CHAPTER 6
SUPPLEMENTAL REFERENCES

6.0 SUPPLEMENTAL REFERENCES

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APPENDICES

APPENDIX A

~~PRELIMINARY~~ THREE OAKS MINE DEPARTMENT OF ARMY PERMIT APPLICATION SECTION 404 (B)(1) GUIDELINE ANALYSIS

69.9 acres of pond habitat, (38.5 acres of jurisdictional, on-channel ponds and ~~***31.4***~~***38.6*** acres of non-jurisdictional, isolated ponds) 23.6 acres of intermittent/ephemeral stream, and 5.3 acres of herbaceous wetland) would be physically removed by mining or filled during construction activities. Consequently, benthic organisms in these water bodies would be lost. These losses would not occur simultaneously, but would occur in a staged progression as mining activities incrementally affected additional ponds or stream channel segments throughout the life of the operation. These incremental losses of aquatic habitat would be offset, in part, by the incremental creation of new ponds and replaced drainage channels in the areas being reclaimed as the mining operations progress through the site. Aside from the physical loss of aquatic habitat, changes would occur in the flow regime of ephemeral and intermittent streams during and after mining due to surface water diversions during mining, installation of detention ponds, depressurization and dewatering activities, and creation of end lakes at the end of operations. These changes would be expected to affect the composition and abundance of benthic communities in the affected stream reaches.

During reclamation of the mined area, it is expected that approximately 895 acres of developed surface water features would be created including approximately 173 acres of various sized ponds plus two end lakes totaling 722 acres. Additionally, approximately 33.9 acres of ephemeral or intermittent stream channel and 10.6 acres of wetland would be created during reclamation. As indicated in Alcoa's Mitigation Plan for Proposed Three Oaks Mine (Appendix E of the EIS), a portion of this mitigation would occur within the proposed disturbance area following mining, and the remainder would occur outside the disturbance area within the proposed Middle Yegua Mitigation Site ***and the Big Sandy Mitigation Site***. Benthic communities would re-establish within the new surface water features. Benthic communities also would establish in the temporary water features present during the active mining operations including the diversion channels, sedimentation/detention ponds, and relocated drainage channels in the reclaimed areas. It is anticipated, however, that the alteration of flow regimes and impoundment conditions from those present in the pre-mining environment would lead to corresponding changes in the presence and abundance of various benthic organisms. Thus, the overall benthic communities during and following mining may be substantially different than the existing communities.

Best Management Practices (BMPs) would be implemented to control erosion and sedimentation at the drainage crossing sites. However, it is possible that limited amounts of sediment may escape during major precipitation events to enter the downstream perennial portions of these drainages. This potential offsite sedimentation could affect benthos in such areas. Discharges from the sediment ponds would likely have less suspended solids than the existing pre-disturbance discharges (based on comparing baseline monitoring data to anticipated water quality). The potential reduction in suspended solids and reduced potential for occasional channel flooding may result in conditions favoring different benthic organisms than those that currently dominate local communities.

2.1.5 Other Effects

None anticipated.

mining would result in a net increase in aquatic habitat below the discharge points. Flow increases could provide pool habitat for suspension and filter-feeding macroinvertebrates.

During the post-mining phase of the project, flows and the amount of habitat would decrease mainly due to watershed modifications made as part of reclamation. The effect of reduced flows on filter and suspension feeders would occur in any perennial or intermittent pool affected by flow reductions.

2.3.3.3 Sight Feeders

Sight-feeders present within and downstream of the project study area include fish species representing the minnow, sunfish, livebearer, killifish, and catfish families. Game fish species consist of sunfishes, catfishes, and low numbers of largemouth bass. These fish species feed on a variety on invertebrates and small fish. Short-term, localized increases in sediment could reduce the visibility for sight-feeders in segments located immediately downstream of disturbance areas. However, effects are considered minor due to the short-term duration of sedimentation, ability of fish to move to less turbid areas to feed, and the use of erosion control measures as part of mine operation.

2.3.4 Actions Taken to Minimize Impacts

As discussed above, Alcoa would use BMPs and the installation of sediment control structures and ponds to limit erosion and reduce sediment transport as a result of storm water runoff from proposed project facilities and disturbance areas. These facilities and practices would control or minimize sediment and turbidity increases in surface water. During and after mining, Alcoa would implement a variety of mitigation measures as described in the proposed Mitigation Plan (Appendix E to the EIS) to recreate wetlands, riparian woodlands, and surface water features of similar nature and function to those existing in the area prior to mining. These mitigation measures include both replacement of features removed on the area disturbed by mining plus creation or enhancement of additional features in ~~a~~ ***two*** protected area***s*** along Mine Creek and Middle Yegua Creek termed the Middle Yegua Mitigation Site ***and along Big Sandy Creek downstream of U.S. Highway 290 termed the Big Sandy Mitigation Site***.

