to compare potential alternatives in an effort to identify plans with the least amount of environmental impacts. Changes to ecosystem integrity within water, soils, and habitat structure and/or landscape context in response to land and water management activities were variables included in the community model. A comprehensive explanation of the floodplain and wet coastal prairie models are found in the *Clear Creek Watershed Flood Risk Management Habitat Assessments Using Habitat Evaluation Procedure* (Burks-Copes and Webb, 2010).

Table 3 illustrates the unavoidable impacts, acres of avoidance/minimization due to design features, compensatory mitigation acres, and AAHUs for the project from 2000 to 2070. Unavoidable impacts include 106 AAHUs of floodplain forest (involving 278 acres of unavoidable impacts and 155 acres of avoidance and minimization features). The impacts are offset by 131 AAHUs of compensatory mitigation generated by restoring flow to 13 oxbows on Clear Creek cut off during past channelization activities to reestablish 31 acres of floodplain forest within the riparian corridor of Clear Creek. The Habitat Tradeoffs and Mitigation section discusses the specific mitigation features in further detail.

Table 3 Floodplain Forest Impacts and Mitigation from Year 2000 to 2070

Flood Risk Management Features			Compensatory Mitigation (Vegetation Community Reestablishment and Rehabilitation)		
Acres					
Unavoidable Impacts	Design Features Providing On-site Avoidance/ Minimization	Net AAHUs	Acres	AAHUs	Net Overall AAHUs
278	155	–106	31	131	25

Source: Corps 2010



Source: Corps 2009b

Figure 9 HSI Modeling Reaches within Clear Creek Project Area

The project area was divided into seven smaller assessment units or ecological reaches (Eco-Reaches) for this model (Figure 9). The degree of human-caused habitat degradation defined each of the reaches. Land use, stream morphology, and past channelization efforts were factors considered when identifying each of the Eco-Reaches. A HEP community model assessed the habitat impacts and mitigation for all the Clear Creek Eco-Reaches. Table 4 details the land use for each of the Eco-Reaches.

Eco-Reach 1

This Eco-Reach begins at Clear Creek's confluence with Galveston Bay near SH 146, extends upstream to the IH 45 bridge and includes the open waters of Clear Lake. The upstream section of this reach narrows to 180 feet in width and resembles typical meandering stream morphology. Eco-Reach 1 has a moderate amount of development and adjacent lands are residential, commercial or pasturelands (Table 4). Most of the remaining undeveloped areas along Clear Creek occur in the upstream portion of this Eco-Reach. The banks are gently sloping and the upstream portions of the reach are forested with some areas of tidal fringe marsh and occasional small cove-like features. This Eco-Reach is not channelized, except for a small section located near the Second Outlet at the SH 146 bridge.

Eco-Reach 1 contains 490 acres of floodplain forest and 255 acres of tidal marsh. These two ecotypes make up nine percent of this reach. Cordgrass (*Spartina sp.),* rush *(Juncus sp.),* arrowhead *(Sagittaria sp.)* and submerged aquatic widgeongrass (*Ruppia sp.)* are commonly

found in this reach. Willow oak is commonly found in the upstream floodplain forested portion of the reach.

Eco-Reach 2

This Eco-Reach begins at the IH 45 Bridge, continues upstream to FM 528, and includes the main channel of Clear Creek and several small tributaries such as Chigger Creek. Development in this reach is low to moderate, with approximately 50 percent of the vegetation cover being pasture, 27 percent forested riparian and 19 percent urban (Table 4). Clear Creek is 180 feet wide until the intersection of FM 528, where the channel narrows to approximately 90 feet. Stream banks slope gently throughout most of the Eco-Reach, and there is some tidally influenced marsh in the lower one-half mile of the reach. This reach of Clear Creek remains unchannelized, and has retained much of it natural meandering stream morphology. Despite some recent clearing by the local drainage district, some forested edge and snags remain. Willow oak and cedar elm are common in this reach of the project area, which includes the healthiest and most extensive stands of floodplain forest totaling almost 1,095 acres.

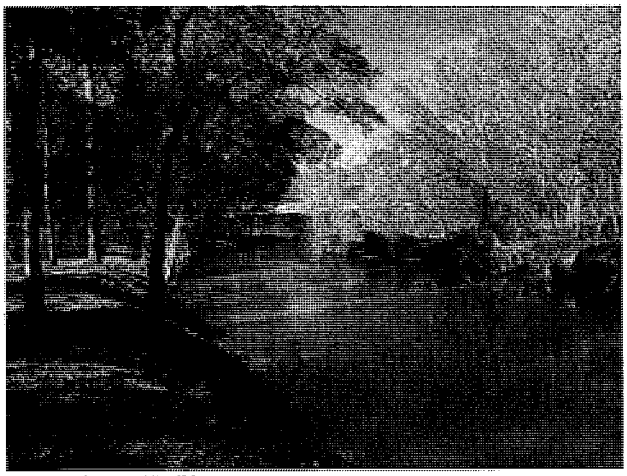
Source: Corps File Photo

Figure 10 Eco-Reach 2 Clear Creek North of IH 45 Bridge

Eco-Reach 3

This Eco-Reach begins at FM 528, continues to FM 2351, and includes the main stem of Clear Creek and Cowarts Creek, a small tributary of Clear Creek. Eco-Reach 3 has experienced a high degree of alteration, with more than 90 percent of the adjacent land being pasture (including old fields and haylands) followed closely by urban lands (including residential, industrial and transportation development) (Table 4). Within this Eco-Reach, Clear Creek narrows considerably, ranging from 90 feet wide at the downstream limits to less than 30 feet wide at the upstream limits at FM 2351; the banks of the Clear Creek main channel also become considerably steeper moving upstream. The Clear Creek main-stem within Eco-Reach 3 has not been channelized and retains its natural meandering sinuosity, although a series of high-flow bypasses have been constructed at various locations. Although still within the tidally influence limits of the creek, no tidal marsh occurs within Eco-Reach 3 and forested riparian habitat has been reduced to a comparatively narrow corridor. As in Eco-Reach 2, the local drainage district

has performed some light clearing and snagging of trees along the edge of the creek (Figure 9). Floodplain forest within this reach includes green ash, American elm, sugar hackberry, water oak, and water hickory and comprises 1,053 acres.



Source: Corps File Photo

Figure 11 Eco-Reach 3 Clear Creek South of FM 2351 Bridge

Eco-Reach 4

This Eco-Reach beings at FM 2351, continues to Country Club Drive and includes the main stem of Clear Creek and two tributaries, Mud Gully and Turkey Creek. Eco-Reach 4 has a moderate to high degree of development, with approximately 75 percent of the adjacent lands classified as urban lands (residential, industrial and transportation development) or pasture lands (Table 4). The main channel of Clear Creek meanders considerably and is relatively narrow. The slopes of the channel are steep and are often nearly vertical because of topography and natural erosion.

Source: Corps File Photo

Figure 12 Eco-Reach 4 Mud Gully South of Sagedown Blvd.

The upper portion of the reach has been channelized, with the excavated material mounded on the north bank (Figure 10). As a result, many of the natural channel meanders have been cut off from the channel and a series of oxbow lakes have formed in the cutoff portions. Culverts connect Clear Creek to the oxbows; however, water elevations at low flow prevent water exchange with the oxbows. During high rainfalls, the oxbows fill and drain into the creek or the flooding creek forces water through the culverts into the oxbows. This reach has 1,053 acres of floodplain forest, which is the second largest area of floodplain forest in the project area.

Mud Gully and Turkey Creek have also been altered extensively by past flood control activities, especially in the upstream areas.

Eco-Reach 5

This Eco-Reach begins at Country Club Drive and continues upstream to SH 35. This reach has experienced a low to moderate degree of development, with approximately 75 percent of the adjacent land predominantly tall-grass prairie (including remnant prairie), and to a lesser extent pasture (Table 4). This portion of Clear Creek ranges from 15 to 20 feet wide, has a trapezoidal shape and was extensively altered in the 1940's. The local drainage district has reshaped, mowed and removed vegetation along the channel, thereby creating a steep, grass-lined, nearly straight low flow channel.

Eco-Reach 6

Eco-Reach 6 begins at SH 35 and continues upstream to just past SH 288. This reach, like Eco-Reach 5, has a low to moderate degree of development. Almost 79 percent of the land cover for this eco-reach is coastal prairie or, to a lesser extent, pasture lands (Table 4). This reach of Clear Creek is very narrow and seldom exceeds 15 feet in width. The channel is an extensively altered, trapezoidal, low flow channel shaped by flood control activities since the 1940s (Figure 11). Mowing, tree removal and reshaping have kept the channel from approximately 1 mile downstream of Cullen Blvd. to SH 35 relatively straight. Upstream of Cullen Blvd., the creek has returned to a natural forested riparian habitat.

Source: Corps File Photo

Figure 13 Eco-Reach 6 Clear Creek near Mykawa Road

Eco-Reach 7

This reach includes Mary's Creek from its confluence with Clear Creek to near Winding Road extending to Sunset Meadows Road. Habitat along Mary's Creek consists of a few small, isolated patches of remnant riparian forest (Table 4). Because of extensive urban and agricultural development (Figure 12), this reach has only about 85 acres of floodplain forest.

Source: Corps File Photo

Figure 14 Eco-Reach 7 Mary's Creek South of Veterans Drive

Table 4 Land Use/ Cover Types for the Clear Creek 500 Year Floodplain Eco-Reaches

	Eco-Reach															
	1		2		3		4		5		6		7		500-year Floodplain	
Vegetation Cover /Land Use	Acres	% Area	Acres	% Area	Acres	% Area	Acres	% Area	Acres	% Area	Acres	% Area	Acres	% Area	Total Acres	% Total Area
Farms and Croplands	1	<0.1	97	2	34	0.7	2	<0.1	28	1.0	1,305	9.1	12	0.4	1,479	3.6
Floodplain Forest	490	6	1,095	27	253	5.4	1,053	23.8	337	12.1	489	3.4	85	3.2	3,802	9.1
Open Bodies of Water Deeper than 1–3 m	2,900	33	66	2	20	0.4	17	0.4	11	0.4	180	1.3	25	0.9	3,219	7.7
Old Fields, Haylands, Pastures	2,260	26	1,997	49	2,522	53.4	1,521	34.3	692	24.9	8,378	58.5	1,120	41.9	18,490	44.5
Prairie	103	1	33	1	0	0	26	0.6	1,094	39.4	1,077	7.5	314	11.7	2,647	6.4
Tidal Marsh	255	3	64	2	0	0	0	0	0	0	0		0		319	0.8
Existing Residential, Industrial, and Transportation Avenues	2,653	31	762	19	1,869	39.5	1,753	39.6	601	21.6	2,871	20.0	1,090	40.8	11,600	27.9
Total	8,662		4,114		4,727		4,431		2,778		14,327		2,673		41,556	

Source: Corps 2009b

Sea Level Rise

On July 1, 2009, new guidance requires the Corps to incorporate relative sea level rise into all coastal activities. For this project, the Corps used the National Research Council (NRC) 1987 rates in their evaluation of sea level changes. The Intergovernmental Panel on Climate Change (IPCC 2007) has suggested recent predictions on sea level rise. The IPCC 2007 report assumes that thermal expansion contributes to 70-75 percent of sea level rise. Should the ice sheets in Greenland and Antarctica melt faster than the current rate, these sea level projections would be obsolete. Table 5 illustrates the NRC and the IPCC's predicted sea level rise. The NRC recommends rates be revisited every decade to incorporate additional data.

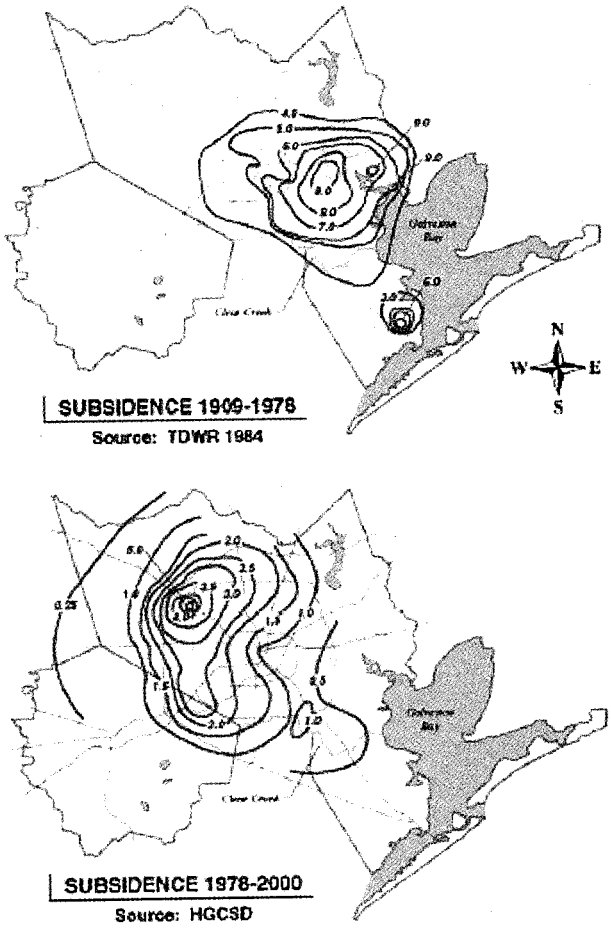
Table 5 NRC and IPCC Rates of Sea Level Rise

Eustatic Sea Level Rise Estimates	50 years	100 years
Existing rate	60 mm (1.2 mm/yr)	120 mm (1.2 mm/yr)
NRC I	130 mm (2.6 mm/yr)	400 mm (4.0 mm/yr)
NRC II	225 mm (4.5 mm/yr)	780 mm (7.8 mm/yr)
NRC III	322.5 mm (6.45 mm/yr)	1125 mm (11.25 mm/yr)
IPCC AR4 - Scenario B1: lower end of range	90 mm (1.8 mm/yr)	180 mm (1.8 mm/yr)
IPCC AR4 - Scenario A1B: mid range of all scenarios	190 mm (3.8 mm/yr)	380 mm (3.8 mm/yr)
IPCC AR4 - Scenario A1F1: high end of range	295 mm (5.9 mm/yr)	590 mm (5.9 mm/yr)

Source: IPCC 2007

Predicting sea level rise in the Galveston Bay estuary systems is very uncertain. However, based on local subsidence and global sea level rise, it is likely that there will be an effect in the project area. Figure 13 shows subsidence from 1909 to 1978 along the Houston Ship Channel (upper figure) and the Texas City area, where industrial sites are concentrated (Corps 2009b). From 1978 to 2000, subsidence migrated westward, with little subsidence noted in the project area (bottom figure). The alarming rates of subsidence in the Houston area led to a shift away from ground water pumping and a move towards surface water supply. Historical ground water pumping has left the project area vulnerable to increases in sea level. The Corps has assumed that the most recent subsidence estimations within the project area (even though data is 10 years old) to be the baseline for the project. Upstream portions of Clear Creek in Fort Bend County have experienced subsidence losses of 2 feet from 1978- 2000. During the same time, lower reaches of the project area experienced a 0.5-foot loss (Corps 2009b). Subsidence in the upper reaches of the project area along Clear Creek contributes to the flooding prevalent during high flow events. As Clear Creek continues to experience subsidence, flooding will continue to be an issue.

Sea level rise will contribute to increased tidal exchanges and salinities in Clear Lake and further upstream in Clear Creek. This salinity change can affect species composition (both fauna and flora) along Clear Creek. Some freshwater species will be forced to migrate further upstream to locate suitable habitats within the project area.



Source: Corps 2009b

Figure 15 Historical Subsidence in the Study Area

Proposed Plan Project Impacts

In the initial phases of project planning and interagency coordination, the Service and the other resource agencies expressed concerns regarding further degradation to remnant wet coastal prairie and floodplain-forested areas along Clear Creek and its tributaries. The Corps held public meetings and received numerous comments regarding the environmental impacts caused by the channelization of portions of Clear Creek. Many suggested that Clear Creek retain its natural sinuosity and riparian forests, which led to the Proposed Plan Alternative. It was determined that the cities of Pearland and Friendswood received the most damage during high flood events; therefore, flood reduction measures were incorporated into the upper portions of Clear Creek that have already been altered or channelized. Construction in the lower portions of Clear Creek will be minimal and the project area will benefit from preservation and enhancement on the mitigation sites.

Freshwater Fish

During construction of the conveyance features and stream modifications, sediment may enter the waterways and increase turbidity. The sediment may cover the creek bottom and destroy

necessary foraging and spawning habitats. However, fish are extremely mobile and can find suitable habitats upstream or downstream of the project area.

After construction, creek banks may be susceptible to erosion and sediment may enter the creek. Best management practices should be used to decrease the amount of erosion until the banks can be planted with native grass and tree species. Planting trees in designated areas (14 per acre) will help to restore the historic riparian corridor and provide shaded habitat for fish species. Additionally, trees provide a natural filter for sediment and pollutants that may wash into the creek, thus positively affecting water quality. A list of Best Management Practices for rivers, streams, and tributaries is located in Appendix E.

Marine Fish and Finfish and EFH

The Proposed Plan's construction activities may temporarily increase sediment in Clear Creek, especially in the more tidally influenced lower reaches. Fish species that use this area of Clear Creek and Clear Lake may experience high turbidity during run-off events, but probably no more than usual. Any impacts to marine fish and shellfish should be temporary and minor.

Wildlife

Unavoidable impacts will affect the wildlife in the project area. Construction activities will permanently affect floodplain forest vegetation and the wildlife that reside there. Removing vegetation to create open areas can provide predators with a temporary advantage over species that rely on the vegetative cover for protection. Some wildlife browse or forage on the vegetation removed during construction. These species may need to locate suitable habitat elsewhere. Low mobility species may not successfully evade construction machinery. Construction, erosion, and run-off along the channels may affect aquatic dependent wildlife and their ability to forage. Increased noise levels will disturb wildlife and may inhibit breeding and nesting behaviors. The use of best management practices along the channels and during the construction of detention, features may help to reduce impacts to wildlife.

One colonial waterbird rookery is located within the project area. This site, known as Raley's colony, has not been active for four years. Construction activities are not expected to impact this colony.

These temporary and permanent impacts to wildlife are expected to be offset by avoidance, minimization, and compensation measures. Compensation measures include the rehabilitation or reestablishment of 155 acres of floodplain forest along the low flow channel of Clear Creek and of 31 acres of floodplain forest associated with restoring natural flow through 13 oxbow lakes.

Habitat Trade-offs and Selected Mitigation Plan

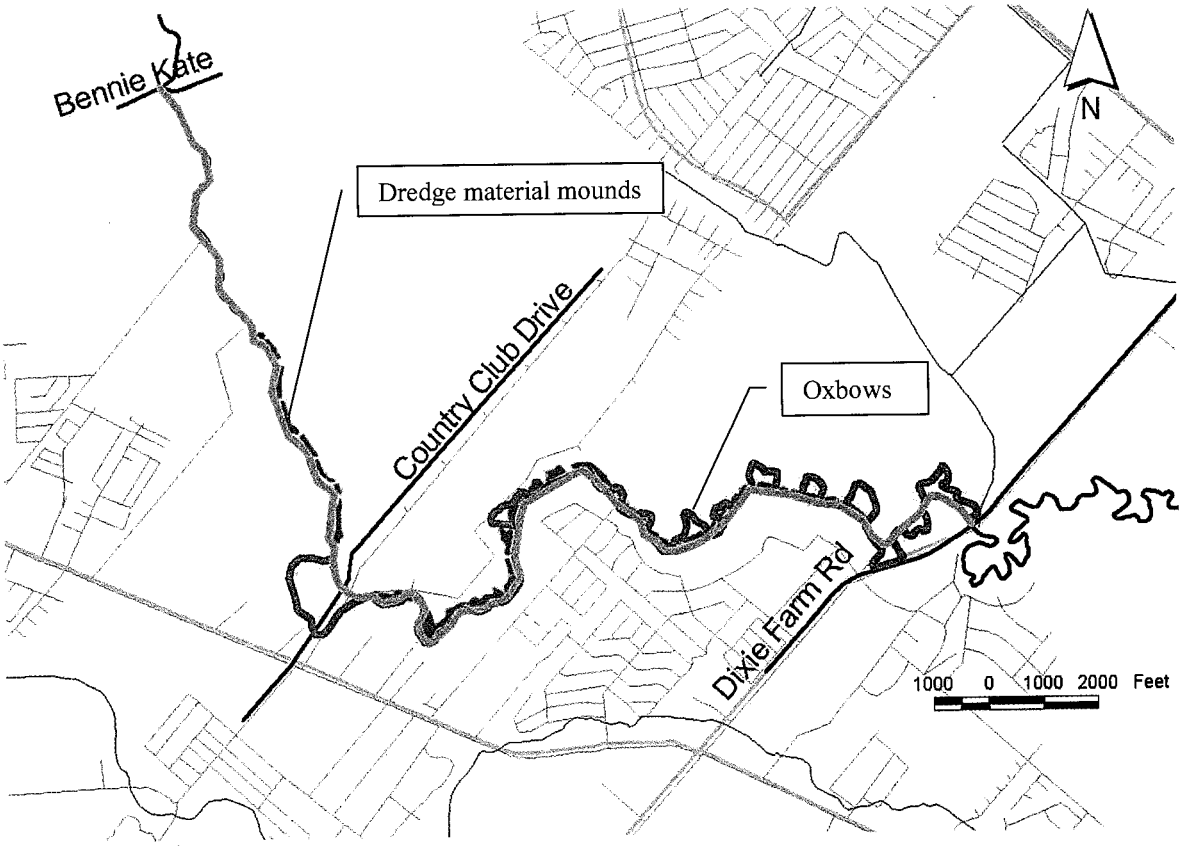
On August 31, 2009, the Corps of Engineers Directorate of Civil Works Planning Community issued implementation guidance for Section 2036(a) of the Water Resources Development Act of 2007. This guidance requires that the proposed alternative contain a mitigation plan for the fish and wildlife resources that are lost as a result of the unavoidable impacts caused by the project. Compensated for these impacts to the extent justified, and the preferred alternative must have

adequate mitigation to ensure the project will not have any negligible adverse impact to the significant resources in the area. The Corps recognizes that the wetland resources outlined in this document are significant and could suffer long-term impacts due to the GRP alternative.

Approximately 278 acres of floodplain forest within the riparian corridor of Clear Creek would be directly impacted by construction of the flood risk management measures associated with the GRP Alternative; no losses or impacts of coastal prairie or tidal marsh are anticipated. Design of the conveyance features along Clear Creek would avoid and minimize impacts to existing floodplain forest as much as possible. The unique flood bench design of the Clear Creek conveyance would preserve the existing morphology of the low-flow channel and allow 122 acres of existing floodplain forest corridor to be preserved and rehabilitated and 33 acres of floodplain forest corridor to be reestablished (total 155 acres). While the Corps sought to avoid and minimize environmental impacts with the proposed plan, the HEP analysis determined that a net loss of 106 AAHUs of floodplain forest would still occur (Table 3). Compensatory mitigation to offset these losses would be accomplished by rehabilitating the low-flow channel to mimic the natural 1955 sinuosity regime of Clear Creek. This would be conducted by reconnecting low flow through 13 remnant oxbows scattered throughout the system between Country Club Drive and Dixie Farm Road that were cut off as a result of past channelization activities. Portions of the current low-flow channel alignment would be modified to restore natural hydrology into the oxbows under low-flow conditions; high-flow conditions would be maintained within the existing conveyance alignment to guarantee flood protection for the area. Excavated material stockpiled along the north bank of the creek would be removed, and the existing cleared overbank areas along the channel would be densely planted to restore the existing floodplain forest to a desired state. These activities would result in the reestablishment of 31 acres (131 AAHUs) of floodplain forest within the riparian corridor of Clear Creek. Mitigation would offset the negative net impacts to floodplain forest from conveyance, avoidance, and minimization features of the GRP (–106 AAHUs) and produce net project benefits (+25 AAHUs). Figure 14 depicts where the existing dredge material mounds (light green color) and the oxbows (red color) occur.

The E-Team agreed there were many opportunities for full mitigation of both floodplain forest and wet coastal prairie. Forest impacts (measured in AAHUs through the floodplain forest model) are mitigated with forest restoration/rehabilitation benefits, and the wet coastal prairie with wet coastal prairie.

The Corps extensively details the cost analysis in the *Draft Environmental Impact Statement* (Corps 2009b) and *Clear Creek Watershed Flood Risk Management Habitat Assessments Using Habitat Evaluation Procedures* (Burke-Cops and Webb 2010).



Source: Corps 2009b

Figure 16 Mitigation Measures Include Reconnecting Oxbows and Removal of Dredge Material Mounds along the Main Stem of Clear Creek

Monitoring and Ecological Success Criteria

The Corps developed ecological success criteria for monitoring the mitigation areas to determine corrective actions if needed. Success criteria are based on an assessment of the structural attributes of the restored habitats, and evaluated using the best scientific understanding of the relationship of these attributes within a functioning ecosystem. The Corps assumes that when the predetermined structural threshold is met, the desired habitat function will be provided, or will be within a designated period. Floodplain forest success criteria include percent survival of tree plantings, control of invasive/exotic species and vegetative cover requirements. Table 6 details the ecological success criteria for the project.

Field data collected at five and ten-year intervals will determine the percent survival of trees. Success criteria require a minimum of 95 percent survivorship of the original planting density at five years and 90 percent at ten years post planting. This criterion ensures the desired acreage of floodplain forest is met.

Table 6 Ecological Success Criteria for the Clear Creek Project

Ecological Success Criteria			
	Avoidance and Minimization Features of the Proposed Plan		Compensation for Unavoidable Impacts
	Clear Creek Mainstem Conveyance, Low-flow Riparian Corridor		Clear Creek Mainstem Low-Flow Channel/Oxbows and Preservation/Rehabilitation of 31 Acres of Associated Forested Riparian Habitat (i.e. Mitigation Plan C1)
	Preservation/ Rehabilitation of 122 Acres of Forested Riparian Habitat	Restoration of 33 Acres of Forested Riparian Habitat	
	Eco-Reaches 4, 5 & 6	Eco-Reaches 5 & 6	Eco-Reaches 4 & 5
Percent survival of planted species will be at least 95% at 5 yrs and 90% at 10 yrs following construction completion	At minimum of 380 live healthy native trees per planted acre at 5 yrs, and 360 live healthy native trees per planted acre at 10 yrs		
Invasive, noxious and/or exotic plant species shall comprise less than 2 percent of areal coverage	A maximum of 2 percent of the areal cover of all mitigation areas will be comprised of invasive, noxious, and/or exotic plant species at 5, 10 and 35 years following construction completion		
Vegetative Cover:			
10 Years Post-Construction			
Tree Canopy Cover (%)	65–75	≥5	65-75
In-stream Vegetative Cover (%)	5–10	≥5	25-30
Stream Overhead Cover (%)	20–60	≥60	20-60
Vegetation Layers (No.)	6–7	≥2	6-7
35 Years Post-Construction			
Tree Canopy Cover (%)	70–75	≥65	70-80
In-stream Vegetative Cover (%)	5–20	≥20	35-65
Stream Overhead Cover (%)	25–60	≥60	30-70
Vegetation Layers (No.)	6–7	≥4	6-7
Monitoring Organization	U.S. Army Corps of Engineers, the Federal Cost Share Sponsors will share responsibility and costs consistent with the apportionment of O&M costs for the project.		

Source: Corps 2010

The effectiveness of invasive/exotic species control will be measured at 5, 10 and 35 years post construction. Invasive species shall comprise less than two percent areal coverage at each of the mitigation sites. Many exotic species are fast growing, become established in newly disturbed areas and can out-compete desired species. Beginning at year five post construction, the ICT

will use aerial photography to evaluate the vegetation coverage at the mitigation sites. If the vegetation coverage is not progressing, the ICT will make recommendations, such as additional plantings, to increase the likelihood of achieving the success criteria.

The Corps will provide an annual report to the ICT on the status of the mitigation sites, which will include data collected during the designated 5, 10, and 15 year post construction monitoring. The report will detail the likelihood the mitigation will achieve success, a timeline to achieving success and recommendations to increase the likelihood of achieving success.

The Service recommends the ICT re-convene to review the annual report and make recommendations on ways to increase the success of the mitigation. The Corps incorporate ICT recommendations and provide adaptive management at the mitigation sites to improve the likelihood of success. The Draft Mitigation and Monitoring Plan (2010) calls for the ICT to discuss corrective measures in the event monitoring efforts indicate the mitigation sites are not responding as anticipated, or in the case of a catastrophic event, that devastates the mitigation sites. Appendix F discusses the monitoring protocol for the project, developed by the Corps.

Summary of Service Conclusions and Recommendations

The Clear Creek General Reevaluation Study project spans four counties (Brazoria, Ft. Bend, Galveston and Harris), is 45 miles long in an east to west direction, and is part of the Clear Creek watershed that spans 250 square miles. The Proposed Plan will incorporate several conveyance and flood reduction features along the main stem of Clear Creek and three tributaries, and will negatively impact 287 acres of floodplain forest. After intensive natural resource agency involvement in the development of the floodplain forest and wet coastal prairie HEP models to analyze impacts and mitigation, the E-Team agreed on three mitigation measures to preserve and restore 31 acres of flood plain forest within the Clear Creek watershed.

In addition, the Service has the following recommendations:

1. Create an interagency work group for the post-authorization planning and construction phases. The work group would execute important design, inspection, and monitoring functions for habitat creation features outlined in the mitigation section of this document.
2. The ICT re-convene to review, discuss, and make recommendation on the annual mitigation report.
3. The Corps use the updated IPCC sea level rise rates to re-evaluate sea level rise impacts to the project prior to construction.
4. Conduct field survey of all areas with suitable nesting habitat for bird nests prior to construction. Appendix D provides migratory bird conservation actions for projects.
5. There is no record that mussel surveys have been conducted within the project area; therefore the Service recommends surveys be conducted prior to construction. Employ Best Management Practices (Appendix E) during construction activities along the main channel and its tributaries to reduce impacts to mussels that may be present. Monitoring efforts should include mussel presence/absence surveys every 2-5 years, and if species of

interest are found, yearly surveys should be conducted and adaptive management measures employed.

6. Channel modifications should mimic natural stream features such as riffles and pools to provide habitats for fish species during various life cycle stages.

7. The mitigation measures outlined in this document be implemented. Removal of dredged material mounds and the restoration of cut off oxbows along the main channel of Clear Creek combined with the preservation and enhancement of 31 acres of floodplain forest will positively offset the impacts associated with the Proposed Plan.

8. Beneficially use or dispose of mounded dredge material in an appropriate manner.

9. The Corps, when possible, require protective easements on privately owned Clear Creek mitigation sites to protect these sites from future development activities.

10. The Corps implement the proposed monitoring plan. A plan, based on the success criteria used in the monitoring plan, should be developed and implemented to control exotic and invasive species at the mitigation sites.

11. Monitoring efforts need to be consistent and well documented due to the sensitive nature of the ecosystems that occur within the project area. The Service recommends establishing photo-points throughout each of the mitigation sites to record visually the changes that occur through time.

12. The Corps should conduct surveys in the fall and spring to record the aviafuana, mammal, fish, and amphibian and reptile species at each of the mitigation sites.

13. In the event the Proposed Plan involves buy-outs, the Service recommends that properties revert to a natural state once demolition is complete and remove any exotic/invasive tree/shrub species from the site. Cap off and/or remove all utilities. No construction debris should enter any waterways. The Service can provide a list of preferred native tree and grass species to plant that will provide foraging, nesting and breeding habitat for wildlife species.

Literature Cited

Armstrong, Neal. 1987. The Ecology of Open-Bay Bottoms of Texas: A Community Profile. U.S. Fish and Wildlife Service. Biological Report 85 (7.12). 104 pp.

Blair, W. F. 1950. The biotic provinces of Texas. Texas Journal of Science. 2: 93-117.

Burks-Copes, K.A., and A.C. Webb. 2010. Clear Creek Watershed Flood Risk Management Habitat Assessments Using Habitat Evaluation Procedures (HEP): Analyses, Results and Documentation. Draft Report. U.S. Army Engineer Research and Development Center, Environmental Laboratory, Vicksburg, M.S.

Cowardin, L.M., V. Carter. F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31, U.S. Fish and Wildlife Service, Washington, D.C. 103pp.

Dannenbaum Engineering Corporation. 1997. Clear Creek Federal Flood Control Project Review. Prepared for Local Sponsored: Harris County District Galveston County. Houston, Texas

Day, J.W., C. A. S. Hall, W. M. Kemp, and A. Yanez-Arancibia. 1989. Estuarine ecology. John Wiley & Sons, New York. 558 p.

Dixon, J.R. 2000 Amphibians and reptiles of Texas. Second edition. Texas A&M University Press, College Station.

Diamond, D.D. and F.E. Smeins. 1984. Remnant grassland vegetation and ecological affinities of the upper coastal prairie of Texas. Southwest Naturalist 29:321-334.

Fisher, W.L, J.H. McGowen, L.F. Brown, Jr. and C.F. Groat. 1972. Environmental Geologic Atlas of the Texas Coastal Zone – Galveston-Houston area. The University of Texas, Bureaus of Economic Geology 93 p.

Glass, P.O. 2010 personal communication.

Glass, P. O. 1994. Do we need more waterbird nesting islands in Galveston Bay, Texas? Dredging '94, Proceedings Second International Conference. Nov. 13-16, 1994. Lake Buena Vista, FL: p. 796-809

Gould, F.W. 1975. The Grasses of Texas. Texas A&M University Press, College Station.

Herke, W.H. 1995. Natural fisheries, marsh management, and mariculture: complexity and conflict in Louisiana. Estuaries 18:10-17.

Howells, R. G. 2002. Distributional surveys of freshwater bivalves in Texas: progress report for 2001. Texas Parks and Wildlife Department, Management Data Series. *Austin* 200:22.

Howells, R. G., R. W. Neck, and H. D. Murray. 1996. Freshwater mussels of Texas. Texas Parks and Wildlife Press, Austin

Green, A., M. Osborn, P. Chai, J. Lin, D. Loeffler, A. Morgan, P. Rubec, S. Spanyers, A. Walton, R.D. Siack, D. Gawlik, D. Harpole, J. Thomas, E. Buskey, K. Schmidt, R. Zimmerman, D. Harper, D. Hinkley, T. Sager, and A. Walton. 1992. Status and Trends of Selected Living Resources in the Galveston Bay System. Galveston Bay National Estuary Program Publication GBNEP-19. Webster, Texas

Lohse, A., and J. Tyson. 1973. Clear Creek, Texas environmental resources inventory and evaluation. U.S. Army Corps of Engineers, Galveston, Texas, Contract No. DACW674-73-C-0074.

McEachron, L.W., C.R. Shaw, and A.W. Moffet. 1977. A Fishery Survey of Christmas, Drum, and Bastrop Bays, Brazoria County, Texas. Texas Parks and Wildlife Department. Technical Series No. 20. Austin, Texas.

McFarlane, R.W. 1995 Upland Coastal Prairie of Texas and Louisiana: Description, Human Impact and Management Options. McFarlane and Associates, Houston, Texas.

Parker, J.C. 1965. An Annotated Checklist of the Fishes of the Galveston Bay System, Texas. Publications of the University of Texas Institute for Marine Science 10:201–220.

Sheridan, P.F., R.D. Siack, S.M. Ray, L.W. McKinney, E.F. Klima, and T.R. Calnan. 1989. Biological Components of Galveston Bay. Pp. 23–51 in Galveston Bay: Issues, Resources, Status and Management. National Oceanic and Atmospheric Administration Estuary-of-the-Month Seminar Series No. 13. Washington, D.C.

Smeins, F. E., D. D. Diamond, and C. W. Hanselka. 1991. Coastal prairie. Pages 269-290 in R. T. Coupland (editor), Ecosystems of the world: Natural grasslands---introduction and western hemisphere. Elsevier, New York:

Soots, R. F. and N. C. Landin. 1978. Development and Management of Avian Habitat on Dredged Material Islands. Technical Report DS-78-18. US Army Engineer Waterways Experiment Station, Vicksburg, MS. 98 pp.

Texas Department of Water Resources (TDWR). 1981. Trinity-San Jacinto Estuary: A Study of the Influence of Freshwater Inflows. Texas Department of Water Resources Report LP-113. Austin, Texas.

Texas Natural Heritage Program (TNHP). 1993. Plant communities of Texas. Texas Parks and Wildlife Department, Austin.

Texas Colonial Waterbird Census (TCWC). 2010. Texas Colonial Waterbird Census, 1973 – 2009. http//texascoastalprogram.fws.gov. U.S. Fish and Wildlife Service, 17629 El Camino Real #211, Houston, TX 77581.

U.S. Army Corps of Engineers (Corps). 2009a. Biological Assessment Clear Creek General Reevaluation Study Brazoria, Fort Bend, Galveston and Harris Counties, Texas. Galveston District Corps of Engineers Galveston, Texas.

U.S. Army Corps of Engineers. 2009b. Draft Environmental Impact Statement Clear Creek General Reevaluation Study Brazoria, Fort Bend, Galveston and Harris Counties, Texas. Galveston District Corps of Engineers, Galveston, Texas.

U.S. Army Corps of Engineers. 2010. Clear Creek Flood Risk Management Project Draft Mitigation Monitoring and Adaptive Management Plan Brazoria and Harris County, Texas. Galveston District Corps of Engineers, Galveston, Texas

U.S. Fish and Wildlife Service (Service). 1980. Habitat as a Basis for Environmental Assessments, Ecological Services, Manual 102. U.S. Fish and Wildlife Service, Department of the Interior, Washington D.C.

Voellinger, L.R. 1987. An Archeological Assessment of Five Sites on the South Shore of Clear Lake, Galveston County, Texas. Document No. 860700. Espey, Huston & Associates, Inc., Austin

Appendices

Appendix A Floodplain Species Found in the Clear Creek Study Area

Scientific Name	Common Name
Quercus phellos L.	willow oak
Quercus nigra L.	water oak
Quercus virginiana Mill.	live oak
Quercus similis Ashe	bottomland post oak
Quercus stellata Wangenh.	post oak
Quercus laurifolia Michx.	laurel oak
Quercus pagoda Raf.	cherry bark oak
Quercus falcata Michx.	southern red oak
Quercus macrocarpa Michx.	bur oak
Ulmus americana L.	American elm
Ulmus crassifolia Nutt.	cedar elm
Ulmus rubra Muhl.	slippery elm
Ulmus alata Michx.	winged elm
Ligustrum sinense Lour.	Chinese privet
Ligustrum L.	ligustrum, tree ligustrum
Ligustrum japonicum Thunb.	Japanese privet
Pinus taeda L.	loblolly pine
Triadica Loureiro	tallow
Triadica sebifera (L.) Small	Chinese tallow
Celtis laevigata Willd.	sugar berry, sugar hackberry
Celtis occidentalis L.	hackberry
Melia azedarach L.	chinaberry
Morus L.	mulberry
Carya Nutt.	hickory
Carya aquatica (Michx. f.) Nutt	water hickory
Carya illinoinensis (Wangenh.) K. Koch	pecan
Fraxinus pennsylvanica Marsh.	green ash

Appendix B Wet Coastal Prairie Species Found Within the Clear Creek Reference Site

Scientific Name	Common Name
Fraxinus pennsylvanica Marsh	green ash
Alocasia macrorrhiza	elephant ears
Lonicera japonica	Japanese honeysuckle
Ligustrum japonicum Thunb.	Japanese ligustrum
Juniperus virginiana	eastern red cedar
Ilex vomitoria Ait.	yaupon
Ambrosia trifida L.	giant ragweed
Ambrosia psilostachya	Cuman ragweed
Triadica sebifera (L.) Small	small tallowtree
Smilax rotundifolia L	Greenbriar
Gleditsia triacanthos L	honeylocust
Sabal Adans.	palmetto
Sabal minor	dwarf palmetto
Uniola L.	sea oats
Solidago sempervirens L.	seaside goldenrod
Oligoneuron Small	goldenrod
Crategis marshallii	parsley hawthorn
Chionanthus virginicus	white fringetree
Campsis radicans (L.)	trumpet creeper
Crataegus viridis L.	green hawthorn
Cercis Canadensis	eastern redbud
Liquidambar styraciflua L.	sweetgum
Nyssa slvatica	blackgum
Panicum virgatum L.	switchgrass
Eleocharis R. Br.	spikerush
Carex castanea Wahlenb.	nut sedge
Polygonum	smartweed
Ageratina altissima (L.) King & H.E.	white snake root
Morella cerifera	southern wax myrtle
Stenotaphrum Trin.	St. Augustine Grass
Axonopus Beauv	carpet grass
Axonopus fissifolius	common carpetgrass
Panicum L	panic grass
Panicum rigidulum Bosc ex Nees var	redtop panic grass
Cyperus virens	green flatsedge
Hydrocotyle bonariensis	pennywort
Cheilanthes aemula Maxon	rival lipfern
Euphorbia bicolor Engelm. & Gray	snow on the prairie
Rubus	dewberry vines
Rubus trivialis Michx.	southern dewberry
Juncus acuminatus Michx.	tapertip rush
Elyleymus Baum	wild rye
Eleocharis quadrangulata (Michx.) Roemer & J.A. Schultes	squarestem spikerush

Cynodon dactylon	Bermuda grass
Sorghastrum Nash	Indian grass
Spartina spartinae (Trin.) Merr.	Gulf cordgrass
Sporobolus indicus (L.) R. Br.	smutgrass
Dicanthium spp.	bluegrass
Trifolium spp.	clovers
Poncirus trifoliata	hardy orange
Ruellia L.	wild petunia
Pluchea foetida (L.) DC.	stinking camphorweed
Centella L	Centella
Pluchea odorata	sweetscent
Juncus effusus	common rush
Cyperus haspan	haspan flatsedge
Cyperus spp.	flatsedge
Myrica	sweetgale
Rubus angustus	blackberry
Lygodium Sw.	climbing fern
Viburnum dentatum	arrowood
Cyperus entrerianus	woodrush flatsedge
Callicarpa Americana L.	American beautyberry
Chasmanthium laxum var laxum	slender woodoats
Cyperus pseudovegetus	flatsedge
Phyla nodiflora	turkey tangle frogfruit
Phyla	fogfruit
Rhynchospora	beaksedge
Rhynchospora odorata	fragrant beaksedge
Rhynchospora corniculata	shortbristle horned
Rhynchospora caduca	anglestem beaksedge
Rhynchospora fascicularis	fascicled beaksedge
Erythrina herbacea	red cardinal
slender woodoats	poison ivy
Tradescantal albiflora	wandering Jew
Vitis spp.	grapevine
Ostrya virginiana	hophornbean
Teucrium cubense	small coastal germander
Eleocharis montevidensis	sand spikerush
Mikania spp.	hempvine
Eleocharis montana (Kunth) Roemer & J.A. Schultes	mountain spikerush
Eleocharis spp	spikerush spp.
Sesbania punicea (Cav.) Benth	rattlebox
Elephantopus	elephant foot
Oplismenus hirtellus	bristle basketgrass
Oplismenus Beauv.	basketgrass
Cyperus entrerianus	flatsedge
Diospyros virginiana	common persimmon

Hypericum L.	St.John's wort
Cephalanthus occidentalis	buttonbush
Polyganum	smartweed
Chasmanthium latifolium	broadleaf wood oats
Juglans	walnut
Eleocharis quadrangulata (Michx.) Roemer & J.A. Schultes	squarestem spikerush
Polygonum hydropiperoides Michx.	swamp smartweed
Alternanthera	joyweed
Alternanthera philoxeroides	alligatorweed
Proserpinaca L.	mermaidweed
Leersia hexandra Sw.	southern cutgrass
Hydrolea ovata	ovate false fiddleleaf
Centella asiatica	spadeleaf
Sesbania drummondii	poisonbean
Paspalum urvillei Steud.	Vasey's Grass
Paspalum lividum Trin.	Longtom
Paspalum floridanum	Florida paspalum
Paspalum praecox	early praecox
Paspalum notatum	bahiagrass
Ampelopsis Michx.	peppervine
Triadica sebifera (L.)	Chinese tallow
Andropogon	bluestem
Andropogon glomeratus (Walt.) B.S.P.	bushy bluestem
Schizachyrium Nees	little bluestem
Berchemia	supplejack
Baccharis halimifolia L	eastern baccharis
Ratibida Raf	prairie coneflower
Ludwigia L.	primrose willos
Iva annua	annual marshelder
Helianthus angustifolius	swamp sunflower
Justicia L.	water willow
Conoclinium coelestinum (L.)	blue mistflower
Stenosiphon linifolius (Nutt. ex James) Heynh.	gaura
Sorghastrum Nash	partridge pea
Tridens spp.	purple top tridens
Helenium amarum	yellowdicks
Physostegia angustifolia Fern.	false dragonhead
Pancium hians Ell.	gaping grass
Panicum hemitomon	maidencane
Palafoxia	Palafaxia spp.
Acmella L.C. Rich. ex Pers	spotflower
Lobelia appendiculata A. DC.	pale lobelia
Linum spp	flax
Verbena brasiliensis Vell	Brazilian vervain
Vernonia Schreb.	ironweed

Salix nigra	black willow
Carpinus caroliniana	American hornbeam

Appendix C Fish and Shellfish Expected in Clear Creek (Freshwater and Tidal Reaches) and Clear Lake

Fish and Shellfish Expected in Clear Creek (Freshwater and Tidal Reaches) and Clear Lake

Common Name	Scientific Name	Habitat Preference			Clear Creek	Armand Bayou	Dickinson Bayou
		Freshwater	Euryhaline	Marine			
Invertebrates							
Blue crab	*Callinectes sapidus*		X			X	X
Mud crab	*Rhithropanopeus harrisii*		X			X	
Brown shrimp	*Farfantopenaeus aztecus*		X			X	X
White shrimp	*Litopenaeus setiferus*		X			X	X
Pink shrimp	*Farfantopenaeus duorarum*		X				
Aarow shrimp	*Tozeuma carolinense*		X				X
Larval shrimp						X	
Grass shrimp	*Palaemonetes kadiakensis*		X			X	
Grass shrimp	*Palaemonetes paludosus*		X			X	
Grass shrimp	*Palaemonetes pugio*		X			X	X
Grass shrimp	*Palaemonetes intermedius*		X				X
Grass shrimp	*Palaemonetes vulgaris*		X				X
Prawn	*Macrobrachium acanthurus*		X				
Prawn	*Macrobrachium ohione*		X				X
Prawn	*Macrobrachium* sp.		X				
Cambaridae							
Crayfish	*Procambarus* sp.	X					X
Soleidae							
Lined sole	*Achirus lineatus*			X		X	
Hogchoker	*Trinectes maculatus*			X		X	
Engraulidae							
Bay anchovy	*Anchoa mitchelli*			X		X	
Striped anchovy	*Anchoa hepsetus*			X			X
Ariidae							
Sea catfish	*Arius felis*			X			X
Gafftop sail catfish	*Bagre marinus*			X		X	
Clupeidae							
Skipjack herring	*Alosa chrysochloris*		X				X
Gulf menhaden	*Brevoortia patronus*			X		X	
Gizzard shad	*Dorosoma cepedianum*	X				X	
Threadfin shad	*Dorosoma petenense*	X					X
Scaled sardine	*Harengula jaguana*		X				X
Bothidae							
Bay whiff	*Citharichthyes spilopterus*			X		X	
Southern flounder	*Paralichthys lethostigma*			X		X	
Sciaenidae							
Freshwater drum	*Aplodinotus grunniens*	X					X
Sand seatrout	*Cynoscion arenarius*			X		X	
Spotted seatrout	*Cynoscion nebulosus*			X		X	
Spot	*Leiostomus xanthurus*			X		X	
Atlantic croaker	*Micropogonias undulatus*			X		X	

Appendix D Suggested Priority of Migratory Bird Conservation Actions for Projects U.S, Fish and Wildlife Service, Migratory Bird Management

1. Avoid any take of migratory birds and/or minimize the loss, destruction, or degradation of migratory bird habitat while completing the proposed project or action.

2. Determine if the proposed project or action will involve below- and/or above-ground construction activities since recommended practices and timing of surveys and clearances could differ accordingly.

3. If the proposed project or action includes a reasonable likelihood that take of migratory birds will occur, then complete actions that could take migratory birds outside of their nesting season. This includes clearing or cutting of vegetation, grubbing, etc. The primary nesting season for migratory birds varies greatly between species and geographic location, but generally extends from early April to mid-July. However, the maximum time period for the migratory bird nesting season can extend from early February through late August. Also, eagles may initiate nesting as early as late December or January depending on the geographic area. Due to this variability, project proponents should consult with the appropriate Regional Migratory Bird Program (USFWS) for specific nesting seasons. Strive to complete all disruptive activities outside the peak of migratory bird nesting season to the greatest extent possible. Always avoid any habitat alteration, removal, or destruction during the primary nesting season for migratory birds. Additionally, clearing of vegetation in the year prior to construction (but not within the nesting season) may discourage birds from attempting to nest in the proposed construction area, thereby decreasing chance of take during construction activities.

4. If a proposed project or action includes the potential for take of migratory birds and/or the loss or degradation of migratory bird habitat and work cannot occur outside the migratory bird nesting season (either the primary or maximum nesting season), project proponents will need to provide the USFWS with an explanation for why work has to occur during the migratory bird nesting season. Further, in these cases, project proponents also need to demonstrate that all efforts to complete work outside the migratory bird nesting season were attempted, and that the reasons work needs to be completed during the nesting season were beyond the proponent's control.

   Also, where project work cannot occur outside the migratory bird nesting season, project proponents must survey those portions of the project area during the nesting season prior to construction occurring to determine if migratory birds are present and nesting in those areas. In addition to conducting surveys during the nesting season/construction phase, companies may also benefit from conducting surveys during the prior nesting season Such surveys will assist the company in any decisions about the likely presence of nesting migratory birds or sensitive species in the proposed project or work area. While individual migratory birds will not necessarily return to nest at the exact site as in previous years, a survey in the nesting season in the year before construction allows the company to become familiar with species and numbers present in the project area well before the nesting season in the year of construction. Bird surveys should be completed during the nesting season in the best biological timeframe for detecting the presence of

nesting migratory birds, using accepted bird survey protocols. USFWS Offices can be contacted for recommendations on appropriate survey guidance. Project proponents should also be aware that results of migratory bird surveys are subject to spatial and temporal variability. Finally, project proponents will need to conduct migratory bird surveys during the actual year of construction, if they cannot avoid work during the primary nesting season (see above) and if construction will impact habitats suitable for supporting nesting birds.

5. If no migratory birds are found nesting in proposed project or action areas immediately prior to the time when construction and associated activities are to occur, then the project activity may proceed as planned.

6. If migratory birds are present and nesting in the proposed project or action area, contact your nearest USFWS Ecological Services Field Office and USFWS Region Migratory Birds Program for guidance as to appropriate next steps to take to minimize impacts to migratory birds associated with the proposed project or action.

* Note: these proposed conservation measures assume that there are no Endangered or Threatened migratory bird species present in the project/action area, or any other Endangered or Threatened animal or plant species present in this area. If Endangered or Threatened species are present, or they could potentially be present, and the project/action may affect these species, then consult with your nearest USFWS Ecological Services Office before proceeding with any project/action.

** The Migratory Bird Treaty Act prohibits the taking, killing, possession, and transportation, (among other actions) of migratory birds, their eggs, parts, and nests, except when specifically permitted by regulations. While the Act has no provision for allowing unauthorized take, the USFWS realizes that some birds may be killed during construction and operation of energy infrastructure, even if all known reasonable and effective measures to protect birds are used. The USFWS Office of Law Enforcement carries out its mission to protect migratory birds through investigations and enforcement, as well as by fostering relationships with individuals, companies, and industries that have taken effective steps to avoid take of migratory birds and by encouraging others to implement measures to avoid take of migratory birds. It is not possible to absolve individuals, companies, or agencies from liability even if they implement bird mortality avoidance or other similar protective measures. However, the Office of Law Enforcement focuses its resources on investigating and prosecuting individuals and companies that take migratory birds without identifying and implementing all reasonable, prudent and effective measures to avoid that take. Companies are encouraged to work closely with Service biologists to identify available protective measures when developing project plans and/or avian protection plans, and to implement those measures prior to/during construction or similar activities.

*** Also note that Bald and Golden Eagles receive additional protection under the Bald and Golden Eagle Protection Act (BGEPA). BGEPA prohibits the take, possession, sale, purchase, barter, offer to sell, purchase, or barter, transport, export or import, of any Bald or Golden Eagle, alive or dead, including any part, nest, or egg, unless allowed by permit. Further, activities that would disturb Bald or Golden Eagles are prohibited under BGEPA. "Disturb" means to agitate or bother a Bald or Golden Eagle to a degree that causes, or is likely to cause, based on the best

scientific information available, (1) injury to an Eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. If a proposed project or action would occur in areas where nesting, feeding, or roosting eagles occur, then project proponents may need to take additional conservation measures to achieve compliance with BGEPA. New regulations (50 CFR § 22.26 and § 22.27) allow the take of bald and golden eagles and their nests, respectively, to protect interests in a particular locality. However, consultation with the Migratory Bird, Ecological Services, and Law Enforcement programs of the Service will be required before a permit may be issued.

Appendix E Best Management Practices for Projects Affecting Rivers, Streams, and Tributaries

The project crosses or potentially affects river, stream or tributary aquatic habitat. Therefore the Service recommends implementing the following applicable Best Management Practices:

1. Construct stream crossings during a period of low streamflow (e.g. July- September);
2. Cross streams, stream banks and riparian zones at right angles and at gentle slopes;
3. When feasible, directionally bore under stream channels;
4. Disturb riparian and floodplain vegetation only when necessary;
5. Construction equipment should cross the stream at one confined location over an existing bridge, equipment pads, clean temporary native rock fill, or over a temporary bridge;
6. Limit in-stream equipment use to that needed to construct crossings;
7. Place trench spoil at least 25 feet away landward from streambanks;
8. Use sediment filter devices to prevent movement of spoil off right-of-way when standing or flowing water is present;
9. Trench de-watering, as necessary, should be conducted to prevent discharge of silt laden water into the stream channel;
10. Maintain the current contours of the bank and channel bottom;
11. Do not store hazardous materials, chemicals, fuels, lubricating oils, and other such substances within 100 feet from streambanks;
12. Refuel construction equipment at least 100 feet from streambanks;
13. Revegetate all disturbed areas as soon as possible after construction to prevent unnecessary soil erosion. Use only native riparian plants to prevent the spread of exotics;
14. Maintain sediment filters at the base of all slopes located adjacent to the streams until right-of-way vegetation becomes established;
15. Maintain vegetative filtration strip adjacent to streams and wetlands. The width of a filter strip is based on the slope of the bank and the width of the stream. Guidance to determine the appropriate filter strip (stream management zone, SMZ) width is provided below; and
16. Direct water runoff into vegetated areas.

SMZ widths should consider watershed characteristics, risk of erosion, soil type and stream width. SMZ widths are measured from the top of each bank and established on each side of the stream. Erosion risk increases with sandy soil, steep slopes, large watersheds, and increasing stream widths. Recommended primary and secondary SMZ widths are provided in the table below.

Stream Width (feet)	Slope (Percent)	Primary SMZ (feet)	Secondary SMZ (feet)
<20	<7	35	0
<20	7-20	35	50
<20	>20	Top of slope or 150	75
20-50	<7	50	0
20-50	7-20	50	50
20-50	>20	Top of slope or 150	75
>50	<7	Width of stream or 100 max	0
>50	7-20	Width of stream or 100 max	50
>50	>20	Top of slope or 150	75

Appendix F Monitoring Data Collection Protocol

Monitoring Data Collection Protocol
Percent survival of tree plantings. Monitoring data on percent survival of planted trees would be collected and assessed at years 2025 and 2030 (i.e., 5 and 10 years following construction completion)[1]. Survival of planted trees would be recorded by pedestrian survey and photo-documentation.
Control of invasive, noxious, and /or exotic plant species. The extent of invasive/exotic species presence would be assessed by determining the percent areal coverage of such species at years 2025, 2030, and 2055 (i.e., 5, 10 and 35 years following construction completion). Starting from streambank edge, run a transect tape perpendicular to stream across the mitigation area for 300 m or until you reach the end of the mitigation area. Keep a minimum width of 100 m between transects, and do not allow overlap. Based on the ICT determined sampling intensity, use nested plots at set intervals along the transect to assess species cover by strata using the Braun-Blanquet method (e.g., 1 m^2 herbaceous quadrat).
Percent Tree Canopy Cover. Starting from streambank edge, run a transect tape perpendicular to stream across the polygon for 300 m or until you reach the end of the mitigation area. Keep a minimum width of 100 m between transects, and do not allow overlap. Stop every 10 m, use a densiometer to estimate percent tree canopy cover at four cardinal directions.
In-Stream Vegetative Cover. The amount (percent) of the Stream Characterized by In-Stream Vegetative Cover. At the start of transects, near the stream edge (approx. 1.5 m from bank), use the Braun-Blanquet method to record percent of the stream characterized by in-stream cover (woody debris, overhanging woody vegetation, aquatic vegetation, etc.).
Overhead Cover. Refers to the Amount (percent) of Vegetation Canopy and/or Overhanging Bank Hanging Over the Water Surface, Providing Shade, Woody Vegetation, Detritus and Insect Drop to the River. At the start of transects, near the stream edge (approx. 1.5 m from bank), record the visual estimate of the percent of the water surface that is shaded by overhanging vegetation. Additionally, measure canopy cover using densiometer at four cardinal directions.
Vegetation Strata. Starting from streambank edge, run a transect tape perpendicular to stream across the mitigation area for 300 m or until you reach the end of the mitigation area. Keep a minimum width of 100 m between transects, and do not allow overlap. Stop every 10 m, use a 5-m width belt on both sides of the tape, record the number of vegetation layers present from the following list of structural components: (1) Herbaceous layer - herbaceous vegetation less than 1 m (39 inches) in height; (2) Shrub layer – woody vegetation less than 3 m (~10 ft) in height; (3) Midstory Tree Canopy layer - woody vegetation 3-6 m (~10–20 ft) in height; (4) Overstory Tree Canopy layer - woody vegetation greater than 6 m (~20 ft) in height; (5) Vine layer - woody vines allowing for travel lanes; (6) Duff, Twigs, Leaf Litter – down or dead wood or herbaceous litter; (7) Coarse Woody Debris – down or dead wood debris greater than or equal to 10 cm (2.5 inches) diameter; (8) Snags – dead but standing trees; and (9) Micro Relief – small pockets or mounds that may allow for cover or ponding water.

[1] Requiring additional monitoring of the percent survival of planted trees during the initial establishment year is unnecessary as project construction contracts will require a survival warranty of 100% for planted trees through the first year following project construction completion, and any replacement planting would be planted according to the original contract planting specifications.

Disposition of Information and Analysis
Annually, the District Engineer will consult with state and Federal agencies regarding the status of mitigation efforts and prepare a report summarizing the results of the consultations and evaluating ecological success of the mitigation to date, likelihood mitigation will achieve success defined in the mitigation plan, projected timeline for achieving success, and recommendations for increasing the likelihood of success. Copies of the report will be provided to members of the consulting state and Federal agencies. Field data collected during monitoring efforts will be stored in an electronic database. Monitoring data will be analyzed, interpreted, and compiled into reports to evaluate the survival, extent, and nature of vegetative cover. Data on percent survival of planted trees will be collected and included in reports at years 2025 and 2030 (i.e., 5 and 10 years following construction completion). Data on percent tree canopy cover, amount of the stream characterized by in-stream vegetative cover, percent of the water surface shaded by overhanging vegetation, and vegetation strata will be collected and included in reports at years 2030 and 2055 (i.e., 10 and 35 years following project completion). Because the monitoring data is collected at various years over the project life, the annual review will often be restricted to mitigation site operation and maintenance data (e.g., annual efforts to control invasive species). These monitoring reports will be evaluated by the ICT.
Contingency Plan/Adaptive Management
If monitoring determines that the vegetation survival, coverage, and composition does not meet ecological success criteria, planting would be employed to restore the requisite acres of floodplain forest to produce the total benefits needed to mitigate for project impacts. The number, species, spacing, and size of trees or any other vegetation to be planted would be determined by the ICT after reviewing monitoring data. Likewise, the ICT would evaluate additional or alternate methods for addressing the control of invasive, noxious, and /or exotic plant species (i.e., Chinese tallow [*Triadica sebiferum*]) if monitoring reveals that the proposed methods for control do not achieve the desired or target level specified in the success criteria. Should the mitigation areas be damaged as a result of catastrophic events (e.g., severe flood disturbance associated with intense storms and hurricanes), the ICT would assess the nature and extent of the damage and recommend measures to correct or restore the mitigation areas to pre-event or target conditions.
Project Closure
Monitoring activities will cease and the project will be formally closed when it is determined that the desired acres of forest vegetation have met the monitoring criteria as specified above. The contingency plan/adaptive management process described is intended to allow periodic modifications in order to achieve the desired number of acres at the end of the project and ensure amounts of unwanted vegetation are minimized. The ICT will meet to evaluate data collected during the last scheduled annual report to close monitoring of the mitigation features.

Appendix E

Biological Assessment

Document No. 120064
Job No. 100013748

BIOLOGICAL ASSESSMENT
CLEAR CREEK GENERAL REEVALUATION STUDY
BRAZORIA, FORT BEND, GALVESTON, AND HARRIS COUNTIES, TEXAS

U.S. Army Corps of Engineers
Galveston District
2000 Fort Point Road
Galveston, Texas 77550

June 2012

Printed on recycled paper

Contents

Page

Page

Appendices:

Figures

Tables

Acronyms and Abbreviations

AOU	American Ornithologist's Union
BA	Biological Assessment
DSEIS	Draft Supplemental Environmental Impact Statement
ESA	Endangered Species Act
FR	Federal Register
GIWW	Gulf Intracoastal Water Way
GRP	General Reevaluation Plan
Gulf	Gulf of Mexico
HSI	Habitat Suitability Index
HEP	Habitat Evaluation Procedure
MMPA	Marine Mammal Protection Act
NED	National Economic Development
NFWL	National Fish and Wildlife Laboratories
NMFS	National Marine Fisheries Service
NPS	National Park Service
NRC	National Research Council
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
PA	placement area
PA SP	sand pit placement areas
TED	turtle excluder device
TOS	Texas Ornithological Society
TPWD	Texas Parks and Wildlife Department
TXNDD	Natural Diversity Database
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

This Biological Assessment (BA) has been prepared to fulfill the U.S. Army Corps of Engineers' (USACE), Galveston District requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. The Federal action requiring this assessment is the proposed Clear Creek General Reevaluation Study in Harris, Galveston, Brazoria, and Fort Bend counties, Texas. The Flood Control Act of 1968 (Public Law 91-611, Section 221) authorizes the proposed project. The Clear Creek General Reevaluation Plan (GRP) includes flood damage reduction measures (in-line detention and conveyance), preservation/ rehabilitation, and creation of floodplain forest, and mitigation for unavoidable impacts. For the purposes of this BA, the study area encompasses the Clear Lake watershed including Clear Creek and Clear Lake, but excluding the upper portions of Armand Bayou and Taylor Bayou. The study area consists of a 1-mile buffer surrounding the Clear Creek reaches (including only the downstream portions of Armand Bayou and Taylor Bayou) and project features (Figure 1). The project area is defined as the footprint of the flood damage reduction measures to be constructed, including in-line detention and conveyance, riparian corridors, and mitigation areas with a ¼-mile buffer that has been extended into a contiguous polygon (Figure 2). This BA evaluates the potential impacts the GRP Alternative may have on federally listed threatened and endangered species identified by the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS).

Agency coordination (Appendix A) was initiated with the NMFS and USFWS to determine which species protected under the ESA should be included in this BA. NMFS identified 11 species: green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta caretta*), blue whale (*Balaenoptera musculus*), finback whale (*B. physalus*), humpback whale (*Megaptera novaengliae*), sei whale (*B. borealis*), and sperm whale (*Physeter macrocephalus*). The five whale species receive additional protection under the Marine Mammal Protection Act (MMPA) (NMFS, 2012). The USFWS identified the same marine species and the following six additional species: brown pelican (*Pelecanus occidentalis*), piping plover (*Charadrius melodus*), whooping crane (*Grus americana*), Eskimo curlew (*Numenius borealis*), and Texas prairie dawn-flower (*Hymenoxys texana*).

Additional federally protected species are listed by the Texas Parks and Wildlife Department (TPWD) as potentially occurring in Harris, Galveston, Brazoria, and Fort Bend counties (Appendices B–E: Annotated County List): jaguarundi (*Herpailurus yaguarondi*), Louisiana black bear (*Ursus americanus luteolus*), ocelot (*Leopardus pardalis*), red wolf (*Canis rufus*) (extirpated), West Indian manatee (*Trichechus manatus*), smalltooth sawfish (*Pristis pectinata*), Houston toad (*Bufo houstonensis*), interior least tern *(Sterna antillarum athalassos*), and red-

cockaded woodpecker (*Picoides borealis*) (TPWD, 2012a–d). These additional species are not covered in this BA as they were not identified by the jurisdictional Federal agencies (NMFS and USFWS). Recently removed from the federal list of threatened and endangered species, peregrine falcon and bald eagle are protected under the Migratory Bird Treaty Act, and the bald eagle continues to receive additional protection under the Bald and Golden Eagle Protection Act (64 *Federal Register* [FR] 164:46542–46558; 72 FR 130:37346–37372); however, these bird species are not included in this BA as they are no longer protected under the ESA. Table 1 presents a list of the 16 federally listed threatened and endangered species and 1 recently delisted species, which are addressed in this BA.

This BA also describes the avoidance, minimization, and conservation measures proposed for this project relative to habitat and species covered in the BA. This BA is offered to assist USFWS and NMFS personnel in fulfilling their obligations under the ESA. A Draft Supplemental Environmental Impact Statement (DSEIS) is being prepared to further address the impacts of the proposed project.

1.2 ALTERNATIVES CONSIDERED

This section summarizes alternatives considered during the preparation of the proposed Clear Creek General Reevaluation Study DSEIS. Alternative flood damage reduction measures are addressed in the DSEIS alternatives analysis. The No Action Alternative always remains an alternative to the proposed action.

1.2.1 No Action Alternative

Under the No Action Alternative, the existing Clear Creek configuration would be retained, and current periodic flooding in the project area would continue. Development in the study area would continue to increase flows into Clear Creek, which would continue to cause increases in water elevation sufficient to cause flooding.

1.2.2 General Reevaluation Plan Alternative

The GRP Alternative includes construction of several miles of high-flow channel adjacent to the existing Clear Creek channel, while maintaining the existing channel and floodplain forest. Detention of floodwaters would also be provided in some areas where the high-flow channel diverges from the existing low-flow channel. All flood damage reduction measures on Clear Creek occur upstream of the Dixie Farm Road crossing (see Figure 2). The proposed project also includes modifying sections of three tributaries to Clear Creek—Mud Gully, Turkey Creek, and Mary's Creek—for improved conveyance of flood flows (see Figure 2).

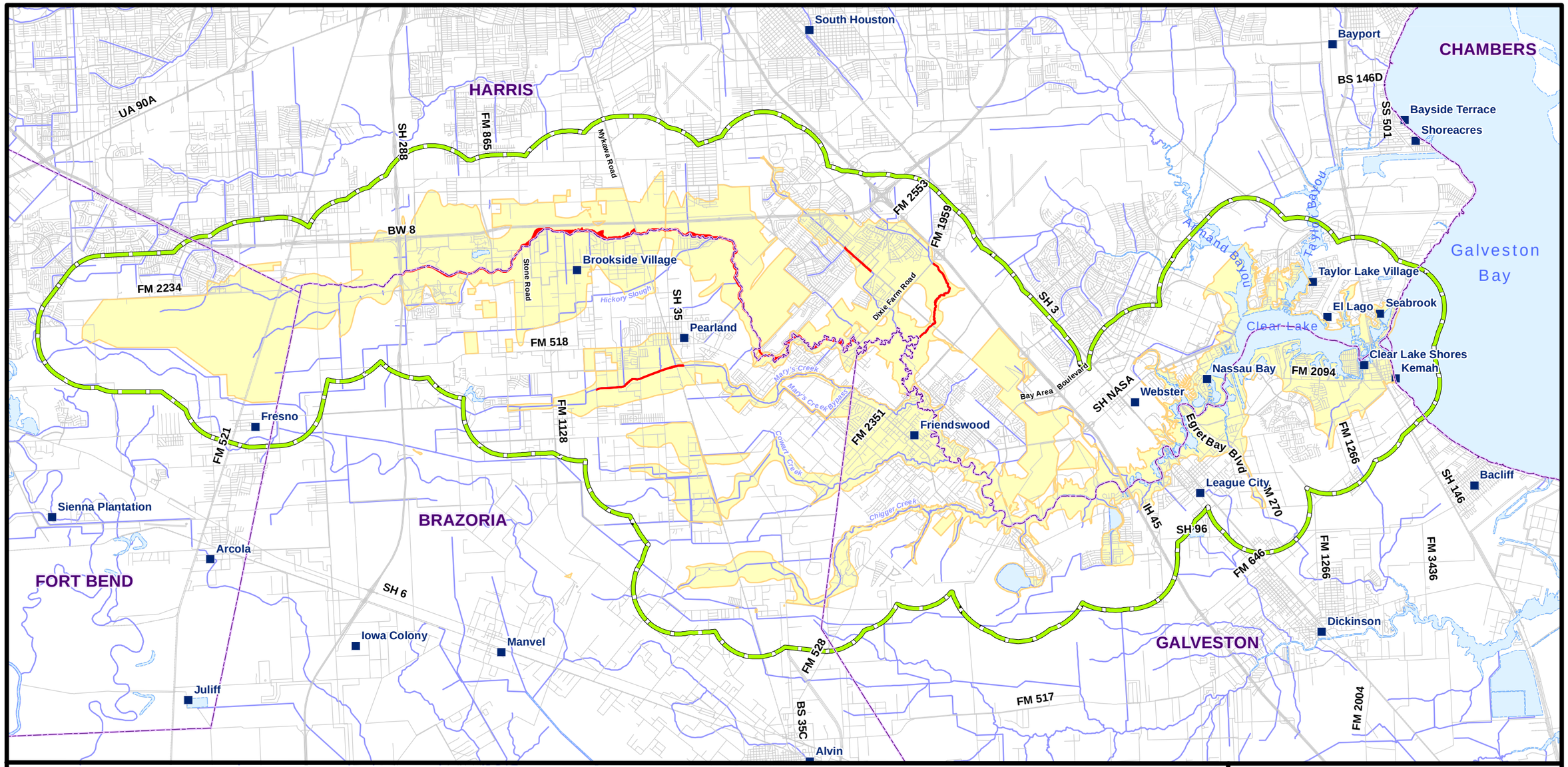


Figure 1

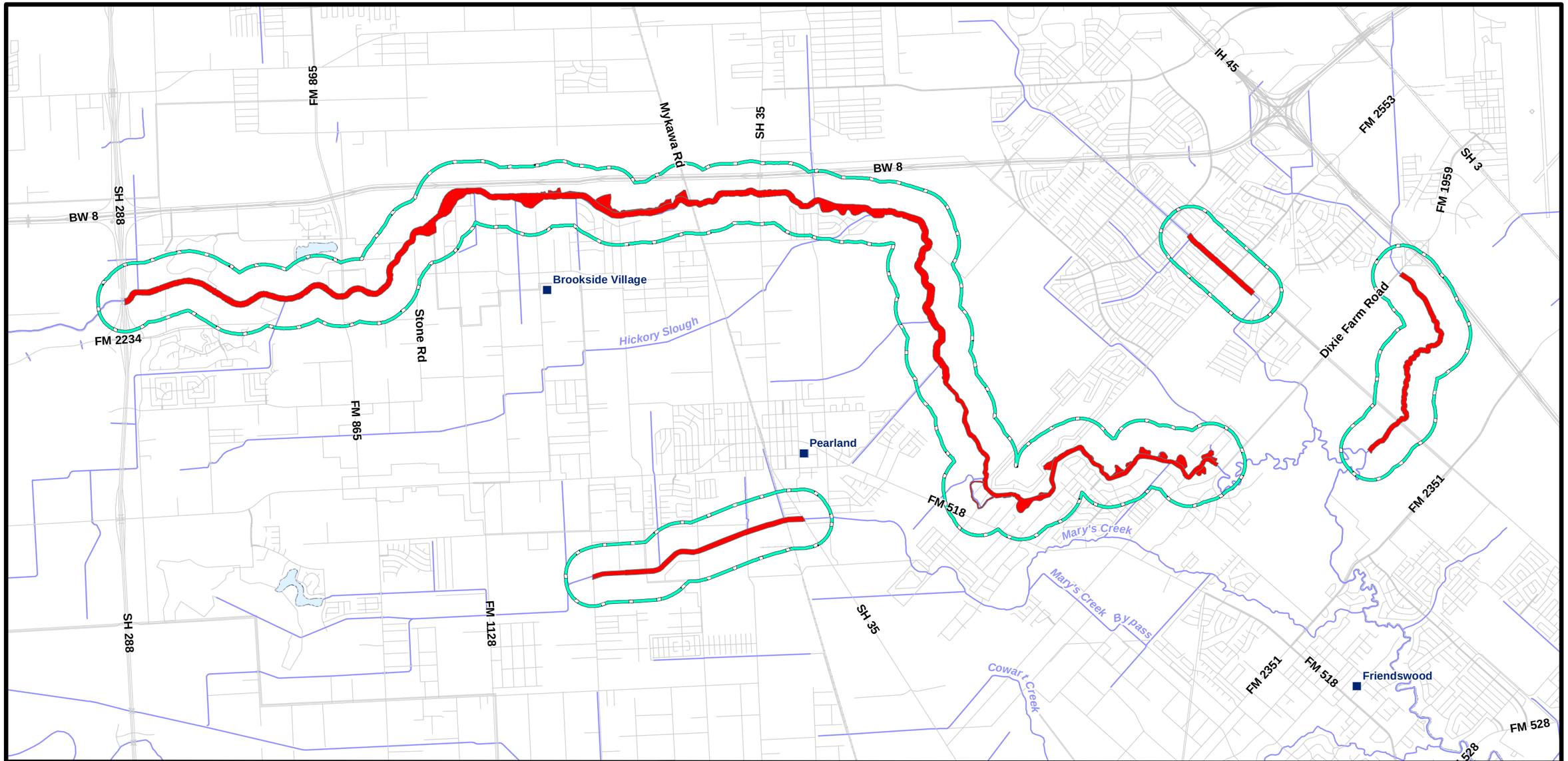
Study Area

Clear Creek
Flood Risk Management Project

Prepared for: USACE	
Job No.: 044188600	Scale: 1 inch = 12,000 feet
Prepared by: 18827	Date: 5/15/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/100002202/figure_3_0_2_vr4.mxd

(This page left blank intentionally.)



N
W E
S

0 0.5 1 1.5 2 2.5 Miles

0 5,000 10,000 Feet

Project Area

Project Features

Figure 2

Project Area

Clear Creek
Flood Risk Management Project

Prepared for: USACE	
Job No.: 044188600	Scale: 1inch = 5,000 feet
Prepared by: 18827	Date: 5/16/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/100002202/Figure_2.mxd

(This page left blank intentionally.)

TABLE 1
FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES

Common Name[1]	Scientific Name[1]	Status[2]	
		USFWS	NMFS
PLANTS			
Texas prairie dawn-flower	*Hymenoxys texana*	E	NA
REPTILES			
Green sea turtle	*Chelonia mydas*	E, T[3]	E, T[3]
Hawksbill sea turtle	*Eretmochelys imbricata*	E	E
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	E
Leatherback sea turtle	*Dermochelys coriacea*	E	E
Loggerhead sea turtle	*Caretta caretta*	T	T
BIRDS			
Brown pelican	*Pelecanus occidentalis*	E, DM	NA
Piping plover	*Charadrius melodus*	T w/CH	NA
Whooping crane	*Grus americana*	E, XN	NA
Eskimo curlew	*Numenius borealis*	E	NA
MAMMALS			
Blue whale	*Balaenoptera musculus*	E	E/D
Finback whale	*B. physalus*	E	E/D
Humpback whale	*Megaptera novaengliae*	E	E/D
Sei whale	*B. borealis*	E	E/D
Sperm whale	*Physeter macrocephalus*	E	E/D

[1] Nomenclature follows American Ornithologist's Union (AOU, 1998, 2000, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011), Crother et al. (2008), TPWD (2007a, 2012a–d), USFWS (2007), and NMFS (2012).

[2] USFWS – U.S. Fish and Wildlife Service; NMFS – National Marine Fisheries Service.

E – Endangered; T – Threatened; w/CH – with designated Critical Habitat; NA – Status Not Applicable for that Agency; D – Depleted; DM – Delisted Taxon, Recovered, Being Monitored First Five Years; XN – Experimental Population.

[3] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

Specifically, construction alternatives include (1) constructing 15.2 miles of 130- to 240-foot-wide high-flow channel in two separate sections of Clear Creek; (2) detention of 485 acre-feet of floodwater via a high-flow channel along Clear Creek where it diverges from the existing low-flow channel; (3) construction of a grass-lined channel on 2.4 miles of Turkey Creek to its confluence with Clear Creek; (4) construction of a concrete-lined channel for 0.8 mile of Mud Gully in the reach that is located between the northbound and southbound lanes of Beamer Road; and (5) construction of a 2.1-mile grass-lined channel on Mary's Creek.

Construction of the GRP Alternative would require excavation of material to create the high-flow channel and in-line detention. Selection criteria used to identify placement areas (PAs) will include proximity to the channel and low habitat value. Excavated material will be placed in PAs located outside of the 500-year floodplain. The location of these project features will be determined prior to finalizing plan designs.

Proposed mitigation measures associated with the project were determined using a community-based Habitat Suitability Index (HSI) Model, based on the Habitat Evaluation Procedure (HEP) and cost evaluation and incremental cost analysis. Mitigation measures currently proposed include rehabilitation as well as restoration of bottomland forest within the study area.

1.3 HABITAT IMPACTS AND PROPOSED MITIGATION

The study area is located in the Coastal Prairie and Marsh Region (Gould, 1975). It is characterized by a diversity of features that are a result of the natural transition between freshwater and marine environments. The eastern portion of the study area consists of a series of tidally influenced marginal marine embayments bordered by Galveston Bay. The western portion is defined by a flat, nearly level coastal plain divided by a headward-eroding stream. The Gulf Coastal Plain occurs inland from extensive coastal marshlands and is gently inclined gulfward at about 5 feet or less per mile (Fisher et al., 1972). Surface drainage within the study area includes numerous tributaries (Clear Creek, Mary's Creek, Turkey Creek, Armand Bayou, and Taylor Bayou) that drain into Clear Creek. Clear Creek generally flows in a southeastern to eastern direction.

The Clear Creek Watershed is approximately 250 square miles in size and roughly 45 miles long and is situated within the counties of Harris, Galveston, Brazoria, and Fort Bend. The Clear Creek Watershed includes 15 to 20 tributaries, with 8 of these tributaries discharging into Clear Creek above the dividing line between Clear Creek and Clear Lake. Within the study area, significant development has occurred since 1990. In Brazoria, Galveston, and Fort Bend counties, single-family residential development is a significant land-use category.

The GRP Alternative incorporates avoidance and minimization of potential impacts and includes preservation and rehabilitation or reestablishment of 155 acres of floodplain forest along Clear

Creek as part of the project design. The USACE coordinated with an Interagency Coordination Team that included the USFWS, TPWD, NMFS, NRCS, EPA, GLO, TCEQ, and the non-Federal sponsors (Harris County Flood Control) to apply a community-based HSI Model and Cost Effectiveness/ Incremental Cost Analysis on proposed plans to identify the preferred mitigation plan for unavoidable impacts of project features. According to results of the HSI Model, approximately 278 acres of floodplain forest habitat would be directly impacted by construction of flood damage reduction measures for the GRP Alternative. Proposed mitigation includes rehabilitation of approximately 31 acres of floodplain forest where the low-flow channel and connecting oxbows would be restored. These mitigation areas would provide higher-quality habitat than is currently available that is capable of supporting a high diversity of wildlife species. Mitigation areas are included in the project footprint shown on Figure 2 and acreage impacts are provided in Table 2.

TABLE 2
IMPACTS TO FLOODPLAIN FOREST FROM THE GENERAL
REEVALUATION PLAN ALTERNATIVE INCLUDING MITIGATION

Flood Damage Reduction Features			Compensatory Mitigation (Vegetation Community Rehabilitation and Reestablishment)		
Acres					
Unavoidable Impacts	Design Features Providing On-site Preservation/Rehabilitation and Reestablishment of Vegetation Community (Avoidance/Minimization)	AAHUs	Acres	AAHUs	Net Overall AAHUs
278	155	–106	31	131	25

*Average Annual Habitat Units.

(This page left blank intentionally.)

2.0 STATUS OF THE LISTED SPECIES

To assess the potential impacts of the proposed project on federally listed threatened and endangered species, PBS&J personnel: (1) requested the list of species from the NMFS and USFWS to include in this BA; (2) reviewed the TPWD's Natural Diversity Database (TXNDD), NMFS and USFWS literature, and other scientific data to determine species distributions, habitat needs, and other biological requirements; (3) interviewed recognized experts on the listed species, including local and regional authorities and Federal and State wildlife personnel; and (4) conducted a field reconnaissance, where possible, of the biological resources within the project area.

Literature sources consulted for this report include the USFWS series on endangered species of the seacoast of the U.S. (National Fish and Wildlife Laboratories [NFWL], 1980), Federal status reports and recovery plans, TPWD Federal aid project reports, peer-reviewed journals, and other standard references including agency websites. Habitat assessments were initially based on aerial photography and National Wetlands Inventory (NWI) mapping and then field-verified for some areas. The USACE, Galveston District provided information on habitat descriptions, the HSI Model, and an evaluation of mitigation alternatives. Input was also solicited from State and Federal resource agency personnel.

Species identified by the USFWS and NMFS for this BA are listed in Table 1 (Section 1.0). The following sections present the natural history of each listed species relevant to its potential occurrence in the study area. Section 3.0 presents the potential affects to these species and USACE determinations.

2.1 TEXAS PRAIRIE DAWN-FLOWER

2.1.1 Reasons for Status

The Texas prairie dawn-flower (*Hymenoxys texana*) was federally listed as endangered on March 13, 1986 (51 FR 8681–8683) without critical habitat. It is also listed as endangered by the State of Texas. This species' suitable habitat is limited to small geographic areas. This species was first discovered in 1889 and 1890 and was not encountered for almost 100 years after its original discovery and was thought to be extinct. There are approximately 50 known locations where this species exists (USFWS, 1989). Habitat destruction by urban development is the primary threat to this species (USFWS, 1989).

2.1.2 Habitat

The Texas prairie dawn-flower occurs on poorly drained, sparsely vegetated areas at the base of pimple (mima) mounds or other barren areas on slightly saline soils in coastal prairie grasslands

(USFWS, 1989). Sometimes it is associated with other Texas Gulf Coastal Plain endemics such as the Texas windmill-grass (*Chloris texensis*) and Houston machaeranthera (*Machaeranthera aurea*).

2.1.3 Range

Texas prairie dawn-flower historically occurred within and around Houston in Fort Bend and Harris counties, and has been recently discovered in Trinity County (USFWS, 2007). An additional specimen was collected around 1879–1880 from southwest Texas between the Nueces and Frio rivers on the Old San Antonio Road; however, recent field research has been unsuccessful in relocating this population (Mahler, 1982).

2.1.4 Distribution in Texas

Texas prairie dawn-flower is endemic only in the state of Texas. A large population of this species is informally protected by the USACE within Addicks and Barker reservoirs (USFWS, 1989). Originally limited to western and northwestern portions of Harris County, populations of this species have been newly discovered in northeastern and southeastern Harris County, and in Trinity County (USFWS 2007). Additionally, the largest known population of this species was recently discovered on a 100-acre tract of land owned by the Katy Prairie Conservancy (USFWS, 2007b).

2.1.5 Presence in the Study Area

A letter request was submitted to USFWS in December 2001 requesting a list of species that should be addressed for the project. The response from USFWS noted that "a review of U.S. Fish and Wildlife Service files and your project information indicate that no federally listed or proposed threatened or endangered species are likely to occur at the project site. The project site is not located within officially designated critical habitat" (Appendix A). In a planning aid letter dated May 3, 2002, the USFWS reiterated that no federally listed or proposed threatened or endangered species are likely to occur at the project nor does any officially designated critical habitat occur in the project area. However, according to TPWD TXNDD (2007), there is a known occurrence of Texas prairie dawn-flower in southeastern Harris County, within the study area. The study area is within the known range of the species, and it is possible that other unrecorded populations are present within the study area, particularly where suitable habitat is present.

A review of historic and recent aerial photography for the project area has identified three areas that could support potential habitat for the Texas prairie dawn-flower; however, none of these occur within the project foot print. Field reconnaissance indicate that one area has been leveled and filled and is now a fallow field. The other two potential areas were located within proposed mitigation sites that are no longer part of the mitigation plan. As part of the habitat assessment

process conducted in support of the modeling effort, these proposed mitigation sites were visited and evaluated by representatives of USACE, TPWD, and USFWS. Although official surveys for the plant were not conducted, USACE has determined that because of physical changes in the topography at the potential sites, the areas identified through review of aerial photography are not currently likely to support habitat appropriate for the Texas prairie dawn-flower.

2.2 GREEN SEA TURTLE

2.2.1 Reasons for Status

The green turtle (*Chelonia mydas*) was listed on July 28, 1978 as threatened except for Florida and the Pacific Coast of Mexico (including the Gulf of California) where it was listed as endangered (43 FR 32808). The greatest cause of decline in green turtle populations is commercial harvest for eggs and food. Other turtle parts are used for leather and jewelry, and small turtles are sometimes stuffed for curios. Incidental catch during commercial shrimp trawling is a continued source of mortality that adversely affects recovery. It is estimated that before the implementation of turtle excluder device (TED) requirements, the offshore commercial shrimp fleet captured about 925 green turtles a year, of which approximately 225 would die. Most turtles killed are juveniles and subadults. Various other fishing operations also negatively affect this species (NMFS, 2012). Epidemic outbreaks of fibropapilloma or "tumor" infections recently have occurred on green sea turtles, especially in Hawaii and Florida, posing a severe threat. The cause of these outbreaks is largely unknown, but it could be caused by a viral infection (Barrett, 1996). This species is also subject to various negative impacts shared by sea turtles in general.

2.2.2 Habitat

The green turtle primarily utilizes shallow habitats such as lagoons, bays, inlets, shoals, estuaries, and other areas with an abundance of marine algae and seagrasses. Individuals observed in the open ocean are believed to be migrants en route to feeding grounds or nesting beaches (Meylan, 1982). Hatchlings often float in masses of sea plants (e.g., rafts of sargassum) in convergence zones. Coral reefs and rocky outcrops near feeding pastures often are used as resting areas. The adults are primarily herbivorous, while the juveniles consume more invertebrates. Foods consumed include seagrasses, macroalgae and other marine plants, mollusks, sponges, crustaceans, and jellyfish (Mortimer, 1982).