2.4 Contaminant Determinations

The material proposed for fill into waters of the U.S. would not introduce, relocate, or increase contaminants in the material itself or in the aquatic environment at the proposed disposal site.

2.5 Aquatic Ecosystem and Organism Determinations

2.5.1 Effects on Plankton

Phytoplankton and zooplankton communities may exist in pools and ponds located within and downstream of the project study area. However, stream environments typically contain low species diversity and abundance. Once mine discharges enter these streams, plankton communities would be limited due to the predominance of riffle and run habitats. As discussed in Section 3.5.2.1 of the EIS, flow changes would

The timber/canebrake rattlesnake (*Crotalus horridus*) is state-listed as threatened by the Texas Parks and Wildlife Department (TPWD). This species has been documented in Bastrop and Lee Counties and at the Sandow Mine in Lee and Milam Counties. However, no timber/canebrake rattlesnakes were observed within the permit area, including during the 1999 and 2000 field surveys (Alcoa 2000 [Volume 6], 2001c [Volume 3]). Based on the known distribution and habitat association of this species, the timber/canebrake rattlesnake could potentially occur in suitable habitat within riparian corridors along jurisdictional waters of the U.S. within the mine area.

The Texas horned lizard (*Phrynosoma cornutum*) also is state-listed as threatened and has the potential to occur in the mine area although none have been observed within the permit boundary or on adjacent areas.

2.5.7 Other Wildlife

The temporary removal of wetlands and riparian areas during the life of the mine would result in a temporary reduction of habitat and foraging locations for wildlife historically utilizing those areas. These impacts are discussed in Section 3.5.2 of the EIS.

2.5.8 Actions to Minimize Impacts

Alcoa's use of BMPs and installation of sediment control structures and ponds would limit erosion and reduce sediment transport associated with storm water runoff from proposed project facilities and disturbance areas. These facilities and practices would control or minimize sediment and turbidity increases in surface water, thereby minimizing impacts to aquatic ecosystems and organisms.

In addition to the environmental control and mitigation measures required by various regulations applicable to the proposed mining activities, Alcoa has proposed a Mitigation Plan (Appendix E of the EIS) that addresses reclamation of wetlands, riparian woodlands, and surface water features. The reclamation objective is to create features of similar nature and function to those existing prior to the mining activities. The mitigation measures outlined in the plan include both replacement of features removed on the area disturbed by mining plus creation or enhancement of additional features in ~~a~~ ***two*** protected area***s*** along Mine Creek and Middle Yegua Creek termed the Middle Yegua Mitigation Site ***and along Big Sandy Creek downstream of U.S. Highway 290 termed the Big Sandy Mitigation Site***.

To mitigate for the proposed adverse impacts to waters of the U.S. associated with the Three Oaks Mine, the applicant has proposed to perform a combination of activities including mine reclamation, channel relocation, riparian habitat enhancement, and wetland creation within the reclaimed areas and in a protected mitigation site outside the disturbance area. Impacts to aquatic resources would be mitigated in accordance with the following ratios: 1:1 for low quality ephemeral and intermittent streams, 1.5:1 for on-channel ponds and medium quality ephemeral/intermittent stream channels, and 2:1 for emergent wetlands and high quality ephemeral/intermittent channels. No perennial streams would be disturbed. Restored, enhanced, and created areas would be revegetated with native plants dominant within the project area.

Alcoa also has ***identified committed environmental protection measures*** ~~prepared mitigation plans~~ related to ***the*** protection of ~~threatened or endangered~~ ***special status*** species potentially occurring in the mine vicinity. These ~~plans~~ ***measures*** are ~~included in Appendix B of the EIS, Attachment B~~ ***identified in Table 2-15 of the Final EIS***. Two species of concern listed by the TPWD as state-threatened have potential to occur in the project area. The timber/canebrake rattlesnake (*Crotalus horridus*) has been documented in Bastrop and Lee Counties and at the Sandow Mine in Lee and Milam Counties. However, no timber/canebrake rattlesnakes were observed within the Three Oaks Mine permit area during 1999 and 2000 field surveys (Alcoa 2000 [Volume 6], 2001c [Volume 3]). The Texas horned lizard (*Phrynosoma cornutum*) also is of potential occurrence although none have been observed within the permit boundary or on adjacent areas. Alcoa has prepared a mitigation plan specific for the timber/canebrake rattlesnake including employee education procedures, field surveys, agency reporting, relocation of individuals from areas to be disturbed, ***conduct of radio-telemetry studies in coordination with TPWD to determine survivability***, and scheduled clearing operations in suitable habitat to minimize potential for impacts. A similar program would be devised for the Texas horned lizard, if it is encountered in the mine area.

2.6 Proposed Disposal Site Determinations.

2.6.1 Mixing Zone Determination

Impacts would occur to those wetlands, ephemeral streams, and intermittent streams eliminated during the mining process. These would be offset by restoration of the habitat types during the reclamation process. Potential impacts to perennial stream reaches downstream from the mine should be minor or nonexistent due to the implementation of BMPs during the mining process.