Terrestrial habitat is typically limited to nesting activities, although in some areas, such as Hawaii and the Galápagos Islands, they will bask on beaches (Balazs, 1980). They prefer high-energy beaches with deep sand, which may be coarse to fine, with little organic content. At least in some regions, they generally nest consistently at the same beach, which is apparently their natal beach (Allard et al., 1994; Meylan et al., 1990), although an individual might switch to a different nesting beach within a single nesting season.

2.2.3 Range

The green turtle is a circumglobal species in tropical and subtropical waters. In U.S. Atlantic waters, it occurs around the U.S. Virgin Islands, Puerto Rico, and from Massachusetts to Texas. Major nesting activity occurs on Ascension Island, Aves Island (Venezuela), Costa Rica, and in Surinam. Relatively small numbers nest in Florida, with even smaller numbers in Georgia, North Carolina, and Texas (Hirth, 1997; NMFS and USFWS, 1991a).

2.2.4 Distribution in Texas

The green turtle in Texas inhabits shallow bays and estuaries where its principal foods, the various marine grasses, grow (Bartlett and Bartlett, 1999). Its population in Texas has suffered a decline similar to that of its world population. In the mid to late nineteenth century, Texas waters supported a green turtle fishery. Most of the turtles were caught in Matagorda Bay, Aransas Bay, and the lower Laguna Madre, although a few also came from Galveston Bay. By 1900, however, the fishery had virtually ceased to exist. Turtles continued to be hunted sporadically for awhile, the last Texas turtler hanging up his nets in 1935. Incidental catches by anglers and shrimpers were sometimes marketed prior to 1963, when it became illegal to do so (Hildebrand, 1982).

Green turtles still occur in these same bays today but in much-reduced numbers (Hildebrand, 1982). While green turtles prefer to inhabit bays with seagrass meadows, they may also be found in bays that are devoid of seagrasses. The green turtles in these Texas bays are mainly small juveniles. Adults, juveniles, and even hatchlings are occasionally caught on trotlines or by offshore shrimpers or are washed ashore in a moribund condition.

Green turtle nests are rare in Texas. Five nests were recorded at the Padre Island National Seashore in 1998, none in 1999, and one in 2000 (National Park Service [NPS], 2006; Shaver, 2000). Between 2001 and 2005, up to five nests per year were recorded from the Texas coast (Shaver, 2006). Two green turtle nests were recorded each year at Padre Island National Seashore during 2006 and 2007 (NPS, 2007). Green turtles, however, nest more frequently in Florida and in Mexico. Since long migrations of green turtles from their nesting beaches to distant feedings grounds are well documented (Green, 1984; Meylan, 1982), the adult green turtles occurring in Texas may be either at their feeding grounds or in the process of migrating to or from their nesting beaches. The juveniles frequenting the seagrass meadows of the bay areas may remain there until they move to other feeding grounds or, perhaps, once having attained sexual maturity, return to their natal beaches outside of Texas to nest.

2.2.5 Presence in the Study Area

While the green turtle occasionally occurs along the Texas coast and juveniles can be found in inshore waters, the species more frequently occurs along the South Texas coast. No green turtle nests have been recorded from the study area (NPS, 2007), largely because of the lack of suitable

nesting habitat. It is possible but unlikely that this species would occur within the study area. The species would not be present within the project area.

2.3 HAWKSBILL SEA TURTLE

2.3.1 Reasons for Status

The hawksbill sea turtle (*Eretmochelys imbricata*) was federally listed as endangered on June 2, 1970 (35 FR 8495) with critical habitat designated in Puerto Rico on May 24, 1978 (43 FR 22224). The greatest threat to this species is harvest to supply the market for tortoiseshell and stuffed turtle curios (Meylan and Donnelly, 1999). Hawksbill shell (bekko) commands high prices. Japanese imports of raw bekko between 1970 and 1989 totaled 713,850 kilograms, representing more than 670,000 turtles. The hawksbill is also used in the manufacture of leather, oil, perfume, and cosmetics (NMFS, 2007).

Other threats include destruction of breeding locations by beach development, incidental take in lobster and Caribbean reef fish fisheries, pollution by petroleum products (especially oil-tanker discharges), entanglement in persistent marine debris, and predation on eggs and hatchlings (Meylan, 1992). In American Samoa, most sea turtles and eggs encountered by villagers are harvested (Tuato'o-Bartley et al., 1993). See USFWS (1998) for detailed information on certain threats, including beach erosion, beach armoring, beach nourishment, sand mining, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, predation, and poaching. In 1998, NMFS designated critical habitat near Isla Mona and Isla Monito, Puerto Rico, seaward to 5.6 kilometers (63 FR 46693–46701).

2.3.2 Habitat

Hawksbills generally inhabit coastal reefs, bays, rocky areas, passes, estuaries, and lagoons, where they occur at depths of less than 70 feet. Like some other sea turtle species, hatchlings are sometimes found floating in masses of marine plants (e.g., sargassum rafts) in the open ocean (NFWL, 1980). Hawksbills re-enter coastal waters when they reach a carapace length of approximately 20 to 25 centimeters. Coral reefs are widely recognized as the resident foraging habitat of juveniles, subadults, and adults. This habitat association is undoubtedly related to their diet of sponges, which need solid substrate for attachment. Hawksbills also occur around rocky outcrops and high-energy shoals, which are also optimum sites for sponge growth. In Texas, juvenile hawksbills are associated with stone jetties (NMFS, 2012).

While this species is omnivorous, it prefers invertebrates, especially encrusting organisms, such as sponges, tunicates, bryozoans, mollusks, corals, barnacles, and sea urchins. Pelagic species consumed include jellyfish and fish, and plant material such as algae, sea grasses, and mangroves have been reported as food items for this turtle (Carr, 1952; Mortimer, 1982; Musick, 1979;

Pritchard, 1977; Rebel, 1974). The young are reported to be somewhat more herbivorous than adults (Ernst and Barbour, 1972).

Terrestrial habitat is typically limited to nesting activities. The hawksbill, which is typically a solitary nester, nests on undisturbed, deep-sand beaches, from high-energy ocean beaches to tiny pocket beaches several meters wide bounded by crevices of cliff walls. Typically, the sand beaches are low energy, with woody vegetation, such as sea grape (*Coccoloba uvifera*), near the waterline (National Research Council [NRC], 1990).

2.3.3 Range

The hawksbill is circumtropical, occurring in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans (Witzell, 1983). This species is probably the most tropical of all marine turtles, although it does occur in many temperate regions. The hawksbill sea turtle is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the northern Gulf (especially Texas), south to Brazil (NMFS, 2012). In the continental U.S., the hawksbill largely nests in Florida where it is sporadic at best (NFWL, 1980). A major nesting beach exists on Mona Island, Puerto Rico. Elsewhere in the western Atlantic, hawksbills nest in small numbers along the Gulf Coast of Mexico, the West Indies, and along the Caribbean coasts of Central and South America (Musick, 1979).

2.3.4 Distribution in Texas

Texas is the only state outside of Florida where hawksbills are sighted with any regularity. Most of these sightings involve posthatchlings and juveniles and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico (NMFS, 2012). On June 13, 1998, the first hawksbill nest recorded on the Texas coast was found at Padre Island National Seashore. This nest remains the only documented hawksbill nest on the Texas coast (NPS, 2007; Shaver, 2006).

2.3.5 Presence in the Study Area

No documented records of hawksbills exist from Harris, Galveston, Brazoria, and Fort Bend counties (Dixon, 2000), and no hawksbills nests have been recorded from the study area (NPS, 2007), largely because of the lack of suitable nesting habitat. Nonetheless, this species is of potential occurrence in the study area. However, no potential habitat exists for this species within the project area.

2.4 KEMP'S RIDLEY SEA TURTLE

2.4.1 Reasons for Status

Kemp's ridley sea turtle (*Lepidochelys kempii*) was listed as endangered throughout its range on December 2, 1970 (35 FR 18320). Populations of this species have declined since 1947, when an estimated 42,000 females nested in one day (Hildebrand, 1963), to a total nesting population of approximately 1,000 in the mid-1980s. The decline of this species was primarily the result of human activities including collection of eggs, fishing for juveniles and adults, killing adults for meat and other products, and direct take for indigenous use. In addition to these sources of mortality, Kemp's ridleys have been subject to high levels of incidental take by shrimp trawlers (NMFS, 2012; USFWS and NMFS, 1992). The NRC Committee on Sea Turtle Conservation estimated in 1990 that 86 percent of the human-caused deaths of juvenile and adult loggerheads and Kemp's ridleys resulted from shrimp trawling (Campbell, 1995). Before the implementation of TEDs, estimates showed that the commercial shrimp fleet killed between 500 and 5,000 Kemp's ridleys each year (NMFS, 2012). Kemp's ridleys have also been taken by pound nets, gill nets, hook and line, crab traps, and longlines.

Another problem shared by adult and juvenile sea turtles is the ingestion of manmade debris and garbage. Postmortem examinations of sea turtles found stranded on the south Texas coast from 1986 through 1988 revealed 54 percent (60 of the 111 examined) of the sea turtles had eaten some type of marine debris. Plastic materials were most frequently ingested and included pieces of plastic bags, Styrofoam, plastic pellets, balloons, rope, and fishing line. Nonplastic debris such as glass, tar, and aluminum foil were also ingested by the sea turtles examined. Much of this debris comes from offshore oil rigs, cargo ships, commercial and recreational fishing boats, research vessels, naval ships, and other vessels operating in the Gulf. Laws enacted during the late 1980s to regulate this dumping are difficult to enforce over vast expanses of water. In addition to trash, pollution from heavy spills of oil or waste products poses additional threats (Campbell, 1995).

Further threats to this species include collisions with boats, explosives used to remove oil rigs, and entrapment in coastal power-plant intake pipes (Campbell, 1995). Dredging operations affect Kemp's ridley turtles through incidental take and by degrading the habitat. Incidental take of ridleys has been documented with hopper dredges. In addition to direct take, channelization of the inshore and nearshore areas can degrade foraging and migratory habitat through spoil dumping, degraded water quality/clarity, and altered current flow (USFWS and NMFS, 1992).

Sea turtles are especially subject to human impacts during the time the females come ashore for nesting. Modifications to nesting areas can have a devastating effect on sea turtle populations. In many cases, prime sea turtle nesting sites are also prime real estate. If a nesting site has been disturbed or destroyed, female turtles may nest in inferior locations where the hatchlings are less

likely to survive, or they may not lay any eggs at all. Artificial lighting from developed beachfront areas often disorients nesting females and hatchling sea turtles causing them to head inland by mistake, often with fatal results. Adult females may also avoid brightly lit areas that would otherwise provide suitable nesting sites.

Kemp's ridley appears to be in the earliest stages of recovery. Approximately 6,000 Kemp's ridley nests were recorded on Mexican beaches during the 2000 nesting season (Shaver, 2000); just over 10,000 nests were recorded there during the 2005 nesting season (Shaver, 2006). Similarly, increased nesting activity has been recorded on the Texas beaches in the last decade or so from 4 nests in 1995 to 51 nests in 2005 (NPS, 2006; Shaver, 2006). Some of these nests were from headstarted ridleys. Of 46 Kemp's ridley nests encountered in the continental U.S. during 2004, 42 were on Texas beaches (NPS, 2006). The increase can likely be attributed to two primary factors: full protection of nesting females and their nests in Mexico, and the requirement to use TEDs in shrimp trawls both in the U.S. and in Mexico (NMFS, 2012).

2.4.2 Habitat

Kemp's ridleys inhabit shallow coastal and estuarine waters, usually over sand or mud bottoms. Adults are primarily shallow-water benthic feeders that specialize on crabs, especially portunid crabs, while juveniles feed on sargassum (*Sargassum* sp.) and associated infauna, and other epipelagic species of the Gulf (USFWS and NMFS, 1992). In some regions the blue crab (*Callinectes sapidus*) is the most common food item of adults and juveniles. Other food items include shrimp, snails, bivalves, sea urchins, jellyfish, sea stars, fish, and occasional marine plants (Campbell, 1995; Pritchard and Marquez, 1973; Shaver, 1991).

2.4.3 Range

Adults are primarily restricted to the Gulf, although juveniles may range throughout the Atlantic Ocean, as they have been observed as far north as Nova Scotia (Musick, 1979) and in coastal waters of Europe (Brongersma, 1972). Important foraging areas include Campeche Bay, Mexico, and Louisiana coastal waters.

Almost the entire population of Kemp's ridleys nests on an 11-mile stretch of coastline near Rancho Nuevo, Tamaulipas, Mexico, approximately 190 miles south of the Rio Grande. A secondary nesting area occurs at Tuxpan, Veracruz, and sporadic nesting has been reported from Mustang Island, Texas, southward to Isla Aquada, Campeche. Several scattered isolated nesting attempts have occurred from North Carolina to Colombia.

Because of the dangerous population decline at the time, a headstarting program was carried out from 1978 to 1988. Eggs were collected from Rancho Nuevo and placed into polystyrene foam boxes containing Padre Island sand so that the eggs never touched the Ranch Nuevo sand. The eggs were flown to the U.S. and placed in a hatchery on Padre Island and incubated. The

resulting hatchlings were allowed to crawl over the Padre Island beaches into the surf for imprinting purposes before being recovered from the surf and taken to Galveston for rearing. They were fed a diet of high-protein commercial floating pellets for 7 to 15 months before being released into Texas or Florida waters (Caillouet et al., 1995). This program has shown some results. The first nesting from one of these headstarted individuals occurred at Padre Island in 1996, and more nesting has occurred since (Shaver, 2000).

2.4.4 Distribution in Texas

Kemp's ridley occurs in Texas in small numbers, and in many cases may well be in transit between crustacean-rich feeding areas in the northern Gulf and breeding grounds in Mexico. It has nested sporadically in Texas in the last 50 years. Nests were found near Yarborough Pass in 1948 and 1950, and in 1960 a single nest was located at Port Aransas. The number of nestings, however, has increased in recent years: 1995 (4 nests); 1996 (6 nests); 1997 (9 nests); 1998 (13 nests); 1999 (16 nests); 2000 (12 nests); 2001 (8 nests); 2002 (38 nests); 2003 (19 nests); 2004 (42 nests); 2005 (51 nests); and 2006 (102 nests) (NPS, 2007; Shaver, 2000, 2006; Yeargan, 2006, 2007). As noted above, some of these nests were from headstarted ridleys. Of the 102 Kemp's ridley nests recorded for Texas in 2006, 64 were at the Padre Island National Seashore (NPS, 2007). In 2007, 128 Kemp's ridley nests have been recorded on Texas beaches, including 73 at Padre Island National Seashore (NPS, 2008). Such nestings, together with the proximity of the Rancho Nuevo rookery, probably account for the occurrence of hatchlings and subadults in Texas. According to Hildebrand (1982, 1986, 1987), sporadic ridley nesting in Texas has always been the case. This is in direct contradiction, however, to Lund (1974), who believed that Padre Island historically supported large numbers of nesting Kemp's ridleys, but that the population became extirpated because of excessive egg collection.

2.4.5 Presence in the Study Area

No Kemp's ridley nests have been recorded from the study area (NPS, 2007), largely due to lack of suitable nesting habitat; however, 7 of the 128 Kemp's ridley nests recorded to date in 2007 are from Galveston Island (NPS, 2007). Kemp's ridley inhabits shallow coastal and estuarine waters and is the most likely of these species to occur in the study area. It is possible, but unlikely, that this species would occur within the study area. No suitable habitat for this species exists within the project area.

2.5 LEATHERBACK SEA TURTLE

2.5.1 Reasons for Status

The leatherback sea turtle (*Dermochelys coriacea*) was listed as endangered throughout its range on June 2, 1970 (35 FR 8495), with critical habitat designated in the U.S. Virgin Islands on September 26, 1978 and March 23, 1979 (43 FR 43688–43689 and 44 FR 17710–17712,

respectively). In 1999, in a rule conforming and consolidating various regulations, NMFS amended and redesignated this habitat while also establishing a "conservation zone" extending from Cape Canaveral to the Virginia-North Carolina border and including all inshore and offshore waters; this zone is subject to shrimping closures when high abundance of leatherbacks is documented (64 FR 14067, March 23, 1999).

This species' decline is attributable to overexploitation and incidental mortality, generally associated with commercial shrimping and fishing activities. Use of turtle meat for fish bait and the consumption of litter by turtles are also causes of mortality, the latter phenomenon apparently occurring when plastic is mistaken for jellyfish (Rebel, 1974). Egg collection, nest destruction, and habitat degradation are major adverse impacts to the species' nesting beaches and hatch success (NatureServe, 2006a). Because leatherbacks nest in the tropics during hurricane season, a potential exists for storm-generated waves and wind to erode nesting beaches, resulting in nest loss (NMFS and USFWS, 1992). This species may be susceptible to drowning in shrimp trawlers equipped with TEDs because adult leatherbacks are too large to pass through the TED exit opening. Mortality associated with the swordfish gillnet fisheries in Peru and Chile represents the single largest source of mortality for East Pacific leatherbacks (Eckert and Sarti, 1997).

2.5.2 Habitat

The leatherback sea turtle is mainly pelagic, inhabiting the open ocean, and seldom approaches land except for nesting (Eckert, 1992). It is most often found in coastal waters only when nesting or when following concentrations of jellyfish (TPWD, 2007b), when it can be found in inshore waters, bays, and estuaries. It dives almost continuously, often to great depths.

Despite their large size, the diet of leatherbacks consists largely of jellyfish and sea squirts. They also consume sea urchins, squid, crustaceans, fish, blue-green algae, and floating seaweed (NFWL, 1980). The leatherback typically nests on beaches with a deepwater approach (Pritchard, 1971).

2.5.3 Range

The leatherback is probably the most wide-ranging of all sea turtle species. It occurs in the Atlantic, Pacific, and Indian oceans; as far north as British Columbia, Newfoundland, Great Britain, and Norway; as far south as Australia, Cape of Good Hope, and Argentina; and in other waterbodies such as the Mediterranean Sea (NFWL, 1980). Leatherbacks nest primarily in tropical regions; major nesting beaches include Malaysia, Mexico, French Guiana, Surinam, Costa Rica, and Trinidad (Ross, 1982). Leatherbacks nest only sporadically in some of the Atlantic and Gulf states of the continental U.S., with one nesting reported as far north as North Carolina (Schwartz, 1976). In the Atlantic and Caribbean, the largest nesting assemblages occur in the U.S. Virgin Islands, Puerto Rico, and Florida (NMFS, 2012).

The leatherback migrates farther and ventures into colder water more than any other marine reptile. Adults appear to engage in routine migrations between boreal, temperate, and tropical waters, presumably to optimize both foraging and nesting opportunities. The longest-known movement is that of an adult female that traveled 5,900 kilometers to Ghana, West Africa, after nesting in Surinam (NMFS and USFWS, 1992). During the summer, leatherbacks tend to occur along the east coast of the U.S. from the Gulf of Maine south to the middle of Florida.

2.5.4 Distribution in Texas

Apart from occasional feeding aggregations such as the large one of 100 animals reported by Leary (1957) off Port Aransas in December 1956, or possible concentrations in the Brownsville Eddy in winter (Hildebrand, 1983), leatherbacks are rare along the Texas coast, tending to keep to deeper offshore waters where their primary food source, jellyfish, occurs. In the Gulf, the leatherback is often associated with two species of jellyfish: cabbagehead (*Stomolophus* sp.) and moon (*Aurelia* sp.) (NMFS and USFWS, 1992). According to the USFWS (1981), leatherbacks have never been common in Texas waters. No nests of this species have been recorded in Texas for at least 70 years (NPS, 2007). The last two, one from the late 1920s and one from the mid-1930s, were both from Padre Island (Hildebrand, 1982, 1986).

2.5.5 Presence in the Study Area

No leatherback nests have been recorded from the study area (NPS, 2007), largely because of the lack of suitable nesting habitat. The leatherback is primarily a pelagic species that rarely occurs in Texas's coastal waters (USFWS, 1995). It is possible, but unlikely, that this species would occur within the study area. The species would not occur within the project area.

2.6 LOGGERHEAD SEA TURTLE

2.6.1 Reasons for Status

The loggerhead sea turtle (*Caretta caretta*) was listed by the USFWS as threatened throughout its range on July 28, 1978 (43 FR 32808). The decline of the loggerhead, like that of most sea turtles, is the result of overexploitation by man, inadvertent mortality associated with fishing and trawling activities, and natural predation. The most significant threats to its population are coastal development, commercial fisheries, and pollution (NMFS, 2012).

2.6.2 Habitat

The loggerhead sea turtle occurs in the open seas as far as 500 miles from shore, but mainly over the continental shelf, and in bays, estuaries, lagoons, and mouths of rivers. It favors warm temperate and subtropical regions not far from shorelines. The adults occupy various habitats, from turbid bays to clear waters of reefs. Subadults occur mainly in nearshore and estuarine

waters. Hatchlings move directly to sea after hatching, and often float in masses of sargassum. They may remain associated with sargassum for perhaps 3 to 5 years (NMFS and USFWS, 1991b).

Commensurate with their use of varied habitats, loggerheads consume a wide variety of both benthic and pelagic food items, which they crush before swallowing. Conches, shellfish, horseshoe crabs, prawns and other crustacea, squid, sponges, jellyfish, basket stars, fish (carrion or slow-moving species), and even hatchling loggerheads have all been recorded as loggerhead prey (Hughes, 1974; Mortimer, 1982; Rebel, 1974). Adults forage primarily on the bottom, but also take jellyfish from the surface. The young feed on prey concentrated at the surface such as gastropods, fragments of crustaceans, and sargassum.

Nesting occurs usually on open sandy beaches above the high-tide mark and seaward of well-developed dunes. They nest primarily on high-energy beaches on barrier islands adjacent to continental land masses in warm-temperate and subtropical regions. Steeply sloped beaches with gradually sloped offshore approaches are favored. In Florida, nesting on urban beaches was strongly correlated with the presence of tall objects (trees or buildings), which apparently shield the beach from city lights (Salmon et al., 1995).

2.6.3 Range

The loggerhead is widely distributed in tropical and subtropical seas, being found in the Atlantic Ocean from Nova Scotia to Argentina, Gulf of Mexico, Indian and Pacific oceans (although it is rare in the eastern and central Pacific), and the Mediterranean Sea (Iverson, 1986; Rebel, 1974; Ross, 1982). In the continental U.S., loggerheads nest along the Atlantic coast from Florida to as far north as New Jersey (Musick, 1979) and sporadically along the Gulf Coast. In recent years, a few have nested on barrier islands along the Texas coast. The loggerhead is the most abundant sea turtle species in U.S. coastal waters (NMFS, 2012).

2.6.4 Distribution in Texas

The loggerhead is the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters and occurring only very infrequently in the bays. It often occurs near offshore oil rig platforms, reefs, and jetties. Loggerheads are probably present year-round but are most noticeable in the spring when a favored food item, the Portuguese man-of-war (*Physalia physalis*) is abundant. Loggerheads constitute a major portion of the dead or moribund turtles washed ashore (stranded) on the Texas coast each year. A large proportion of these deaths are the result of accidental capture by shrimp trawlers, where caught turtles drown and their bodies are dumped overboard. Before 1977, no positive documentation of loggerhead nests in Texas existed (Hildebrand, 1982). Since that time, several nests have been recorded along the Texas coast. In 1999, two loggerhead nests were confirmed in Texas, while in 2000, five loggerhead nests were confirmed (Shaver, 2000). Between 2001 and 2005, up to five loggerhead nests per year were

recorded from the Texas coast (Shaver, 2006). Two loggerhead nests were recorded in 2006: one at Padre Island National Seashore and the other on South Padre Island, and six loggerhead nests, four at Padre Island National Seashore, and two at South Padre Island have been recorded on Texas beaches in 2007 (NPS, 2007). Like the worldwide population, the population of loggerheads in Texas has declined. Prior to World War I, the species was taken in Texas for local consumption and a few were marketed (Hildebrand, 1982). Today, even with protection, insufficient loggerheads exist to support a fishery.

2.6.5 Presence in the Study Area

The loggerhead occasionally nests on the Texas coast and is common in the Gulf; however, no loggerhead nests have been recorded from the study area (NPS, 2007) largely because of the lack of suitable nesting habitat. It is possible, but unlikely, that this species occurs within the study area. No suitable habitat exists within the project area.

2.7 BROWN PELICAN

2.7.1 Reasons for Status

The USFWS listed the brown pelican (*Pelecanus occidentalis*) as endangered throughout its range outside the U.S. on June 2, 1970 (35 FR 8495) and throughout its U.S. range on October 13, 1970 (35 FR 16047). On December 17, 2009, it was delisted with a DM (Delisted Tax, Recovered, Being Monitored First Five Years) designation. Population declines were largely the result of organochlorine pesticides, particularly endrin and DDT, entering the marine food web. Endrin resulted in direct mortality, while DDT impaired reproduction by causing eggshell thinning; thus, eggs desiccated and became susceptible to breaking during incubation (Shields, 2002). Other factors included human disturbance and habitat loss resulting from commercial and residential development (USFWS, 1995). Pelicans are large, heavy birds and easily flushed from the nest. Flushing exposes the eggs and young to predation, temperature stress, and permanent abandonment by the parents.

A ban on the use of DDT in the U.S. in 1972, together with efforts to conserve and improve remaining populations, has led to increased numbers of brown pelicans. Populations in some areas have increased to historical breeding levels or above, with stable population numbers and productivity. The USFWS has delisted the brown pelican along the U.S. Atlantic Coast and the Gulf coasts of Florida and Alabama. It remains endangered throughout the remainder of its range, which includes Mississippi, Louisiana, Texas, California, Mexico, Central and South America, and the West Indies.

2.7.2 Habitat

Brown pelicans inhabit warm coastal marine and estuarine environments. They are generally rare inland, but permanent year-round populations exist at the Salton Sea, California, and Lake Okeechobee, Florida, and they regularly occur as postbreeding visitors to inland waters in the southwest U.S. and central Florida (Shields, 2002). Brown pelicans breed colonially on undisturbed offshore islands, where they build nests on the ground or in trees and small bushes (AOU, 1998; Shields, 2002). Preferred sites are those free from human disturbance, flooding, and terrestrial predators. Brown pelicans typically forage in shallow waters within 12 miles of nesting sites during breeding, and rarely venture more than 45 miles offshore during nonbreeding. Sandbars, offshore rocks and islands, mangrove islets, jetties, pilings, piers, wharves, and oil/gas platforms provide important roosting and loafing sites (Shields, 2002).

2.7.3 Range

The brown pelican occurs along the Pacific Coast of the Americas from southern British Columbia south to Cape Horn, and throughout the Atlantic, Gulf, and Caribbean coastal areas from New Jersey south to eastern Venezuela. In North America, it occasionally ventures inland, with records from Idaho, Wyoming, North Dakota, Iowa, Wisconsin, Michigan, Ontario, and Quebec (AOU, 1998; Shields, 2002). Its breeding range is more restricted: along the Pacific Coast from central California south to Chile, including the Galápagos Islands; and from North Carolina, south to eastern Venezuela, the West Indies, Greater Antilles, and Virgin Islands (AOU, 1998). While some migration occurs after nesting in both subspecies, many individuals overwinter close to their breeding grounds (USFWS, 1980). Atlantic Coast populations move southward in the fall, with most birds wintering in the U.S., particularly in Florida. Some birds, however, disperse to the Cuban coast (Clapp et al., 1982). Gulf Coast birds tend to remain on the Gulf Coast, although banded Texas and Louisiana birds have occurred in Mexico and Cuba (Clapp et al., 1982; Palmer, 1962).

Two subspecies occur in North America: the eastern brown pelican (*P. o. carolinensis*) ranging from North Carolina south through Florida and west to Texas, and the California brown pelican (*P. o. californicus*) in California (NFWL, 1980). The eastern subspecies' present-day range is the same as its historical range, but it occurs in reduced numbers. It became extirpated in Louisiana in 1966, but has since (beginning in 1968) been reintroduced from Florida. No known nesting records exist from Mississippi or Georgia (USFWS, 1980; 50 FR 4938, February 9, 1985). Brown pelican colonies occur on the east coast of Mexico off the eastern tip of the Yucatan Peninsula (Mabie, 1986, 1988).

2.7.4 Distribution in Texas

Historically, the brown pelican was a common bird of the Texas Gulf Coast with an estimated breeding population of 5,000 pairs residing in 17 colonies in 1918. By the 1960s, however, it was

nearing extirpation. In 1963, only 14 recorded breeding pairs were present along the Texas coast; in 1964, no known nesting occurred (Mabie, 1986). The decline started during the 1920s and 1930s in relation to human disturbance (Oberholser, 1974) and continued until the 1970s because of pesticide contamination (King et al., 1977; Mabie, 1986). Since the 1960s, the brown pelican has made a gradual comeback in Texas with an estimated 2,400 breeding pairs in 1995 (Campbell, 1995). The majority of breeding birds occur on Pelican Island in Corpus Christi Bay, Nueces County, and Sundown Island near Port O'Connor in Matagorda County. Smaller colonies occasionally nest on Bird Island in Matagorda Bay, a series of older dredged-material islands in West Matagorda Bay, Dressing Point Island in East Matagorda Bay, and islands in Aransas Bay (Campbell, 1995).

2.7.5 Presence in Study Area

The majority of breeding birds in Texas occur from Nueces County to Galveston County (Texas Ornithological Society [TOS], 1995). The brown pelican is an uncommon to common resident along the Texas Gulf Coast, occasionally wandering inland during postbreeding in late summer and fall (Lockwood and Freeman, 2004). Brown pelicans are unlikely to nest in the study area; however, according to Richardson et al. (1998), the species is a common resident in the general area and likely occurs in the open-water habitats in the easternmost portion of the study area. This species is not likely to occur within the project area because of lack of suitable habitat.

2.8 PIPING PLOVER

2.8.1 Reasons for Status

The USFWS listed the piping plover (*Charadrius melodus*) as threatened and endangered on December 11, 1985 (50 FR 50726 50734). The piping plover is a federally listed endangered species in the Great Lakes watershed, while the birds breeding on the Atlantic Coast and northern Great Plains are federally listed as threatened. Piping plovers wintering in Texas and Louisiana are part of the northern Great Plains and Great Lakes populations.

Shorebird hunting during the early 1900s caused the first known major decline of piping plovers (Bent, 1929). Since then, loss or modification of habitat resulting from commercial, residential, and recreational developments, dune stabilization, damming and channelization of rivers (eliminating sandbars, encroachment of vegetation, and altering water flows), and wetland drainage have further contributed to the decline of the species. Additional threats include human disturbances through recreational use of habitat, and predation of individuals and eggs by feral pets (USFWS, 1995).

2.8.2 Habitat

Piping plovers typically inhabit shorelines of oceans, rivers, and inland lakes. Nest sites include sandy sparsely vegetated beaches; sandbars; causeways; bare areas on dredge-created and natural alluvial islands in rivers; riparian gravel pits; and sand, gravel, or pebbly mud on interior alkali lakes and ponds (AOU, 1998; USFWS, 1995). On the wintering grounds, these birds use beaches, mudflats, sandflats, dunes, and offshore spoil islands (Haig and Elliott-Smith, 2004).

2.8.3 Range

The piping plover breeds on the northern Great Plains (Iowa, northwestern Minnesota, Montana, Nebraska, North and South Dakota, Alberta, Manitoba, and Saskatchewan), in the Great Lakes (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario), and along the Atlantic Coast from Newfoundland to Virginia and (formerly) North Carolina. It winters on the Atlantic and Gulf coasts from North Carolina to Mexico, including coastal Texas, and, less commonly, in the Bahamas and West Indies (AOU, 1998; 50 FR 50726, December 11, 1985). Migration occurs both through the interior of North America east of the Rocky Mountains (especially in the Mississippi Valley) and along the Atlantic Coast (AOU, 1998). Few data exist on the migration routes of this species.

2.8.4 Distribution in Texas

Approximately 35 percent of the known global population of piping plovers winters along the Texas Gulf Coast, where they spend 60 to 70 percent of the year (Campbell, 1995; Haig and Elliott-Smith, 2004). The species is a common migrant and rare to uncommon winter resident on the upper Texas coast (Lockwood and Freeman, 2004; Richardson et al., 1998). Piping plover concentrations in Texas occur in the following counties: Aransas, Brazoria, Calhoun, Cameron, Chambers, Galveston, Jefferson, Kleberg, Matagorda, Nueces, San Patricio, and Willacy (USFWS, 1988).

2.8.5 Presence in the Study Area

The piping plover overwinters along the Texas coast and uses beaches and tidal flats (Oberholser 1974; TOS 1995); however, the species is a common migrant and rare to uncommon winter resident on the upper Texas coast (Lockwood and Freeman, 2004; Richardson et al., 1998)., . No USFWS-designated Critical Habitat for the piping plover is present within the study area. There is no suitable habitat for wintering piping plovers in the study area, and TPWD TXNDD data (2007a) show no documented records within the project area.

2.9 WHOOPING CRANE

2.9.1 Reasons for Status

The whooping crane (*Grus americana*) was federally listed as endangered on March 11, 1967 (32 FR 4001). Critical habitat has been designated in Aransas, Calhoun, and Refugio counties in Texas, and includes the Aransas National Wildlife Refuge (NWR). The main factors for the decline of the whooping crane were loss of habitat to agriculture, human disturbance of nesting areas, uncontrolled hunting, and collisions with power lines (NatureServe, 2006b). Biological factors, such as delayed sexual maturity and small clutch size, prevent rapid population recovery. Drought during the breeding season presents serious hazards to this species (Campbell, 1995). Whooping cranes are vulnerable to loss of habitat along their long migration route (NatureServe, 2006b), along which they are still subject to cataclysmic weather events, accidental shooting, collision with power lines, and predators. They are susceptible to avian tuberculosis, avian cholera, and lead poisoning (Campbell, 1995). Exposure to disease is a special problem when large numbers of birds are concentrated in limited areas, as often happens during times of drought.

While in Texas, the main population is at risk from chemical spills along the Gulf Intracoastal Waterway (GIWW), which passes through the center of their winter range (Campbell, 1995). The presence of contaminants in the food base is another potential problem on their wintering grounds (Oberholser, 1974), and a late-season hurricane or other weather event could be disastrous to this concentrated population.

2.9.2 Habitat

Nesting habitat in Canada is freshwater marshes and wet prairies (NatureServe, 2006b), interspersed with numerous potholes and narrow-wooded ridges. Whooping cranes use a variety of habitats during migration (Campbell, 1995). They feed on grain in croplands (Lewis, 1995), and large wetland areas are used for feeding and roosting. Riverine habitats, such as submerged sandbars, are often used for roosting. The principal winter habitat in Texas is brackish bays, marshes, and salt flats, although whooping cranes sometimes feed in upland sites characterized by oak mottes, grassland swales, and ponds on gently rolling sandy soils (Campbell, 1995).

Summer foods include large insect nymphs or larvae, frogs, rodents, small birds, minnows, and berries. During the winter in Texas they eat a wide variety of plant and animal foods. Blue crabs, clams, and fruit of Carolina wolfberry (*Lycium carolinianum*) comprise the diet. Foods taken at upland sites include acorns, snails, crayfish, and insects (Campbell, 1995).

2.9.3 Range

Whooping cranes were originally found throughout most of North America. In the nineteenth century, the main breeding area was from the Northwest Territories to the prairie provinces in Canada, and the northern prairie states to Illinois. Whooping cranes wintered from Florida to New Jersey along the Atlantic Coast, along the Texas Gulf Coast, and in the high plateaus of central Mexico. They now breed in isolated, marshy areas of Wood Buffalo National Park, Northwest Territories, Canada. They winter primarily in the Aransas NWR and adjacent areas of the central Texas Gulf Coast (USFWS, 1995). During migration they use various stopover areas in western Canada and the American Midwest.

As of May 5, 2011, four populations of whooping cranes in the wild totaled 414 birds; 279 in the Aransas-Wood Buffalo flock, 20 in the nonmigratory population in central Florida, 105 in the eastern population that migrates between Wisconsin and Florida, and 10 in the nonmigratory population released in Louisiana in February 2011 (Whooping Crane Conservation Association, 2011).

2.9.4 Distribution in Texas

The natural wild population of whooping cranes spends its winters at the Aransas NWR, Matagorda Island, Isla San Jose, portions of the Lamar Peninsula, and Welder Point on the east side of San Antonio Bay (NatureServe, 2006a). The main stopover points in Texas for migrating birds are in the central and eastern panhandle (USFWS, 1995).

2.9.5 Presence in the Study Area

Of the four wild populations of whooping cranes, the largest is the Aransas/Wood Buffalo population, which breeds in Wood Buffalo National Park in northern Canada and migrates annually to the Aransas NWR and adjacent areas of the central Texas coast in Aransas, Calhoun, and Refugio counties where it winters (Lewis, 1995; USFWS, 1995). During migration, whooping cranes stop over at wetlands and pastures to roost and feed. TPWD (2007b–e) includes the species on their list of species potentially occurring in the study area counties; however, the study area is not within the regular migration corridor of this species (Lockwood and Freeman, 2004) and whooping cranes are not expected to occur in the study area or the project area.

2.10 ESKIMO CURLEW

2.10.1 Reasons for Status

The Eskimo curlew (*Numenius borealis*) was federally listed as endangered on March 11, 1967 (32 FR 4001) without critical habitat. The status of the Eskimo curlew is uncertain and the species may be extinct, and, if not, it exists only in perilously low numbers. The Eskimo curlew

was extremely abundant in the mid-1800s, and during the last half of the nineteenth century, the species experienced a decline from great abundance to great scarcity (TPWD, 2003). In the last 50 years only about 70 individuals have been seen, and they have not been reported with any certainty in at least 30 of the last 86 years (TPWD, 2003). The last fully documented occurrence of this species in Texas was in 1962 (Gill et al., 1998; Lockwood and Freeman, 2004). The main factors for the decline of the Eskimo curlew were unregulated hunting and loss of grassland habitat along migration and wintering grounds (TPWD, 2003).

2.10.2 Habitat

Eskimo curlews have extensive migration routes and use a variety of habitats. Nonbreeding birds historically used a variety of habitats, such as grasslands, pastures, plowed fields, marshes, and mudflats (AOU, 1998; Gill et al., 1998). Eskimo curlews historically bred on treeless arctic tundra and subarctic tundra (Gill et al., 1998). In Texas, Eskimo curlews frequented plains and prairies in interior and coastal regions and fed over sand flats, shallow ponds, and well-drained pastures (TPWD, 2003). The Eskimo curlew diet consisted of insects, seeds, berries, and snails.

2.10.3 Range

As a migratory bird, the Eskimo curlew has quite an extensive range. From nesting in the arctic tundra of northwestern Canada between the Mackenzie and Coppermine rivers to fall migration, which carries them to Newfoundland and Nova Scotia, over the Atlantic Ocean to South America (TPWD, 2003). Spring migration routes include crossing the Andes, Chile, and the Pacific Ocean, Guatemala, and the Gulf of Mexico to the coasts of Texas and Louisiana (TPWD, 2003).

2.10.4 Distribution in Texas

Oberholser (1974) noted that the Eskimo curlew has been seen in Eliasville, Lampasas, Fort Stockton, Boerne, and San Antonio, Texas. Observations were also noted at Brownsville, North Padre Island, Corpus Christi, Galveston Island, Long Point, Rice, Gainesville, and Clarksville, and in Victoria, Calhoun, and Wise counties.

2.10.5 Presence in the Study Area

TPWD (2012a, 2012c) includes this species on their list of species potentially occurring within Brazoria and Fort Bend counties in the study area counties and USFWS lists it as a species of potential occurrence in Galveston County. However, because of its extreme rarity and the lack of recent records, the likelihood of this species occurring in the study area or project area is extremely low.

2.11 WHALES

NMFS identified five whale species of potential occurrence in the Gulf (see Table 1). These species are generally restricted to offshore marine waters and their presence in Galveston Bay is extremely unlikely. Therefore, it is unlikely that any of these five species would occur in Clear Lake or within the study area. These species would not occur within the project area because no suitable habitat exists within the project area.

3.0 EFFECTS ANALYSIS AND AVOIDANCE, MINIMIZATION, AND CONSERVATION MEASURES

In this document, the USACE presents their determinations about each species potentially occurring within the affected area of the GRP Alternative, using language recommended by the USFWS:

- *No effect* – USACE determines that its proposed action will not affect a federally listed species or critical habitat;
- *May affect, but not likely to adversely affect* – USACE determines that the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial; or
- *Likely to adversely affect* – USACE determines adverse effects to listed species and/or critical habitat may occur as a direct result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or completely beneficial. Under this determination, an additional determination is made whether the action is likely to jeopardize the continued survival and eventual recovery of the species.

The GRP Alternative is composed of numerous conveyance improvements and in-line detention, which will reduce flooding and flood damages. The improved channel conveyances and additional in-line detention will allow Clear Creek and its tributaries to handle the increased peak flows during flood events. The GRP Alternative would reduce flood damages for the upstream end of the Clear Creek watershed, and prevent flood damages to the downstream segments of the watershed. The improved channels and in-line detention planned for the upstream reach of Clear Creek and for some of its tributaries (Mud Gully, Turkey Creek, and Mary's Creek) would help detain runoff and reduce the increased peak flows attributed to increased urbanization. The net effect of these changes would mean that the rate of flow to Clear Lake would remain as it is presently (USACE, 2008). Thus, the GRP Alternative will not affect Clear Lake itself (i.e., conditions would not change). However, it should be noted that when the Second Outlet and Gate Structure at Clear Lake (built in the 1990s) is taken into consideration in the modeling, flood elevations in Clear Lake are reduced by approximately 2 feet. This is because the Second Outlet allows flood waters to pass through Clear Lake and into the Gulf at a faster rate, thus reducing potential flood elevations within the lake.

Because the primary impacts associated with the project are direct topographical or land use changes associated with the project footprint, the impact analysis focuses on the project area. However, the reduction in peak flows and flood elevations downstream from the project area is taken into consideration in effect determinations.

The following sections present the USACE's effect determinations for this project on federally listed species and include species-specific avoidance, minimization, and conservation measures that support the effect determinations. Submittal of this BA to the USFWS and NMFS will initiate Section 7 review process under the ESA.

3.1 TEXAS PRAIRIE DAWN-FLOWER

Although the Texas prairie dawn-flower could occur within the study area, the GRP Alternative would only result in impacts to this species within the footprint of the proposed project (see Figure 2). As noted in Section 2.1.5, review of historic and recent aerial photography and field reconnaissance identified three sites within the project area that could support habitat for the Texas prairie dawn-flower. Two of these sites are located within proposed mitigation areas that would be protected from future development. The other site is located adjacent to Clear Creek. However, because of physical changes in topography, USACE has determined that habitat appropriate for the Texas prairie dawn-flower is not currently likely to occur at the site. Thus, the GRP Alternative will have no effect on the Texas prairie dawn-flower.

3.2 MARINE (SEA) TURTLES

No green, loggerhead, Kemp's ridley, hawksbill, or leatherback sea turtle nests have been recorded within the study area but, while rare in Texas waters, these species may occur in the study area. Of the five species of sea turtle known to potentially occur in Texas waters, the leatherback is the least likely to occur in the study area because of its pelagic nature. Kemp's ridley is the most likely to occur in the study area because of its preference for shallow coastal and estuarine waters. Sea turtles may be present within the study area during certain times of the year. However, construction and operation of the project is not expected to affect downstream areas (including Clear Lake). The reduction of flood elevations and peak flows during flood events is not expected to affect sea turtles, their habitat, or their prey. Because these species would not occur within the project area, there would be no direct effects on sea turtles. Thus, the GRP Alternative will have no effect on these species.

3.3 BROWN PELICAN

This species is a common resident in the general area and likely forages in open-water portions of the easternmost portion of the study area; however, no active nesting colonies occur in the study area, and habitats found inland within the project area are not the types typically used by brown pelicans.

Construction activities are not expected to affect the brown pelican, its habitat, or its prey. Downstream of the project area, reduction in peak flow and flood elevations are not expected to affect salinity or tidal ranges. The GRP Alternative will not negatively affect this species'

feeding, nesting, or resting activities. Thus, the proposed action will have no effect on the brown pelican.

3.4 PIPING PLOVER

Because reductions in peak flow and flood elevations are not expected to affect salinity or tidal ranges within the study area, there should be no effect to piping plovers downstream from the project area. The habitats found inland within the project area are not the types typically used by piping plovers; therefore, potential loss of habitat from construction and associated mitigation activities are not expected to affect piping plover. Thus, the proposed action will have no effect on this species.

3.5 WHOOPING CRANE

The study area is not within the regular migration corridor of the whooping crane (Lockwood and Freeman, 2004), and whooping cranes are not expected to occur in the study area or project area. Thus, the proposed action will have no effect on this species.

3.6 ESKIMO CURLEW

This species has the potential to occur within the study area; however, because of its extreme rarity and the lack of recent records, coupled with the developed nature of the study area, the likelihood of this species occurring in the study area or project area is extremely low; therefore, the proposed action will have no effect on this species.

3.7 WHALES

None of the five whale species are expected to occur in the study area or project area; therefore, no effects to the five whale species are anticipated from the proposed action.

(This page left blank intentionally.)

4.0 SUMMARY

Table 3 presents a summary of effect determinations for the federally threatened and endangered species covered in this BA. Because of the nature and location of the expected project effects, the lack of suitable habitat and/or the extreme unlikelihood that these species are present within the project area, the GRP Alternative will have no effect on federally listed threatened or endangered species or their critical habitat.

TABLE 3
EFFECT DETERMINATIONS SUMMARY FOR THE
CLEAR CREEK GENERAL REEVALUATION STUDY

Common Name[1]	Scientific Name[1]	Implementation of the GRP Alternative
PLANTS		
Texas prairie dawn-flower	*Hymenoxys texana*	No effect
REPTILES		
Green sea turtle	*Chelonia mydas*	No effect
Hawksbill sea turtle	*Eretmochelys imbricata*	No effect
Kemp's ridley sea turtle	*Lepidochelys kempii*	No effect
Leatherback sea turtle	*Dermochelys coriacea*	No effect
Loggerhead sea turtle	*Caretta caretta*	No effect
BIRDS		
Brown pelican	*Pelecanus occidentalis*	No effect
Piping plover	*Charadrius melodus*	No effect
Whooping crane	*Grus Americana*	No effect
Eskimo curlew	*Numenius borealis*	No effect
MAMMALS		
Blue whale	*Balaenoptera musculus*	No effect
Finback whale	*B. physalus*	No effect
Humpback whale	*Megaptera novaengliae*	No effect
Sei whale	*Balaenoptera borealis*	No effect
Sperm whale	*Physeter macrocephalus*	No effect

[1] Nomenclature follows AOU (1998, 2000, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011), Crother et al. (2008), TPWD (2007a, 2012a–d), USFWS (2007), and NMFS (2012).

(This page left blank intentionally.)

5.0 REFERENCES

Allard, M.W., M.M. Miyamoto, K.A. Bjorndal, A.B. Bolton, and B.W. Bowen. 1994. Support for natal homing in green turtles from mitochondrial DNA sequences. *Copeia* 1994:34–41.

American Ornithologists' Union (AOU). 1998. Check-list of North American birds. Seventh edition. Allen Press, Inc., Lawrence, Kansas.

———. 2000. 42nd supplement to the check-list of North American birds. Auk 117:847–858.

———. 2002. 43rd supplement to the check-list of North American birds. Auk 119:897–906.

———. 2003. 44th supplement to the check-list of North American birds. Auk 120:923–931.

———. 2004. 45th supplement to the check-list of North American birds. Auk 121:985–995.

———. 2005. 46th supplement to the check-list of North American birds. Auk 122:1026–1031.

———. 2006. 47th supplement to the check-list of North American birds. Auk 123:926–936.

———. 2007. 48th supplement to the check-list of North American birds. Auk 124:1109–1115.

———. 2008. 49th supplement to the check-list of North American birds. Auk 125.

———. 2009. 50th supplement to the check-list of North American birds. Auk 126:705–714.

———. 2010. 51st supplement to the check-list of North American birds. Auk 127(3):726–744.

———. 2011. 52nd supplement to the check-list of North American birds. *Auk* 128(3):600–613.

Balazs, G. 1980. Synopsis of biological data on the green turtle in the Hawaiian Islands. NOAA Technical Memorandum. NMFS-SWFC-7.

Barrett, S. 1996. Disease threatens green sea turtles. Endangered Species Bulletin 21(2):8–9.

Bartlett, R.D., and P.P. Bartlett. 1999. A field guide to Texas reptiles and amphibians. Gulf Publishing Company, Houston.

Bent, A.C. 1929. Life histories of North American shorebirds. Pt. 2. U.S. Natl. Mus. Bull. No. 146.

Brongersma, L.D. 1972. European Atlantic turtles. *Zool. Verhl*. 121.

Caillouet, C.W. Jr., C.T. Fontaine, S.A. Manzella-Tirpak, and D.J. Shaver. 1995. Survival of head-started Kemp's ridley sea turtles (*Lepidochelys kempii*) released into the Gulf of Mexico or adjacent bays. *Chelonian Conservation and Biology* 1(4):285–292.

Campbell, L. 1995. Endangered and threatened animals of Texas, their life history and management. Texas Parks and Wildlife Department, Resource Protection Division, Endangered Resources Branch, Austin.

Carr, A.F. 1952. Handbook of turtles: the turtles of the United States, Canada and Baja California. Comstock Publ. Assoc., Cornell Univ. Press, Ithaca, New York.

Clapp, R.B., R.C. Banks, D. Morgan-Jacobs, and W. Hoffman. 1982. Marine birds of the southeastern U.S. and Gulf of Mexico. Part I: Gaviiformes through Pelicaniformes. U.S. Fish and Wildlife Service, Biological Services Program, Washington, D.C. FWS/OBS-82/01.

Crother, B.I., J. Boundy, F.T. Burbrink, J.A. Campbell, K. De Quieroz, D.R. Frost, R. Highton, J.B. Iverson, F. Kraus, R.W. McDiarmid, J.R. Mendelson III, P.A. Meylan, T.W. Reeder, M.E. Seidel, S.G. Tilley, and D.B. Wake. 2008. Scientific and standard English names of amphibians and reptiles of North America north of Mexico: with comments regarding confidence in our understanding. Society for the Study of Amphibians and Reptiles, Herpetological Circular 37. January. 84 pp.

Dixon, J.R. 2000. Amphibians and reptiles of Texas. Second edition. Texas A&M University Press, College Station.

Eckert, S.A. 1992. Bound for deepwater. Natural History, March 1992, pp. 28–35.

Eckert, S.A., and M.L. Sarti. 1997. Distant fisheries implicated in the loss of the world's largest leatherback nesting population. Marine Turtle Newsletter 78:2–7.

Ernst, C.H., and R.W. Barbour. 1972. Turtles of the United States. University of Kentucky Press, Lexington.

Fisher, W.L., J.H. McGowen, L.F. Brown, Jr., and C.F. Groat. 1972. Environmental geologic atlas of the Texas Coastal Zone – Galveston-Houston area. The University of Texas, Bureau of Economic Geology.

Gill, R.E., Jr., P. Canevari, and E.H. Iverson. 1998. Eskimo curlew *(Numenius borealis*). In: the birds of North America, No. 347 (A. Poole and F. Gill, editors). The Birds of North America, Inc., Philadelphia, Pennsylvania.

Gould, F.W. 1975. The grasses of Texas. Texas A&M University Press, College Station.

Green, D. 1984. Long-distance movements of Galapagos green turtles. *Journal of Herpetology* 18:121–130.

Haig, Susan M., and E. Elliott-Smith. 2004. Piping plover. In: the birds of North America Online. (A. Poole, editor) Cornell Laboratory of Ornithology, Ithaca, New York; Retrieved from The birds of North America online database: http://bna.birds.cornell.edu/BNA/account/Piping_Plover/.

Hildebrand, H. 1963. Hallazgo del area de anidacion de la tortuga marina "lora" *Lepidochelys kempi* (Garman) en la costa occidental del Golfo de Mexico. *Ciencia* (Mexico) 22:105–112.

———. 1982. A historical review of the status of sea turtle populations in the western Gulf of Mexico. In: biology and conservation of sea turtles (K. Bjorndal, editor), 447–453. Smithsonian Institution Press, Washington, D.C.

———. 1983. Random notes on sea turtles in the Western Gulf of Mexico. In: D. Owens et al. (editors) Proc. Western Gulf of Mexico Turtle Workshop, Texas A&M University, College Station. Pp. 34–40. TAMU 56-84-105. 74 pp.

———. 1986. Personal communication to Derek Green, EH&A, 16 January 1986. Corpus Christi, Texas.

———. 1987. A reconnaissance of beaches and coastal waters from the border of Belize to the Mississippi River as habitats for marine turtles. Report prepared for National Marine Fisheries Service, Southeast Fisheries Center, Panama City Laboratory, Panama City, Florida. Purchase Order No. NA-84-CF-A-134.

Hirth, H.F. 1997. Synopsis of the biological data on the green turtle *Chelonia mydas* (Linnaeus 1758). Biological Report 97 (1). U.S. Fish and Wildlife Service, Washington, D.C.

Hughes, G.R. 1974. The sea turtles of Southeast Africa. II. The biology of the Tongaland loggerhead turtle *Caretta caretta* L. with comments on the leatherback turtle *Dermochelys coriacea* L. and the green turtle *Chelonia mydas* L. in the study region. South African Association for Marine Biological Research, Oceanographic Research Institute, Investigational Report No. 36. Durban, South Africa.

Iverson, J.B. 1986. A checklist with distribution maps of the turtles of the world. Paust Printing, Richmond, Indiana.

King, K.A., E.L. Flickinger, and H.H. Hildebrand. 1977. The decline of brown pelicans on the Louisiana and Texas Gulf Coast. *Southwestern Naturalist* 21(4):417–431.

Leary, T. 1957. A schooling of leatherback turtles, *Dermochelys coriacea coriacea*, on the Texas coast. Copeia 3:232.

Lewis, J.C. 1995. Whooping crane (*Grus americana*). In: the birds of North America, No. 153 (A. Poole and F. Gill, editors). The Academy of Natural Sciences, Philadelphia, and the American Ornithologist's Union, Washington, D.C.

Lockwood, M.W., and B. Freeman. 2004. The TOS handbook of Texas birds. Texas A&M University Press, College Station.

Lund, P.F. 1974. A survey of marine turtle nesting in the United States. U.S. Dept. Interior. Unpubl., Mississippi.

Mabie, D.W. 1986. Brown pelican study. Final Report, Federal Aid Project No. W-103-R-15, Job No. 41. Texas Parks and Wildlife Department, Austin. 20 January.

———. 1988. Personal communication to Derek Green, EH&A, 23 May 1988.

Mahler, W.F. 1982. Status report on *Hymenoxys texana*. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 10 pp.

Meylan, A. 1982. Sea turtle migration – evidence from tag returns. In: biology and conservation of sea turtles (K. Bjorndal, editor), 91–100. Smithsonian Institution Press, Washington, D.C.

———. 1992. Hawksbill turtle *Eretmochelys imbricata* (Linnaeus). In rare and endangered biota of Florida. Vol. III. Amphibians and reptiles (P.E. Moler, editor). University Press of Florida, Gainesville.

Meylan, A.B., B.W. Bowen, and J.C. Avise. 1990. A genetic test of the natal homing versus social facilitation models for green turtle migration. *Science* 248:724–727.

Meylan, A.B., and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as critically endangered on the 1996 IUCN red list of threatened animals. *Chelonian Conservation and Biology* 3(2):200–224.

Mortimer, J.A. 1982. Feeding ecology of sea turtles. In: biology and conservation of sea turtles (K. Bjorndal, editor), 103–109. Smithsonian Institution Press, Washington, D.C.

Musick, J. 1979. The marine turtles of Virginia with notes on identification and natural history. Educational Series No. 24. Sea Grant Program, Virginia Institute of Marine Science, Gloucester Point.

National Fish and Wildlife Laboratory (NFWL). 1980. Selected vertebrate endangered species of the seacoast of the United States. U.S. Fish and Wildlife Service, Biological Services Program, Washington, D.C. FWS/OBS-80/01.

National Marine Fisheries Service (NMFS). 2012. Species status: marine turtles. http://www.nmfs.noaa.gov/pr/species/turtles/ (accessed May 25, 2012).

National Marine Fisheries Service and U.S. Fish and Wildlife Service (NMFS and USFWS). 1991a. Recovery plan for U.S. population of Atlantic green turtle. National Marine Fisheries Service, Washington, D.C.

———. 1991b. Recovery plan for U.S. population of loggerhead turtle. National Marine Fisheries Service, Washington, D.C.

———. 1992. Recovery plan for leatherback turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C.

National Park Service (NPS). 2006. Information on sea turtles. http://www.nps.gov/pais/myweb2a/

———. 2007. Information on sea turtles. http://www.nps.gov/pais/naturescience/

——— 2008. Sea turtle science and recovery. Information on sea turtles. http://www.nps.gov/pais/stsr.htm

National Research Council (NRC). 1990. Decline of the sea turtles: causes and prevention. National Academy Press, Washington, D.C.

NatureServe. 2006. NatureServe Explorer, s.v. "leatherback sea turtle." http://www.natureserve.org/explorer. NatureServe, Arlington, Virginia.

Oberholser, H.C. 1974. The bird life of Texas. 2 vol. University of Texas Press, Austin.

Palmer, R.S. (editor). 1962. Handbook of North American birds. Vol. 1: loons through flamingos. Yale University Press, Newhaven, Connecticut.

Pritchard, P.C.H. 1971. The leatherback or leathery turtle *Dermochelys coriacea*. IUCN Monograph No. 1. International Union for Conservation of Nature and Natural Resources, Morges, Switzerland.

———. 1977. Marine turtles of Micronesia. Chelonia Press, San Francisco, California.

Pritchard, P.C.H., and R. Marquez. 1973. Kemp's ridley turtle or Atlantic ridley, *Lepidochelys kempi*. IUCN Monograph 2, Morges, Switzerland.

Rebel, T.P. 1974. Sea turtles and the turtle industry of the West Indies, Florida, and the Gulf of Mexico. Rev. Ed. University of Miami Press, Coral Gables, Florida.

Richardson, D., E. Rozenburg, and D. Sarkozi. 1998. A birder's checklist of the upper Texas coast: Brazoria, Chambers, Fort Bend, Galveston, Harris, and Jefferson counties. Eighth edition. Houston Outdoor Nature Club, Ornithology Group. November.

Ross, J.P. 1982. Historical decline of loggerhead, ridley, and leatherback sea turtles. In: biology and conservation of sea turtles (K. Bjorndal, editor), 189–195. Smithsonian Institution Press, Washington, D.C.

Salmon, M., R. Reiners, C. Lavin, and J. Wyneken. 1995. Behavior of loggerhead sea turtles on an urban beach. 1. Correlates of nest placement. *Journal of Herpetology* 29:560–567.

Schwartz, F. 1976. Status of sea turtles, *Cheloniidae* and *Dermochelidae*, in North Carolina. Abstr. in proceedings and abstracts from the 73rd meeting of the North Carolina Academy of Science, Inc., April 2–3, 1976, at the University of North Carolina, Wilmington. J. Elisha Mitchell *Sci. Soc*. 92(2):76–77.

Shaver, D. 1991. Feeding ecology of wild and head-started Kemp's ridley sea turtles in south Texas waters. *Journal of Herpetology* 25(3):327–334.

———. 2000. Padre Island National Seashore, field station leader. Personal communication to Derek Green, PBS&J, 20 November.

———. 2006. Padre Island National Seashore, field station leader. Personal communication to Derek Green, PBS&J, 3 April.

Shields, M. 2002. Brown pelican (*Pelecanus occidentalis*). In: the birds of North America, No. 609 (A. Poole and F. Gill, editors). The Birds of North America, Inc., Philadelphia, Pennsylvania.

Texas Ornithological Society (TOS). 1995. Checklist of the birds of Texas, 3rd Edition. Capital Printing, Inc., Austin.

Texas Parks and Wildlife Department (TPWD). 2003. Endangered and threatened animals of Texas. Their Life History and Management, Wildlife Division, Austin.

———. 2007a. Texas Natural Diversity Database (TXNDD) (rare species and natural community data files), s.v. "Clear Creek Flood Control Project." Agency coordination and data request. PBS&J project files.

———. 2007b. Information on the leatherback sea turtle. http://www.tpwd.state.tx.us/huntwild/wild/species/endang/animals/reptiles_amphibians/lethback.phtml.

———. 2012a. Annotated county lists of rare species, s.v. "Brazoria County." Last updated on October 10, 2011. http://gis.tpwd.state.tx./TPWEndangeredSpecies/DesktopDefault.aspx?tabindex=0&tabid =9&type=countylist&parm=Brazoria (accessed on May 25, 2012).

———. 2012b. Annotated county lists of rare species, s.v. "Fort Bend County." Last updated on October 10, 2011. http://gis.tpwd.state.tx./TPWEndangeredSpecies/DesktopDefault.aspx?tabindex=0&tabid=9&type=countylist&parm=Brazoria (accessed on May 25, 2012).

———. 2012c. Annotated county lists of rare species, s.v. "Galveston County." Last updated on May 25, 2011. http://gis.tpwd.state.tx./TPWEndangeredSpecies/DesktopDefault.aspx?tabindex =0&tabid=9&type=countylist&parm=Galveston (accessed on May 25, 2012).

———. 2012d. Annotated county lists of rare species, s.v. "Harris County." Last updated on May 25, 2011. http://gis.tpwd.state.tx./TPWEndangeredSpecies/DesktopDefault.aspx?tabindex= 0&tabid=9&type=countylist&parm=Brazoria (accessed on May 25, 2012).

Tuato'o-Bartley, N., T.E. Morrell, and P. Craig. 1993. Status of sea turtles in American Samoa in 1991. *Pacific Science* 47(3):215–221.

U.S. Army Corps of Engineers (USACE). 2008. Clear Creek, Texas flood risk management, Draft General Reevaluation Report, Engineering Appendix.

U.S. Department of Agriculture. 2007. Natural Resources Conservation Service, plants database, s.v. “black mangrove,” “red mangrove.” http://plants.usda.gov (accessed October 17, 2007).

U.S. Fish and Wildlife Service (USFWS), U.S. Department of the Interior. 1980. Recovery plan for the eastern brown pelican (*Pelecanus occidentalis carolinensis*). Prepared in cooperation with the Eastern Brown Pelican Recovery Team.

———. 1981. Endangered species assessments and surveys in Hidalgo and Willacy counties, Texas. Final report to USACE, Galveston by USFWS, Denver Wildlife Research Center. 84 pp.

———. 1988. Great Lakes and Northern Great Plains piping plover recovery plan. U.S. Fish and Wildlife Service, Twin Cities, Minnesota.

———. 1989. *Hymenoxys texana* recovery plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 53 pp.

———. 1995. Threatened and endangered species of Texas. U.S. Fish and Wildlife Service, Austin, Texas. June.

———. 1998. Multi-species recovery plan for the threatened and endangered species of South Florida. Technical/Agency draft, U.S. Fish and Wildlife Service, Atlanta, Georgia.

———. 2007. Rare plants of east Texas, Clear Lake Ecological Services Field Office. http://www.fws/gov/southwest/clearlakees/RarePlantseastTexas.htm (accessed November 14, 2007).

U.S. Fish and Wildlife Service and National Marine Fisheries Service (USFWS and NMFS). 1992. Recovery plan for the Kemp’s ridley sea turtle (*Lepidochelys kempii*). National Marine Fisheries Service, St. Petersburg, Florida.

Whooping Crane Conservation Association. 2011. Flock Status 2011 May. http://whoopingcrane.com/flock-status/flock-status-2011-may/

Witzell, W.N. 1983. Synopsis of biological data on the hawksbill turtle *Eretmochelys imbricata* (Linnaeus, 1766). FAO Fisheries Synopsis No. 137. FIR/S137, SAST – Hawksbill Turtle – 5.31 (07) 017.01. Food and Agriculture Organization (FAO) of the United Nations, Rome, Italy.

Yeargan, C. 2006. U.S. Fish and Wildlife Service, Clear Lake office. Personal communication to Derek Green, PBS&J, 6 April 2006.

———. 2007. U.S. Fish and Wildlife Service, Clear Lake office. Personal communication to Derek Green, PBS&J, 29 January 2007.

(This page left blank intentionally.)

Appendix A

Agency Coordination

Harris-Brazoria-Galveston-CE

PBS&J

An employee-owned company

RECEIVED
JAN 02 2002
USFWS ClearLake ES

December 31, 2001

U.S. Fish and Wildlife Service
Division of Ecological Services
Attn: Carlos Mendoza
17629 El Camino Real, Suite 211
Houston, Texas 77058

RE: Clear Creek Flood Control Project
PBS&J Job Number 440909

Dear Mr. Mendoza:

PBS&J has contracted with the Galveston District of the U.S. Army Corps of Engineers (Galveston District) to collect the initial data for the Clear Creek Flood Control Project (project) located in Brazoria, Galveston, Fort Bend, and Harris Counties, Texas. The Galveston District is engaged in a complete re-evaluation of flood damage reduction measures for Clear Creek. The local sponsors of the project are Brazoria Drainage District No. 4, Galveston County, and Harris County Flood Control District. This federally funded flood control plan was developed many years ago and included deepening and widening Clear Creek to reduce flooding that has impacted area residents for over thirty years. Alternatives that may be considered include floodwater detention areas, bypass channels, and channelizing portions of Clear Creek. Non-structural alternatives are also being considered including purchasing and raising structures of frequently flooded homeowners.

PBS&J is collecting data for the preparation of the Affected Environment portion of an Environmental Impact Statement for the project. The level of detail for our assessment will be as necessary to describe existing conditions and to provide analysis of future conditions due to project impacts. The project study area encompasses the entire Clear Creek Watershed, to include Clear Lake, Clear Creek, and all tributaries, and the surrounding riparian and upland environments.

PBS&J is submitting this information letter to request a list of threatened and endangered species, which should be addressed for the project, and any particular areas of concern you may have. We are also requesting concurrence on the need for a Biological Assessment to be prepared or not as required by Section 7 of the Endangered Species Act. Please call Andy Labay or me at (512) 327-6840 if you have any questions or need additional information.

Sincerely,
PBS&J

Kari A. Jecker
Ecologist

A review of U.S. Fish and Wildlife Service files and your project information indicate that no federally listed or proposed threatened or endangered species are likely to occur at the project site. The project site is not located within officially designated critical habitat.

This review does not constitute our approval for wetlands, sensitive habitats, migratory birds or any other environmental requirements.

Approved M M Morgan

Date 1/22/2002

Clear Lake Ecological Services Field Office
U.S. Fish and Wildlife Service
17629 El Camino Real, Suite 211
Houston, Texas 77058-3051

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

September 24, 2007

RECEIVED
SEP 25 2007
CLEAR LAKE ES
HOUSTON, TEXAS

REPLY TO THE ATTENTION OF

Environmental Section

Mr. Steve Parris
U. S. Fish and Wildlife Service
Field Supervisor Ecological Services
17629 El Camino Real, Suite 211
Houston, TX 77058

Dear Mr. Parris:

The U. S. Army Corps of Engineers will prepare an Environmental Impact Statement (EIS) to address proposed actions to manage flooding of Clear Creek which is south of Houston, Texas and located in parts of Brazoria, Fort Bend, Harris and Galveston counties (see attached figure). Flooding along Clear Creek has been a concern for over 30 years. Floodwaters in 1973, 1976, 1979, 1989, 1994, and 2001 caused substantial damage to residences along the creek and recent flooding has resulted in the buyout of approximately 300 flood-prone homes along the creek. In 1968, Congress authorized the Clear Creek Flood Control Project and plans were formulated in the 1980s, which included deepening, widening, and realigning the creek channel. Due to concerns regarding its design, the U.S. Army Corps of Engineers, Galveston District (USACE) has reconsidered flood control options in the watershed.

Flood control options being considered include both flood conveyance and detention features on Clear Creek and a few of its tributaries. Approximately 15 miles of flood conveyance will be proposed for Clear Creek and shorter flood conveyance will be constructed on Mud Gully, Turkey Creek and Mary's Creek, all tributaries to Clear Creek. Offline detention features will be proposed for portions of Clear Creek, Mary's Creek and Mud Gully. Inline detention will be proposed for some reaches of Clear Creek. All structural components of the plan will occur upstream of the Dixie Farm Road area, although benefits will occur throughout the entire watershed. The proposed project is not expected to change freshwater inflow into Clear Lake or Galveston Bay.

To ensure compliance with the requirements of Section 7 of the Endangered Species Act, a list of proposed threatened or endangered species, their critical habitat, and species proposed for listing that may be found in the Clear Creek study area is requested.

Your assistance with our coordination responsibilities is appreciated. If you have any questions, please contact Ms. Andrea Catanzaro at 409.766.6346 or by email at andrea.catanzaro@SWG02.usace.army.mil.

Sincerely,

Carolyn Murphy
Chief, Environmental Branch

Enclosure

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Division of Ecological Services
17629 El Camino Real #211
Houston, Texas 77058-3051

February 2007

This responds to your request for threatened and endangered species information in the Clear Lake Ecological Services Field Office's area of responsibility. According to Section 7(a)(2) of the Endangered Species Act and the implementing regulations, it is the responsibility of each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any federally listed species. Therefore, we are providing information to assist you in meeting your obligations under the Endangered Species Act.

A county by county listing of federally listed threatened and endangered species that occur within this office's work area can be found at http://www.fws.gov/southwest/es/EndangeredSpecies/lists/ListSpecies.cfm. You should use the county by county listing and other current species information to determine whether suitable habitat for a listed species is present at your project site. If suitable habitat is present, a qualified individual should conduct surveys to determine whether a listed species is present.

After completing a habitat evaluation and/or any necessary surveys, you should evaluate the project for potential effects to listed species and make one of the following determinations:

No effect – the proposed action will not affect federally listed species or critical habitat (i.e., suitable habitat for the species occurring in the project county is not present in or adjacent to the action area). No coordination or contact with the Service is necessary. However, if the project changes or additional information on the distribution of listed or proposed species becomes available, the project should be reanalyzed for effects not previously considered.

Is not likely to adversely affect – the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. You should seek written concurrence from the Service that adverse effects have been eliminated. Be sure to include all of the information and documentation you used to reach your decision with your request for concurrence. The Service must have this documentation before issuing a concurrence.

Is likely to adversely affect – adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires formal Section 7 consultation with this office.

Regardless of your determination, the Service recommends that you maintain a complete record of the evaluation, including steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles.

TAKE PRIDE IN AMERICA

The Service's Consultation Handbook is available online to assist you with further information on definitions, process, and fulfilling Endangered Species Act requirements for your projects at http://endangered.fws.gov/consultations/s7hndbk/s7hndbk.htm.

If we can further assist you in understanding your obligations under the Endangered Species Act, please contact Kathy Nemec, Edith Erfling, or Catherine Yeargan at 281/286-8282.

Sincerely,

Stephen D. Parris

Stephen D. Parris
Field Supervisor, Clear Lake Field Office

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Brazoria

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Brazoria County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
bald eagle	*Haliaeetus leucocephalus*	Birds	DM				P
brown pelican	*Pelecanus occidentalis*	Birds	DM, E				P
green sea turtle	*Chelonia mydas*	Reptiles	E, T				P
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E				P
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E				P
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E				P
loggerhead sea turtle	*Caretta caretta*	Reptiles	T				P
piping Plover	*Charadrius melodus*	Birds	E, T				P
whooping crane	*Grus americana*	Birds	E, EXPN				P

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Fort Bend

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Fort Bend County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
bald eagle	*Haliaeetus leucocephalus*	Birds	DM				P
sharpnose Shiner	*Notropis oxyrhynchus*	Fishes	C	No Image			P
Texas prairie dawn-flower	*Hymenoxys texana*	Flowering Plants	E				P
whooping crane	*Grus americana*	Birds	E, EXPN				P

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Galveston

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Galveston County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
Attwater's greater prairie-chicken	*Tympanuchus cupido attwateri*	Birds	E				P
bald eagle	*Haliaeetus leucocephalus*	Birds	DM				P
brown pelican	*Pelecanus occidentalis*	Birds	DM, E				P
Eskimo curlew	*Numenius borealis*	Birds	E				P
green sea turtle	*Chelonia mydas*	Reptiles	E, T				P
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E				P
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E				P
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E				P
loggerhead sea turtle	*Caretta caretta*	Reptiles	T				P
piping Plover	*Charadrius melodus*	Birds	E, T				P

U.S. Fish & Wildlife Service

Endangered Species List

Back to Start

List of species by county for Texas:

Counties Selected: Harris

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Harris County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critical Habitat	More Info
bald eagle	*Haliaeetus leucocephalus*	Birds	DM				P
Texas prairie dawn-flower	*Hymenoxys texana*	Flowering Plants	E				P

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

September 24, 2007

REPLY TO THE ATTENTION OF

Environmental Section

Mr. David Bernhart
Assistant Regional Administrator
for Protected Resources
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, Florida 33701

Dear Mr. Bernhart:

The U. S. Army Corps of Engineers will prepare an Environmental Impact Statement (EIS) to address proposed actions to manage flooding of Clear Creek which is south of Houston, Texas and located in parts of Brazoria, Fort Bend, Harris and Galveston counties (see attached figure). Flooding along Clear Creek has been a concern for over 30 years. Floodwaters in 1973, 1976, 1979, 1989, 1994, and 2001 caused substantial damage to residences along the creek and recent flooding has resulted in the buyout of approximately 300 flood-prone homes along the creek. In 1968, Congress authorized the Clear Creek Flood Control Project and plans were formulated in the 1980s, which included deepening, widening, and realigning the creek channel. Due to concerns regarding its design, the U.S. Army Corps of Engineers, Galveston District (USACE) has reconsidered flood control options in the watershed.

Flood control options being considered include both flood conveyance and detention features on Clear Creek and a few of its tributaries. Approximately 15 miles of flood conveyance will be proposed for Clear Creek and shorter flood conveyance will be constructed on Mud Gully, Turkey Creek and Mary's Creek, all tributaries to Clear Creek. Offline detention features will be proposed for portions of Clear Creek, Mary's Creek and Mud Gully. Inline detention will be proposed for some reaches of Clear Creek. All structural components of the plan will occur upstream of the Dixie Farm Road area, although benefits will occur throughout the entire watershed. The proposed project is not expected to change freshwater inflow into Clear Lake or Galveston Bay.

To ensure compliance with the requirements of Section 7 of the Endangered Species Act, a list of proposed threatened or endangered species, their critical habitat, and species proposed for listing that may be found in the Clear Creek study area is requested.

CATANZARO/6346
24 SEP 2007

Your assistance with our coordination responsibilities is appreciated. If you have any questions, please contact Ms. Andrea Catanzaro at 409.766.6346 or by email at andrea.catanzaro@SWG02.usace.army.mil.

MURPHY
PE-PR
9/24

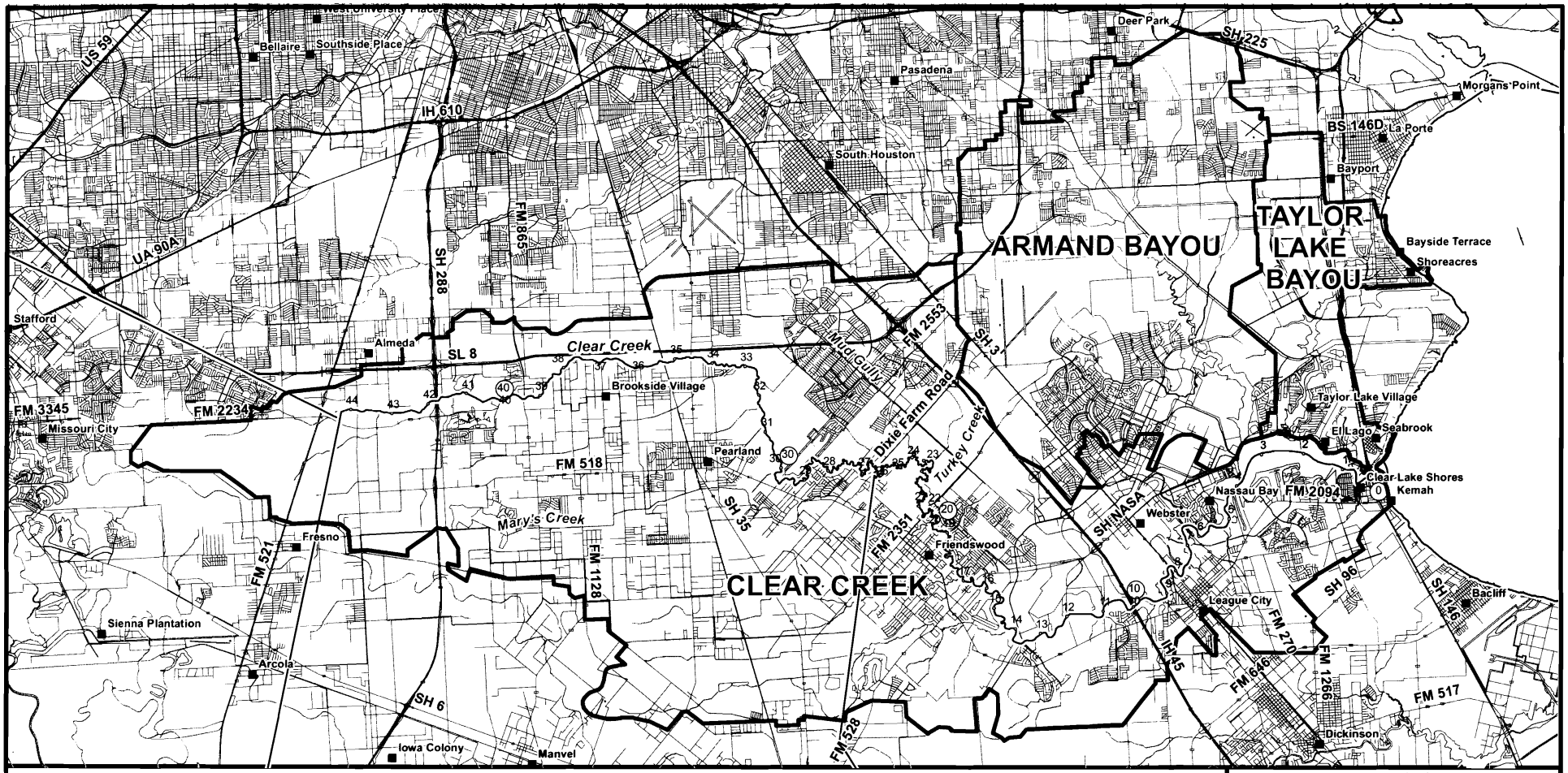
Sincerely,

Carolyn Murphy
Chief, Environmental Branch

Enclosure

Copy Furnished:

Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, TX 77551



PBSJ
6504 Bridge Point Pkwy, Ste. 200
Austin, Texas 78730
Phone: (512) 329-8342 Fax: (512) 327-2453

Study Area

Clear Creek Flood Control Project

Prepared for: USACE	
Job No.: 41886.00	Scale: 1in = 12,500ft
Prepared by: A.Christiansen	Date: 8/30/2007
File:N:/44188600/projects/study_area_vr2.mxd	

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Ave. South
St. Petersburg, FL 33701
(727) 824-5312, FAX (727) 824-5309
http://sero.nmfs.noaa.gov

F/SER3:TM

OCT - 2 2007

Ms. Carolyn Murphy
Chief, Environmental Branch
Department of the Army
Galveston District, Corps of Engineers
P.O. Box 1229
Galveston, TX 77553-1229

Dear Ms. Murphy:

This correspondence responds to the Department of the Army's letter dated September 24, 2007, regarding an Environmental Impact Statement to address proposed actions to manage flooding of Clear Creek which is south of Houston, Texas, and located in parts of Brazoria, Fort Bend, Harris and Galveston counties.

As requested, enclosed is a list of federally-protected species under the jurisdiction of the National Marine Fisheries Service for the state of Texas.

We look forward to continued cooperation with the Army in conserving our endangered and threatened resources. If you have any questions regarding the ESA consultation process, please contact Mr. Robert Hoffman, fishery biologist, at (727) 824-5312, or by e-mail at Robert.Hoffman@noaa.gov.

Sincerely,

David M. Bernhart
Assistant Regional Administrator
Protected Resources Division

Enclosure

File: 1514-22.F.1.TX

Endangered and Threatened Species and Critical Habitats
under the Jurisdiction of the NOAA Fisheries Service

Texas

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaengliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Threatened[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened	07/28/78
Fish			
smalltooth sawfish	*Pristis pectinata*	Endangered	04/01/03

Designated Critical Habitat
None

Species Proposed for Listing
None

Proposed Critical Habitat
None

[1] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered

Texas

Candidate Species[2]	Scientific Name
none	

Species of Concern[3]	Scientific Name
Fish	
dusky shark	*Carcharhinus obscurus*
largetooth sawfish	*Pristis pristis*
night shark	*Carcharhinus signatus*
saltmarsh topminnow	*Fundulus jenkinsi*
sand tiger shark	*Carcharias taurus*
speckled hind	*Epinephelus drummondhayi*
Warsaw grouper	*Epinephelus nigritus*
white marlin	*Tetrapturus albidus*
Invertebrates	
ivory bush coral	*Oculina varicosa*

[2] The Candidate Species List has been renamed the Species of Concern List. The term "candidate species" is limited to species that are the subject of a petition to list and for which NOAA Fisheries Service has determined that listing may be warranted (69 FR 19975).

[3] Species of Concern are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided.

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

January 26, 2009

REPLY TO THE ATTENTION OF
Environmental Section

Mr. Steve Parris
U.S. Fish and Wildlife Service
17629 El Camino Real, Suite 211
Houston, Texas 77058

Dear Mr. Parris:

This letter is in regard to the Clear Creek General Reevaluation Study, Brazoria, Fort Bend, Harris and Galveston Counties, Texas. The study addresses proposed flood risk management measures consisting of numerous conveyance and detention features on the main stem of Clear Creek and several tributaries to reduce flood damages in the upper extent of the Clear Creek watershed while preventing induced damages downstream. The plan also utilizes environmental features to reduce impacts while increasing acceptability of the project by the surrounding communities.

A number of threatened or endangered species were identified by your office and the National Marine Fisheries Service, and are addressed in the attached Biological Assessment (BA), which will be included as an appendix to the DEIS when it is released for review. Please review the enclosed BA for the proposed work.

It is our conclusion as documented in the BA that the project will have no effect on any federally-listed threatened or endangered species in the project area. I am hereby requesting your written concurrence, pursuant to 50 CFR 402.13, that the proposed action will have no effect on listed species or critical habitat under your jurisdiction.

We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act. Should you need additional information or have any questions please call Ms. Andrea Catanzaro at (409) 766-6346.

Sincerely,

Carolyn Murphy

Carolyn Murphy,
Chief, Environmental Section

Enclosure

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

January 26, 2009

REPLY TO THE ATTENTION OF
Environmental Section

David M. Bernhart
Assistant RA for Protected Resources
Southeast Regional Office
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, Florida 33701

Dear Mr. Bernhart:

This letter is in regard to the Clear Creek General Reevaluation Study, Brazoria, Fort Bend, Harris and Galveston Counties, Texas. The study addresses proposed flood risk management measures consisting of numerous conveyance and detention features on the main stem of Clear Creek and several tributaries to reduce flood damages in the upper extent of the Clear Creek watershed while preventing induced damages downstream. The plan also utilizes environmental features to reduce impacts while increasing acceptability of the project by the surrounding communities.

A number of threatened or endangered species were identified by your office and the U.S. Fish and Wildlife Service, and are addressed in the attached Biological Assessment (BA), which will be included as an appendix to the DEIS when it is released for review. Please review the enclosed BA for the proposed work.

It is our conclusion as documented in the BA that the project will have no effect on any federally-listed threatened or endangered species in the project area. I am hereby requesting your written concurrence, pursuant to 50 CFR 402.13, that the proposed action will have no effect on listed species or critical habitat under your jurisdiction.

We appreciate your continued cooperation in allowing us to fulfill our responsibilities under the Endangered Species Act. Should you need additional information or have any questions please call Ms. Andrea Catanzaro at (409) 766-6346.

Sincerely,

Carolyn Murphy

Carolyn Murphy,
Chief, Environmental Section

Enclosures
Copy Furnished (See Page 2)

CF:

Mr. Rusty Swafford
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, Texas 77551

Appendix B

Threatened and Endangered Species, Harris County

HARRIS COUNTY

AMPHIBIANS

		Federal Status	State Status
Houston toad	*Anaxyrus houstonensis*	LE	E

endemic; sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring especially after rains; burrows in soil of adjacent uplands when inactive; breeds February-June; associated with soils of the Sparta, Carrizo, Goliad, Queen City, Recklaw, Weches, and Willis geologic formations

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black Rail	*Laterallus jamaicensis*		

salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia

Brown Pelican	*Pelecanus occidentalis*	DL	E

largely coastal and near shore areas, where it roosts and nests on islands and spoil banks

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Mountain Plover	*Charadrius montanus*		

breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous

HARRIS COUNTY

BIRDS

		Federal Status	State Status
Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Red-cockaded Woodpecker	*Picoides borealis*	LE	E

cavity nests in older pine (60+ years); forages in younger pine (30+ years); prefers longleaf, shortleaf, and loblolly

Snowy Plover	*Charadrius alexandrinus*		

formerly an uncommon breeder in the Panhandle; potential migrant; winter along coast

Southeastern Snowy Plover	*Charadrius alexandrinus tenuirostris*		

wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats

Sprague's Pipit	*Anthus spragueii*	C	

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

White-faced Ibis	*Plegadis chihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

White-tailed Hawk	*Buteo albicaudatus*		T

near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May

Whooping Crane	*Grus americana*	LE	E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
American eel	*Anguilla rostrata*		

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

HARRIS COUNTY

FISHES

		Federal Status	State Status
Creek chubsucker	*Erimyzon oblongus*		T

tributaries of the Red, Sabine, Neches, Trinity, and San Jacinto rivers; small rivers and creeks of various types; seldom in impoundments; prefers headwaters, but seldom occurs in springs; young typically in headwater rivulets or marshes; spawns in river mouths or pools, riffles, lake outlets, upstream creeks

Smalltooth sawfish	*Pristis pectinata*	LE	E

different life history stages have different patterns of habitat use; young found very close to shore in muddy and sandy bottoms, seldom descending to depths greater than 32 ft (10 m); in sheltered bays, on shallow banks, and in estuaries or river mouths; adult sawfish are encountered in various habitat types (mangrove, reef, seagrass, and coral), in varying salinity regimes and temperatures, and at various water depths, feed on a variety of fish species and crustaceans

MAMMALS

		Federal Status	State Status
Louisiana black bear	*Ursus americanus luteolus*	LT	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

Plains spotted skunk	*Spilogale putorius interrupta*	

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	T

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

Southeastern myotis bat	*Myotis austroriparius*	

roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures

MOLLUSKS

		Federal Status	State Status
Little spectaclecase	*Villosa lienosa*		

creeks, rivers, and reservoirs, sandy substrates in slight to moderate current, usually along the banks in slower currents; east Texas, Cypress through San Jacinto River basins

Louisiana pigtoe	*Pleurobema riddellii*	T

streams and moderate-size rivers, usually flowing water on substrates of mud, sand, and gravel; not generally known from impoundments; Sabine, Neches, and Trinity (historic) River basins

Sandbank pocketbook	*Lampsilis satura*	T

small to large rivers with moderate flows and swift current on gravel, gravel-sand, and sand bottoms; east Texas, Sulfur south through San Jacinto River basins; Neches River

HARRIS COUNTY

MOLLUSKS

		Federal Status	State Status
Texas pigtoe	*Fusconaia askewi*		T

rivers with mixed mud, sand, and fine gravel in protected areas associated with fallen trees or other structures; east Texas River basins, Sabine through Trinity rivers as well as San Jacinto River

Wabash pigtoe	*Fusconaia flava*		

creeks to large rivers on mud, sand, and gravel from all habitats except deep shifting sands; found in moderate to swift current velocities; east Texas River basins, Red through San Jacinto River basins; elsewhere occurs in reservoirs and lakes with no flow

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Green sea turtle	*Chelonia mydas*	LT	T

Gulf and bay system; shallow water seagrass beds, open water between feeding and nesting areas, barrier island beaches; adults are herbivorous feeding on sea grass and seaweed; juveniles are omnivorous feeding initially on marine invertebrates, then increasingly on sea grasses and seaweeds; nesting behavior extends from March to October, with peak activity in May and June

Gulf Saltmarsh snake	*Nerodia clarkii*		

saline flats, coastal bays, and brackish river mouthss

Kemp's Ridley sea turtle	*Lepidochelys kempii*	LE	E

Gulf and bay system, adults stay within the shallow waters of the Gulf of Mexico; feed primarily on crabs, but also snails, clams, other crustaceans and plants, juveniles feed on sargassum and its associated fauna; nests April through August

Leatherback sea turtle	*Dermochelys coriacea*	LE	E

Gulf and bay systems, and widest ranging open water reptile; omnivorous, shows a preference for jellyfish; in the US portion of their western Atlantic nesting territories, nesting season ranges from March to August

Loggerhead sea turtle	*Caretta caretta*	LT	T

Gulf and bay system primarily for juveniles, adults are most pelagic of the sea turtles; omnivorous, shows a preference for mollusks, crustaceans, and coral; nests from April through November

Smooth green snake	*Liochlorophis vernalis*		T

Gulf Coastal Plain; mesic coastal shortgrass prairie vegetation; prefers dense vegetation

Texas horned lizard	*Phrynosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

HARRIS COUNTY

REPTILES

		Federal Status	State Status
Timber/Canebrake rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status
Coastal gay-feather	*Liatris bracteata*		

Texas endemic; coastal prairie grasslands of various types, from salty prairie on low- lying somewhat saline clay loams to upland prairie on nonsaline clayey to sandy loams; flowering in fall

Giant sharpstem umbrella-sedge *Cyperus cephalanthus*

in Texas on saturated, fine sandy loam soils, along nearly level fringes of deep prairie depressions; also in depressional area within coastal prairie remnant on heavy black clay; in Louisiana, most sites are coastal prairie on poorly drained sites, some on slightly elevated areas surrounded by standing shallow water, and on moderately drained sites; soils include very strongly acid to moderately alkaline silt loams and silty clay loams; flowering/fruiting May-June, August-September, and possibly other times in response to rainfall

Houston daisy *Rayjacksonia aurea*

Texas endemic; on and around naturally barren or sparsely vegetated saline slick spots or pimple mounds on coastal prairies, usually on sandy to sandy loam soils, occasionally in pastures and on roadsides in similar soil types where mowing may mimic natural prairie disturbance regimes; flowering late September-November (-December)

Texas meadow-rue *Thalictrum texanum*

Texas endemic; mostly found in woodlands and woodland margins on soils with a surface layer of sandy loam, but it also occurs on prairie pimple mounds; both on uplands and creek terraces, but perhaps most common on claypan savannas; soils are very moist during its active growing season; flowering/fruiting (January-)February-May, withering by midsummer, foliage reappears in late fall(November) and may persist through the winter

Texas prairie dawn	*Hymenoxys texana*	LE	E

Texas endemic; in poorly drained, sparsely vegtated areas (slick spots) at the base of mima mounds in open grassland or almost barren areas on slightly saline soils that are sticky when wet and powdery when dry; flowering late February-early April

Texas windmill-grass *Chloris texensis*

Texas endemic; sandy to sandy loam soils in relatively bare areas in coastal prairie grassland remnants, often on roadsides where regular mowing may mimic natural prairie fire regimes; flowering in fall

Threeflower broomweed *Thurovia triflora*

HARRIS COUNTY

PLANTS	Federal Status	State Status

Texas endemic; near coast in sparse, low vegetation on a veneer of light colored silt or fine sand over saline clay along drier upper margins of ecotone between between salty prairies and tidal flats; further inland associated with vegetated slick spots on prairie mima mounds; flowering September-November

Appendix C

Threatened and Endangered Species, Galveston County

Last Revision: 5/25/2011 3:02:00 PM

GALVESTON COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Attwater's Greater Prairie-Chicken	*Tympanuchus cupido attwateri*	LE	E

this county within historic range; endemic; open prairies of mostly thick grass one to three feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks during late winter-early spring; booming grounds important; breeding February-July

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black Rail	*Laterallus jamaicensis*		

salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia

Brown Pelican	*Pelecanus occidentalis*	DL	E

largely coastal and near shore areas, where it roosts and nests on islands and spoil banks

Eskimo Curlew	*Numenius borealis*	LE	E

historic; nonbreeding: grasslands, pastures, plowed fields, and less frequently, marshes and mudflats

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Mountain Plover	*Charadrius montanus*		

breeding: nests on high plains or shortgrass prairie, on ground in shallow depression; nonbreeding: shortgrass plains and bare, dirt (plowed) fields; primarily insectivorous

GALVESTON COUNTY

BIRDS

		Federal Status	State Status
Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Reddish Egret	*Egretta rufescens*		T

resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear

Snowy Plover *Charadrius alexandrinus*

formerly an uncommon breeder in the Panhandle; potential migrant; winter along coast

Southeastern Snowy Plover *Charadrius alexandrinus tenuirostris*

wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats

Sprague's Pipit	*Anthus spragueii*	C	

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

White-faced Ibis	*Plegadis chihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

White-tailed Hawk	*Buteo albicaudatus*		T

near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May

Whooping Crane	*Grus americana*	LE	E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

GALVESTON COUNTY

FISHES

		Federal Status	State Status
American eel	*Anguilla rostrata*		

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

Smalltooth sawfish	*Pristis pectinata*	LE	E

different life history stages have different patterns of habitat use; young found very close to shore in muddy and sandy bottoms, seldom descending to depths greater than 32 ft (10 m); in sheltered bays, on shallow banks, and in estuaries or river mouths; adult sawfish are encountered in various habitat types (mangrove, reef, seagrass, and coral), in varying salinity regimes and temperatures, and at various water depths, feed on a variety of fish species and crustaceans

MAMMALS

		Federal Status	State Status
Louisiana black bear	*Ursus americanus luteolus*	LT	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

Plains spotted skunk	*Spilogale putorius interrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

West Indian manatee	*Trichechus manatus*	LE	E

Gulf and bay system; opportunistic, aquatic herbivore

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Atlantic hawksbill sea turtle	*Eretmochelys imbricata*	LE	E

Gulf and bay system, warm shallow waters especially in rocky marine environments, such as coral reefs and jetties, juveniles found in floating mats of sea plants; feed on sponges, jellyfish, sea urchins, molluscs, and crustaceans, nests April through November

GALVESTON COUNTY

REPTILES		Federal Status	State Status
Green sea turtle	*Chelonia mydas*	LT	T

Gulf and bay system; shallow water seagrass beds, open water between feeding and nesting areas, barrier island beaches; adults are herbivorous feeding on sea grass and seaweed; juveniles are omnivorous feeding initially on marine invertebrates, then increasingly on sea grasses and seaweeds; nesting behavior extends from March to October, with peak activity in May and June

Gulf Saltmarsh snake *Nerodia clarkii*

saline flats, coastal bays, and brackish river mouthss

Kemp's Ridley sea turtle	*Lepidochelys kempii*	LE	E

Gulf and bay system, adults stay within the shallow waters of the Gulf of Mexico; feed primarily on crabs, but also snails, clams, other crustaceans and plants, juveniles feed on sargassum and its associated fauna; nests April through August

Leatherback sea turtle	*Dermochelys coriacea*	LE	E

Gulf and bay systems, and widest ranging open water reptile; omnivorous, shows a preference for jellyfish; in the US portion of their western Atlantic nesting territories, nesting season ranges from March to August

Loggerhead sea turtle	*Caretta caretta*	LT	T

Gulf and bay system primarily for juveniles, adults are most pelagic of the sea turtles; omnivorous, shows a preference for mollusks, crustaceans, and coral; nests from April through November

Texas diamondback terrapin *Malaclemys terrapin littoralis*

coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide

Texas horned lizard	*Phrynosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

Timber/Canebrake rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS		Federal Status	State Status
Coastal gay-feather	*Liatris bracteata*		

Texas endemic; coastal prairie grasslands of various types, from salty prairie on low- lying somewhat saline clay loams to upland prairie on nonsaline clayey to sandy loams; flowering in fall

Correll's false dragon-head *Physostegia correllii*

wet, silty clay loams on streamsides, in creek beds, irrigation channels and roadside drainage ditches; or seepy, mucky, sometimes gravelly soils along riverbanks or small islands in the Rio Grande; or underlain by Austin Chalk limestone along gently flowing spring-fed creek in central Texas; flowering May-September

GALVESTON COUNTY

PLANTS

Federal Status State Status

Grand Prairie evening primrose *Oenothera pilosella ssp sessilis*

known in Texas from a single historic collection from Galveston Island; elsewhere known from remnant moist to dry tallgrass prairies on sandy or silty Alfisols over claypan on ancient river terraces of the Mississippi Alluvial Plain, and fragipan flatwoods; flowering May-June

Houston daisy *Rayjacksonia aurea*

Texas endemic; on and around naturally barren or sparsely vegetated saline slick spots or pimple mounds on coastal prairies, usually on sandy to sandy loam soils, occasionally in pastures and on roadsides in similar soil types where mowing may mimic natural prairie disturbance regimes; flowering late September-November (-December)

Texas windmill-grass *Chloris texensis*

Texas endemic; sandy to sandy loam soils in relatively bare areas in coastal prairie grassland remnants, often on roadsides where regular mowing may mimic natural prairie fire regimes; flowering in fall

Threeflower broomweed *Thurovia triflora*

Texas endemic; near coast in sparse, low vegetation on a veneer of light colored silt or fine sand over saline clay along drier upper margins of ecotone between between salty prairies and tidal flats; further inland associated with vegetated slick spots on prairie mima mounds; flowering September-November

Appendix D

Threatened and Endangered Species, Brazoria County

Last Revision: 10/10/2011 2:25:00 PM

BRAZORIA COUNTY

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Black Rail	*Laterallus jamaicensis*		

salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mat of previous year's dead grasses; nest usually hidden in marsh grass or at base of Salicornia

Brown Pelican	*Pelecanus occidentalis*	DL	E

largely coastal and near shore areas, where it roosts and nests on islands and spoil banks

Eskimo Curlew	*Numenius borealis*	LE	E

historic; nonbreeding: grasslands, pastures, plowed fields, and less frequently, marshes and mudflats

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Piping Plover	*Charadrius melodus*	LT	T

wintering migrant along the Texas Gulf Coast; beaches and bayside mud or salt flats

Reddish Egret	*Egretta rufescens*		T

resident of the Texas Gulf Coast; brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear

BRAZORIA COUNTY

BIRDS

Federal Status State Status

Snowy Plover *Charadrius alexandrinus*

formerly an uncommon breeder in the Panhandle; potential migrant; winter along coast

Sooty Tern *Sterna fuscata* T

predominately 'on the wing'; does not dive, but snatches small fish and squid with bill as it flies or hovers over water; breeding April-July

Southeastern Snowy Plover *Charadrius alexandrinus tenuirostris*

wintering migrant along the Texas Gulf Coast beaches and bayside mud or salt flats

Sprague's Pipit *Anthus spragueii* C

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

Western Snowy Plover *Charadrius alexandrinus nivosus*

uncommon breeder in the Panhandle; potential migrant; winter along coast

White-faced Ibis *Plegadis chihi* T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

White-tailed Hawk *Buteo albicaudatus* T

near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May

Whooping Crane *Grus americana* LE E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork *Mycteria americana* T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

Federal Status State Status

American eel *Anguilla rostrata*

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

Sharpnose shiner *Notropis oxyrhynchus* C

endemic to Brazos River drainage; also, apparently introduced into adjacent Colorado River drainage; large turbid river, with bottom a combination of sand, gravel, and clay-mud

BRAZORIA COUNTY

FISHES

		Federal Status	State Status
Smalltooth sawfish	*Pristis pectinata*	LE	E

different life history stages have different patterns of habitat use; young found very close to shore in muddy and sandy bottoms, seldom descending to depths greater than 32 ft (10 m); in sheltered bays, on shallow banks, and in estuaries or river mouths; adult sawfish are encountered in various habitat types (mangrove, reef, seagrass, and coral), in varying salinity regimes and temperatures, and at various water depths, feed on a variety of fish species and crustaceans

MAMMALS

		Federal Status	State Status
Jaguarundi	*Herpailurus yaguarondi*	LE	E

thick brushlands, near water favored; 60 to 75 day gestation, young born sometimes twice per year in March and August, elsewhere the beginning of the rainy season and end of the dry season

Louisiana black bear	*Ursus americanus luteolus*	LT	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

Ocelot	*Leopardus pardalis*	LE	E

dense chaparral thickets; mesquite-thorn scrub and live oak mottes; avoids open areas; breeds and raises young June-November

Plains spotted skunk	*Spilogale putorius interrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

West Indian manatee	*Trichechus manatus*	LE	E

Gulf and bay system; opportunistic, aquatic herbivore

MOLLUSKS

		Federal Status	State Status
False spike mussel	*Quadrula mitchelli*		T

possibly extirpated in Texas; probably medium to large rivers; substrates varying from mud through mixtures of sand, gravel and cobble; one study indicated water lilies were present at the site; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins

Smooth pimpleback	*Quadrula houstonensis*	C	T

small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins

BRAZORIA COUNTY

MOLLUSKS

		Federal Status	State Status
Texas fawnsfoot	*Truncilla macrodon*	C	T

little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Atlantic hawksbill sea turtle	*Eretmochelys imbricata*	LE	E

Gulf and bay system, warm shallow waters especially in rocky marine environments, such as coral reefs and jetties, juveniles found in floating mats of sea plants; feed on sponges, jellyfish, sea urchins, molluscs, and crustaceans, nests April through November

Green sea turtle	*Chelonia mydas*	LT	T

Gulf and bay system; shallow water seagrass beds, open water between feeding and nesting areas, barrier island beaches; adults are herbivorous feeding on sea grass and seaweed; juveniles are omnivorous feeding initially on marine invertebrates, then increasingly on sea grasses and seaweeds; nesting behavior extends from March to October, with peak activity in May and June

Gulf Saltmarsh snake *Nerodia clarkii*

saline flats, coastal bays, and brackish river mouthss

Kemp's Ridley sea turtle	*Lepidochelys kempii*	LE	E

Gulf and bay system, adults stay within the shallow waters of the Gulf of Mexico; feed primarily on crabs, but also snails, clams, other crustaceans and plants, juveniles feed on sargassum and its associated fauna; nests April through August

Leatherback sea turtle	*Dermochelys coriacea*	LE	E

Gulf and bay systems, and widest ranging open water reptile; omnivorous, shows a preference for jellyfish; in the US portion of their western Atlantic nesting territories, nesting season ranges from March to August

Loggerhead sea turtle	*Caretta caretta*	LT	T

Gulf and bay system primarily for juveniles, adults are most pelagic of the sea turtles; omnivorous, shows a preference for mollusks, crustaceans, and coral; nests from April through November

Texas diamondback terrapin *Malaclemys terrapin littoralis*

coastal marshes, tidal flats, coves, estuaries, and lagoons behind barrier beaches; brackish and salt water; burrows into mud when inactive; may venture into lowlands at high tide

BRAZORIA COUNTY

REPTILES

		Federal Status	State Status
Texas horned lizard	*Phrynosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

Timber/Canebrake rattlesnake	*Crotalus horridus*		T

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS

		Federal Status	State Status
Coastal gay-feather	*Liatris bracteata*		

Texas endemic; coastal prairie grasslands of various types, from salty prairie on low- lying somewhat saline clay loams to upland prairie on nonsaline clayey to sandy loams; flowering in fall

Giant sharpstem umbrella-sedge	*Cyperus cephalanthus*		

in Texas on saturated, fine sandy loam soils, along nearly level fringes of deep prairie depressions; also in depressional area within coastal prairie remnant on heavy black clay; in Louisiana, most sites are coastal prairie on poorly drained sites, some on slightly elevated areas surrounded by standing shallow water, and on moderately drained sites; soils include very strongly acid to moderately alkaline silt loams and silty clay loams; flowering/fruiting May-June, August-September, and possibly other times in response to rainfall

Texas meadow-rue	*Thalictrum texanum*		

Texas endemic; mostly found in woodlands and woodland margins on soils with a surface layer of sandy loam, but it also occurs on prairie pimple mounds; both on uplands and creek terraces, but perhaps most common on claypan savannas; soils are very moist during its active growing season; flowering/fruiting (January-)February-May, withering by midsummer, foliage reappears in late fall(November) and may persist through the winter

Texas windmill-grass	*Chloris texensis*		

Texas endemic; sandy to sandy loam soils in relatively bare areas in coastal prairie grassland remnants, often on roadsides where regular mowing may mimic natural prairie fire regimes; flowering in fall

Threeflower broomweed	*Thurovia triflora*		

Texas endemic; near coast in sparse, low vegetation on a veneer of light colored silt or fine sand over saline clay along drier upper margins of ecotone between between salty prairies and tidal flats; further inland associated with vegetated slick spots on prairie mima mounds; flowering September-November

Appendix E

Threatened and Endangered Species, Fort Bend County

FORT BEND COUNTY

AMPHIBIANS

		Federal Status	State Status
Houston toad	*Anaxyrus houstonensis*	LE	E

endemic; sandy substrate, water in pools, ephemeral pools, stock tanks; breeds in spring especially after rains; burrows in soil of adjacent uplands when inactive; breeds February-June; associated with soils of the Sparta, Carrizo, Goliad, Queen City, Recklaw, Weches, and Willis geologic formations

BIRDS

		Federal Status	State Status
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T

year-round resident and local breeder in west Texas, nests in tall cliff eyries; also, migrant across state from more northern breeding areas in US and Canada, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	

migrant throughout state from subspecies' far northern breeding range, winters along coast and farther south; occupies wide range of habitats during migration, including urban, concentrations along coast and barrier islands; low-altitude migrant, stopovers at leading landscape edges such as lake shores, coastlines, and barrier islands.

Attwater's Greater Prairie-Chicken	*Tympanuchus cupido attwateri*	LE	E

this county within historic range; endemic; open prairies of mostly thick grass one to three feet tall; from near sea level to 200 feet along coastal plain on upper two-thirds of Texas coast; males form communal display flocks during late winter-early spring; booming grounds important; breeding February-July

Bald Eagle	*Haliaeetus leucocephalus*	DL	T

found primarily near rivers and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds

Henslow's Sparrow	*Ammodramus henslowii*		

wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking

Interior Least Tern	*Sterna antillarum athalassos*	LE	E

subspecies is listed only when inland (more than 50 miles from a coastline); nests along sand and gravel bars within braided streams, rivers; also know to nest on man-made structures (inland beaches, wastewater treatment plants, gravel mines, etc); eats small fish and crustaceans, when breeding forages within a few hundred feet of colony

FORT BEND COUNTY

BIRDS

		Federal Status	State Status
Peregrine Falcon	*Falco peregrinus*	DL	T

both subspecies migrate across the state from more northern breeding areas in US and Canada to winter along coast and farther south; subspecies (F. p. anatum) is also a resident breeder in west Texas; the two subspecies' listing statuses differ, F.p. tundrius is no longer listed in Texas; but because the subspecies are not easily distinguishable at a distance, reference is generally made only to the species level; see subspecies for habitat.

Sprague's Pipit	*Anthus spragueii*	C	

only in Texas during migration and winter, mid September to early April; short to medium distance, diurnal migrant; strongly tied to native upland prairie, can be locally common in coastal grasslands, uncommon to rare further west; sensitive to patch size and avoids edges.

Western Burrowing Owl	*Athene cunicularia hypugaea*		

open grasslands, especially prairie, plains, and savanna, sometimes in open areas such as vacant lots near human habitation or airports; nests and roosts in abandoned burrows

White-faced Ibis	*Plegadis chihi*		T

prefers freshwater marshes, sloughs, and irrigated rice fields, but will attend brackish and saltwater habitats; nests in marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats

White-tailed Hawk	*Buteo albicaudatus*		T

near coast on prairies, cordgrass flats, and scrub-live oak; further inland on prairies, mesquite and oak savannas, and mixed savanna-chaparral; breeding March-May

Whooping Crane	*Grus americana*	LE	E

potential migrant via plains throughout most of state to coast; winters in coastal marshes of Aransas, Calhoun, and Refugio counties

Wood Stork	*Mycteria americana*		T

forages in prairie ponds, flooded pastures or fields, ditches, and other shallow standing water, including salt-water; usually roosts communally in tall snags, sometimes in association with other wading birds (i.e. active heronries); breeds in Mexico and birds move into Gulf States in search of mud flats and other wetlands, even those associated with forested areas; formerly nested in Texas, but no breeding records since 1960

FISHES

		Federal Status	State Status
American eel	*Anguilla rostrata*		

coastal waterways below reservoirs to gulf; spawns January to February in ocean, larva move to coastal waters, metamorphose, then females move into freshwater; most aquatic habitats with access to ocean, muddy bottoms, still waters, large streams, lakes; can travel overland in wet areas; males in brackish estuaries; diet varies widely, geographically, and seasonally

Sharpnose shiner	*Notropis oxyrhynchus*	C	

endemic to Brazos River drainage; also, apparently introduced into adjacent Colorado River drainage; large turbid river, with bottom a combination of sand, gravel, and clay-mud

FORT BEND COUNTY

MAMMALS

		Federal Status	State Status
Louisiana black bear	*Ursus americanus luteolus*	LT	T

possible as transient; bottomland hardwoods and large tracts of inaccessible forested areas

Plains spotted skunk	*Spilogale putorius interrupta*		

catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie

Red wolf	*Canis rufus*	LE	E

extirpated; formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies

MOLLUSKS

		Federal Status	State Status
False spike mussel	*Quadrula mitchelli*		T

possibly extirpated in Texas; probably medium to large rivers; substrates varying from mud through mixtures of sand, gravel and cobble; one study indicated water lilies were present at the site; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins

Smooth pimpleback	*Quadrula houstonensis*	C	T

small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins

Texas fawnsfoot	*Truncilla macrodon*	C	T

little known; possibly rivers and larger streams, and intolerant of impoundment; flowing rice irrigation canals, possibly sand, gravel, and perhaps sandy-mud bottoms in moderate flows; Brazos and Colorado River basins

REPTILES

		Federal Status	State Status
Alligator snapping turtle	*Macrochelys temminckii*		T

perennial water bodies; deep water of rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near deep running water; sometimes enters brackish coastal waters; usually in water with mud bottom and abundant aquatic vegetation; may migrate several miles along rivers; active March-October; breeds April-October

Texas horned lizard	*Phrynosoma cornutum*		T

open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September

Timber/Canebrake rattlesnake	*Crotalus horridus*		T

FORT BEND COUNTY

REPTILES		Federal Status	State Status

swamps, floodplains, upland pine and deciduous woodlands, riparian zones, abandoned farmland; limestone bluffs, sandy soil or black clay; prefers dense ground cover, i.e. grapevines or palmetto

PLANTS		Federal Status	State Status
Texas prairie dawn	*Hymenoxys texana*	LE	E

Texas endemic; in poorly drained, sparsely vegtated areas (slick spots) at the base of mima mounds in open grassland or almost barren areas on slightly saline soils that are sticky when wet and powdery when dry; flowering late February-early April

Threeflower broomweed *Thurovia triflora*

Texas endemic; near coast in sparse, low vegetation on a veneer of light colored silt or fine sand over saline clay along drier upper margins of ecotone between between salty prairies and tidal flats; further inland associated with vegetated slick spots on prairie mima mounds; flowering September-November

Appendix F

Marine Threatened and Endangered Species
State of Texas

Endangered and Threatened Species and Critical Habitats
under the Jurisdiction of the NOAA Fisheries Service

Texas

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaeangliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Threatened[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened[2]	09/22/11
Fish			
None			

[1] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered

[2] Northwest Atlantic Ocean (NWA) DPS. On September 22, 2011, NMFS and USFWS issued a final rule changing the listing of loggerhead sea turtles from a single, threatened species to nine distinct population segments (DPSs) listed as either threatened or endangered (FR 76 58868). The NWA DPS was listed as threatened.

Texas

Candidate Species[3]	Scientific Name
Fish	
scalloped hammerhead shark	*Sphyrna lewini*
Invertebrates	
boulder star coral	*Montastraea annularis*
boulder star coral	*Montastraea franksi*
elliptical star coral	*Dichocoenia stokesii*
Lamarck's sheet coral	*Agaricia lamarcki*
mountainous star coral	*Montastraea faveolata*
pillar coral	*Dendrogyra cylindrus*
rough cactus coral	*Mycetophyllia ferox*

Species of Concern[4]	Scientific Name
Fish	
dusky shark	*Carcharhinus obscurus*
opossum pipefish	*Microphis brachyurus lineatus*
sand tiger shark	*Carcharias taurus*
speckled hind	*Epinephelus drummondhayi*
warsaw grouper	*Epinephelus nigritus*

[3] Candidate species are those petitioned species that are actively being considered for listing as endangered or threatened under the Endangered Species Act (ESA), as well as those species which NMFS has initiated an ESA status review.
[4] Species of Concern are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided. For more information please visit: http://sero.nmfs.noaa.gov/pr/SOC.htm

Appendix G

U.S. Fish and Wildlife Service's County List of Threatened and Endangered Species in the Project Area

Ecological Services

"Conserving the Nature of America"

Southwes

SOUTHWEST HOME
SOUTHWEST ES HOME
Welcome
Contacts
Photo Gallery
ELECTRONIC LIBRARY
CONTAMINANTS
ENDANGERED SPECIES
Mexican Wolf
Mexican Spotted Owl
Houston Toad
Willow Flycatcher
PROPOSED LISTINGS
Dunes Sagebrush Lizard
CANDIDATE LISTINGS
Lesser Prairie Chicken
PARTNERSHIPS
WIND ENERGY
WETLANDS
ES FIELD OFFICES
Arizona
New Mexico
Oklahoma
Texas

Last updated: May 14, 2012

Back to Start

List of species by county for Texas:

Counties Selected: Brazoria, Fort Bend, Galveston, Harris

Select one or more counties from the following list to view a county list:

Anderson
Andrews
Angelina
Aransas
Archer

View County List

Brazoria County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critic Habit
brown pelican	*Pelecanus occidentalis*	Birds	DM			
green sea turtle	*Chelonia mydas*	Reptiles	E, T			
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E			
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E			
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E			
loggerhead sea turtle	*Caretta caretta*	Reptiles	T			
piping Plover	*Charadrius melodus*	Birds	E, T			Fina
whooping crane	*Grus americana*	Birds	E, EXPN			

Fort Bend County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critic Habit
Texas prairie dawn-flower	*Hymenoxys texana*	Flowering Plants	E			
whooping crane	*Grus americana*	Birds	E, EXPN			

Galveston County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critic Habit
brown pelican	*Pelecanus occidentalis*	Birds	DM			
Eskimo curlew	*Numenius borealis*	Birds	E			
green sea turtle	*Chelonia mydas*	Reptiles	E, T			
hawksbill sea turtle	*Eretmochelys imbricata*	Reptiles	E			
Kemp's ridley sea turtle	*Lepidochelys kempii*	Reptiles	E			
leatherback sea turtle	*Dermochelys coriacea*	Reptiles	E			
loggerhead sea turtle	*Caretta caretta*	Reptiles	T			
piping Plover	*Charadrius melodus*	Birds	E, T			Fina

Harris County

Common Name	Scientific Name	Species Group	Listing Status	Species Image	Species Distribution Map	Critic Habit
Texas prairie dawn-flower	*Hymenoxys texana*	Flowering Plants	E			

Appendix F

Cultural Resources

Appendix F-1

Programmatic Agreement

Advisory Council On Historic Preservation

1522 K Street NW.
Washington D.C.
20005

April 15, 1980

Colonel James M. Sigler
District Engineer
Corps of Engineers, Galveston District
Department of the Army
P. O. Box 1229
Galveston, Texas 77553

Dear Colonel Sigler:

The Memorandum of Agreement for the six on-going construction projects in the State of Texas (Mouth of Colorado, Freeport Harbor (45-Foot Project), Taylors Bayou, Highland Bayou, Buffalo Bayou and Tributaries and the Corpus-Christi Ship Channel (45-Foot Project)) with the potential of affecting Fort Valasco-Quintana Historic District and other cultural properties has been ratified by the Chairman of the Council. This document constitutes the comments of the Council required by Section 106 of the National Historic Preservation Act, Section 2(b) of Executive Order 11593, "Protection and Enhancement of the Cultural Environment", and completes compliance with the Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800). A copy of the Agreement is enclosed.

In accordance with Section 800.6(c)(2) and 800.9(e) of the regulations, a copy of this Memorandum of Agreement should be included in any environmental assessment or statement prepared for this undertaking to meet requirements of the National Environmental Policy Act and should be retained in your records as evidence of compliance with Section 106 of the National Historic Preservation Act, and Section 2(b) of Executive Order 11593.

The Council appreciates your cooperation in reaching a satisfactory resolution of this matter.

Sincerely,

Louis S. Wall
Chief, Western Division
of Project Review

Enclosures

Advisory
Council On
Historic
Preservation

1522 K Street NW.
Washington D.C.
20005

MEMORANDUM OF AGREEMENT

WHEREAS, the Galveston District, Corps of Engineers, proposes to implement the following ongoing construction projects: Mouth of Colorado River, Freeport Harbor, Taylors Bayou, Highland Bayou, Buffalo Bayou and Tributaries, Corpus Christi Ship Channel, Texas; and,

WHEREAS, the Galveston District, in consultation with the Texas State Historic Preservation Officer (SHPO), has determined that this undertaking as proposed may have an adverse effect upon cultural properties which may be eligible for the National Register of Historic Places; and,

WHEREAS, pursuant to Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320) and Section 800.4(d) of the regulations of the Advisory Council on Historic Preservation (Council), "Protection of Historic and Cultural Properties" (36 CFR Part 800), the Galveston District has requested the comments of the Council; and,

WHEREAS, pursuant to Section 800.6 of the Council's regulations, representatives of the Council, the Galveston District, and the Texas SHPO have consulted and reviewed the undertaking to consider feasible and prudent alternatives to avoid or satisfactorily mitigate the adverse effect;

NOW, THEREFORE, it is mutually agreed that the undertaking will be implemented in accordance with the following stipulations:

Stipulations

The Galveston District will comply with the following procedures in implementing further actions on the below listed six authorized, ongoing construction projects:

Mouth of Colorado River, Texas;
Freeport Harbor, Texas (45-Foot Navigation Project)
Taylors Bayou, Texas;
Highland Bayou, Texas;
Buffalo Bayou and Tributaries, Texas;
Corpus Christi Ship Channel, Texas (45-Foot Navagation Project;

1. Prior to any land disturbing activities the Galveston District will complete a cultural resources survey designed in accordance with guidelines established in consultation with the SHPO to identify historic and cultural properties included in or eligible for inclusion in the National Register of Historic Places that may be affected by the undertaking. The Galveston District shall provide the Council with a copy of the guidelines established.

   A. Cultural resource surveys will be administered by the Galveston District staff archeologist.

   B. Copies of survey reports will be provided to the Texas SHPO.

   C. All historic and cultural properties identified by the surveys will be evaluated in consultation with the Texas SHPO to identify those properties that appear to meet National Register criteria. For those properties that appear to meet the criteria, the Galveston District will seek determinations of eligibility from the Secretary of the Interior in accordance with National Register procedures (36 CFR Sec. 63.3).

   D. For those sites included in or found to be eligible for inclusion in the National Register, the Galveston District will evaluate, in consultation with the Texas SHPO, the proposed undertaking to determine effect pursuant to 36 CFR Sec. 800.4(b). If "no effect" is found through such consultation, the undertaking may proceed.

   E. Upon finding that the undertaking will affect a property included in or eligible for the National Register, the Galveston District will develop a set of alternatives that would result in avoidance, or mitigation of adverse effects. In consultation with the Texas SHPO, the most prudent and feasible alternative will be selected.

      1. If the selected alternative results in avoidance, the Galveston District will document a determination of no effect and retain it in its files; the project may proceed.

      2. If the selected alternative would result in preservation of the cultural property and not create an adverse effect, the Galveston District will document this finding and forward a copy of the documentation to the Council and afford the

Council the opportunity to object pursuant to 36 CFR Sec. 800.6(a), before proceeding with the project.

2. Where it is not prudent and feasible to avoid or to preserve historic and cultural properties included in or eligible for inclusion in the National Register, the Galveston District will consult with the Texas SHPO and,

A. If it is determined that the affected historic or cultural property is included in or eligible for inclusion in the National Register primarily because it may be likely to yield information important in prehistory or history, and meets the criteria detailed in Part I of the "Guidelines for Making 'Adverse Effect' and 'No Adverse Effect' Determinations for Archeological Resources in Accordance with 36 CFR Part 800" (Guidelines), the Galveston District will institute a data recovery program in consultation with the Texas SHPO, in accordance with Part 2 of the Guidelines and the Department of the Interior's "Recovery of Scientific, Prehistoric, Historic, and Archeologcal Data: Methods, Standards, and Reporting Requirements" (36 CFR Part 66). (Copies of the Guidelines and 36 CFR Part 66 are attached.)

B. If it is determined that the affected historic or cultural property is listed in or eligible for inclusion in the National Register primarily for criteria other than the criterion that it is likely to yield information important in the prehistory or history of the area, but is not a National Historic Landmark or National Historic Site, and it is not known to have historic or cultural significance to any community or social or ethnic group, the Galveston District will develop measures acceptable to the Texas SHPO to mitigate the impact of the proposed action.

C. The Galveston District shall provide the Council with documentation supporting the agreements reached with the Texas SHPO under the provisions of A and B of this section and shall afford the Council an opportunity to object within 30 days after receipt of adequate documentation before undertaking data recovery program or proposed mitigative measures.

D. If it is determined that the affected historic or cultural property is a National Historic Landmark, National Historic Site, or is known to have significance to any community or social or ethnic group, or agreement cannot be reached between the Galveston

District and the Texas SHPO on satisfactory mitigation measures, or if the Council objects to the measures agreed upon, the comments of the Council will be requested in accordance with 36 CFR Part 800.

3. During construction activities covered by the Agreement and after the cultural resource surveys required by Stipulation 1 have been completed, should previously unknown historic or cultural properties be discovered, the Galveston District will cause potentially damaging activities to be delayed until it has had an opportunity to consult with the Texas SHPO and has complied with 36 CFR Sec. 800.7 of the Council's regulations.

4. The Galveston District may request that this Agreement be amended at any time to cover additional authorized construction projects by submitting a formal request to the Council with a preliminary case report concurred in by the Texas SHPO. The Council will review the documentation provided and advise the Galveston District of its concurrence or objection. If the Council objects, consultation with the Galveston District will continue until an amendment acceptable to all parties is agreed upon.

5. Failure to carry out the terms of this Agreement requires that the Galveston District again request the Council's comments in accordance with 36 CFR Part 800. If the Galveston District cannot carry out the terms of the Agreement, it shall not take or sanction any action or make any irreversible commitment that would result in an adverse effect with respect to National Register or eligible properties covered by the Agreement or would foreclose the Council's consideration of modifications or alternatives to the ongoing construction projects that could avoid or mitigate the adverse effect until the commenting process as been completed.

6. If any of the signatories to this Agreement determine that the terms of the Agreement cannot be met or believes a change is necessary, that signatory shall immediately request the consulting parties to consider an amendment or addendum to the Agreement. Such an amendment or addendum shall be executed in the same manner as the original Agreement.

Deputy Robert R. Garvey 1/30/80
(date)
Executive Director
Advisory Council on Historic Preservation

(date) 22 Feb 80
District Engineer
Corps of Engineers, Galveston District

(date) 3-12-80
Texas State Historic Preservation Officer

(date) 4/7/80
Chairman
Advisory Council on Historic Preservation

Advisory Council On Historic Preservation

1522 K Street, NW
Washington, DC 20005

JAN 12 1983

Mr. Joseph C. Trahan
Chief, Engineering and Planning Division
U.S. Army Corps of Engineers
Galveston District
P.O. Box 1229
Galveston, TX 77553

Dear Mr. Trahan:

The Memorandum of Agreement of 1980 for the Galveston Dsitrict's six on-going construction projects has been amended to include the Clear Creek Flood Control Project. The amendment has been ratified by the Chairman of the Council. This document constitutes the comments of the Council required by Section 106 of the National Historic Preservation Act and Section 2(b) of Executive Order 11593, "Protection and Enhancement of the Cultural Environment," and completes compliance with the Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800). A copy of the amendment is enclosed.

In accordance with Section 800.6(c)(2) and 800.9(e) of the regulations, a copy of the amended Memorandum of Agreement should be included in any environmental assessment or statement prepared for this undertaking to meet requirements of the National Environmental Policy Act and should be retained in your records as evidence of compliance with Section 106 of the National Historic Preservation Act and Section 2(b) of Executive Order 11593.

The Council appreciates your cooperation in reaching a satisfactory resolution of this matter.

Sincerely,

Thomas F. King
Director, Office of Cultural
Resource Preservation

Enclosure

AMENDMENT
TO
MEMORANDUM OF AGREEMENT

WHEREAS, the Galveston District, Corps of Engineers (COE), the Texas State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (Council), executed a Memorandum of Agreement on April 7, 1980, for several ongoing construction projects in the district in Texas; and

WHEREAS, the Clear Creek, Texas Flood Control Project will have similar effects on historic properties; and

WHEREAS, pursuant to 36 CFR Sec. 800.6(c)(4) of the Council's regulations, the Corps of Engineers has now requested an amendment to the Memorandum of Agreement to include the Clear Creek, Texas Flood Control Project.

NOW THEREFORE, it is mutually agreed that the Clear Creek, Texas Flood Control Project will be implemented in accordance with the Memorandum of Agreement ratified on April 7, 1980.

25 Oct 82
District Engineer (date)
Corps of Engineers, Galveston District

3 Nov. 1982
Texas State Historic (date)
Preservation Officer

12/27/82
Chairman (date)
Advisory Council on Historic Preservation

Dec 17 1982
Executive Director (date)
Advisory Council on Historic Preservation

Appendix F-2

Site Location Information Table

Appendix F-2
Recorded Historic and Prehistoric Sites in the Clear Creek Project Study Area

Site No.	Quadrangle Map	Temporal Affiliation	Type of Site	Landform	Site Condition	Type of Investigations	NRHP Status
41BO78	Friendswood	Prehistoric	lithic	mound	unknown		
41BO182	Friendswood				likely destroyed		
41BO1034	Friendswood	prehistoric	campsite	upland terrace	disturbed	survey, testing	–
41GV2	League City	Prehistoric		underwater (Aten, 1970: TARL Files)	appears in developed area	survey	
41GV8	Friendswood	Late Prehistoric	camp	knoll on bluff	appears eroded	survey	
41GV9	Friendswood	Late Ceramic period	camp	terrace	appears undisturbed		potentially eligible
41GV10	League City	Prehistoric	shell midden		appears undisturbed	survey, testing	NRHP Clear Creek
41GV11	League City	Late Prehistoric	*Rangia* shell midden		appears eroded		
41GV12	League City	Late Prehistoric and Archaic	*Rangia* shell midden	bluff	appears eroded		
41GV13	League City	Late Prehistoric	*Rangia* shell midden	bank	disturbed	survey, testing	
41GV14	League City	Late Prehistoric	*Rangia* shell midden	bluff	appears eroded		
41GV15	League City	Prehistoric	*Rangia* shell midden	mound	appears eroded and under developed area		
41GV16	League City	Prehistoric	*Rangia* shell midden	peninsula	appears eroded and under developed area		
41GV17	League City	Prehistoric	*Rangia* shell midden	eroded bank		testing	not eligible
41GV19	League City	Prehistoric	*Rangia* shell midden		appears in developed area		
41GV20	League City	Late Prehistoric	shell midden, lithic and ceramic	creek bank	disturbed	survey, testing	
41GV21	League City	Prehistoric	*Rangia* shell midden	mound	appears eroded		
41GV22	League City	Prehistoric	shell midden	Clear Lake south shore	appears eroded	survey, testing, excavation	NRHP South Shore Harbor
41GV44	League City	Ceramic period	shell midden	eroding bank south shore	appears eroded and under developed area	survey	not eligible
41GV46	Friendswood	Prehistoric	camp	terrace	appears undisturbed	survey, testing	not eligible
41GV49	ceramic period	Ceramic period	lithic and ceramic	terrace	appears undisturbed	survey, testing	

441886/070229

Site No.	Quadrangle Map	Temporal Affiliation	Type of Site	Landform	Site Condition	Type of Investigations	NRHP Status
41GV53	League City	Prehistoric	shell midden		appears undisturbed	survey, testing	NRHP Clear Creek
41GV54	Friendswood	Prehistoric	lithic/shell	knoll	appears eroded	survey, testing	not eligible
41GV55	League City	Prehistoric	Rangia shell midden	mound	appears undisturbed but may be eroded	survey, testing	
41GV56	League City	Prehistoric	camp	mound	appears undisturbed	survey	
41GV58	Friendswood	Ceramic period	lithic and ceramic	mound		intensive survey	not eligible
41GV59	Friendswood	Ceramic period	camp	mound	appears undisturbed	intensive survey	not eligible
41GV60	Friendswood	Ceramic period	camp	terrace	appears undisturbed	intensive survey	not eligible
41GV61	Friendswood	Prehistoric	camp	mound	appears undisturbed	intensive survey; testing	not eligible
41GV62	Friendswood	Prehistoric	camp	mound	appears undisturbed	intensive survey; testing	not eligible
41GV63	Friendswood	Prehistoric	camp	mound		intensive survey; testing	not eligible
41GV76	League City	Ceramic period	camp	mound on terrace	appears eroded	survey, testing	potentially eligible
41GV77	League City	Ceramic period	camp	mound on terrace	appears eroded	survey, testing	potentially eligible
41GV78	League City	Prehistoric	shell midden	floodplain	appears under road	survey	
41GV79	League City	Historic	Butler Building		appears in developed area		
41GV82	League City	prehistoric/historic	camp	floodplain	eroding	survey	potentially eligible
41GV91	League City	Prehistoric	lithics and shell	terrace	appears undisturbed		
41GV100	League City	Ceramic period and Late Prehistoric	camp	slope on shore		survey, testing	not eligible
41GV103	Algoa	Ceramic period	camp	levee	appears undisturbed		potentially eligible
41GV104	Algoa	Prehistoric	camp	prominent rise	appears undisturbed		not eligible

441886/070229

Site No.	Quadrangle Map	Temporal Affiliation	Type of Site	Landform	Site Condition	Type of Investigations	NRHP Status
41GV105	Friendswood	Historic	bridge pilings	creek bed	appears undisturbed		not eligible
41GV120	Friendswood	Early and Late Ceramic period	camp	mound	appears eroded		potentially eligible
41GV121	Friendswood	Prehistoric	camp	terrace	appears undisturbed		not eligible
41GV122	Friendswood	Prehistoric	camp	mound	appears undisturbed		not eligible
41GV123	Friendswood	Ceramic period	camp	terrace	appears undisturbed		not eligible
41GV124	Friendswood	Historic	brick structure	terrace	appears undisturbed	survey	
41GV134	Friendswood	Prehistoric	camp	creek bank	appears undisturbed	survey	
41GV135	Algoa	Historic	habitation	terrace		survey	
41HR67	[Jacinto] City		earth midden	mound	appears undisturbed	survey	
41HR80	League City	Prehistoric	shell midden	upland bluff		survey, testing	NRHP/SAL Harris County Boys School sites
41HR81	League City	Early Ceramic and Late Prehistoric	*Rangia* shell midden	bluff above Armand Bayou	appears undisturbed	survey, testing data recovery	NRHP Armand Bayou Arch. District
41HR82	League City	Late Prehistoric and Late Archaic	shell midden		appears in developed area	survey, testing data recovery	NRHP Armand Bayou Arch. District
41HR84	Friendswood	Prehistoric	camp	mound	appears undisturbed	survey, testing	potentially eligible
41HR85	League City	Prehistoric	*Rangia* shell midden	mound		survey, excavation	NRHP/SAL Harris County Boys School sites
41HR86	League City	Prehistoric	*Rangia* shell midden	mound	appears in developed area	survey, testing	
41HR87	League City	Prehistoric	*Rangia* shell midden	mound	appears in developed area	survey	
41HR91	League City	Prehistoric	shell midden		appears undisturbed	survey	
41HR92	League City	Prehistoric	*Rangia* shell midden			survey	
41HR93	League City	Ceramic period	small shell deposit	shore		survey	not eligible

441886/070229

Site No.	Quadrangle Map	Temporal Affiliation	Type of Site	Landform	Site Condition	Type of Investigations	NRHP Status
41HR94	League City	Prehistoric	*Rangia* shell midden	north shore		survey	not eligible
41HR95	League City	Possible Preceramic, Ceramic, and Historic	*Rangia* shell midden	shore		survey, testing	potentially eligible
41HR142	League City	Prehistoric	camp		appears undisturbed		NRHP Armand Bayou Arch. District
41HR151	League City	Prehistoric	camp	ridge	appears in developed area		NRHP Armand Bayou Arch. District
41HR152	League City	Prehistoric	camp	bank	appears in developed area		NRHP Armand Bayou Arch. District
41HR161	Friendswood	Late Prehistoric	lithic	mound	buried under a few meters of dredge spoil		potentially eligible
41HR162	Friendswood	Late Prehistoric	lithic	mound	severe erosion, partially buried under dredge spoil		not eligible
41HR163	Friendswood	Late Prehistoric	lithic and ceramic	mound	buried under a few meters of dredge spoil		not eligible
41HR164	Friendswood	Late Prehistoric	lithic and ceramic	mound	likely destroyed		not eligible
41HR165	Friendswood	Late Ceramic period	camp	mound	appears undisturbed	intensive survey	potentially eligible
41HR166	Friendswood	Prehistoric	camp	mound	appears undisturbed	intensive survey	not eligible
41HR168	Friendswood	Late Prehistoric	camp	mound		intensive survey	not eligible
41HR169	Friendswood	Prehistoric	camp	terrace	appears undisturbed	intensive survey	not eligible
41HR170	Friendswood	Prehistoric	camp	terrace	appears undisturbed	intensive survey	not eligible
41HR171	Friendswood	Prehistoric	camp	mound		intensive survey, testing	not eligible
41HR189	League City	Late Prehistoric Archaic	lithic and ceramic	terrace	appears undisturbed		

Appendix F-2 (Cont;'d)

Site No.	Quadrangle Map	Temporal Affiliation	Type of Site	Landform	Site Condition	Type of Investigations	NRHP Status
41HR190	League City	Prehistoric	lithic	terrace	appears undisturbed		
41HR191	Friendswood	Late Prehistoric	lithic	mound	buried under a few meters of dredge spoil		not eligible
41HR192	Friendswood	Late Prehistoric	lithic and ceramic	mound	disturbed		not eligible
41HR193	Friendswood	Ceramic period		mound		intensive survey, testing	not eligible
41HR194	Friendswood	Early Archaic to Late Ceramic	lithic and ceramic	mound		survey, testing	potentially eligible
41HR195	Friendswood	Ceramic period		mound	appears undisturbed	survey	potentially eligible
41HR503	Friendswood	Prehistoric		mound	appears undisturbed	survey	
41HR504	Friendswood	Ceramic period		mound	appears undisturbed	survey	
41HR528	League City	Historic	house			survey	
41HR529	League City	Historic	early 20th century defunct power plant	floodplain	appears undisturbed	survey, testing	not eligible
41HR538	League City	Prehistoric					site underwater
41HR539	League City				appears under road		
41HR602					appears undisturbed		
41HR633	Friendswood	Late Archaic	lithic and ceramic	point bar deposit	appears undisturbed	survey, NRHP testing	not eligible
41HR634	Friendswood	Prehistoric	camp	valley margin	appears undisturbed	survey	not eligible
41HR635	League City	Historic	homesite	uplands	appears undisturbed	survey, testing	potentially eligible
41HR636	Friendswood	Historic	Whitcomb Cemetery	uplands	appears undisturbed	survey	not eligible
41HR696	Friendswood	Late Ceramic period		mound	appears undisturbed	survey	potentially eligible
41HR697	Friendswood	Prehistoric		mound	appears undisturbed	survey	not eligible
41HR698	Friendswood	Prehistoric		mound	appears undisturbed	survey	not eligible
41HR699					appears undisturbed		
41HR817	Pearland	Prehistoric	shell midden		destroyed, the site is now a retention pond	survey, testing, data recovery	not eligible

Site No.	Quadrangle Map	Temporal Affiliation	Type of Site	Landform	Site Condition	Type of Investigations	NRHP Status
41HR828	League City?						
41HR829	Friendswood	Prehistoric	lithic/ceramic	mounds	appears undisturbed	survey	
41HR830	Friendswood	Historic	house		appears undisturbed	survey	
41HR1034	Friendswood	Prehistoric	*lithic*	mound	possibly disturbed		recommended as ineligible

Appendix G

Socioeconomic and Land Use Baseline

Document No. 070229
Job No. 441886

CLEAR CREEK GENERAL REEVALUATION STUDY
SOCIOECONOMIC AND LAND USE BASELINE

U.S. Army Corps of Engineers
Galveston District
2000 Fort Point Road
Galveston, Texas 77550

July 2011

Printed on recycled paper

Contents

Figures

Page

Tables

Acronyms and Abbreviations

CEQ	Council on Environmental Quality
CMSA	Consolidated Metropolitan Statistical Area
EO	Executive Order
FM	Farm-to-Market Road
HHS	Department of Health and Human Services
I-	Interstate Highway
ISD	Independent School District
JSC	Johnson Space Flight Center
NASA	National Aeronautics and Space Administration
PMSA	Primary Metropolitan Statistical Areas
SH	State Highway
TCEQ	Texas Commission on Environmental Quality
TMC	Texas Medical Center
TNRIS	Texas Natural Resources Information Service
TPWD	Texas Parks and Wildlife Department
TSHA	Texas State Historical Association
TWC	Texas Workforce Commission
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WCID	Water Control and Improvement District
WDA	Workforce Development Area

1.0 SOCIOECONOMIC RESOURCES

1.1 INTRODUCTION

The following presents a summary of the demographic and economic characteristics of the study area population. Population, community characteristics, community services, employment, and area economics are key areas of discussion. Information was obtained from the U.S. Census Bureau, Texas Water Development Board (TWDB), and Texas Workforce Commission (TWC), as well as various county and municipal data sources.

The study area is located within four counties (Harris, Galveston, Brazoria, and Fort Bend). Within these counties are the municipalities Brookside Village, Clear Lake Shores, Deer Park, El Lago, Fresno, Friendswood, Houston (partial), Kemah, La Porte, League City, Missouri City, Nassau Bay, Pasadena (partial), Pearland, Seabrook, Taylor Lake Village, and Webster. The socioeconomic study area is comprised of census tracts within these municipalities and counties (Figure 1). Information is provided for the study area counties, municipalities, and census tracts that are traversed by the study area. For demographic information, the study area census tracts are identified as the study area population.

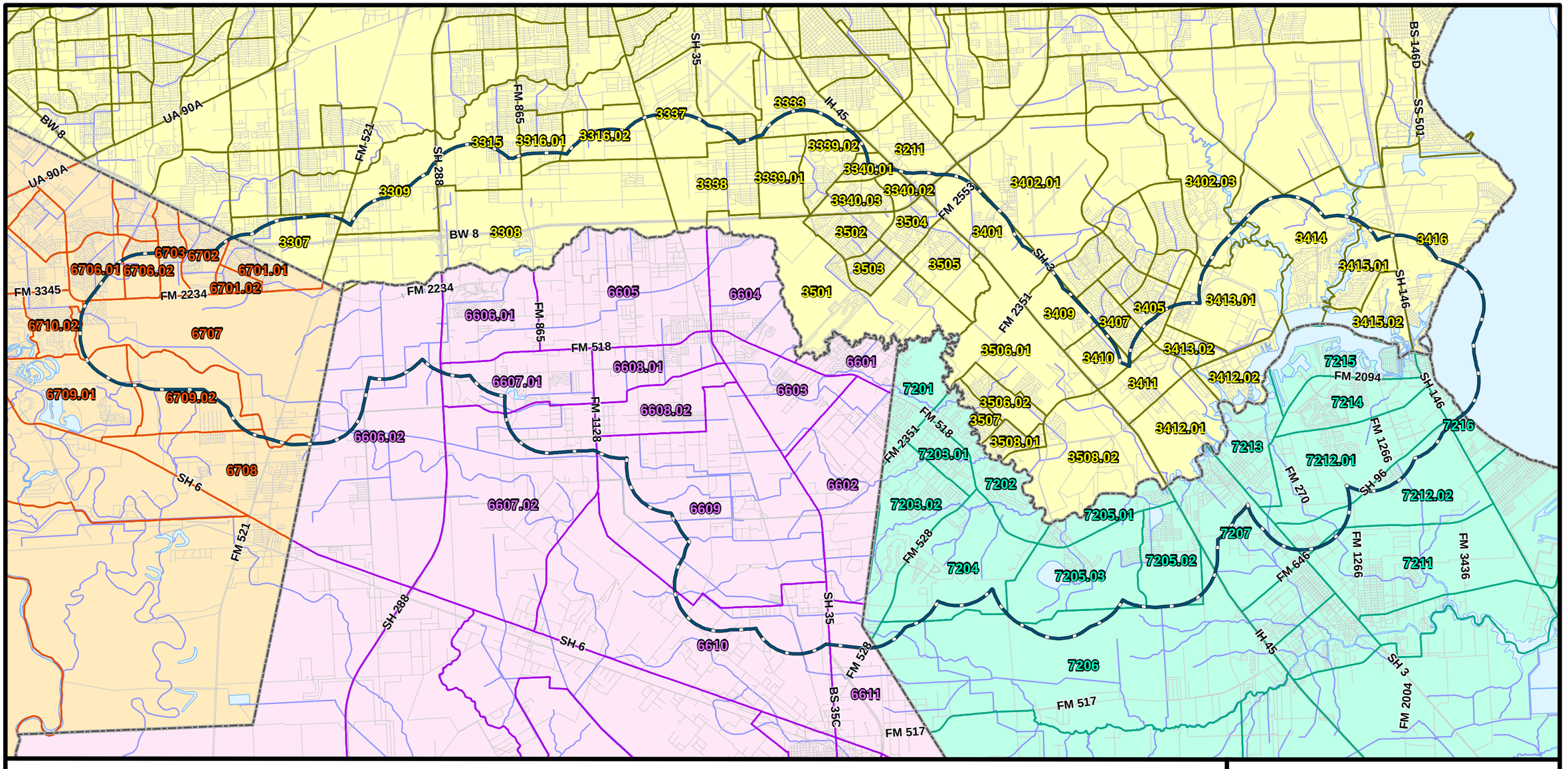
1.2 POPULATION AND DEMOGRAPHICS

1.2.1 Historic and Projected Population

Table 1 presents historic populations for the study area municipalities and counties. Of the municipalities in the study area, the highest increase in population growth from 1970 to 1980 occurred in Missouri City with a 490.5 percent increase in population. In the same time period, Webster City experienced the lowest population growth of 7.8 percent. The municipality that experienced the highest population growth from 1980 to 1990 was Friendswood at 112.8 percent increase. Taylor Lake Village experienced a decrease of 7.5 percent for the same time period. From 1990 to 2000, Fresno increased in population by 107.5 percent while El Lago decreased 5.9 percent in population for the same time period. Of the four counties in the study area, Fort Bend maintained the highest percentage of population growth over a 40-year time period, increasing 150.3 percent in 1970 to 1980 and continued this increase at 57.2 percent from years 1990 to 2000. Compared to the other counties in the study area, Galveston County experienced the lowest overall increase over the same 40-year time period, from 15.3 percent in 1970 to 1980 and 15.1 percent of population change from 1990 to 2000. Overall, the study area has experienced an increase in population between 1970 and 2000.

Table 2 provides population projections from 2000 to 2030 for the study area municipalities and counties. Fort Bend County is expected to have the highest population growth compared to the other three counties in the study area, with expected increases of between 27.3 percent and

(This page left blank intentionally.)



N
W E
S

0 1 2 4 Miles

0 6,000 12,000 24,000 Feet

2010 Census Tracts

- Fort Bend
- Galveston
- Harris
- Brazoria
- Study Area
- County Boundary

Figure 1

2010 Census Tracts

Clear Creek
Flood Risk Management Project

Prepared for: USACE	
Job No.: 100013748	Scale: 1 inch = 12,000 feet
Prepared by: 18827	Date: 5/16/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/100013748/geo/figs/Figure_1_Census_Tracts.mxd

(This page left blank intentionally.)

38.3 percent. Galveston County is expected to experience the lowest population growth of the four counties in the study area, with population increases of between 3.3 and 7.4 percent. Of the municipalities in the study area, the City of Pearland is expected to experience the highest population increase from 2000 to 2010 at 75.5 percent. Webster City is expected to have the highest population increase from 2010 to 2020 at 29.7 percent, and from 2020 to 2030 at 22.5 percent. Deer Park is expected to maintain the lowest population change from 2000 to 2030 with 3.5 percent change from 2000 to 2010, decreasing to a 3.1 percent change from 2020 to 2030. Overall, the increases in population seen from 1970 to 2000 are expected to continue through 2030, with growth generally slowing each decade.

1.2.2 Demographics and Community Cohesion Factors

Community cohesion is a social attribute that indicates a shared sense of identity, common responsibility, and social interaction among people who live or work within a defined geographic area. It is the degree to which people have a sense of belonging to their neighborhood or community or a strong attachment to neighbors, groups, and institutions as a continual association over time.

This section provides a profile of the study area with regard to age, education, and ethnic/racial make-up of the population. The 2000 Census Tracts traversed by the study area are used to identify the study area population (see Figure 1).

Table 3 provides the age characteristics of the study area population, municipalities, and counties. The study area population is the compilation of all census tracts located within the study area. Of the study area population, the 35 to 64 age group has the largest percentage of persons (39.8 percent) followed by the 20 to 34 age group (21.3 percent).

Table 4 shows the educational attainment levels for the study area population, municipalities, and counties. The study area population had 21.5 percent of the population being high school graduates, followed by 21.4 percent of the population attaining bachelor's degrees and 10.4 percent of the population attaining a graduate or professional degree. Of the municipalities, the highest percentage of high school graduates is within the City of La Porte at 33.3 percent and the lowest is Taylor Lake Village at 8.2 percent. The highest graduation rates for bachelor's degrees are in Taylor Lake Village at 36.3 percent, while the highest graduation rates for graduate degrees are in Nassau Bay at 25.6 percent. Within the counties, Galveston County has the highest high school graduation rate at 26.4 percent while Fort Bend County has the lowest at 19.4 percent. However, Fort Bend County has the highest graduation rate for bachelors and graduate degrees at 25.2 percent and 11.8 percent, respectively.

As previously discussed, the study area has experienced consistent growth from 1970 to 2000, and this growth is expected to continue, albeit at an increasingly slower rate, through the next

30 years. The majority of residents within the study area are aged between 35 and 64, followed by the 20 to 34 age group.

1.2.3 Housing Characteristics

As shown in Table 5, there were a total of 167,302 housing units within the study area, and the majority (94.5 percent) of these units are occupied, leaving little vacant housing in the study area. Of these occupied units, 66.4 percent are owner-occupied. This is true of the municipalities within the study area as well, with the exceptions of Houston, with the majority (54.2 percent) of housing units being renter-occupied, and within the municipality of Webster, with 86.4 percent of the housing units being renter-occupied.

Table 6 shows the length of residency in the study area municipalities and counties. The majority of residents moved into their houses between 1990 and 2000, resulting in a length of residency of 10 years or less. The median number of persons per unit ranged from 2.04 (Clear Lake Shores and Nassau Bay) to 3.52 (Fresno) for the study area municipalities, and from 2.60 (Galveston County) to 3.14 (Fort Bend County) for the study area counties. Median value for owner-occupied units ranged from $70,300 (Pasadena) to $152,700 (Taylor Lake Village) for the study area municipalities, and from $85,200 (Galveston County) to $115,100 (Fort Bend County) for the study area counties.

An economic evaluation of current flooding impacts was conducted by U.S. Army Corps of Engineers (USACE) (General Reevaluation Report [GRR], Economic Appendix). The study considered structures within an identified floodplain in which the probability of first-floor flooding is 0.2 percent each year. According to the economic evaluation, over 90 percent of the structures inventoried within the identified project floodplain on Clear Creek would flood. Based on 2009 prices, there were 7,500 structures valued at over $860 million within the AEP floodplain on the main stem and tributaries. Approximately 163 residential structures have been purchased and removed from the floodplain under the Federal Emergency Management Agency's Hazard Mitigation Program. Residences that would flood within the identified floodplains for Mary's Creek, Mud Gully, and Turkey Creek range from 84 to 99 percent, with values ranging from $70 to $155 million.

1.2.4 Environmental Justice

The proposed project is in compliance with Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," signed by the president on February 11, 1994, which directs Federal agencies to take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of Federal projects on the health of the environment of minority and low-income populations to the greatest extent practicable and permitted by law. The EO requires that minority and low-income populations not receive disproportionately high adverse human health or environmental impacts,

affected by the proposed project be involved in the community participation and public involvement process.

Table 7 shows the study area population is primarily comprised of white persons (64.9 percent) followed by Hispanic or Latino persons (19.1 percent) and black or African American persons (9.2 percent). As defined by the Council on Environmental Quality (CEQ), a minority population is defined as either (a) the minority population of the affected area exceeds 50 percent, or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate geographical analysis. While the racial minority population of the study area as a whole does not exceed 50 percent, several municipalities within the study area have racial minority populations greater than 50 percent. Fresno has a racial minority population that is 78.4 percent of the total population, the City of Houston has 67.8 racial minority, while Missouri City has 59.7 percent racial minority and Pasadena has a racial minority population that accounts for 51.8 percent of the total population. While the study area as a whole is not considered to be a minority population, these municipalities would be considered as such.

Low-income persons are defined as "a person whose household income is at or below the Department of Health and Human Services (HHS) poverty guidelines." The 2008 HHS poverty guideline for a family of four is $21,200. The average median household income for the study area is $59,133, which is well above the 2008 HHS poverty guideline. The median household incomes for the study area municipalities ranged from $36,616 (Houston) to $99,535 (Taylor Lake Village). None of the study area counties or municipalities had a median household income below the 2008 HHS poverty guideline.

1.2.5 Community Services

1.2.5.1 Fire Protection

Fire protection within the study area is handled by a combination of municipal, county, and volunteer fire departments (Table 8). However, various other departments throughout the four-county study area may be available in emergency situations. As populations increase within the study area, additional fire protection facilities may be needed.

1.2.5.2 Utilities, Water, Wastewater, and Solid Waste

Within the study area, a variety of entities provide electric, natural gas, water, wastewater, and solid waste disposal services. Information was obtained from various sources within the study area, including personal communications with municipal and county personnel as well as internet searches. Current available services in the study area are summarized in Table 9. As populations increase within the study area, additional infrastructure may be needed.

1.2.5.3 Local Government and School Districts

The study area has over 60 units of local government, including 4 counties, 12 municipalities, 5 independent school districts (ISDs), 3 water control and improvement districts (WCIDs), and several special districts and authorities.

The four counties provide basic infrastructure and services including roads, community facilities, law enforcement, hospitals, and welfare programs. The municipalities provide a wide range of infrastructure and services. The municipalities also have local ordinance-making authority. WCIDs supply water for domestic, commercial, and industrial use. They also operate sanitary wastewater systems and provide irrigation, drainage, and water quality services. Special general law districts, such as WCIDs, are created by either a County Commissioner's Court or by the Texas Commission on Environmental Quality (TCEQ).

The multitude of political jurisdictions in the study area in addition to the lack of zoning regulations makes development planning, including planning for flood damage reduction, difficult. For example, much of the study area's populations live in unincorporated areas that fall under the jurisdiction of the county. Counties, however, have only a limited authority to regulate development and provide public services. Infrastructure and services in these unincorporated areas are therefore provided primarily through a combination of special districts and private homeowners associations.

Table 10 identifies the ISDs that provide primary and secondary public education and have property-taxing authority. As populations increase within the study area, more schools may be needed.

Within residential subdivisions, Homeowners or Property Owners Associations are the main tools that residents use in areas outside the city limits to control the appearance, development, and character of their neighborhoods. These associations provide services such as maintaining common areas and property, providing constable patrol services, and forum for neighborhood disputes. They also often supply services normally provided by a city such as waste removal and streetlights.

1.3 ECONOMICS

1.3.1 Historical Perspective

The population influx in the early 1900s marked the beginning of a shift from agriculture to industry in the study area. The Houston Ship Channel began to flourish at this time. Large energy companies began to locate in the area, including Texaco, Arco, Crown Central Refining, Champion Paper Company, and Houston Lighting and Power. During World War II, the area's

population grew significantly, and the ship channel was a center of activity for refining, chemical manufacturing, shipbuilding, and exporting (Texas State Historical Association [TSHA], 2007).

1.3.1.1 Harris County

The development of Harris County as an industrial power began in 1911, when voters approved the formation of the Harris County Ship Channel Navigation District. In 1914 the existing 50-mile-long channel was deepened to 25 feet. By 1918, petroleum refineries began locating along Buffalo Bayou and the San Jacinto River, as did various other industries. Since that time, the channel has been deepened to 50 feet and widened to accommodate larger vessels. The success of the channel in attracting industry caused a surge in population (TSHA, 2001).

1.3.1.2 Galveston County

Located on the Gulf Coast, the Galveston County economy is highly dependent on the petrochemical industry. By 1944, eight oilfields with 272 oil wells produced more than 4.6 million barrels of oil. Agriculture also played a large part in the economy, with crops such as cotton, wheat, sugar, bananas, rice, and vegetables. By 1944, over 16,000 acres were used in rice farming. Taking advantage of port facilities, by 1951 Galveston County began receiving foreign shipments, largely of cotton, sulfur, and grain, totaling 5.2 million tons. In 1954, a shift from commercial farming to manufacturing was apparent, with 24 percent of the workforce, primarily at oil refineries and chemical plants, being employed by 87 manufacturing establishments (TSHA, 2002).

1.3.1.3 Brazoria County

Mineral development in Brazoria County began in the early 1900s with oil production reaching 12,500,000 barrels in 1921 and 29,308,106 barrels in 1946, resulting in Brazoria County being ranked fourth among Texas counties for oil production. However, during the 1940s, manufacturing became an important part of the economy, and the number of manufacturing jobs increased rapidly. Companies such as Dow Chemical Company came to Freeport, giving rise to the Brazosport industrial and port community. By the 1980s the county had 186 manufacturing establishments that employed approximately 18,000 employees (TSHA, 2006).

1.3.1.4 Fort Bend County

Mineral development also began early in Fort Bend County. Throughout the county, subterranean salt domes have concentrated deposits of oil, gas, sulfur, and salt. The first commercially producing oil well was brought in by Gulf Oil Company in 1919 at Blue Ridge, and in 1921 two additional major fields were established at Big Creek and Thompsons Oil Field. Farming and ranching have been the primary focus for the Fort Bend County economy since its inception; however, since the 1960s, residential development, industry, and commerce in the county have forced a trend towards fewer commercial farms. An attempt to move away from

commercial farming, and towards commerce and industry, especially that associated with the development and transport of oil, gas, and sulfur in the county, have created a more diverse economy within the county (TSHA, 2005).

1.3.1.5 Other

In the 1960s, the land east of Webster became the home of the National Aeronautics and Space Administration's (NASA) Manned Spacecraft Center, renamed the Johnson Space Flight Center (JSC) in 1973. Houston quickly annexed the area, and development changed the rural aspect of the region when several new towns sprang up along the north shore of Clear Lake, the largest being Clear Lake City (TSHA, 2001). The area has since grown to include an array of high-tech companies combined with a mix of traditional industries, including the JSC, the Texas Medical Center (TMC), the Houston Ship Channel, and its associated world's largest petrochemical complex. The area has been able to couple its high-tech and manufacturing industry base with strong growth in upscale commercial, retail, and boating facilities. Now firmly centered on the aerospace, specialty chemicals, biomedical, tourism, and boating industries, the Clear Lake economy was relatively isolated from the 1983–1985 oil industry recession because of its specialty chemical producers and aerospace firms that draw their business from other than oil-based exploration and refining (TSHA, 2007; City of Pearland, 2007).

Other communities began to flourish around Clear Lake in the 1950s and 1960s. Nassau Bay was developed on an old ranch by a group of Houston businessmen who built several stores, homes, office buildings, parks, and marinas. Similarly, El Lago was established in the 1950s and incorporated in 1964. Fearing annexation by Houston and La Porte, Seabrook was incorporated in 1961. Taylor Lake Village was incorporated in 1961, and Clear Lake City, which was annexed by Houston in 1977, was developed by the Humble Oil Company, in 1963, for residential and industrial use (TSHA, 2007).

The discovery of oil in the Friendswood-Webster oilfields during the 1930s brought some population growth to these two towns, as well as to League City and Pearland. By 1946, League City was a center for railroad shops and home to a Humble Oil tank field. Growth in primarily services-related industries began in Pearland at this time as well.

Population growth in the Clear Creek area was slow and relatively insignificant until the location of the NASA/JSC in nearby Clear Lake in the early 1960s. Between the mid-1930s and 1950s, for example, the population in Pearland fluctuated between only 150 and 350 people. But by the mid-1960s the town had 1,497 inhabitants and 41 businesses. Similarly, Friendswood had a population of only 75 and 2 businesses in the 1940s, but grew to 1,675 people and 26 businesses by 1968. By 1976, League City had a population of 16,000 and 112 businesses. In the same year, the population of Webster was 3,250 and 47 businesses up from only about 120 people and no more than 5 businesses in 1950. Brookside Village in the 1940s was nothing more than scattered

dwellings, but by the early 1960s the community's population reached 560 people. The Clear Creek area developed in the 1960s and 1970s as a primarily residential community for the Houston, Galveston, and Clear Lake areas with some, primarily service-related, businesses. Early settlers in the region engaged primarily in agriculture, and the Pearland area was particularly fertile (TSHA, 2007; City of Pearland, 2007).

Within the greater Houston area, the aerospace industry began to grow in the region when the JSC opened. Based on 1993 figures used in a study by the University of Houston-Clear Lake, the aerospace industry contributed approximately $1.1 billion to the Clear Lake area economy. As the JSC has grown, so too has the aerospace contractor community. Major aerospace leaders such as Boeing, Lockheed Martin, United Space Alliance, and others are located in the Clear Lake region (TSHA, 2007; City of Pearland, 2007). The JSC has also contributed to a healthy tourism industry in the Clear Lake area. In 1992, the $68 million facility opened, showcasing the United States's accomplishments in space. The estimated number of visitors to the facility annually is near 1 million. The indirect impact of the JSC is estimated at approximately $12 million in personal income and 600 jobs in addition to those directly employed at the center.

As previously stated, the chemicals industry is also important to the regional economy. The area's chemical industry is composed of operating plants located in the Bayport Industrial Complex (Route 146 and Bay Area Boulevard) and chemical services offices located in local office space. Chemical companies with offices in the region include Dow, Haldor Topsoe, Occidental, Seachem, Teekay Shipping, Cargo Tank, and others. The member companies of the Bayport Complex contribute an estimated $729 million to $1.06 billion annually to the Clear Lake area economy (TSHA, 2007; City of Pearland, 2007). Sixty-five operating specialty chemical plants, employing between 7,000 and 8,000 workers, are located in the Bayport Complex. Growth in the Bayport Complex has been steady over the past 25 years, and the Port of Houston Authority has proposed a container ship terminal at Bayport. Specialty chemical industry prices have declined in the last few years in response to changes in oil demand.

A fairly significant biomedical industry has also developed in the Clear Lake region as a result of the area's proximity to the TMC. The TMC is an organization of nonprofit medical providers including 2 medical schools, 4 schools of nursing, 13 hospitals, and 2 specialty institutions. More than $2 billion has been received by the TMC member institutions as grants for research during the past 5 years. Within the Clear Lake area, Cyberonics, Diagnostic Systems Laboratories, and Cardionics Inc. are the primary biomedical companies, combined employing more than 325 workers (City of Pearland, 2007; TSHA, 2007).

Of growing importance for the regional economy is the boating and recreation industry. Clear Lake has 22 marinas that provide 7,300 boat slips of all sizes and dockage facilities for powerboats and sailboats, making it the third largest boating community in the nation. The Kemah-Seabrook area also serves as a commercial landing port. The Clear Lake region accounts

for approximately 20 percent of the direct business volume for all Texas recreational boating and is home to about 20 percent of all coastal Texas establishments engaged in recreational boating. The Clear Lake region holds the largest number of boats and slips of any single location along the Texas Gulf coast and provides harborage for the third largest number of privately owned boats in the nation (Clear Lake City Information, 2007).

The area has also seen some commercial and business development, but it is essentially a residential set of communities. Between the various communities, there are a wide variety of recreational facilities, including scenic parks (some of which are included in the Great Texas Birding Trail), golf courses, tennis courts, a few sports complexes, an Olympic-sized pool, softball and soccer fields, picnic facilities, hike/bike trails, and major marinas.

1.3.2 Current Regional Economics

Table 11 provides employment data for the study area municipalities and counties in 2006. Information was not available for the study area population (2000 Census tracts) for 2006; therefore, the Gulf Coast Workforce Development Area (WDA) data are used to provide employment information for the region as well as the study area municipalities and counties. Data were unavailable for the municipalities Brookside Village, Clear Lake Shores, El Lago, Nassau Bay, Seabrook, Taylor Lake Village, and Webster. For municipalities in which information was provided, the unemployment rate ranged from 5.3 percent in Pasadena to 4.0 percent for Friendswood, League City, and Pearland. The unemployment rate for the counties ranged from 5.0 percent in Galveston and Harris counties to 4.7 percent in Fort Bend County. These rates are comparable to those of the State of Texas (4.9 percent) and the U.S. (4.6 percent).

As shown in Table 12, a study of the first-quarter employment data for 2007 reveals the top three industries for the Gulf Coast WDA are Trade–Wholesale and Retail (21.6 percent), Government (20.4 percent), and Manufacturing (12.8 percent). The top manufacturers within the study area counties are shown in Table 13.

As shown in Table 14, the majority of workers in the study area traveled less than 25 minutes to work in 2000. In general, the municipalities and counties were comparable with respect to travel time to work.

1.3.3 Tax Base

In Texas, property is appraised and property tax is collected by local (county) tax offices or appraisal districts. These monies are used to fund public schools, city streets, county roads, and police and fire protection. Table 15 lists the 2006 tax rate for the study area municipalities and counties.

2.0 LAND USE/AESTHETICS

In order to evaluate existing land use patterns within the study area, data were obtained from a variety of public agencies and private entities, and were integrated into ArcView® GIS. Land use/land cover coverage data for the study area from 1990 were obtained from the U.S. Geological Survey (USGS). This coverage was developed by the USGS through interpretation of satellite imagery (USGS, 1990). This land use/land cover coverage uses the Anderson system of classification, which categorizes land uses into 19 categories. Also, 1999 Texas Department of Transportation (TxDOT) county roads coverage (TxDOT, 1999a), and 1999 parks coverage (derived from the TxDOT urban data) data were obtained from the Texas Natural Resources Information Service (TNRIS) (TxDOT, 1999b). Finally, Atlantic Technologies provided 1-foot ground resolution orthophotography that was flown specifically for the proposed project in 2000 (Atlantic Technologies, 2000).

Within the study area, significant urban development has occurred since 2000, so the 2000 USGS land use/land cover coverage did not adequately capture areas of development. In order to address this issue, the orthophotography coverage from 2005 was used as a base map, with all other layers superimposed. Land-use interpretation was conducted from these working maps, to identify and categorize land use from areas that had been developed since 2000. In addition, the Anderson system of classification (Anderson et al., 1976) categories was aggregated for display in order to focus on urban land uses, rather than vegetation types.

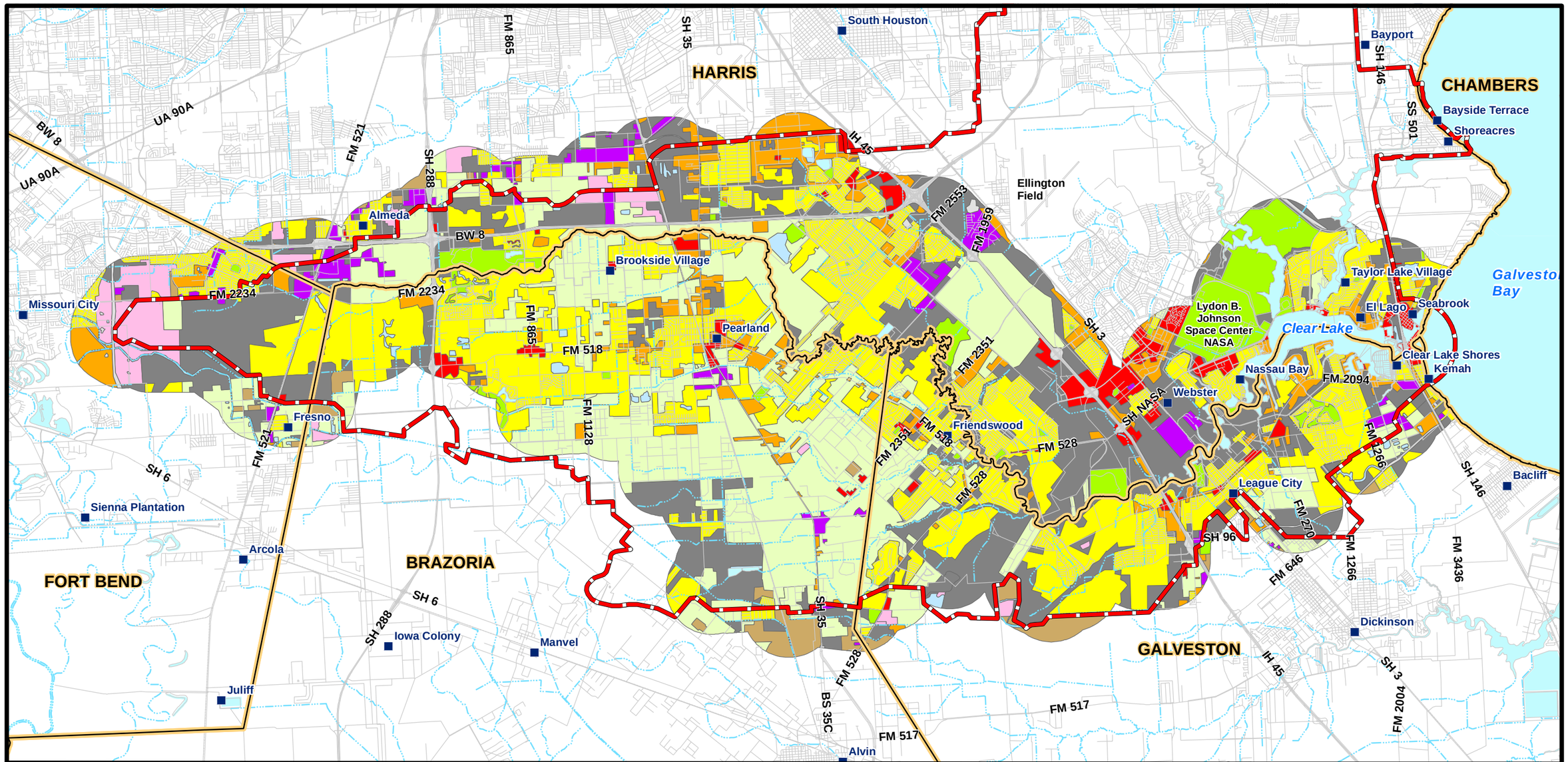
The study area is approximately 219 square miles, and includes portions of Harris, Galveston, Brazoria, and Fort Bend counties. The study area includes 17 municipalities: Brookside Village, Clear Lake Shores, Deer Park, El Lago, Fresno, Friendswood, Houston (partial), Kemah, La Porte, League City, Missouri City, Nassau Bay, Pasadena (partial), Pearland, Seabrook, Taylor Lake Village, and Webster. Land uses for the study area are shown on Figure 2.

2.1 STUDY AREA AND LAND-USE PATTERNS

The study area falls within the Houston-Galveston-Brazoria Consolidated Metropolitan Statistical Area (CMSA), which is made up of three Primary Metropolitan Statistical Areas (PMSA): the Houston PMSA (Chambers, Ford Bend, Harris, Liberty, Montgomery, and Waller counties), the Galveston-Texas City PMSA (Galveston County), and the Brazoria PMSA (Brazoria County).

Examination of 2005 aerial photographic coverage indicated that the study area includes a variety of land uses, including highly developed residential-urban, industrial, recreational, and agricultural land. Generally, the most intensive development is found in the rapidly growing areas immediately adjacent to the major roadways (State Highway [SH] 288, Sam Houston

(This page left blank intentionally.)



Land Use/ Land Cover (Source: USGS LU/LC 1990 Digital Data updated by PBSJ using Aerial Photo Interpretation)

- Agricultural Land
- Commercial
- Industrial
- Mining
- Other Urban Land
- Water Features
- Transportation Communication and Utilities
- Park
- Residential
- Rural (Large lot/Ranchette) Residential
- Undeveloped Land

- Study Area
- Texas Cities
- Texas Counties

N W E S

0 12,000 24,000 36,000 Feet

Figure 2

Land Use

Clear Creek
Flood Risk Management Project

Prepared for: USACE	
Job No.: 100013748	Scale: 1 inch = 12,000 feet
Prepared by: 18827	Date: 5/16/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/100013748/geo/figs/Figure_2_Land_Use.mxd

(This page left blank intentionally.)

Tollway/Tollway 8, SH 35, Interstate Highway 45 [I-45], and SH 146). The remainder of the study area is characterized by agricultural land uses, scattered small residential clusters, and parklands (see Figure 2).

The study area is approximately 165,126 acres in size. Based on review of 2005 aerial photography, within the study area, residential, including large lot/ranchettes, constitutes 82,902 acres (50 percent) of the total study area followed by undeveloped land with 47,403 acres (29 percent), and urban uses with 24,447 acres (15 percent), including commercial, industrial, transportation, and other urban land uses. Total parkland within the study area is 6,573 acres, or 4 percent.

Primarily rural until the 1970s, the suburban growth of Fort Bend and Brazoria counties has been closely tied to the economic prosperity of Houston. The lower cost of land in Fort Bend and other counties surrounding Houston has drawn residential development away from the central city to areas more affordable for the developer and homeowner. As bedroom communities increased through the 1980s, decentralization of Houston continued as jobs and retail sales began to follow homeowners to the suburbs. Over time, the Houston region has become a central city surrounded by smaller edge cities, large enough to support shopping and labor markets.

This type of growth, master-planned communities developed by private entities, is rapidly occurring in the study area. Such communities are large enough to lower the per-unit costs of private development of capital infrastructure while at the same time offering open space and community facilities. Often, such communities are annexed by surrounding cities in efforts to improve that city's tax base, providing the residents of the affected area approve it by referendum. Houston and its surrounding edge communities have typically expanded in this way (Wilbur Smith Associates, 1999). Many of the study area's municipalities have incorporated no-impact policies in addressing new development. These are established to protect the stormwater flow at a 100-year level of protection; however, these requirements are not in place for the entire watershed.

Recent development is in the form of suburban-style master-planned communities consisting of fairly high-density, single-family homes along curvilinear streets. The residential pattern of recent developments contrasts sharply with the rural nature of the traditional housing stock of the area where small clusters of homes or individual farm homesteads are scattered along farm-to-market (FM) roads. Many of the residences in more-rural settings include farm-related structures such as garages, barns, storage buildings, and other agricultural outbuildings. Commercial and industrial land uses in the study area tend to be located along Beltway 8, I-45, and SH 146.

As shown in Table 16, the greatest change in land use acreages between 2000 and 2005 was with residential and undeveloped land. Within the study area, residential land increased by 85.7 percent while undeveloped land decreased 46.8 percent. Urban uses such as commercial,

industrial, and transportation also showed an increase (13.8 percent) and the amount of land dedicated to parks increased by 7.8 percent.

2.2 TRANSPORTATION AND UTILITIES

Surface transportation within the study area is provided by a network of primary, secondary, and local roads. I-45 crosses the study area immediately to the west of Webster, and provides access to downtown Houston (traveling northwest), and to Galveston (traveling southeast). The Sam Houston Tollway/Tollway 8 is a highway facility forming a loop around Houston. This facility runs in an east-west direction through the northwestern portion of the study area, and runs in a northerly direction through the City of Pasadena (just east of its intersection with I-45).

In the western portion of the study area, a number of roadways provide north-south access through the study area, and these are (ordered from west to east) Alameda Road/County Road 521, the Nolan Ryan Expressway/State Highway 288 (SH 288), and SH 35/Telephone Road. Also, in the eastern portion of the study area, County Road 518 and the Sam Houston Tollway/Tollway 8 (as mentioned above) provide east-west access.

In the eastern portion of the study area, a number of roads provide access across the study area in a northwest to southeast direction, connecting central Houston with study area communities and other communities to the south of the study area (along Galveston Bay). These roadways include (ordered from west to east) I-45, Galveston Road/SH 3, Red Bluff Road, and SH 146 (connects to La Porte and Baytown). Also, important for north-south access, is Egret Bay Boulevard (spans the confluence of Clear Creek with Clear Lake), which provides local access only within the study area. Also, in the western portion of the study area, County Road 2094, County Road 518, NASA Boulevard/SH 1, Bay Area Boulevard, and Spencer Highway provide east-west access.

Brazoria, Galveston, and Harris counties are three of four counties in the Houston-Galveston area that have established hurricane evacuation planning zones. According to the State Department of Public Safety, Accidents Records Bureau, in 1998 there were 71 accidents in Harris County that occurred where high water or flood debris was a prevailing road condition at the time of the accident. Floodwaters resulting from torrential downpours and storm surges associated with a category 3-4-5 hurricane would raise water levels to over 20 feet above sea level at Clear Creek, inundating I-45 (Jack Faucett, Inc., 2001).

Houston Hobby Airport is located just north of the study area (adjacent to I-45) and is the closest major airport to the study area providing national air service. George Bush Intercontinental Airport is located in northern Houston, approximately 28 miles north of the study area, and provides both international and national flights. The La Porte Municipal Airport, in the City of La Porte, is the only small municipal airport in the study area. Ellington Field is a joint-use civil/military airport. Acquired by the City of Houston in 1984, Ellington now supports the operations of the U.S. military, NASA, Continental Express, United Parcel Service, and general

aviation. The airport is home to the largest flying club in Texas and is the site of the annual Wings Over Houston Airshow. Ellington Field is located east of I-45 and southeast of the Sam Houston Tollway (Houston Airport System, 2008). The Houston Gulf Airport is located in the southeastern portion of the study area, in League City and adjacent to FM 1266.

Within the study area there are four railroads that provide rail freight service, and these are essential for industrial operations within the region. The Union-Pacific Railroad crosses the far western portion of the study area in a southwest to northeast direction, immediately to the east of Missouri City. The Burlington-Northern Santa Fe Railroad crosses the central-western portion of the study area in a northwest to southeast direction, crossing through Pearland and Brookside Village. The Galveston, Houston, and Henderson Railroad parallels I-45, directly to the east, crossing through League City, Webster, and portions of the City of Houston. The Southern Pacific Railroad travels in a north-south direction, in the far eastern portion of the study area, parallel to SH 146, crossing through Kemah, Clear Lake Shores, and Seabrook.

2.3 AESTHETICS

In order to assess the potential impact on a given landscape, two primary elements must be evaluated (1) the nature of the receiving landscape, and (2) the nature of the land-use change that will be introduced to the viewscape.

In regard to the receiving landscape, a distinction is made between public and private impacts. Potential public impacts are generally governed by accessibility to the general public and the relative value of the view to the community. Although these are subjective valuations, several criteria are applied to select viewsheds of unique community value:

- Visibility from public roadways
- Visibility from recreational areas
- Visibility from commercial or institutional sites
- Visibility from areas of recognized national or regional importance
- Prominence of water in viewshed (water in landscape is generally considered to enhance aesthetic value, even in highly urbanized settings)
- Intrusion of the new use into significant scenic views or areas with unique topographic features or geological formations

Although values placed on visual resources are subjective and differ from one community to another, there are some common features that landscape architects have identified as contributing to viewsheds perceived with higher aesthetic quality than others. These attributes relate to the aesthetic qualities of line, form, composition, contrast, texture, diversity (visual interest), and other aspects typically addressed by design professionals.

Viewsheds generally perceived as having a high level of visual quality have some or all of the following characteristics:

- "Natural environments," i.e., those with little or minimal human control over the design of the landscape, are generally viewed as having higher visual quality than human-made environments.
- Water in the landscape, even in a highly urbanized setting, is usually seen as enhancing the quality of the view.
- Views with a relatively higher degree of diversity, in terms of various forms, vegetation, land uses, etc., are perceived as having greater visual interest than more-uniform landscapes.
- Landscapes with unique topographic, geologic, or vegetative attributes for the given region are often more highly valued than more-typical landscapes.

Some landscapes are more sensitive in terms of their ability to absorb the visual impact of a new land use than others. For example, viewscapes with a high degree of closure (i.e., a greater density of large vegetation or topographic relief that tends to screen the visibility of the intruding land use) are better able to incorporate an inconsistent use than open, more-transparent landscapes. Moreover, views that have little visual complexity and consist of repetitive and consistent elements may be perceived to be more vulnerable to aesthetic intrusion than more-complex vistas.

The study area is largely a flat plain with grasslike native vegetation. In an area without much variety in its terrain, the gullies, creeks, and bayous of the Houston area are collectively considered an aesthetic resource. Clear Creek is divided into three reaches — lower, middle, and upper — with the lower reaches near the creek's terminus at Clear Lake, and the upper reaches in the northern section around Friendswood. Clear Creek is a natural habitat for riparian forest, prairie grasses, and migratory birds. Oak and green ash trees draped with Spanish moss (*Tillandsia usneoides*) line the relatively wide lower reaches of the creek, and the upper reaches are relatively narrow and winding. Generally speaking, the creek is considered aesthetically pleasing, with area neighborhoods touting parks and residential developments along its banks for their bird watching, picnicking, walking, and other recreational opportunities. Housing values reflect this, with portions of Friendswood located along the creek having some of the highest housing values in the study area. The winding water flow and tall bordering vegetation provide an attractive contrast to the basically flat and dry terrain and also provide a natural noise and space barrier for residential developments along the I-45 corridor.

2.4 RECREATION

2.4.1 Parks and Recreational Facilities

Table 17 provides an inventory of parks and recreational facilities within the study area. The inventory was obtained by referencing a variety of sources, including information provided on city and county websites for communities within the study area.

Throughout the study area, 77 parks and other recreational facilities were identified encompassing approximately 5,534 acres (4 percent of total land cover in the study area). Also, many of the parks and recreational activities within the study area are oriented toward water-based activities such as fishing, swimming, wind surfing, boating, birding, and other aquatic-based recreation.

2.4.2 Fishing and Boating

The fishing industry is important to the area economy as a source of recreation, as a draw for tourism, and for commercial fishing enterprises. Commercial fishermen based in the Clear Lake area harvest shrimp and oysters almost year-round from Galveston Bay, the Gulf of Mexico, and several other local waters, and sell their catch to local processors for nationwide distribution (Clear Lake Area Chamber of Commerce, 2002). The Clear Lake area is considered to have the nation's third largest concentration of pleasure boats, and is a very strong industry within the local economy. The Clear Lake area supports an estimated 22 marinas with over 7,300 boat slips, and up to 100,000 Texas-registered boats, and is referred to by the Clear Lake Area Chamber of Commerce as the “Boating Capitol of Texas.” There are an estimated nine public boat ramps providing access to Clear Lake and to Galveston Bay (Clear Lake City Information, 2002). Other water-based sports/activities that are popular within the area include water skiing, personal watercraft, windsurfing, rowing, canoeing, and kayaking. There are dozens of companies located in the Clear Lake area that specialize in chartering and renting many types of watercraft, including luxurious cruisers, sailboats, small fishing boats, personal watercraft, and windsurfing equipment, contributing to Clear Lake’s reputation as a major tourism destination for water sports (Clear Lake Area Chamber of Commerce, 2002). Both recreational and commercial boaters are served by hundreds of marine businesses around Clear Lake that provide bait and fuel, ropes and sails, anchors, nets, engine and boat repairs, and skis and lifejackets. Many other businesses in the Clear Lake area contribute to the local fishing and boating economy, including boat sales, brokerage businesses to the boatyards and marinas, marine documenters, and insurance agents (Clear Lake Area Chamber of Commerce, 2002).

2.4.3 Birding

Birding is a popular activity along the Texas Gulf coast that attracts many tourists. Texas Parks and Wildlife Department (TPWD) and TxDOT have jointly sponsored the development of the

Great Texas Coastal Birding Trails. Forty-three birding loops have been identified and marked with trail logos. Published information is available about the attributes of each site. Both private and public entities cooperate in providing access to these sites.

Within the study area, one loop has been identified: the Clear Lake Loop. The Clear Lake Loop is one of several trails within the Upper Texas Coast Birding Trail (a subset of the Great Texas Coastal Birding Trail). The Clear Lake Loop consists of the following park facilities within the study area (TPWD, 1999a):

- McHale Park
- Pine Gully Park
- Nassau Bay Park
- Armand Bayou Nature Center
- Bay Area Park
- Challenger 7 Memorial Park
- Walter Hall County Park

3.0 REFERENCES

Anderson, J.R., E.H. Hardy, J.H. Roach, and R.E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. Geological Survey Professional Paper 964. U.S. Government Printing Office, Washington, D.C.

Atlantic Technologies. 2000. Digital orthophotography coverage for study area (1-foot ground resolution). Flown in September 2000.

Brazoria County Appraisal District. 2007. 2006 tax rates and exemption amounts. http://www. brazoriacad.org/ Last updated 05 April 2007 (accessed September 6, 2007).

City of Pearland. 2007. A little history about a growing city. http://www.cityofpearland.com (accessed August 13, 2007).

Clear Lake Area Chamber of Commerce. 2002. Issues and impacts – Marine Industry.

Clear Lake City Information. 2007. Clear Lake city information website. http://www.photohome.com/ clearlake/marinas.html (accessed August 21, 2007).

Fort Bend County Appraisal District. 2007. Property assessment and tax information. http://www.fbcad.org/Appraisal/PublicAccess/ (accessed September 6, 2007).

Galveston County Appraisal District. 2006. 2006 tax rates and exemptions. http://galvestoncad. org/Appraisal/PublicAccess/ Last updated 20 December 2006 (accessed September 6, 2007).

Harris County Appraisal District. 2007. Jurisdiction information. http://www.hcad.org/ default.asp (accessed September 6, 2007).

Houston Airport System. 2008. About Ellington Field. http://www.houstonairportsystem.org/ EllingtonAbout (accessed April 2008).

Jack Faucett, Inc. 2001. Socioeconomic profile for Clear Creek, Texas. Final Report. February 2001.

Natural Resources Conservation Service (NRCS). 2000. Land use estimates by county for Texas. 1997 Natural Resources Inventory. U.S. Department of Agriculture. Washington D.C. http://www.nrcs.usda.gov/technical/NRI/1997/summary_report/Revised December 2000.

Texas Commission on Fire Protection. 2002. Directory of Texas Fire Departments. http://www.tcfp.state. tx.us/directory/TX_fire_depts.asp (accessed February 18, 2002).

Texas Department of Transportation. 1999a. TxDOT urban files for Brazoria, Fort Bend, Galveston, and Harris Counties, Texas.

———. 1999b. Parks coverage for Brazoria, Fort Bend, Galveston, and Harris Counties, Texas (derived from TxDOT Urban Files).

Texas Education Agency (TEA). 2007. School district locator. http://deleon.tea.state.tx.us/SDL/Forms/txtSearch.aspx Last updated 24 July 2007 (accessed August 29, 2007).

Texas Parks and Wildlife Department (TPWD). 1999a. Great nature wildlife trails. Austin, Texas.

———. 1999b. Seagrass conservation plan for Texas. Texas Parks and Wildlife Dept., Austin.

Texas State Historical Association. 2001. Handbook of Texas Online, s.v. "Harris County." http://www.tsha.utexas.edu/handbook/online/articles/HH/hch7.html (accessed September 12, 2007).

———. 2002. Handbook of Texas Online, s.v. "Galveston County." http://www.tsha.utexas.edu/handbook/online/articles/GG/hcg2.html (accessed September 12, 2007).

———. 2005. Handbook of Texas Online, s.v. "Fort Bend County." http://www.tsha.utexas.edu/handbook/online/articles/FF/hcf7.html (accessed September 12, 2007).

———. 2006. Handbook of Texas Online, s.v. "Brazoria County." http://www.tsha.utexas.edu/handbook/online/articles/BB/hcb12.html (accessed September 12, 2007).

———. 2007. Handbook of Texas Online, s.v. "Clear Lake City, Texas." http://www.tsha.utexas.edu/handbook/online/articles/CC/hjc23.html (accessed September 12, 2007).

Texas Water Development Board (TWDB). 2004a. 2006 regional water plan. County population projections for 2000–2060. http://www.twdb.state.tx.us/data/popwaterdemand/2003Projections/Population%20Projections/STATE_REGION/County_Pop.htm Last updated February 17, 2004.

———. 2004b. 2006 regional water plan regional and state total population Projections for 2000–2060. http://www.twdb.state.tx.us/data/popwaterdemand/2003Projections/Population%20Projections/STATE_REGION/State_Region_Pop.htm Last updated February 17, 2004.

———. 2006a. 2006 regional water plan city population projections for 2000–2060. http://www.twdb.state.tx/us/data/popwaterdemand/2003Projections/Population%20Projections/STATE_REGION/City_Pop.htm Last updated April 17, 2006.

———. 2006b. Aquifers of the Gulf Coast of Texas. Report No. 365.

Texas Workforce Commission (TWC). 2007a. County narrative profile. Multi-County Report. http://socrates.cdr.state.tx.us/cnp/asp/cnp.asp (accessed August 29, 2007).

———. 2007b. Quarterly employment and wages. First Quarter 2007. http://www.tracer2.com/cgi/dataAnalysis/IndustryReport.asp.

———. 2007c. Unemployment. Annual 2006. http://www.tracer2.com/cgi/dataanalysis/labforcereport.asp (accessed September 6, 2007).

U.S. Census Bureau. 1990a. Population and housing units 1940 to 1990 for counties and states.

———. 1990b. Population and housing units 1970 to 1990 for cities.

———. 2000a. Hispanic or Latino by race.

———. 2000b. Median household income in 1999.

———. 2000c. Occupancy status.

———. 2000d. Profile of general demographic characteristics.

———. 2000e. Profile of selected housing characteristics.

———. 2000f. Profile of selected social characteristics.

———. 2000g. Ratio of income to poverty level.

———. 2000h. Tenure.

———. 2000i. Travel time to work for workers 16 years and over.

———. 2000j. Year structure built and year householder moved into unit.

———. 2000k. 2010 Census Redistricting Data (Public Law 94-171 Summary File).

U.S Geological Survey (USGS). 1990. Land use and land cover data collected by the USGS National Mapping Division (NMD). GIS database retrieved from internet site by PBS&J staff 2001.

Wilbur Smith Associates. 1999. Fort Bend Parkway toll road traffic and revenue study. Growth evaluation prepared by Dr. Barton Smith. Houston. February.

Table 1
Study Area Historic Populations

Area	Year					Percent Change			
	1970	1980	1990	2000	2010	1970–1980	1980–1990	1990–2000	2000–2010
Municipalities									
Brookside Village	N/A	N/A	N/A	1,960	1,523	N/A	N/A	N/A	-22.3
Clear Lake Shores	N/A	N/A	N/A	1,205	1,063	N/A	N/A	N/A	-11.8
Deer Park	12,773	22,648	27,652	28,520	32,010	77.3	22.0	3.1	12.2
El Lago	2,308	3,129	3,269	3,075	2,706	35.6	4.5	-5.9	-12.0
Fresno	N/A	N/A	3,182	6,603	19,069	N/A	N/A	107.5	188.8
Friendswood	5,675	10,719	22,814	29,037	35,805	88.9	112.8	27.3	23.3
Houston	1,233,535	1,595,138	1,630,553	1,953,631	2,099,451	29.3	2.2	19.8	7.5
Kemah	N/A	N/A	N/A	2,330	1,773	N/A	N/A	N/A	-23.9
La Porte	7,149	14,062	27,910	31,880	33,800	96.7	98.5	14.2	6.0
League City	10,818	16,578	30,159	45,444	83,560	53.2	81.9	50.7	83.9
Missouri City	4,136	24,423	36,176	52,913	67,358	490.5	48.1	46.3	27.3
Nassau Bay	N/A	4,526	4,320	4,170	4,002	–	-4.6	3.5	-4.0
Pasadena	89,957	112,560	119,363	141,674	149,043	25.1	6.0	18.7	5.2
Pearland	6,444	13,248	18,697	37,640	91,252	105.6	41.1	101.3	142.4
Seabrook	3,811	4,670	6,685	9,443	11,952	22.5	43.1	41.3	26.6
Taylor Lake Village	990	3,669	3,394	3,694	3,544	270.6	-7.5	8.8	-4.1
Webster City	2,231	2,405	4,678	9,083	10,400	7.8	94.5	94.2	14.5
Counties									
Brazoria	108,312	169,587	191,707	241,767	313,166	56.6	13.0	26.1	29.5
Fort Bend	52,314	130,962	225,421	354,452	585,375	150.3	72.1	57.2	65.1
Galveston	169,812	195,738	217,399	250,158	291,309	15.3	11.1	15.1	16.5
Harris	1,741,912	2,409,547	2,818,199	3,400,578	4,092,459	38.3	17.0	20.7	20.3

Source: U.S. Census Bureau (1990, 2010a, 2010b, 2010k).

Table 2
Study Area Population Projections

Area	Year				Percent Change		
	2000	2010	2020	2030	2000–2010	2010–2020	2020–2030
Municipalities							
Brookside Village	1,960	2,282	2,618	2,939	16.4	14.7	12.3
Clear Lake Shores	1,205	1,263	1,313	1,343	11.4	8.8	4.8
Deer Park	28,520	29,513	30,480	31,432	3.5	3.3	3.1
El Lago	3,075	3,075	3,075	3,075	N/A	N/A	N/A
Fresno	6,603	N/A	N/A	N/A	N/A	N/A	N/A
Friendswood	29,037	32,353	35,215	36,910	11.4	8.8	4.8
Houston	1,953,631	2,240,974	2,520,926	2,798,278	14.7	12.5	11.0
Kemah	2,330	2,985	3,550	3,885	28.1	18.9	9.4
La Porte	31,880	35,467	38,960	42,394	11.3	9.8	8.8
League City	45,444	53,546	60,539	64,683	17.8	13.1	6.8
Missouri City	52,913	83,645	104,844	125,194	58.1	25.3	19.4
Nassau Bay	4,170	4,170	4,170	4,170	N/A	N/A	N/A
Pasadena	141,674	161,678	181,156	200,314	14.1	12.0	10.6
Pearland	37,640	66,049	83,462	99,342	75.5	26.4	19.0
Seabrook	9,443	11,943	14,377	16,771	26.5	20.4	16.7
Taylor Lake Village	3,694	4,004	4,004	4,004	8.4	N/A	N/A
Webster City	9,083	13,076	16,964	20,788	44.0	29.7	22.5
Counties							
Brazoria	241,767	285,850	331,731	375,664	18.2	16.1	13.2
Fort Bend	354,452	490,072	630,624	802,486	38.3	28.7	27.3
Galveston	250,158	268,714	284,731	294,218	7.4	6.0	3.3
Harris	3,400,578	3,951,682	4,502,786	5,053,890	16.2	13.9	12.2

Source: TWDB (2004a, 2004b, 2006a).

Table 3
Study Area Age Characteristics

Area	Years of Age (Percentage)					
	Under 5	5 to 9	10 to 19	20 to 34	35 to 64	65 and Older
Study Area Population	7.8	8.1	15.8	21.3	39.8	7.1
Municipalities						
Brookside Village	4.9	8.1	15.1	18.7	40.3	13.0
Clear Lake Shores	4.3	4.4	9.5	14.0	41.9	8.9
Deer Park	6.3	7.8	18.4	18.1	42.0	7.3
El Lago	5.1	6.7	12.2	15.7	30.8	12.5
Fresno	10.9	10.5	17.7	23.4	33.2	4.4
Friendswood	6.6	8.3	17.6	14.2	44.8	8.6
Houston	8.2	7.9	14.3	26.4	34.6	8.4
Kemah	8.2	7.2	14.4	27.6	36.5	6.1
La Porte	7.9	8.1	16.6	21.2	39.3	6.9
League City	8.1	8.4	15.3	19.4	42.9	5.9
Missouri City	7.3	8.4	18.0	15.5	45.4	5.4
Nassau Bay	4.2	3.7	9.0	16.1	49.0	18.1
Pasadena	9.3	9.0	16.5	24.0	33.3	7.9
Pearland	8.0	8.1	15.5	19.8	40.3	8.3
Seabrook	6.7	6.8	12.6	25.0	43.2	5.6
Taylor Lake Village	5.7	6.8	14.8	8.0	51.3	13.3
Webster City	7.8	5.8	10.2	39.6	31.6	5.1
Counties						
Brazoria	7.7	8.0	15.7	20.2	39.5	8.9
Fort Bend	7.7	8.9	18.1	17.8	41.7	5.6
Galveston	7.0	7.5	15.0	19.1	35.3	11.1
Harris	8.3	8.3	22.8	24.3	36.3	7.5

Source: U.S. Census Bureau (2000d).

Table 4
Study Area Population Educational Attainment

Area	Percent of Persons 25 Years and Older		
	High School Graduate	Bachelor's Degree	Professional Degree
Study Area Population	21.5	21.4	10.4
Municipalities			
Brookside Village	26.5	7.5	5.1
Clear Lake Shores	14.1	25.6	16.8
Deer Park	32.8	11.7	4.8
El Lago	12.0	33.6	23.2
Fresno	26.6	11.6	4.2
Friendswood	18.1	27.1	11.5
Houston	20.4	17.3	9.7
Kemah	26.4	20.1	8.1
La Porte	33.3	9.6	3.5
League City	20.0	23.9	11.6
Missouri City	15.4	29.8	14.7
Nassau Bay	11.3	27.9	25.6
Pasadena	27.9	8.1	16.3
Pearland	22.7	21.9	7.2
Seabrook	16.4	29.4	11.8
Taylor Lake Village	8.2	36.3	25.5
Webster City	17.1	19.0	11.7
Counties			
Brazoria	27.2	13.8	5.9
Fort Bend	19.4	25.2	11.8
Galveston	26.4	14.7	8.0
Harris	21.6	17.9	9.0

Source: U.S. Census Bureau (2000f).

Table 5
Study Area Housing Characteristics

Area	Housing Units				
	Number of Units	Units Occupied	Owner Occupied	Renter Occupied	Units Vacant
Study Area	167,302	94.5 %	66.4 %	28.1 %	5.5 %
Municipalities					
Brookside Village	708	92.5	79.2	20.8	7.5
Clear Lake Shores	661	89.3	69.7	30.3	10.7
Deer Park	9,921	96.9	79.3	20.7	3.2
El Lago	1,409	92.5	73.6	26.4	7.5
Fresno	2,002	94.0	87.0	13.0	6.0
Friendswood	10,405	97.1	80.1	19.9	2.9
Houston	782,009	91.8	45.8	54.2	8.2
Kemah	1,075	83.0	54.5	45.5	17.0
La Porte	11,720	93.2	77.2	22.8	7.2
League City	17,280	93.7	77.0	23.0	6.3
Missouri City	17,481	97.6	90.8	9.2	2.4
Nassau Bay	2,243	91.4	60.2	39.8	8.6
Pasadena	50,367	93.4	56.1	43.9	6.6
Pearland	13,922	94.8	79.4	20.6	5.2
Seabrook	4,536	90.3	51.9	48.1	9.7
Taylor Lake Village	1,364	98.3	98.0	2.0	1.7
Webster	4,733	86.9	13.6	86.4	13.1
Counties					
Brazoria	90,628	90.4	74.0	25.9	9.6
Fort Bend	115,991	95.6	80.8	19.2	4.4
Galveston	111,733	84.8	66.2	33.8	15.2
Harris	1,298,516	92.8	55.3	44.7	7.1

Source: U.S. Census Bureau (2000c, 2000d, 2000e).

Table 6
Study Area Length of Residence

Area	Number of Occupied Housing Units	Year Moved into House (%)				Median # Persons per Unit	Median Value Owner Occupied
		1990–2000	1980–1990	1970–1980	Prior to 1970		
Municipalities							
Brookside Village	655	50.5	20.0	10.8	18.6	2.99	$ 96,300
Clear Lake Shores	585	77.4	9.2	10.8	2.6	2.04	131,400
Deer Park	9,602	58.7	20.6	15.4	5.2	2.93	90,900
El Lago	1,364	68.0	12.4	9.6	10.0	2.35	128,500
Fresno	1,897	77.5	13.7	5.0	3.9	3.52	103,600
Friendswood	10,024	70.3	14.8	12.8	2.1	2.85	124,500
Houston City	718,231	73.3	11.0	8.2	7.5	2.67	79,300
Kemah	906	83.3	5.4	6.0	5.3	2.82	126,100
La Porte	10,905	68.9	17.5	9.2	4.4	2.90	82,100
League City	16,168	79.3	13.5	4.5	2.7	2.78	112,000
Missouri City	17,024	72.7	18.5	8.0	0.8	3.09	111,800
Nassau Bay	2,022	68.1	16.4	11.2	4.4	2.04	152,200
Pasadena	47,063	72.6	11.8	7.9	7.8	2.99	70,300
Pearland	13,150	72.4	13.6	9.9	4.1	2.84	117,700
Seabrook	4,017	83.0	7.5	5.7	3.9	2.31	118,600
Taylor Lake Village	1,344	51.8	22.8	17.7	7.7	2.75	152,700
Webster City	4,077	93.0	3.6	2.3	1.1	2.14	108,700
Counties							
Brazoria	81,954	69.3	14.8	9.7	6.3	2.82	85,500
Fort Bend	110,915	73.2	17.7	6.7	2.4	3.14	115,100
Galveston	94,782	68.5	13.8	8.8	8.9	2.60	85,200
Harris	1,205,516	73.4	12.7	7.9	6.0	2.79	87,000

Source: U.S. Census Bureau (2000e, 2000h, 2000j).

Table 7
Study Area Ethnicity/Racial Distribution and Income Characteristics

Area	Total Population	Racial/Ethnic Distribution (Percentage)							Income	
		White	Black	American Indian/ Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Hispanic or Latino	Minority[1]	Percent Below Poverty Level[2]	Median Household Income[3] ($)
Study Area Population	440,479	64.9	9.2	0.5	5.1	< 0.1	19.1	35.1	6.6	59,133
Census Tracts										
CT 6601	4,869	81.8	3.6	0.1	3.6	<0.1	9.3	16.8	1.0	76,586
CT 6603	5,701	77.5	4.4	0.2	2.8	0.0	14.2	21.5	5.1	60,380
CT 6604	4,951	78.7	4.2	0.3	3.0	<0.1	12.7	20.2	3.8	58,493
CT 6605	7,684	65.5	2.6	0.5	1.3	<0.1	29.3	33.7	9.5	46,725
CT 6606	8,439	59.9	11.7	0.2	7.1	<0.1	19.8	38.8	5.9	60,192
CT 6608	9,395	68.2	6.3	0.4	2.8	0.1	21.1	30.6	5.4	64,864
CT 3308	2,773	18.6	49.7	0.4	1.6	<0.1	28.2	79.9	10.7	47,407
CT 3338	8,173	16.6	23.2	0.1	2.6	0.1	56.6	82.5	11.8	40,997
CT 3501	3,635	69.8	6.5	0.1	8.5	<0.1	13.3	28.4	2.3	85,953
CT 3503	6,290	56.6	12.4	0.1	10.2	0.1	19.3	42.2	1.7	77,397
CT 3504	5,571	41.3	12.4	0.2	14.1	<0.1	29.7	56.4	4.8	56,875
CT 3505	5,551	30.4	14.1	0.3	14.1	0.0	39.5	67.9	11.5	43,972
CT 3506	10,890	65.9	8.8	0.3	10.2	<0.1	13.0	32.4	2.4	69,628
Municipalities										
Brookside Village	1,960	51.7	3.1	0.5	0.8	0.0	43.6	48.0	16.0	44,650
Clear Lake Shores	1,205	92.5	0.3	0.3	0.7	0.0	3.3	4.7	4.2	67,500
Deer Park	28,520	80.8	1.3	0.3	1.1	<0.1	15.2	18.0	5.6	61,334
El Lago	3,075	91.4	0.8	0.2	1.4	0.1	5.0	7.5	2.9	66,223
Fresno	6,603	21.6	26.3	0.1	1.0	0.0	49.9	78.4	15.3	46,290
Friendswood	29,037	84.5	2.7	0.3	2.4	<0.1	8.8	14.2	3.2	69,384
Houston	1,953,631	30.8	25.0	0.2	5.3	<0.1	37.4	67.8	19.1	36,616
Kemah	2,330	67.0	3.8	0.6	3.5	0.0	8.3	33.0	8.2	51,620
La Porte	31,880	70.7	6.1	0.4	1.1	0.1	20.5	28.1	7.5	55,810
League City	45,444	76.6	5.1	0.3	3.1	<0.1	13.5	22.0	4.7	67,838
Missouri City	52,913	38.6	38.1	0.2	10.5	<0.1	10.9	59.7	3.3	72,434
Pasadena	141,674	47.2	1.5	0.3	1.8	<0.1	48.2	51.8	16.0	38,522
Pearland	37,640	73.4	5.2	0.3	3.6	<0.1	16.2	25.4	4.6	64,156
Nassau Bay	4,170	85.2	1.9	0.5	3.9	0.1	6.3	12.7	4.5	57,353
Seabrook	9,443	81.9	2.1	0.5	3.3	<0.1	10.8	16.6	5.5	54,175
Taylor Lake Village	3,694	89.0	2.7	0.4	2.1	0.1	4.6	9.9	0.9	99,535
Webster City	9,083	55.6	8.8	0.3	5.7	0.2	27.2	42.3	13.2	42,385

Table 7, concluded

Area	Total Population	Racial/Ethnic Distribution (Percentage)							Income	
		White	Black	American Indian/ Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Hispanic or Latino	Minority[1]	Percent Below Poverty Level[2]	Median Household Income[3] ($)
Counties										
Brazoria	241,767	65.4	8.3	0.3	2.0	<0.1	22.8	33.5	10.1	48,632
Fort Bend	354,452	46.2	19.6	0.2	11.2	<0.1	21.1	52.1	7.1	63,831
Galveston	250,158	63.1	15.3	0.4	2.1	<0.1	18.0	35.7	13.2	42,419
Harris	3,400,578	42.1	18.2	0.2	5.1	<0.1	32.9	56.5	14.9	42,598

Source: U.S. Census Bureau (2000a, 2000b, 2000g).

[1]Total number of persons reporting in non-white racial categories, including black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, and Hispanic or Latino.

[2]1999 poverty-level data as reported in the 2000 Census (most recent available).

[3]1999 median household income as reported in the 2000 Census (most recent available). The U.S. Department of Health and Human Services 2007 poverty guideline for a family of four is $20,650. For project area totals, it is the average median household income. Median income is shown as average for the study area Census Tracts.

Table 8
Fire Services in the Study Area

Area	Department	Type	City
Brazoria County	Brookside Fire Marshall	Municipal	Brookside Village
	Brookside Village VFD*	Volunteer	Brookside Village
	Pearland Fire Marshall	Municipal	Pearland
	Pearland VFD	Volunteer	Pearland
Fort Bend County	Fort Bend County Fire Marshall	County	Richmond
	Fort Bend County Emergency Management	County	Richmond
	Fort Bend County VFD	Volunteer	Sugarland
Galveston County	Clear Lake Shores VFD	Volunteer	Kemah
	Dickinson Fire Marshall	Municipal	Dickinson
	Dickinson VFD	Volunteer	Dickinson
	Forest Bend VFD	Volunteer	Friendswood
	Friendswood Fire Marshall	Municipal	Friendswood
	Friendswood Fire Dept.	Municipal	Friendswood
	Kemah VFD	Volunteer	Kemah
	League City Fire Marshall	Municipal	League City
	League City VFD	Volunteer	League City
	San Leon Fire Dept.	Municipal	Dickinson
	San Leon VFD	Volunteer	Dickinson
Harris County	Clear Lake VFD	Volunteer	Houston
	El Lago VFD	Volunteer	Houston
	Ellington Field Fire Dept.	Municipal	Houston
	Forest Bend VFD	Volunteer	Webster
	Houston Fire Dept.	Municipal	Houston
	Houston VFD	Volunteer	Houston
	Johnson Space Center Fire Dept.	Municipal	Houston
	La Porte Fire Dept.	Municipal	La Porte
	Nassau Bay Fire Marshall	Municipal	Nassau Bay
	Nassau Bay VFD	Volunteer	Nassau Bay
	Pasadena VFD	Volunteer	Pasadena
	Seabrook Fire Marshall	Municipal	Seabrook
	Seabrook VFD	Volunteer	Seabrook
	Taylor Lake Village VFD	Volunteer	Taylor Lake Village
	Webster Fire Marshall	Municipal	Webster
	Webster Fire Dept.	Municipal	Webster

Source: Texas Commission on Fire Protection (2002).

*VFD = Volunteer Fire Department.

Table 9
Utilities, Water, and Solid Waste Services in the Study Area

Community	Electric Utility Service	Natural Gas Service	Water	Waste Water	Solid Waste Disposal Service
Brookside Village	Reliant/Entex	Reliant/Entex	Well	Septic	Waste Management
Clear Lake Shores	Reliant/Entex	Reliant/Entex	WCID #12	WCID #12	IESI/EnviroTex
El Lago	Reliant/Entex	Reliant/Entex	WCID #50	WCID #50	BFI
Friendswood	Reliant/Entex	Reliant/Entex	City of Friendswood	City of Friendswood	Waste Management
Houston	Reliant/Entex	Reliant/Entex	City of Houston	City of Houston	City of Houston
League City	Reliant/Entex	Reliant/Entex	City of League City	City of League City	IESI/EnviroTex
Nassau Bay	Reliant/Entex	Reliant/Entex	City of Nassau Bay	City of Nassau Bay	Bay Area Waste
Pasadena	Reliant/Entex	Reliant/Entex	City of Pasadena	City of Pasadena	City of Pasadena
Pearland	Reliant/Entex	Reliant/Entex	City of Pearland	City of Pearland	City of Pearland
Seabrook	Reliant/Entex	Reliant/Entex	City of Seabrook	City of Seabrook	Best Waste Systems
Taylor Lake Village	Reliant/Entex	Reliant/Entex	Clear Lake City Water Authority, WCID #50, and South Taylor Lake	Clear Lake City Water Authority, WCID #50, and South Taylor Lake	Bay Area Waste
Webster	Reliant/Entex	Reliant/Entex	City of Webster	City of Webster	Republic Waste

Table 10
School Districts within the Study Area

Types of Facilities	Clear Creek ISD	Friendswood ISD	Houston ISD	Pasadena ISD	Pearland ISD
Elementary	24	2	194	37	11
Intermediate	8	3	48	16	9
High School	7	1	45	9	4
Enrollment 2006–2007	35,378	5,808	202,449	49,630	16,159

Source: Texas Education Agency (2007).

Table 11
Employment and Unemployment in the Study Area, Annual 2006

Area	Labor Force	Total Employment	Total Unemployment	Unemployment Rate
Gulf Coast Workforce Development Area	2,770,100	2,632,716	137,384	5.0
Municipalities				
Brookside Village	N/A	N/A	N/A	N/A
Clear Lake Shores	N/A	N/A	N/A	N/A
Deer Park	16,313	15,575	738	4.5
El Lago	N/A	N/A	N/A	N/A
Friendswood	18,108	17,386	722	4.0
Houston	1,001,590	949,129	52,461	5.2
La Porte	18,376	17,495	881	4.8
League City	35,099	33,707	1,392	4.0
Missouri City	39,976	38,102	1,874	4.7
Nassau Bay	N/A	N/A	N/A	N/A
Pasadena	67,192	63,614	3,578	5.3
Pearland	32,493	31,178	1,315	4.0
Seabrook	N/A	N/A	N/A	N/A
Taylor Lake Village	N/A	N/A	N/A	N/A
Webster City	N/A	N/A	N/A	N/A
Counties				
Brazoria	138,590	131,773	6,817	4.9
Fort Bend	244,666	233,134	11,532	4.7
Galveston	143,120	135,927	7,193	5.0
Harris	1,895,870	1,800,678	95,192	5.0

Source: TWC (2007c).

Table 12
Percent Employment by Industry, First Quarter 2007

Area	Industry											
	Agriculture, Forestry, Fishing, Hunting	Mining	Utilities	Construction	Mfg	Trade – Wholesale & Retail	Real Estate & Rental & Leasing	Educational Services	Health Care	Arts, Entertainment, & Recreation	Accommodation & Food Services	Govt
Gulf Coast Workforce Development Area	0.3	4.6	0.9	10.6	12.8	21.6	2.8	1.6	12.0	1.4	11.0	20.4
Counties												
Brazoria	0.4	1.1	0.4	17.0	14.7	16.1	1.5	12.2	7.7	1.1	7.9	19.8
Fort Bend	0.7	2.1	1.0	10.1	12.1	18.2	1.4	13.6	10.5	1.6	8.9	19.7
Galveston	<0.1	0.5	0.6	6.9	6.4	12.2	1.4	22.0	8.0	2.1	11.8	27.9
Harris	<0.1	4.8	1.0	9.7	11.5	19.7	1.9	11.0	13.3	1.3	9.7	16.1

Source: TWC (2007b).

Table 13
Top 10 Manufacturers in the Study Area, 2007

Laird Plastics
Coastal Refining & Marketing
Nextiraone LLC
Shell Chemical LP
BP Chemical Co.
Conoco Phillips Refinery
Corporate Brand Foods America
Equistar Chemicals LP
Coca-Cola Bottling Co.
Simpson Pasadena Paper Co.

Source: TWC (2007a).

Table 14
Travel Time to Work in the Study Area, 2000

Area	Percent of Workers 16 Years and Over			
	< 5 minutes	5–24 minutes	25–59 minutes	> 60 minutes
Municipalities				
Brookside Village	4.1	30.5	55.4	9.1
Clear Lake Shores	1.7	55.0	54.3	14.4
Deer Park	2.9	58.8	32.9	4.4
El Lago	1.2	58.9	33.7	10.6
Fresno	0.8	27.7	57.2	12.9
Friendswood	2.1	42.9	43.0	9.5
Houston	1.7	49.0	39.5	7.4
Kemah	2.8	46.7	36.1	11.4
La Porte	2.4	57.2	33.6	5.6
League City	1.3	47.1	40.1	8.5
Missouri City	1.0	31.7	56.3	8.7
Nassau Bay	5.2	51.1	37.5	9.6
Pasadena	1.8	54.9	36.2	5.7
Pearland	1.7	36.5	52.4	6.9
Seabrook	4.0	50.2	32.2	9.1
Taylor Lake Village	1.2	52.5	33.6	7.4
Webster City	3.2	36.7	34.5	10.4
Counties				
Brazoria	2.7	47.8	38.5	3.1
Fort Bend	1.4	35.5	49.3	10.9
Galveston	2.9	53.8	28.2	10.4
Harris	1.7	47.1	35.6	8.0

U.S. Census Bureau (2000i).

Table 15
Study Area Taxing Entities

Taxing Entity	2006 Tax Rate
(dollars per $100 value)	
Municipalities	
City of Brookside Village	0.460000
City of Clear Lake Shores	0.210000
Deer Park	0.720000
City of El Lago	0.36500
City of Friendswood	0.582100
City of Houston	0.64500
City of Kemah	0.270000
City of League City	0.608800
City of Nassau Bay	0.65657
City of Pasadena	0.56700
City of Pearland	0.652659
City of Seabrook	0.62101
City of Taylor Lake Village	0.37300
City of Webster City	0.25750
Counties	
Brazoria	0.321701
Fort Bend	0.493340
Galveston	0.587350
Harris	0.40239

Source: Brazoria County Appraisal District (2007); Fort Bend County Appraisal District (2007); Galveston County Appraisal District (2006); Harris County Appraisal District (2007).

Table 16
Change in Land Use Acreages, 2000–2005

Land Use Category	2000	Percent of Total Study Area	2005	Percent of Total Study Area	Percent Change 2000–2005
Total acres in study area*	165,095	–	165,126	–	
Residential land	44,639	27.0	82,902	50.2	85.7
Undeveloped land	89,114	54.0	47,403	28.7	-46.8
Urban land	21,485	13.0	24,447	14.8	13.8
Parkland	6,099	3.7	6,573	3.9	7.8

*Study Area has expanded slightly since 2000.

NRCS (2000).

Table 17
Study Area Parks and Recreational Facilities

Area	Name of Park or Recreational Facility	Location
Brookside Village	Catherine Keegan Wilderness Ranch	Suburban Garden Road
Clear Lake	Bay Oaks Country Club	Bay Oaks Boulevard
Clear Lake	David A Rutledge Memorial Park	Shell Lake Drive
Clear Lake	Fullerton Park	Ramada Drive
Clear Lake	Kenneth W Royal Park	Reseda Drive
Clear Lake	Mesa Verde Park	Mesa Verde Drive
Clear Lake	Middlebrook Community Assoc. Park	Spring Forest Drive
Clear Lake	Oakbrook West Park	Pineloch Drive
Clear Lake	Pine Brook Neighborhood Park	Clear Lake City Boulevard
Clear Lake	Texas Avenue Park	North Texas Avenue
Clear Lake Shores	South Shore Harbour Club	South Shore Boulevard
Deer Park	Battleground at Deer Park	West 13th Street
Deer Park	Dow Park	East San Augustine Street
Deer Park	Park Meadows Park	East Pasadena Boulevard
El Lago	McNair Memorial Park	Bellgrove Drive
Friendswood	Arena Park	Merriewood Drive
Friendswood	Frankie Carter Randolph Park	Choate Road
Friendswood	Friendswood Country Club	West Parkwood Avenue
Friendswood	Memorial Park	Imperial Drive
Friendswood	Oxnard Park	Oxnard Lane
Friendswood	Renwick Park	West Edgewood Drive
Friendswood	Renwood Park	Stadium Lane
Friendswood	Stevenson Park	South Friendswood Drive
Friendswood	Timber Creek Golf Club	Choate Road
Houston	Cloverleaf Park	Beacon at Waxahachie
Houston	El Franco Lee Park	Hall Road
Houston	Havenpark Park	Havenpark Drive
Houston	North Shore Park	Wallisville Road
La Porte	Fairmont Park	Farrington Boulevard
League City	Challenger Seven Memorial Park	West NASA Road
League City	Heritage Park	Fife Lane
League City	Walter Hall Park	SH 3
Missouri City	Blue Ridge Park	Court Road
Missouri City	Ridgemont Park	Cooper Ridge Lane
Missouri City	South Post Oak Park	South Post Oak Road
Pasadena	Baywood Country Club	Genoa Red Bluff Road
Pasadena	Briar Park	Bennett Drive
Pasadena	Brown Memorial Field	Durant Avenue

Table 17 (Cont'd)

Area	Name of Park or Recreational Facility	Location
Pasadena	Burke Crenshaw Park	Crenshaw Road
Pasadena	Crest Haven Park	Spencer Highway
Pasadena	Deep Water Park	Pasadena Freeway
Pasadena	Parkview Park	Burke Road
Pasadena	Pasadena Municipal Golf Course	East Sam Houston Tollway S
Pasadena	Red Bluff Park	Burke Road
Pasadena	Revelon Park	Foster Avenue
Pasadena	San Jacinto College Golf Course	West Fairmont Parkway
Pasadena	Satsuma Gardens Park	Red Bluff Road
Pasadena	Southmore Park	East Southmore Avenue
Pasadena	South Park	Preston Road
Pasadena	Strawberry Park	Strawberry Road
Pearland	Bishop Park	Blackhawk Boulevard
Pearland	Centennial Park	McLean Road
Pearland	Choate Park	Longwood Drive
Pearland	Christia V Adair Park	FM 865
Pearland	Clear Creek Golf Course	Fellows Road
Pearland	Country Place Golf Club	Michard Road
Pearland	Dads Club Community Park	Daughtery Road
Pearland	Dixie Farm Road Park	Dixie Farm Road
Pearland	El Franco Lee Park	Hall Road
Pearland	Golfcrest Country Club	Country Club Drive
Pearland	Jones Park	Coastway Lane
Pearland	Kirkwood South Park	Hall Road
Pearland	Southwyk Golf Course	SH 288
Pearland	Tom Bass Regional Park	South Sam Houston Tollway E
Nassau Bay	Howard L Ward Park	Upper Bay Road
Seabrook	Friendship Park	Red Bluff Road
Seabrook	Meador Park	Hammer Street
Seabrook	Miramar Park	North Meyer Road
Seabrook	Seabrook Sports Complex	North Meyer Road
Shore Acres	Bay Forest Golf Course	Wharton Weems Boulevard
Shore Acres	Little Cedar Bayou Park	South Broadway Street
Taylor Lake Village	Armand Bayou Park	Red Bluff Road
Taylor Lake Village	Bay Area Park / Hike & Bike Trail	Bay Area Boulevard
Taylor Lake Village	Chemlake Golf Club	Bayport Boulevard
Taylor Lake Village	Clear Lake Forest Park	Baronridge Drive
Taylor Lake Village	Clear Lake Park	FM 528 (NASA Road 1)
Webster	Galveston Country Club	Galveston Road

Appendix H

General Conformity Determination

Document No. 080194
Job No. 100013748

FINAL
GENERAL CONFORMITY DETERMINATION
CLEAR CREEK GENERAL REEVALUATION PLAN
ALTERNATIVE
BRAZORIA, FORT BEND, GALVESTON, AND HARRIS COUNTIES, TEXAS

Prepared for:

U.S. Army Corps of Engineers
Galveston District
P.O. Box 1229
Galveston, Texas 77553-1229

Prepared by:

Atkins
6504 Bridge Point Parkway
Suite 200
Austin, Texas 78730

September 2012

PROFESSIONAL ENGINEER STATEMENT

This Final General Conformity Determination Document and estimate of air contaminant emissions (attachment) is released on September 5, 2012, under the authority of Ruben I. Velasquez, P.E., Registration No. 69126, for the purpose of evaluation and discussion. This document is not to be used for construction, bidding, or permitting purposes.

TCEQ and USACE's determination of conformity is based on the emissions information and project schedule proposed at the time. Once a final project schedule is completed, USACE will provide an update of the General Conformity documentation to TCEQ and EPA for review and concurrence that the updated emissions and schedule will still be conformant with the currently approved Houston-Galveston State Implementation Plan.

Ruben I. Velasquez, PE
Atkins
TBPE REG. #F-474

Contents

Figures

Tables

Acronyms and Abbreviations

CAA	Federal Clean Air Act
CFR	Code of Federal Regulations
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
GRP	General Reevaluation Plan
HGB	Houston-Galveston-Brazoria
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO_x	nitrogen oxides
PM_{10}	particulate matter with an aerodynamic diameter equal to or less than 10 microns
SEIS	Supplemental Environmental Impact Statement
SH	State Highway
SIP	State Implementation Plan
SO_2	sulfur oxides
TCEQ	Texas Commission on Environmental Quality
tpd	tons per day
tpy	tons per year
USACE	U.S. Army Corps of Engineers
VOC	volatile organic compound

1.0 INTRODUCTION

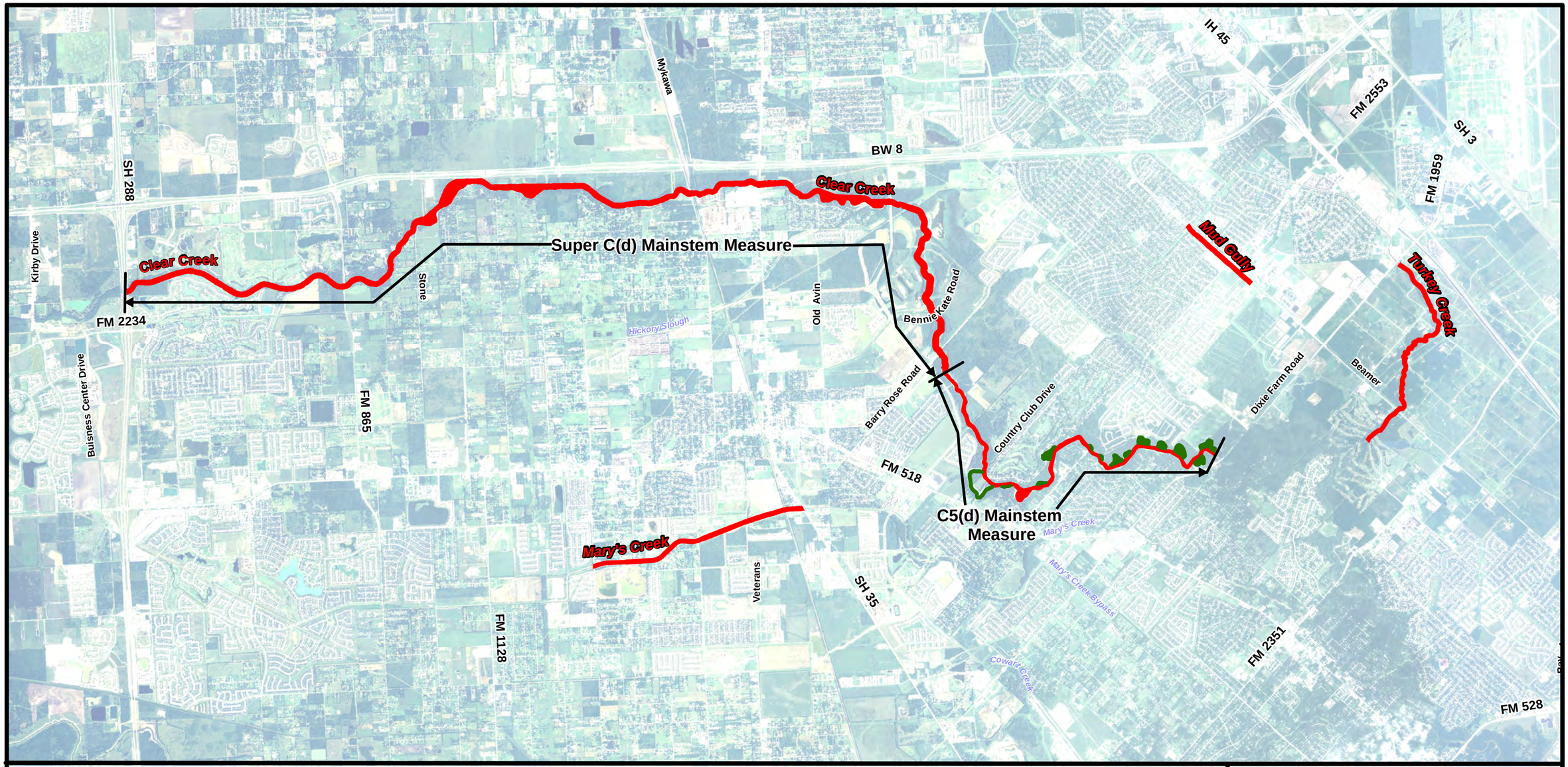
Clear Creek is located south of the City of Houston and is included in parts of Harris, Galveston, Brazoria, and Fort Bend counties, Texas (Figure 1). Flooding along Clear Creek has been a concern for over 30 years. Floodwaters in 1973, 1976, 1979, 1989, and 1994 caused substantial damage to residences along the creek. More recently, heavy rains from Tropical Storm Allison in 2001 resulted in severe flooding along Clear Creek that has prompted the buyout of approximately 300 flood-prone homes. However, flooding is not only a problem associated with severe rain events, but also has become increasingly more frequent along Clear Creek, even with moderate amounts of rainfall.

The problem of flooding along Clear Creek has not been easily addressed. Local authorities have made limited channel improvements to address specific flood concerns, but those efforts have contributed little to resolving the current large-scale flooding problems. In 1968, Congress authorized the Clear Creek Flood Control Project and plans were formulated in the 1980s, which included deepening, widening, and realigning the creek channel. Due to concerns regarding its design, the project's non-Federal sponsors, Galveston County and Harris County Flood Control District, with input from the public and governmental entities, did not support the project. As a result, the U.S. Army Corps of Engineers (USACE), Galveston District is reconsidering the project through a general reevaluation study. The purpose of this study is to develop and evaluate alternatives for flood risk management and ecosystem restoration within the Clear Creek watershed.

Flooding along Clear Creek has historically been a problem associated with severe rainfall events. Damages were typically incurred by a relatively small number of businesses and residences that were established in the existing floodplain. In 1992, all entities in the watershed adopted the regional plan with detention policies in place and a commitment to work together. However, continuing commercial and residential growth within the watershed has severely aggravated flooding problems. Although the county has detention policies in place, rapid urban growth in this region has substantially increased the extent of impervious cover and reduced the watershed's natural detention capacity, resulting in higher and more frequent stormwater flows. As a consequence, overbank flows have become more common, even with moderate rainfall events. In addition, continued development within the floodplain has compounded the problem of addressing flood risk management not only by introducing additional flood-prone structures, but also by narrowing flood risk management options.

Following an alternatives screening analysis, a General Reevaluation Plan (GRP) Alternative was identified to address these concerns. The GRP Alternative includes a series of flood damage reduction measures and mitigation areas, which are described in detail in the SEIS for this

(This page left blank intentionally.)



Key

Conveyance and Protected Riparian Habitat Corridor

Mitigation Features:

Floodplain Forest C1

N W E S

0 5,000 10,000 Feet

Figure 1
Project Features of the GRP Alternative
Clear Creek Flood Risk Management Project

Prepared for: USACE	
Job No.: 100002202	Scale: 1 inch = 5,000 feet
Prepared by: 18827	Date: 5/16/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/100002202/Project_Features_of_GRP.mxd

(This page left blank intentionally.)

project. Flood damage reduction measures include conveyance measures on or adjacent to Clear Creek from State Highway 288 (SH 288) to Dixie Farm Road and on or nearby portions of three tributaries; Mud Gully, Turkey Creek, and Mary's Creek. Mitigation features include rehabilitating and reestablishing floodplain forest. Placement areas would be required for placement of excavated material associated with the project.

The construction activities associated with the GRP Alternative will be located within Brazoria, Galveston, and Harris counties. These counties are within the Houston-Galveston-Brazoria (HGB) ozone nonattainment area. The U.S. Environmental Protection Agency (EPA) has classified the HGB as being in attainment or unclassified with the National Ambient Air Quality Standards (NAAQS) for all criteria pollutants except ozone. The HGB is classified as a "severe" nonattainment area under the 1-hour ozone standard and the 1997 8-hour NAAQS. Under the recently promulgated 2008 8-hour ozone standard, the HGB is classified as a "marginal" nonattainment area. Counties in the HGB nonattainment area affected under this status are Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller.

For a nonattainment area, a General Conformity Determination is required when the total air contaminant emissions caused by the proposed project would equal or exceed a specific threshold for nitrogen oxides (NO_x) or volatile organic compounds (VOCs). Based on an evaluation of air contaminant emissions from the construction activities associated with the GRP Alternative, it has been determined that a General Conformity Determination for NO_x emissions is required. Emissions of VOC for the project are exempt from a General Conformity Determination because they are below the emissions threshold requiring such an analysis.

This document represents the Final General Conformity Determination prepared on behalf of the USACE, Galveston District, pursuant to the Clean Air Act (CAA) to document that air contaminant emissions that would result from the USACE action in approving the GRP Alternative are in conformity with the State Implementation Plan (SIP) for the HGB ozone nonattainment area. Best available information was used to prepare this draft determination. However, in the event that the construction schedule is modified, a revised determination will be submitted to TCEQ and EPA for review.

(This page left blank intentionally.)

2.0 REGULATORY BACKGROUND – GENERAL CONFORMITY

General Conformity refers to the process of evaluating plans, programs, and projects to determine and demonstrate they meet the requirements of the CAA and the SIP. The General Conformity Rule requires conformity in coordination with and as part of the National Environmental Policy Act (NEPA) process. The proposed project, as a Federal action, is subject to the General Conformity Rule (40 Code of Federal Regulations [CFR] Part 93, Subpart B). This rule implements the Federal CAA conformity provision in Title I, Section 176(c)(1), "Limitation on Certain Federal Assistance," which mandates that the Federal government not engage, support, or provide financial assistance for licensing or permitting, or approving any activity not conforming to an approved CAA implementation plan.

In Texas, the applicable implementation plan is the Texas SIP, an EPA-approved plan for the regulation and enforcement of the NAAQS in each air quality region within the state. The General Conformity Rule is designed to ensure that Federal actions do not cause or contribute to degradation in air quality in an area that is designated as being a "nonattainment" area or a "maintenance" area with regard to meeting the NAAQS; thus, supporting the achievement of State and Federal air quality goals. The General Conformity Rule is codified at Title 40 CFR Part 93, Subpart B, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans."

The CAA defines conformity to the SIP as the upholding of "an implementation plan's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards." Conforming activities or actions should not, through additional air pollutant emissions, result in the following:

- Cause or contribute to new violations of any NAAQS in any area;
- Increase the frequency or severity of any existing violation of any NAAQS in any area; or
- Delay timely attainment of any NAAQS or interim emission reductions or other milestones in any area.

Pursuant to the General Conformity Rule, the USACE, must make a General Conformity Determination for all Federal actions in nonattainment or maintenance areas where the total emissions of a nonattainment pollutant or its precursors exceeds levels established by the regulations. For the HGB nonattainment area, the threshold level is 25 tons per year (tpy) for either NO_X or VOC under the 1-hour and 1997 8-hour ozone standard. Under the 2008 8-hour ozone standard, the threshold level is 100 tpy for either NO_X or VOC as of July 20, 2012. Only those air emissions of NO_x and VOC related to the Federal action; i.e., those considered to be jurisdictional by the USACE should be considered in this General Conformity Determination.

(This page left blank intentionally.)

3.0 APPLICABILITY

The General Conformity Rule is applicable only to nonattainment and maintenance areas. The GRP Alternative construction related activities will occur in Brazoria, Galveston, and Harris Counties, Texas, Texas. These counties are included in the eight-county HGB ozone nonattainment area, which is classified as "severe" in terms of its degree of compliance with the current 1-hour and 1997 8-hour ozone standards. Under the recently promulgated 2008 8-hour ozone standard, the HGB is classified as a "marginal" nonattainment area. This classification affects facilities that generate the ozone precursors, NO_X and VOC. As such, the project is subject to the General Conformity Rule, which applies to all nonattainment and maintenance areas.

The GRP Alternative was evaluated based on the identification of expected air contaminants and estimated emission rates for this project alternative. The emission sources evaluated include land-based mobile sources that will be used during construction activities, including off-road earth-moving equipment and on-road construction equipment. Air contaminant emissions associated with this equipment will be primarily combustion products from fuel burned in the engines powering this equipment. In addition, the movement or disturbance of soil and other construction materials will result in emissions of particulate matter to the air. Based this evaluation, it has been determined that a General Conformity Determination for NO_X emissions would be required for this alternative as emissions of NO_X are estimated to exceed the 25 tpy applicability threshold for general conformity. Emissions of VOC for the construction activities for each of these alternatives are exempt from a General Conformity Determination because they are below the 25 ton per year emissions threshold requiring such an analysis. The No-Action alternative would be also be exempt from the General Conformity Determination as it would not result in air contaminant emissions from new construction activities.

(This page left blank intentionally.)

4.0 AIR EMISSIONS INVENTORY

For the SEIS and the General Conformity Determination, an air emissions inventory was prepared for project-related activities for the GRP Alternative based on the schedule and other assumptions as developed by the USACE. Air emissions estimates were calculated using techniques appropriate for a specific emissions generating activity or source. The basis, emission factors, and summary of emissions are attached to this document.

4.1 Project Emissions

The land-based emission sources for the GRP Alternative would include both off-road equipment such as bulldozers, crawlers, cranes, etc. and on-road construction vehicles such as dump trucks and haul trucks. The off-road and on-road construction equipment would consist primarily of diesel-powered engines.

Emissions of NO_x and VOC were estimated in tpy for each piece of equipment based on the equipment horsepower, fuel type, and expected operating hours for each year of construction for which construction is projected to occur.

The basis for emissions included the following:

- Preliminary project description and other information, as provided by the USACE for the GRP Alternative.
- The EPA NONROAD emission factor model, Final 2005 Version, was used to predict emissions resulting from landside, off-road construction equipment with inputs for assumed equipment usage developed for this alternative. This model may be used to predict air emissions for off-road construction equipment based on information including geographic location, equipment type, and fuel use for specific years that may be selected. It provides an estimate of emissions for different equipment based on equipment population, load factor, available horsepower, deterioration, and applicable standards.

4.2 GRP ALTERNATIVE – SUMMARY OF NO_X AND VOC EMISSIONS

For comparison with the thresholds defined in the General Conformity Rule, the estimated annual emissions of NO_x and VOC for the GRP Alternative are summarized in Table 1 for each year of the anticipated construction activities. Emissions of carbon monoxide, sulfur dioxide, and particulate matter are not considered in the General Conformity evaluation as this area is in attainment with the NAAQS for each of those pollutants.

TABLE 1
GRP ALTERNATIVE – SUMMARY OF NO_x AND VOC EMISSIONS
(tpy)

	2012	2013	2014	2015	2016	2017	2018
NO_X	6.05	22.41	42.16	52.44	31.59	28.78	15.28
VOC	0.56	2.05	3.36	4.46	2.62	2.49	1.36

The estimate of VOC emissions for the GRP Alternative would not exceed the conformity threshold of 25 tpy for either of these years. Therefore, a General Conformity Determination for VOC emissions would not be required for this alternative.

The estimate of NO_X emissions for the GRP Alternative would exceed General Conformity threshold (25 tpy) in 2014, 2015, 2016, and 2017. Therefore, a General Conformity Determination for NO_X emissions is required for this alternative.

The basis, emission factors, and summary of emissions are provided in Attachment A of this document.

5.0 ISSUANCE OF DRAFT GENERAL CONFORMITY DETERMINATION AND AGENCY RESPONSE

In December 16, 2011, the USACE, Galveston District, issued a Draft General Conformity Determination concurrently with the Draft Environmental Impact Statement (EIS) for the proposed GRP Alternative. Copies of these documents were provided to various Federal and State agencies including the TCEQ and the EPA, Region VI. On December 16, 2011, the USACE also published the notice of availability of the Draft General Conformity Determination in *The Galveston Daily News, The Houston Chronicle,* and *The Facts*, daily newspapers of general circulation. A copy of these publications and publisher's affidavits are in provided in Attachment B of this document.

In response to the issuance of the Draft General Conformity Determination, the TCEQ provided a General Conformity Concurrence letter dated February 7, 2012. A copy of this letter is provided in Attachment C.

In its letter, the TCEQ provided its General Conformity concurrence for the proposed GRP Alternative and a determination that emissions from the project would not exceed the emissions budgets in the most recent SIP approved by the EPA. The most recently approved SIP revision as of the date of this letter was the "HGB Reasonable Further Progress SIP BPA Rate-of-Progress," adopted by the TCEQ on May 23, 2007, was approved by the EPA on March 29, 2010 (TCEQ, 2007). In addition, the TCEQ suggested that the USACE adopt pollution prevention and/or reduction measures in conjunction with this and future projects including the following:

- Encourage construction contractors to apply to Texas Emission Reduction Plan grants;
- Establish bidding conditions that give preference to clean contractors;
- Direct construction contractors to exercise air quality best management practices;
- Direct contractors that will use tugboats during construction to use clean fuels;
- Direct operators of the assist tugboats used in maneuvering dredge vessels to use clean fuels;
- Select assist tugs based on lowest NO_X emissions instead of lowest price; and/or
- Purchase and permanently retire surplus NO_X offsets prior to commencement of operations.

(This page left blank intentionally.)

6.0 FINAL GENERAL CONFORMITY DETERMINATION

Based on evaluation of the proposed project description and the estimated air quality emissions, and with consideration of the General Conformity Concurrence Letter from the TCEQ, the USACE has determined that its approval of the proposed GRP Alternative will meet the General Conformity requirements of 40 CFR §93.158(a)(5)(i)(A). This section of the General Conformity Rule applies to an ozone nonattainment area where the EPA has approved a revision to an area's attainment demonstration after 1990, and the TCEQ makes a determination that "the total of direct and indirect emissions from the action, or portion thereof, is determined by the state agency responsible for the applicable SIP to result in a level of emissions, which, together with all other emissions in the nonattainment area, would not exceed the emissions budgets specified in the SIP."

The emissions budget for General Conformity purposes is defined in the 40 CFR §93.152. The emissions budget is that portion of the total allowable emissions used as a basis for the latest approved revision of the SIP that is allocated to mobile sources; any stationary source or class of stationary sources; to any Federal action or class of actions; to any class of area sources; or to any subcategory of the emissions inventory. For the HGB nonattainment area, as of the date of the TCEQ General Concurrence Letter to the USACE dated February 7, 2012, the most recently approved SIP revision is the HGB Reasonable Further Progress SIP adopted by the TCEQ on May 23, 2007, and approved by the EPA on March 29, 2010 (TCEQ, 2007).

As previously noted, the HGB nonattainment area is classified as "severe" under the 1-hour ozone standard and under the 8-hour NAAQS. The attainment dated under the 8-hour ozone standard is June 15, 2019. Thus, the attainment year that should be used for the General Conformity analyses should be 2018, so as to demonstrate attainment by June 15, 2019. However, the emissions inventory in the most recently approved SIP is based on the attainment year 2007, and thus, the budgets in the applicable categories and subcategories of the emissions inventory for 2007 were used in this analysis to represent the emissions budgets for the attainment year 2019.

Nonroad mobile sources include a very broad category of nonroad equipment that includes engines mounted on construction equipment. The nonroad mobile emissions weekday budget for 2007 is 64.53 tons per day (tpd) of NO_x and 50.62 tpd of VOC (TCEQ, 2004). The nonroad mobile emissions inventory includes emissions from equipment associated with agricultural, aircraft, commercial, construction, ground support (airport), industrial, lawn and garden, railroad maintenance, logging, locomotives, oil and gas, recreational, and recreational marine equipment.

6.1 GRP ALTERNATIVE EMISSIONS COMPARED TO SIP EMISSIONS BUDGETS

For comparison to the SIP Area Source Emissions budget, the annual NO_x emission rates estimated for the GRP Alternative that are subject to this General Conformity determination may be summarized in terms of tpd and compared to the SIP emissions budget as shown on Table 2.

TABLE 2
GRP ALTERNATIVE – NO_X EMISSIONS COMPARED TO SIP 2007
WEEKDAY NONROAD MOBILE SOURCE EMISSIONS BUDGET[1]

	2014	2015	2016	2017
Tons per year	42.16	52.44	31.59	28.78
Tons per day	0.12	0.14	0.09	0.08
% of Nonroad Mobile Emissions Budget (64.53 tons per day)	0.2	0.2	0.1	0.1

[1]TCEQ (2004).

As shown on Table 2, NO_X emissions for the GRP Alternative project nonroad mobile equipment emissions would represent about 0.1 to 0.2 percent of the SIP 2007 Nonroad Emissions Budget for NO_X.

6.2 GENERAL CONFORMITY DETERMINATION

Based on an evaluation of the GRP Alternative emissions, it is believed that the total estimated emissions of NO_X for this alternative are well within the 2007 Nonroad Mobile Emissions Budget in the most recently approved SIP revision. As the GRP is not unusual in scope for an area like the HGB, it is anticipated that emissions from each year of the project will be less than an increase of 10 percent of the VOC and NO_X emissions inventories for the entire HGB nonattainment area. Therefore, emissions from the activities would not be considered regionally significant for purposes of General Conformity. Because of this, it is expected that emissions from the project construction activities would not:

- Cause or contribute to new violation of any NAAQS in any area;
- Increase the frequency or severity of any existing violation of any NAAQS in any area; or
- Delay timely attainment of any NAAQS or interim emission reductions or other milestones in any area.

Based on a review of the Draft General Conformity Determination, the TCEQ has determined that emissions from the proposed project will not exceed the emissions from the applicable SIP revision, the "HGB Reasonable Further Progress SIP BPA Rate-of-Progress," adopted by the

TCEQ on May 23, 2007, and approved by the EPA on March 29, 2010. Therefore, the USACE has determined that the proposed project complies with the requirements of the General Conformity Rule and is conformant with the currently approved SIP for the HGB nonattainment area.

Best available information was used to prepare this conformity determination. The TCEQ and USACE's determination of conformity is based on the emissions information and project schedule proposed at the time. Once a final project schedule is completed, the USACE will provide an update of the General Conformity documentation to the TCEQ and EPA for review and concurrence that the updated emissions and schedule will still be conformant with the currently approved HGB SIP.

(This page left blank intentionally.)

7.0 REFERENCES

40 Code of Federal Regulations (CFR) Part 93, Subpart B, "Determining Conformity of General Federal Actions to State and Federal Implementation Plans."

Texas Commission on Environmental Quality (TCEQ). 2004. "Revisions to the State Implementation Plan (SIP) for the control of ozone air pollution, Houston/Galveston/Brazoria Ozone Nonattainment Area," Adopted December 1, 2004.

———. 2007. "Houston-Galveston-Brazoria Eight-Hour Ozone Nonattainment Area Reasonable Further Progress SIP," Adopted May 23, 2007.

(This page left blank intentionally.)

Attachment A

Summary of Estimated Air Emissions

TABLE A-1

Total Estimated Project Emissions by Year of Construction Activity
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NO_x	-	-	6.05	22.41	42.16	52.44	31.59	28.78	15.28	-	-
VOC	-	-	0.56	2.05	3.36	4.46	2.62	2.49	1.36	-	-
PM_{10}	-	-	0.55	2.05	3.73	4.67	2.82	2.56	1.34	-	-
$PM_{2.5}$	-	-	0.53	1.98	3.62	4.52	2.73	2.48	1.30	-	-
CO	-	-	5.61	16.18	18.86	28.04	15.36	14.85	8.14	-	-
SO_2	-	-	1.33	4.94	9.40	11.66	6.97	6.30	3.34	-	-

Table A-2

Contract Duration
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Contract	Description	Excavation Volume (cubic yards)	Duration (months)	Start Date	End Date
1	MUD GULLY CONVEYANCE	37,500	9	Oct-12	Jul-13
2	TURKEY CREEK CONVEYANCE	340,600	8	May-15	Jan-16
3	MARY'S CREEK CONVEYANCE	461,500	11	May-14	Apr-15
4	LOWER CLEAR CREEK CONVEYANCE (& C1 oxbow mitigaiton site)	805,100	19	Oct-12	Apr-14
5	RR BRIDGE REPLACEMENT AT MYKAWA		12	Jul-16	Jul-17
6	MYKAWA TO BENNIE KATE UPPER CLEAR CREEK CONVEYANCE	1,150,700	27	Apr-14	Jul-16
7	HWY 288 TO MYKAWA UPPER CLEAR CREEK CONVEYANCE	1,099,000	28	Jul-16	Sep-18
10	MITIGATION (A1b, Xb)		0	Apr-15	Jan-16

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2700

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	Hours of Operation										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9											
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9			0.3	0.7							
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1	300	9			100	200							
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	26	9			9	17							
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	45	9			15	30							
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	45	9			15	30							
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	160	9			53	107							
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	45	9			15	30							
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	1	4	9			1	3							
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	160	9			53	107							
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	45	9			15	30							
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1	1,463	9			488	975							
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	1,463	9			488	975							
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	1	13	9			4	9							
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1	300	9			100	200							
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	1	13	9			4	9							
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1	234	9			78	156							
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	1	2,482	9			827	1,655							
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	300	9			100	200							
GENERATOR, 5.5 KW, 120/240V,PORT	1	1,241	9			414	827							
HYD EXCAV, CRWLR, 3.125CY BKT	1	94	9			31	63							
HYD EXCAV, CRWLR, 1.50 CY BKT	1	51	9			17	34							
LDR,FE, CRWLR, 1.50 CY	1	20	9			7	13							
LDR,FE, WH, 2.75 CY, ARTIC, 936E	1	304	9			101	203							
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	1	940	9			313	627							
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	1	270	9			90	180							
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	1	398	9			133	265							
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	1	270	9			90	180							
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	1	398	9			133	265							
MISC. POWER TOOLS	1	1,683	9			561	1,122							
Haul,12CY (91M3) Trk, 6 Mi(10Km)	1	20	9			7	13							
Contract 2 - Turkey Creek Conveyance			8											
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8						1	-				
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	1	620	8						620	-				
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	2	2,725	8						2,725	-				
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	1,240	8						1,240	-				
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	51	8						51	-				
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	51	8						51	-				
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	456	8						456	-				
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8						1	-				
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	1	620	8						620	-				
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	51	8						51	-				
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	6	8						6	-				
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	456	8						456	-				
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	51	8						51	-				
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8						1	-				
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	5	13,305	8						13,305	-				
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	5	13,305	8						13,305	-				
MAP A10ET001	1	1	8						1	-				
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	2	2,725	8						2,725	-				

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2700

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	Hours of Operation										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1	2,129	8						2,129	-				
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8						-	-				
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8						1	-				
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8						-	-				
WATER TANK, 3000 GAL (ADD TRK	1	0	8						-	-				
LDR,FE, WH, 2.75 CY, ARTIC, 936E	1	383	8						383	-				
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	1	902	8						902	-				
Contract 3 - Mary's Creek Conveyance			11											
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11					0.7	0.3					
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	2	3,692	11					2,685	1,007					
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	64	11					47	17					
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	84	11					61	23					
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	84	11					61	23					
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	476	11					346	130					
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11					-	-					
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	84	11					61	23					
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	1	8	11					6	2					
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	476	11					346	130					
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	84	11					61	23					
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	7	18,027	11					13,111	4,916					
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7	18,027	11					13,111	4,916					
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	15	11					11	4					
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	1	32	11					23	9					
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	2	3,692	11					2,685	1,007					
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	1	40	11					29	11					
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	1	717	11					521	196					
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	2	2,884	11					2,097	787					
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	1	1,227	11					892	335					
LDR,FE, WH, 2.75 CY, ARTIC, 936E	1	1,106	11					804	302					
LDR,FE, WH, 4.50 CY, ARTIC, 966E	1	307	11					223	84					
LDR,FE, WH, 5.25 CY, ARTIC, 980C	1	77	11					56	21					
DOZER,CWLR, D-6H,	1	409	11					297	112					
DOZER,CWLR, D-7H	1	774	11					563	211					
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	1	1,227	11					892	335					
Contract 4 - Lower Clear Creek Conveyance			19											
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19			0.2	0.6	0.2						
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	3	6,441	19			1,017	4,068	1,356						
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	1,461	19			231	923	308						
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	46	19			7	29	10						
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX	1	1,172	19			185	740	247						
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	46	19			7	29	10						
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	160	19			25	101	34						
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	46	19			7	29	10						
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	1	196	19			31	124	41						
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	160	19			25	101	34						
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	46	19			7	29	10						
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	2	3,046	19			481	1,924	641						
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	14	35,257	19			5,567	22,268	7,423						
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	1	730	19			115	461	154						

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2700

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	Hours of Operation										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	3	6,441	19			1,017	4,068	1,356						
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	1	730	19			115	461	154						
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	1	141	19			22	89	30						
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	3	5,584	19			882	3,527	1,176						
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	1	1,210	19			191	764	255						
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	300	19			47	189	63						
HYD EXCAV, CRWLR, 3.125CY BKT	1	580	19			92	366	122						
HYD EXCAV, CRWLR, 1.50 CY BKT	1	311	19			49	196	65						
LDR,FE, WH, 2.75 CY, ARTIC, 936E	1	668	19			105	422	141						
LDR,FE, WH, 4.50 CY, ARTIC, 966E	1	303	19			48	191	64						
LDR,FE, WH, 5.25 CY, ARTIC, 980C	1	76	19			12	48	16						
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	1	940	19			148	594	198						
DOZER,CWLR, D-4H	2	4,950	19			782	3,126	1,042						
DOZER,CWLR, D-6H	1	2,473	19			390	1,562	521						
DOZER,CWLR, D-7H	1	1,476	19			233	932	311						
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	1	2,475	19			391	1,563	521						
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	1	1,210	19			191	764	255						
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	1	2,475	19			391	1,563	521						
Contract 5 - RR Bridge Replacement at Mykawa														
Backhoe Loader, 45 HP, 5/8 CY	1	2,100	12							1,050	1,050			
Excavator, diesel hydraulic, crawler mounted, 1 CY	1	1,800	12							900	900			
Grader, self-propelled, 40,000 lb.	1	1,220	12							610	610			
Pile driving hammer, air, 24,450 ft-lb	1	600	12							300	300			
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	1	600	12							300	300			
Sheepsfoot roller, 240 HP	1	300	12							150	150			
Pneumatic Tire Roller, 80 HP	1	600	12							300	300			
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	1	1,950	12							975	975			
Vibrators, concrete, gas engine, 5 HP	1	200	12							100	100			
Pump, concrete, truck mounted	1	200	12							100	100			
Swingloader-20,000 lb capacity 175 HP	1	400	12							200	200			
25 Ton Telescopic Railway Crane	1	1,500	12							750	750			
Rail Scrap Retriever	1	500	12							250	250			
Tie Plate Picker	1	260	12							130	130			
Truck, 45,000 lb GVW, 3 axle	2	3,600	12							1,800	1,800			
Truck, Water, Off-Highway, 6,000 Gal	1	1,500	12							750	750			
Hyd. Excav, Crawler 1.5 CY	1	1,700	12							850	850			
Rear Dump Truck 8 CY	4	9,000	12							4,500	4,500			
Rear Dump Truck, 12 CY	3	6,000	12							3,000	3,000			
Misc. Power Tools	1	1,670	12							835	835			
Gradall, 5/8 CY	1	1,050	12							525	525			
Oiler, Truck	1	1,800	12							900	900			
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27											
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27					0.3	0.4	0.2				
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	4	9,206	27					3,069	4,092	2,046				
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	1,730	27					577	769	384				
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	75	27					25	33	17				
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	75	27					25	33	17				
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	578	27					193	257	128				
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	75	27					25	33	17				

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2700

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	Hours of Operation										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	1	385	27					128	171	86				
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	3	7,999	27					2,666	3,555	1,778				
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	75	27					25	33	17				
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	17	44,950	27					14,983	19,978	9,989				
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3	7,421	27					2,474	3,298	1,649				
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	1	2,558	27					853	1,137	568				
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	20	52,371	27					17,457	23,276	11,638				
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	2,558	27					853	1,137	568				
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	1	865	27					288	384	192				
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	4	9,206	27					3,069	4,092	2,046				
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	1	865	27					288	384	192				
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	1	967	27					322	430	215				
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	3	7,744	27					2,581	3,442	1,721				
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	275	27					92	122	61				
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	2	3,108	27					1,036	1,381	691				
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	300	27					100	133	67				
HYD EXCAV, CRWLR, 3.125CY BKT	1	580	27					193	258	129				
HYD EXCAV, CRWLR, 1.50 CY BKT	1	311	27					104	138	69				
LDR,FE, WH, 2.75 CY, ARTIC, 936E	2	2,805	27					935	1,247	623				
LDR,FE, WH, 4.50 CY, ARTIC, 966E	1	777	27					259	345	173				
LDR,FE, WH, 5.25 CY, ARTIC, 980C	1	194	27					65	86	43				
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	1	940	27					313	418	209				
DOZER,CWLR, D-6H,PS	2	3,106	27					1,035	1,380	690				
DOZER,CWLR, D-7H,PS	1	1,750	27					583	778	389				
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	2	3,108	27					1,036	1,381	691				
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			26											
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	26							0.2	0.5	0.3		
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	1	242	26							56	112	74		
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	1	483	26							111	223	149		
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	1	483	26							111	223	149		
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	4	8,792	26							2,029	4,058	2,705		
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	2,672	26							617	1,233	822		
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	9	26							2	4	3		
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	9	26							2	4	3		
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM	1	736	26							170	340	226		
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	9	26							2	4	3		
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	1	239	26							55	110	74		
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	736	26							170	340	226		
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	9	26							2	4	3		
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8	1	3	26							1	1	1		
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	16	42,929	26							9,907	19,813	13,209		
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	1	9	26							2	4	3		
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	16	42,929	26							9,907	19,813	13,209		
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	9	26							2	4	3		
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	26							1	1	1		
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	1	1,336	26							308	617	411		
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	4	8,792	26							2,029	4,058	2,705		
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	1	1,338	26							309	618	412		
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	1	650	26							150	300	200		
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	3	7,421	26							1,713	3,425	2,283		

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2700

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	Hours of Operation										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	26							-	-	-		
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	26							-	-	-		
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	424	26							98	196	130		
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	26							-	-	-		
WATER TANK, 3000 GAL (ADD TRK	1	0	26							-	-	-		
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	1	998	26							230	461	307		
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	300	26							69	138	92		
HYD EXCAV, CRWLR, 3.125CY BKT	1	580	26							134	268	178		
HYD EXCAV, CRWLR, 1.50 CY BKT	1	311	26							72	144	96		
LDR,FE, WH, 2.75 CY, ARTIC, 936E	2	4,320	26							997	1,994	1,329		
LDR,FE, WH, 4.50 CY, ARTIC, 966E	1	249	26							57	115	77		
LDR,FE, WH, 5.25 CY, ARTIC, 980C	1	62	26							14	29	19		
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	1	940	26							217	434	289		
DOZER,CWLR, D-6H	1	2,275	26							525	1,050	700		
DOZER,CWLR, D-7H	1	2,694	26							622	1,243	829		
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	1	998	26							230	461	307		
Contract 10 - Mitigation			10											
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	2,446	10						2,201.4	244.6				
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1	2,446	10						2,201.4	244.6				
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	1	2,238	10						2,014.2	223.8				
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	2,446	10						2,201.4	244.6				
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	2,238	10						2,014.2	223.8				
BLADE, ANGLE, HYDR (FOR D4	1	1,600	10						1,440.0	160.0				
DOZER,CWLR, D-4H,PS (ADD BLADE)	1	1,600	10						1,440.0	160.0				
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	1	400	10						360.0	40.0				
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	1	400	10						360.0	40.0				

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)					
					NO_x	VOC	PM_{10}	PM2.5	CO	SO_2
Contract 1 - Mud Gully Conveyance										
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	165	59%	3.7275103	0.3038857	0.3738079	0.3625936	1.4494156	0.7501369
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%	0	0	0	0	0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	0.9099999	62.807919	9.7481978	8.968342	348.86535	0.1401917
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	151	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	5.1855796	0.6284272	0.7162177	0.6947312	4.2076746	0.8317739
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	Tractor/Loader/Backhoe	DIESEL	46	21%	5.4157886	1.0278464	0.8625109	0.8366355	4.7154581	0.9697997
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	400	21%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	Chippers/Stump Grinders	DIESEL	125	43%	5.5726604	0.4804895	0.4037859	0.3916723	1.7681354	0.7412687
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	DIESEL	350	43%	4.9466198	0.2860631	0.2690519	0.2609803	1.3649245	0.7421122
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	Crawler Dozers/Tractor	DIESEL	160	59%	3.7592743	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	Other General Industrial Equipment	ELECTRIC	2		0	0	0	0	0	0
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	152	43%	4.2905919	0.3223134	0.2992159	0.2902394	1.0287693	0.7419549
GENERATOR, 5.5 KW, 120/240V,PORT	Generator Set	GASOLINE	11	68%	2.7739994	8.085377	0.1249904	0.1149911	808.47071	0.2148772
HYD EXCAV, CRWLR, 3.125CY BKT	Excavators	DIESEL	306	59%	3.9086077	0.2111309	0.2743808	0.2661494	1.6396473	0.7505392
HYD EXCAV, CRWLR, 1.50 CY BKT	Excavators	DIESEL	128	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
LDR,FE, CRWLR, 1.50 CY	Crawler Dozers/Tractor	DIESEL	90	59%	4.3723796	0.4108428	0.582033	0.564572	3.8945656	0.8327176
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	Pumps	DIESEL	21	43%	4.6668262	0.535964	0.4110015	0.3986714	2.4660502	0.8240731
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	Crawler Dozers/Tractor	DIESEL	165	59%	3.7592743	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	Crawler Dozers/Tractor	DIESEL	325	59%	4.1896802	0.2300861	0.2877833	0.2791498	1.7685323	0.7504571
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	Crawler Dozers/Tractor	DIESEL	165	59%	3.7592743	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	Crawler Dozers/Tractor	DIESEL	200	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722
MISC. POWER TOOLS	--	--	0	0%	0	0	0	0	0	0
Haul,12CY (91M3) Trk, 6 Mi(10Km)	Highway Truck	DIESEL	265	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
Contract 2 - Turkey Creek Conveyance										
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	165	59%	3.7275103	0.3038857	0.3738079	0.3625936	1.4494156	0.7501369
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Chippers/Stump Grinders	GASOLINE	71	78%	2.8968463	1.810596	0.0692225	0.0636847	70.334006	0.1506827
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%	0	0	0	0	0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	0.9099999	62.807919	9.7481978	8.968342	348.86535	0.1401917
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	151	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	5.1855796	0.6284272	0.7162177	0.6947312	4.2076746	0.8317739
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	Tractor/Loader/Backhoe	DIESEL	90	21%	6.2932764	1.4626406	1.2286706	1.1918105	7.6272456	0.9679136
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	Tractor/Loader/Backhoe	DIESEL	121	21%	6.2439281	1.0368315	0.7586621	0.7359022	4.0710719	0.8725372
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)					
					NO_x	VOC	PM_{10}	PM2.5	CO	SO_2
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	Other Construction Equipment	DIESEL	46	59%	4.6888012	0.3662925	0.485629	0.4710601	2.3638091	0.832911
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	DIESEL	310	59%	6.0061466	0.9490323	0.6705996	0.2791498	3.617949	0.8729183
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	400	21%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
MAP A10ET001	--	--	0	0%	0	0	0	0	0	0
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	DIESEL	350	43%	4.9466198	0.2860631	0.2690519	0.2609803	1.3649245	0.7421122
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	310	59%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	Off-Highway Truck	DIESEL	330	59%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
ROLLR,STATIC,S/P,13T,84"W,11TIRE	Rollers	DIESEL	85	59%	4.5696333	0.4555986	0.616367	0.597876	3.9596442	0.8325237
WATER TANK, 3000 GAL (ADD TRK	Off-Highway Truck	DIESEL	175	59%	3.140366	0.2571653	0.390086	0.3783834	1.4380946	0.7503395
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	Crawler Dozers/Tractor	DIESEL	200	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722
Contract 3 - Mary's Creek Conveyance										
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	165	59%	3.7275103	0.3038857	0.3738079	0.3625937	1.4494156	0.7501369
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%	0	0	0	0	0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	0.9099999	62.807917	9.7481973	8.9683415	348.86535	0.1401917
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	151	59%	3.5462135	0.2925814	0.3708078	0.3596835	1.4265771	0.7501859
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	3.5462135	0.2925814	0.3708078	0.3596835	1.4265771	0.7501859
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	5.1855793	0.6284272	0.7162177	0.6947312	4.2076751	0.831774
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	Tractor/Loader/Backhoe	DIESEL	90	21%	6.2932764	1.4626407	1.2286707	1.1918106	7.6272456	0.9679136
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	6.0061464	0.9490322	0.6705996	0.6504816	3.6179489	0.8729183
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	Tractor/Loader/Backhoe	DIESEL	46	21%	5.4157883	1.0278463	0.8625108	0.8366355	4.715458	0.9697997
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	6.1853212	1.4199318	1.1390236	1.1048529	6.9925619	0.9680987
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	6.1853212	1.4199318	1.1390236	1.1048529	6.9925619	0.9680987
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	400	21%	3.3473835	0.1862279	0.2655378	0.2575717	1.4525931	0.7506471
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	2.959707	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	Dumpers/Tenders	DIESEL	265	21%	2.959707	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	Chippers/Stump Grinders	DIESEL	125	43%	5.5854924	0.5494683	0.5766194	0.5593208	2.660177	0.7490716
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	DIESEL	350	43%	4.9466193	0.2860631	0.2690519	0.2609803	1.3649245	0.7421122
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	Crawler Dozers/Tractor	DIESEL	160	59%	3.7592742	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	Tractor/Loader/Backhoe	DIESEL	67	21%	6.1853212	1.4199318	1.1390236	1.1048529	6.9925619	6.1853212
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	3.5859806	0.2726538	0.2942913	0.2854626	1.2374106	0.7502722
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	2.959707	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	6.2439281	1.0368314	0.7586621	0.7359022	4.0710714	0.8725372
LDR,FE, WH, 4.50 CY, ARTIC, 966E	Tractor/Loader/Backhoe	DIESEL	246	21%	6.2439281	1.0368314	0.7586621	0.7359022	4.0710714	0.8725372
LDR,FE, WH, 5.25 CY, ARTIC, 980C	Tractor/Loader/Backhoe	DIESEL	265	21%	6.2439281	1.0368314	0.7586621	0.7359022	4.0710714	0.8725372
DOZER,CWLR, D-6H,	Crawler Dozers/Tractor	DIESEL	165	59%	3.7592742	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
DOZER,CWLR, D-7H	Crawler Dozers/Tractor	DIESEL	200	59%	3.5859806	0.2726538	0.2942913	0.2854626	1.2374106	0.7502722
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	Dumpers/Tenders	DIESEL	265	21%	2.959707	0.228783	0.2925913	0.2838136	1.2399916	0.7504627

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)					
					NO_x	VOC	PM_{10}	PM2.5	CO	SO_2
Contract 4 - Lower Clear Creek Conveyance										
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	165	59%	3.7275103	0.3038857	0.3738079	0.3625936	1.4494156	0.7501369
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%	0	0	0	0	0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	0.9099999	62.807919	9.7481978	8.968342	348.86535	0.1401917
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	125	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX DIGGING	Excavators	DIESEL	238	59%	3.3773756	0.2611944	0.2860623	0.2774804	1.2224024	0.750322
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	5.1855796	0.6284272	0.7162177	0.6947312	4.2076746	0.8317739
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	Tractor/Loader/Backhoe	DIESEL	46	21%	5.4157886	1.0278464	0.8625109	0.8366355	4.7154581	0.9697997
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Dozers/Tractor	DIESEL	180	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	Chippers/Stump Grinders	DIESEL	125	43%	5.5726604	0.4804895	0.4037859	0.3916723	1.7681354	0.7412687
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	DIESEL	350	43%	4.9466198	0.2860631	0.2690519	0.2609803	1.3649245	0.7421122
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	Crawler Dozers/Tractor	DIESEL	160	59%	3.7592743	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	152	43%	4.2905919	0.3223134	0.2992159	0.2902394	1.0287693	0.7419549
HYD EXCAV, CRWLR, 3.125CY BKT	Excavators	DIESEL	306	59%	3.9086077	0.2111309	0.2743808	0.2661494	1.6396473	0.7505392
HYD EXCAV, CRWLR, 1.50 CY BKT	Excavators	DIESEL	128	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
LDR,FE, WH, 4.50 CY, ARTIC, 966E	Tractor/Loader/Backhoe	DIESEL	246	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
LDR,FE, WH, 5.25 CY, ARTIC, 980C	Tractor/Loader/Backhoe	DIESEL	265	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	Pumps	DIESEL	21	43%	4.6668262	0.535964	0.4110015	0.3986714	2.4660502	0.8240731
DOZER,CWLR, D-4H	Crawler Dozers/Tractor	DIESEL	80	59%	4.3723796	0.4108428	0.582033	0.564572	3.8945656	0.8327176
DOZER,CWLR, D-6H	Crawler Dozers/Tractor	DIESEL	165	59%	3.7592743	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
DOZER,CWLR, D-7H	Crawler Dozers/Tractor	DIESEL	200	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	Dumpers/Tenders	DIESEL	265	21%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	Dumpers/Tenders	DIESEL	265	21%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
Contract 5 - RR Bridge Replacement at Mykawa										
Backhoe Loader, 45 HP, 5/8 CY	Tractor/Loader/Backhoe	DIESEL	46	21%	5.4157886	1.0278464	0.8625109	0.8366355	4.7154581	0.9697997
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	DIESEL	128	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
Grader, self-propelled, 40,000 lb.	Graders	DIESEL	185	59%	3.7275103	0.3038857	0.3738079	0.3625936	1.4494156	0.7501369
Pile driving hammer, air, 24,450 ft-lb	Other General Industrial Equipment	Air	0	0%	0	0	0	0	0	0
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	DIESEL	230	43%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
Sheepsfoot roller, 240 HP	Rollers	DIESEL	240	59%	3.5859806	0.2726538	0.2942913	0.2854626	1.2374106	0.7502722
Pneumatic Tire Roller, 80 HP	Rollers	DIESEL	80	59%	4.5696333	0.4555986	0.616367	0.597876	3.9596442	0.8325237
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	Tractor/Loader/Backhoe	DIESEL	145	21%	6.2439281	1.0368315	0.7586621	0.7359022	4.0710719	0.8725372
Vibrators, concrete, gas engine, 5 HP	Vibrators	GASOLINE	5	48%	0.9099999	62.807919	9.7481978	8.968342	348.86535	0.1401917

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)					
					NO_x	VOC	PM_{10}	PM2.5	CO	SO_2
Pump, concrete, truck mounted	Pumps	DIESEL	21	43%	4.6668262	0.535964	0.4110015	0.3986714	2.4660502	0.8240731
Swingloader-20,000 lb capacity 175 HP	Other Construction Equipment	DIESEL	175	59%	3.140366	0.2571653	0.390086	0.3783834	1.4380946	0.7503395
25 Ton Telescopic Railway Crane	Cranes	DIESEL	152	43%	4.2905919	0.3223134	0.2992159	0.2902394	1.0287693	0.7419549
Rail Scrap Retriever	Other Construction Equipment	DIESEL	46	59%	4.6888012	0.3662925	0.485629	0.4710601	2.3638091	0.832911
Tie Plate Picker	Other Construction Equipment	DIESEL	46	59%	4.6888012	0.3662925	0.485629	0.4710601	2.3638091	0.832911
Truck, 45,000 lb GVW, 3 axle	Highway Truck	DIESEL	230	59%	2.959707	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	DIESEL	330	59%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
Hyd. Excav, Crawler 1.5 CY	Excavators	DIESEL	128	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
Rear Dump Truck 8 CY	Dumper/Tender	DIESEL	400	21%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
Rear Dump Truck, 12 CY	Dumper/Tender	DIESEL	400	21%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
Misc. Power Tools	Other General Industrial Equipment	Electric	0	0%	0	0	0	0	0	0
Gradall, 5/8 CY	Graders	DIESEL	165	59%	3.7275103	0.3038857	0.3738079	0.3625936	1.4494156	0.7501369
Oiler, Truck	Off-Highway Truck	DIESEL	175	59%	3.140366	0.2571653	0.390086	0.3783834	1.4380946	0.7503395
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance										
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	140	59%	3.7275103	0.3038857	0.3738079	0.3625936	1.4494156	0.7501369
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%	0	0	0	0	0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	0.9099999	62.807919	9.7481978	8.968342	348.86535	0.1401917
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	151	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	5.1855796	0.6284272	0.7162177	0.6947312	4.2076746	0.8317739
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET (BOBCAT), 13 CWT (590 KG)	Tractor/Loader/Backhoe	DIESEL	46	21%	5.4157886	1.0278464	0.8625109	0.8366355	4.7154581	0.9697997
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	400	21%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	230	21%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Off-Highway Truck	DIESEL	400	59%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	310	59%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	Chippers/Stump Grinders	DIESEL	125	43%	5.5726604	0.4804895	0.4037859	0.3916723	1.7681354	0.7412687
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	DIESEL	350	43%	4.9466198	0.2860631	0.2690519	0.2609803	1.3649245	0.7421122
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	Crawler Dozers/Tractor	DIESEL	160	59%	3.7592743	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	190	43%	4.0891554	0.2871882	0.2397886	0.2325949	0.8792386	0.7421074
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	152	43%	4.2905919	0.3223134	0.2992159	0.2902394	1.0287693	0.7419549
HYD EXCAV, CRWLR, 3.125CY BKT	Excavators	DIESEL	306	59%	3.9086077	0.2111309	0.2743808	0.2661494	1.6396473	0.7505392
HYD EXCAV, CRWLR, 1.50 CY BKT	Excavators	DIESEL	128	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
LDR,FE, WH, 4.50 CY, ARTIC, 966E	Tractor/Loader/Backhoe	DIESEL	246	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
LDR,FE, WH, 5.25 CY, ARTIC, 980C	Tractor/Loader/Backhoe	DIESEL	265	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	Pumps	DIESEL	21	43%	4.6668262	0.535964	0.4110015	0.3986714	2.4660502	0.8240731

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)					
					NO_x	VOC	PM_{10}	PM2.5	CO	SO_2
DOZER,CWLR, D-6H,PS	Crawler Dozers/Tractor	DIESEL	165	59%	3.7592743	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
DOZER,CWLR, D-7H,PS	Crawler Dozers/Tractor	DIESEL	200	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	Dumpers/Tenders	DIESEL	265	21%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance										
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	165	59%	3.7275103	0.3038857	0.3738079	0.3625936	1.4494156	0.7501369
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	Other General Industrial Equipment	GASOLINE	75	43%	3.7650431	2.4212818	0.0707538	0.0650935	92.164814	0.1539553
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	Other General Industrial Equipment	GASOLINE	50	43%	3.7650431	2.4212818	0.0707538	0.0650935	92.164814	0.1539553
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	--	--	0	0%	0	0	0	0	0	0
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%	0	0	0	0	0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	0.9099999	62.807919	9.7481978	8.968342	348.86535	0.1401917
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	151	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	5.1855796	0.6284272	0.7162177	0.6947312	4.2076746	0.8317739
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET (BOBCAT), 13 CWT (590 KG)	Tractor/Loader/Backhoe	DIESEL	46	21%	5.4157886	1.0278464	0.8625109	0.8366355	4.7154581	0.9697997
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8 M)	Off-Highway Truck	DIESEL	210	59%	3.7291629	0.2811662	0.3016065	0.2838136	1.261517	0.7502354
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	400	21%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	--	--	0	0%	0	0	0	0	0	0
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	310	59%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	Dumpers/Tenders	DIESEL	265	21%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	Chippers/Stump Grinders	DIESEL	125	43%	5.5726604	0.4804895	0.4037859	0.3916723	1.7681354	0.7412687
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	Cranes	DIESEL	350	43%	4.9466198	0.2860631	0.2690519	0.2609803	1.3649245	0.7421122
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	Crawler Dozers/Tractor	DIESEL	160	59%	3.7592743	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	310	59%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	Off-Highway Truck	DIESEL	330	59%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	152	43%	4.2905919	0.3223134	0.2992159	0.2902394	1.0287693	0.7419549
ROLLR,STATIC,S/P,13T,84"W,11TIRE	Rollers	DIESEL	85	59%	4.5696333	0.4555986	0.616367	0.597876	3.9596442	0.8325237
WATER TANK, 3000 GAL (ADD TRK	Off-Highway Truck	DIESEL	175	59%	3.140366	0.2571653	0.390086	0.3783834	1.4380946	0.7503395
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	152	43%	4.2905919	0.3223134	0.2992159	0.2902394	1.0287693	0.7419549
HYD EXCAV, CRWLR, 3.125CY BKT	Excavators	DIESEL	306	59%	3.9086077	0.2111309	0.2743808	0.2661494	1.6396473	0.7505392
HYD EXCAV, CRWLR, 1.50 CY BKT	Excavators	DIESEL	128	59%	3.5462134	0.2925814	0.3708077	0.3596835	1.4265772	0.7501859
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
LDR,FE, WH, 4.50 CY, ARTIC, 966E	Tractor/Loader/Backhoe	DIESEL	246	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
LDR,FE, WH, 5.25 CY, ARTIC, 980C	Tractor/Loader/Backhoe	DIESEL	265	21%	6.0061466	0.9490323	0.6705996	0.6504816	3.617949	0.8729183
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	Pumps	DIESEL	21	43%	4.6668262	0.535964	0.4110015	0.3986714	2.4660502	0.8240731
DOZER,CWLR, D-6H	Crawler Dozers/Tractor	DIESEL	165	59%	3.7592743	0.3060689	0.3742501	0.3630226	1.4566403	0.7501273
DOZER,CWLR, D-7H	Crawler Dozers/Tractor	DIESEL	200	59%	3.5859803	0.2726538	0.2942913	0.2854626	1.2374105	0.7502722

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)					
					NO_x	VOC	PM_{10}	PM2.5	CO	SO_2
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	--	--	0	0%	0	0	0	0	0	0
Contract 10 - Mitigation										
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	6.185321	1.4199317	1.1390236	1.1048529	6.9925618	0.9680986
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	230	21%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Off-Highway Truck	DIESEL	400	59%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	310	59%	3.3473836	0.1862279	0.2655379	0.2575717	1.4525932	0.7506472
BLADE, ANGLE, HYDR (FOR D4	--	--	0	0%	0	0	0	0	0	0
DOZER,CWLR, D-4H,PS (ADD BLADE)	Crawler Dozers/Tractor	DIESEL	80	59%	4.3723796	0.4108428	0.582033	0.564572	3.8945656	0.8327176
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	--	--	0	0%	0	0	0	0	0	0
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	2.9597069	0.228783	0.2925913	0.2838136	1.2399916	0.7504627

TABLE A-5

Load Factors For Equipment Using Diesel or Gasoline

SCC Code	Equipment	Load Factor[1] Diesel	Gasoline
22xx003010	Aerial Lifts	21%	46%
22xx005015	Agricultural Tractor	59%	62%
22xx006015	Air Compressors	43%	56%
22xx001030	All Terrain Vehicles	42%	100%
22xx002033	Bore/Drill Rigs	43%	79%
22xx002042	Cement & Motar Mixers	43%	59%
22xx004066	Chippers/Stump Grinders	43%	78%
22xx002039	Concrete/Industrial Saws	59%	78%
22xx002045	Cranes	43%	47%
22xx002066	Crawler Dozers/Tractor	59%	80%
22xx002054	Crushing/Procesing Equipment	43%	85%
22xx002078	Dumpers/Tenders	21%	41%
22xx002036	Excavators	59%	53%
22xx007015	Fellers/Bunchers/Skidders	59%	70%
22xx003020	Forklifts	59%	30%
22xx006020	Gas Compressors	43%	85%
22xx006005	Generator Sets	43%	68%
22xx002048	Graders	59%	64%
22xx005050	Hydro Power Units	43%	56%
22xx004056	Lawn and Garden Tractor	43%	44%
22xx002051	Off-Highway Truck	59%	80%
22xx002075	Off-Highway Tractor	59%	70%
22xx004056	Other Agricultural Equipment	59%	55%
22xx002081	Other Construction Equipment	59%	48%
22xx003040	Equipment	43%	54%
22xx003050	Other Material Handling Equipment	21%	53%
22xx002003	Pavers	59%	66%
22xx002021	Paving Equipment	59%	59%
22xx002009	Plate Compactors	43%	55%
22xx006030	Pressure Washer	43%	85%
22xx006010	Pumps	43%	69%
22xx003060	Refrigeration/AC	43%	46%
22xx002015	Rollers	59%	62%
22xx002057	Rough Terrain Forklifts	59%	63%
22xx002063	Rubber Tire Dozer	59%	75%
22xx002060	Rubber Tire Loader	59%	71%
22xx002018	Scrapers	59%	70%
22xx002072	Skid Steer Loader	21%	58%
22xx001060	Specialty Vehicle/Carts	21%	58%
22xx002024	Surfacing Equipment	59%	49%
22xx003030	Sweepers/Scrubbers	43%	71%
22xx002006	Tampers/Rammers	43%	55%
22xx003070	Terminal Tractors	59%	78%
22xx005040	Tillers > 6 hp	59%	71%
22xx004026	Timmer/Edger/Brush Cutter	43%	91%
22xx002066	Tractor/Loader/Backhoe	21%	48%
22xx002030	Trenchers	59%	66%
22xx006025	Welders	21%	68%

1. Load Factors from Appendix A of *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling,*EPA Office of Air and Radiation Report Number NR-005b, December 2002

TABLE A-6

NOx Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	NOx Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9	-	-	0.000	0.000	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	60	300	9	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	6	26	9	-	-	0.000	0.000	-	-	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	9	45	9	-	-	0.005	0.010	-	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	9	45	9	-	-	0.006	0.011	-	-	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	9	-	-	0.010	0.020	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	9	45	9	-	-	0.004	0.008	-	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	1	4	9	-	-	0.000	0.000	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	9	-	-	0.005	0.010	-	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	9	45	9	-	-	0.001	0.003	-	-	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	293	1,463	9	-	-	0.151	0.302	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	293	1,463	9	-	-	0.216	0.432	-	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	3	13	9	-	-	0.001	0.003	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	60	300	9	-	-	0.082	0.164	-	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	3	13	9	-	-	0.002	0.003	-	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	47	234	9	-	-	0.044	0.087	-	-	-	-	-	-	-
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	497	2,482	9	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	9	-	-	0.031	0.062	-	-	-	-	-	-	-
GENERATOR, 5.5 KW, 120/240V,PORT	249	1,241	9	-	-	0.009	0.019	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	19	94	9	-	-	0.024	0.049	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	11	51	9	-	-	0.005	0.010	-	-	-	-	-	-	-
LDR,FE, CRWLR, 1.50 CY	4	20	9	-	-	0.002	0.003	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	61	304	9	-	-	0.026	0.051	-	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	9	-	-	0.015	0.029	-	-	-	-	-	-	-
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	54	270	9	-	-	0.036	0.073	-	-	-	-	-	-	-
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	80	398	9	-	-	0.117	0.235	-	-	-	-	-	-	-
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	54	270	9	-	-	0.036	0.073	-	-	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	80	398	9	-	-	0.062	0.124	-	-	-	-	-	-	-
MISC. POWER TOOLS	337	1,683	9	-	-	-	-	-	-	-	-	-	-	-
Haul,12CY (91M3) Trk, 6 Mi(10Km)	4	20	9	-	-	0.003	0.007	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 2 - Turkey Creek Conveyance			8	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	124	620	8	-	-	-	-	-	0.110	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	545	2,725	8	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	248	1,240	8	-	-	-	-	-	0.006	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	11	51	8	-	-	-	-	-	0.018	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	11	51	8	-	-	-	-	-	0.019	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	92	456	8	-	-	-	-	-	0.085	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	124	620	8	-	-	-	-	-	0.108	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	11	51	8	-	-	-	-	-	0.014	-	-	-	-	-
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	6	8	-	-	-	-	-	0.001	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	92	456	8	-	-	-	-	-	0.044	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	11	51	8	-	-	-	-	-	0.005	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8	-	-	-	-	-	0.001	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	2,661	13,305	8	-	-	-	-	-	4.124	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2,661	13,305	8	-	-	-	-	-	5.890	-	-	-	-	-

TABLE A-6

NOx Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	NOx Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
MAP A10ET001	1	1	8	-	-	-	-	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	545	2,725	8	-	-	-	-	-	2.236	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	426	2,129	8	-	-	-	-	-	1.192	-	-	-	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8	-	-	-	-	-	0.001	-	-	-	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	8	-	-	-	-	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	77	383	8	-	-	-	-	-	0.096	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	181	902	8	-	-	-	-	-	0.421	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 3 - Mary's Creek Conveyance			11	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11	-	-	-	-	0.000	0.000	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	739	3,692	11	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	13	64	11	-	-	-	-	0.000	0.000	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	17	84	11	-	-	-	-	0.021	0.008	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	17	84	11	-	-	-	-	0.023	0.009	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	96	476	11	-	-	-	-	0.064	0.024	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11	-	-	-	-	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	17	84	11	-	-	-	-	0.017	0.006	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	2	8	11	-	-	-	-	0.000	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	96	476	11	-	-	-	-	0.033	0.012	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	17	84	11	-	-	-	-	0.006	0.002	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3,606	18,027	11	-	-	-	-	4.064	1.524	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	3,606	18,027	11	-	-	-	-	5.804	2.177	-	-	-	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	3	15	11	-	-	-	-	0.002	0.001	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	7	32	11	-	-	-	-	0.008	0.003	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	739	3,692	11	-	-	-	-	2.203	0.826	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	8	40	11	-	-	-	-	0.011	0.004	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	144	717	11	-	-	-	-	0.050	0.019	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	577	2,884	11	-	-	-	-	1.174	0.440	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	246	1,227	11	-	-	-	-	0.395	0.148	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	222	1,106	11	-	-	-	-	0.210	0.079	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	62	307	11	-	-	-	-	0.079	0.030	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	77	11	-	-	-	-	0.021	0.008	-	-	-	-	-
DOZER,CWLR, D-6H,	82	409	11	-	-	-	-	0.120	0.045	-	-	-	-	-
DOZER,CWLR, D-7H	155	774	11	-	-	-	-	0.263	0.098	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	246	1,227	11	-	-	-	-	0.162	0.061	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 4 - Lower Clear Creek Conveyance			19	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19	-	-	0.000	0.000	0.000	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,289	6,441	19	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	293	1,461	19	-	-	0.001	0.004	0.001	-	-	-	-	-	-
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	10	46	19	-	-	0.002	0.008	0.003	-	-	-	-	-	-
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX	235	1,172	19	-	-	0.097	0.387	0.129	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	10	46	19	-	-	0.003	0.011	0.004	-	-	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	19	-	-	0.005	0.019	0.006	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	10	46	19	-	-	0.002	0.008	0.003	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	40	196	19	-	-	0.002	0.007	0.002	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	19	-	-	0.002	0.010	0.003	-	-	-	-	-	-

TABLE A-6

NOx Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	NOx Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	10	46	19	-	-	0.001	0.003	0.001	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	610	3,046	19	-	-	0.202	0.808	0.269	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7,052	35,257	19	-	-	2.465	9.858	3.286	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	146	730	19	-	-	0.038	0.152	0.051	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,289	6,441	19	-	-	0.835	3.338	1.113	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	146	730	19	-	-	0.045	0.180	0.060	-	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	29	141	19	-	-	0.002	0.009	0.003	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,117	5,584	19	-	-	0.494	1.974	0.658	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	242	1,210	19	-	-	0.085	0.338	0.113	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	19	-	-	0.015	0.059	0.020	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	19	-	-	0.071	0.285	0.095	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	19	-	-	0.014	0.058	0.019	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	134	668	19	-	-	0.027	0.106	0.035	-	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	61	303	19	-	-	0.016	0.065	0.022	-	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	76	19	-	-	0.004	0.018	0.006	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	19	-	-	0.007	0.028	0.009	-	-	-	-	-	-
DOZER,CWLR, D-4H	990	4,950	19	-	-	0.178	0.711	0.237	-	-	-	-	-	-
DOZER,CWLR, D-6H	495	2,473	19	-	-	0.158	0.630	0.210	-	-	-	-	-	-
DOZER,CWLR, D-7H	296	1,476	19	-	-	0.109	0.435	0.145	-	-	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	495	2,475	19	-	-	0.071	0.284	0.095	-	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	242	1,210	19	-	-	0.035	0.139	0.046	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	495	2,475	19	-	-	0.173	0.692	0.231	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 5 - RR Bridge Replacement at Mykawa														
Backhoe Loader, 45 HP, 5/8 CY	actor/Loader/Backh	1	2,100	-	-	-	-	-	-	0.061	0.061	-	-	-
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	1	1,800	-	-	-	-	-	-	0.266	0.266	-	-	-
Grader, self-propelled, 40,000 lb.	Graders	1	1,220	-	-	-	-	-	-	0.274	0.274	-	-	-
Pile driving hammer, air, 24,450 ft-lb	eneral Industrial Eq	1	600	-	-	-	-	-	-	-	-	-	-	-
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	1		-	-	-	-	-	-	0.097	0.097	-	-	-
Sheepsfoot roller, 240 HP	Rollers	1	300	-	-	-	-	-	-	0.084	0.084	-	-	-
Pneumatic Tire Roller, 80 HP	Rollers	1	600	-	-	-	-	-	-	0.071	0.071	-	-	-
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	actor/Loader/Backh	1	1,950	-	-	-	-	-	-	0.204	0.204	-	-	-
Vibrators, concrete, gas engine, 5 HP	Vibrators	1	200	-	-	-	-	-	-	0.000	0.000	-	-	-
Pump, concrete, truck mounted	Pumps	1	200	-	-	-	-	-	-	0.005	0.005	-	-	-
Swingloader-20,000 lb capacity 175 HP	Construction Equip	1	400	-	-	-	-	-	-	0.071	0.071	-	-	-
25 Ton Telescopic Railway Crane	Cranes	1	1,500	-	-	-	-	-	-	0.232	0.232	-	-	-
Rail Scrap Retriever	Construction Equip	1	500	-	-	-	-	-	-	0.035	0.035	-	-	-
Tie Plate Picker	Construction Equip	1	260	-	-	-	-	-	-	0.018	0.018	-	-	-
Truck, 45,000 lb GVW, 3 axle	Highway Truck	2	3,600	-	-	-	-	-	-	0.797	0.797	-	-	-
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	1	1,500	-	-	-	-	-	-	0.539	0.539	-	-	-
Hyd. Excav, Crawler 1.5 CY	Excavators	1	1,700	-	-	-	-	-	-	0.251	0.251	-	-	-
Rear Dump Truck 8 CY	Dumper/Tender	4	9,000	-	-	-	-	-	-	1.395	1.395	-	-	-
Rear Dump Truck, 12 CY	Dumper/Tender	3	6,000	-	-	-	-	-	-	0.930	0.930	-	-	-
Misc. Power Tools	eneral Industrial Eq	1	1,670	-	-	-	-	-	-	-	-	-	-	-
Gradall, 5/8 CY	Graders	1	1,050	-	-	-	-	-	-	0.210	0.210	-	-	-
Oiler, Truck	Off-Highway Truck	1	1,800	-	-	-	-	-	-	0.322	0.322	-	-	-
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27	-	-	-	-	-	-	-	-	-	-	-
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27	-	-	-	-	0.000	0.000	0.000	-	-	-	-

TABLE A-6

NOx Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	NOx Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,842	9,206	27	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	346	1,730	27	-	-	-	-	0.003	0.004	0.002	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	15	75	27	-	-	-	-	0.009	0.012	0.006	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	15	75	27	-	-	-	-	0.009	0.013	0.006	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	116	578	27	-	-	-	-	0.036	0.048	0.024	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	15	75	27	-	-	-	-	0.007	0.009	0.005	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	77	385	27	-	-	-	-	0.007	0.010	0.005	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1,600	7,999	27	-	-	-	-	0.256	0.341	0.171	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	15	75	27	-	-	-	-	0.002	0.003	0.002	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,990	44,950	27	-	-	-	-	4.644	6.192	3.096	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1,485	7,421	27	-	-	-	-	0.390	0.520	0.260	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	512	2,558	27	-	-	-	-	0.743	0.990	0.495	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	10,475	52,371	27	-	-	-	-	7.729	10.305	5.152	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	512	2,558	27	-	-	-	-	0.575	0.767	0.384	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	173	865	27	-	-	-	-	0.095	0.127	0.063	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,842	9,206	27	-	-	-	-	2.518	3.358	1.679	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	173	865	27	-	-	-	-	0.113	0.150	0.075	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	194	967	27	-	-	-	-	0.031	0.041	0.021	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,549	7,744	27	-	-	-	-	1.445	1.926	0.963	-	-	-	-
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	55	275	27	-	-	-	-	0.034	0.045	0.023	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	622	3,108	27	-	-	-	-	0.459	0.612	0.306	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	27	-	-	-	-	0.031	0.041	0.021	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	27	-	-	-	-	0.150	0.201	0.100	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	27	-	-	-	-	0.031	0.041	0.020	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	561	2,805	27	-	-	-	-	0.235	0.314	0.157	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	156	777	27	-	-	-	-	0.089	0.118	0.059	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	39	194	27	-	-	-	-	0.024	0.032	0.016	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	27	-	-	-	-	0.015	0.019	0.010	-	-	-	-
DOZER,CWLR, D-6H,PS	622	3,106	27	-	-	-	-	0.418	0.557	0.278	-	-	-	-
DOZER,CWLR, D-7H,PS	350	1,750	27	-	-	-	-	0.272	0.363	0.181	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	622	3,108	***27***	-	-	-	-	0.188	0.251	0.125	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			28	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	49	242	28	-	-	-	-	-	-	0.007	0.015	0.010	-	-
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	97	483	28	-	-	-	-	-	-	0.010	0.020	0.013	-	-
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	97	483	28	-	-	-	-	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,759	8,792	28	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	535	2,672	28	-	-	-	-	-	-	0.003	0.006	0.004	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	2	9	28	-	-	-	-	-	-	0.001	0.001	0.001	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	2	9	28	-	-	-	-	-	-	0.001	0.002	0.001	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	148	736	28	-	-	-	-	-	-	0.032	0.063	0.042	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	2	9	28	-	-	-	-	-	-	0.001	0.001	0.001	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	48	239	28	-	-	-	-	-	-	0.003	0.006	0.004	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	148	736	28	-	-	-	-	-	-	0.016	0.033	0.022	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8	1	3	28	-	-	-	-	-	-	0.000	0.001	0.000	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,586	42,929	28	-	-	-	-	-	-	3.071	6.141	4.094	-	-
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	2	9	28	-	-	-	-	-	-	-	-	-	-	-

TABLE A-6

NOx Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	NOx Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	8,586	42,929	28	-	-	-	-	-	-	4.386	8.772	5.848	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2	9	28	-	-	-	-	-	-	0.001	0.003	0.002	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	268	1,336	28	-	-	-	-	-	-	0.102	0.204	0.136	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,759	8,792	28	-	-	-	-	-	-	1.665	3.330	2.220	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	268	1,338	28	-	-	-	-	-	-	0.121	0.242	0.161	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	130	650	28	-	-	-	-	-	-	0.014	0.029	0.019	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,485	7,421	28	-	-	-	-	-	-	0.959	1.917	1.278	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	28	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	85	424	28	-	-	-	-	-	-	0.030	0.060	0.040	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	200	998	28	-	-	-	-	-	-	0.102	0.204	0.136	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	28	-	-	-	-	-	-	0.021	0.043	0.029	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	28	-	-	-	-	-	-	0.104	0.208	0.139	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	28	-	-	-	-	-	-	0.021	0.042	0.028	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	864	4,320	28	-	-	-	-	-	-	0.251	0.502	0.335	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	50	249	28	-	-	-	-	-	-	0.020	0.039	0.026	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	13	62	28	-	-	-	-	-	-	0.005	0.011	0.007	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	28	-	-	-	-	-	-	0.010	0.020	0.013	-	-
DOZER,CWLR, D-6H	455	2,275	28	-	-	-	-	-	-	0.212	0.424	0.282	-	-
DOZER,CWLR, D-7H	539	2,694	28	-	-	-	-	-	-	0.290	0.580	0.387	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	200	998	28	-	-	-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 10 - Mitigation				-	-	-	-	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	490	2,446	0	-	-	-	-	-	0.211	0.023	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	490	2,446	0	-	-	-	-	-	0.347	0.039	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	448	2,238	0	-	-	-	-	-	1.754	0.195	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	490	2,446	0	-	-	-	-	-	0.975	0.108	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	448	2,238	0	-	-	-	-	-	1.359	0.151	-	-	-	-
BLADE, ANGLE, HYDR (FOR D4	320	1,600	0	-	-	-	-	-	-	-	-	-	-	-
DOZER,CWLR, D-4H,PS (ADD BLADE)	320	1,600	0	-	-	-	-	-	0.328	0.036	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	80	400	0	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	80	400	0	-	-	-	-	-	0.159	0.018	-	-	-	-
			TOTALS	**-**	**-**	**6.05**	**22.41**	**42.16**	**52.44**	**31.59**	**28.78**	**15.28**	**-**	**-**

TABLE A-7

VOC Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	VOC Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9	-	-	0.000	0.000	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	60	300	9	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	6	26	9	-	-	0.003	0.006	-	-	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	9	45	9	-	-	0.000	0.001	-	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	9	45	9	-	-	0.000	0.001	-	-	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	9	-	-	0.001	0.002	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	9	45	9	-	-	0.001	0.001	-	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	1	4	9	-	-	0.000	0.000	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	9	-	-	0.001	0.002	-	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	9	45	9	-	-	0.000	0.001	-	-	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	293	1,463	9	-	-	0.008	0.017	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	293	1,463	9	-	-	0.017	0.033	-	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	3	13	9	-	-	0.000	0.000	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	60	300	9	-	-	0.005	0.009	-	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	3	13	9	-	-	0.000	0.000	-	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	47	234	9	-	-	0.003	0.007	-	-	-	-	-	-	-
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	497	2,482	9	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	9	-	-	0.002	0.005	-	-	-	-	-	-	-
GENERATOR, 5.5 KW, 120/240V,PORT	249	1,241	9	-	-	0.028	0.055	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	19	94	9	-	-	0.001	0.003	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	11	51	9	-	-	0.000	0.001	-	-	-	-	-	-	-
LDR,FE, CRWLR, 1.50 CY	4	20	9	-	-	0.000	0.000	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	61	304	9	-	-	0.004	0.008	-	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	9	-	-	0.002	0.003	-	-	-	-	-	-	-
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	54	270	9	-	-	0.003	0.006	-	-	-	-	-	-	-
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	80	398	9	-	-	0.006	0.013	-	-	-	-	-	-	-
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	54	270	9	-	-	0.003	0.006	-	-	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	80	398	9	-	-	0.005	0.009	-	-	-	-	-	-	-
MISC. POWER TOOLS	337	1,683	9	-	-	-	-	-	-	-	-	-	-	-
Haul,12CY (91M3) Trk, 6 Mi(10Km)	4	20	9	-	-	0.000	0.001	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 2 - Turkey Creek Conveyance			8	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	124	620	8	-	-	-	-	-	0.069	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	545	2,725	8	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	248	1,240	8	-	-	-	-	-	0.402	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	11	51	8	-	-	-	-	-	0.001	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	11	51	8	-	-	-	-	-	0.002	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	92	456	8	-	-	-	-	-	0.010	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	124	620	8	-	-	-	-	-	0.018	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	11	51	8	-	-	-	-	-	0.002	-	-	-	-	-
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	6	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	92	456	8	-	-	-	-	-	0.010	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	11	51	8	-	-	-	-	-	0.001	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	2,661	13,305	8	-	-	-	-	-	0.229	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2,661	13,305	8	-	-	-	-	-	0.455	-	-	-	-	-
MAP A10ET001	1	1	8	-	-	-	-	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	545	2,725	8	-	-	-	-	-	0.129	-	-	-	-	-

TABLE A-7

VOC Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	VOC Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	426	2,129	8	-	-	-	-	-	0.091	-	-	-	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	8	-	-	-	-	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	77	383	8	-	-	-	-	-	0.015	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	181	902	8	-	-	-	-	-	0.032	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 3 - Mary's Creek Conveyance			11	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11	-	-	-	-	0.000	0.000	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	739	3,692	11	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	13	64	11	-	-	-	-	0.015	0.006	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	17	84	11	-	-	-	-	0.002	0.001	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	17	84	11	-	-	-	-	0.002	0.001	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	96	476	11	-	-	-	-	0.008	0.003	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11	-	-	-	-	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	17	84	11	-	-	-	-	0.003	0.001	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	2	8	11	-	-	-	-	0.000	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	96	476	11	-	-	-	-	0.008	0.003	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	17	84	11	-	-	-	-	0.001	0.001	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3,606	18,027	11	-	-	-	-	0.226	0.085	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	3,606	18,027	11	-	-	-	-	0.449	0.168	-	-	-	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	3	15	11	-	-	-	-	0.000	0.000	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	7	32	11	-	-	-	-	0.001	0.000	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	739	3,692	11	-	-	-	-	0.127	0.048	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	8	40	11	-	-	-	-	0.001	0.000	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	144	717	11	-	-	-	-	0.011	0.004	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	577	2,884	11	-	-	-	-	0.089	0.033	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	246	1,227	11	-	-	-	-	0.031	0.011	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	222	1,106	11	-	-	-	-	0.035	0.013	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	62	307	11	-	-	-	-	0.013	0.005	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	77	11	-	-	-	-	0.004	0.001	-	-	-	-	-
DOZER,CWLR, D-6H,	82	409	11	-	-	-	-	0.010	0.004	-	-	-	-	-
DOZER,CWLR, D-7H	155	774	11	-	-	-	-	0.020	0.007	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	246	1,227	11	-	-	-	-	0.013	0.005	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 4 - Lower Clear Creek Conveyance			19	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19	-	-	0.000	0.000	0.000	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,289	6,441	19	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	293	1,461	19	-	-	0.075	0.299	0.100	-	-	-	-	-	-
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX	235	1,172	19	-	-	0.007	0.030	0.010	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	19	-	-	0.001	0.002	0.001	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	40	196	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	19	-	-	0.001	0.002	0.001	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	610	3,046	19	-	-	0.015	0.061	0.020	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7,052	35,257	19	-	-	0.191	0.762	0.254	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	146	730	19	-	-	0.003	0.013	0.004	-	-	-	-	-	-

TABLE A-7

VOC Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	VOC Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,289	6,441	19	-	-	0.048	0.193	0.064	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	146	730	19	-	-	0.004	0.015	0.005	-	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	29	141	19	-	-	0.000	0.002	0.001	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,117	5,584	19	-	-	0.038	0.150	0.050	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	242	1,210	19	-	-	0.007	0.026	0.009	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	19	-	-	0.001	0.004	0.001	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	19	-	-	0.004	0.015	0.005	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	19	-	-	0.001	0.005	0.002	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	134	668	19	-	-	0.004	0.017	0.006	-	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	61	303	19	-	-	0.003	0.010	0.003	-	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	76	19	-	-	0.001	0.003	0.001	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	19	-	-	0.001	0.003	0.001	-	-	-	-	-	-
DOZER,CWLR, D-4H	990	4,950	19	-	-	0.017	0.067	0.022	-	-	-	-	-	-
DOZER,CWLR, D-6H	495	2,473	19	-	-	0.013	0.051	0.017	-	-	-	-	-	-
DOZER,CWLR, D-7H	296	1,476	19	-	-	0.008	0.033	0.011	-	-	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	495	2,475	19	-	-	0.005	0.022	0.007	-	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	242	1,210	19	-	-	0.003	0.011	0.004	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	495	2,475	19	-	-	0.013	0.053	0.018	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 5 - RR Bridge Replacement at Mykawa														
Backhoe Loader, 45 HP, 5/8 CY	actor/Loader/Backh	1	2,100	-	-	-	-	-	-	0.011	0.011	-	-	-
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	1	1,800	-	-	-	-	-	-	0.022	0.022	-	-	-
Grader, self-propelled, 40,000 lb.	Graders	1	1,220	-	-	-	-	-	-	0.022	0.022	-	-	-
Pile driving hammer, air, 24,450 ft-lb	eneral Industrial Eq	1	600	-	-	-	-	-	-	-	-	-	-	-
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	1		-	-	-	-	-	-	0.007	0.007	-	-	-
Sheepsfoot roller, 240 HP	Rollers	1	300	-	-	-	-	-	-	0.006	0.006	-	-	-
Pneumatic Tire Roller, 80 HP	Rollers	1	600	-	-	-	-	-	-	0.007	0.007	-	-	-
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	actor/Loader/Backh	1	1,950	-	-	-	-	-	-	0.034	0.034	-	-	-
Vibrators, concrete, gas engine, 5 HP	Vibrators	1	200	-	-	-	-	-	-	0.017	0.017	-	-	-
Pump, concrete, truck mounted	Pumps	1	200	-	-	-	-	-	-	0.001	0.001	-	-	-
Swingloader-20,000 lb capacity 175 HP	Construction Equip	1	400	-	-	-	-	-	-	0.006	0.006	-	-	-
25 Ton Telescopic Railway Crane	Cranes	1	1,500	-	-	-	-	-	-	0.017	0.017	-	-	-
Rail Scrap Retriever	Construction Equip	1	500	-	-	-	-	-	-	0.003	0.003	-	-	-
Tie Plate Picker	Construction Equip	1	260	-	-	-	-	-	-	0.001	0.001	-	-	-
Truck, 45,000 lb GVW, 3 axle	Highway Truck	2	3,600	-	-	-	-	-	-	0.062	0.062	-	-	-
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	1	1,500	-	-	-	-	-	-	0.030	0.030	-	-	-
Hyd. Excav, Crawler 1.5 CY	Excavators	1	1,700	-	-	-	-	-	-	0.021	0.021	-	-	-
Rear Dump Truck 8 CY	Dumper/Tender	4	9,000	-	-	-	-	-	-	0.078	0.078	-	-	-
Rear Dump Truck, 12 CY	Dumper/Tender	3	6,000	-	-	-	-	-	-	0.052	0.052	-	-	-
Misc. Power Tools	eneral Industrial Eq	1	1,670	-	-	-	-	-	-	-	-	-	-	-
Gradall, 5/8 CY	Graders	1	1,050	-	-	-	-	-	-	0.017	0.017	-	-	-
Oiler, Truck	Off-Highway Truck	1	1,800	-	-	-	-	-	-	0.026	0.026	-	-	-
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27	-	-	-	-	-	-	-	-	-	-	-
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27	-	-	-	-	0.000	0.000	0.000	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,842	9,206	27	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	346	1,730	27	-	-	-	-	0.187	0.249	0.125	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	15	75	27	-	-	-	-	0.001	0.001	0.000	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	15	75	27	-	-	-	-	0.001	0.001	0.001	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	116	578	27	-	-	-	-	0.004	0.006	0.003	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	15	75	27	-	-	-	-	0.001	0.001	0.001	-	-	-	-

TABLE A-7

VOC Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	VOC Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	77	385	27	-	-	-	-	0.001	0.002	0.001	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1,600	7,999	27	-	-	-	-	0.059	0.078	0.039	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	15	75	27	-	-	-	-	0.001	0.001	0.000	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,990	44,950	27	-	-	-	-	0.258	0.344	0.172	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1,485	7,421	27	-	-	-	-	0.030	0.040	0.020	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	512	2,558	27	-	-	-	-	0.041	0.055	0.028	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	10,475	52,371	27	-	-	-	-	0.597	0.797	0.398	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	512	2,558	27	-	-	-	-	0.032	0.043	0.021	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	173	865	27	-	-	-	-	0.008	0.011	0.005	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,842	9,206	27	-	-	-	-	0.146	0.194	0.097	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	173	865	27	-	-	-	-	0.009	0.012	0.006	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	194	967	27	-	-	-	-	0.007	0.009	0.005	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,549	7,744	27	-	-	-	-	0.110	0.146	0.073	-	-	-	-
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	55	275	27	-	-	-	-	0.002	0.003	0.002	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	622	3,108	27	-	-	-	-	0.035	0.047	0.024	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	27	-	-	-	-	0.002	0.003	0.002	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	27	-	-	-	-	0.008	0.011	0.005	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	27	-	-	-	-	0.003	0.003	0.002	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	561	2,805	27	-	-	-	-	0.037	0.050	0.025	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	156	777	27	-	-	-	-	0.014	0.019	0.009	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	39	194	27	-	-	-	-	0.004	0.005	0.003	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	27	-	-	-	-	0.002	0.002	0.001	-	-	-	-
DOZER,CWLR, D-6H,PS	622	3,106	27	-	-	-	-	0.034	0.045	0.023	-	-	-	-
DOZER,CWLR, D-7H,PS	350	1,750	27	-	-	-	-	0.021	0.028	0.014	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	622	3,108	***27***	-	-	-	-	0.015	0.019	0.010	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			28	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	49	242	28	-	-	-	-	-	-	0.005	0.010	0.006	-	-
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	97	483	28	-	-	-	-	-	-	0.006	0.013	0.009	-	-
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	97	483	28	-	-	-	-	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,759	8,792	28	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	535	2,672	28	-	-	-	-	-	-	0.200	0.400	0.266	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	148	736	28	-	-	-	-	-	-	0.004	0.008	0.005	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	48	239	28	-	-	-	-	-	-	0.001	0.001	0.001	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	148	736	28	-	-	-	-	-	-	0.004	0.007	0.005	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,586	42,929	28	-	-	-	-	-	-	0.171	0.342	0.228	-	-
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	2	9	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	8,586	42,929	28	-	-	-	-	-	-	0.339	0.678	0.452	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	268	1,336	28	-	-	-	-	-	-	0.009	0.018	0.012	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,759	8,792	28	-	-	-	-	-	-	0.096	0.193	0.128	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	268	1,338	28	-	-	-	-	-	-	0.010	0.020	0.013	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	130	650	28	-	-	-	-	-	-	0.003	0.007	0.004	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,485	7,421	28	-	-	-	-	-	-	0.073	0.146	0.097	-	-

TABLE A-7

VOC Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	VOC Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	28	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	85	424	28	-	-	-	-	-	-	0.002	0.005	0.003	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	200	998	28	-	-	-	-	-	-	0.008	0.016	0.011	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	28	-	-	-	-	-	-	0.002	0.003	0.002	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	28	-	-	-	-	-	-	0.006	0.011	0.007	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	28	-	-	-	-	-	-	0.002	0.003	0.002	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	864	4,320	28	-	-	-	-	-	-	0.040	0.079	0.053	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	50	249	28	-	-	-	-	-	-	0.003	0.006	0.004	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	13	62	28	-	-	-	-	-	-	0.001	0.002	0.001	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	28	-	-	-	-	-	-	0.001	0.002	0.002	-	-
DOZER,CWLR, D-6H	455	2,275	28	-	-	-	-	-	-	0.017	0.034	0.023	-	-
DOZER,CWLR, D-7H	539	2,694	28	-	-	-	-	-	-	0.022	0.044	0.029	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	200	998	28	-	-	-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 10 - Mitigation				-	-	-	-	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	490	2,446	0	-	-	-	-	-	0.048	0.005	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	490	2,446	0	-	-	-	-	-	0.027	0.003	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	448	2,238	0	-	-	-	-	-	0.098	0.011	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	490	2,446	0	-	-	-	-	-	0.075	0.008	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	448	2,238	0	-	-	-	-	-	0.076	0.008	-	-	-	-
BLADE, ANGLE, HYDR (FOR D4	320	1,600	0	-	-	-	-	-	-	-	-	-	-	-
DOZER,CWLR, D-4H,PS (ADD BLADE)	320	1,600	0	-	-	-	-	-	0.031	0.003	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	80	400	0	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	80	400	0	-	-	-	-	-	0.012	0.001	-	-	-	-
			TOTALS	**-**	**-**	**0.56**	**2.05**	**3.36**	**4.46**	**2.62**	**2.49**	**1.36**	**-**	**-**

TABLE A-8

PM10 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	PM10 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9	-	-	0.000	0.000	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	60	300	9	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	6	26	9	-	-	0.000	0.001	-	-	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	9	45	9	-	-	0.001	0.001	-	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	9	45	9	-	-	0.001	0.001	-	-	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	9	-	-	0.001	0.003	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	9	45	9	-	-	0.000	0.001	-	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	1	4	9	-	-	0.000	0.000	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	9	-	-	0.001	0.002	-	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	9	45	9	-	-	0.000	0.001	-	-	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	293	1,463	9	-	-	0.012	0.024	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	293	1,463	9	-	-	0.021	0.043	-	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	3	13	9	-	-	0.000	0.000	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	60	300	9	-	-	0.004	0.009	-	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	3	13	9	-	-	0.000	0.000	-	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	47	234	9	-	-	0.004	0.007	-	-	-	-	-	-	-
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	497	2,482	9	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	9	-	-	0.002	0.004	-	-	-	-	-	-	-
GENERATOR, 5.5 KW, 120/240V,PORT	249	1,241	9	-	-	0.000	0.001	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	19	94	9	-	-	0.002	0.003	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	11	51	9	-	-	0.001	0.001	-	-	-	-	-	-	-
LDR,FE, CRWLR, 1.50 CY	4	20	9	-	-	0.000	0.000	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	61	304	9	-	-	0.003	0.006	-	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	9	-	-	0.001	0.003	-	-	-	-	-	-	-
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	54	270	9	-	-	0.004	0.007	-	-	-	-	-	-	-
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	80	398	9	-	-	0.008	0.016	-	-	-	-	-	-	-
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	54	270	9	-	-	0.004	0.007	-	-	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	80	398	9	-	-	0.005	0.010	-	-	-	-	-	-	-
MISC. POWER TOOLS	337	1,683	9	-	-	-	-	-	-	-	-	-	-	-
Haul,12CY (91M3) Trk, 6 Mi(10Km)	4	20	9	-	-	0.000	0.001	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 2 - Turkey Creek Conveyance			8	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	124	620	8	-	-	-	-	-	0.003	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	545	2,725	8	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	248	1,240	8	-	-	-	-	-	0.062	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	11	51	8	-	-	-	-	-	0.002	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	11	51	8	-	-	-	-	-	0.002	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	92	456	8	-	-	-	-	-	0.012	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	124	620	8	-	-	-	-	-	0.013	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	11	51	8	-	-	-	-	-	0.002	-	-	-	-	-
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	6	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	92	456	8	-	-	-	-	-	0.008	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	11	51	8	-	-	-	-	-	0.001	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	2,661	13,305	8	-	-	-	-	-	0.327	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2,661	13,305	8	-	-	-	-	-	0.582	-	-	-	-	-
MAP A10ET001	1	1	8	-	-	-	-	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	545	2,725	8	-	-	-	-	-	0.122	-	-	-	-	-

TABLE A-8

PM10 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	PM10 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	426	2,129	8	-	-	-	-	-	0.098	-	-	-	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	8	-	-	-	-	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	77	383	8	-	-	-	-	-	0.011	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	181	902	8	-	-	-	-	-	0.035	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 3 - Mary's Creek Conveyance			11	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11	-	-	-	-	0.000	0.000	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	739	3,692	11	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	13	64	11	-	-	-	-	0.002	0.001	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	17	84	11	-	-	-	-	0.002	0.001	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	17	84	11	-	-	-	-	0.002	0.001	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	96	476	11	-	-	-	-	0.009	0.003	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11	-	-	-	-	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	17	84	11	-	-	-	-	0.002	0.001	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	2	8	11	-	-	-	-	0.000	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	96	476	11	-	-	-	-	0.006	0.002	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	17	84	11	-	-	-	-	0.001	0.000	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3,606	18,027	11	-	-	-	-	0.322	0.121	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	3,606	18,027	11	-	-	-	-	0.574	0.215	-	-	-	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	3	15	11	-	-	-	-	0.000	0.000	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	7	32	11	-	-	-	-	0.001	0.000	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	739	3,692	11	-	-	-	-	0.120	0.045	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	8	40	11	-	-	-	-	0.001	0.000	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	144	717	11	-	-	-	-	0.009	0.003	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	577	2,884	11	-	-	-	-	0.096	0.036	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	246	1,227	11	-	-	-	-	0.039	0.015	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	222	1,106	11	-	-	-	-	0.026	0.010	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	62	307	11	-	-	-	-	0.010	0.004	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	77	11	-	-	-	-	0.003	0.001	-	-	-	-	-
DOZER,CWLR, D-6H,	82	409	11	-	-	-	-	0.012	0.004	-	-	-	-	-
DOZER,CWLR, D-7H	155	774	11	-	-	-	-	0.022	0.008	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	246	1,227	11	-	-	-	-	0.016	0.006	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 4 - Lower Clear Creek Conveyance			19	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19	-	-	0.000	0.000	0.000	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,289	6,441	19	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	293	1,461	19	-	-	0.012	0.046	0.015	-	-	-	-	-	-
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX	235	1,172	19	-	-	0.008	0.033	0.011	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	19	-	-	0.001	0.003	0.001	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	40	196	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	19	-	-	0.000	0.002	0.001	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	610	3,046	19	-	-	0.017	0.066	0.022	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7,052	35,257	19	-	-	0.244	0.975	0.325	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	146	730	19	-	-	0.003	0.011	0.004	-	-	-	-	-	-

TABLE A-8

PM10 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	PM10 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,289	6,441	19	-	-	0.045	0.182	0.061	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	146	730	19	-	-	0.004	0.018	0.006	-	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	29	141	19	-	-	0.000	0.002	0.001	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,117	5,584	19	-	-	0.041	0.162	0.054	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	242	1,210	19	-	-	0.008	0.033	0.011	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	19	-	-	0.001	0.004	0.001	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	19	-	-	0.005	0.020	0.007	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	19	-	-	0.002	0.006	0.002	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	134	668	19	-	-	0.003	0.012	0.004	-	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	61	303	19	-	-	0.002	0.007	0.002	-	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	76	19	-	-	0.000	0.002	0.001	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	19	-	-	0.001	0.002	0.001	-	-	-	-	-	-
DOZER,CWLR, D-4H	990	4,950	19	-	-	0.024	0.095	0.032	-	-	-	-	-	-
DOZER,CWLR, D-6H	495	2,473	19	-	-	0.016	0.063	0.021	-	-	-	-	-	-
DOZER,CWLR, D-7H	296	1,476	19	-	-	0.009	0.036	0.012	-	-	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	495	2,475	19	-	-	0.007	0.028	0.009	-	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	242	1,210	19	-	-	0.003	0.014	0.005	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	495	2,475	19	-	-	0.017	0.068	0.023	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 5 - RR Bridge Replacement at Mykawa														
Backhoe Loader, 45 HP, 5/8 CY	actor/Loader/Backh	1	2,100	-	-	-	-	-	-	0.010	0.010	-	-	-
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	1	1,800	-	-	-	-	-	-	0.028	0.028	-	-	-
Grader, self-propelled, 40,000 lb.	Graders	1	1,220	-	-	-	-	-	-	0.027	0.027	-	-	-
Pile driving hammer, air, 24,450 ft-lb	eneral Industrial Eq	1	600	-	-	-	-	-	-	-	-	-	-	-
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	1		-	-	-	-	-	-	0.010	0.010	-	-	-
Sheepsfoot roller, 240 HP	Rollers	1	300	-	-	-	-	-	-	0.007	0.007	-	-	-
Pneumatic Tire Roller, 80 HP	Rollers	1	600	-	-	-	-	-	-	0.010	0.010	-	-	-
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	actor/Loader/Backh	1	1,950	-	-	-	-	-	-	0.025	0.025	-	-	-
Vibrators, concrete, gas engine, 5 HP	Vibrators	1	200	-	-	-	-	-	-	0.003	0.003	-	-	-
Pump, concrete, truck mounted	Pumps	1	200	-	-	-	-	-	-	0.000	0.000	-	-	-
Swingloader-20,000 lb capacity 175 HP	Construction Equip	1	400	-	-	-	-	-	-	0.009	0.009	-	-	-
25 Ton Telescopic Railway Crane	Cranes	1	1,500	-	-	-	-	-	-	0.016	0.016	-	-	-
Rail Scrap Retriever	Construction Equip	1	500	-	-	-	-	-	-	0.004	0.004	-	-	-
Tie Plate Picker	Construction Equip	1	260	-	-	-	-	-	-	0.002	0.002	-	-	-
Truck, 45,000 lb GVW, 3 axle	Highway Truck	2	3,600	-	-	-	-	-	-	0.079	0.079	-	-	-
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	1	1,500	-	-	-	-	-	-	0.043	0.043	-	-	-
Hyd. Excav, Crawler 1.5 CY	Excavators	1	1,700	-	-	-	-	-	-	0.026	0.026	-	-	-
Rear Dump Truck 8 CY	Dumper/Tender	4	9,000	-	-	-	-	-	-	0.111	0.111	-	-	-
Rear Dump Truck, 12 CY	Dumper/Tender	3	6,000	-	-	-	-	-	-	0.074	0.074	-	-	-
Misc. Power Tools	eneral Industrial Eq	1	1,670	-	-	-	-	-	-	-	-	-	-	-
Gradall, 5/8 CY	Graders	1	1,050	-	-	-	-	-	-	0.021	0.021	-	-	-
Oiler, Truck	Off-Highway Truck	1	1,800	-	-	-	-	-	-	0.040	0.040	-	-	-
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27	-	-	-	-	-	-	-	-	-	-	-
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27	-	-	-	-	0.000	0.000	0.000	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,842	9,206	27	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	346	1,730	27	-	-	-	-	0.029	0.039	0.019	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	15	75	27	-	-	-	-	0.001	0.001	0.001	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	15	75	27	-	-	-	-	0.001	0.001	0.001	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	116	578	27	-	-	-	-	0.005	0.007	0.003	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	15	75	27	-	-	-	-	0.001	0.001	0.001	-	-	-	-

TABLE A-8

PM10 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	PM10 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	77	385	27	-	-	-	-	0.001	0.002	0.001	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1,600	7,999	27	-	-	-	-	0.047	0.063	0.031	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	15	75	27	-	-	-	-	0.000	0.001	0.000	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,990	44,950	27	-	-	-	-	0.368	0.491	0.246	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1,485	7,421	27	-	-	-	-	0.039	0.051	0.026	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	512	2,558	27	-	-	-	-	0.059	0.079	0.039	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	10,475	52,371	27	-	-	-	-	0.764	1.019	0.509	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	512	2,558	27	-	-	-	-	0.046	0.061	0.030	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	173	865	27	-	-	-	-	0.007	0.009	0.005	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,842	9,206	27	-	-	-	-	0.137	0.183	0.091	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	173	865	27	-	-	-	-	0.011	0.015	0.007	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	194	967	27	-	-	-	-	0.006	0.008	0.004	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,549	7,744	27	-	-	-	-	0.119	0.158	0.079	-	-	-	-
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	55	275	27	-	-	-	-	0.002	0.003	0.001	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	622	3,108	27	-	-	-	-	0.045	0.060	0.030	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	27	-	-	-	-	0.002	0.003	0.001	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	27	-	-	-	-	0.011	0.014	0.007	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	27	-	-	-	-	0.003	0.004	0.002	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	561	2,805	27	-	-	-	-	0.026	0.035	0.018	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	156	777	27	-	-	-	-	0.010	0.013	0.007	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	39	194	27	-	-	-	-	0.003	0.004	0.002	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	27	-	-	-	-	0.001	0.002	0.001	-	-	-	-
DOZER,CWLR, D-6H,PS	622	3,106	27	-	-	-	-	0.042	0.055	0.028	-	-	-	-
DOZER,CWLR, D-7H,PS	350	1,750	27	-	-	-	-	0.022	0.030	0.015	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	622	3,108	***27***	-	-	-	-	0.019	0.025	0.012	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			28	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	49	242	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	97	483	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	97	483	28	-	-	-	-	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,759	8,792	28	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	535	2,672	28	-	-	-	-	-	-	0.031	0.062	0.041	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	148	736	28	-	-	-	-	-	-	0.004	0.009	0.006	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	48	239	28	-	-	-	-	-	-	0.001	0.001	0.001	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	148	736	28	-	-	-	-	-	-	0.003	0.006	0.004	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,586	42,929	28	-	-	-	-	-	-	0.244	0.487	0.325	-	-
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	2	9	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	8,586	42,929	28	-	-	-	-	-	-	0.434	0.867	0.578	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	268	1,336	28	-	-	-	-	-	-	0.007	0.015	0.010	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,759	8,792	28	-	-	-	-	-	-	0.091	0.181	0.121	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	268	1,338	28	-	-	-	-	-	-	0.012	0.024	0.016	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	130	650	28	-	-	-	-	-	-	0.003	0.005	0.004	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,485	7,421	28	-	-	-	-	-	-	0.079	0.157	0.105	-	-

TABLE A-8

PM10 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	PM10 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	28	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	85	424	28	-	-	-	-	-	-	0.002	0.004	0.003	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	200	998	28	-	-	-	-	-	-	0.010	0.020	0.013	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	28	-	-	-	-	-	-	0.001	0.003	0.002	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	28	-	-	-	-	-	-	0.007	0.015	0.010	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	28	-	-	-	-	-	-	0.002	0.004	0.003	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	864	4,320	28	-	-	-	-	-	-	0.028	0.056	0.037	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	50	249	28	-	-	-	-	-	-	0.002	0.004	0.003	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	13	62	28	-	-	-	-	-	-	0.001	0.001	0.001	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	28	-	-	-	-	-	-	0.001	0.002	0.001	-	-
DOZER,CWLR, D-6H	455	2,275	28	-	-	-	-	-	-	0.021	0.042	0.028	-	-
DOZER,CWLR, D-7H	539	2,694	28	-	-	-	-	-	-	0.024	0.048	0.032	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	200	998	28	-	-	-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 10 - Mitigation				-	-	-	-	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	490	2,446	0	-	-	-	-	-	0.039	0.004	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	490	2,446	0	-	-	-	-	-	0.034	0.004	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	448	2,238	0	-	-	-	-	-	0.139	0.015	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	490	2,446	0	-	-	-	-	-	0.096	0.011	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	448	2,238	0	-	-	-	-	-	0.108	0.012	-	-	-	-
BLADE, ANGLE, HYDR (FOR D4	320	1,600	0	-	-	-	-	-	-	-	-	-	-	-
DOZER,CWLR, D-4H,PS (ADD BLADE)	320	1,600	0	-	-	-	-	-	0.044	0.005	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	80	400	0	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	80	400	0	-	-	-	-	-	0.016	0.002	-	-	-	-
			TOTALS	**-**	**-**	**0.55**	**2.05**	**3.73**	**4.67**	**2.82**	**2.56**	**1.34**	**-**	**-**

TABLE A-9

PM2.5 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	PM2.5 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9	-	-	0.000	0.000	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	60	300	9	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	6	26	9	-	-	0.000	0.001	-	-	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	9	45	9	-	-	0.001	0.001	-	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	9	45	9	-	-	0.001	0.001	-	-	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	9	-	-	0.001	0.003	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	9	45	9	-	-	0.000	0.001	-	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	1	4	9	-	-	0.000	0.000	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	9	-	-	0.001	0.002	-	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	9	45	9	-	-	0.000	0.001	-	-	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	293	1,463	9	-	-	0.012	0.023	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	293	1,463	9	-	-	0.021	0.041	-	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	3	13	9	-	-	0.000	0.000	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	60	300	9	-	-	0.004	0.009	-	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	3	13	9	-	-	0.000	0.000	-	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	47	234	9	-	-	0.003	0.007	-	-	-	-	-	-	-
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	497	2,482	9	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	9	-	-	0.002	0.004	-	-	-	-	-	-	-
GENERATOR, 5.5 KW, 120/240V,PORT	249	1,241	9	-	-	0.000	0.001	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	19	94	9	-	-	0.002	0.003	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	11	51	9	-	-	0.001	0.001	-	-	-	-	-	-	-
LDR,FE, CRWLR, 1.50 CY	4	20	9	-	-	0.000	0.000	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	61	304	9	-	-	0.003	0.006	-	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	9	-	-	0.001	0.002	-	-	-	-	-	-	-
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	54	270	9	-	-	0.004	0.007	-	-	-	-	-	-	-
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	80	398	9	-	-	0.008	0.016	-	-	-	-	-	-	-
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	54	270	9	-	-	0.004	0.007	-	-	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	80	398	9	-	-	0.005	0.010	-	-	-	-	-	-	-
MISC. POWER TOOLS	337	1,683	9	-	-	-	-	-	-	-	-	-	-	-
Haul,12CY (91M3) Trk, 6 Mi(10Km)	4	20	9	-	-	0.000	0.001	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 2 - Turkey Creek Conveyance			8	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	124	620	8	-	-	-	-	-	0.002	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	545	2,725	8	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	248	1,240	8	-	-	-	-	-	0.057	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	11	51	8	-	-	-	-	-	0.002	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	11	51	8	-	-	-	-	-	0.002	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	92	456	8	-	-	-	-	-	0.011	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	124	620	8	-	-	-	-	-	0.013	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	11	51	8	-	-	-	-	-	0.002	-	-	-	-	-
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	6	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	92	456	8	-	-	-	-	-	0.008	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	11	51	8	-	-	-	-	-	0.001	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	2,661	13,305	8	-	-	-	-	-	0.317	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2,661	13,305	8	-	-	-	-	-	0.565	-	-	-	-	-
MAP A10ET001	1	1	8	-	-	-	-	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	545	2,725	8	-	-	-	-	-	0.118	-	-	-	-	-

TABLE A-9

PM2.5 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	PM2.5 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	426	2,129	8	-	-	-	-	-	0.095	-	-	-	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	8	-	-	-	-	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	77	383	8	-	-	-	-	-	0.010	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	181	902	8	-	-	-	-	-	0.033	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 3 - Mary's Creek Conveyance			11	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11	-	-	-	-	0.000	0.000	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	739	3,692	11	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	13	64	11	-	-	-	-	0.002	0.001	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	17	84	11	-	-	-	-	0.002	0.001	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	17	84	11	-	-	-	-	0.002	0.001	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	96	476	11	-	-	-	-	0.009	0.003	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11	-	-	-	-	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	17	84	11	-	-	-	-	0.002	0.001	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	2	8	11	-	-	-	-	0.000	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	96	476	11	-	-	-	-	0.006	0.002	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	17	84	11	-	-	-	-	0.001	0.000	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3,606	18,027	11	-	-	-	-	0.313	0.117	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	3,606	18,027	11	-	-	-	-	0.557	0.209	-	-	-	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	3	15	11	-	-	-	-	0.000	0.000	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	7	32	11	-	-	-	-	0.001	0.000	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	739	3,692	11	-	-	-	-	0.116	0.044	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	8	40	11	-	-	-	-	0.001	0.000	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	144	717	11	-	-	-	-	0.009	0.003	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	577	2,884	11	-	-	-	-	0.093	0.035	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	246	1,227	11	-	-	-	-	0.038	0.014	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	222	1,106	11	-	-	-	-	0.025	0.009	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	62	307	11	-	-	-	-	0.009	0.004	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	77	11	-	-	-	-	0.003	0.001	-	-	-	-	-
DOZER,CWLR, D-6H,	82	409	11	-	-	-	-	0.012	0.004	-	-	-	-	-
DOZER,CWLR, D-7H	155	774	11	-	-	-	-	0.021	0.008	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	246	1,227	11	-	-	-	-	0.016	0.006	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 4 - Lower Clear Creek Conveyance			19	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19	-	-	0.000	0.000	0.000	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,289	6,441	19	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	293	1,461	19	-	-	0.011	0.043	0.014	-	-	-	-	-	-
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX	235	1,172	19	-	-	0.008	0.032	0.011	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	19	-	-	0.001	0.003	0.001	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	40	196	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	19	-	-	0.000	0.002	0.001	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	10	46	19	-	-	0.000	0.000	0.000	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	610	3,046	19	-	-	0.016	0.064	0.021	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7,052	35,257	19	-	-	0.236	0.945	0.315	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	146	730	19	-	-	0.003	0.011	0.004	-	-	-	-	-	-

TABLE A-9

PM2.5 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	PM2.5 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,289	6,441	19	-	-	0.044	0.176	0.059	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	146	730	19	-	-	0.004	0.017	0.006	-	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	29	141	19	-	-	0.000	0.002	0.001	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,117	5,584	19	-	-	0.039	0.157	0.052	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	242	1,210	19	-	-	0.008	0.032	0.011	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	19	-	-	0.001	0.004	0.001	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	19	-	-	0.005	0.019	0.006	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	19	-	-	0.001	0.006	0.002	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	134	668	19	-	-	0.003	0.011	0.004	-	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	61	303	19	-	-	0.002	0.007	0.002	-	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	76	19	-	-	0.000	0.002	0.001	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	19	-	-	0.001	0.002	0.001	-	-	-	-	-	-
DOZER,CWLR, D-4H	990	4,950	19	-	-	0.023	0.092	0.031	-	-	-	-	-	-
DOZER,CWLR, D-6H	495	2,473	19	-	-	0.015	0.061	0.020	-	-	-	-	-	-
DOZER,CWLR, D-7H	296	1,476	19	-	-	0.009	0.035	0.012	-	-	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	495	2,475	19	-	-	0.007	0.027	0.009	-	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	242	1,210	19	-	-	0.003	0.013	0.004	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	495	2,475	19	-	-	0.017	0.066	0.022	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 5 - RR Bridge Replacement at Mykawa														
Backhoe Loader, 45 HP, 5/8 CY	actor/Loader/Backh	1	2,100	-	-	-	-	-	-	0.009	0.009	-	-	-
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	1	1,800	-	-	-	-	-	-	0.027	0.027	-	-	-
Grader, self-propelled, 40,000 lb.	Graders	1	1,220	-	-	-	-	-	-	0.027	0.027	-	-	-
Pile driving hammer, air, 24,450 ft-lb	eneral Industrial Eq	1	600	-	-	-	-	-	-	-	-	-	-	-
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	1		-	-	-	-	-	-	0.009	0.009	-	-	-
Sheepsfoot roller, 240 HP	Rollers	1	300	-	-	-	-	-	-	0.007	0.007	-	-	-
Pneumatic Tire Roller, 80 HP	Rollers	1	600	-	-	-	-	-	-	0.009	0.009	-	-	-
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	actor/Loader/Backh	1	1,950	-	-	-	-	-	-	0.024	0.024	-	-	-
Vibrators, concrete, gas engine, 5 HP	Vibrators	1	200	-	-	-	-	-	-	0.002	0.002	-	-	-
Pump, concrete, truck mounted	Pumps	1	200	-	-	-	-	-	-	0.000	0.000	-	-	-
Swingloader-20,000 lb capacity 175 HP	Construction Equip	1	400	-	-	-	-	-	-	0.009	0.009	-	-	-
25 Ton Telescopic Railway Crane	Cranes	1	1,500	-	-	-	-	-	-	0.016	0.016	-	-	-
Rail Scrap Retriever	Construction Equip	1	500	-	-	-	-	-	-	0.004	0.004	-	-	-
Tie Plate Picker	Construction Equip	1	260	-	-	-	-	-	-	0.002	0.002	-	-	-
Truck, 45,000 lb GVW, 3 axle	Highway Truck	2	3,600	-	-	-	-	-	-	0.076	0.076	-	-	-
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	1	1,500	-	-	-	-	-	-	0.041	0.041	-	-	-
Hyd. Excav, Crawler 1.5 CY	Excavators	1	1,700	-	-	-	-	-	-	0.025	0.025	-	-	-
Rear Dump Truck 8 CY	Dumper/Tender	4	9,000	-	-	-	-	-	-	0.107	0.107	-	-	-
Rear Dump Truck, 12 CY	Dumper/Tender	3	6,000	-	-	-	-	-	-	0.072	0.072	-	-	-
Misc. Power Tools	eneral Industrial Eq	1	1,670	-	-	-	-	-	-	-	-	-	-	-
Gradall, 5/8 CY	Graders	1	1,050	-	-	-	-	-	-	0.020	0.020	-	-	-
Oiler, Truck	Off-Highway Truck	1	1,800	-	-	-	-	-	-	0.039	0.039	-	-	-
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27	-	-	-	-	-	-	-	-	-	-	-
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27	-	-	-	-	0.000	0.000	0.000	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,842	9,206	27	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	346	1,730	27	-	-	-	-	0.027	0.036	0.018	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	15	75	27	-	-	-	-	0.001	0.001	0.001	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	15	75	27	-	-	-	-	0.001	0.001	0.001	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	116	578	27	-	-	-	-	0.005	0.006	0.003	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	15	75	27	-	-	-	-	0.001	0.001	0.001	-	-	-	-

TABLE A-9

PM2.5 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	PM2.5 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	77	385	27	-	-	-	-	0.001	0.002	0.001	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1,600	7,999	27	-	-	-	-	0.046	0.061	0.030	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	15	75	27	-	-	-	-	0.000	0.001	0.000	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,990	44,950	27	-	-	-	-	0.357	0.476	0.238	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1,485	7,421	27	-	-	-	-	0.037	0.050	0.025	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	512	2,558	27	-	-	-	-	0.057	0.076	0.038	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	10,475	52,371	27	-	-	-	-	0.741	0.988	0.494	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	512	2,558	27	-	-	-	-	0.044	0.059	0.030	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	173	865	27	-	-	-	-	0.007	0.009	0.004	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,842	9,206	27	-	-	-	-	0.133	0.177	0.089	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	173	865	27	-	-	-	-	0.011	0.015	0.007	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	194	967	27	-	-	-	-	0.006	0.007	0.004	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,549	7,744	27	-	-	-	-	0.115	0.153	0.077	-	-	-	-
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	55	275	27	-	-	-	-	0.002	0.003	0.001	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	622	3,108	27	-	-	-	-	0.044	0.059	0.029	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	27	-	-	-	-	0.002	0.003	0.001	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	27	-	-	-	-	0.010	0.014	0.007	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	27	-	-	-	-	0.003	0.004	0.002	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	561	2,805	27	-	-	-	-	0.025	0.034	0.017	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	156	777	27	-	-	-	-	0.010	0.013	0.006	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	39	194	27	-	-	-	-	0.003	0.003	0.002	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	27	-	-	-	-	0.001	0.002	0.001	-	-	-	-
DOZER,CWLR, D-6H,PS	622	3,106	27	-	-	-	-	0.040	0.054	0.027	-	-	-	-
DOZER,CWLR, D-7H,PS	350	1,750	27	-	-	-	-	0.022	0.029	0.014	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	622	3,108	27	-	-	-	-	0.018	0.024	0.012	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			28	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	49	242	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	97	483	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	97	483	28	-	-	-	-	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,759	8,792	28	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	535	2,672	28	-	-	-	-	-	-	0.029	0.057	0.038	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	148	736	28	-	-	-	-	-	-	0.004	0.008	0.006	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	48	239	28	-	-	-	-	-	-	0.000	0.001	0.001	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	148	736	28	-	-	-	-	-	-	0.003	0.006	0.004	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,586	42,929	28	-	-	-	-	-	-	0.236	0.473	0.315	-	-
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	2	9	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	8,586	42,929	28	-	-	-	-	-	-	0.421	0.841	0.561	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	268	1,336	28	-	-	-	-	-	-	0.007	0.014	0.010	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,759	8,792	28	-	-	-	-	-	-	0.088	0.176	0.117	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	268	1,338	28	-	-	-	-	-	-	0.012	0.023	0.016	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	130	650	28	-	-	-	-	-	-	0.003	0.005	0.003	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,485	7,421	28	-	-	-	-	-	-	0.076	0.153	0.102	-	-

TABLE A-9

PM2.5 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	PM2.5 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	28	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	85	424	28	-	-	-	-	-	-	0.002	0.004	0.003	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	200	998	28	-	-	-	-	-	-	0.010	0.020	0.013	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	28	-	-	-	-	-	-	0.001	0.003	0.002	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	28	-	-	-	-	-	-	0.007	0.014	0.009	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	28	-	-	-	-	-	-	0.002	0.004	0.003	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	864	4,320	28	-	-	-	-	-	-	0.027	0.054	0.036	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	50	249	28	-	-	-	-	-	-	0.002	0.004	0.003	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	13	62	28	-	-	-	-	-	-	0.001	0.001	0.001	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	28	-	-	-	-	-	-	0.001	0.002	0.001	-	-
DOZER,CWLR, D-6H	455	2,275	28	-	-	-	-	-	-	0.020	0.041	0.027	-	-
DOZER,CWLR, D-7H	539	2,694	28	-	-	-	-	-	-	0.023	0.046	0.031	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	200	998	28	-	-	-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 10 - Mitigation				-	-	-	-	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	490	2,446	0	-	-	-	-	-	0.038	0.004	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	490	2,446	0	-	-	-	-	-	0.033	0.004	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	448	2,238	0	-	-	-	-	-	0.135	0.015	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	490	2,446	0	-	-	-	-	-	0.093	0.010	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	448	2,238	0	-	-	-	-	-	0.105	0.012	-	-	-	-
BLADE, ANGLE, HYDR (FOR D4	320	1,600	0	-	-	-	-	-	-	-	-	-	-	-
DOZER,CWLR, D-4H,PS (ADD BLADE)	320	1,600	0	-	-	-	-	-	0.042	0.005	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	80	400	0	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	80	400	0	-	-	-	-	-	0.015	0.002	-	-	-	-
			TOTALS	**-**	**-**	**0.53**	**1.98**	**3.62**	**4.52**	**2.73**	**2.48**	**1.30**	**-**	**-**

TABLE A-10

CO Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	CO Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9	-	-	0.000	0.000	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	60	300	9	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	6	26	9	-	-	0.016	0.031	-	-	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	9	45	9	-	-	0.002	0.004	-	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	9	45	9	-	-	0.002	0.005	-	-	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	9	-	-	0.008	0.016	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	9	45	9	-	-	0.003	0.005	-	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	1	4	9	-	-	0.000	0.000	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	9	-	-	0.006	0.012	-	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	9	45	9	-	-	0.002	0.003	-	-	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	293	1,463	9	-	-	0.066	0.131	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	293	1,463	9	-	-	0.090	0.181	-	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	3	13	9	-	-	0.000	0.001	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	60	300	9	-	-	0.023	0.045	-	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	3	13	9	-	-	0.001	0.001	-	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	47	234	9	-	-	0.015	0.030	-	-	-	-	-	-	-
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	497	2,482	9	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	9	-	-	0.007	0.015	-	-	-	-	-	-	-
GENERATOR, 5.5 KW, 120/240V,PORT	249	1,241	9	-	-	2.758	5.515	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	19	94	9	-	-	0.010	0.020	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	11	51	9	-	-	0.002	0.004	-	-	-	-	-	-	-
LDR,FE, CRWLR, 1.50 CY	4	20	9	-	-	0.002	0.003	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	61	304	9	-	-	0.015	0.031	-	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	9	-	-	0.008	0.015	-	-	-	-	-	-	-
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	54	270	9	-	-	0.014	0.028	-	-	-	-	-	-	-
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	80	398	9	-	-	0.050	0.099	-	-	-	-	-	-	-
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	54	270	9	-	-	0.014	0.028	-	-	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	80	398	9	-	-	0.021	0.043	-	-	-	-	-	-	-
MISC. POWER TOOLS	337	1,683	9	-	-	-	-	-	-	-	-	-	-	-
Haul,12CY (91M3) Trk, 6 Mi(10Km)	4	20	9	-	-	0.001	0.003	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 2 - Turkey Creek Conveyance			8	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	124	620	8	-	-	-	-	-	2.662	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	545	2,725	8	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	248	1,240	8	-	-	-	-	-	2.232	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	11	51	8	-	-	-	-	-	0.007	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	11	51	8	-	-	-	-	-	0.008	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	92	456	8	-	-	-	-	-	0.069	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	124	620	8	-	-	-	-	-	0.071	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	11	51	8	-	-	-	-	-	0.009	-	-	-	-	-
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	6	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	92	456	8	-	-	-	-	-	0.049	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	11	51	8	-	-	-	-	-	0.006	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8	-	-	-	-	-	0.001	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	2,661	13,305	8	-	-	-	-	-	1.790	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2,661	13,305	8	-	-	-	-	-	2.468	-	-	-	-	-
MAP A10ET001	1	1	8	-	-	-	-	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	545	2,725	8	-	-	-	-	-	0.617	-	-	-	-	-

TABLE A-10

CO Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	CO Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	426	2,129	8	-	-	-	-	-	0.411	-	-	-	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	8	-	-	-	-	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	77	383	8	-	-	-	-	-	0.058	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	181	902	8	-	-	-	-	-	0.145	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 3 - Mary's Creek Conveyance			11	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11	-	-	-	-	0.000	0.000	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	739	3,692	11	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	13	64	11	-	-	-	-	0.084	0.031	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	17	84	11	-	-	-	-	0.009	0.003	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	17	84	11	-	-	-	-	0.009	0.003	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	96	476	11	-	-	-	-	0.052	0.020	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11	-	-	-	-	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	17	84	11	-	-	-	-	0.010	0.004	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	2	8	11	-	-	-	-	0.000	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	96	476	11	-	-	-	-	0.038	0.014	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	17	84	11	-	-	-	-	0.007	0.002	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3,606	18,027	11	-	-	-	-	1.763	0.661	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	3,606	18,027	11	-	-	-	-	2.432	0.912	-	-	-	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	3	15	11	-	-	-	-	0.001	0.000	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	7	32	11	-	-	-	-	0.004	0.001	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	739	3,692	11	-	-	-	-	0.608	0.228	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	8	40	11	-	-	-	-	0.004	0.002	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	144	717	11	-	-	-	-	0.057	0.021	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	577	2,884	11	-	-	-	-	0.405	0.152	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	246	1,227	11	-	-	-	-	0.166	0.062	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	222	1,106	11	-	-	-	-	0.137	0.051	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	62	307	11	-	-	-	-	0.052	0.019	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	77	11	-	-	-	-	0.014	0.005	-	-	-	-	-
DOZER,CWLR, D-6H,	82	409	11	-	-	-	-	0.046	0.017	-	-	-	-	-
DOZER,CWLR, D-7H	155	774	11	-	-	-	-	0.091	0.034	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	246	1,227	11	-	-	-	-	0.068	0.025	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 4 - Lower Clear Creek Conveyance			19	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19	-	-	0.000	0.000	0.000	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,289	6,441	19	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	293	1,461	19	-	-	0.415	1.661	0.554	-	-	-	-	-	-
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	10	46	19	-	-	0.001	0.003	0.001	-	-	-	-	-	-
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX	235	1,172	19	-	-	0.035	0.140	0.047	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	10	46	19	-	-	0.001	0.004	0.001	-	-	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	19	-	-	0.004	0.015	0.005	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	10	46	19	-	-	0.001	0.005	0.002	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	40	196	19	-	-	0.002	0.006	0.002	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	19	-	-	0.003	0.011	0.004	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	10	46	19	-	-	0.001	0.003	0.001	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	610	3,046	19	-	-	0.070	0.279	0.093	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7,052	35,257	19	-	-	1.033	4.130	1.377	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	146	730	19	-	-	0.012	0.048	0.016	-	-	-	-	-	-

TABLE A-10

CO Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	CO Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,289	6,441	19	-	-	0.230	0.921	0.307	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	146	730	19	-	-	0.017	0.070	0.023	-	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	29	141	19	-	-	0.002	0.010	0.003	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,117	5,584	19	-	-	0.170	0.681	0.227	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	242	1,210	19	-	-	0.035	0.142	0.047	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	19	-	-	0.004	0.014	0.005	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	19	-	-	0.030	0.120	0.040	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	19	-	-	0.006	0.023	0.008	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	134	668	19	-	-	0.016	0.064	0.021	-	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	61	303	19	-	-	0.010	0.039	0.013	-	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	76	19	-	-	0.003	0.011	0.004	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	19	-	-	0.004	0.015	0.005	-	-	-	-	-	-
DOZER,CWLR, D-4H	990	4,950	19	-	-	0.158	0.633	0.211	-	-	-	-	-	-
DOZER,CWLR, D-6H	495	2,473	19	-	-	0.061	0.244	0.081	-	-	-	-	-	-
DOZER,CWLR, D-7H	296	1,476	19	-	-	0.038	0.150	0.050	-	-	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	495	2,475	19	-	-	0.030	0.119	0.040	-	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	242	1,210	19	-	-	0.015	0.058	0.019	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	495	2,475	19	-	-	0.072	0.290	0.097	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 5 - RR Bridge Replacement at Mykawa														
Backhoe Loader, 45 HP, 5/8 CY	actor/Loader/Backh	1	2,100	-	-	-	-	-	-	0.053	0.053	-	-	-
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	1	1,800	-	-	-	-	-	-	0.107	0.107	-	-	-
Grader, self-propelled, 40,000 lb.	Graders	1	1,220	-	-	-	-	-	-	0.106	0.106	-	-	-
Pile driving hammer, air, 24,450 ft-lb	eneral Industrial Eq	1	600	-	-	-	-	-	-	-	-	-	-	-
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	1		-	-	-	-	-	-	0.041	0.041	-	-	-
Sheepsfoot roller, 240 HP	Rollers	1	300	-	-	-	-	-	-	0.029	0.029	-	-	-
Pneumatic Tire Roller, 80 HP	Rollers	1	600	-	-	-	-	-	-	0.062	0.062	-	-	-
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	actor/Loader/Backh	1	1,950	-	-	-	-	-	-	0.133	0.133	-	-	-
Vibrators, concrete, gas engine, 5 HP	Vibrators	1	200	-	-	-	-	-	-	0.092	0.092	-	-	-
Pump, concrete, truck mounted	Pumps	1	200	-	-	-	-	-	-	0.002	0.002	-	-	-
Swingloader-20,000 lb capacity 175 HP	Construction Equip	1	400	-	-	-	-	-	-	0.033	0.033	-	-	-
25 Ton Telescopic Railway Crane	Cranes	1	1,500	-	-	-	-	-	-	0.056	0.056	-	-	-
Rail Scrap Retriever	Construction Equip	1	500	-	-	-	-	-	-	0.018	0.018	-	-	-
Tie Plate Picker	Construction Equip	1	260	-	-	-	-	-	-	0.009	0.009	-	-	-
Truck, 45,000 lb GVW, 3 axle	Highway Truck	2	3,600	-	-	-	-	-	-	0.334	0.334	-	-	-
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	1	1,500	-	-	-	-	-	-	0.234	0.234	-	-	-
Hyd. Excav, Crawler 1.5 CY	Excavators	1	1,700	-	-	-	-	-	-	0.101	0.101	-	-	-
Rear Dump Truck 8 CY	Dumper/Tender	4	9,000	-	-	-	-	-	-	0.605	0.605	-	-	-
Rear Dump Truck, 12 CY	Dumper/Tender	3	6,000	-	-	-	-	-	-	0.404	0.404	-	-	-
Misc. Power Tools	eneral Industrial Eq	1	1,670	-	-	-	-	-	-	-	-	-	-	-
Gradall, 5/8 CY	Graders	1	1,050	-	-	-	-	-	-	0.082	0.082	-	-	-
Oiler, Truck	Off-Highway Truck	1	1,800	-	-	-	-	-	-	0.147	0.147	-	-	-
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27	-	-	-	-	-	-	-	-	-	-	-
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27	-	-	-	-	0.000	0.000	0.000	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,842	9,206	27	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	346	1,730	27	-	-	-	-	1.038	1.384	0.692	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	15	75	27	-	-	-	-	0.004	0.005	0.002	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	15	75	27	-	-	-	-	0.004	0.005	0.003	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	116	578	27	-	-	-	-	0.029	0.039	0.019	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	15	75	27	-	-	-	-	0.004	0.006	0.003	-	-	-	-

TABLE A-10

CO Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	CO Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	77	385	27	-	-	-	-	0.006	0.009	0.004	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1,600	7,999	27	-	-	-	-	0.289	0.386	0.193	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	15	75	27	-	-	-	-	0.003	0.004	0.002	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,990	44,950	27	-	-	-	-	2.015	2.687	1.344	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1,485	7,421	27	-	-	-	-	0.163	0.218	0.109	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	512	2,558	27	-	-	-	-	0.322	0.430	0.215	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	10,475	52,371	27	-	-	-	-	3.238	4.317	2.159	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	512	2,558	27	-	-	-	-	0.250	0.333	0.166	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	173	865	27	-	-	-	-	0.030	0.040	0.020	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,842	9,206	27	-	-	-	-	0.695	0.926	0.463	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	173	865	27	-	-	-	-	0.044	0.058	0.029	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	194	967	27	-	-	-	-	0.035	0.047	0.023	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,549	7,744	27	-	-	-	-	0.499	0.665	0.332	-	-	-	-
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	55	275	27	-	-	-	-	0.007	0.010	0.005	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	622	3,108	27	-	-	-	-	0.192	0.256	0.128	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	27	-	-	-	-	0.007	0.010	0.005	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	27	-	-	-	-	0.063	0.084	0.042	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	27	-	-	-	-	0.012	0.016	0.008	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	561	2,805	27	-	-	-	-	0.142	0.189	0.094	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	156	777	27	-	-	-	-	0.053	0.071	0.036	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	39	194	27	-	-	-	-	0.014	0.019	0.010	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	27	-	-	-	-	0.008	0.010	0.005	-	-	-	-
DOZER,CWLR, D-6H,PS	622	3,106	27	-	-	-	-	0.162	0.216	0.108	-	-	-	-
DOZER,CWLR, D-7H,PS	350	1,750	27	-	-	-	-	0.094	0.125	0.063	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	622	3,108	27	-	-	-	-	0.079	0.105	0.053	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 9 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			28	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	49	242	28	-	-	-	-	-	-	0.183	0.366	0.244	-	-
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	97	483	28	-	-	-	-	-	-	0.243	0.487	0.325	-	-
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	97	483	28	-	-	-	-	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,759	8,792	28	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	535	2,672	28	-	-	-	-	-	-	1.110	2.219	1.480	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	2	9	28	-	-	-	-	-	-	0.000	0.001	0.000	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	2	9	28	-	-	-	-	-	-	0.000	0.001	0.000	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	148	736	28	-	-	-	-	-	-	0.026	0.051	0.034	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	2	9	28	-	-	-	-	-	-	0.000	0.001	0.000	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	48	239	28	-	-	-	-	-	-	0.003	0.006	0.004	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	148	736	28	-	-	-	-	-	-	0.018	0.037	0.025	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,586	42,929	28	-	-	-	-	-	-	1.332	2.665	1.777	-	-
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	2	9	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	8,586	42,929	28	-	-	-	-	-	-	1.838	3.675	2.450	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2	9	28	-	-	-	-	-	-	0.001	0.001	0.001	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	268	1,336	28	-	-	-	-	-	-	0.032	0.065	0.043	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	1,759	8,792	28	-	-	-	-	-	-	0.459	0.919	0.613	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	268	1,338	28	-	-	-	-	-	-	0.047	0.094	0.062	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	130	650	28	-	-	-	-	-	-	0.016	0.033	0.022	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,485	7,421	28	-	-	-	-	-	-	0.331	0.662	0.441	-	-

TABLE A-10

CO Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	CO Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	28	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	85	424	28	-	-	-	-	-	-	0.007	0.015	0.010	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	200	998	28	-	-	-	-	-	-	0.043	0.085	0.057	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	28	-	-	-	-	-	-	0.005	0.010	0.007	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	28	-	-	-	-	-	-	0.044	0.087	0.058	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	28	-	-	-	-	-	-	0.009	0.017	0.011	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	864	4,320	28	-	-	-	-	-	-	0.151	0.302	0.201	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	50	249	28	-	-	-	-	-	-	0.012	0.024	0.016	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	13	62	28	-	-	-	-	-	-	0.003	0.006	0.004	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	28	-	-	-	-	-	-	0.005	0.011	0.007	-	-
DOZER,CWLR, D-6H	455	2,275	28	-	-	-	-	-	-	0.082	0.164	0.109	-	-
DOZER,CWLR, D-7H	539	2,694	28	-	-	-	-	-	-	0.100	0.200	0.133	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	200	998	28	-	-	-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 10 - Mitigation				-	-	-	-	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	490	2,446	0	-	-	-	-	-	0.239	0.027	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	490	2,446	0	-	-	-	-	-	0.145	0.016	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	448	2,238	0	-	-	-	-	-	0.761	0.085	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	490	2,446	0	-	-	-	-	-	0.408	0.045	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	448	2,238	0	-	-	-	-	-	0.590	0.066	-	-	-	-
BLADE, ANGLE, HYDR (FOR D4	320	1,600	0	-	-	-	-	-	-	-	-	-	-	-
DOZER,CWLR, D-4H,PS (ADD BLADE)	320	1,600	0	-	-	-	-	-	0.292	0.032	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	80	400	0	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	80	400	0	-	-	-	-	-	0.067	0.007	-	-	-	-
			TOTALS	**-**	**-**	**5.61**	**16.18**	**18.86**	**28.04**	**15.36**	**14.85**	**8.14**	**-**	**-**

TABLE A-11

SO2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	SO2 Emissions (tons per year)										
				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9	-	-	0.000	0.000	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	60	300	9	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	6	26	9	-	-	0.000	0.000	-	-	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	9	45	9	-	-	0.001	0.002	-	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	9	45	9	-	-	0.001	0.002	-	-	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	9	-	-	0.002	0.003	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	9	45	9	-	-	0.001	0.001	-	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	4	9	-	-	0.000	0.000	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER,	32	160	9	-	-	0.001	0.002	-	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	9	45	9	-	-	0.000	0.000	-	-	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	293	1,463	9	-	-	0.034	0.068	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	293	1,463	9	-	-	0.055	0.109	-	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	3	13	9	-	-	0.000	0.000	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	60	300	9	-	-	0.012	0.025	-	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	3	13	9	-	-	0.000	0.001	-	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	47	234	9	-	-	0.009	0.018	-	-	-	-	-	-	-
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	497	2,482	9	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	9	-	-	0.005	0.011	-	-	-	-	-	-	-
GENERATOR, 5.5 KW, 120/240V,PORT	249	1,241	9	-	-	0.001	0.001	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	19	94	9	-	-	0.005	0.009	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	11	51	9	-	-	0.001	0.002	-	-	-	-	-	-	-
LDR,FE, CRWLR, 1.50 CY	4	20	9	-	-	0.000	0.001	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	61	304	9	-	-	0.004	0.007	-	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	9	-	-	0.003	0.005	-	-	-	-	-	-	-
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	54	270	9	-	-	0.007	0.014	-	-	-	-	-	-	-
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	80	398	9	-	-	0.021	0.042	-	-	-	-	-	-	-
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	54	270	9	-	-	0.007	0.014	-	-	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	80	398	9	-	-	0.013	0.026	-	-	-	-	-	-	-
MISC. POWER TOOLS	337	1,683	9	-	-	-	-	-	-	-	-	-	-	-
Haul,12CY (91M3) Trk, 6 Mi(10Km)	4	20	9	-	-	0.001	0.002	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 2 - Turkey Creek Conveyance			8	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	124	620	8	-	-	-	-	-	0.006	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	545	2,725	8	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	248	1,240	8	-	-	-	-	-	0.001	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	11	51	8	-	-	-	-	-	0.004	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	11	51	8	-	-	-	-	-	0.004	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	92	456	8	-	-	-	-	-	0.014	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	124	620	8	-	-	-	-	-	0.015	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	11	51	8	-	-	-	-	-	0.002	-	-	-	-	-
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	6	8	-	-	-	-	-	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER,	92	456	8	-	-	-	-	-	0.007	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	11	51	8	-	-	-	-	-	0.001	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-

TABLE A-11

SO2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

									Hrs/Day:		10			
									Day/Week:		5			
									Week/Month:		4.5			
									Month/Year:		12			
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	2,661	13,305	8	-	-	-	-	-	0.925	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2,661	13,305	8	-	-	-	-	-	1.494	-	-	-	-	-
MAP A10ET001	1	1	8	-	-	-	-	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	545	2,725	8	-	-	-	-	-	0.335	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	426	2,129	8	-	-	-	-	-	0.249	-	-	-	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8	-	-	-	-	-	0.000	-	-	-	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	8	-	-	-	-	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	77	383	8	-	-	-	-	-	0.014	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	181	902	8	-	-	-	-	-	0.088	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 3 - Mary's Creek Conveyance			11	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11	-	-	-	-	0.000	0.000	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	739	3,692	11	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	13	64	11	-	-	-	-	0.000	0.000	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	17	84	11	-	-	-	-	0.005	0.002	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	17	84	11	-	-	-	-	0.005	0.002	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	96	476	11	-	-	-	-	0.010	0.004	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11	-	-	-	-	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	17	84	11	-	-	-	-	0.002	0.001	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	8	11	-	-	-	-	0.000	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER,	96	476	11	-	-	-	-	0.005	0.002	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	17	84	11	-	-	-	-	0.001	0.000	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3,606	18,027	11	-	-	-	-	0.911	0.342	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	3,606	18,027	11	-	-	-	-	1.472	0.552	-	-	-	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	3	15	11	-	-	-	-	0.001	0.000	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	7	32	11	-	-	-	-	0.001	0.000	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	739	3,692	11	-	-	-	-	0.331	0.124	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	8	40	11	-	-	-	-	0.002	0.001	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	144	717	11	-	-	-	-	0.050	0.019	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	577	2,884	11	-	-	-	-	0.246	0.092	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	246	1,227	11	-	-	-	-	0.100	0.038	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	222	1,106	11	-	-	-	-	0.029	0.011	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	62	307	11	-	-	-	-	0.011	0.004	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	77	11	-	-	-	-	0.003	0.001	-	-	-	-	-
DOZER,CWLR, D-6H,	82	409	11	-	-	-	-	0.024	0.009	-	-	-	-	-
DOZER,CWLR, D-7H	155	774	11	-	-	-	-	0.055	0.021	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	246	1,227	11	-	-	-	-	0.041	0.015	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 4 - Lower Clear Creek Conveyance			19	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19	-	-	0.000	0.000	0.000	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,289	6,441	19	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	293	1,461	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	10	46	19	-	-	0.000	0.002	0.001	-	-	-	-	-	-
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX DIGGING	235	1,172	19	-	-	0.021	0.086	0.029	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	10	46	19	-	-	0.001	0.002	0.001	-	-	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	19	-	-	0.001	0.003	0.001	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	10	46	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	40	196	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-

TABLE A-11

SO2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

									Hrs/Day:		10			
									Day/Week:		5			
									Week/Month:		4.5			
									Month/Year:		12			
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER,	32	160	19	-	-	0.000	0.002	0.001	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	10	46	19	-	-	0.000	0.000	0.000	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	610	3,046	19	-	-	0.042	0.169	0.056	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7,052	35,257	19	-	-	0.625	2.500	0.833	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	146	730	19	-	-	0.005	0.020	0.007	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,289	6,441	19	-	-	0.125	0.501	0.167	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	146	730	19	-	-	0.009	0.036	0.012	-	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	29	141	19	-	-	0.000	0.001	0.000	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,117	5,584	19	-	-	0.103	0.413	0.138	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	242	1,210	19	-	-	0.021	0.086	0.029	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	19	-	-	0.003	0.010	0.003	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	19	-	-	0.014	0.055	0.018	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	19	-	-	0.003	0.012	0.004	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	134	668	19	-	-	0.004	0.015	0.005	-	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	61	303	19	-	-	0.002	0.010	0.003	-	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	76	19	-	-	0.001	0.003	0.001	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	19	-	-	0.001	0.005	0.002	-	-	-	-	-	-
DOZER,CWLR, D-4H	990	4,950	19	-	-	0.034	0.135	0.045	-	-	-	-	-	-
DOZER,CWLR, D-6H	495	2,473	19	-	-	0.031	0.126	0.042	-	-	-	-	-	-
DOZER,CWLR, D-7H	296	1,476	19	-	-	0.023	0.091	0.030	-	-	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	495	2,475	19	-	-	0.018	0.072	0.024	-	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	242	1,210	19	-	-	0.009	0.035	0.012	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	495	2,475	19	-	-	0.044	0.175	0.058	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 5 - RR Bridge Replacement at Mykawa														
Backhoe Loader, 45 HP, 5/8 CY	actor/Loader/Backh	1	2,100	-	-	-	-	-	-	0.011	0.011	-	-	-
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	1	1,800	-	-	-	-	-	-	0.056	0.056	-	-	-
Grader, self-propelled, 40,000 lb.	Graders	1	1,220	-	-	-	-	-	-	0.055	0.055	-	-	-
Pile driving hammer, air, 24,450 ft-lb	eneral Industrial Eq	1	600	-	-	-	-	-	-	-	-	-	-	-
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	1		-	-	-	-	-	-	0.025	0.025	-	-	-
Sheepsfoot roller, 240 HP	Rollers	1	300	-	-	-	-	-	-	0.018	0.018	-	-	-
Pneumatic Tire Roller, 80 HP	Rollers	1	600	-	-	-	-	-	-	0.013	0.013	-	-	-
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	actor/Loader/Backh	1	1,950	-	-	-	-	-	-	0.029	0.029	-	-	-
Vibrators, concrete, gas engine, 5 HP	Vibrators	1	200	-	-	-	-	-	-	0.000	0.000	-	-	-
Pump, concrete, truck mounted	Pumps	1	200	-	-	-	-	-	-	0.001	0.001	-	-	-
Swingloader-20,000 lb capacity 175 HP	Construction Equip	1	400	-	-	-	-	-	-	0.017	0.017	-	-	-
25 Ton Telescopic Railway Crane	Cranes	1	1,500	-	-	-	-	-	-	0.040	0.040	-	-	-
Rail Scrap Retriever	Construction Equip	1	500	-	-	-	-	-	-	0.006	0.006	-	-	-
Tie Plate Picker	Construction Equip	1	260	-	-	-	-	-	-	0.003	0.003	-	-	-
Truck, 45,000 lb GVW, 3 axle	Highway Truck	2	3,600	-	-	-	-	-	-	0.202	0.202	-	-	-
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	1	1,500	-	-	-	-	-	-	0.121	0.121	-	-	-
Hyd. Excav, Crawler 1.5 CY	Excavators	1	1,700	-	-	-	-	-	-	0.053	0.053	-	-	-
Rear Dump Truck 8 CY	Dumper/Tender	4	9,000	-	-	-	-	-	-	0.313	0.313	-	-	-
Rear Dump Truck, 12 CY	Dumper/Tender	3	6,000	-	-	-	-	-	-	0.209	0.209	-	-	-
Misc. Power Tools	eneral Industrial Eq	1	1,670	-	-	-	-	-	-	-	-	-	-	-
Gradall, 5/8 CY	Graders	1	1,050	-	-	-	-	-	-	0.042	0.042	-	-	-
Oiler, Truck	Off-Highway Truck	1	1,800	-	-	-	-	-	-	0.077	0.077	-	-	-
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27	-	-	-	-	-	-	-	-	-	-	-
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27	-	-	-	-	0.000	0.000	0.000	-	-	-	-

TABLE A-11

SO2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

									Hrs/Day:		10				
									Day/Week:		5				
									Week/Month:		4.5				
									Month/Year:		12				
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,842	9,206	27	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	346	1,730	27	-	-	-	-	0.000	0.001	0.000	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	15	75	27	-	-	-	-	0.002	0.002	0.001	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	15	75	27	-	-	-	-	0.002	0.003	0.001	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	116	578	27	-	-	-	-	0.006	0.008	0.004	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	15	75	27	-	-	-	-	0.001	0.001	0.001	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET (BOBCAT), 13 CWT (590 KG)	77	385	27	-	-	-	-	0.001	0.002	0.001	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER,	1,600	7,999	27	-	-	-	-	0.040	0.053	0.027	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	15	75	27	-	-	-	-	0.000	0.001	0.000	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,990	44,950	27	-	-	-	-	1.041	1.389	0.694	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1,485	7,421	27	-	-	-	-	0.099	0.132	0.066	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	512	2,558	27	-	-	-	-	0.167	0.222	0.111	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	10,475	52,371	27	-	-	-	-	1.960	2.613	1.306	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	512	2,558	27	-	-	-	-	0.129	0.172	0.086	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	173	865	27	-	-	-	-	0.013	0.017	0.008	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,842	9,206	27	-	-	-	-	0.378	0.504	0.252	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	173	865	27	-	-	-	-	0.023	0.030	0.015	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	194	967	27	-	-	-	-	0.005	0.006	0.003	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,549	7,744	27	-	-	-	-	0.302	0.403	0.202	-	-	-	-
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	55	275	27	-	-	-	-	0.006	0.008	0.004	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	622	3,108	27	-	-	-	-	0.116	0.155	0.078	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	27	-	-	-	-	0.005	0.007	0.004	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	27	-	-	-	-	0.029	0.039	0.019	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	27	-	-	-	-	0.006	0.009	0.004	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	561	2,805	27	-	-	-	-	0.034	0.046	0.023	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	156	777	27	-	-	-	-	0.013	0.017	0.009	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	39	194	27	-	-	-	-	0.003	0.005	0.002	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	27	-	-	-	-	0.003	0.003	0.002	-	-	-	-
DOZER,CWLR, D-6H,PS	622	3,106	27	-	-	-	-	0.083	0.111	0.056	-	-	-	-
DOZER,CWLR, D-7H,PS	350	1,750	27	-	-	-	-	0.057	0.076	0.038	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	622	3,108	27	-	-	-	-	0.048	0.064	0.032	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			28	-	-	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	49	242	28	-	-	-	-	-	-	0.000	0.001	0.000	-	-
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	97	483	28	-	-	-	-	-	-	0.000	0.001	0.001	-	-
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	97	483	28	-	-	-	-	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,759	8,792	28	-	-	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	535	2,672	28	-	-	-	-	-	-	0.000	0.001	0.001	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	148	736	28	-	-	-	-	-	-	0.005	0.010	0.007	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET (BOBCAT), 13 CWT (590 KG)	48	239	28	-	-	-	-	-	-	0.001	0.001	0.001	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER,	148	736	28	-	-	-	-	-	-	0.003	0.005	0.003	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	2	9	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8 M)	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,586	42,929	28	-	-	-	-	-	-	0.689	1.377	0.918	-	-
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	2	9	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	8,586	42,929	28	-	-	-	-	-	-	1.112	2.224	1.483	-	-

TABLE A-11

SO2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

									Hrs/Day:		10			
									Day/Week:		5			
									Week/Month:		4.5			
									Month/Year:		12			
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2	9	28	-	-	-	-	-	-	0.000	0.001	0.000	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	28	-	-	-	-	-	-	0.000	0.000	0.000	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	268	1,336	28	-	-	-	-	-	-	0.014	0.027	0.018	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,759	8,792	28	-	-	-	-	-	-	0.250	0.500	0.333	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	268	1,338	28	-	-	-	-	-	-	0.024	0.048	0.032	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	130	650	28	-	-	-	-	-	-	0.002	0.005	0.003	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,485	7,421	28	-	-	-	-	-	-	0.201	0.401	0.267	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	28	-	-	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	85	424	28	-	-	-	-	-	-	0.005	0.010	0.007	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	28	-	-	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	28	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	200	998	28	-	-	-	-	-	-	0.026	0.052	0.034	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	28	-	-	-	-	-	-	0.004	0.007	0.005	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	28	-	-	-	-	-	-	0.020	0.040	0.027	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	28	-	-	-	-	-	-	0.004	0.009	0.006	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	864	4,320	28	-	-	-	-	-	-	0.036	0.073	0.049	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	50	249	28	-	-	-	-	-	-	0.003	0.006	0.004	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	13	62	28	-	-	-	-	-	-	0.001	0.002	0.001	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	28	-	-	-	-	-	-	0.002	0.004	0.002	-	-
DOZER,CWLR, D-6H	455	2,275	28	-	-	-	-	-	-	0.042	0.085	0.056	-	-
DOZER,CWLR, D-7H	539	2,694	28	-	-	-	-	-	-	0.061	0.121	0.081	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	200	998	28	-	-	-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-	-	-
Contract 10 - Mitigation				-	-	-	-	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M) DIPPER,	490	2,446	0	-	-	-	-	-	0.033	0.004	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	490	2,446	0	-	-	-	-	-	0.088	0.010	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	448	2,238	0	-	-	-	-	-	0.393	0.044	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	490	2,446	0	-	-	-	-	-	0.247	0.027	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	448	2,238	0	-	-	-	-	-	0.305	0.034	-	-	-	-
BLADE, ANGLE, HYDR (FOR D4	320	1,600	0	-	-	-	-	-	-	-	-	-	-	-
DOZER,CWLR, D-4H,PS (ADD BLADE)	320	1,600	0	-	-	-	-	-	0.062	0.007	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	80	400	0	-	-	-	-	-	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	80	400	0	-	-	-	-	-	0.040	0.004	-	-	-	-
			TOTALS	**-**	**-**	**1.33**	**4.94**	**9.40**	**11.66**	**6.97**	**6.30**	**3.34**	**-**	**-**

Attachment B

Public Notice and Publisher’s Affidavit

A F F I D A V I T

Attachment

NOTICE OF PUBLIC MEETING AND AVAILABILITY OF THE DRAFT GENERAL REEVALUATION REPORT, DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT CLEAR CREEK GENERAL REEVALUATION STUDY AND DRAFT GENERAL CONFORMITY DETERMINATION

Interested parties are hereby notified of and invited to attend an open house and public meeting to be conducted by the U.S. Army Corps of Engineers on: WEDNESDAY JANUARY 11, 2012 OPEN HOUSE 5:30 PM TO 6:30 PM PUBLIC MEETING 7:00 PM TO 8:30 PM MARIE SPENCE FLICKENGER FINE ARTS BUILDING SAN JACINTO COLLEGE SOUTH 13735 BEAMER ROAD, HOUSTON, TEXAS

The meeting will provide an opportunity for all persons to comment on the Draft General Reevaluation Report (DGRR), Draft Supplemental Environmental Impact Statement (DSEIS), and the Draft General Conformity Determination (DGCD). Those unable to attend may find the DGRR, DSEIS, and DGCD at http://www.swg.usace.army.mil/pao/HotTopic.asp. Written comments on the DGRR/DSEIS and the DGCD must be postmarked by January 30, 2012. Comments may be mailed or emailed to: GALVESTON DISTRICT, CORPS OF ENGINEERS, ATTN: MS. ANDREA CATANZARO, P.O. BOX 1229 GALVESTON, TEXAS 77553 or andrea.catanzaro@usace.army.mil

Published: December 16, 2011
00285440

County of Galveston §
§
State of Texas §

Before me, the undersigned authority, on this day personally came and appeared **Lois Colvin**, to me well known (or proved to me on the basis of satisfactory evidence), and who after being duly sworn (affirmed) did depose and say that she is an **AGENT** for **THE GALVESTON COUNTY DAILY NEWS**, a newspaper of general circulation, which has been continuously and regularly published for a period of not less than one year, in the County of Galveston, and that the **NOTICE**, a copy of which is hereto attached was published in said newspaper on the following days, to wit:

December 16, 2011

Lois Colvin
Agent Signature

Sworn and subscribed before me

On this the 16th day of Dec, 2011

Lynette Tisdale
Notary for the State of Texas

LYNETTE TISDALE
Notary Public, State of Texas
My Commission Expires
2-11-2012

Advertising Invoice

Galveston County Daily News

P.O. Box 628
Galveston, TX 77553-0628

Phone: (409) 683-5300
Fax: (409) 938-8409
URL: www.galvnews.com

Andrea Catanzaro
US Army Corp of Engineers - Galveston Dist.
P O Box 1229
GALVESTON, TX 77553

Cust #: 18107064
Phone: #: (409)766-3802
Post Date: 12/16/2011
Due Date: 01/27/2012
Invoice #: 300765766

Classification: 006 Legal Notices **Acct Type:** cr **Salesperson:** 021 **Ad Taker:** 021

Ad #	Text	Start	Stop	Amount	Prepaid	Due
00285440	NOTICE OF PUBLIC MEETING AND A	12/16/2011	12/16/2011	187.08	-187.08	0.00

Please return a copy with payment **Total Due** **0.00**

AFFIDAVIT OF PUBLICATION

STATE OF TEXAS:

COUNTY OF HARRIS:

Before me, the undersigned authority, a Notary Public in and for the State of Texas, on this day personally appeared, the Newspaper Representative at the HOUSTON CHRONICLE, a daily newspaper published in Harris County, Texas, and generally circulated in the Counties of: HARRIS, TRINITY, WALKER, GRIMES, POLK, SAN JACINTO, WASHINGTON, MONTGOMERY, LIBERTY, AUSTIN, WALLER, CHAMBERS, COLORADO, BRAZORIA, FORT BEND, GALVESTON, WHARTON, JACKSON, and MATAGORDA and that the publication, of which the annexed herein, or attached to, is a true and correct copy, was published to-wit:

US ARMY CORPS OF ENGINEERS 25165637 91118226
RAN A LEGAL NOTICE
SIZE BEING: 1 X 50 L

product	date	class	page
hc	Dec 16 2011	1245.0	D_frilg_5

Edward Silva
NEWSPAPER REPRESENTATIVE

Sworn and subscribed to before me, this the 16th Day of December A.D. 2011

NOTARY PUBLIC STATE OF TEXAS
PENNY STOW
NOTARY PUBLIC, STATE OF TEXAS
MY COMMISSION EXPIRES
FEB. 4, 2014

Notary Public in and for the State of Texas

NOTICE OF PUBLIC MEETING AND AVAILABILITY OF THE CLEAR CREEK DRAFT GENERAL REEVALUATION REPORT (DGRR), DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT(DSEIS) AND DRAFT GENERAL CONFORMITY DETERMINATION (DGCD)

Public Meeting and Invitation to Comment:

Wednesday, January 11, 2012
Open House
5:30 Pm To 6:30 PM
Public Meeting
7:00-8:30 PM

Marie Spence Flickenger Fine Arts Building
San Jacinto College South
13735 Beamer Road,
Houston, Texas

For info: *http://www.swg.usace.army.mil/pao/HotTopic.asp.*

Written comments on the DGRR/DSEIS and the DGCD must be postmarked by January 30, 2012.

Comments may be mailed or emailed to:
Galveston District, Corps of Engineers, Attn:
Ms. Andrea Catanzaro,
P.O. Box 1229 Galveston, Texas 77553
or *andrea.catanzaro@usace.army.mil*

USACE - Galveston District
PO Box 1229
Galveston TX 77553

THE STATE OF TEXAS
COUNTY OF BRAZORIA

Before me, the undersigned authority, on this day personally appeared Judy Starnes

who, after being duly sworn, did depose and say:

My name is Judy Starnes
General Manager of The Facts, a daily newspaper as that term is defined by Art. 28 a R.C.S. of Texas 1925, as amended, having a general circulation in Brazoria County and published in the City of Clute, County of Brazoria, State of Texas.

The attached printed matter is a true and correct copy of the publication of Notice of Public Meeting

which was published and appeared in said newspaper, with publication being on the following date(s): December 16, 2011

My fee is 92.40

Judy Starnes

Given under my hand and seal of office on this 16th day of December, 2011, A.D.

Alexi Meredith Self
Notary Public in and for
Brazoria County, Texas.
My commission expires 08/24/15.

ALEXI MEREDITH SELF NOTARY PUBLIC STATE OF TEXAS EXPIRES 08-24-2015

NOTICE OF PUBLIC MEETING AND AVAILABILITY OF THE DRAFT GENERAL REEVALUATION REPORT, DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT CLEAR CREEK GENERAL REEVALUATION STUDY AND DRAFT GENERAL CONFORMITY DETERMINATION

Interested parties are hereby notified of and invited to attend an open house and public meeting to be conducted by the U.S. Army Corps of Engineers on:

WEDNESDAY, JANUARY 11, 2012
OPEN HOUSE 5:30 PM TO 6:30 PM
PUBLIC MEETING 7:00 PM TO 8:30 PM

MARIE SPENCE FLICKENGER FINE ARTS BUILDING
SAN JACINTO COLLEGE SOUTH
13735 BEAMER ROAD, HOUSTON, TEXAS

The meeting will provide an opportunity for all persons to comment on the Draft General Reevaluation Report (DGRR), Draft Supplemental Environmental Impact Statement (DSEIS), and the Draft General Conformity Determination (DGCD). Those unable to attend may find the DGRR, DSEIS, and DGCD at http://www.swg.usace.army.mil/pao/HotTopic.asp. Written comments on the DGRR/DSEIS and the DGCD must be postmarked by January 30, 2012.

Comments may be mailed or emailed to: GALVESTON DISTRICT, CORPS OF ENGINEERS, ATTN: MS. ANDREA CATANZARO, P.O. BOX 1229 GALVESTON, TEXAS 77553 or andrea.catanzaro@usace.army.mil

Attachment C

TCEQ General Conformity Concurrence Letter

Bryan W. Shaw, Ph.D., *Chairman*
Buddy Garcia, *Commissioner*
Carlos Rubinstein, *Commissioner*
Mark R. Vickery, P.G., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

February 7, 2012

Ms. Carolyn Murphy
Department of the Army
Galveston District, Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Re: General Conformity Concurrence for the Clear Creek General Reevaluation Study

Dear Ms. Murphy:

This letter provides general conformity concurrence for the proposed Clear Creek General Reevaluation Study. The Texas Commission on Environmental Quality (TCEQ) reviewed the project in accordance with Title 40 Code of Federal Regulations Part 93, and Title 30 Texas Administrative Code (TAC) § 101.30. The proposed project is located in the Houston-Galveston-Brazoria (HGB) area, which is classified as severe nonattainment for the 1997 eight-hour ozone standard, and emissions are expected to be above the 25 tons per year *de minimis* threshold. This threshold amount is specified in the table found in § 101.30(c)(2)(A). Therefore, a general conformity analysis is required.

The TCEQ has determined, pursuant to 30 TAC §101.30(h)(1)(E)(i)(I), that emissions from the proposed project will not exceed the emissions budgets specified in the most recent state implementation plan (SIP) revision approved by the United States Environmental Protection Agency (EPA). The most recently approved SIP revision, the HGB Reasonable Further Progress SIP adopted by the Commission on May 23, 2007, was approved by the EPA on March 29, 2010. This general conformity determination is based upon information provided in a December 2011 Draft General Conformity Determination prepared by the United States Army Corps of Engineers (USACE).

In support of the ozone National Ambient Air Quality Standard, the TCEQ suggests the USACE adopt pollution prevention and/or reduction measures in conjunction with this and future projects, such as the following:

- encourage construction contractors to apply for Texas Emission Reduction Plan grants;
- establish bidding conditions that give preference to clean contractors;
- direct construction contractors to exercise air quality best management practices;
- direct contractors that will use tugboats during construction to use clean fuels;
- direct operators of the assist tugboats used in maneuvering dredge vessels to use clean fuels;
- select assist tugs based on lowest nitrogen oxides (NO_X) emissions instead of lowest price; and/or
- purchase and permanently retire surplus NO_X offsets prior to commencement of operations.

Thank you for providing the necessary information and staff assistance for our review. We would also appreciate update(s), as appropriate, as this project moves forward. I look forward to working with you in the future on any upcoming projects you may have that affect air quality in your district. If you require further assistance on this matter, please contact Mrs. Amy Muttoni at (512) 239-6351 or Amy.Muttoni@tceq.texas.gov.

Sincerely,

David Brymer, Director
Air Quality Division
Texas Commission on Environmental Quality

DB/KH/kb

Appendix I

Cumulative Impacts Analysis Appendix

Job No. 100013748

APPENDIX I
CLEAR CREEK FLOOD RISK MANAGEMENT PROJECT
CUMULATIVE IMPACTS ANALYSIS-PROJECT DESCRIPTIONS
BRAZORIA, FORT BEND, GALVESTON, AND HARRIS COUNTIES, TEXAS

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

September 2012

Printed on recycled paper

Appendix I

Clear Creek Flood Risk Management Project
Cumulative Impacts Analysis
Brazoria, Fort Bend, Galveston, and Harris Counties, Texas

CUMULATIVE IMPACTS ANALYSIS

Past or Present Actions

Primarily rural until the 1970s, the suburban growth of Fort Bend and Brazoria counties has been closely tied to the economic prosperity of Houston (Auch et al., 2004). Recent development in the study area is in the form of suburban-style master-planned communities. Commercial and industrial land uses in the study area are fewer, located along Beltway 8, Interstate Highway 45 (I-45), and State Highway (SH) 146. Population growth and subsequent development has been highest in Missouri City (490.5 percent increase 1970 to 1980), Friendswood (112.8 percent increase 1980 to 1990), and Fresno (107.5 percent increase 1990 to 2000). Compared to the other counties in the study area, Galveston County experienced the lowest overall increase over the same 40-year time period; however, overall, the study area has experienced an increase in population between 1970 and 2000 (Appendix G). Generally, the most intensive development is found in the rapidly growing areas immediately adjacent to the major roadways (SH 288, Sam Houston Tollway/Beltway 8, SH 35, I-45, and SH 146).

Development associated with this growth has contributed to the loss of undeveloped land (which may provide ecologically important functions such as provision of wildlife habitat or flood abatement, given the presence of wetlands). Study area development has increased impervious cover within the Clear Creek watershed.

Brio/Dixie Oil Superfund Site Remediation

According to the U.S. Environmental Protection Agency (EPA) EnviroFacts database and mapper, the EPA tracks approximately 467 Superfund sites in Texas; of those, approximately 20 fall within the study area counties (EPA, 2007), and as noted in Section 3.8 of the Supplemental Environmental Impact Statement (SEIS), two sites are of potential concern for the Clear Creek Project. The two sites (EPA Nos. TXD980625453 and TXD089793046) are one location: approximately 50+ acres on both sides of Dixie Farm Road, north of Clear Creek, west of Turkey Creek, southwest of Beamer (Hall) Road, and intersected by Mud Gully, near Friendswood. The site is associated with the abandoned Brio Refinery and the Dixie Oil Processors (27 TexReg 6896, August 2, 2002; EPA, 2008). The original 1988 remediation Record of Decision was amended in 1997. Main cleanup components for the site(s) included the following: remove surface tanks, dispose of residuals, cover the site with 6 inches of topsoil and grade to promote runoff, channelize Mud Gully to remove flow restrictions and improve long-term maintenance

and stability, install a sub-grade barrier wall to limit the potential for off-site migration of contaminated groundwater, and add a composite cap (including a gas collection layer, flexible membrane layer, compacted clay, and topsoil to promote vegetation growth) (EPA, 1997, 2002). A 1998 study concluded that the Brio sites would not be disturbed by flood control projects on Clear Creek; sediment sampling and analysis were conducted, and results indicated that many of the contaminants of concern were not present in samples collected from Clear Creek (Espey, Huston & Associates, Inc., 1998). In 2006, the Brio/Dixie Oil site was removed from the National Priority List (NPL) (71 FR 120:35810–35813). Deletion from the NPL does not preclude future actions under Superfund; however, this project is included in the Past Actions cumulative impacts analysis as the project is currently in an operations and maintenance phase. Impacts available through this site's environmental documents are included in Table 4.15-2 of the SEIS.

Weiner Development Corporation Shopping Center

The project is located immediately southwest of the intersection of the I-45 south frontage road and El Dorado Boulevard, north of the Baybrook Mall, near Friendswood, Harris County, Texas (General Land Office [GLO], 1999). The Weiner Development Corporation proposed to fill 4.03 acres of isolated depressional wetlands on a 76.62-acre site for the construction of a shopping center. As mitigation for the project impacts, the applicant proposed to place a 46-acre tract, including 16 acres of jurisdictional wetlands, into a conservation easement (U.S. Army Corps of Engineers [USACE] permit application #21714). While an environmental document was not publicly available, impacts are included in Table 4.15-2 of the SEIS for the resources where impacts are known from the above-referenced sources.

Rail Build-Out to the Bayport Loop

On August 30, 2001, San Jacinto Rail Limited (SJRL) and the Burlington Northern and Santa Fe Railway (BNSF) filed a petition with the U.S. Department of Transportation Surface Transportation Board (STB) pursuant to 49 USC 10502 for authority for construction by SJRL and operation by BNSF of a new rail line near Houston, Harris County, Texas. The project, known as the Bayport Loop Build-Out, involved construction of approximately 12.8 miles of new rail line to serve the petrochemical industries in the Bayport Industrial District (Bayport Loop). The project included rail operations to and from the new rail line near Ellington Field over trackage rights on Union Pacific Railroad Company's (UP) Galveston Houston and Henderson Railroad Company (GH&H) line and UP's East Belt, Terminal, Lafayette, and Baytown subdivisions to the storage yard operated by CMC Railroad at Dayton, approximately 30 miles east of Houston. Several Federal agencies were required to approve the project: STB, U.S. Coast Guard, National Aeronautics and Space Administration (NASA), and the Federal Aviation Administration. The STB announced the Notice of Availability of the Draft Environmental Impact Statement (DEIS) in December 2002 (STB, 2002). The DEIS presented "moderate wetland, surface water, and biological impacts" and "proposed voluntary mitigation

measures." The DEIS comment period closed January 27, 2003; a Final Environmental Impact Statement (FEIS) was issued in May 2003 (68 FR 95:26607).

The project involved new construction in floodplains along Horsepen Bayou, Armand Bayou, Spring Gully, Big Island Slough, Taylor Bayou, and various unnamed tributaries and flood risk management channels because of the linear nature of the project; however, it was determined that the action would not cause adverse effects or be considered incompatible development in a floodplain because the facility would be designed, constructed, and maintained to accommodate flood flows and minimize impacts to floodplains. The project involved unavoidable new construction in wetlands and included all practicable measures to avoid and minimize harm to wetlands. The mitigation plan compensates for unavoidable impacts to wetlands and includes wetland restoration, creation, and preservation (STB, 2003). Project effects from the Bayport Loop Rail Build-Out EIS are included in Table 4.15-2 of the SEIS.

Previous Clear Creek Flood Risk Management Efforts

Galveston County Consolidated Drainage District (GCCDD) and Brazoria County Drainage District #4 (BCDD4) (also known as Pearland Drainage District) have implemented flood risk management and vegetation management steps prior to the Clear Creek General Reevaluation Project. Selective areas along Clear Creek were cleared of dead and dying trees for flood control/management near the Longwood/Myrtlewood area within a 100- to 125-foot maintenance easement (*Reporter News*, 2007). In 2002, the USACE, Galveston District provided a letter of no objection. BCDD4, in cooperation with GCCDD, have implemented vegetation management in the creek from FM 2351 to the Dixie Farm area (Pearland Drainage District, 2007). Galveston County Parks Department constructed 750 linear feet of shoreline stabilization along Clear Creek within Walter Hall Park (League City area) using riprap (USACE permit application #23588). Approximately 0.25 acre of fill (1,162 cubic yards) was placed below the ordinary high water mark and extended 20 feet into Clear Creek. Additionally, the Parks Department constructed 350 linear feet of pier/boardwalk over the riprap (GLO, 2005a). Potential project effects are included in Table 4.15-2 of the SEIS, based on publicly available information.

Coastal Bottomlands Mitigation Bank

The Texas Department of Transportation (TxDOT) has initiated a 3,552-acre wetland mitigation bank for roadway improvements. The wetland mitigation bank is not within the Clear Creek study area; however, it can be used for mitigation of TxDOT Houston District projects in the study area, within the drainage basins of the San Jacinto-Brazos Coastal Basin, Brazos Basin, Brazos-Colorado Coastal Basin, Colorado Basin, and within the boundaries of the USACE, Galveston District. In 2008 3,552 acres (1,522 credits) had been approved in Brazoria County, within 7 miles of the Peach Point Wildlife Management Area and the San Bernard National Wildlife Refuge. The site provides buffer area uplands with 500-year-old live oak trees (diameter at breast height greater than 200 inches) and compensation for bald eagle nesting and foraging

areas (FHWA, 2005). The Coastal Bottomlands Mitigation Bank is active (Environmental Law Institute, 2002; TxDOT, 1999), credits are available, and wetland rehabilitations are expected to continue.

City of Pearland

Cowart Creek Diversion and Regional Detention for the Bailey Road corridor between FM 1128 and Wells Road. Completed in April 2012, the project entailed construction of approximately 4,300 linear feet of interceptor box culvert, 3.2 miles of diversion ditches, a 600 acre-foot regional detention facility and associated bridge, culvert, and road ditch improvements. The basis of this diversion and detention project was to separate the drainage corridor out of the Bailey Road (FM 1128 to Veterans) transportation corridor, thereby allowing for the development of both the ultimate transportation and drainage facilities in adequately sized, separate corridors (City of Pearland, 2011). Potential project effects are included in Table 4.15-2 of the SEIS, based on publicly available information.

East Mary's Creek Phase I, confluence of Mary's Creek and Mary's Creek Bypass. Completed in September 2010, an approximately 150-acre-feet detention facility within a 70-acre site at confluence of Mary's Creek and Mary's Creek Bypass was constructed. The facility will ultimately be expandable to approximately 400 acre-feet of storage. The project is intended to provide floodplain relief for Mary's Creek up to and including a ten-year storm event, reducing the risk of flooding in areas adjacent to Mary's Creek, approximately 2,500 feet west of Dixie Farm Road and 2,800 feet south of FM 518 (City of Pearland, 2012). The project also provides mitigation for the Dixie Farm Road Widening Phase II Project and for improvements Brazoria Drainage District #4 made to Mary's Creek Bypass; provides detention for drainage improvements made in Pine Hollow Subdivision; and allows for completion of those improvements. Potential project effects are included in Table 4.15-2 of the SEIS, based on publicly available information.

Texas Department of Transportation Road Improvement Projects

Projects included in this section are from the Houston-Galveston Area Council (H-GAC) Transportation Improvement Program (TIP) 2005 to 2008 and 2008 to 2011, a collaborative effort with local communities from eight counties and TxDOT (H-GAC, 2006a, 2008). Projects selected for the TIP are priorities for the region in all transportation areas including transit, roadway and highways, bicycle and pedestrian, preventative maintenance, rehabilitation, and transportation operations. Transportation improvements contained in the TIP are required to comply with air quality regulations for vehicle emissions. In addition to projects receiving Federal funding, locally funded projects considered to be regionally significant must also be included in the conformity analysis requirements of the Clean Air Act (CAA). For all of these projects, environmental documentation of project effects were unavailable during the production of the SEIS or projects were identified to have no significant environmental impacts, therefore

this effort is not included in Table 4.15-2 of the SEIS. Although project effects were unavailable, general potential project effects that may typically occur are considered in Section 4.15.4.

National Aeronautics and Space Administration (NASA) Road 1 Project and NASA Parkway Bypass

NASA Road 1 is 7.7 miles from I-45 to SH 146. Expansion plans will modify the road at I-45 and widen it from four to six lanes with a divider to SH 3. Four lanes are scheduled to be expanded to eight lanes of divided roadway from SH 3 to El Camino Real. Overpasses are planned across SH 3 and El Camino Real. The projected 42-month construction also calls for six lanes to be built from the Johnson Space Center (JSC) to SH 146 in Seabrook. Some flood-prone areas are to be elevated to at least 10 feet above sea level. The 1-mile section of the Gulf Freeway will be completely rebuilt south of the present NASA Road 1 to the proposed interchange. The project will build the north and southbound three-lane frontage roads of I-45 as an at-grade intersection with the new NASA Road 1 bypass (Rendon, 1992; Texas Construction, 2006). A Finding of No Significant Impact (FONSI) was issued by the Federal Highway Administration (FHWA) on March 4, 1988, for the original design, which involved approximately an acre of wetland loss; however, there was a decision to reroute the project around Webster (Texas Commission on Environmental Quality [TCEQ], 1994).

The 2.7-mile NASA Parkway bypass will provide a connection from I-45 in Webster to Nassau Bay and the JSC. Construction of the four-lane divided highway began in 2004 and was expected to be completed in 2008 (H-GAC, 2006b). To be consistent with *The Galveston Bay Plan*, the project had to be designed to preserve or rehabilitate the water quality of the bay, avoid causing significant increases in nonpoint source pollution, and result in no net loss of estuarine or riparian wetlands (TCEQ, 1994).

SH 288 Frontage Roads

From Farm-to-Market Road (FM) 2234 (McHard Road) to FM 518 (approximately 1.7 miles) along SH 288 (locally known as the Nolan Ryan Expressway) in Brazoria County, TxDOT Houston District, in cooperation with the FHWA, is constructing two three-lane frontage roads. An environmental assessment has been prepared, and the first public meeting was January 18, 2007; however, environmental documentation of project effects were unavailable to the public during the production of the SEIS, and thus, this project is not included in Table 4.15-2 of the SEIS.

Dixie Farm Road Widening, Phases I and II

TxDOT phased the widening of Dixie Farm Road to four lanes, south of FM 518 (Phase I, 2005) and to SH 35 (Phase II, 2006). Environmental documentation of project effects was unavailable during the production of the SEIS; therefore, this project is not included in Table 4.15-2 of the

SEIS. Although project effects were unavailable, general potential project effects that may typically occur are considered in Section 4.15.4.

Brazoria County Road 90

In 2007, TxDOT made improvements to the South Fork Mary's Creek bridge on County Road 90 and approaches to that structure. Actions from this project, based on past experience with similar actions, did not involve significant environmental impacts; therefore, this project underwent a Categorical Exclusion and is not included in Table 4.15-2 of the SEIS.

Robinson Drive

In 2007, TxDOT replaced the Robinson Drive Bridge and approaches at Hickory Slough. Actions from this project, based on past experience with similar actions, did not involve significant environmental impacts; therefore, this project underwent a Categorical Exclusion and is not included in Table 4.15-2 of the SEIS.

Pipeline Projects

Numerous pipelines intersect the study area. For the following projects, environmental documentation of project effects was unavailable during the production of the SEIS; therefore, these projects are not included in Table 4.15-2 of the SEIS. Although project effects were unavailable, general potential project effects that may typically occur are considered in Section 4.15.4. Pipelines crossing the study area include:

- **Spectra Energy Eastern Transmission** has easements in the study area. Based in Houston, Spectra Energy operates in the U.S. and Canada approximately 17,500 miles of transmission pipeline, 265 billion cubic feet of storage, natural gas gathering and processing, natural gas liquids operations, and local distribution assets. Eastern Transmission offers connections from the Gulf Coast to the mid-Atlantic and Northeast market with 9,040 miles of pipeline supplying 6.2 billion cubic feet of fuel per day for electric generation facilities, with 75.1 billion cubic feet of gas storage (Spectra Energy, 2008).
- **Huntsmen Petrochemical Corporation**. The project is located in the Clear Creek Channel, just west of the SH 146 Bridge in Seabrook, Harris County (GLO, 1999). Huntsmen Petrochemical requested authorization to place 1,000 sandbags over an existing pipeline into an area approximately 8 feet wide and 40 feet long, and ranging from a depth of 4 to 15 feet below mean sea level, to provide an additional 2 feet of cover over the pipeline.
- **TEPPCO Pipelines**
  - **Dean North RPG**. The Dean North RPG line travels 142 miles from Mont Belvieu to Point Comfort, Texas, carrying refinery-grade propylene. This facility intersects the project and study areas: crosses Mary's Creek east of Dixie Farm Road and west of

the Brazoria-Galveston county line and crosses Clear Creek northeast of Friendswood (TEPPCO, 2008).

- **South Texas System**. The TEPPCO South Texas System carries crude oil approximately 1,150 miles from south central Texas to Houston, crossing the Clear Creek study and project areas. This line provides 1.1 million barrels of storage.

Petrakos Fiber Optic Network

Petrakos, a Gulf of Mexico cellular and microwave communications provider, created a fiber optic ring in a rough oval, starting in Texas from Freeport north to Houston, crossing into Louisiana to New Orleans and south to Fourchon, then offshore south and westward to return to Freeport. Cable installation began in June 1999 (Smith, 1999). The oval network allows bi-directional signal transmission, increasing reliability in case of a break in the cable. This advanced technology provides offshore oil production platforms with the infrastructure for high-volume, high-speed voice, data, and video capabilities (Payne and Miller, 1999). Environmental documentation of project effects was unavailable during the production of the SEIS; therefore, this project is not included in Table 4.15-2 of the SEIS. Although project effects were unavailable, general potential project effects that may typically occur are considered in Section 4.15.4.

Buffalo Camp Bayou Recreational Improvements

In 2005, Brazoria County Parks Department constructed a new boat ramp, pier, and bulkheads under USACE permit application 23545(1) (GLO, 2005b). Environmental documentation of project effects were unavailable during the production of the SEIS, therefore this project is not included in Table 4.15-2 of the SEIS. Although project effects were unavailable, general potential project effects that may typically occur are considered in Section 4.15.4.

REASONABLY FORESEEABLE FUTURE ACTIONS

Using population projections from 2000 to 2030 (Texas Comptrollers Office, 2008) for the study area municipalities and counties, Fort Bend County is expected to continue to have the highest population growth compared to the other three counties in the study area, with expected increases of between 27.3 and 38.3 percent. Galveston County is expected to experience the lowest population growth of the four study area counties. The City of Pearland is expected to experience the highest population increase from 2000 to 2010 at 75.5 percent. Webster City is expected to have the highest population increase from 2010 to 2020 at 29.7 percent, and from 2020 to 2030 at 22.5 percent. Deer Park is expected to maintain the lowest population change from 2000 to 2030 with 3.5 percent change from 2000 to 2010, decreasing to a 3.1 percent change from 2020 to 2030. Overall, the increases in population seen from 1970 to 2000 are expected to continue through 2030, with growth generally slowing each decade (Texas Comptrollers Office, 2008); this continued increase in population can be expected to result in

continued development within the study area. The following sections provide descriptions of reasonably foreseeable future actions that were identified in the study area.

Armand Bayou Watershed Plan

The Armand Bayou watershed is located in southeast Harris County, predominantly east of Beltway 8 and south of Highway 225, draining approximately 59 square miles to Clear Creek (Coastal Coordination Council, 2006). The habitat in the watershed was once dominated by tallgrass prairie, punctuated by forest corridors along stream channels and flatwood forest across much of the lower part of the watershed. Trust for Public Land (TPL) is coordinating efforts focused on the use of land conservation to meet the community's needs for parks and bayou access, water quality protection, habitat preservation, and stormwater management. Cooperating partners include National Oceanic and Atmospheric Administration, through the Texas Coastal Management Program, with additional support from the Galveston Bay Estuary Program of the TCEQ, the City of Pasadena, local foundations, and others. The Armand Bayou Greenprint (Coastal Coordination Council, 2006) identified almost 12,000 acres of high-priority, undeveloped, unprotected lands within the watershed, representing critical lands directly adjacent to the bayou and its tributaries, large tracts of coastal flatwoods, and pristine Armand coastal tallgrass prairie. Maintaining the regional interconnectivity of these three habitats is critical to flood risk management, water quality, and overall ecological health of the bayou. Funding and conservation opportunities and partnerships have been identified. Potential project effects are included in Table 4.15-2 of the SEIS, based on publicly available information. However, priority actions have not been entered into the matrix as of the writing of this document, so potential watershed benefits are not included in Table 4.15-2.

City of Pearland Capital Improvement Projects

The City of Pearland plans on improving several roadways, drainages, and recreation areas (City of Pearland, 2008, 2012). Environmental documentation of project effects was unavailable during the production of the SEIS; therefore, this project is not included in Table 4.15-2 of the SEIS. Although project effects were unavailable, general potential project effects that may typically occur are considered in Section 4.15.4. City of Pearland Capital Improvement Projects includes:

- **Hickory Slough Detention at Max Road** (estimated completion January 2012). The project is intended to provide approximately 425 acre-feet of detention along Hickory Slough. The project will include a weir and pump station and will be designed to accommodate for a concurrent project use, a sports field complex on the basin floor. Phase I will consist of approximately 100-acre feet. The project will allow for detention along the slough to lower the level of the slough during 3-, 10-, and 100-year events. Additionally, the athletic/sports use will be a concurrent use for this site.
- **Veterans Road Detention Pond**, south of Mary's Creek between Veterans Road and Railroad (completion February 2009). The Veterans Drive detention facility is a

101.6 acre-feet of offline detention. This facility will help with some localized flooding issues upstream by reducing the flows for the 10- and 50-year storm events. Also, the detention facility will be used to mitigate for the Magnolia Road widening between SH 35 and McLean.

- **Walnut Street and Veterans** (estimated completion November 2011). This project proposes underground drainage along the south side of Walnut from the BNSF Railroad to McLean Road and on Veterans from Walnut to Mary's Creek. Also included is the installation of a box culvert trunk line along Walnut that will drain into a twin box culvert alongside and beneath Veterans. The system will collect and convey 100-year flows from the Old Town area across Walnut and down Veterans to Mary's Creek. The project is planned for a four-phase approach to the construction, with the first phase to coincide with the improvements to Walnut itself. Extreme weather events currently inundate and flood residential neighborhoods north of Walnut and west of the railroad. Walnut blocks sheet flow of these waters, and existing conveyance systems are not sufficient to convey even 3-year events past Walnut.
- **Trail Connectivity along Mary's Creek from Centennial Park to FM 1128** (estimated completion January 2009). This project would implement a portion of Phase I of the Hike and Bike Master Plan starting at Centennial Park along Mary's Creek to and around Southwest Environmental Center to Mary's Creek detention to Municipal Utility District #6 ultimately connecting to Magnolia. The Master Plan was presented in draft form to the City Council in June 2007. The Parks and Recreation Plan that was adopted by the Council in December 2005 lists the hike and bike trails as the number one priority for acquisition and development.
- **SH 35 Drainage along SH 35 from FM 518 to BW 8** (estimated completion December 2011). The project will provide detention and mitigation for SH 35 widening project from FM 518 to BW 8 that is being managed by TxDOT. The city will provide the project detention and floodplain fill mitigation in the Clear Creek, Hickory Slough, and Town Ditch watersheds. This project is required to detain the increase stormwater and to mitigate floodplain fill created by the SH 35 widening project.
- **Westchester Sidewalk and Drainage**, FM 518 to FM 1128 (estimated completion June 2013). A sidewalk will be constructed along the west/south side of the road, a total length of approximately 2,000 feet. Enclosing the existing ditches to make room for the sidewalk will also address some existing drainage concerns.
- **Dolores Fenwick Nature Center Phase 2 (Design)** off Magnolia behind the John Hargrove Environmental Center (estimated completion April 2012). Phase 2 includes 2 miles of 6- and 8-foot trails, being a combination of crushed granite and concrete in low lying areas, boardwalk, pedestrian bridge, fishing pier, picnic tables, benches, trash receptacles, drinking fountain, and a paddle craft launching area and grasscrete parking. The project will give Pearland a unique opportunity to showcase the center as a learning opportunity for the entire community. Children/adults will be able to come and take classes and learn about the environment in a hands-on setting. This will be the office for the staff. There is a great need in the community to educate the public on the benefit of recycling, green space, and trees. This will also provide an opportunity to showcase the entire concept of utilizing one site as multi-purposing for parks, recreation, detention, education, recycling, and environmental park.

- **Bailey Rd between Veterans to FM 1128** (estimated completion November 2012). Bailey Road will be improved to a four-lane concrete curb-and-gutter boulevard between FM 1128 and Veterans Drive, a distance of 2.5 miles. The drainage improvements will accommodate the roadway after the Cowart Creek Diversion project has been completed. The four-lane boulevard segment will accommodate school traffic and provide drainage improvements that will provide regraded ditches that will drain to the south and away from Bailey Road.
- **Business Center Drive** consisting of two lanes from Broadway to the southern entry of the Pearland Town Center and four lanes from the southern Pearland Town Center entrance to CR 59 (estimated completion December 2013). The lanes of Business Center Drive already exist from Broadway to the southern Pearland Town Center entrance. The limits of this project include the remaining two lanes from Broadway to the southern entry of the Pearland Town Center and the four lanes from the southern Pearland Town Center entrance to CR 59. The proposed cross section is concrete curb and gutter with sidewalks. The project will also include improvements to CR 59 that will accommodate the increase in traffic. This project will provide a secondary thoroughfare to alleviate traffic near the Pearland Town Center.
- **Cullen Parkway Improvements from BW 8 to FM 51**8 (estimated completion October 2013). A TxDOT project north of the city limits that widens the roadway from two lanes of asphalt to four lanes of concrete. Also, reconstructing a traffic signal by the park at Kilnar Road and Adair Road, and reconstructing the bridge. A 6-foot trail will continue along the west side of the road to the park as well.
- **State Highway 35 Reconstruction between BW 8 South to Walnut Street** (estimated completion June 2013). SH 35 reconstruction is a TxDOT project in response to regional transportation growth requirements. The mitigation detention pond will also be constructed in 2012.
- **Orange Street Improvements from SH 35 to Hatfield** (estimated completion February 2012). The project consists of reconstruction of existing Orange Street from SH 35 to Hatfield into a two-lane minor collector. Right of way from Hatfield to O'Day will be identified and acquired. This project includes a 12-inch water main along Orange from SH 35 to Woody.
- **Pearland Parkway Extension from Oiler Drive to Dixie Farm Road** (estimated completion May 2015). A new extension of approximately 4,500 feet from 500 feet east of Oiler Drive to Dixie Farm Road, constructing a four-lane, concrete, curb-and-gutter, divided roadway with raised medians and a bridge crossing at Cowart's Creek. This project is a connection of a minor thoroughfare to a major thoroughfare in accordance with the thoroughfare plan, which will provide for traffic congestion relief to and from the Beltway.

City of Friendswood Capital Improvement Projects

The City of Friendswood plans on improving several roadways, drainages, sewer, and water (City of Friendswood, 2007, 2008, 2012). Environmental documentation of project effects was unavailable during the production of the SEIS; therefore, these projects are not included in Table

4.15-2 of the SEIS. Although project effects were unavailable, general potential project effects that may typically occur are considered in Section 4.15.4. City of Friendswood Capital Improvement Projects includes:

- **Brittany Bay Improvements.** This is a jointly funded project between TxDOT and City of Friendswood. The proposed project includes upgrades to Brittany Bay Boulevard, FM 528, and FM 2351 to four-lane boulevards with curbs and gutters.
- **Glenshannon Drainage Project**. Improvements include construction of 1,300 feet of conveyance and sewer outfalls across Wilderness Trails from Londonderry to Chigger Creek. Other improvements include larger culverts along Greenbriar between Briarmeadow.
- **Clover Acres Drainage**. This project integrated TxDOT's drainage work associated with its plans to widen FM 2351 and the city's drainage solution for the subdivision. The project consists of the purchase of property for a detention site, the installation of a detention pond, and the construction of a portion of TxDOT's drainage system for its future expansion of FM 2351.
- **Sun Meadow Drainage Improvements**. The project consists of the replacement, straightening, and oversizing of an existing outfall. The 72-inch outfall pipe is to be largely replaced with an 84-inch pipe.
- **Additional Surface Water Purchase**. In an effort to reduce the city's groundwater consumption to 20 percent of the total water demand, Friendswood is purchasing surface water capacity from the City of Houston Southeast Water Purification.
- **Blackhawk Main Replacement**. This project consists of the replacement of a problematic, old water main within the Wedgewood Subdivision.
- **Water Plant Number Five Replacement**. The project is currently under construction. The scope of this project is to replace the elevated storage tank and the ground storage tank with new concrete tanks. The pump house, pumps, controls, and yard piping are also scheduled to be replaced during the construction process also and a new natural gas generator will be installed.
- **Deepwood Force Main**. This project increases a primary wastewater discharge to a larger, 27-inch Gravity Main to the Blackhawk Wastewater Treatment Plant.
- **Deepwood Lift Station**. This project includes expansion of the Deepwood Lift Station to accommodate demands for wastewater discharge pumping to the Blackhawk Wastewater Treatment Plant.
- **South Friendswood Force Main Diversion**. The San Joaquin Lift Station would be increased in size to accommodate current load or demand.
- **Sun Meadow Lift Station**. A new lift station would be built to offset the demolition of an outdated lift station.
- **Fire Station No. 4**. The 6,650-square-foot facility, situated on approximately 2 acres, would contain about 2,020 square feet of living/administrative/workspace and approximately 4,625 square feet of apparatus and support space.

- **Public Safety Building, Phase I**. The new building will house police department operations, including a citywide dispatch, patrol, criminal investigation division, administration and holding facilities, the fire marshal's operations, including an emergency operations center and administration, and the municipal court.
- **Melody Lane and FM 2351 Reconstruction**. The project consists of new concrete paving and an upgraded traffic signal at FM 2351 and Melody Lane. The project also includes a new storm drainage system with two new outfall systems to Mary's Creek. This project is being funded by the Galveston County 2008 Bond Election. Schedule and weather permitting, this project is scheduled to be completed by mid-2012.
- **Surface Water Plant #2 Phase 1, Ground Storage Tank Addition**. The tank has been completed and awaiting the completion of Surface Water Plant #2, Phase 2, to fill and put the new tank into service.
- **Surface Water Plant #2 Phase 2, System Upgrades**. This project includes upgrades to the existing control room, a new pump, and the installation of new piping to tie in the new storage tank to the existing pumping system. The new upgraded surface water plant will assist in meeting the required demands for the vital water distribution system. The installation of the newer pump, upgraded controls, and new piping connecting the new storage tank will assist in confirming the water plant is appropriately prepared to provide continuous service along with the potential to provide service to any future development in the panhandle area of the city.
- **TDRA Natural Gas Emergency Generators**. The Texas Department of Rural Affairs (TDRA) has supplied the city with a grant to install emergency generators at various critical facilities throughout the city. These facilities include Fire Station #1, Fire Station #2, Surface Water Plant #1, Water Plant #2, and 29 of Friendswood's sanitary sewer lift stations. Generators will allow the city to maintain critical needs such as sewer and water services to citizens if power is lost in an emergency situation such as a hurricane. The work on the Water Plants and Fire Stations is primarily complete, and the work on the lift stations is nearing completion.
- **Water Plant #6 Rehabilitation**. A new 500,000-gallon steel water tank, as well as a new pump house and an emergency generator has been installed at the city's water plant on Pennystone Way. The new water storage tank will greatly increase the city's water storage capacity. The contractor on this project is in the process of finalizing the work.
- **Fire Station #3 Rehabilitation**. – The TDRA awarded a grant to the city to assist in the repair costs of the existing Fire Station # 3 facility. The facility received substantial damage during Hurricane Ike. The project is currently under construction, and the repairs and improvements to the building will include replacing the roof, interior walls, windows, and doors and adding to the building to extend the apparatus bays. Construction is scheduled to be completed by mid-2012. The city and the Friendswood Volunteer Fire Department have worked jointly in coordinating this project.
- **Blackhawk, Oak Vista, and Wandering Trail Paving Project**. Improvements are scheduled to be made on Blackhawk Boulevard from Friendswood Link Road to Thursa Lane, on Wandering Trail from Kingsmill Road to Geneva Drive, and on Oak Vista from Magnolia Street to East Spreading Oaks. The project is currently under construction and is scheduled to be completed early 2013.

Mud Gully Detention Pond and Channel Improvements

Originally included for study in the Clear Creek Federal Project, the Mud Gully Detention Pond was identified as being effective for flood management. However, cost-benefit analysis did not yield a high enough ratio for inclusion into the GRP. Harris and Galveston counties have decided to fund the project. Design of the project is expected to be complete in 2012 and construction expected to start in 2015. The project consists of a 120-acre detention pond providing 1,550 acre-feet of detention capacity and improvements to 1 mile of existing conveyance channel. The conveyance improvements on Mud Gully from Sagedowne to Astoria are designed as a concrete-lined channel. Having undergone significant modifications in the past, this section of the waterbody has a limited footprint available for changes to occur because it is located between the northbound and southbound lanes of Beamer Road (League City, 2012; USACE, 2011). Potential project effects are included in Table 4.15-2 of the SEIS, based on publicly available information.

Harris County Flood Control District (HCFCD) – Proposed Detention Features

HCFCD has two proposed locations for detention features that may be constructed in 2012. Each location would consist of two detention features. The first area proposed for two detention features is located approximately 3,000 feet west of the Dixie Farm and Beamer Road intersection along Mud Gully. The total proposed acres for detention is approximately 170 acres. The second proposed location for two proposed detention features is located near the intersection of Beltway 8 and Pearland Parkway, south of Lee Franco Park, and east of Clear Creek. The two proposed detention features would occupy 100.1 and 115.8 acres and would be associated with Clear Creek.

Galveston Commuter Rail

Houston's Metropolitan Transit Authority commuter rail plans were initiated under a 2003 referendum regarding five light-rail extensions. Three commuter rail lines are in the most immediate future plans, including paralleling U.S. Highway (US) 90A to Fort Bend County, Hempstead Highway or US 290 to beyond SH 6, and Old Galveston Road to NASA and Clear Lake. The last of these proposed commuter lines lies within the Clear Creek watershed and study area. Current estimates of completion dates range between 2012 and 2030. The Galveston Commuter Rail is part of the H-GAC 2035 Regional Transportation Plan, released in October 2007 (H-GAC, 2007). While the Galveston Commuter Rail is in regional plans and reasonably foreseeable, no environmental documents have been completed for this potential project; therefore, impacts are not included in Table 4.15-2 of the SEIS.

Houston Region Freight Rail Improvements

The Houston Region Freight Rail Study (HRFRS; TxDOT, 2007) proposes several multimodal improvements to move freight through the Houston Metropolitan Area; of these, two corridors

cross the Clear Creek study area: the UP Galveston Subdivision and the Mykawa Subdivision. The UP Galveston Subdivision was constructed in the mid-1850s by the GH&H and is currently owned and operated by UP.

The Galveston Subdivision begins at South GH&H Junction, located in south Houston just east and north of US 59 and I-45, respectively, and essentially parallels I-45 to Galveston. The Mykawa Subdivision consists of approximately 20 miles of BNSF-owned and -operated track with terminus points at Tower 81 (T&NO Junction) near the Mykawa/Griggs Road intersection in south Houston to Alvin, Texas, where the Mykawa Subdivision connects to the BNSF Galveston Subdivision. The Mykawa Subdivision parallels Mykawa Road. UP is granted authority to operate trains on the Mykawa Subdivision from Algoa on the BNSF Galveston Subdivision to Alvin, then to Tower 81. The HRFRS evaluates potential future projects to leverage legislative funding, but does not authorize construction or improvements. Individual projects would be pursued by non-Federal sponsors with TxDOT collaboration. Approximately $258,000,000 worth of improvements are proposed for both the UP Galveston Subdivision and the Mykawa Subdivision. Environmental documentation of project effects were unavailable during the production of the SEIS, therefore this project is not included in Table 4.15-2 of the SEIS.

TxDOT Road Improvement Projects

Projects included in this section are from the H-GAC TIP 2008–2011 (H-GAC, 2008). For all of these projects, a preliminary engineering and environmental analysis (PE/EA) and feasibility project development study has started or has been completed but environmental documentation of project effects was unavailable during the production of the SEIS; therefore, these projects are not included in Table 4.15-2 of the SEIS. Although project effects were unavailable, general potential project effects that may typically occur are considered in Section 4.15.4.

- **Grand Parkway.** Over the last 40 years, Grand Parkway (SH 99) vision has advanced as 11 segments of constructed and proposed multilane improvements to SH 99, across seven counties encircling the Greater Houston region. In August 2002, the FHWA, in cooperation with TxDOT and The Grand Parkway Association, announced that it would prepare an EIS to upgrade the existing road network in Brazoria and Galveston counties (67 FR 154:51923–51924). Currently, the facility in northern Brazoria and Galveston counties is a multilane controlled-access facility, part of a third circumferential loop around Houston. Segment A (SH 99 from SH 146 to I-45) in Galveston County is the only portion within the Clear Creek study area, and it is designated for future studies; no studies are ongoing at this time (TxDOT, 2008; The Grand Parkway Association, n.d.). Although this project is reasonably foreseeable, no environmental documents are available for Segment A.
- **SH 35 Tollway.** TxDOT Houston District is conducting a Major Corridor Feasibility Study related to a 47-mile segment of SH 35 in Harris and Brazoria counties, from I-45 in downtown Houston to SH 288 in the City of Angleton. The purpose of the study is to evaluate all reasonable alternative modes of transportation and travel routes and select the

most feasible alternative that will improve existing and future mobility and safety conditions along the SH 35 corridor. Cities and communities along the corridor include Houston, Pearland, Brookside Village, Alvin, Manvel, Hillcrest Village, Danbury, and Angleton.

- **SH 288 to I-45.** This TxDOT project has Federal support through the FHWA in Brazoria and Galveston counties. The Notice of Intent (NOI) to prepare an EIS was announced in August 2002 and is an active FHWA EIS project (FHWA, 2008).
- **SH 288 Reconstruction.** This project includes reconstruction of SH 288 from US 59 (Harris County) to County Road 60 (Brazoria County). The project would accommodate toll lanes and associated frontage road, ramp, and interchange improvements.
- **FM 2234 from FM 521 to SH 288.** This project would occur in Brazoria and Fort Bend counties. A public involvement program was initiated in 2006, with construction anticipated between 2009 and 2011. FM 2234 would be expanded from two to four lanes within existing ROW for approximately 2.8 miles.
- **SH 146 Widening.** This project proposes to widen SH 146 to six lanes with two three-lane frontage roads, from Red Bluff Road to FM 518.
- **5th Street, FM 1092, and FM 2234.** This project consists of widening of 5th Street, FM 1092, and FM 223 to a four-lane curb and gutter to road from a two-lane rural road in Fort Bend County.
- **25th Avenue North, SH 3, and SH 146.** This project proposes the replacement of two-lane asphalt with four-lane concrete divided road with curb and gutter in Galveston County.
- **Atchison, Topeka and Santa Fe (ATSF) Railroad Bridge.** The project consists of replacement of the bascule bridge with a lift bridge on the railroad the runs parallel to I-45/Galveston Causeway in Galveston County.
- **Bay Area and Brittany Bay Boulevards.** In 2012, the City of League City proposed an extension of Bay Area Boulevard approximately 1.0 mile south to Brittany Bay Boulevard.
- **Beamer Road, Dixie Farm Road, Tall Ships Lane, West Bay Boulevard, and FM 528.** The project consists of widening Beamer Road, Dixie Farm Road, and Talls Ships Lane to 4-lane concrete boulevards with bridges & drainage. Phase II of the project includes widening West Bay Boulevard to a four-lane divided section with curb and gutter and adding left-turn lanes, storm sewers, and traffic signals. Phase III includes the widening of FM 528 to a four-lane divided section with curb-and-gutter, left-turn lanes, storm sewers and traffic signals as well as considering future bicycle/pedestrian needs on all roads.

- **Arnold Road at South Fork of Mary's Creek**. Proposed is the replacement of the bridge at Arnold Road where is crosses the south fork of Mary's Creek (National Bridge Inventory (NBI) # 12020AA0570001 in Brazoria County.
- **CR 541 at Chigger Creek.** Proposed is the replacement of the bridge at CR 541 where is crosses Chigger Creek (NBI# 12020AA0707002) in Brazoria County.
- **Rivers Road at South Fork of Mary's Creek**. Proposed is the replacement of the bridge at Rivers Road where is crosses South Fork of Mary's Creek (NBI# 12020AA0562001) in Galveston County.
- **CR 105 (Roy Road) at Hickory Slough**. Proposed is the replacement of the bridge at CR 105 near Brookside Village where is crosses Hickory Slough (NBI# 12020M00385001) in Brazoria County.
- **Hatfield Road at Hickory Slough**. The project consists of replacement of the bridge at Hatfield Road near Pearland where it crosses Hickory Slough (NBI# 12020M01095001) in Brazoria County.
- **Mary's Crossing at Mary's Creek**. Proposed is the replacement of the bridge at Mary's Crossing where is crosses Mary's Creek (NBI# 12085PP1070002) in Galveston County.
- **Miller Ranch Rd at Hickory Slough**. The project consists of replacement of the bridge at Miller Ranch Road where is crosses Hickory Slough (NBI# 12020M00367001) in Brazoria County.
- **O'Day Road at Hickory Slough**. Proposed is the replacement of the bridge at O'Day Road where it crosses Hickory Slough (NBI# 12020M01820001) in Brazoria County.

REFERENCES

Auch, Roger, Janis Tayor, and William Acevedo. 2004. Urban growth in American cities: glimpses of U.S. urbanization. U.S. Geological Survey circular 1252.

Coastal Coordination Council. 2006. Armand Bayou watershed plan, phase I. Available at http://www. tpl.org/content_documents/tx_Armand_Bayou.pdf (accessed April 13, 2008).

City of Friendswood. 2007. Glenshannon project update, December 2007. http://www.ci.friendswood.tx.us/agendas/cc071203%20Regular/CDD%2012-03-07/CMR/Dec%203rd%20Glenshannon%20 Project%20Update.pdf (accessed April 13, 2008).

———. 2008. Information regarding City of Friendswood capital improvement projects. http://www.ci.friendswood.tx.us/COF/residents/construction/default.htm (accessed September 2008 and May 2012).

———. 2012. Information regarding City of Friendswood capital improvement projects. http://www.ci.friendswood.tx.us/COF/residents/construction/default.htm (accessed May 2012).

City of Pearland. 2011. Proposed City of Pearland 2011–2015 Capital Improvement Programs - Overall. Revised September 2010.

———. 2012. City of Pearland. Completed Capital Improvement Program Projects. East Mary's Creek Phase I. http://cityofpearland.com/index.asp?Type=B_BASIC&SEC={4C20C710-3576-4B25-A7F9-AA9B6E7194D0} (accessed May 2012).

Environmental Law Institute. 2002. Banks and fees: the status of off-site wetland mitigation in the United States. Published by Environmental Law Institute, 199 pgs.

Environmental Protection Agency (EPA). 1997. Brio superfund site amended record of decision declaration. http://epa.gov/region6/6sf/pdffiles/briorod.pdf (accessed January 2008). EPA Region 6, Dallas, Texas.

———. 2002. Proposed draft restoration plan and environmental assessment for the Brio NPL site and Dixie Oil processors NPL site (2501 Dixie Farm Road, Friendswood, Texas 77089). http://163.234.20.106/assets/public/remediation/nrtp/pdf0107.pdf (accessed April 10, 2008).

———. 2007. Consent Decree: United States of America, Plaintiff v. TE Products Pipeline Company, LLC and TEPPCO Crude Pipeline, LLC, Defendants. http://www.epa.gov/compliance/resources/decrees/civil/cwa/teppco-cd.pdf (accessed April 13, 2008). U.S. District Court for Eastern District of Texas, Beaumont Division. 31 pp.

———. 2008. Enviromapper and database: TXD980625453 and TXD089793046 (Brio Superfund site progress profile, Brio Refining, Inc. EPA ID: TXD980625453). http://cfpub2.epa.gov/supercpad/cursites/csitinfo.cfm?id=0602601 (accessed April 13, 2008).

Espey, Huston & Associates, Inc. 1998. Clear Creek Flood Control Project for the U.S. Army Engineer District, Galveston, Texas.

Federal Highways Administration (FHWA). 2005. Results of the FHWA domestic scan of successful wetland mitigation programs. http://www.fhwa.dot.gov/environment/wetland/scanrpt/tx.htm (accessed April 10, 2008).

———. 2008. Active FHWA EIS projects list (Last Updated February 11, 2008). http://www.environment.fhwa.dot.gov/projdev/active_eis.asp (accessed April 10, 2008).

General Land Office, Texas (GLO). 1999. On the coast newsletter. CCC Project Nos. 99-0249-F1 and 99-0231-F1. http://www.glo.state.tx.us/coastal/pdf/onthecoast0899.pdf (accessed April 10, 2008).

———. 2005a. Coastal consistency determinations: CCC Project No. 05-0140-F1. http://www.glo.state.tx.us/coastal/consistency/2005/03-09-05.pdf (accessed April 10, 2008).

———. 2005b. Coastal consistency determinations: CCC Project No. 05-0435-F1 http://www.glo.state.tx.us/coastal/consistency/2005/08-31-05.pdf (accessed April 10, 2008).

Grand Parkway Association, The. n.d. The Grand Parkway: Segments. http://www.grandpky.com/segments/a/ (accessed April 10, 2008).

Houston-Galveston Area Council (H-GAC). 2006a. 2006–2008 transportation improvement program (TIP). http://www.h-gac.com/taq/publications/archive/default.aspx (accessed March 2008 and May 2012).

———. 2006b. 2006 Transportation progress: improving transportation in the Houston-Galveston Area. http://www.h-gac.com/NR/rdonlyres/emajqaz2ag3quahhsivw6w4t6y74ae6nd6x4q3mwhbczvoxaheqoyzdujv6uzjpzrxsaondbrpudbehuooide7pft5a/2006+Progress+Report.pdf (accessed April 12, 2008).

———. 2007. 2035 Regional transportation plan. http://www.h-gac.com/taq/publications/archive/2035_rtp.zip (accessed April and May 2008).

———. 2008. Bridging our communities: 2008–2011 transportation improvement program (TIP). http://www.h-gac.com/taq/tip/2008-2011/Documents/2008TIP.pdf (accessed April 2008).

League City. 2012. Clear Creek Watershed Steering Committee information. Available at http://leaguecity.com/index. aspx?NID=1687 (accessed on May 15, 2012).

Payne, J.W., and D.J. Miller. 1999. First fiber optic cable system in the Gulf of Mexico. Sea Technology 40(9):59–65.

Pearland Drainage District. 2007. Project information and images. http://www.pearland-drainage.dst.tx.us/index.htm (accessed March 2008 and May 2012).

Rendon, Ruth. 1992. NASA Road 1 (May 25, 1992). *The Houston Chronicle*. http://www.texasfreeway.com/Houston/schematics/nasa1/nasa1_25_may_92.shtml (accessed April 14, 2008).

Reporter News, The. 2007. Creek clearing draws mixed response from nearby residents (March 19, 2007). http://www.thereporternews.com/pearlandnews.html (accessed April 5, 2008).

Smith, J. 1999. Fiber-optic loop to connect U.S. Gulf platforms, onshore. Offshore 59(6): June 1999. http://www.offshore-mag.com/articles/print_screen.cfm?ARTICLE_ID=35989 (accessed November 19, 2007).

Spectra Energy. 2008. Texas eastern transmission facility. http://www.spectraenergy.com/businesses/us/facilities/texas_eastern/ (accessed April 9, 2008).

Surface Transportation Board (STB). 2002. Notice of availability of draft environmental impact statement and notice of public meetings. Federal Register: December 6, 2002 (Vol. 67, Number 235), page 72718–72720.

———. 2003. Final environmental impact statement. Finance Docket No. 34079. San Jacinto Rail Limited and the Burlington Northern and Santa Fe Railway Company Construction and Operation of a Rail Line from the Bay Port Loop in Harris County, Texas. 255 pp.

TEPPCO. 2008. TEPPCO business segments. http://www.teppco.com/our_business/downstream/, http://www.teppco.com/our_business/upstream/, and http://www.teppco.com/components/flash/map.htm (accessed January 2008).

Texas Construction. 2006. Texas top 10 highway projects. http://texas.construction.com/projects/0606_TC_HP.pdf (accessed April 13, 2008).

Texas Commission on Environmental Quality (TCEQ). 1994. Galveston Bay national estuary program (GBNEP-48). http://www.tceq.state.tx.us/assets/public/comm_exec/pubs/gbnep/gbnep-48/gbnep_48_17-23.pdf (accessed April 13, 2008).

Texas Comptrollers Office. 2008. Texas in focus: a statewide view of opportunities. http://www.window.state.tx.us/ecodata/popdata/cpacopop1990_2030.xls (accessed June 2008).

Texas Department of Transportation (TxDOT). 1999. Mitigation banking instrument for the coastal bottomlands mitigation bank. Mitigation Instrument. Brazoria, Texas.

———. 2007. Houston region freight rail study. http://www.houstonrailplan.com/index.htm (accessed May 2008).

U.S. Army Corps of Engineers (USACE). 2011. Clear Creek, Texas, Flood Risk Management, Draft General Reevaluation Report and Supplemental Environmental Impact Statement.

Appendix J

Mitigation Monitoring and Adaptive Management Plan

Job No. 441886

APPENDIX J
CLEAR CREEK FLOOD RISK MANAGEMENT PROJECT
DRAFT MITIGATION MONITORING AND ADAPTIVE MANAGEMENT PLAN
BRAZORIA, FORT BEND, GALVESTON, AND HARRIS COUNTIES, TEXAS

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

August 2010

Printed on recycled paper

Appendix J

Clear Creek Flood Risk Management Project
Draft Mitigation Monitoring and
Adaptive Management Plan
Brazoria, Fort Bend, Galveston, and Harris Counties, Texas

BACKGROUND

The Tentatively Selected Plan, also known as the General Reevaluation Plan (GRP), for the Clear Creek Flood Risk Management Project would provide for improvements to existing conveyances along approximately 19.7 miles of Clear Creek, Turkey Creek, Mary's Creek, and Mud Gully. The project study area is located in Harris, Galveston, Brazoria, and Fort Bend counties in southeast Texas and generally encompasses the Clear Creek watershed, to include Clear Creek, its tributaries, Clear Lake, and the surrounding riparian and upland environments within the 500-year floodplain. The project, including mitigation, would create the opportunity to preserve and rehabilitate or reestablish 186 acres of forested riparian corridor along the Clear Creek low flow channel within the project footprint.

Recent guidance issued by the USACE requires monitoring for mitigation plans, updates previous requirements, and supplements regulatory guidelines. Mitigation guidance includes:

- Memorandum for Commanders, Major Subordinate Commands, Subject: Implementation Guidance for Section 2036 (a) of the Water Resources Development Act of 2007 (WRDA 07) – Mitigation for Fish & Wildlife and Wetland Losses, CECW-PC, dated 31 August 2009.
- Section 906(d) of the Water Resources Development Act 1986 (33 USC 2283 (d)), as amended.
- ER 1105-2-100 dated 22 April 2000, Planning Guidance Notebook.
- Compensatory Mitigation for Losses of Aquatic Resources; Final Rule; Federal Register, Volume 73, No. 70, April 10, 2008.
- Conference Report to Accompany H.R. 14945, Report 110-280, dated July 31, 2007, Joint Explanatory Statement of the Committee of Conference.

PURPOSE

This document describes the monitoring and contingency/adaptive management plans for mitigation proposed in the Clear Creek Flood Risk Management project as required by the Section 2036 guidance referenced above. Monitoring plans described in this document are conceptual and based on the net functional costs of unavoidable resource impacts and the functional benefits of proposed in-kind mitigation activities as evaluated using community-based Habitat Evaluation Procedure (HEP) modeling. Further description of this modeling effort for the 50-year period of analysis (i.e., 2020–2070) is provided in Appendix B.

MITIGATION PLANS

Section 2036 (a) guidance of WRDA 07, issued August 31, 2009, requires that the General Reevaluation Report and Preliminary Draft Supplemental Environmental Impact Statement contain a specific plan to mitigate unavoidable impacts to fish and wildlife resources. Adverse impacts to these resources must be avoided or minimized to the extent practicable, and the remaining unavoidable impacts must be compensated to the extent justified.

Mitigation Planning Objectives

Paragraph C-3(e)(8)(a)(3) of ER 1105-2-100 requires the development of planning objectives to guide mitigation plan formation, to determine the appropriate mitigation management features, and to establish performance standards for evaluating each increment of mitigation management. The following mitigation planning objectives were established to evaluate restoration and mitigation measures considered for the Clear Creek Project.

- Replace lost habitat quality on a one-to-one basis as measured by Average Annualized Habitat Units (AAHUs) for a minimum of 106 AAHUs of floodplain forest.
- Replace habitats in-kind to the maximum extent practicable.
- Contribute to the rehabilitation of fish and wildlife resources of Clear Creek and its tributaries.
- Preserve and protect natural, cultural, and historical resources for public education and outreach.
- Meet goal of no net loss of wetlands.

Comparison of Recommended Mitigation Plan with Planning Objectives

The GRP was designed to avoid and minimize impacts to riparian floodplain forests in areas where doing so would be compatible with the flood risk management measures. The GRP minimizes impacts to terrestrial and aquatic resources associated with the riparian habitat along Clear Creek and its tributaries by limiting construction to approximately 19.7 miles of project footprint in upstream areas of the Clear Creek and areas of Turkey Creek, Mary's Creek, and Mud Gully that have been channelized in the past. Within these previously channelized areas, much of the low flow channel and side slopes are currently being mowed and maintained by the non-Federal sponsors. The GRP also reduces impacts to fish and wildlife resources over time by preserving and rehabilitating 122 acres of existing forested riparian corridor and reestablishing 33 acres of forested riparian corridor that have been severely degraded or eliminated along the low flow channel within the limits of the proposed high-flow conveyance features (i.e., flood benches).

Avoidance and minimization features would be located along the Clear Creek mainstem within the project footprint (Figure 1) and would differ slightly for the Super C(d) and Cd(5) conveyance measures and inline detention features. Conceptual cross-sections are depicted by

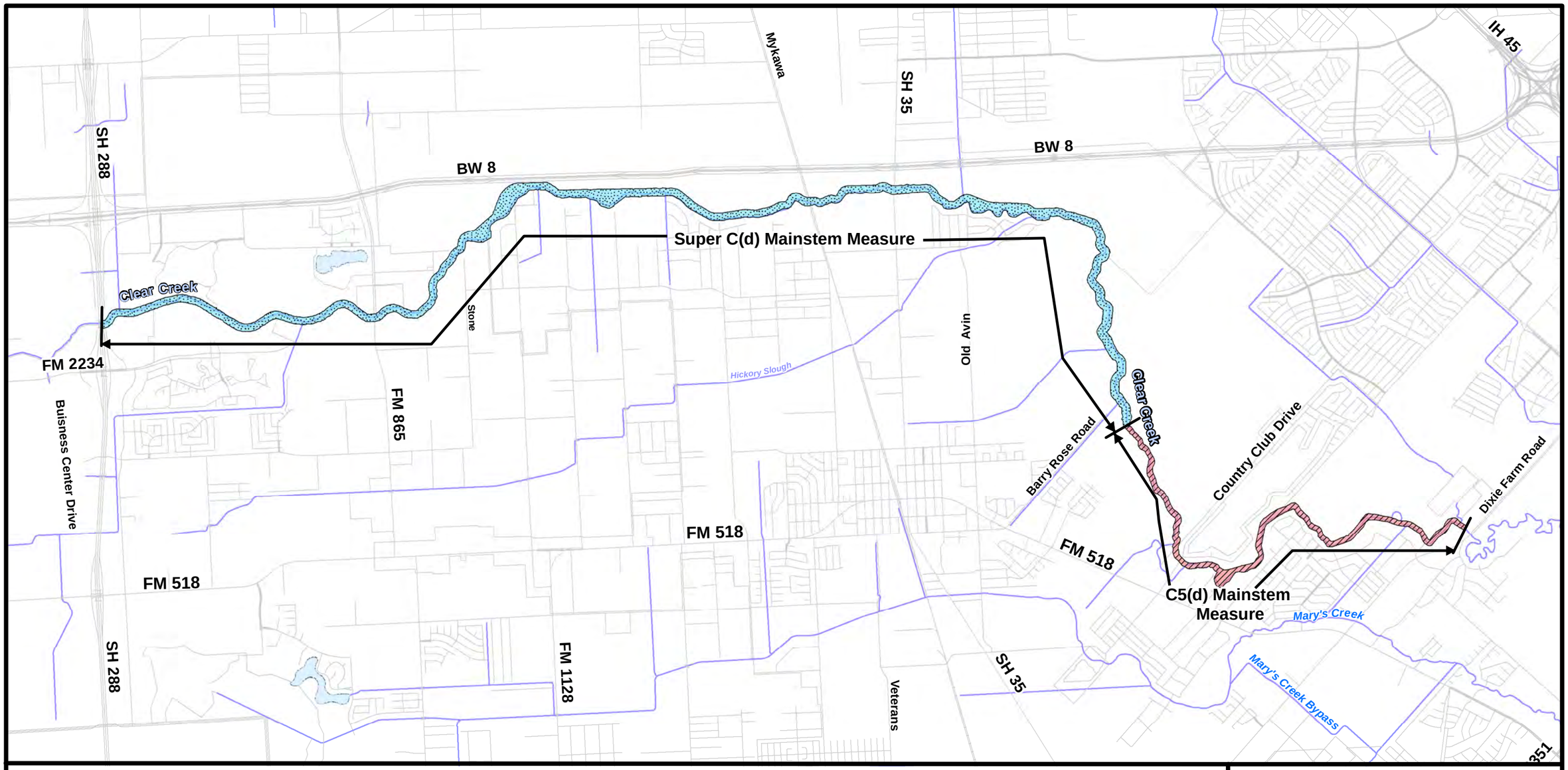
location in figures 2–4. Actions would include preserving and rehabilitating a 65-foot riparian corridor that would expand to larger forest patches where the high-flow and low-flow channels diverge; planting trees in cleared areas; and removing invasive, noxious, and/or exotic plant species throughout. Despite these actions, remaining unavoidable impacts from implementing the GRP would occur to approximately 278 acres of floodplain forest along Clear Creek and its tributaries resulting in a loss of 106 AAHUs over the 50-year period of analysis.

In-kind compensatory mitigation for these remaining, unavoidable impacts to 106 AAHUs of forested riparian habitat along Clear Creek and its tributaries would be accomplished by reestablishing and rehabilitating approximately 31 acres of floodplain forest (Figure 5). Past flood control activities channelized and straightened segments of Clear Creek from Dixie Farm Road to Country Club Drive, with dredged material side-cast along the banks. Bypassed segments formed remnant oxbows where the historic channel and adjacent floodplain forests are disconnected from flow except during high stage events. These oxbows and the approximate 31 acres of associated riparian floodplain forest immediately surrounding them are undeveloped and within the floodway of Clear Creek. Proposed mitigation includes modifying conveyance features to reconnect the 13 remnant oxbows and restore the flow of Clear Creek during low stage to mimic the historic, pre-1955 sinuosity of this reach. Additional proposed activities to return the existing floodplain forest to a desired state include the removal of dredged material stock piled along the north bank of the Creek, the dense planting (400 trees per acre) of native species in overbank areas along the channel that have been cleared, and aggressive management of nuisance, exotic, and/or invasive species. The compensatory mitigation would provide for 131 AAHUs over the 50-year period of analysis, providing overall benefits of 25 AAHUs in excess of the impacts.

IMPLEMENTATION

The GRP is located within much of the existing low flow channel and associated rights-of-way along Clear Creek, Mud Gully, Turkey Creek, and Mary's Creek which are currently owned by or controlled via easements through the project's non-Federal cost-share sponsors, Harris County Flood Control District and Brazoria County Drainage District No. 4. Upon approval of the GRP, any additional real estate purchases or easements necessary for the purposes of performing project and mitigation planning, engineering and design, as well as construction and postconstruction monitoring of the associated mitigation, will be completed by the project's non-Federal cost-share sponsors. Agencies on the Interagency Coordination Team (ICT) would be consulted to provide input to the future engineering, design, construction, and monitoring of the project. The ICT would also participate in the detailed planning, construction, and postconstruction monitoring of the mitigation areas.

(This page left blank intentionally.)



Key

- Road
- Stream

N
W E
S

0 4,000 8,000 Feet

Figure 1
Generalized Location of GRP Avoidance and Minimization Features on Clear Creek Mainstream
Clear Creek
Flood Risk Management Project

Prepared for: USACE	
Job No.: 100002202	Scale: 1 inch = 4,000 ft
Prepared by: 18827	Date: 5/16/2012

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/044188600/figures/mitigation/mitigation_superC_sectionC5.mxd

(This page left blank intentionally.)

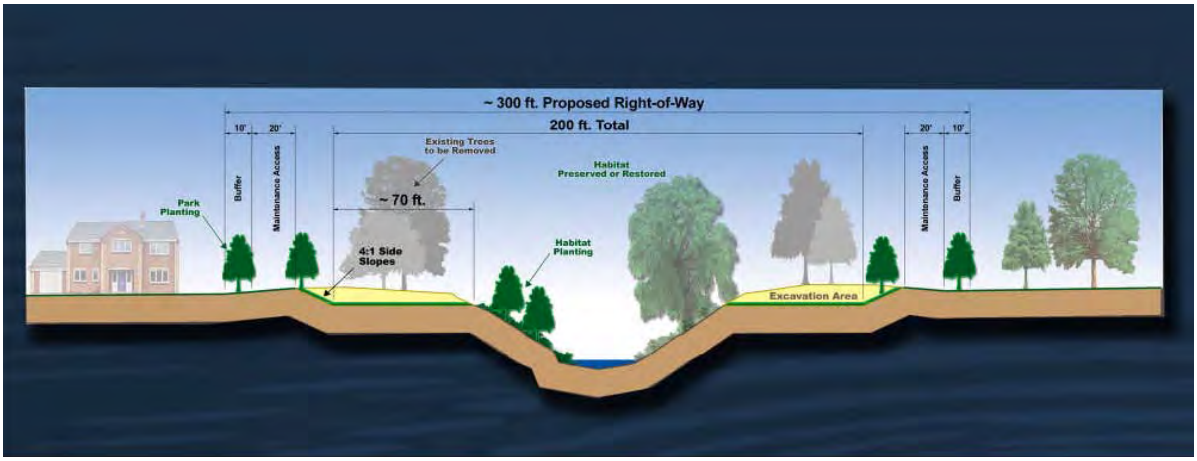


Figure 2. Super C(d) Conveyance Measure Cross Section.

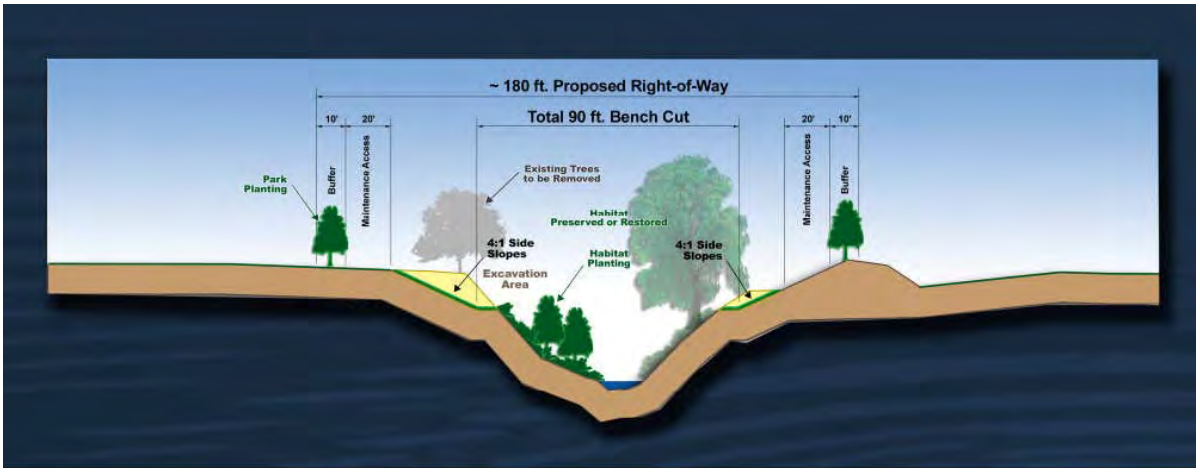


Figure 3. C5(d) Conveyance Measure Cross Section.

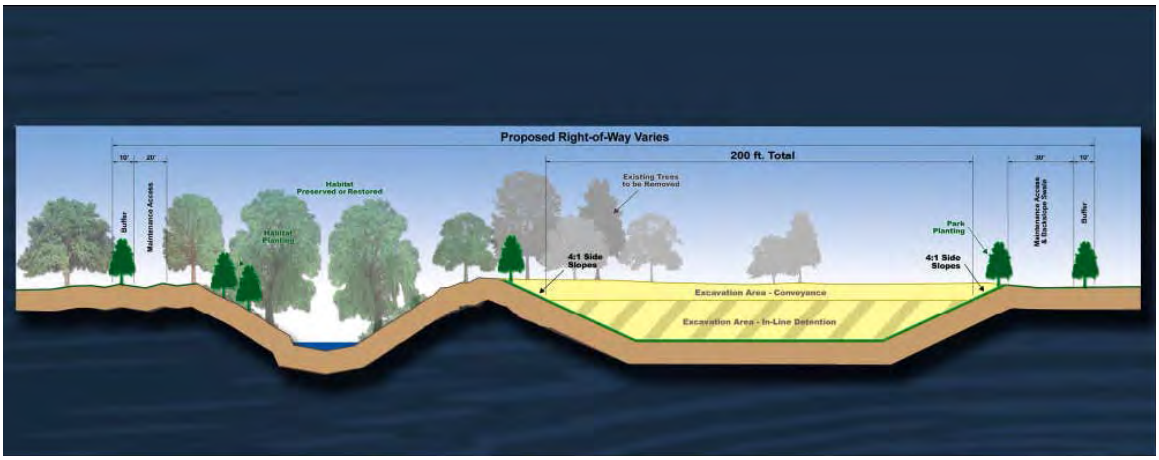


Figure 4. Clear Creek In-Line Detention Measure Cross Section.

(This page left blank intentionally.)

Key

- Road
- Stream
- Project Footprint

Mitigation Features:

- Mitigation Site C1

N
W E
S

0 1,000 2,000 Feet

Figure 5

Compensatory Mitigation Site C1

Clear Creek Flood Risk Management Project

Prepared for: USACE	
Job No.: 100002202	Scale: 1in = 1000 ft
Prepared by: GR	Date: 3/23/2010

File: N:/Clients/U_Z/USACE/Projects/Clear_Crk/044188600/figures/mitigation/Mitigation_C1.mxd

(This page left blank intentionally.)

MONITORING PLANS

Mitigation Monitoring

Monitoring mitigation is a critical part of the mitigation process and for this proposed project will be a cooperative process. According to ER 1105-2-100, Section C-3(e) (10) the non-Federal sponsor is primarily responsible for mitigation monitoring to determine the success of mitigation measures. While the non-Federal sponsor is responsible for implementing the monitoring plan, the Galveston District will lead initial monitoring efforts, in cooperation with the non-Federal sponsor and the ICT to ensure successful establishment of the mitigation features. The Galveston District will review monitoring results and will make decisions regarding corrective actions. The purpose of monitoring is to:

- obtain an objective assessment of project progress towards pre-determined project goals and success criteria;
- identify and correct problems through an adaptive management approach; and
- ensure that USACE Galveston District and non-Federal sponsor meet their mitigation obligations.

Ecological Success Criteria

Performance standards developed during mitigation planning objectives formation establish the basis for determining the ecological success of mitigation measures. Success criteria are used to objectively evaluate the progress of mitigation plans in achieving predetermined objectives, and to determine whether corrective actions need to be implemented. Because habitat functions are difficult to measure directly, success criteria may be based on an assessment of the structural attributes of restored habitats and evaluated according to the best available scientific understanding of the relationship of these attributes with ecosystem functioning. In this way, structural attributes serve as surrogate measures of habitat function. Once site conditions have met or surpassed predetermined structural thresholds, it is assumed that the desired functions are either currently being provided or will be provided given time. Success criteria for the floodplain forest mitigation features would pertain to percent survival of tree plantings, control of invasive, noxious, and/or exotic plant species, and vegetative cover requirements.

Field data would be collected to determine the percent survival of trees planted at 5 and 10 years. Success criteria for tree seedling survivorship target a minimum survivorship of 95 percent of the original planting density at 5 years postplanting and 90 percent of original planting density at 10 years postplanting. This criterion ensures that the mitigation areas will have the requisite acres of desired native floodplain forest vegetation.

Invasive, noxious, and/or exotic plant species shall comprise less than 2 percent areal coverage of mitigation sites and will be measured at 5, 10, and 35 years after construction. This criterion ensures that the mitigation areas will not be overrun by invasive, noxious, and/or exotic plants

before native forest vegetation has developed sufficient cover to prevent the establishment of these undesired plant species.

To evaluate vegetative cover requirements, percent tree canopy cover, in-stream cover, stream overhead cover, and the number of vegetation strata present within mitigation areas will be measured at 10 and 35 years following construction completion. Specific mitigation requirements associated with vegetative cover, in addition to further detail on all criteria, are shown in Table 1. This criterion ensures that the mitigation sites will provide sufficient forest cover for the full period of analysis to produce the total benefits needed to mitigate for project impacts.

Monitoring Data Collection Protocol

The primary monitoring data for evaluating achievement of the ecological success criteria within the mitigation areas would be field data collected at 5, 10, and 35 years postcompletion (i.e., 2025, 2030, and 2055, respectively), conducted at the same general time during summer months preceding the annual removal[1] of invasive species for these years. The exact timing of the monitoring as well as the number and location of monitoring stations or transects would be determined by the ICT based on preliminary field data, and field sampling would be performed in accordance with standard scientific procedures required to capture the spatial variability of parameters defining the success criteria. Key project areas would be photo-documented from stationary points (i.e., same station/transect location, same angle, etc.) prior to construction and during monitoring events to provide a consistent basis for visually comparing conditions through time. Monitoring data would also document other relevant information such as general site conditions, damage by herbivory or vandalism, and erosion.

Following completion of monitoring events, field data collected to evaluate the success of the mitigation plan would be digitally stored, statistically analyzed and interpreted, and compiled into detailed monitoring reports to be assessed by the ICT. Monitoring data on percent survival of planted trees would be collected and assessed at years 2025 and 2030 (i.e., 5 and 10 years following construction completion)[2]. Monitoring data on the percent areal coverage of invasive, exotic, and/or nuisance plant species would be documented at years 2025, 2030, and 2055 (i.e., 5, 10, and 35 years following construction completion). Data on percent tree canopy cover, amount of the stream characterized by in-stream vegetative cover, percent of the water surface shaded by overhanging vegetation, and vegetation strata would be collected at years 2030 and

[1] Removal of invasive plant species, specifically Chinese tallow (*Triadica sebiferum*), from forested areas will be performed annually in the fall through the 35th year following completion of project construction, using hand pulling or foliar and basal stem application of herbicide (method is dependent on the size and density of trees). It is important to link optimal herbicide application to a specific stage in the annual cycle of Chinese tallow tree. Research has shown that maximum movement of herbicide in tallow trees occurs following seed maturation and prior to leaf color change. Generally, this period would be between mid-July and mid-September (Hanselka, 2009; The Nature Conservancy, 2007).

[2] Requiring additional monitoring of the percent survival of planted trees during the initial establishment year is unnecessary as project construction contracts will require a survival warranty of 100 percent for planted trees through the first year following project construction completion, and any replacement planting would be planted according to the original contract planting specifications.

2055 (i.e., 10 and 35 years following project completion). Field collection of monitoring data would follow the protocols discussed herein and provided in Table 1.

Disposition of Information and Analysis

Annually, the District Engineer will consult with State and Federal agencies regarding the status of mitigation efforts and prepare a report summarizing the results of consultation and the evaluation of the ecological success of the mitigation to date, the likelihood mitigation will achieve success defined in the mitigation plan, the projected timeline for achieving success, and recommendations for increasing the likelihood of success. Copies of these annual reports will be provided to the Division Commander and members of the consulting State and Federal agencies.

All field data collected during monitoring efforts will be stored in an electronic database, statistically analyzed and interpreted, and compiled into detailed monitoring reports. Because the mitigation monitoring data is collected and reported at various years over the period of analysis, these annual reviews will often be restricted to mitigation site operation and maintenance data (e.g., annual efforts to control invasive species). All mitigation monitoring reports will be evaluated by the ICT.

Monitoring Cost Estimates

Cost estimates may change as details on the number of monitoring locations are developed and monitoring dates identified. For field measurement of vegetation, cost estimates are based on three biologists spending a day in the field at the mitigation areas for each major monitoring event. Cost estimate include the cost of field data management and preparation and distribution of monitoring reports. Estimated costs also include costs for preparation of annual reports summarizing data for presentation to the Division Commander.

Contingency Plan/Adaptive Management

The following contingency plan has been developed to guide corrective actions where monitoring demonstrates that mitigation is not achieving ecological success as measured by the success criteria. If monitoring determines that the vegetation survival, coverage, and composition do not meet ecological success criteria, planting would be employed to restore the requisite acres of floodplain forest to produce the total benefits needed to mitigate for project impacts. The number, species, spacing, and size of trees or any other vegetation to be planted would be determined by the ICT after reviewing monitoring data. Likewise, the ICT would evaluate additional or alternate methods for addressing the control of invasive, noxious, and/or exotic plant species if monitoring reveals that the proposed “cut stump” or similar methods for control do not achieve the desired or target level specified in the success criteria, or if the methods prove to be highly successful and invasive species control could be performed less frequently using the same or different methods to save costs.

Table 1

Ecological Success Criteria			
	Avoidance and Minimization Features of the GRP		Compensation for Unavoidable Impacts
	Clear Creek Mainstem Conveyance, Low-flow Riparian Corridor		Clear Creek Mainstem Low-Flow Channel/Oxbows and Rehabilitation of 31 acres of Associated Forested Riparian Habitat (i.e., Mitigation Plan C1)
	Preservation/ Rehabilitation of 155 Acres of Forested Riparian Habitat	Restoration of 33 Acres of Forested Riparian Habitat	
	Eco-Reaches 4, 5, and 6	Eco-Reaches 5 and 6	Eco-Reaches 4 and 5
Percent survival of planted species will be at least 95% at 5 years and 90% at 10 years following construction completion	At minimum of 380 live healthy native trees per planted acre at 5 years, and 360 live healthy native trees per planted acre at 10 years		
Invasive, noxious and/or exotic plant species shall comprise less than 2% of areal coverage	A maximum of 2% of the areal cover of all mitigation areas will be comprised of invasive, noxious, and/or exotic plant species at 5, 10, and 35 years following construction completion		
Vegetative Cover:			
10 Years Postconstruction			
Tree Canopy Cover (%)	65–75	≥5	65–75
Instream Vegetative Cover (%)	5–10	≥5	25–30
Stream Overhead Cover (%)	20–60	≥60	20–60
Vegetation Layers (No.)	6–7	≥2	6–7
35 Years Postconstruction			
Tree Canopy Cover (%)	70–75	≥65	70–80
Instream Vegetative Cover (%)	5–20	≥20	35–65
Stream Overhead Cover (%)	25–60	≥60	30–70
Vegetation Layers (No.)	6–7	≥4	6–7
Monitoring Organization	U.S. Army Corps of Engineers, the Federal Cost Share Sponsors will share responsibility and costs consistent with the apportionment of O&M costs for the project		

Table 1 (Cont'd)

Cost	
Field survey of vegetation at 5, 10, and 35 (constant dollars, 4.375% interest rate)	$17,583
Data analysis and reporting (constant dollars, 4.375% interest rate)	$9,453
Total monitoring Cost 50 years (constant dollars, 4.375% interest rate)	$27,036
Monitoring Data Collection Protocol	
Percent survival of tree plantings Monitoring data on percent survival of planted trees would be collected and assessed at years 2025 and 2030 (i.e., 5 and 10 years following construction completion)[3]. Survival of planted trees would be recorded by pedestrian survey and photo-documentation.	
Control of invasive, noxious, and /or exotic plant species The extent of invasive/exotic species presence would be assessed by determining the percent areal coverage of such species at years 2025, 2030, and 2055 (i.e., 5, 10, and 35 years following construction completion). Starting from streambank edge, run a transect tape perpendicular to stream across the mitigation area for 300 meters (m) or until you reach the end of the mitigation area. Keep a minimum width of 100 m between transects and do not allow overlap. Based on the ICT determined sampling intensity, use nested plots at set intervals along the transect to assess species cover by strata using the Braun-Blanquet method (e.g., 1 m^2 herbaceous quadrat).	
Percent Tree Canopy Cover Starting from streambank edge, run a transect tape perpendicular to stream across the polygon for 300 m or until you reach the end of the mitigation area. Keep a minimum width of 100 m between transects and do not allow overlap. Stop every 10 m, use a densiometer to estimate percent tree canopy cover at four cardinal directions.	
In-Stream Vegetative Cover The amount (percent) of the Stream Characterized by In-Stream Vegetative Cover. At the start of transects, near the stream edge (approximately 1.5 m from bank), use the Braun-Blanquet method to record percent of the stream characterized by in-stream cover (woody debris, overhanging woody vegetation, aquatic vegetation, etc.).	
Overhead Cover Refers to the Amount (percent) of Vegetation Canopy and/or Overhanging Bank Hanging Over the Water Surface, Providing Shade, Woody Vegetation, Detritus and Insect Drop to the River. At the start of transects, near the stream edge (approximately 1.5 m from bank), record the visual estimate of the percent of the water surface that is shaded by overhanging vegetation. Additionally, measure canopy cover using densiometer at four cardinal directions.	
Vegetation Strata Starting from streambank edge, run a transect tape perpendicular to stream across the mitigation area for 300 m or until you reach the end of the mitigation area. Keep a minimum width of 100 m between transects and do not allow overlap. Stop every 10 m, use a 5-m-width belt on both sides of the tape, record the number of vegetation layers present from the following list of structural components: (1) herbaceous layer – herbaceous vegetation less than 1 m (39 inches) in height; (2) shrub layer – woody vegetation less than 3 m (~10 feet [ft]) in height; (3) midstory tree canopy layer – woody vegetation 3–6 m (~10–20 ft) in height; (4) overstory tree canopy layer – woody vegetation greater than 6 m (~20 ft) in height; (5) vine layer – woody vines allowing for travel lanes; (6) duff, twigs, leaf litter – down or dead wood or herbaceous litter; (7) coarse woody debris – down or dead wood debris greater than or equal to 10 centimeters (2.5 inches) diameter; (8) snags – dead but standing trees; and (9) micro relief – small pockets or mounds that may allow for cover or ponding water.	

[3] Requiring additional monitoring of the percent survival of planted trees during the initial establishment year is unnecessary as project construction contracts will require a survival warranty of 100 percent for planted trees through the first year following project construction completion, and any replacement planting would be planted according to the original contract planting specifications.

Table 1 (Cont'd)

Disposition of Information and Analysis
Annually, the District Engineer will consult with State and Federal agencies regarding the status of mitigation efforts and prepare a report summarizing the results of the consultations and evaluating ecological success of the mitigation to date, likelihood mitigation will achieve success defined in the mitigation plan, projected timeline for achieving success, and recommendations for increasing the likelihood of success. Copies of the report will be provided to members of the consulting State and Federal agencies. Field data collected during monitoring efforts will be stored in an electronic database. Monitoring data will be analyzed, interpreted, and compiled into reports to evaluate the survival, extent, and nature of vegetative cover. Data on percent survival of planted trees will be collected and included in reports at years 2025 and 2030 (i.e., 5 and 10 years following construction completion). Data on percent tree canopy cover, amount of the stream characterized by in-stream vegetative cover, percent of the water surface shaded by overhanging vegetation, and vegetation strata will be collected and included in reports at years 2030 and 2055 (i.e., 10 and 35 years following project completion). Because the monitoring data is collected at various years over the period of analysis, the annual review will often be restricted to mitigation site operation and maintenance data (e.g., annual efforts to control invasive species). These monitoring reports will be evaluated by the ICT.
Contingency Plan/Adaptive Management
If monitoring determines that the vegetation survival, coverage, and composition does not meet ecological success criteria, planting would be employed to restore the requisite acres of floodplain forest to produce the total benefits needed to mitigate for project impacts. The number, species, spacing, and size of trees or any other vegetation to be planted would be determined by the ICT after reviewing monitoring data. Likewise, the ICT would evaluate additional or alternate methods for addressing the control of invasive, noxious, and /or exotic plant species (i.e., Chinese tallow [*Triadica sebiferum*]) if monitoring reveals that the proposed "cut stump" or similar methods for control do not achieve the desired or target level specified in the success criteria. Should the mitigation areas be damaged as a result of catastrophic events (e.g., severe flood disturbance associated with intense storms and hurricanes), the ICT would assess the nature and extent of the damage and recommend measures to correct or restore the mitigation areas to pre-event or target conditions.
Project Closure
Monitoring activities will cease and the project will be formally closed when it is determined that the desired acres of forest vegetation have met the monitoring criteria as specified above. The contingency plan/adaptive management process described is intended to allow periodic modifications in order to achieve the desired number of acres at the end of the project and ensure amounts of unwanted vegetation are minimized. The ICT will meet to evaluate data collected during the last scheduled annual report to close monitoring of the mitigation features.

Should the mitigation areas be damaged as a result of catastrophic disturbance events (e.g., severe flooding associated with intense storms and hurricanes), the ICT would assess the nature and extent of the damage and recommend measures to correct or restore the mitigation areas to predamage or target conditions.

Project Closure

Monitoring activities will cease and the project will be formally closed when it is determined that the desired acres of forest vegetation have met the monitoring ecological success criteria as specified above. The contingency plan/adaptive management process described above is intended to allow periodic modifications in order to achieve the necessary functional mitigation for project impacts at the end of the 50-year period of analysis and ensure that presence of undesirable vegetation is minimized. The ICT will meet to evaluate data collected during the last scheduled annual report to determine if appropriate to close monitoring of the mitigation features. Monitoring would continue until it has been demonstrated that the mitigation has met

the ecological success criteria as documented by the District Engineer and determined by the Division Commander.

SUMMARY

Ecological success criteria for the GRP for the Clear Creek Flood Risk Management Project focus on the preservation, rehabilitation, and restoration of forested riparian habitat adjacent to Clear Creek. Achievement of these criteria is expected to be maintained for the 50-year period of analysis. Monitoring focuses on the collection of data, particularly field data, which allow the survival, coverage, and composition of vegetation in the mitigation areas to be determined and evaluated. Photo-documentation at stationary monitoring points will also be utilized to depict the progression of mitigation activities.

The total estimated cost (constant dollars, 4.375 percent interest rate) for monitoring all mitigation is $27,035. The costs estimate includes field sampling, data management and analysis, and report preparation.

Analysis of the monitoring data collected will be reviewed by the ICT and provided to the USACE Division Commander annually. This analysis will include recommendations for actionable changes in mitigation practices, if necessary, to achieve the ecological success criteria. Recommendations will also be made for necessary modifications to monitoring plans to ensure accurate documentation of mitigation outcomes.

REFERENCES

Hanselka, C.W. 2009. How to take out tallowtrees. Texas AgriLife Extension, Brush Busters Brush Control Program. http://texnat.tamu.edu/BrushBusters/Tallowtrees.htm (accessed March 3, 2010).

The Nature Conservancy. 2007. Chinese tallow control and management: a landowner's guide. http://www.nature.org/wherewework/northamerica/states/texas/files/invasive_chinese_tallow_booklet_1008.pdf (accessed March 3, 2010).

Appendix K

Texas Coastal Zone Management Programs Consistency Determination

Job No. 441886

APPENDIX K
COMPLIANCE WITH GOALS AND POLICIES
CLEAR CREEK GENERAL REEVALUATION STUDY
BRAZORIA, FORT BEND, GALVESTON, AND HARRIS COUNTIES, TEXAS
TEXAS COASTAL ZONE MANAGEMENT PROGRAMS
CONSISTENCY DETERMINATION

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

August 2010

Printed on recycled paper

Appendix K

Compliance with Goals and Policies of Texas Coastal Zone Management Programs Consistency Determination Clear Creek General Reevaluation Study Brazoria, Fort Bend, Galveston, and Harris Counties, Texas

INTRODUCTION

The Clear Creek General Reevaluation Study is located in Brazoria, Fort Bend, Galveston, and Harris counties in southeast Texas. The project study area encompasses most of the Clear Creek Watershed, to include Clear Creek, its tributaries, Clear Lake, and the surrounding riparian and upland environments. Clear Creek generally flows from west to east and drains into Clear Lake, which eventually drains into Galveston Bay at Seabrook, Texas. The project area is defined as the footprint of the project features to be constructed, including mitigation areas and conveyance and preserved riparian corridors (see Figure 3.0-1 of the Draft Supplemental Environmental Impact Statement [DSEIS]) with a 0.25-mile buffer. Further descriptions of the Clear Creek project and study areas can be found in Section 3.0 of the DSEIS.

The proposed project is needed to reduce flood damages within the Clear Creek watershed while preserving natural features for aesthetics, recreation, and rehabilitation of flood risk management. This will allow a balance between structural modifications of the creek, floodplain regulations, and a broad program of floodplain management.

The Clear Creek Federal flood control project was authorized by Congress in the Flood Control Act of 1968 (Public Law 91-611, Section 221). This plan is referred to as the General Reevaluation Plan (GRP). The authorized project reaches extended 31 miles from Clear Lake to the Fort Bend County line. In 1982 the Phase I General Design Memorandum, including the Final Environmental Impact Statement, was signed by the Southwest Division Engineer, thus authorizing the detailed design later evaluated and rejected by the non-Federal sponsors. In 1997, the non-Federal sponsors requested that the USACE adopt changes to the plans. The changes requested by the non-Federal sponsors were beyond the discretionary authority of the USACE Division Commander to approve. As a result, in February 1999, the USACE decided that a general reevaluation study would be needed. In April 1999, the non-Federal sponsors agreed to accept the USACE recommendation to conduct the general reevaluation study. The general reevaluation study will reconsider the previously authorized project as well as non-Federal sponsor-proposed alternatives and other alternatives that are deemed reasonable. As of June 1999, Brazoria County Drainage District No. 4 joined the non-Federal sponsors in this effort. The congressional authorization for this project only allows the consideration of reducing flood damage caused by rainfall runoff along the main channel of Clear Creek and not coastal flooding

caused by tropical storm systems. To achieve reduction in flood damages, the U.S. Army Corps of Engineers (USACE) plans to implement flood risk management measures, which include conveyance measures on areas on/or adjacent to Clear Creek from State Highway 288 to Bennie Kate Road, Bennie Kate Road to Dixie Farm Road, and on three tributaries: Mudd Gully, Turkey Creek, and Mary's Creek. This plan is referred to as the GRP.

IMPACTS ON COASTAL NATURAL RESOURCE AREAS

Several of the Coastal Natural Resource Areas (CNRAs) listed in 31 Texas Administrative Code (TAC) §501.3 are found reasonably close to the areas discussed in the DSEIS. A short description of each CNRA near the project, and of methods to minimize or avoid potential impacts, is provided below.

Waters of the Open Gulf of Mexico

Waters of the open Gulf of Mexico (Gulf) are located east and south of the project site. All construction activities, including excavation and placement of excavated material, will occur inland, upstream from tidally influenced portions of Clear Creek. Waters of the open Gulf will not be impacted.

Waters Under Tidal Influence

The study area encompasses portions of Clear Creek that experience tidal influence; however, no work would occur in tidal waters. Excavation and placement activities represent a negligible impact because the potential release of suspended solids is minimized by using upland confined placement areas (PAs), appropriate best management practices (BMPs), and compliance with the required State §401 Certification.

Submerged Lands

The project footprint does not occur in areas characterized as submerged lands. No impacts to this resource are expected as a result of the project.

Coastal Wetlands

Although coastal wetlands occur within the study area, no coastal wetlands would be directly affected by the project footprint, which is beyond the Texas Coastal Zone boundary. No impacts to this resource are expected as a result of the project.

SUBMERGED AQUATIC VEGETATION

Although submerged aquatic vegetation (SAV) may occur within the study area, no SAV would be directly affected by the project footprint, which is beyond the Texas Coastal Zone boundary. No impacts to this resource are expected as a result of the project.

Tidal Sand and Mud Flats

Although tidal sands and mud flats may occur within the study area, these areas would not be directly affected by the project footprint, which is beyond the Texas Coastal Zone boundary. No impacts to this resource are expected as a result of the project.

Oyster Reefs

There are no oyster reefs identified within the project footprint. No impacts to this resource are expected as a result of the project.

Hard Substrate Reefs

There are no naturally occurring hard substrate formations in the vicinity of the project. No impacts to this resource are expected as a result of the project.

COASTAL BARRIERS

The coastal barrier downdrift of the study area consists of Galveston Island, which is highly developed with some marshes in the backshore and with narrow beaches and overwash terrace on the foreshore. The proposed project would occur in the upper portions of the Clear Creek watershed. No impacts to this resource are expected as a result of the project.

Coastal Shore Areas

These resource areas function as buffers, protecting upland habitats from erosion and storm damage and adjacent marshes and waterways from water quality degradation. Coastal shore areas occur outside of the study area, and no construction would occur in these areas. No impacts to this resource are expected as a result of the project.

Gulf Beaches

The project would not affect any Gulf beaches since all project areas occur inland and excavated material would be placed in several upland confined PAs. No impacts to this resource are expected as a result of the project.

Critical Dune Areas

The project would not affect any critical dune areas since all project areas occur inland and excavated material would be placed in several upland confined PAs. No impacts to this resource are expected as a result of the project.

Special Hazard Areas

Special hazard areas are areas designated by the Administrator of the Federal Insurance Administration under the National Flood Insurance Act as having special flood, mudslide, and/or flood-related erosion hazards. The project area is covered under the Flood Insurance Studies (FIS) for Brazoria, Fort Bend, Galveston, and Harris counties, Texas. The land along the channel within the area studied is predominantly located in or adjacent to the 100-year floodplain. Project objectives would decrease the hazard of the flood-prone areas, and a beneficial effect to the hazard area is expected.

Critical Erosion Areas

These areas are those Gulf and bay shorelines that are undergoing erosion and are designated by the Commissioner of the General Land Office under Texas Natural Resources Code, §33.601(b). The project would not affect any critical erosion areas since all project features occur inland and excavated material would be placed in several upland confined PAs. No impacts to this resource are expected as a result of the project.

Coastal Historic Areas

No coastal historic areas (sites in the National Register of Historic Places on public land or State Archeological Landmarks that are identified by the Texas Historical Commission as being coastal in character) would be impacted by the project.

Coastal Preserves

The project would not affect any coastal preserves since all project features occur inland and excavated material would be placed in several upland confined PAs. No impacts to this resource are expected as a result of the project.

COMPLIANCE WITH GOALS AND POLICIES

The following goals and policies of the Texas Coastal Management Program (TCMP) were reviewed for compliance.

- §501.15 – Policy for Major Actions
- §501.34 – Policies for Levees and Flood Control Projects

§501.15 – Policy for Major Actions

(a) For purposes of this section, "major action" means an individual agency or subdivision action listed in §505.11 of this title (relating to Actions and Rules Subject to the Coastal Management Program), §506.12 of this title (relating to Federal Actions Subject to the Coastal Management Program), or §505.60 of this title (relating to Local Government Actions Subject to the Coastal Management Program), relating to an activity for which a Federal environmental impact statement under the National Environmental Policy Act, 42 United States Code Annotated, §4321, et seq. is required.

(b) Prior to taking a major action, the agencies and subdivisions having jurisdiction over the activity shall meet and coordinate their major actions relating to the activity. The agencies and subdivisions shall, to the greatest extent practicable, consider the cumulative and secondary adverse effects, as described in the Federal environmental impact assessment process, of each major action relating to the activity.

(c) No agency or subdivision shall take a major action that is inconsistent with the goals and policies of this chapter. In addition, an agency or subdivision shall avoid and otherwise minimize the cumulative adverse effects to coastal natural resource areas of each of its major actions relating to the activity.

Compliance: This project involves action subject to §506.12 and constitutes a major action. Therefore, a Federal EIS is required under National Environmental Policy Act, 42 U.S. Code (USC), §4321, et seq. Both State and Federal agencies have met and coordinated on the identification and mitigation of project impacts and placement of excavated material. The purpose of this appendix to the DSEIS (which considers cumulative and secondary adverse effects of the project) is to demonstrate that the General Reevaluation Plan Alternative is consistent with the TCMP. All project planning has made efforts to avoid and otherwise minimize the cumulative adverse effects to coastal natural resource areas relating to the activity. Project objectives of flood damage reduction would result in only beneficial effects to CNRAs, and no adverse effects to CNRAs are anticipated.

§501.34 – Policies for Levees and Flood Control Projects

(a) Drainage, reclamation, channelization, levee construction or modification, or flood- or floodwater-control infrastructure projects shall be designed, constructed, and maintained to avoid the impoundment and draining of coastal wetlands to the greatest extent practicable. If impoundment or draining of coastal wetlands cannot be avoided, adverse effects to the wetlands shall be mitigated in accordance with the sequencing requirements in §501.23 of this title.

(b) TCEQ rules and approvals for the levee construction, modification, drainage, reclamation, channelization, or flood- or floodwater-control projects, pursuant to the Texas Water Code, §16.236, shall comply with the policies in this section.

<u>Compliance:</u> The Clear Creek Flood Risk Management Project would not result in the impoundment or draining of any coastal wetlands because the tentatively proposed project occurs in the upstream portion of the Clear Creek watershed, which is outside of the Texas Coastal Zone boundary. Additionally, the tentatively proposed project would result in minimal, if any, changes to downstream flows.

The tentatively proposed project is not located within the Texas Coastal Zone boundary and does not involve construction or modification to any levees.

Bryan W. Shaw, Ph.D., *Chairman*
Carlos Rubinstein, *Commissioner*
Toby Baker, *Commissioner*
Zak Covar, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

June 15, 2012

Ms. Carolyn Murphy
U.S. Army Corps of Engineers
Galveston District CESWG-PE-RE
P.O. Box 1229
Galveston, Texas 77553-1229

Re: Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement for the Federal Clear Creek Reevaluation Study §401 Water Quality Certification

Dear Ms. Murphy:

This letter is in response to the United States Army Corps of Engineers – Galveston District (Corps) correspondence dated May 10, 2012, requesting §401 State Water Quality Certification for the above referenced project. As described in the December 2011, Draft General Reevaluation Report (GRR) and November 2011, Draft Supplemental Environmental Impact Statement (DSEIS), the Corps, in conjunction with the Harris County Flood Control District (HCFCD), Galveston County, and Brazoria County Drainage District #4 have undertaken a study to reevaluate the Clear Creek Flood Control Project, originally authorized by Congress in the Flood Control Act of 1968. The stated purpose of the reevaluation study is the development and evaluation of alternatives for flood risk management and ecosystem restoration in the Clear Creek watershed. The project is located south of the City of Houston, in portions of Harris, Galveston, Brazoria, and Fort Bend counties in southeast Texas.

The Texas Commission on Environmental Quality (TCEQ) has reviewed the GRR and DSEIS and related project information provided by the Corps. On behalf of the Executive Director and based on our evaluation of the information contained in these documents, the TCEQ certifies that there is reasonable assurance that the project will be conducted in a way that will not violate Texas surface water quality standards.

The TCEQ acknowledges the level of resource commitment, both public and private that has been dedicated to the development of the GRR, DSEIS and the Corps preferred alternative, referred to as the Tentatively Proposed Project or General Reevaluation Plan (GRP) Alternative. Major components of the GRP Alternative include the Super C(d) Section conveyance improvement feature from SH 288 to 4,000 feet downstream of Bennie Kate Road, C5(d) Section conveyance feature from 4,000 feet downstream of Bennie Kate Road to Dixie Farm Road and improved conveyance construction on portions of Turkey Creek, Mud Gully, and Mary's Creek. Included in the Super C(d) Section and C5(d) Section conveyance features are high-flow by-pass channels and in-line detention structures that intersect the existing low-flow Clear Creek channel.

Your May 10, 2012 correspondence provides clarification on issues raised by TCEQ in correspondence dated February 13, 2012. These issues include future hydrologic and hydraulic survey data collection and analysis, development of more detailed design plans during the Pre-Construction Engineering and Design (PED) Phase of the project, riparian zone restoration and shading effects, need for updated Water Quality Inventory data for TCEQ classified segments 1101 and 1102, and the location of upland confined placement areas for the excavated dredge material.

The TCEQ has reviewed this proposed action for consistency with the Texas Coastal Management Program (CMP) goals and policies in accordance with the regulations of the Coastal Coordination Council and has determined that the proposed action is consistent with the applicable CMP goals and policies.

This certification was reviewed for consistency with the CMP's development in critical areas policy {Title 31, Texas Administrative Code (TAC), Chapter (§) 501.23} and dredging and dredged material disposal and placement policy {31 TAC §501.25}. This certification complies with the CMP goals {31 TAC §501.12(1, 2, 3, 5)} applicable to these policies.

No review of property rights, location of property lines, nor the distinction between public and private ownership has been made, and this certification may not be used in any way with regard to questions of ownership.

If you require additional information or further assistance, please contact Mr. Robert Hansen, Water Quality Assessment Section, Water Quality Division (MC-150), at (512) 239-4583.

Sincerely,

David W Galindo

David W. Galindo, Director
Water Quality Division
Texas Commission on Environmental Quality

DWG/RSH/gg

Attachment

cc: Ms. Kate Zultner, Secretary, Coastal Coordination Council, P.O. box 12873, Austin, Texas 78711-2873

Appendix L

404(b)(1) Analysis

Job No. 100013748

APPENDIX L
CLEAR CREEK GENERAL REEVALUATION STUDY
BRAZORIA, FORT BEND, GALVESTON, AND HARRIS COUNTIES, TEXAS
SECTION 404(B)(1) EVALUATION

U.S. Army Corps of Engineers, Galveston District
2000 Fort Point Road
Galveston, Texas 77550

July 2012

Printed on recycled paper

Appendix L

Clear Creek General Reevaluation Study
Brazoria, Fort Bend, Galveston, and Harris Counties, Texas
Section 404(b)(1) Evaluation

I. PROJECT DESCRIPTION

a. Location

The Clear Creek General Reevaluation Plan (GRP Alternative) is located in Brazoria, Fort Bend, Galveston, and Harris counties in southeast Texas. The study area encompasses most of the Clear Creek watershed, to include Clear Creek, its tributaries, Clear Lake, and the surrounding riparian and upland environments. Clear Creek generally flows from west to east and drains into Clear Lake, which eventually drains into Galveston Bay at Seabrook, Texas. The project area is defined as the footprint of the project features to be constructed, including mitigation and conveyance areas, and preserved riparian corridors with a 0.25-mile buffer (see Figure 3.0-1 in the Draft Supplemental Environmental Impact Statement [DSEIS]). Further descriptions of the Clear Creek GRP and study areas can be found in Section 3.0 of the DSEIS.

b. General Description

This Section 404(b)(1) evaluation addresses discharges of dredged or fill material into waters of the U.S. Objectives of the Clear Creek GRP include implementation of flood damage reduction designs to portions of the Clear Creek watershed. Several alternatives were analyzed including a No Action Alternative and GRP Alternative, which is the U.S. Army Corps of Engineers' (USACE) recommended plan; this 404(b)(1) evaluation only focuses on the GRP Alternative.

The GRP Alternative is the preferred alternative and includes a series of flood risk management measures and mitigation areas, referred to as project features. Flood risk management measures include conveyance measures areas on or adjacent to Clear Creek from SH 288 to Bennie Kate Road [Section Super C(d)], Bennie Kate Road to Dixie Farm Road [Section C5(d)], and on three tributaries: Mud Gully, Turkey Creek, and Mary's Creek.

Primary components of environmental features incorporated into the design of the GRP Alternative adjacent to Clear Creek conveyance measures include preservation/ rehabilitation and reestablishment of an approximate 65-foot-wide riparian corridor of floodplain forest habitat along the low-flow channel, as well as mitigation areas. Specifically, these features include preserving and/or rehabilitating approximately 122 acres and reestablishing 33 acres of floodplain forest.

c. Authority and Purpose

The Clear Creek Federal flood control project was authorized by Congress in the Flood Control Act of 1968 (Public Law 91-611, Section 221). The authorized project reaches extended 31 miles from Clear Lake to the Fort Bend county line. In 1982 the Phase I General Design Memorandum, including the Final Environmental Impact Statement, was signed by the Southwest Division Engineer, thus authorizing the detailed design later evaluated and rejected by the non-Federal sponsors; Galveston County, Harris County Flood Control District, and Brazoria County Drainage District #4. In 1997, the non-Federal sponsors requested that the USACE adopt changes to the plans. The changes requested by the non-Federal sponsors were beyond the discretionary authority of the USACE Division Commander to approve. As a result, in February 1999, the USACE decided that a general reevaluation study would be needed. In April 1999, the non-Federal sponsors agreed to accept the USACE recommendation to conduct the general reevaluation study. The general reevaluation study will reconsider the previously authorized project as well as non-Federal sponsor-proposed alternatives and other alternatives that are deemed reasonable. As of June 1999, Brazoria County Drainage District No. 4 joined the non-Federal sponsors in this effort. The congressional authorization for this project only allows the consideration of reducing flood damage caused by rainfall runoff along the main channel of Clear Creek and not coastal flooding caused by tropical storm systems.

d. General Description of Dredged or Fill Material

(1) General Characteristics of Material

Sediment samples were collected for the USACE and others (Espey, Huston & Associates, Inc. [EH&A, now PBS&J], 1998) in portions of Clear Creek and tributaries, including Mud Gully. The conclusion of EH&A (1998) was that “high concentration of a number of compounds have been found in Mud Gully” and “to a lesser extent in Clear Creek.” However, a decrease in the concentration of these compounds, with time, was noted. The report concluded that, from the perspective of a flood damage reduction project in which materials may be removed from Clear Creek and its tributaries and placed into upland confined PAs, “no adverse impacts can be expected.” There have been no spills or other significant events since 1998 that would change that conclusion.

(2) Quantity of Material

Almost all project features require excavation of materials to create a high flow flood bench. Excavated materials would be placed into upland confined placement areas (PAs). The location of 376 acres of upland confined PAs for the excavated material will be located in areas outside of the 500-year floodplain. All reasonable attempts will be made to locate the PAs in areas that will not result in impacts to ecological resources such as wetlands (e.g., agricultural lands, pasture, and other urban lands). Potential impacts associated with placement of materials in these areas will be assessed. Within Mud Gully, excavation, followed by concrete lining, would occur, thus resulting in a discharge of concrete within approximately 2.4 acres. Assuming an

approximate thickness of 1 foot, approximately 35,200 cubic yard of concrete fill would be used to line the excavated channel of Mud Gully.

e. Description of the Proposed Discharge

(1) Location

Excess materials from excavation of high-flow flood benches would be transported via truck to upland confined PAs. The location of 376 acres of upland confined PAs for the excavated material will be in areas outside of the 500-year floodplain. All reasonable attempts will be made to locate the PAs in areas that will not result in impacts to ecological resources such as wetlands (e.g., agricultural lands, pasture, and other urban lands). Potential impacts associated with placement of materials in these areas will be assessed. The concrete lining of Mud Gully would occur over a 0.8-mile segment between Sagedowne to Astoria (shown as MUC1b on Figure 2.3-4 of the DSEIS).

(2) Size

Within Mud Gully, excavation, followed by concrete lining, would occur along over a 0.8-mi segment between Sagedowne to Astoria. After excavation the channel bottom would be concrete lined (channel bottom is currently about 25 feet wide). Total area of concrete discharge is approximately 2.4 acres. It is anticipated that 376 acres would be required for PA construction.

(3) Type of Site and Habitat

Although the project footprint consists of an altered channel and floodplain, with some floodplain forests, the location of the discharge (i.e., concrete lining) occurs along a segment of Mud Gully that has been highly altered and channelized and currently consists of a grass-lined, maintained, trapezoidal channel.

(4) Time and Duration of Discharge

Excess excavated materials would be placed in PAs during initial construction (estimated construction start of 2012 and completion in 2020). However, maintenance of conveyance measures may take place throughout the life of the project (estimated 2070).

f. Description of Disposal Method

Excess excavated material would be transported to upland confined PAs via truck. No effluent is associated with placement activities since placement material is expected to contain negligible amounts of water and placement area design is sufficiently sized to hold any potential excess water for evaporative loss. No dewatering would result due to placement of material.

II. FACTUAL DETERMINATIONS

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope

Excess excavated materials would be placed in upland confined PAs; therefore, placement area levees may dictate the substrate elevation and slope. Additionally, substrates not placed within PAs would be excavated to create the various conveyance measures, thus slopes associated with conveyance measures (e.g., flood benches) would vary based on project feature.

(2) Sediment Type

Substrates that would be excavated for conveyance measures or placed within PAs would consist primarily of clayey and loamy soils (see Section 3.7 of the DSEIS).

(3) Dredged/Fill Material Movement

In the short term, best management practices (BMPs) will be implemented to minimize or avoid discharges and increased turbidity. In the long term, vegetation efforts (as part of the environmental features of the project) would include planting all areas of the bench cut with a grass seed mix to stabilize the channel.

(4) Physical Effects on Benthos

Benthic fauna would be adversely affected from concrete fill placement at Mud Gully; however, current conditions offer relatively poor aquatic habitat (e.g., grass-lined, maintained, trapezoidal channel).

(5) Other Effects

None known.

(6) Actions Taken to Minimize Impacts

This project was fully coordinated with State and Federal resource agencies, and their comments have been incorporated into the development of the project to the maximum extent practicable. Any unavoidable losses were mitigated and are discussed more thoroughly in Section 5 of the DSEIS.

b. Water Circulation, Fluctuation, and Salinity Determinations

(1) Water

The GRP Alternative would reduce the flood damage in high-damage reaches (Pearland area and Friendswood area) by adding improvements to Clear Creek and some of its tributaries (Mud Gully, Turkey Creek, and Mary's Creek). The GRP Alternative is composed of numerous conveyance improvements, and additional in-

line detention components that would reduce flooding and flood damages. The improved channel conveyances would allow Clear Creek and its tributaries to handle the increased peak flows during flood events. The GRP Alternative would reduce flood damages for the upstream end of the Clear Creek watershed, and prevent flood damages to the downstream segments of the watershed, thus benefitting the overall system.

(a) Salinity

The USACE has determined that salinity changes are not expected (Section 4.2) as the project would not increase overall flood elevations or volume of freshwater in the lake.

(b) Water Chemistry

There are no indications of water chemistry problems would be associated with implementation of the Clear Creek GRP, and BMPs would be implemented to maintain conditions.

(c) Clarity

There may be some temporary and localized increases in turbidity during excavation operations. Water clarity is expected to return to normal background levels shortly after operations are completed.

(d) Color

Water immediately surrounding some construction areas (i.e., where excavation or fill placement would occur) may become discolored temporarily due to disturbance of the sediment. BMPs would be implemented to reduce and control turbidity during construction and material placement dewatering.

(e) Odor

The material is not expected to be anoxic, and there should be no odors associated with placement, nor are any expected from upland confined placement.

(f) Taste

No detectable impact to the environment is expected.

(g) Dissolved Gas Levels

No detectable impact to the environment is expected. The project would not create conditions that would cause an increase in dissolved gas levels (e.g., increased solar gain, increased aeration, or additional nutrient loading).

(h) Nutrients

Project implementation would not create conditions that would increase nutrient loading and no detectable negative impact is expected.

(i) Eutrophication

Project implementation would not create conditions that would increase nutrient loading and eutrophication is not expected.

(j) Others as Appropriate

None known.

(2) Current Patterns and Circulation

The GRP Alternative would reduce the flood damage in high-damage reaches (Pearland area and Friendswood area) by adding improvements to Clear Creek and some of its tributaries (Mud Gully, Turkey Creek, and Mary's Creek). The GRP Alternative is composed of numerous conveyance improvements, and additional in-line detention components that would reduce flooding and flood damages. The improved channel conveyances would allow Clear Creek and its tributaries to handle the increased peak flows during flood events.

(a) Current Patterns and Flow

Typical current patterns and flow would not be altered. Flow during flood events would be changed as a result of the project. For example, conveyance measures work to reduce flooding by increasing flow capacity and reducing storage.

(b) Velocity

While flood flows in the downstream reach would slightly increase, hydrology and hydraulics modeling shows that an increase in water surface elevation with the Recommended Plan in place would be 0.15 foot (less than 2 inches). This is well within one standard deviation of uncertainty in water surface elevations (one standard deviation is generally on the order of 0.75 foot) and, therefore, any induced damages are considered statistically insignificant (meaning there is no statistical basis indicating that induced damages actually exist)..

(c) Stratification

Stratification would not be altered during typical flows but during extreme flood events, less flooding in Clear Lake would occur. Salinity changes are not expected (Section 4.2 of DSEIS).

(d) Hydrologic Regime

Hydrologic regime would not change under typical flows. The floodplain will continue to experience relatively shallow and slow rising flood events, but the flood damage risk will be reduced. However, during extreme flood events (e.g., during a 100-year flood event) flood levels are reduced from approximately 0.1 to 3 feet within the mainstem reach, and almost 2 feet within Clear Lake (Hydrology and Hydraulics Appendix to the General Reevaluation Report).

(3) Normal Water Level Fluctuations

Because all project features are located well above the tidally influenced portion of Clear Creek, no changes are expected. The project targets preserving the current channel (and normal water levels) but would alter floodways during high flows.

(4) Salinity Gradients

Due to the nature of the project objectives (i.e., flood damage reduction with environmental features), salinity gradients are not expected to change relative to current conditions. All project features are above tidally influenced portions of Clear Creek.

(5) Actions that Will Be Taken to Minimize Impacts

In addition to alternatives analyses, fill PAs will be located to avoid impacts to various resources such as threatened and endangered species habitat, cultural resources, waters of the U.S., and essential fish habitat. BMPs will be implemented during construction and maintenance activities.

c. Suspended Particulate/Turbidity Determination

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site

An increase in suspended particulates and the concomitant turbidity levels may occur during fill placement operations. These are temporary and localized events, and appropriate BMPs would be implemented.

(2) Effects on Chemical and Physical Properties of the Water Column

(a) Light Penetration

Turbidity levels will be temporarily increased during fill placement operations. These are temporary and localized events, and appropriate BMPs would be implemented.

(b) Dissolved Oxygen

No adverse effects to dissolved oxygen (DO) are expected. Ultimately, project objectives would improve dissolved oxygen levels within the project area (via eventual establishment of a riparian zone that shades water and lowers temperature, thereby increasing DO [U.S. Department of Agriculture, 1998]).

(c) Toxic Metals and Organics

Generally, high concentrations of a number of compounds have been found in Mud Gully, with the highest amounts found on the Brio and Dixie Oil Producers sites (Resource Engineering, Inc., 1986a, 1986b). These compounds were found in lesser amounts in Clear Creek. However, data from surficial and subsurficial sediment samples from studies through 1998 show a decrease in concentrations, and the data from U.S. Geological Survey (2003) indicated very or extremely low concentrations in recent sediments. The Texas Commission on Environmental Quality (TCEQ, 2007) noted no concerns for multiple toxic constituents in sediments from Clear Creek Tidal, Clear Creek Above Tidal, Clear Lake, and Upper Galveston Bay. No cause for concern has been indicated by testing of fill material, and specific information regarding metals and organics is provided within Section 3.3 of the DSEIS.

(d) Pathogens

None expected or found.

(e) Aesthetics

The project has been designed and selected in coordination with resource agencies to avoid detrimental environmental impacts and reduce or eliminate adverse aesthetic qualities. Many project environmental features (i.e., riparian zone preservation/rehabilitation and reestablishment) would increase the area aesthetics.

(f) Others as Appropriate

None known.

(3) Effects on Biota

No impacts are expected on photosynthesis, suspension/filter feeders, and sight feeders, except for direct and temporary impacts from fill placement (e.g., temporary and local increases in local turbidity levels). Areas that would require fill currently offer relatively low aquatic habitat value (i.e., maintained, grass-lined, trapezoidal channel – Mud Gully). Appropriate BMPs would be implemented.

(4) Actions Taken to Minimize Impacts

The project has been closely coordinated with the resource agencies to assure locations have minimal impacts and beneficial effects. Through the use of a Habitat Evaluation Procedure (HEP) Model (Appendix B), potential impacts to floodplain forests would be mitigated (Section 5 of DSEIS). BMPs will be applied to reduce and control turbidity and sediment discharge.

In addition, the location of 376 acres of upland confined PAs for the excavated material will be in areas outside of the 500-year floodplain. All reasonable attempts will be made to locate the PAs in areas that will not result in impacts to ecological resources such as wetlands (e.g., agricultural lands, pasture, and other urban lands). Potential impacts associated with placement of materials in these areas will be assessed.

d. Contaminant Determinations

No increase in contaminant levels is expected during construction and placement operations. The potential for contaminants has been evaluated through sediment and water quality analyses (sections 4.2 and 4.3 of the DSEIS).

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton

Construction and placement operations are expected to have only minor temporary, local impacts on plankton from potential increased turbidity levels.

(2) Effects on Benthos

Benthic fauna, if present within areas of channel reshaping efforts, would be adversely affected from fill placement; however, current conditions offer relatively poor aquatic habitat, and channel reshaping efforts (and environmental features like establishment of a riparian zone) are intended to increase aquatic habitat value, including benthic habitat (Section 4.10 of the DSEIS).

(3) Effects on Nekton

Construction and placement operations are expected to have only minor temporary, local impacts on nekton from potential increased turbidity levels.

(4) Effects on Aquatic Food Web

Except for potentially localized and temporary increased turbidity and suspended solids, no impact is expected on the aquatic food web. Appropriate BMPs would be implemented to minimize or avoid detrimental effects to aquatic trophic dynamics (Section 4.10 of the DSEIS). Restoration of sinuosity and riparian vegetation along the low-flow channel of Clear Creek could have long-term positive effects by increasing habitat diversity.

(5) Effects on Special Aquatic Sites

The GRP Alternative footprint includes the conveyance areas and protected riparian habitat corridors; however, potential permanent wetland impacts would occur within high-flow flood bench areas. Although there are about 41.5 acres of freshwater emergent, scrub-shrub, and forested wetlands within the overall project footprint, there will be permanent impacts to 29.3 acres of these wetlands from bench cutting the high-flow flood bench (Figure 3.9-2). Avoidance and minimization of wetland impacts within the project footprint would be accomplished through preservation and rehabilitation of the existing low-flow channel, including a 60-foot-wide corridor of adjacent riparian areas (which includes wetlands). Within the low-flow channel, 7.3 acres of wetland fringe forested wetlands are expected to be reestablished. Compensatory mitigation wetlands are included as a project component in addition to the avoided, rehabilitated, and reestablished wetlands. Specifically, 21.1 acres of forested wetlands would be hydrologically enhanced and preserved as additional mitigation (Figure 3.9-2 in the FSEIS). Wetlands that may be permanently impacted, avoided, and restored by the GRP Alternative are displayed in the following table.

Wetlands That May be Impacted, Avoided, and Restored
(Rehabilitation or Reestablishment) by the GRP Alternative

Wetland Type	Existing Wetlands in Construction Footprint (acres)[1]	Potential Permanent Wetland Impacts (acres)	Wetlands Avoided (acres)	Restored acres (Rehabilitated/ Reestablished)	Compensatory Mitigation Wetlands (Acres Rehabilitated)	Sum of Wetlands Avoided, Restored, and Preserved (acres)
Emergent	11.2	2.9	8.3[2]	0.0	0.0	8.3
Forested	26.7	23.7	3.0	7.3[3]	21.1	31.4
Scrub-Shrub	3.6	2.7	0.9	0.0	0.0	0.9
Totals	41.5	29.3	12.2	7.3	21.1	40.6

[1] Does not include compensatory mitigation areas.

[2] A large emergent wetland within an existing HCFCD detention basin is assumed to be deeper than the proposed cut of the high-flow flood bench within the footprint of the linear detention feature. As such, the 4.8 acres of this wetland within the footprint would not likely be impacted and is included within the table as an avoided area.

[3] Within the low-flow corridor, project designs include an anticipated 2- to 4-foot-wide forested wetland fringe to establish along and adjacent to the ordinary high-water mark of Clear Creek. The value presented in the table is based on a conservative estimate of a 2-foot width.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination

Mixing is not required due to the lack of contaminants, BMPs, and locations of fill placement.

(2) Determination of Compliance with Applicable Water Quality Standards

Sediment analyses of material have been performed, and testing of maintenance and construction material has not demonstrated any violation of applicable water quality

standards. The State of Texas will be asked to issue a water quality certificate for the Clear Creek GRP, indicating that water quality standards will be met.

(3) Potential Effects on Human Use Characteristics

(a) Municipal and Private Water Supply

No water wells occur within the project footprint, and no impacts to water supplies are expected (Section 3.4 of the DSEIS).

(b) Recreational and Commercial Fisheries

No direct detrimental effects to recreational and commercial fisheries are expected as a result of the project; however, due to the project objectives, fisheries may realize an indirect benefit through increased flood abatement and restored riparian vegetation.

(c) Water-related Recreation

No direct detrimental effects to water-related recreational activities are expected as a result of the project; however, due to the project objectives, recreational opportunities may realize an indirect benefit through increased flood abatement and restored riparian vegetation.

(d) Aesthetics

The project is designed to minimize any adverse impacts to the environment and increase aesthetic qualities in the area.

(e) Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

No parks, national and historic monuments, national seashores, wilderness areas, or research sites will be negatively impacted by the project.

g. Determination of Cumulative Effects on the Aquatic Ecosystem

The project is not expected to result in negative cumulative impacts in the aquatic ecosystem. A community-based habitat suitability index (HSI) model and mitigation was performed to ensure adequate replacement of wildlife habitats and functions, where appropriate. Cumulative effects on the aquatic ecosystem are expected to be beneficial due to project objectives and environmental features (Section 4.15 of the DSEIS).

h. Determination of Secondary Effects on the Aquatic Ecosystem

No adverse significant secondary effects on the aquatic ecosystem should occur as a result of the recommended project. Secondary effects on the aquatic ecosystem are expected to be beneficial due to project objectives and environmental features.

REFERENCES

Espey, Huston & Associates, Inc. (EH&A). 1998. Clear Creek Flood control project for the U.S. Army Engineer District, Galveston, Texas.

Resource Engineering, Inc. 1986a. Brio Refining Site, Friendswood, Texas, remedial investigation/feasibility study. 351-03. July 1986.

———. 1986b. Dixie Oil Producers Site, Friendswood, Texas, remedial investigation/feasibility study. 378-03. November 1986.

Texas Commission on Environmental Quality (TCEQ). 2007. Draft 2006 water quality inventory, assessments by basin. http://www.tceq.state.tx.us/compliance/monitoring/water/quality/data/06twqi/06_list.html).

Texas Water Development Board (TWDB). 2006. Groundwater database reports, Brazoria County. Web site: www.twdb.state.tx.us.

U.S. Department of Agriculture. 1998. Stream visual assessment protocol. National Water and Climate Technical Note 99-1.

U.S. Geological Survey. 2003. A chronicle of organochlorine contamination in Clear Creek, Galveston and Harris Counties, Texas, 1960–2002, as recorded in sediment cores, by B.J. Mahler and P.C. Van Metre. U.S. Geological Survey Fact Sheet 088–03, 4 p. http://pubs.usgs.gov/fs/fs-088-03/pdf/FS_088-03.pdf

Findings of Compliance with
Section 404(b)(1) Guidelines
Clear Creek General Reevaluation Study
Harris, Galveston, Brazoria, and Fort Bend Counties, Texas

1. No significant adaptations of the Guidelines were made relative to the evaluation for this project.

2. The recommended plan is the result of a thorough evaluation of alternatives.

3. The recommended plan will not violate any applicable State or Federal water quality criteria or toxic effluent standards of Section 307 of the Clean Water Act.

4. The recommended plan will not jeopardize the existence of any federally or State-listed threatened or endangered species or their critical habitat or violate any protective measures for any sanctuary. Various resource agencies, including U.S. Fish and Wildlife Service and National Marine Fisheries Service, have been consulted regarding potential issues of any federally or State-listed threatened or endangered species or their critical habitat.

5. The recommended plan will not result in adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. There are no significant adverse impacts expected to the aquatic ecosystem diversity, productivity and stability, or recreational, aesthetic, and economic values.

6. Appropriate steps to minimize potential adverse impacts on the aquatic system include close coordination with State and Federal resource agencies during final design prior to construction to incorporate all valid suggestions. Any wildlife habitats affected by the project will be mitigated.

7. Based on the guidelines, the GRP Alternative is specified as complying with the requirements of the Section 404(b)(1) guidelines.

Carolyn Murphy — Nov. 30, 2011

Ms. Carolyn Murphy
Chief, Environmental Section
U.S. Army Corps of Engineers, Galveston District

Date

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

May 10, 2012

REPLY TO ATTENTION OF
Environmental Section

Mr. Charles Maguire
Director, Water Quality
Texas Commission on Environmental Quality
12100 Park 35 Circle, Mail Code 150
Austin, Texas 78753

Dear Mr. Maguire:

Reference is made to your letter dated February 13, 2012, regarding the Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement (DSEIS) for the Federal Clear Creek Reevaluation Study, Brazoria County, Fort Bend, Galveston, and Harris Counties, Texas. The Draft SEIS was issued for public and agency review and comment on December 16, 2011. We offer the following information in response to your February 13, 2012 comment letter to assist you in review of the proposed project.

1. You have requested additional details regarding the design configuration and number of the intersections of the existing low-flow channel with the proposed high-flow flood benches. The current layout of the low-flow/high-flow intersections depicted in the GRR/SEIS is conceptual. Additional hydrologic and hydraulic survey data collection, analysis and design efforts for the proposed project will be performed during the Pre-Construction Engineering and Design (PED) Phase of the project to develop more detailed plans depicting the design of these features.

2. We concur with your comment regarding the lack of shading effects of the project in the lower reaches of Clear Creek and Clear Lake, and the SEIS and 404(b)(1) analysis will be revised to clarify that the shading effects of the proposed project are generally limited to the upstream portions of Texas Commission on Environmental Quality (TCEQ) classified segment 1102, or the areas of Clear Creek within the project footprint. However we would like to clarify that within the proposed project footprint, a 60-foot-wide corridor that includes the low-flow channel and areas immediately adjacent to Clear Creek will be planted at a density of 400 trees per acre, not 14 trees per acre. A 200-foot-wide conveyance feature in the form of a high-flow bench will be constructed on either side of this corridor. Thus the immediate riparian edge of the low-flow channel will be well-shaded for a distance of 30 feet on either side of the centerline of the low-flow channel of Clear Creek. This corridor will be continuous for the 15-mile length of the project.

3. We will incorporate the information you provided regarding the lack of listing of TCEQ classified segments 1101 and 1102 in the 2010 Water Quality Inventory for toxic substances in water and sediments due to inadequate data. During the PED Phase of the project, the Galveston District will again review and evaluate current TCEQ water and sediment quality data, and based on this evaluation, or in the event of insufficient data, water and sediment quality testing will be performed as needed prior to construction and coordinated with your office.

4. The text of Appendix L will be clarified to read as follows: "While flood flows in the downstream reach would slightly increase, investigations show that the maximum increase in water surface elevation with the Recommended Plan in place would be 0.15 feet (less than 2 inches). This is well within one standard deviation of uncertainty in water surface elevations, which is generally on the order of 0.75 feet. Therefore, any induced damages are considered statistically insignificant, meaning there is no statistical basis indicating that induced damages actually exist."

5. The location of 376 acres of upland confined placement areas for the excavated material will be determined in areas outside of the 500-year floodplain during PED, pending project approval and funding. All reasonable attempts will be made to locate the placement areas in areas (e.g. agricultural lands, pasture, and other urban lands) that will not result in impacts to ecological resources such as wetlands. Potential impacts associated with placement of materials in these areas will be assessed during PED and additional National Environmental Policy Act documentation may be prepared and coordinated at that time, if needed.

6. Figure 2.3-3 will be color-coded to make it easier for the reader to distinguish among the various project components that make up the Recommended Plan. Likewise, the different floodplains in Figure 4.1-1 will also be color coded to make the changes from the without-project to the with-project floodplain conditions more discernible.

The TCEQ has been an active member of the Clear Creek Project Interagency Coordination Team (ICT) since its inception in 2003 through the last meeting in 2010. The ICT, comprised of Federal and State resource agency representatives from Texas, has assisted the Galveston District in modeling and analyzing environmental impacts and selecting mitigation for the Tentatively Recommended Plan described in the DSEIS. The ICT would remain active through the PED and construction phases of this project to provide input during the development of plans and specifications of mitigation measures and to provide recommendations on the use of best management practices. The ICT involvement would continue into the operations phase to ensure that the mitigation measures have been constructed as specified in the DSEIS and that the goals of the compensatory mitigation plan have been fully achieved.

In conclusion, we hope this additional information will be helpful in your review. We trust that we have provided sufficient information for you to provide §401 State Water Quality certification. However, we would be happy to meet with you to provide further information if needed. All public and agency comments on the DSEIS and our responses will be available for your review when they are presented in the FSEIS. Please do not hesitate to contact Ms. Andrea by telephone at 409-766-6346 or by email at andrea.catanzaro@usace.army.mil should you need further assistance.

Sincerely,

Carolyn Murphy

Carolyn Murphy
Chief, Environmental Section

Bryan W. Shaw, Ph.D., *Chairman*
Carlos Rubinstein, *Commissioner*
Toby Baker, *Commissioner*
Zak Covar, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

June 15, 2012

Ms. Carolyn Murphy
U.S. Army Corps of Engineers
Galveston District CESWG-PE-RE
P.O. Box 1229
Galveston, Texas 77553-1229

Re: Draft General Reevaluation Report and Draft Supplemental Environmental Impact Statement for the Federal Clear Creek Reevaluation Study §401 Water Quality Certification

Dear Ms. Murphy:

This letter is in response to the United States Army Corps of Engineers – Galveston District (Corps) correspondence dated May 10, 2012, requesting §401 State Water Quality Certification for the above referenced project. As described in the December 2011, Draft General Reevaluation Report (GRR) and November 2011, Draft Supplemental Environmental Impact Statement (DSEIS), the Corps, in conjunction with the Harris County Flood Control District (HCFCD), Galveston County, and Brazoria County Drainage District #4 have undertaken a study to reevaluate the Clear Creek Flood Control Project, originally authorized by Congress in the Flood Control Act of 1968. The stated purpose of the reevaluation study is the development and evaluation of alternatives for flood risk management and ecosystem restoration in the Clear Creek watershed. The project is located south of the City of Houston, in portions of Harris, Galveston, Brazoria, and Fort Bend counties in southeast Texas.

The Texas Commission on Environmental Quality (TCEQ) has reviewed the GRR and DSEIS and related project information provided by the Corps. On behalf of the Executive Director and based on our evaluation of the information contained in these documents, the TCEQ certifies that there is reasonable assurance that the project will be conducted in a way that will not violate Texas surface water quality standards.

The TCEQ acknowledges the level of resource commitment, both public and private that has been dedicated to the development of the GRR, DSEIS and the Corps preferred alternative, referred to as the Tentatively Proposed Project or General Reevaluation Plan (GRP) Alternative. Major components of the GRP Alternative include the Super C(d) Section conveyance improvement feature from SH 288 to 4,000 feet downstream of Bennie Kate Road, C5(d) Section conveyance feature from 4,000 feet downstream of Bennie Kate Road to Dixie Farm Road and improved conveyance construction on portions of Turkey Creek, Mud Gully, and Mary's Creek. Included in the Super C(d) Section and C5(d) Section conveyance features are high-flow by-pass channels and in-line detention structures that intersect the existing low-flow Clear Creek channel.

Your May 10, 2012 correspondence provides clarification on issues raised by TCEQ in correspondence dated February 13, 2012. These issues include future hydrologic and hydraulic survey data collection and analysis, development of more detailed design plans during the Pre-Construction Engineering and Design (PED) Phase of the project, riparian zone restoration and shading effects, need for updated Water Quality Inventory data for TCEQ classified segments 1101 and 1102, and the location of upland confined placement areas for the excavated dredge material.

The TCEQ has reviewed this proposed action for consistency with the Texas Coastal Management Program (CMP) goals and policies in accordance with the regulations of the Coastal Coordination Council and has determined that the proposed action is consistent with the applicable CMP goals and policies.

This certification was reviewed for consistency with the CMP's development in critical areas policy {Title 31, Texas Administrative Code (TAC), Chapter (§) 501.23} and dredging and dredged material disposal and placement policy {31 TAC §501.25}. This certification complies with the CMP goals {31 TAC §501.12(1, 2, 3, 5)} applicable to these policies.

No review of property rights, location of property lines, nor the distinction between public and private ownership has been made, and this certification may not be used in any way with regard to questions of ownership.

If you require additional information or further assistance, please contact Mr. Robert Hansen, Water Quality Assessment Section, Water Quality Division (MC-150), at (512) 239-4583.

Sincerely,

David W Galindo

David W. Galindo, Director
Water Quality Division
Texas Commission on Environmental Quality

DWG/RSH/gg

Attachment

cc: Ms. Kate Zultner, Secretary, Coastal Coordination Council, P.O. box 12873, Austin, Texas 78711-2873

WORK DESCRIPTION: As described in the December 2011, Draft General Reevaluation Report (GRR) and November 2011, Draft Supplemental Environmental Impact Statement, (DSEIS) and additional information provided by the Corps, dated May 10, 2012.

SPECIAL CONDITIONS: None

GENERAL: This certification, issued pursuant to the requirements of Title 30, Texas Administrative Code, Chapter 279, is restricted to the work described in the December 2011 GRR and November 2011 DSEIS. This certification may be extended to any minor revision of the Environmental Impact Statement (EIS) when such change(s) would not result in an impact on water quality. The Texas Commission on Environmental Quality (TCEQ) reserves the right to require full joint public notice on a request for minor revision. The applicant is hereby placed on notice that any activity conducted pursuant to the EIS and COE project authorization which results in a violation of the state's surface water quality standards may result in an enforcement proceeding being initiated by the TCEQ or a successor agency.

STANDARD PROVISIONS: These following provisions attach to any permit or project authorization issued by the COE and shall be followed by the permittee or any employee, agent, contractor, or subcontractor of the permittee during any phase of work authorized by the COE.

1. The water quality of wetlands shall be maintained in accordance with all applicable provisions of the Texas Surface Water Quality Standards including the General, Narrative, and Numerical Criteria.

2. The applicant shall not engage in any activity which will cause surface waters to be toxic to man, aquatic life, or terrestrial life.

3. Permittee shall employ measures to control spills of fuels, lubricants, or any other materials to prevent them from entering a watercourse. All spills shall be promptly reported to the TCEQ by calling the State of Texas Environmental Hotline at 1-800-832-8224.

4. Sanitary wastes shall be retained for disposal in some legal manner. Marinas and similar operations which harbor boats equipped with marine sanitation devices shall provide state/federal permitted treatment facilities or pump out facilities for ultimate transfer to a permitted treatment facility. Additionally, marinas shall display signs in appropriate locations advising boat owners that the discharge of sewage from a marine sanitation device to waters in the state is a violation of state and federal law.

5. Materials resulting from the destruction of existing structures shall be removed from the water or areas adjacent to the water and disposed of in some legal manner.

6. A discharge shall not cause substantial and persistent changes from ambient conditions of turbidity or color. The use of silt screens or other appropriate methods is encouraged to confine suspended particulates.

7. The placement of any material in a watercourse or wetlands shall be avoided and placed there only with the approval of the Corps when no other reasonable alternative is available. If work

within a wetland is unavoidable, gouging or rutting of the substrate is prohibited. Heavy equipment shall be placed on mats to protect the substrate from gouging and rutting if necessary.

8. Dredged Material Placement: Dredged sediments shall be placed in such a manner as to prevent any sediment runoff onto any adjacent property not owned by the applicant. Liquid runoff from the disposal area shall be retained on-site or shall be filtered and returned to the watercourse from which the dredged materials were removed. Except for material placement authorized by this permit, sediments from the project shall be placed in such a manner as to prevent any sediment runoff into waters in the state, including wetlands.

9. If contaminated spoil that was not anticipated or provided for in the permit application is encountered during dredging, dredging operations shall be immediately terminated and the TCEQ shall be contacted by calling the State of Texas Environmental Hotline at 1-800-832-8224. Dredging activities shall not be resumed until authorized by the Commission.

10. Contaminated water, soil, or any other material shall not be allowed to enter a watercourse. Noncontaminated stormwater from impervious surfaces shall be controlled to prevent the washing of debris into the waterway.

11. Storm water runoff from construction activities that result in a disturbance of one or more acres, or are a part of a common plan of development that will result in the disturbance of one or more acres, must be controlled and authorized under Texas Pollutant Discharge Elimination System (TPDES) general permit TXR150000. A copy of the general permit, application (notice of intent), and additional information is available at: http://www.tceq.state.tx.us/nav/permits/wq_construction.html or by contacting the TCEQ Storm Water & Pretreatment Team at (512) 239-4671.

12. Upon completion of earthwork operations, all temporary fills shall be removed from the watercourse/wetland, and areas disturbed during construction shall be seeded, riprapped, or given some other type of protection to minimize subsequent soil erosion. Any fill material shall be clean and of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters.

13. Disturbance to vegetation will be limited to only what is absolutely necessary. After construction, all disturbed areas will be revegetated to approximate the pre-disturbance native plant assemblage.

14. Where the control of weeds, insects, and other undesirable species is deemed necessary by the permittee, control methods which are nontoxic to aquatic life or human health shall be employed when the activity is located in or in close proximity to water, including wetlands.

15. Concentrations of taste and odor producing substances shall not interfere with the production of potable water by reasonable water treatment methods, impart unpalatable flavor to food fish including shellfish, result in offensive odors arising from the water, or otherwise interfere with reasonable use of the water in the state.

16. Surface water shall be essentially free of floating debris and suspended solids that are conducive to producing adverse responses in aquatic organisms, putrescible sludge deposits, or sediment layers which adversely affect benthic biota or any lawful uses.

17. Surface waters shall be essentially free of settleable solids conducive to changes in flow characteristics of stream channels or the untimely filling of reservoirs, lakes, and bays.

18. The work of the applicant shall be conducted such that surface waters are maintained in an aesthetically attractive condition and foaming or frothing of a persistent nature is avoided. Surface waters shall be maintained so that oil, grease, or related residue will not produce a visible film of oil or globules of grease on the surface or coat the banks or bottoms of the watercourse.

19. This certification shall not be deemed as fulfilling the applicant's/permittee's responsibility to obtain additional authorization/approval from other local, state, or federal regulatory agencies having special/specific authority to preserve and/or protect resources within the area where the work will occur.

Appendix M

Record of Decision

Clear Creek, Texas

Flood Control

Preconstruction Authorization

Planning Report

MAIN REPORT
AND
FINAL ENVIRONMENTAL
IMPACT STATEMENT

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
GALVESTON, TEXAS

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1229
GALVESTON, TEXAS 77553

REPLY TO
ATTENTION OF:

SWGED-E

29 OCT 1982

TO INTERESTED PARTIES:

The Record of Decision for the Clear Creek, Texas, Federal project which consists of structural and non-structural flood control measures is inclosed.

A Notice of Availability for the Final Environmental Impact Statement was published in the Federal Register on 27 August 1982.

Further information may be obtained by contacting the Environmental Resources Branch, U.S. Army Engineer District, Galveston, P.O. Box 1229, Galveston, Texas 77553.

Sincerely,

ALAN L. LAUBSCHER
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

RECORD OF DECISION

FOR

CLEAR CREEK, TEXAS

The U.S. Army Corps of Engineers has determined that the plan for the Clear Creek Flood Control Project described in the Preconstruction Authorization Planning Report (PAPR) and Final Environmental Impact Statement (FEIS) announced in the Federal Register on 27 August 1982, is economically justified, is environmentally sound, is in the public interest, is publicly acceptable, is technically implementable, and is consistent with National policy and statutes.

Authorization for the Clear Creek Flood Control Project is contained in Section 203 of the Flood Control Act approved 13 August 1968 (Public Law 90-483). The plan described in the PAPR and FEIS is basically the same as the authorized project. The primary purpose of the project is to control flooding on Clear Creek. The selected plan consists of an enlarged and rectified channel from Mile 3.8 to Mile 26.05 and incorporates an additional outlet channel between Clear Lake and Galveston Bay to insure that upstream channel improvements do not aggravate flooding problems around Clear Lake. The additional outlet channel is 0.86 miles long, is approximately 15 feet deep, has a bottom width of 70 feet, and is gated to insure that the risk of tidal flooding is not increased in the project area. This plan will reduce average annual flood damages in the watershed by 72 percent.

The selected plan also includes nonstructural measures for the residual 100-year flood plain and fish and wildlife conservation features. The fish and wildlife conservation measures include development of wetland, brushland, and woodland habitat and stabilizing soils subject to erosion.

The total first cost of the plan, based on February 1982 price levels, is estimated at $88.5 million, of which $19.4 million is apportioned in accordance with the authorization to non-Federal interests. The Federal share of the project cost is $69.1 million. The average annual benefits, derived from flood damage reduction to existing and future development, are estimated at $9.9 million based on an interest rate of 7-5/8 percent. The average annual costs are estimated at $7.8 million; the resulting benefit-to-cost ratio is 1.3.

Alternatives Considered. Various alternative measures, both structural and nonstructural, which would control flooding along Clear Creek were examined. These measures included various sizes of channel enlargements, detention reservoirs, bypass channels, pumping facilities in combination with other structural measures, flood plain acquisition, and floodproofing. The following plans to alleviate flooding problems in the watershed were selected for detailed study: a 10-year flood channel with a buy out of development in the residual 100-year flood plain, a modified 10-year flood channel, a 25-year flood channel, and acquisition of flood plain development. A no action plan was also considered during the plan-selection process.

Economic and Environmental Considerations. Economic investigations and analyses were made to identify the National benefits that would be derived from construction of the Clear Creek Project and to assure that the selected plan maximizes the economic return on the investment.

The environmental objectives in developing the project were preservation or enhancement of fish and wildlife, enhanced aesthetics along Clear Creek, improvement of water quality, preservation of archeological resources, stabilization of soils, and increased recreational opportunities. The plan which best contributes to these objectives is the Acquisition of Flood Plain Development Plan. The EQ plan, consisting of acquisition development within the 10-year flood plain, has a benefit-to-cost ratio 0.4.

Based on the analyses of cost and benefits, effectiveness in satisfying environmental and other planning objectives, and the desires of the affected public, the Modified 10-year Channel Plan was selected as the recommended plan. This plan, as well as other plans, has been coordinated with the U.S. Fish and Wildlife Service and other agencies. The need for fish and wildlife conservation was recognized and adequate measures have been incorporated into the plan to maintain the resource value of Clear Creek. These measures include development of riparian vegetation, brushland habitat, wetland habitat and wood duck nesting boxes; the avoidance of park areas; and the inclusion of soils stabilization practices.

Statutory Considerations. The selected plan has been reviewed in light of the requirements of all applicable environmental laws and regulations, including Executive Orders 11990 and 11988, and has been found in full compliance with all except the National Historic Preservation Act of 1966, as amended. An intensive cultural resource survey for the project area will be completed during preparation of plans and specifications and a final report will be prepared. It has been determined that the Federal project, as described in the planning report and FEIS, meets the requirements of Section 404(b)(1) guidelines. Requirements of the Clean Water Act of 1977 were satisfied by receipt of a State Water Quality Certificate on 9 September 1982.

Conclusion. In the selection of a plan to control flooding along Clear Creek and conserve the natural environment of the creek, careful consideration was given to all technical information as well as the views of other interested agencies and the concerned public. The selected plan has been evaluated for engineering feasibility and identification and definition of the environmental, social, and economic effects, both regionally and Nationally. The draft EIS was coordinated with over 130 concerned agencies, groups and individuals. The coordination did not raise any comments which resulted in significant changes to the recommended plan. The final EIS, filed with the Environmental Protection Agency on 25 August 1982, was coordinated in a similar manner and the comments received were such that no changes in the project were required. It is concluded that, of the practicable alternative courses of action for achieving the stated project objectives, the total public interest is best served by implementation of the selected plan.

21 October 1982

for M L McGaughey COL CE
HUGH G. ROBINSON
Major General, USA
Division Engineer

Appendix N

Greenhouse Gas Emissions and Climate Change

Document No. 120064
Job No. 100013748

GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE FOR THE CLEAR CREEK GENERAL REEVALUATION STUDY BRAZORIA, FORT BEND, GALVESTON, AND HARRIS COUNTIES, TEXAS

Prepared for:

U.S. Army Corps of Engineers
Galveston District
P.O. Box 1229
Galveston, Texas 77553-1229

Prepared by:

Atkins North America, Inc.
6504 Bridge Point Parkway
Suite 200
Austin, Texas 78730

May 2012

Contents

Tables

Page

1.0 INTRODUCTION

This section describes the Greenhouse Gas Emissions and their related impacts on climate change for the Clear Creek General Reevaluation Study, General Revaluation Plan (GRP) Alternative. Air emissions from the GRP Alternative will result from the operation of construction equipment powered by internal combustion engines that produce exhaust emissions. Emissions from this equipment will result in an increase in Greenhouse Gas (GHG) emissions that could contribute to global climate change. To date, specific thresholds to evaluate adverse impacts pertaining to GHG emissions have not been established by local decision-making agencies, the State, or the Federal government. The Council on Environmental Quality (CEQ) has published "Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions," February 10, 2010. The Draft Guidance suggests that the impacts of projects directly emitting GHGs in excess of 25,000 metric tons or more of carbon dioxide (CO_2)-equivalent (CO_2e) GHG emissions on an annual basis be considered in a qualitative and quantitative manner. However, the guidance stresses that, given the nature of GHGs and their persistence in the atmosphere, climate change impacts should be considered on a cumulative level. For consistency, this section presents a project-level analysis of GHG emissions.

1.1 QUANTIFICATION OF GHG EMISSIONS

An inventory of GHGs was prepared for construction activities based on the schedule and other assumptions developed for the GRP Alternative. Air emissions estimates were calculated using techniques appropriate for a specific emissions-generating activity or source. The basis, emission factors, and summary of emissions are provided in Attachment A.

GHG emissions were estimated for emissions of CO_2, methane (CH_4), and nitrous oxides (N_2O), which are GHGs that may result from the combustion of fuel. The emission sources consist of construction equipment powered by internal combustion engines that produce exhaust emissions.

1.1.1 Methods Used for Estimation of Air Contaminant Emissions

GHG emissions were estimated for each piece of equipment. The emissions were then categorized and totaled and broken out on an annual basis for each year for which construction is scheduled to occur.

The basis for emissions included the following:

- Preliminary project description and other information, as provided for the GRP Alternative.
- The EPA's, NONROAD emission factor model, was used to predict CO_2 emissions resulting off-road and on-road construction, industrial and agricultural equipment. This

model may be used to predict air emissions for nonroad equipment based on information including geographic location, equipment type, and fuel use for specific years that may be selected. It provides an estimate of emissions for different equipment based on equipment population, load factor, available horsepower, deterioration, and applicable standards.

- Emission factors for the different construction equipment were based on the EPA's NONROAD Emissions Model and information from the "California Climate Action Registry, General Reporting Protocol," January 2009.

1.1.2 Summary of GHG Emissions

The estimated annual GHG emissions for the GRP Alternative are summarized in Table 1 for each year of anticipated construction activities.

Table 1
Summary of GHG Emissions – GRP Alternative
(tons per year)

	2012	2013	2014	2015	2016	2017	2018
CO_2	951	3,536	6,689	8,351	4,994	4,516	2,393
CH_4	0.07	0.26	0.49	0.61	0.36	0.33	0.17
N_2O	0.02	0.09	0.17	0.21	0.13	0.12	0.06
CO_2e	960	3,570	6,752	8,430	5,041	4,559	2,415

2.0 MITIGATION

Measures that may be used to reduce GHG emissions from the GRP Alternative would consider the equipment used for the project over the expected life of the project and the feasibility and practicality of such measures. Alternatives considered for their ability to reduce or mitigate GHG emissions are those that may provide for enhanced energy efficiency, lower GHG-emitting technology, or the use of renewable energy, as appropriate, for the construction equipment to be used. Possible mitigation options include the following;

- Design of the construction equipment operation and schedule so as to reduce overall fuel use;
- Repowering/refitting with cleaner diesel engines;
- Selection of newer construction equipment with more efficient engines; and
- Use of alternative lower GHG emitting fuels such as biodiesels, if possible. Biodiesel can be used directly in the unmodified diesel engines of some construction equipment, trucks, and other heavy vehicles; resultant emissions are considerably cleaner than conventional diesel and it is a greenhouse-neutral fuel. Biodiesel would provide a 7 percent reduction in CO_2 emissions compared to diesel fuel.
- Conversion to compressed natural gas (CNG) or liquid propane gas (LPG) – CNG would provide a 40 percent reduction in CO_2 emissions compared to gasoline, and LPG would provide about a 34 percent reduction.

The GRP Alternative includes a series of flood risk management measures and mitigation areas, referred to as project features. Impacts to existing floodplain forest would be avoided and minimized as much as possible within the design of the conveyance features along Clear Creek. However, it is anticipated that approximately 278 acres of floodplain forest habitat would be directly impacted as a result of the GRP Alternative, and approximately 31 acres of prime farmland that would no longer be available for agricultural use. No losses of or impacts to coastal prairie or tidal marsh are anticipated. Mitigation features include avoidance, minimization, and compensation for project impacts through rehabilitation and reestablishment of floodplain forest.

While the unavoidable impacts of construction may result in loss of the existing natural carbon removal process, clearing of streamside vegetation within the conveyance channels can improve habitat through re-vegetation of small shrubs, perennial forbs, and grasses. In addition, environmentally sensitive design features of the GRP Alternative encompass preservation, rehabilitation, and reestablishment of floodplain forest comprising 155 acres in portions of the existing low-flow channels, which includes 7.3 acres of wetlands.

According to the EarthWatch Institute (2012), "Carbon is incorporated into forests and forest soils by trees and other plants. . . . A young forest, composed of growing trees, absorbs CO_2 and acts as a sink. Mature forests, made up of a mix of various aged trees as well as dead and decaying matter, may be carbon neutral above ground, as they will emit and sequester equal amounts of CO_2." Thus, it appears that the reestablishment of floodplain forest would enhance the carbon removal process until the forest is mature.

3.0 GHG EMISSIONS CONTRIBUTION TO CLIMATE CHANGE

As described above, the GRP Alternative would increase GHG emissions. However, it would be unlikely that GHGs emitted would have an individually discernible impact on global climate change. GHG emissions accumulate in the atmosphere because of their relatively long lifespan. Consequently, their impact on climate change is independent of the point of emission. Because GHGs accumulate in the atmosphere and affect climate change on a global scale, it is not practical to predict the impact on climate change based on a project level evaluation; this analysis is more practically done on a regional or global scale.

(This page intentionally left blank.)

4.0 REFERENCES

California Climate Action Registry. 2009. "California Climate Action Registry, General Reporting Protocol," January 2009.

Council on Environmental Quality. 2010. "Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions," February 10, 2010.

EarthWatch Institute. 2012. Climate change: mitigation – carbon capture and storage. Earthwatch Educational Resources, Climate Change: Section 5. Earthwatch Institute, Oxford, United Kingdom. Available at http://www.earthwatch.org/europe/downloads/Get_Involved/ClimateChange5.pdf (accessed 25 May 2012).

Environmental Protection Agency (EPA). 2004. "Nonroad Emissions Model Draft NONROAD 2002 Support Document, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling – Compression-Ignition," April 2004.

———. 2004a. "Nonroad Emissions Model Draft NONROAD 2002 Support Document, "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling," April 2004.

(This page intentionally left blank.)

Attachment A

GRP Alternative – GHG Emissions Summary

TABLE A-1

Total Estimated Greenhouse Gas Emissions by Year of Construction Activity
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

	2012	2013	2014	2015	2016	2017	2018
CO_2	951	3,536	6,689	8,351	4,994	4,516	2,393
CH_4	0.07	0.26	0.49	0.61	0.36	0.33	0.17
N_2O	0.02	0.09	0.17	0.21	0.13	0.12	0.06
CO_2e	**960**	**3,570**	**6,752**	**8,430**	**5,041**	**4,559**	**2,415**

Table A-2

Contract Duration
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Contract	Description	Excavation Volume (cubic yards)	Duration (months)	Start Date	End Date
1	MUD GULLY CONVEYANCE	37,500	9	Oct-12	Jul-13
2	TURKEY CREEK CONVEYANCE	340,600	8	May-15	Jan-16
3	MARY'S CREEK CONVEYANCE	461,500	11	May-14	Apr-15
4	LOWER CLEAR CREEK CONVEYANCE (& C1 oxbow mitigaiton site)	805,100	19	Oct-12	Apr-14
5	RR BRIDGE REPLACEMENT AT MYKAWA		12	Jul-16	Jul-17
6	MYKAWA TO BENNIE KATE UPPER CLEAR CREEK CONVEYANCE	1,150,700	27	Apr-14	Jul-16
7	HWY 288 TO MYKAWA UPPER CLEAR CREEK CONVEYANCE	1,099,000	28	Jul-16	Sep-18
10	MITIGATION (A1b, Xb)		0	Apr-15	Jan-16

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2700

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9									
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9	0.3	0.7							
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1	300	9	100	200							
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	26	9	9	17							
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	45	9	15	30							
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	45	9	15	30							
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	160	9	53	107							
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	45	9	15	30							
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	4	9	1	3							
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	160	9	53	107							
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	45	9	15	30							
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1	1,463	9	488	975							
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	1,463	9	488	975							
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	1	13	9	4	9							
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1	300	9	100	200							
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	1	13	9	4	9							
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1	234	9	78	156							
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	1	2,482	9	827	1,655							
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	300	9	100	200							
GENERATOR, 5.5 KW, 120/240V,PORT	1	1,241	9	414	827							
HYD EXCAV, CRWLR, 3.125CY BKT	1	94	9	31	63							
HYD EXCAV, CRWLR, 1.50 CY BKT	1	51	9	17	34							
LDR,FE, CRWLR, 1.50 CY	1	20	9	7	13							
LDR,FE, WH, 2.75 CY, ARTIC, 936E	1	304	9	101	203							
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	1	940	9	313	627							
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	1	270	9	90	180							
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	1	398	9	133	265							
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	1	270	9	90	180							
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	1	398	9	133	265							
MISC. POWER TOOLS	1	1,683	9	561	1,122							
Haul,12CY (91M3) Trk, 6 Mi(10Km)	1	20	9	7	13							
Contract 2 - Turkey Creek Conveyance			8									
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8				1	-				
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	1	620	8				620	-				
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	2	2,725	8				2,725	-				
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	1,240	8				1,240	-				
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	51	8				51	-				
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	51	8				51	-				
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	456	8				456	-				
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8				1	-				
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	1	620	8				620	-				
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	51	8				51	-				

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2700**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	6	8				6	-				
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	456	8				456	-				
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	51	8				51	-				
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8				1	-				
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	5	13,305	8				13,305	-				
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	5	13,305	8				13,305	-				
MAP A10ET001	1	1	8				1	-				
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	2	2,725	8				2,725	-				
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1	2,129	8				2,129	-				
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8				-	-				
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8				1	-				
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8				-	-				
WATER TANK, 3000 GAL (ADD TRK	1	0	8				-	-				
LDR,FE, WH, 2.75 CY, ARTIC, 936E	1	383	8				383	-				
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	1	902	8				902	-				
Contract 3 - Mary's Creek Conveyance			11									
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11			0.7	0.3					
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	2	3,692	11			2,685	1,007					
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	64	11			47	17					
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	84	11			61	23					
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	84	11			61	23					
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	476	11			346	130					
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11			-	-					
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	84	11			61	23					
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	8	11			6	2					
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	476	11			346	130					
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	84	11			61	23					
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	7	18,027	11			13,111	4,916					
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7	18,027	11			13,111	4,916					
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	15	11			11	4					
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	1	32	11			23	9					
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	2	3,692	11			2,685	1,007					
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	1	40	11			29	11					
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	1	717	11			521	196					
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	2	2,884	11			2,097	787					
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	1	1,227	11			892	335					
LDR,FE, WH, 2.75 CY, ARTIC, 936E	1	1,106	11			804	302					
LDR,FE, WH, 4.50 CY, ARTIC, 966E	1	307	11			223	84					
LDR,FE, WH, 5.25 CY, ARTIC, 980C	1	77	11			56	21					
DOZER,CWLR, D-6H,	1	409	11			297	112					
DOZER,CWLR, D-7H	1	774	11			563	211					
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	1	1,227	11			892	335					

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2700

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 4 - Lower Clear Creek Conveyance			19									
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19	0.2	0.6	0.2						
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	3	6,441	19	1,017	4,068	1,356						
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	1,461	19	231	923	308						
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	46	19	7	29	10						
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX DIGGING	1	1,172	19	185	740	247						
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	46	19	7	29	10						
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	160	19	25	101	34						
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	46	19	7	29	10						
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	196	19	31	124	41						
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	160	19	25	101	34						
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	46	19	7	29	10						
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	2	3,046	19	481	1,924	641						
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	14	35,257	19	5,567	22,268	7,423						
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	1	730	19	115	461	154						
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	3	6,441	19	1,017	4,068	1,356						
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	1	730	19	115	461	154						
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	1	141	19	22	89	30						
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	3	5,584	19	882	3,527	1,176						
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	1	1,210	19	191	764	255						
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	300	19	47	189	63						
HYD EXCAV, CRWLR, 3.125CY BKT	1	580	19	92	366	122						
HYD EXCAV, CRWLR, 1.50 CY BKT	1	311	19	49	196	65						
LDR,FE, WH, 2.75 CY, ARTIC, 936E	1	668	19	105	422	141						
LDR,FE, WH, 4.50 CY, ARTIC, 966E	1	303	19	48	191	64						
LDR,FE, WH, 5.25 CY, ARTIC, 980C	1	76	19	12	48	16						
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	1	940	19	148	594	198						
DOZER,CWLR, D-4H	2	4,950	19	782	3,126	1,042						
DOZER,CWLR, D-6H	1	2,473	19	390	1,562	521						
DOZER,CWLR, D-7H	1	1,476	19	233	932	311						
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	1	2,475	19	391	1,563	521						
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	1	1,210	19	191	764	255						
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	1	2,475	19	391	1,563	521						
Contract 5 - RR Bridge Replacement at Mykawa												
Backhoe Loader, 45 HP, 5/8 CY	1	2,100	12					1,050	1,050			
Excavator, diesel hydraulic, crawler mounted, 1 CY	1	1,800	12					900	900			
Grader, self-propelled, 40,000 lb.	1	1,220	12					610	610			
Pile driving hammer, air, 24,450 ft-lb	1	600	12					300	300			
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	1	600	12					300	300			
Sheepsfoot roller, 240 HP	1	300	12					150	150			
Pneumatic Tire Roller, 80 HP	1	600	12					300	300			

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2700**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	1	1,950	12					975	975			
Vibrators, concrete, gas engine, 5 HP	1	200	12					100	100			
Pump, concrete, truck mounted	1	200	12					100	100			
Swingloader-20,000 lb capacity 175 HP	1	400	12					200	200			
25 Ton Telescopic Railway Crane	1	1,500	12					750	750			
Rail Scrap Retriever	1	500	12					250	250			
Tie Plate Picker	1	260	12					130	130			
Truck, 45,000 lb GVW, 3 axle	2	3,600	12					1,800	1,800			
Truck, Water, Off-Highway, 6,000 Gal	1	1,500	12					750	750			
Hyd. Excav, Crawler 1.5 CY	1	1,700	12					850	850			
Rear Dump Truck 8 CY	4	9,000	12					4,500	4,500			
Rear Dump Truck, 12 CY	3	6,000	12					3,000	3,000			
Misc. Power Tools	1	1,670	12					835	835			
Gradall, 5/8 CY	1	1,050	12					525	525			
Oiler, Truck	1	1,800	12					900	900			
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27									
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27			0.3	0.4	0.2				
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	4	9,206	27			3,069	4,092	2,046				
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	1,730	27			577	769	384				
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	75	27			25	33	17				
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	75	27			25	33	17				
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	578	27			193	257	128				
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	75	27			25	33	17				
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	385	27			128	171	86				
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	3	7,999	27			2,666	3,555	1,778				
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	75	27			25	33	17				
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	17	44,950	27			14,983	19,978	9,989				
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3	7,421	27			2,474	3,298	1,649				
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	1	2,558	27			853	1,137	568				
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	20	52,371	27			17,457	23,276	11,638				
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	2,558	27			853	1,137	568				
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	1	865	27			288	384	192				
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	4	9,206	27			3,069	4,092	2,046				
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	1	865	27			288	384	192				
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	1	967	27			322	430	215				
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	3	7,744	27			2,581	3,442	1,721				
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	275	27			92	122	61				
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	2	3,108	27			1,036	1,381	691				
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	300	27			100	133	67				
HYD EXCAV, CRWLR, 3.125CY BKT	1	580	27			193	258	129				
HYD EXCAV, CRWLR, 1.50 CY BKT	1	311	27			104	138	69				
LDR,FE, WH, 2.75 CY, ARTIC, 936E	2	2,805	27			935	1,247	623				

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2700**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
LDR,FE, WH, 4.50 CY, ARTIC, 966E	1	777	27			259	345	173				
LDR,FE, WH, 5.25 CY, ARTIC, 980C	1	194	27			65	86	43				
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	1	940	27			313	418	209				
DOZER,CWLR, D-6H,PS	2	3,106	27			1,035	1,380	690				
DOZER,CWLR, D-7H,PS	1	1,750	27			583	778	389				
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	2	3,108	27			1,036	1,381	691				
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			26									
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	26					0.2	0.5	0.3		
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	1	242	26					56	112	74		
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	1	483	26					111	223	149		
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	1	483	26					111	223	149		
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	4	8,792	26					2,029	4,058	2,705		
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	1	2,672	26					617	1,233	822		
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	1	9	26					2	4	3		
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	1	9	26					2	4	3		
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	1	736	26					170	340	226		
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	1	9	26					2	4	3		
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	239	26					55	110	74		
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	736	26					170	340	226		
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	1	9	26					2	4	3		
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8 M)	1	3	26					1	1	1		
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	16	42,929	26					9,907	19,813	13,209		
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	1	9	26					2	4	3		
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	16	42,929	26					9,907	19,813	13,209		
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	9	26					2	4	3		
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	26					1	1	1		
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	1	1,336	26					308	617	411		
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	4	8,792	26					2,029	4,058	2,705		
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	1	1,338	26					309	618	412		
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	1	650	26					150	300	200		
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	3	7,421	26					1,713	3,425	2,283		
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	26					-	-	-		
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	26					-	-	-		
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	424	26					98	196	130		
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	26					-	-	-		
WATER TANK, 3000 GAL (ADD TRK	1	0	26					-	-	-		
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	1	998	26					230	461	307		
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	1	300	26					69	138	92		
HYD EXCAV, CRWLR, 3.125CY BKT	1	580	26					134	268	178		
HYD EXCAV, CRWLR, 1.50 CY BKT	1	311	26					72	144	96		
LDR,FE, WH, 2.75 CY, ARTIC, 936E	2	4,320	26					997	1,994	1,329		
LDR,FE, WH, 4.50 CY, ARTIC, 966E	1	249	26					57	115	77		

TABLE A-3

Equipment Hours of Operation
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2700**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
LDR,FE, WH, 5.25 CY, ARTIC, 980C	1	62	26					14	29	19		
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	1	940	26					217	434	289		
DOZER,CWLR, D-6H	1	2,275	26					525	1,050	700		
DOZER,CWLR, D-7H	1	2,694	26					622	1,243	829		
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	1	998	26					230	461	307		
Contract 10 - Mitigation			10									
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1	2,446	10				2,201.4	244.6				
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1	2,446	10				2,201.4	244.6				
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	1	2,238	10				2,014.2	223.8				
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	2,446	10				2,201.4	244.6				
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	1	2,238	10				2,014.2	223.8				
BLADE, ANGLE, HYDR (FOR D4	1	1,600	10				1,440.0	160.0				
DOZER,CWLR, D-4H,PS (ADD BLADE)	1	1,600	10				1,440.0	160.0				
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	1	400	10				360.0	40.0				
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	1	400	10				360.0	40.0				

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)		
					CO_2	CH_4[2]	N_2O[2]
Contract 1 - Mud Gully Conveyance							
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	165	59%	536.05072	0.0390815	0.0137313
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%		0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	685.997	0.0498341	0.0171305
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	151	59%	536.08839	0.0390843	0.0137323
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	536.08839	0.0390843	0.0137323
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	594.54831	0.0433464	0.0152298
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	624.10926	0.0455016	0.015987
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	Tractor/Loader/Backhoe	DIESEL	46	21%	693.6681	0.0505728	0.0177688
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	693.6681	0.0505728	0.0177688
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	693.6681	0.0505728	0.0177688
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	400	21%	535.90326	0.0390708	0.0137276
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	Chippers/Stump Grinders	DIESEL	125	43%	529.75324	0.0386224	0.01357
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	Cranes	DIESEL	350	43%	530.32056	0.0386638	0.0135846
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	Crawler Dozers/Tractor	DIESEL	160	59%	536.04382	0.039081	0.0137312
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	536.13912	0.039088	0.0137336
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	Other General Industrial Equipment	ELECTRIC	2			0	0
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	152	43%	530.19455	0.0386546	0.0135813
GENERATOR, 5.5 KW, 120/240V,PORT	Generator Set	GASOLINE	11	68%	1043.4672	0.0758024	0.0260571
HYD EXCAV, CRWLR, 3.125CY BKT	Excavators	DIESEL	306	59%	536.2591	0.0390967	0.0137367
HYD EXCAV, CRWLR, 1.50 CY BKT	Excavators	DIESEL	128	59%	536.08839	0.0390843	0.0137323
LDR,FE, CRWLR, 1.50 CY	Crawler Dozers/Tractor	DIESEL	90	59%	595.17654	0.0433922	0.0152459
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	623.80764	0.0454796	0.0159793
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	Pumps	DIESEL	21	43%	588.88497	0.0429335	0.0150847
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	Crawler Dozers/Tractor	DIESEL	165	59%	536.04382	0.039081	0.0137312
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	Crawler Dozers/Tractor	DIESEL	325	59%	536.21331	0.0390934	0.0137355
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	Crawler Dozers/Tractor	DIESEL	165	59%	536.04382	0.039081	0.0137312
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	Crawler Dozers/Tractor	DIESEL	200	59%	536.13912	0.039088	0.0137336
MISC. POWER TOOLS	--	--	0	0%		0	0
Haul,12CY (91M3) Trk, 6 Mi(10Km)	Highway Truck	DIESEL	265	59%	536.26381	0.0390971	0.0137368
Contract 2 - Turkey Creek Conveyance							
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	165	59%	536.05072	0.0390815	0.0137313

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)		
					CO_2	CH_4[2]	N_2O[2]
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	Chippers/Stump Grinders	GASOLINE	71	78%	711.44871	0.051683	0.017766
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%		0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	685.997	0.0498341	0.0171305
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	151	59%	536.08839	0.0390843	0.0137323
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	536.08839	0.0390843	0.0137323
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	594.54831	0.0433464	0.0152298
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	Tractor/Loader/Backhoe	DIESEL	90	21%	692.16168	0.050463	0.0177302
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	Tractor/Loader/Backhoe	DIESEL	121	21%	623.80764	0.0454796	0.0159793
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	624.10926	0.0455016	0.015987
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	Other Construction Equipment	DIESEL	46	59%	595.18739	0.043393	0.0152462
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Tractor/Dozers	DIESEL	310	59%	536.21331	0.0390934	0.0137355
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	400	21%	535.90326	0.0390708	0.0137276
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
MAP A10ET001	--	--	0	0%		0	0
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	Cranes	DIESEL	350	43%	530.32056	0.0386638	0.0135846
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	536.13912	0.039088	0.0137336
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	310	59%	536.30863	0.0391003	0.013738
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	Off-Highway Truck	DIESEL	330	59%	536.30863	0.0391003	0.013738
ROLLR,STATIC,S/P,13T,84"W,11TIRE	Rollers	DIESEL	85	59%	595.02837	0.0433814	0.0152421
WATER TANK, 3000 GAL (ADD TRK	Off-Highway Truck	DIESEL	175	59%	536.20534	0.0390928	0.0137353
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	624.10926	0.0455016	0.015987
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	Crawler Dozers/Tractor	DIESEL	200	59%	536.13912	0.039088	0.0137336
Contract 3 - Mary's Creek Conveyance							
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	165	59%	536.05072	0.0390815	0.0137313
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%		0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	685.997	0.0498341	0.0171305
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	151	59%	536.08839	0.0390843	0.0137323
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	536.08839	0.0390843	0.0137323
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	594.54831	0.0433464	0.0152298
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	Tractor/Loader/Backhoe	DIESEL	90	21%	692.16168	0.050463	0.0177302
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	624.10926	0.0455016	0.015987

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)		
					CO_2	CH_4[2]	N_2O[2]
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	Tractor/Loader/Backhoe	DIESEL	46	21%	693.6681	0.0505728	0.0177688
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	400	21%	535.90326	0.0390708	0.0137276
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	Dumpers/Tenders	DIESEL	265	21%	535.98362	0.0390766	0.0137296
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	Chippers/Stump Grinders	DIESEL	125	43%	529.75324	0.0386224	0.01357
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	Cranes	DIESEL	350	43%	530.32056	0.0386638	0.0135846
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	Crawler Dozers/Tractor	DIESEL	160	59%	536.04382	0.039081	0.0137312
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	Tractor/Loader/Backhoe	DIESEL	67	21%	692.16168	0.050463	0.0177302
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	536.13912	0.039088	0.0137336
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	624.10926	0.0455016	0.015987
LDR,FE, WH, 4.50 CY, ARTIC, 966E	Tractor/Loader/Backhoe	DIESEL	246	21%	624.10926	0.0455016	0.015987
LDR,FE, WH, 5.25 CY, ARTIC, 980C	Tractor/Loader/Backhoe	DIESEL	265	21%	624.10926	0.0455016	0.015987
DOZER,CWLR, D-6H,	Crawler Dozers/Tractor	DIESEL	165	59%	536.04382	0.039081	0.0137312
DOZER,CWLR, D-7H	Crawler Dozers/Tractor	DIESEL	200	59%	536.13912	0.039088	0.0137336
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	Dumpers/Tenders	DIESEL	265	21%	535.98362	0.0390766	0.0137296
Contract 4 - Lower Clear Creek Conveyance							
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	165	59%	536.05072	0.0390815	0.0137313
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%		0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	685.997	0.0498341	0.0171305
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	125	59%	536.08839	0.0390843	0.0137323
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX DIGGING	Excavators	DIESEL	238	59%	536.2591	0.0390967	0.0137367
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	536.08839	0.0390843	0.0137323
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	594.54831	0.0433464	0.0152298
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	624.10926	0.0455016	0.015987
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	Tractor/Loader/Backhoe	DIESEL	46	21%	693.6681	0.0505728	0.0177688
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	Crawler Dozers/Tractor	DIESEL	180	59%	536.13912	0.039088	0.0137336
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	Chippers/Stump Grinders	DIESEL	125	43%	529.75324	0.0386224	0.01357

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)		
					CO_2	CH_4[2]	N_2O[2]
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	Cranes	DIESEL	350	43%	530.32056	0.0386638	0.0135846
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	Crawler Dozers/Tractor	DIESEL	160	59%	536.04382	0.039081	0.0137312
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	536.13912	0.039088	0.0137336
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	152	43%	530.19455	0.0386546	0.0135813
HYD EXCAV, CRWLR, 3.125CY BKT	Excavators	DIESEL	306	59%	536.2591	0.0390967	0.0137367
HYD EXCAV, CRWLR, 1.50 CY BKT	Excavators	DIESEL	128	59%	536.08839	0.0390843	0.0137323
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	624.10926	0.0455016	0.015987
LDR,FE, WH, 4.50 CY, ARTIC, 966E	Tractor/Loader/Backhoe	DIESEL	246	21%	624.10926	0.0455016	0.015987
LDR,FE, WH, 5.25 CY, ARTIC, 980C	Tractor/Loader/Backhoe	DIESEL	265	21%	624.10926	0.0455016	0.015987
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	Pumps	DIESEL	21	43%	588.88497	0.0429335	0.0150847
DOZER,CWLR, D-4H	Crawler Dozers/Tractor	DIESEL	80	59%	595.17654	0.0433922	0.0152459
DOZER,CWLR, D-6H	Crawler Dozers/Tractor	DIESEL	165	59%	536.04382	0.039081	0.0137312
DOZER,CWLR, D-7H	Crawler Dozers/Tractor	DIESEL	200	59%	536.13912	0.039088	0.0137336
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	Dumpers/Tenders	DIESEL	265	21%	535.98362	0.0390766	0.0137296
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	Dumpers/Tenders	DIESEL	265	21%	535.98362	0.0390766	0.0137296
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
Contract 5 - RR Bridge Replacement at Mykawa							
Backhoe Loader, 45 HP, 5/8 CY	Tractor/Loader/Backhoe	DIESEL	46	21%	693.6681	0.0505728	0.0177688
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	DIESEL	128	59%	536.08839	0.0390843	0.0137323
Grader, self-propelled, 40,000 lb.	Graders	DIESEL	185	59%	536.14448	0.0390884	0.0137338
Pile driving hammer, air, 24,450 ft-lb	Other General Industrial Equipment	Air	0	0%		0	0
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	DIESEL	230	43%	722.43352	0.05267	0.0185057
Sheepsfoot roller, 240 HP	Rollers	DIESEL	240	59%	536.07144	0.039083	0.0137319
Pneumatic Tire Roller, 80 HP	Rollers	DIESEL	80	59%	595.02837	0.0433814	0.0152421
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	Tractor/Loader/Backhoe	DIESEL	145	21%	623.80764	0.0454796	0.0159793
Vibrators, concrete, gas engine, 5 HP	Vibrators	GASOLINE	5	48%	1221.1626	0.088711	0.0304944
Pump, concrete, truck mounted	Pumps	DIESEL	21	43%	588.88497	0.0429335	0.0150847
Swingloader-20,000 lb capacity 175 HP	Other Construction Equipment	DIESEL	175	59%	535.87758	0.0390689	0.0137269
25 Ton Telescopic Railway Crane	Cranes	DIESEL	152	43%	530.19455	0.0386546	0.0135813
Rail Scrap Retriever	Other Construction Equipment	DIESEL	46	59%	595.18739	0.043393	0.0152462
Tie Plate Picker	Other Construction Equipment	DIESEL	46	59%	595.18739	0.043393	0.0152462

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)		
					CO_2	CH_4[2]	N_2O[2]
Truck, 45,000 lb GVW, 3 axle	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	DIESEL	330	59%	536.26381	0.0390971	0.0137368
Hyd. Excav, Crawler 1.5 CY	Excavators	DIESEL	128	59%	536.08839	0.0390843	0.0137323
Rear Dump Truck 8 CY	Dumper/Tender	DIESEL	400	21%	535.90326	0.0390708	0.0137276
Rear Dump Truck, 12 CY	Dumper/Tender	DIESEL	400	21%	535.90326	0.0390708	0.0137276
Misc. Power Tools	Other General Industrial Equipment	Electric	0	0%		0	0
Gradall, 5/8 CY	Graders	DIESEL	165	59%	536.05072	0.0390815	0.0137313
Oiler, Truck	Off-Highway Truck	DIESEL	175	59%	536.20534	0.0390928	0.0137353
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance							
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	140	59%	536.05072	0.0390815	0.0137313
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%		0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	685.997	0.0498341	0.0171305
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	151	59%	536.08839	0.0390843	0.0137323
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	536.08839	0.0390843	0.0137323
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	594.54831	0.0433464	0.0152298
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	624.10926	0.0455016	0.015987
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	Tractor/Loader/Backhoe	DIESEL	46	21%	693.6681	0.0505728	0.0177688
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	400	21%	535.90326	0.0390708	0.0137276
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	230	21%	535.98362	0.0390766	0.0137296
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Off-Highway Truck	DIESEL	400	59%	536.30863	0.0391003	0.013738
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	310	59%	536.30863	0.0391003	0.013738
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	Chippers/Stump Grinders	DIESEL	125	43%	529.75324	0.0386224	0.01357
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	Cranes	DIESEL	350	43%	530.32056	0.0386638	0.0135846
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	Crawler Dozers/Tractor	DIESEL	160	59%	536.04382	0.039081	0.0137312
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	536.13912	0.039088	0.0137336
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	190	43%	530.29399	0.0386618	0.0135839
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	152	43%	530.29399	0.0386618	0.0135839
HYD EXCAV, CRWLR, 3.125CY BKT	Excavators	DIESEL	306	59%	536.2591	0.0390967	0.0137367

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)		
					CO_2	CH_4[2]	N_2O[2]
HYD EXCAV, CRWLR, 1.50 CY BKT	Excavators	DIESEL	128	59%	536.08839	0.0390843	0.0137323
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	624.10926	0.0455016	0.015987
LDR,FE, WH, 4.50 CY, ARTIC, 966E	Tractor/Loader/Backhoe	DIESEL	246	21%	624.10926	0.0455016	0.015987
LDR,FE, WH, 5.25 CY, ARTIC, 980C	Tractor/Loader/Backhoe	DIESEL	265	21%	624.10926	0.0455016	0.015987
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	Pumps	DIESEL	21	43%	588.88497	0.0429335	0.0150847
DOZER,CWLR, D-6H,PS	Crawler Dozers/Tractor	DIESEL	165	59%	536.04382	0.039081	0.0137312
DOZER,CWLR, D-7H,PS	Crawler Dozers/Tractor	DIESEL	200	59%	536.13912	0.039088	0.0137336
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	Dumpers/Tenders	DIESEL	265	21%	535.98362	0.0390766	0.0137296
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance							
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	Graders	DIESEL	165	59%	536.05072	0.0390815	0.0137313
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	Other General Industrial Equipment	GASOLINE	75	43%	722.43357	0.052481	0.0180403
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	Other General Industrial Equipment	GASOLINE	50	43%	722.43357	0.052481	0.0180403
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	--	--	0	0%		0	0
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	Bucket	--	0	0%		0	0
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	Concrete/Industrial Saws	GASOLINE	6	78%	685.997	0.0498341	0.0171305
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	Excavators	DIESEL	151	59%	536.08839	0.0390843	0.0137323
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	Excavators	DIESEL	163	59%	536.08839	0.0390843	0.0137323
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	Agricultural Tractor	DIESEL	55	59%	594.54831	0.0433464	0.0152298
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	Tractor/Loader/Backhoe	DIESEL	200	21%	624.10926	0.0455016	0.015987
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590	Tractor/Loader/Backhoe	DIESEL	46	21%	693.6681	0.0505728	0.0177688
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8	Off-Highway Truck	DIESEL	210	59%	536.26381	0.0390971	0.0137368
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	400	21%	535.90326	0.0390708	0.0137276
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	--	--	0	0%		0	0
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	310	59%	536.30863	0.0391003	0.013738
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	Dumpers/Tenders	DIESEL	265	21%	535.98362	0.0390766	0.0137296
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	Chippers/Stump Grinders	DIESEL	125	43%	529.75324	0.0386224	0.01357
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD	Cranes	DIESEL	350	43%	530.32056	0.0386638	0.0135846
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	Crawler Dozers/Tractor	DIESEL	160	59%	536.04382	0.039081	0.0137312
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	Crawler Dozers/Tractor	DIESEL	240	59%	536.13912	0.039088	0.0137336

TABLE A-4

Construction Equipment Emission Factors
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Equipment Type	Description	Fuel Type1	HP	Typical Load Factor	Emission Factors[1] (g/hp-hr)		
					CO_2	CH_4[2]	N_2O[2]
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	310	59%	536.30863	0.0391003	0.013738
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	Off-Highway Truck	DIESEL	330	59%	536.30863	0.0391003	0.013738
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	152	43%	530.19455	0.0386546	0.0135813
ROLLR,STATIC,S/P,13T,84"W,11TIRE	Rollers	DIESEL	85	59%	595.02837	0.0433814	0.0152421
WATER TANK, 3000 GAL (ADD TRK	Off-Highway Truck	DIESEL	175	59%	536.20534	0.0390928	0.0137353
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	Cranes	DIESEL	152	43%	530.19455	0.0386546	0.0135813
HYD EXCAV, CRWLR, 3.125CY BKT	Excavators	DIESEL	306	59%	536.2591	0.0390967	0.0137367
HYD EXCAV, CRWLR, 1.50 CY BKT	Excavators	DIESEL	128	59%	536.08839	0.0390843	0.0137323
LDR,FE, WH, 2.75 CY, ARTIC, 936E	Tractor/Loader/Backhoe	DIESEL	181	21%	624.10926	0.0455016	0.015987
LDR,FE, WH, 4.50 CY, ARTIC, 966E	Tractor/Loader/Backhoe	DIESEL	246	21%	624.10926	0.0455016	0.015987
LDR,FE, WH, 5.25 CY, ARTIC, 980C	Tractor/Loader/Backhoe	DIESEL	265	21%	624.10926	0.0455016	0.015987
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	Pumps	DIESEL	21	43%	588.88497	0.0429335	0.0150847
DOZER,CWLR, D-6H	Crawler Dozers/Tractor	DIESEL	165	59%	536.04382	0.039081	0.0137312
DOZER,CWLR, D-7H	Crawler Dozers/Tractor	DIESEL	200	59%	536.13912	0.039088	0.0137336
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	--	--	0	0%		0	0
Contract 10 - Mitigation							
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	Tractor/Loader/Backhoe	DIESEL	67	21%	692.31972	0.0504745	0.0177343
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	Dumper/Tender	DIESEL	230	21%	535.98362	0.0390766	0.0137296
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	Off-Highway Truck	DIESEL	400	59%	536.30863	0.0391003	0.013738
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	Highway Truck	DIESEL	310	59%	536.30863	0.0391003	0.013738
BLADE, ANGLE, HYDR (FOR D4	--	--	0	0%		0	0
DOZER,CWLR, D-4H,PS (ADD BLADE)	Crawler Dozers/Tractor	DIESEL	80	59%	595.17654	0.0433922	0.0152459
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	--	--	0	0%		0	0
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	Highway Truck	DIESEL	230	59%	536.26381	0.0390971	0.0137368

TABLE A-5

Load Factors For Equipment Using Diesel or Gasoline

SCC Code	Equipment	Load Factor[1] Diesel	Gasoline
22xx003010	Aerial Lifts	21%	46%
22xx005015	Agricultural Tractor	59%	62%
22xx006015	Air Compressors	43%	56%
22xx001030	All Terrain Vehicles	42%	100%
22xx002033	Bore/Drill Rigs	43%	79%
22xx002042	Cement & Motar Mixers	43%	59%
22xx004066	Chippers/Stump Grinders	43%	78%
22xx002039	Concrete/Industrial Saws	59%	78%
22xx002045	Cranes	43%	47%
22xx002066	Crawler Dozers/Tractor	59%	80%
22xx002054	Crushing/Procesing Equipment	43%	85%
22xx002078	Dumpers/Tenders	21%	41%
22xx002036	Excavators	59%	53%
22xx007015	Fellers/Bunchers/Skidders	59%	70%
22xx003020	Forklifts	59%	30%
22xx006020	Gas Compressors	43%	85%
22xx006005	Generator Sets	43%	68%
22xx002048	Graders	59%	64%
22xx005050	Hydro Power Units	43%	56%
22xx004056	Lawn and Garden Tractor	43%	44%
22xx002051	Off-Highway Truck	59%	80%
22xx002075	Off-Highway Tractor	59%	70%
22xx004056	Other Agricultural Equipment	59%	55%
22xx002081	Other Construction Equipment	59%	48%
22xx003040	Equipment	43%	54%
22xx003050	Other Material Handling Equipment	21%	53%
22xx002003	Pavers	59%	66%
22xx002021	Paving Equipment	59%	59%
22xx002009	Plate Compactors	43%	55%
22xx006030	Pressure Washer	43%	85%
22xx006010	Pumps	43%	69%
22xx003060	Refrigeration/AC	43%	46%
22xx002015	Rollers	59%	62%
22xx002057	Rough Terrain Forklifts	59%	63%
22xx002063	Rubber Tire Dozer	59%	75%
22xx002060	Rubber Tire Loader	59%	71%
22xx002018	Scrapers	59%	70%
22xx002072	Skid Steer Loader	21%	58%
22xx001060	Specialty Vehicle/Carts	21%	58%
22xx002024	Surfacing Equipment	59%	49%
22xx003030	Sweepers/Scrubbers	43%	71%
22xx002006	Tampers/Rammers	43%	55%
22xx003070	Terminal Tractors	59%	78%
22xx005040	Tillers > 6 hp	59%	71%
22xx004026	Timmer/Edger/Brush Cutter	43%	91%
22xx002066	Tractor/Loader/Backhoe	21%	48%
22xx002030	Trenchers	59%	66%
22xx006025	Welders	21%	68%

1. Load Factors from Appendix A of *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*,EPA Office of Air and Radiation Report Number NR-005b, December 2002

TABLE A-6

CO_2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9	0.019	0.038	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	60	300	9	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	6	26	9	0.031	0.061	-	-	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	9	45	9	0.790	1.579	-	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	9	45	9	0.852	1.705	-	-	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	9	1.134	2.268	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	9	45	9	0.433	0.867	-	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	4	9	0.010	0.020	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	9	0.574	1.148	-	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	9	45	9	0.161	0.323	-	-	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	293	1,463	9	24.199	48.398	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	293	1,463	9	39.119	78.238	-	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	3	13	9	0.136	0.272	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	60	300	9	8.798	17.596	-	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	3	13	9	0.242	0.483	-	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	47	234	9	6.527	13.055	-	-	-	-	-	-	-
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	497	2,482	9	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	9	3.820	7.640	-	-	-	-	-	-	-
GENERATOR, 5.5 KW, 120/240V,PORT	249	1,241	9	3.559	7.118	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	19	94	9	3.344	6.688	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	11	51	9	0.759	1.517	-	-	-	-	-	-	-
LDR,FE, CRWLR, 1.50 CY	4	20	9	0.232	0.464	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	61	304	9	2.649	5.297	-	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	9	1.837	3.673	-	-	-	-	-	-	-
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	54	270	9	5.177	10.354	-	-	-	-	-	-	-
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	80	398	9	15.036	30.073	-	-	-	-	-	-	-
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	54	270	9	5.177	10.354	-	-	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	80	398	9	9.252	18.504	-	-	-	-	-	-	-
MISC. POWER TOOLS	337	1,683	9	-	-	-	-	-	-	-	-	-
Haul,12CY (91M3) Trk, 6 Mi(10Km)	4	20	9	0.616	1.232	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 2 - Turkey Creek Conveyance			8	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8	-	-	-	0.058	-	-	-	-	-
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	124	620	8	-	-	-	26.927	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	545	2,725	8	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	248	1,240	8	-	-	-	4.388	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	11	51	8	-	-	-	2.685	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	11	51	8	-	-	-	2.898	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	92	456	8	-	-	-	9.698	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8	-	-	-	0.014	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	124	620	8	-	-	-	10.833	-	-	-	-	-

TABLE A-6

CO_2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	11	51	8	-	-	-	1.474	-	-	-	-	-
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	6	8	-	-	-	0.107	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	92	456	8	-	-	-	4.896	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	11	51	8	-	-	-	0.548	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8	-	-	-	0.108	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	2,661	13,305	8	-	-	-	660.218	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2,661	13,305	8	-	-	-	1,067.283	-	-	-	-	-
MAP A10ET001	1	1	8	-	-	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	545	2,725	8	-	-	-	239.744	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	426	2,129	8	-	-	-	178.165	-	-	-	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8	-	-	-	0.115	-	-	-	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	8	-	-	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	77	383	8	-	-	-	10.015	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	181	902	8	-	-	-	62.903	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 3 - Mary's Creek Conveyance			11	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11	-	-	0.042	0.016	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	739	3,692	11	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	13	64	11	-	-	0.165	0.062	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	17	84	11	-	-	3.216	1.206	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	17	84	11	-	-	3.472	1.302	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	96	476	11	-	-	7.362	2.761	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11	-	-	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	17	84	11	-	-	1.765	0.662	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	8	11	-	-	0.043	0.016	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	96	476	11	-	-	3.717	1.394	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	17	84	11	-	-	0.656	0.246	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3,606	18,027	11	-	-	650.568	243.963	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	3,606	18,027	11	-	-	1,051.685	394.382	-	-	-	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	3	15	11	-	-	0.359	0.135	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	7	32	11	-	-	0.730	0.274	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	739	3,692	11	-	-	236.233	88.587	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	8	40	11	-	-	1.623	0.609	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	144	717	11	-	-	5.598	2.099	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	577	2,884	11	-	-	175.525	65.822	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	246	1,227	11	-	-	71.582	26.843	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	222	1,106	11	-	-	21.034	7.888	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	62	307	11	-	-	7.935	2.976	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	77	11	-	-	2.144	0.804	-	-	-	-	-
DOZER,CWLR, D-6H,	82	409	11	-	-	17.111	6.416	-	-	-	-	-

TABLE A-6

CO_2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
DOZER,CWLR, D-7H	155	774	11	-	-	39.256	14.721	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	246	1,227	11	-	-	29.340	11.003	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 4 - Lower Clear Creek Conveyance			19	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19	0.009	0.036	0.012	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,289	6,441	19	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	293	1,461	19	0.816	3.266	1.089	-	-	-	-	-	-
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	10	46	19	0.317	1.266	0.422	-	-	-	-	-	-
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX DIGGING	235	1,172	19	15.361	61.442	20.481	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	10	46	19	0.413	1.651	0.550	-	-	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	19	0.537	2.149	0.716	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	10	46	19	0.210	0.839	0.280	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	40	196	19	0.229	0.914	0.305	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	19	0.271	1.085	0.362	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	10	46	19	0.078	0.312	0.104	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	610	3,046	19	30.186	120.744	40.248	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7,052	35,257	19	446.558	1,786.232	595.411	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	146	730	19	3.618	14.471	4.824	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,289	6,441	19	89.475	357.901	119.300	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	146	730	19	6.429	25.718	8.573	-	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	29	141	19	0.239	0.956	0.319	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,117	5,584	19	73.784	295.135	98.378	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	242	1,210	19	15.326	61.302	20.434	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	19	1.809	7.238	2.413	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	19	9.774	39.094	13.031	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	19	2.191	8.766	2.922	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	134	668	19	2.758	11.032	3.677	-	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	61	303	19	1.700	6.801	2.267	-	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	76	19	0.459	1.838	0.613	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	19	0.870	3.480	1.160	-	-	-	-	-	-
DOZER,CWLR, D-4H	990	4,950	19	24.203	96.812	32.271	-	-	-	-	-	-
DOZER,CWLR, D-6H	495	2,473	19	22.461	89.845	29.948	-	-	-	-	-	-
DOZER,CWLR, D-7H	296	1,476	19	16.252	65.010	21.670	-	-	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	495	2,475	19	12.849	51.396	17.132	-	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	242	1,210	19	6.282	25.127	8.376	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	495	2,475	19	31.348	125.391	41.797	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 5 - RR Bridge Replacement at Mykawa												
Backhoe Loader, 45 HP, 5/8 CY	actor/Loader/Backh	1	2,100	-	-	-	-	7.756	7.756	-	-	-
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	1	1,800	-	-	-	-	40.165	40.165	-	-	-
Grader, self-propelled, 40,000 lb.	Graders	1	1,220	-	-	-	-	39.350	39.350	-	-	-
Pile driving hammer, air, 24,450 ft-lb	eneral Industrial Eq	1	600	-	-	-	-	-	-	-	-	-

TABLE A-6

CO_2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	1		-	-	-	-	23.628	23.628	-	-	-
Sheepsfoot roller, 240 HP	Rollers	1	300	-	-	-	-	12.551	12.551	-	-	-
Pneumatic Tire Roller, 80 HP	Rollers	1	600	-	-	-	-	9.288	9.288	-	-	-
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	actor/Loader/Backh	1	1,950	-	-	-	-	20.415	20.415	-	-	-
Vibrators, concrete, gas engine, 5 HP	Vibrators	1	200	-	-	-	-	0.323	0.323	-	-	-
Pump, concrete, truck mounted	Pumps	1	200	-	-	-	-	0.586	0.586	-	-	-
Swingloader-20,000 lb capacity 175 HP	Construction Equip	1	400	-	-	-	-	12.198	12.198	-	-	-
25 Ton Telescopic Railway Crane	Cranes	1	1,500	-	-	-	-	28.649	28.649	-	-	-
Rail Scrap Retriever	Construction Equip	1	500	-	-	-	-	4.452	4.452	-	-	-
Tie Plate Picker	Construction Equip	1	260	-	-	-	-	2.315	2.315	-	-	-
Truck, 45,000 lb GVW, 3 axle	Highway Truck	2	3,600	-	-	-	-	144.390	144.390	-	-	-
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	1	1,500	-	-	-	-	86.320	86.320	-	-	-
Hyd. Excav, Crawler 1.5 CY	Excavators	1	1,700	-	-	-	-	37.934	37.934	-	-	-
Rear Dump Truck 8 CY	Dumper/Tender	4	9,000	-	-	-	-	223.298	223.298	-	-	-
Rear Dump Truck, 12 CY	Dumper/Tender	3	6,000	-	-	-	-	148.865	148.865	-	-	-
Misc. Power Tools	eneral Industrial Eq	1	1,670	-	-	-	-	-	-	-	-	-
Gradall, 5/8 CY	Graders	1	1,050	-	-	-	-	30.200	30.200	-	-	-
Oiler, Truck	Off-Highway Truck	1	1,800	-	-	-	-	54.925	54.925	-	-	-
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27	-	-	-	-	-	-	-	-	-
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27	-	-	0.016	0.022	0.011	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,842	9,206	27	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	346	1,730	27	-	-	2.041	2.721	1.361	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	15	75	27	-	-	1.316	1.755	0.877	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	15	75	27	-	-	1.421	1.894	0.947	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	116	578	27	-	-	4.097	5.463	2.732	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	15	75	27	-	-	0.722	0.963	0.482	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	77	385	27	-	-	0.948	1.264	0.632	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1,600	7,999	27	-	-	28.630	38.173	19.087	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	15	75	27	-	-	0.268	0.358	0.179	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,990	44,950	27	-	-	743.499	991.333	495.666	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1,485	7,421	27	-	-	70.591	94.121	47.060	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	512	2,558	27	-	-	118.963	158.618	79.309	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	10,475	52,371	27	-	-	1,400.343	1,867.124	933.562	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	512	2,558	27	-	-	92.196	122.929	61.464	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	173	865	27	-	-	9.050	12.067	6.033	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,842	9,206	27	-	-	269.980	359.973	179.987	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	173	865	27	-	-	16.083	21.444	10.722	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	194	967	27	-	-	3.461	4.615	2.307	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,549	7,744	27	-	-	216.019	288.025	144.012	-	-	-	-
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	55	275	27	-	-	4.378	5.837	2.919	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	622	3,108	27	-	-	83.105	110.806	55.403	-	-	-	-

TABLE A-6

CO_2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	27	-	-	3.821	5.094	2.547	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	27	-	-	20.633	27.511	13.755	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	27	-	-	4.626	6.169	3.084	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	561	2,805	27	-	-	24.450	32.600	16.300	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	156	777	27	-	-	9.205	12.273	6.137	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	39	194	27	-	-	2.476	3.301	1.651	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	27	-	-	1.837	2.449	1.224	-	-	-	-
DOZER,CWLR, D-6H,PS	622	3,106	27	-	-	59.556	79.408	39.704	-	-	-	-
DOZER,CWLR, D-7H,PS	350	1,750	27	-	-	40.680	54.240	27.120	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	622	3,108	27	-	-	34.063	45.417	22.709	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			28	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	28	-	-	-	-	0.013	0.027	0.018	-	-
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	49	242	28	-	-	-	-	1.434	2.869	1.912	-	-
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	97	483	28	-	-	-	-	1.908	3.817	2.545	-	-
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	97	483	28	-	-	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,759	8,792	28	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	535	2,672	28	-	-	-	-	2.182	4.364	2.910	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	2	9	28	-	-	-	-	0.109	0.219	0.146	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	2	9	28	-	-	-	-	0.118	0.236	0.157	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	148	736	28	-	-	-	-	3.612	7.224	4.816	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	2	9	28	-	-	-	-	0.060	0.120	0.080	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	48	239	28	-	-	-	-	0.407	0.815	0.543	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	148	736	28	-	-	-	-	1.824	3.647	2.432	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	2	9	28	-	-	-	-	0.022	0.045	0.030	-	-
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8 M)	1	3	28	-	-	-	-	0.051	0.101	0.068	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,586	42,929	28	-	-	-	-	491.588	983.175	655.450	-	-
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	2	9	28	-	-	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	8,586	42,929	28	-	-	-	-	794.682	1,589.365	1,059.576	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2	9	28	-	-	-	-	0.225	0.449	0.299	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	28	-	-	-	-	0.023	0.046	0.030	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	268	1,336	28	-	-	-	-	9.677	19.354	12.903	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,759	8,792	28	-	-	-	-	178.504	357.007	238.005	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	268	1,338	28	-	-	-	-	17.223	34.446	22.964	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	130	650	28	-	-	-	-	1.611	3.221	2.148	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,485	7,421	28	-	-	-	-	143.314	286.627	191.085	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	28	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	28	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	85	424	28	-	-	-	-	3.738	7.475	4.984	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	28	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	28	-	-	-	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	200	998	28	-	-	-	-	18.475	36.949	24.633	-	-

TABLE A-6

CO_2 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	28	-	-	-	-	2.645	5.289	3.526	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	28	-	-	-	-	14.284	28.569	19.046	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	28	-	-	-	-	3.203	6.406	4.271	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	864	4,320	28	-	-	-	-	26.069	52.138	34.759	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	50	249	28	-	-	-	-	2.042	4.084	2.723	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	13	62	28	-	-	-	-	0.548	1.096	0.730	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	28	-	-	-	-	1.272	2.543	1.695	-	-
DOZER,CWLR, D-6H	455	2,275	28	-	-	-	-	30.200	60.399	40.266	-	-
DOZER,CWLR, D-7H	539	2,694	28	-	-	-	-	43.355	86.710	57.807	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	200	998	28	-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 10 - Mitigation				-	-	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	490	2,446	0	-	-	-	23.638	2.626	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	490	2,446	0	-	-	-	62.821	6.980	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	448	2,238	0	-	-	-	281.019	31.224	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	490	2,446	0	-	-	-	176.589	19.621	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	448	2,238	0	-	-	-	217.790	24.199	-	-	-	-
BLADE, ANGLE, HYDR (FOR D4	320	1,600	0	-	-	-	-	-	-	-	-	-
DOZER,CWLR, D-4H,PS (ADD BLADE)	320	1,600	0	-	-	-	44.592	4.955	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	80	400	0	-	-	-	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	80	400	0	-	-	-	28.878	3.209	-	-	-	-
			TOTALS	**951**	**3,536**	**6,689**	**8,351**	**4,994**	**4,516**	**2,393**	**-**	**-**

TABLE A-7

CH_4 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9	0.000	0.000	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	60	300	9	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	6	26	9	0.000	0.000	-	-	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	9	45	9	0.000	0.000	-	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	9	45	9	0.000	0.000	-	-	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	9	0.000	0.000	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	9	45	9	0.000	0.000	-	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	4	9	0.000	0.000	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	9	0.000	0.000	-	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	9	45	9	0.000	0.000	-	-	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	293	1,463	9	0.002	0.004	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	293	1,463	9	0.003	0.006	-	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	3	13	9	0.000	0.000	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	60	300	9	0.001	0.001	-	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	3	13	9	0.000	0.000	-	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	47	234	9	0.000	0.001	-	-	-	-	-	-	-
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	497	2,482	9	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	9	0.000	0.001	-	-	-	-	-	-	-
GENERATOR, 5.5 KW, 120/240V,PORT	249	1,241	9	0.000	0.001	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	19	94	9	0.000	0.000	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	11	51	9	0.000	0.000	-	-	-	-	-	-	-
LDR,FE, CRWLR, 1.50 CY	4	20	9	0.000	0.000	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	61	304	9	0.000	0.000	-	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	9	0.000	0.000	-	-	-	-	-	-	-
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	54	270	9	0.000	0.001	-	-	-	-	-	-	-
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	80	398	9	0.001	0.002	-	-	-	-	-	-	-
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	54	270	9	0.000	0.001	-	-	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	80	398	9	0.001	0.001	-	-	-	-	-	-	-
MISC. POWER TOOLS	337	1,683	9	-	-	-	-	-	-	-	-	-
Haul,12CY (91M3) Trk, 6 Mi(10Km)	4	20	9	0.000	0.000	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 2 - Turkey Creek Conveyance			8	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8	-	-	-	0.000	-	-	-	-	-
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	124	620	8	-	-	-	0.002	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	545	2,725	8	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	248	1,240	8	-	-	-	0.000	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	11	51	8	-	-	-	0.000	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	11	51	8	-	-	-	0.000	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	92	456	8	-	-	-	0.001	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8	-	-	-	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	124	620	8	-	-	-	0.001	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	11	51	8	-	-	-	0.000	-	-	-	-	-

TABLE A-7

CH_4 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	6	8	-	-	-	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	92	456	8	-	-	-	0.000	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	11	51	8	-	-	-	0.000	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8	-	-	-	0.000	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	2,661	13,305	8	-	-	-	0.048	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2,661	13,305	8	-	-	-	0.078	-	-	-	-	-
MAP A10ET001	1	1	8	-	-	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	545	2,725	8	-	-	-	0.017	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	426	2,129	8	-	-	-	0.013	-	-	-	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8	-	-	-	0.000	-	-	-	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	8	-	-	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	77	383	8	-	-	-	0.001	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	181	902	8	-	-	-	0.005	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 3 - Mary's Creek Conveyance			11	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11	-	-	0.000	0.000	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	739	3,692	11	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	13	64	11	-	-	0.000	0.000	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	17	84	11	-	-	0.000	0.000	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	17	84	11	-	-	0.000	0.000	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	96	476	11	-	-	0.001	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11	-	-	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	17	84	11	-	-	0.000	0.000	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	8	11	-	-	0.000	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	96	476	11	-	-	0.000	0.000	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	17	84	11	-	-	0.000	0.000	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3,606	18,027	11	-	-	0.047	0.018	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	3,606	18,027	11	-	-	0.077	0.029	-	-	-	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	3	15	11	-	-	0.000	0.000	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	7	32	11	-	-	0.000	0.000	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	739	3,692	11	-	-	0.017	0.006	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	8	40	11	-	-	0.000	0.000	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	144	717	11	-	-	0.000	0.000	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	577	2,884	11	-	-	0.013	0.005	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	246	1,227	11	-	-	0.005	0.002	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	222	1,106	11	-	-	0.002	0.001	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	62	307	11	-	-	0.001	0.000	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	77	11	-	-	0.000	0.000	-	-	-	-	-
DOZER,CWLR, D-6H,	82	409	11	-	-	0.001	0.000	-	-	-	-	-
DOZER,CWLR, D-7H	155	774	11	-	-	0.003	0.001	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	246	1,227	11	-	-	0.002	0.001	-	-	-	-	-

TABLE A-7

CH_4 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	10
Day/Week:	5
Week/Month:	4.5
Month/Year:	12
Hours/Year	2500

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
				-	-	-	-	-	-	-	-	-
Contract 4 - Lower Clear Creek Conveyance			19	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19	0.000	0.000	0.000	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,289	6,441	19	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	293	1,461	19	0.000	0.000	0.000	-	-	-	-	-	-
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	10	46	19	0.000	0.000	0.000	-	-	-	-	-	-
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX DIGGING	235	1,172	19	0.001	0.004	0.001	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	10	46	19	0.000	0.000	0.000	-	-	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	19	0.000	0.000	0.000	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	10	46	19	0.000	0.000	0.000	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	40	196	19	0.000	0.000	0.000	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	19	0.000	0.000	0.000	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	10	46	19	0.000	0.000	0.000	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	610	3,046	19	0.002	0.009	0.003	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7,052	35,257	19	0.033	0.130	0.043	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	146	730	19	0.000	0.001	0.000	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,289	6,441	19	0.007	0.026	0.009	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	146	730	19	0.000	0.002	0.001	-	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	29	141	19	0.000	0.000	0.000	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,117	5,584	19	0.005	0.022	0.007	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	242	1,210	19	0.001	0.004	0.001	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	19	0.000	0.001	0.000	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	19	0.001	0.003	0.001	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	19	0.000	0.001	0.000	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	134	668	19	0.000	0.001	0.000	-	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	61	303	19	0.000	0.000	0.000	-	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	76	19	0.000	0.000	0.000	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	19	0.000	0.000	0.000	-	-	-	-	-	-
DOZER,CWLR, D-4H	990	4,950	19	0.002	0.007	0.002	-	-	-	-	-	-
DOZER,CWLR, D-6H	495	2,473	19	0.002	0.007	0.002	-	-	-	-	-	-
DOZER,CWLR, D-7H	296	1,476	19	0.001	0.005	0.002	-	-	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	495	2,475	19	0.001	0.004	0.001	-	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	242	1,210	19	0.000	0.002	0.001	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	495	2,475	19	0.002	0.009	0.003	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 5 - RR Bridge Replacement at Mykawa												
Backhoe Loader, 45 HP, 5/8 CY	actor/Loader/Backh	1	2,100	-	-	-	-	0.001	0.001	-	-	-
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	1	1,800	-	-	-	-	0.003	0.003	-	-	-
Grader, self-propelled, 40,000 lb.	Graders	1	1,220	-	-	-	-	0.003	0.003	-	-	-
Pile driving hammer, air, 24,450 ft-lb	eneral Industrial Eq	1	600	-	-	-	-	-	-	-	-	-
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	1		-	-	-	-	0.002	0.002	-	-	-
Sheepsfoot roller, 240 HP	Rollers	1	300	-	-	-	-	0.001	0.001	-	-	-
Pneumatic Tire Roller, 80 HP	Rollers	1	600	-	-	-	-	0.001	0.001	-	-	-

TABLE A-7

CH_4 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	actor/Loader/Backh	1	1,950	-	-	-	-	0.001	0.001	-	-	-
Vibrators, concrete, gas engine, 5 HP	Vibrators	1	200	-	-	-	-	0.000	0.000	-	-	-
Pump, concrete, truck mounted	Pumps	1	200	-	-	-	-	0.000	0.000	-	-	-
Swingloader-20,000 lb capacity 175 HP	Construction Equip	1	400	-	-	-	-	0.001	0.001	-	-	-
25 Ton Telescopic Railway Crane	Cranes	1	1,500	-	-	-	-	0.002	0.002	-	-	-
Rail Scrap Retriever	Construction Equip	1	500	-	-	-	-	0.000	0.000	-	-	-
Tie Plate Picker	Construction Equip	1	260	-	-	-	-	0.000	0.000	-	-	-
Truck, 45,000 lb GVW, 3 axle	Highway Truck	2	3,600	-	-	-	-	0.011	0.011	-	-	-
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	1	1,500	-	-	-	-	0.006	0.006	-	-	-
Hyd. Excav, Crawler 1.5 CY	Excavators	1	1,700	-	-	-	-	0.003	0.003	-	-	-
Rear Dump Truck 8 CY	Dumper/Tender	4	9,000	-	-	-	-	0.016	0.016	-	-	-
Rear Dump Truck, 12 CY	Dumper/Tender	3	6,000	-	-	-	-	0.011	0.011	-	-	-
Misc. Power Tools	eneral Industrial Eq	1	1,670	-	-	-	-	-	-	-	-	-
Gradall, 5/8 CY	Graders	1	1,050	-	-	-	-	0.002	0.002	-	-	-
Oiler, Truck	Off-Highway Truck	1	1,800	-	-	-	-	0.004	0.004	-	-	-
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27	-	-	-	-	-	-	-	-	-
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27	-	-	0.000	0.000	0.000	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,842	9,206	27	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	346	1,730	27	-	-	0.000	0.000	0.000	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	15	75	27	-	-	0.000	0.000	0.000	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	15	75	27	-	-	0.000	0.000	0.000	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	116	578	27	-	-	0.000	0.000	0.000	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	15	75	27	-	-	0.000	0.000	0.000	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	77	385	27	-	-	0.000	0.000	0.000	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1,600	7,999	27	-	-	0.002	0.003	0.001	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	15	75	27	-	-	0.000	0.000	0.000	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,990	44,950	27	-	-	0.054	0.072	0.036	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1,485	7,421	27	-	-	0.005	0.007	0.003	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	512	2,558	27	-	-	0.009	0.012	0.006	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	10,475	52,371	27	-	-	0.102	0.136	0.068	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	512	2,558	27	-	-	0.007	0.009	0.004	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	173	865	27	-	-	0.001	0.001	0.000	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,842	9,206	27	-	-	0.020	0.026	0.013	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	173	865	27	-	-	0.001	0.002	0.001	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	194	967	27	-	-	0.000	0.000	0.000	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,549	7,744	27	-	-	0.016	0.021	0.010	-	-	-	-
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	55	275	27	-	-	0.000	0.000	0.000	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	622	3,108	27	-	-	0.006	0.008	0.004	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	27	-	-	0.000	0.000	0.000	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	27	-	-	0.002	0.002	0.001	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	27	-	-	0.000	0.000	0.000	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	561	2,805	27	-	-	0.002	0.002	0.001	-	-	-	-

TABLE A-7

CH_4 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
LDR,FE, WH, 4.50 CY, ARTIC, 966E	156	777	27	-	-	0.001	0.001	0.000	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	39	194	27	-	-	0.000	0.000	0.000	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	27	-	-	0.000	0.000	0.000	-	-	-	-
DOZER,CWLR, D-6H,PS	622	3,106	27	-	-	0.004	0.006	0.003	-	-	-	-
DOZER,CWLR, D-7H,PS	350	1,750	27	-	-	0.003	0.004	0.002	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	622	3,108	27	-	-	0.002	0.003	0.002	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			28	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	28	-	-	-	-	0.000	0.000	0.000	-	-
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	49	242	28	-	-	-	-	0.000	0.000	0.000	-	-
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	97	483	28	-	-	-	-	0.000	0.000	0.000	-	-
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	97	483	28	-	-	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,759	8,792	28	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	535	2,672	28	-	-	-	-	0.000	0.000	0.000	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	2	9	28	-	-	-	-	0.000	0.000	0.000	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	2	9	28	-	-	-	-	0.000	0.000	0.000	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	148	736	28	-	-	-	-	0.000	0.001	0.000	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	2	9	28	-	-	-	-	0.000	0.000	0.000	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	48	239	28	-	-	-	-	0.000	0.000	0.000	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	148	736	28	-	-	-	-	0.000	0.000	0.000	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	2	9	28	-	-	-	-	0.000	0.000	0.000	-	-
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8 M)	1	3	28	-	-	-	-	0.000	0.000	0.000	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,586	42,929	28	-	-	-	-	0.036	0.072	0.048	-	-
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	2	9	28	-	-	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	8,586	42,929	28	-	-	-	-	0.058	0.116	0.077	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2	9	28	-	-	-	-	0.000	0.000	0.000	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	28	-	-	-	-	0.000	0.000	0.000	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	268	1,336	28	-	-	-	-	0.001	0.001	0.001	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,759	8,792	28	-	-	-	-	0.013	0.026	0.017	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	268	1,338	28	-	-	-	-	0.001	0.003	0.002	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	130	650	28	-	-	-	-	0.000	0.000	0.000	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,485	7,421	28	-	-	-	-	0.010	0.021	0.014	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	28	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	28	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	85	424	28	-	-	-	-	0.000	0.001	0.000	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	28	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	28	-	-	-	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	200	998	28	-	-	-	-	0.001	0.003	0.002	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	28	-	-	-	-	0.000	0.000	0.000	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	28	-	-	-	-	0.001	0.002	0.001	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	28	-	-	-	-	0.000	0.000	0.000	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	864	4,320	28	-	-	-	-	0.002	0.004	0.003	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	50	249	28	-	-	-	-	0.000	0.000	0.000	-	-

TABLE A-7

CH_4 Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
LDR,FE, WH, 5.25 CY, ARTIC, 980C	13	62	28	-	-	-	-	0.000	0.000	0.000	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	28	-	-	-	-	0.000	0.000	0.000	-	-
DOZER,CWLR, D-6H	455	2,275	28	-	-	-	-	0.002	0.004	0.003	-	-
DOZER,CWLR, D-7H	539	2,694	28	-	-	-	-	0.003	0.006	0.004	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	200	998	28	-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 10 - Mitigation				-	-	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	490	2,446	0	-	-	-	0.002	0.000	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	490	2,446	0	-	-	-	0.005	0.001	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	448	2,238	0	-	-	-	0.020	0.002	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	490	2,446	0	-	-	-	0.013	0.001	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	448	2,238	0	-	-	-	0.016	0.002	-	-	-	-
BLADE, ANGLE, HYDR (FOR D4	320	1,600	0	-	-	-	-	-	-	-	-	-
DOZER,CWLR, D-4H,PS (ADD BLADE)	320	1,600	0	-	-	-	0.003	0.000	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	80	400	0	-	-	-	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	80	400	0	-	-	-	0.002	0.000	-	-	-	-
			TOTALS	**0.07**	**0.26**	**0.49**	**0.61**	**0.36**	**0.33**	**0.17**	**-**	**-**

TABLE A-8

N_2O Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Contract 1 - Mud Gully Conveyance			9	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	9	0.000	0.000	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	60	300	9	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	6	26	9	0.000	0.000	-	-	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	9	45	9	0.000	0.000	-	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	9	45	9	0.000	0.000	-	-	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	9	0.000	0.000	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	9	45	9	0.000	0.000	-	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	1	4	9	0.000	0.000	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	9	0.000	0.000	-	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	9	45	9	0.000	0.000	-	-	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	293	1,463	9	0.001	0.001	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	293	1,463	9	0.001	0.002	-	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	3	13	9	0.000	0.000	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	60	300	9	0.000	0.000	-	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	3	13	9	0.000	0.000	-	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	47	234	9	0.000	0.000	-	-	-	-	-	-	-
CONC VIBRATOR, 2.50D, EL,HI-FREQ (ADD 2KV GENERATOR)	497	2,482	9	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	9	0.000	0.000	-	-	-	-	-	-	-
GENERATOR, 5.5 KW, 120/240V,PORT	249	1,241	9	0.000	0.000	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	19	94	9	0.000	0.000	-	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	11	51	9	0.000	0.000	-	-	-	-	-	-	-
LDR,FE, CRWLR, 1.50 CY	4	20	9	0.000	0.000	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	61	304	9	0.000	0.000	-	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	9	0.000	0.000	-	-	-	-	-	-	-
BLADE, ANGLE, HYDR, D-6 (ADD D-6 TRACTOR DOZER)	54	270	9	0.000	0.000	-	-	-	-	-	-	-
BLADE, UNIVERSAL, HYDR, D-7 (ADD D-7 TRACTOR DOZER)	80	398	9	0.000	0.001	-	-	-	-	-	-	-
DOZER,CWLR, D-6H,PS (ADD BLADE & ATTACHMENTS)	54	270	9	0.000	0.000	-	-	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	80	398	9	0.000	0.000	-	-	-	-	-	-	-
MISC. POWER TOOLS	337	1,683	9	-	-	-	-	-	-	-	-	-
Haul,12CY (91M3) Trk, 6 Mi(10Km)	4	20	9	0.000	0.000	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 2 - Turkey Creek Conveyance			8	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	8	-	-	-	0.000	-	-	-	-	-
BRUSH CHIPPER, 12" (305 MM) DIA LOG DISC TYPE CUTTER, TRAILER MOUNTED	124	620	8	-	-	-	0.001	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	545	2,725	8	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	248	1,240	8	-	-	-	0.000	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	11	51	8	-	-	-	0.000	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	11	51	8	-	-	-	0.000	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	92	456	8	-	-	-	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	1	8	-	-	-	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 2.60 CY (2.0 M3) BUCKET	124	620	8	-	-	-	0.000	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	11	51	8	-	-	-	0.000	-	-	-	-	-

TABLE A-8

N_2O Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	6	8	-	-	-	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	92	456	8	-	-	-	0.000	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	11	51	8	-	-	-	0.000	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 300-340 HP (224-254 KW), POWERSHIFT, W/UNIVERSAL BLADE	1	1	8	-	-	-	0.000	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	2,661	13,305	8	-	-	-	0.017	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2,661	13,305	8	-	-	-	0.027	-	-	-	-	-
MAP A10ET001	1	1	8	-	-	-	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	545	2,725	8	-	-	-	0.006	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	426	2,129	8	-	-	-	0.005	-	-	-	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	8	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	1	8	-	-	-	0.000	-	-	-	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	8	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	8	-	-	-	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	77	383	8	-	-	-	0.000	-	-	-	-	-
DOZER,CWLR, D-7H,PS (ADD BLADE & ATTACHMENTS)	181	902	8	-	-	-	0.002	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 3 - Mary's Creek Conveyance			11	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	11	-	-	0.000	0.000	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	739	3,692	11	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	13	64	11	-	-	0.000	0.000	-	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	17	84	11	-	-	0.000	0.000	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	17	84	11	-	-	0.000	0.000	-	-	-	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	96	476	11	-	-	0.000	0.000	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 1.50 CY (1.2 M3) BUCKET	1	0	11	-	-	-	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	17	84	11	-	-	0.000	0.000	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	2	8	11	-	-	0.000	0.000	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	96	476	11	-	-	0.000	0.000	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	17	84	11	-	-	0.000	0.000	-	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	3,606	18,027	11	-	-	0.017	0.006	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	3,606	18,027	11	-	-	0.027	0.010	-	-	-	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	3	15	11	-	-	0.000	0.000	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	7	32	11	-	-	0.000	0.000	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	739	3,692	11	-	-	0.006	0.002	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	8	40	11	-	-	0.000	0.000	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	144	717	11	-	-	0.000	0.000	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	577	2,884	11	-	-	0.004	0.002	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	246	1,227	11	-	-	0.002	0.001	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	222	1,106	11	-	-	0.001	0.000	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	62	307	11	-	-	0.000	0.000	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	77	11	-	-	0.000	0.000	-	-	-	-	-
DOZER,CWLR, D-6H,	82	409	11	-	-	0.000	0.000	-	-	-	-	-
DOZER,CWLR, D-7H	155	774	11	-	-	0.001	0.000	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	246	1,227	11	-	-	0.001	0.000	-	-	-	-	-

TABLE A-8

N_2O Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
				-	-	-	-	-	-	-	-	-
Contract 4 - Lower Clear Creek Conveyance			19	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	19	0.000	0.000	0.000	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,289	6,441	19	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	293	1,461	19	0.000	0.000	0.000	-	-	-	-	-	-
HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	10	46	19	0.000	0.000	0.000	-	-	-	-	-	-
HYDRAULIC EXCAVATOR, CRAWLER, 70,000 LB (31,751 KG), 2.00 CY (1.5 M3) BUCKET, 21.6' (6.6 M) MAX DIGGING	235	1,172	19	0.000	0.002	0.001	-	-	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	10	46	19	0.000	0.000	0.000	-	-	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	32	160	19	0.000	0.000	0.000	-	-	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	10	46	19	0.000	0.000	0.000	-	-	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	40	196	19	0.000	0.000	0.000	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	32	160	19	0.000	0.000	0.000	-	-	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	10	46	19	0.000	0.000	0.000	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 136-180 HP (101-134 KW), POWERSHIFT, W/UNIVERSAL BLADE	610	3,046	19	0.001	0.003	0.001	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	7,052	35,257	19	0.011	0.046	0.015	-	-	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	146	730	19	0.000	0.000	0.000	-	-	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,289	6,441	19	0.002	0.009	0.003	-	-	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	146	730	19	0.000	0.001	0.000	-	-	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	29	141	19	0.000	0.000	0.000	-	-	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,117	5,584	19	0.002	0.008	0.003	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	242	1,210	19	0.000	0.002	0.001	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	19	0.000	0.000	0.000	-	-	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	19	0.000	0.001	0.000	-	-	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	19	0.000	0.000	0.000	-	-	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	134	668	19	0.000	0.000	0.000	-	-	-	-	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	61	303	19	0.000	0.000	0.000	-	-	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	16	76	19	0.000	0.000	0.000	-	-	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	19	0.000	0.000	0.000	-	-	-	-	-	-
DOZER,CWLR, D-4H	990	4,950	19	0.001	0.002	0.001	-	-	-	-	-	-
DOZER,CWLR, D-6H	495	2,473	19	0.001	0.002	0.001	-	-	-	-	-	-
DOZER,CWLR, D-7H	296	1,476	19	0.000	0.002	0.001	-	-	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	495	2,475	19	0.000	0.001	0.000	-	-	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	242	1,210	19	0.000	0.001	0.000	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	495	2,475	19	0.001	0.003	0.001	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 5 - RR Bridge Replacement at Mykawa												
Backhoe Loader, 45 HP, 5/8 CY	actor/Loader/Backh	1	2,100	-	-	-	-	0.000	0.000	-	-	-
Excavator, diesel hydraulic, crawler mounted, 1 CY	Excavators	1	1,800	-	-	-	-	0.001	0.001	-	-	-
Grader, self-propelled, 40,000 lb.	Graders	1	1,220	-	-	-	-	0.001	0.001	-	-	-
Pile driving hammer, air, 24,450 ft-lb	eneral Industrial Eq	1	600	-	-	-	-	-	-	-	-	-
AIR COMPRESSOR, 600 CFM, 150 PSI (ADD HOSE)	Air Compressors	1		-	-	-	-	0.001	0.001	-	-	-
Sheepsfoot roller, 240 HP	Rollers	1	300	-	-	-	-	0.000	0.000	-	-	-
Pneumatic Tire Roller, 80 HP	Rollers	1	600	-	-	-	-	0.000	0.000	-	-	-

TABLE A-8

N_2O Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
Front end loader 4WD, 2 ½ to 3 ½ CY, 145 HP	actor/Loader/Backh	1	1,950	-	-	-	-	0.001	0.001	-	-	-
Vibrators, concrete, gas engine, 5 HP	Vibrators	1	200	-	-	-	-	0.000	0.000	-	-	-
Pump, concrete, truck mounted	Pumps	1	200	-	-	-	-	0.000	0.000	-	-	-
Swingloader-20,000 lb capacity 175 HP	Construction Equip	1	400	-	-	-	-	0.000	0.000	-	-	-
25 Ton Telescopic Railway Crane	Cranes	1	1,500	-	-	-	-	0.001	0.001	-	-	-
Rail Scrap Retriever	Construction Equip	1	500	-	-	-	-	0.000	0.000	-	-	-
Tie Plate Picker	Construction Equip	1	260	-	-	-	-	0.000	0.000	-	-	-
Truck, 45,000 lb GVW, 3 axle	Highway Truck	2	3,600	-	-	-	-	0.004	0.004	-	-	-
Truck, Water, Off-Highway, 6,000 Gal	Off-Highway Truck	1	1,500	-	-	-	-	0.002	0.002	-	-	-
Hyd. Excav, Crawler 1.5 CY	Excavators	1	1,700	-	-	-	-	0.001	0.001	-	-	-
Rear Dump Truck 8 CY	Dumper/Tender	4	9,000	-	-	-	-	0.006	0.006	-	-	-
Rear Dump Truck, 12 CY	Dumper/Tender	3	6,000	-	-	-	-	0.004	0.004	-	-	-
Misc. Power Tools	eneral Industrial Eq	1	1,670	-	-	-	-	-	-	-	-	-
Gradall, 5/8 CY	Graders	1	1,050	-	-	-	-	0.001	0.001	-	-	-
Oiler, Truck	Off-Highway Truck	1	1,800	-	-	-	-	0.001	0.001	-	-	-
Contract 6 - Mykawa to Bennie Kate Upper Clear Creek Conveyance			27	-	-	-	-	-	-	-	-	-
EP G15CA003 GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	27	-	-	0.000	0.000	0.000	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,842	9,206	27	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	346	1,730	27	-	-	0.000	0.000	0.000	-	-	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	15	75	27	-	-	0.000	0.000	0.000	-	-	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	15	75	27	-	-	0.000	0.000	0.000	-	-	-	-
SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	116	578	27	-	-	0.000	0.000	0.000	-	-	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	15	75	27	-	-	0.000	0.000	0.000	-	-	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	77	385	27	-	-	0.000	0.000	0.000	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	1,600	7,999	27	-	-	0.001	0.001	0.000	-	-	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	15	75	27	-	-	0.000	0.000	0.000	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,990	44,950	27	-	-	0.019	0.025	0.013	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	1,485	7,421	27	-	-	0.002	0.002	0.001	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	512	2,558	27	-	-	0.003	0.004	0.002	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	10,475	52,371	27	-	-	0.036	0.048	0.024	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	512	2,558	27	-	-	0.002	0.003	0.002	-	-	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	173	865	27	-	-	0.000	0.000	0.000	-	-	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,842	9,206	27	-	-	0.007	0.009	0.005	-	-	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	173	865	27	-	-	0.000	0.001	0.000	-	-	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	194	967	27	-	-	0.000	0.000	0.000	-	-	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,549	7,744	27	-	-	0.006	0.007	0.004	-	-	-	-
MIL C75GV002 CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	55	275	27	-	-	0.000	0.000	0.000	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	622	3,108	27	-	-	0.002	0.003	0.001	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	27	-	-	0.000	0.000	0.000	-	-	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	27	-	-	0.001	0.001	0.000	-	-	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	27	-	-	0.000	0.000	0.000	-	-	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	561	2,805	27	-	-	0.001	0.001	0.000	-	-	-	-

TABLE A-8

N_2O Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
LDR,FE, WH, 4.50 CY, ARTIC, 966E	156	777	27	-	-	0.000	0.000	0.000	-	-	-	-
LDR,FE, WH, 5.25 CY, ARTIC, 980C	39	194	27	-	-	0.000	0.000	0.000	-	-	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	27	-	-	0.000	0.000	0.000	-	-	-	-
DOZER,CWLR, D-6H,PS	622	3,106	27	-	-	0.002	0.002	0.001	-	-	-	-
DOZER,CWLR, D-7H,PS	350	1,750	27	-	-	0.001	0.001	0.001	-	-	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	622	3,108	27	-	-	0.001	0.001	0.001	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 7 - Hwy 288 to Mykawa Upper Clear Creek Conveyance			28	-	-	-	-	-	-	-	-	-
GRADER, MOTOR, ARTICULATED, 6X4, 12' BLADE W/17 TEETH SCARIFIERS	1	1	28	-	-	-	-	0.000	0.000	0.000	-	-
AIR COMPRESSOR, 250 CFM (7 CMM), 100 PSI (689 KPA) (ADD HOSE)	49	242	28	-	-	-	-	0.000	0.000	0.000	-	-
PAVING BREAKER, 66 LB (30 KG) (ADD 100 CFM (2.8 CMM) COMPRESSOR)	97	483	28	-	-	-	-	0.000	0.000	0.000	-	-
AIR HOSE, 1.5" (38 MM) DIA x 100' (31 M) LENGTH, HARDROCK (USE AS DRILLING ACCESSORY)	97	483	28	-	-	-	-	-	-	-	-	-
BUCKET, DRAGLINE, 3.0 CY (2.3 M3) MEDIUM WEIGHT (ADD TEETH WEAR COST)	1,759	8,792	28	-	-	-	-	-	-	-	-	-
CHAINSAW, 24" - 42" (610-1,067 MM) BAR	535	2,672	28	-	-	-	-	0.000	0.000	0.000	-	-
HYD HAMMER, 1000FT-LBS (1356N-M) (ADD 1.0CY EXCV)(W/DEMO TOOL)	2	9	28	-	-	-	-	0.000	0.000	0.000	-	-
BUCKET, PAVEMENT-REMOVAL, 36" (914MM) (FOR 1.5CY HYD EXCV)	2	9	28	-	-	-	-	0.000	0.000	0.000	-	-
LANDSCAPING EQUIPMENT, SPREADER, 85 CF (2.4 M3), DRY CHEMICAL (ADD 55 HP (41 KW) FARM TRACTOR)	148	736	28	-	-	-	-	0.000	0.000	0.000	-	-
LOADER, F/E, WHEEL, 4.00CY (3.1M3), 4WD	2	9	28	-	-	-	-	0.000	0.000	0.000	-	-
LOADER, FRONT END, WHEEL, SKID-STEER, 9-11 CF (0.2-0.3 M3), 60" (1.5 M) BUCKET {BOBCAT}, 13 CWT (590 KG)	48	239	28	-	-	-	-	0.000	0.000	0.000	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	148	736	28	-	-	-	-	0.000	0.000	0.000	-	-
LOADER/BCK-HOE,WH, 0.80CY(0.6M3) F/E BKT, 9.8'(3.0M)DEPTH OF HOE	2	9	28	-	-	-	-	0.000	0.000	0.000	-	-
MAN-LIFT, LINE-TRUCK, AERIAL PLATFORM 24" (0.61 M) x 48" (1.2 M), 700 LB (318 KG), 46' (14 M) HEIGHT, 32' (9.8 M)	1	3	28	-	-	-	-	0.000	0.000	0.000	-	-
TRUCK OPTION, DUMP BODY, REAR, 16-23.5 CY (12.2-18 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	8,586	42,929	28	-	-	-	-	0.013	0.025	0.017	-	-
TRUCK TRAILER, LOWBOY, 75 TON (68.0 MT), 3 AXLE (ADD TOWING TRUCK)	2	9	28	-	-	-	-	-	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	8,586	42,929	28	-	-	-	-	0.020	0.041	0.027	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	2	9	28	-	-	-	-	0.000	0.000	0.000	-	-
DUMP TRUCK, HIGHWAY, 16 - 20 CY (12.2 - 15.3 M3) DUMP BODY, 75,000 LBS (34,000 KG) GVW, 2 AXLE, 6X4	1	3	28	-	-	-	-	0.000	0.000	0.000	-	-
BRUSH CHIPPER, 13" CAPACITY, DRUM TYPE, TRAILER MTD	268	1,336	28	-	-	-	-	0.000	0.000	0.000	-	-
CRANES, MECHANICAL, LATTICE BOOM, CRAWLER, DRAGLINE/CLAMSHELL, 3.5 CY, 80' BOOM (ADD BUCKET)	1,759	8,792	28	-	-	-	-	0.005	0.009	0.006	-	-
LOADER, FRONT END, CRAWLER, 3.20 CY BUCKET	268	1,338	28	-	-	-	-	0.000	0.001	0.001	-	-
LOADER / BACKHOE, WHEEL, 0.80 CY FRONT END BUCKET, 24" DIP, 4.3 CF, 12' DIGGING DEPTH, 4X4	130	650	28	-	-	-	-	0.000	0.000	0.000	-	-
TRACTOR, CRAWLER (DOZER), 240 HP, LOW GROUND PRESSURE, W/7.70 CY STRAIGHT BLADE (ADD	1,485	7,421	28	-	-	-	-	0.004	0.007	0.005	-	-
TRK,HWY, 50,000 GVW, 6X4, 3 AXLE	1	0	28	-	-	-	-	-	-	-	-	-
TRUCK, WATER, OFF-HIGHWAY, 6000 GAL, W/CAT 621E TRACTOR	1	0	28	-	-	-	-	-	-	-	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	85	424	28	-	-	-	-	0.000	0.000	0.000	-	-
ROLLR,STATIC,S/P,13T,84"W,11TIRE	1	0	28	-	-	-	-	-	-	-	-	-
WATER TANK, 3000 GAL (ADD TRK	1	0	28	-	-	-	-	-	-	-	-	-
TRK,HWY, 43,220 GVW, 6X4, 3 AXLE	200	998	28	-	-	-	-	0.000	0.001	0.001	-	-
CRANE,HYD,S/P,RT,4WD,20T/70'BOOM	60	300	28	-	-	-	-	0.000	0.000	0.000	-	-
HYD EXCAV, CRWLR, 3.125CY BKT	116	580	28	-	-	-	-	0.000	0.001	0.000	-	-
HYD EXCAV, CRWLR, 1.50 CY BKT	63	311	28	-	-	-	-	0.000	0.000	0.000	-	-
LDR,FE, WH, 2.75 CY, ARTIC, 936E	864	4,320	28	-	-	-	-	0.001	0.001	0.001	-	-
LDR,FE, WH, 4.50 CY, ARTIC, 966E	50	249	28	-	-	-	-	0.000	0.000	0.000	-	-

TABLE A-8

N_2O Emissions Summary
General Reevaluation Plan Alternative
Clear Creek Flood Control Project

Hrs/Day:	**10**
Day/Week:	**5**
Week/Month:	**4.5**
Month/Year:	**12**
Hours/Year	**2500**

Equipment Type	Number of Units	Total Equipment Hours of Operation	Contract Duration (months)	2012	2013	2014	2015	2016	2017	2018	2019	2020
LDR,FE, WH, 5.25 CY, ARTIC, 980C	13	62	28	-	-	-	-	0.000	0.000	0.000	-	-
PUMP,CENTRF,DW,4"D, 465GPM/40'HD	188	940	28	-	-	-	-	0.000	0.000	0.000	-	-
DOZER,CWLR, D-6H	455	2,275	28	-	-	-	-	0.001	0.002	0.001	-	-
DOZER,CWLR, D-7H	539	2,694	28	-	-	-	-	0.001	0.002	0.001	-	-
REAR DUMP BODY, 12.0CY (ADD 36,000 GVW TRUCK)	200	998	28	-	-	-	-	-	-	-	-	-
				-	-	-	-	-	-	-	-	-
Contract 10 - Mitigation				-	-	-	-	-	-	-	-	-
LOADER/BACKHOE, WHEEL, 0.80 CY (0.6 M3) FRONT END BUCKET, 9.8' (3.0 M) DEPTH OF HOE, 24" (0.61 M)	490	2,446	0	-	-	-	0.001	0.000	-	-	-	-
TRUCK OPTION, DUMP BODY, REAR, 12 CY (9.2 M3) (ADD 45,000 LB (20,412 KG) GVW TRUCK)	490	2,446	0	-	-	-	0.002	0.000	-	-	-	-
TRUCK TRAILER, WATER TANKER, 5,000 GAL (18,927 L) (ADD 50,000 LB (22,680 KG) GVW TRUCK)	448	2,238	0	-	-	-	0.007	0.001	-	-	-	-
TRUCK, HIGHWAY, 45,000 LB (20,412 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	490	2,446	0	-	-	-	0.005	0.001	-	-	-	-
TRUCK, HIGHWAY, 55,000 LB (24,948 KG) GVW, 6X4, 3 AXLE (ADD ACCESSORIES)	448	2,238	0	-	-	-	0.006	0.001	-	-	-	-
BLADE, ANGLE, HYDR (FOR D4	320	1,600	0	-	-	-	-	-	-	-	-	-
DOZER,CWLR, D-4H,PS (ADD BLADE)	320	1,600	0	-	-	-	0.001	0.000	-	-	-	-
REAR DUMP BODY, 8.0CY (ADD 30,000 GVW TRUCK)	80	400	0	-	-	-	-	-	-	-	-	-
TRK,HWY, 46,000 GVW, 6X4, 3 AXLE	80	400	0	-	-	-	0.001	0.000	-	-	-	-
			TOTALS	**0.02**	**0.09**	**0.17**	**0.21**	**0.13**	**0.12**	**0.06**	**-**	**-**