2.6.2 Determination of Compliance with Applicable Water Quality Standards

The project would not exceed current applicable water quality standards for the State of Texas.

2.6.3 Potential Effects on Human Use Characteristics

2.6.3.1 Municipal and Private Water Supply

The proposed discharge of dredged and fill material into waters of the U.S. would not affect municipal and private water supplies. Pumping of dewatering and depressurization wells would result in a reduction in water quantity for private and municipal wells that are screened within the 20-foot drawdown area of the Simsboro aquifer or within the 20-foot drawdown area in the lower third of the Calvert Bluff Formation. However, if mine-related impacts to private or municipal wells are identified, Alcoa would mitigate the impact as required by the RRC. As discussed in the Groundwater Quality Impacts subsection in Section 2.3.2.3 of the EIS, no impacts to groundwater quality are anticipated.

2.6.3.2 Recreational and Commercial Fisheries

The proposed project would have minimal impact on recreational or commercial fisheries (see Sections 3.9.2 and 3.5.2, respectively, of the EIS).

APPENDIX B

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and expensive to acquire the large number of contiguous land tracts necessary to support a surface-mining operation.

If western coal were to be used as a fuel source for the Rockdale Power Generating Station, rail offloading and storage facilities would need to be installed at the power plant at an estimated cost of $30 million.

If natural gas were to be used as a fuel source for the Rockdale Power Generating Station, a pipeline would have to be built capable of providing 85 million cubic feet per day of natural gas to the power plant, costing approximately $100 million.

C. Are there technological limitations for the alternatives considered?

Use of either western coal or natural gas to fuel the existing power plants would require that the existing boilers be modified.

D. Are there other reasons certain alternatives are not feasible?

All fuel or energy alternatives other than lignite are cost prohibitive to making aluminum for sale on the world-wide commodity market. To be competitive, the fuel source for making aluminum must not only be below $1.25/MM Btu, it must also be stable and predictable. The cost of the energy alternatives are as follows:

1. **Power purchased from the commercial utility grid -- $2.70/MM Btu**
2. **Coal from the western United States -- $1.49/MM Btu**
3. **Natural Gas -- $5.80/MM Btu**

III. If you have not chosen an alternative which would avoid impacts to surface water in the state, explain:

A. Why your alternative was selected, and

The Three Oaks Mine site is the only feasible alternative for long-term continued aluminum production, considering cost, recoverable reserves, and distance from the power plant.

APPENDIX C

WATER RESOURCES

Table C-5a
Quarterly Well Monitoring to be Conducted Under the RRC Permit[1]

Chloride	*Sulfate*
Dissolved iron	*Temperature (field)*
Dissolved manganese	*Total dissolved solids*
pH (field)	*Total iron*
Specific conductance (field)	*Total manganese*

[1]*Field measurements are indicated as such; the remainder would be analyzed in a certified laboratory.*

Source: Alcoa 2001c (Volume 4).

Table C-5b
Annual Spoil Well Monitoring to be Conducted Under the RRC Permit[1]

Alkalinity	*Dissolved molybdenum*
Bicarbonate	*Dissolved selenium*
Calcium	*Dissolved zinc*
Carbonate	*Fluoride*
Chloride	*Magnesium*
Dissolved aluminum	*Nitrogen (nitrate and nitrite)*
Dissolved arsenic	*pH*
Dissolved boron	*Potassium*
Dissolved cadmium	*Sodium*
Dissolved chromium	*Specific conductance (field)*
Dissolved copper	*Sulfate*
Dissolved iron	*Temperature (field)*
Dissolved lead	*Total dissolved solids*
Dissolved manganese	*Total iron*
Dissolved mercury	*Total manganese*

[1]*Field measurements are indicated as such; the remainder would be analyzed in a certified laboratory.*

Source: Alcoa 2001c (Volume 4).

Table C-9
Baseline Inventory Flow Data in the Three Oaks Mine Vicinity

Dates	Surface Water Monitoring Stations[1] and Flow Rates (cfs)									
	LLS	UBS	LBS	LMY	LMC	LWC	UWC	CC	LC	I3
1999										
April	1.32	no data	1.28	0.99	0.02	0.00	no data	0.00	0.00	0.00
May	0.75	0.08	0.62	0.64	0.00	0.00	0.00	0.00	0.00	0.00
June	0.65	0.04	0.74	0.62	0.00	0.00	0.00	0.00	0.00	0.00
July	0.61	<0.01	<0.01	3.49	0.00	0.00	0.00	0.00	0.00	0.00
August	0.28	<0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
September	0.13	<0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
October	0.45	<0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
November	no data	no data	no data	no data	no data	no data	no data	no data	0.00	0.00
December	0.43	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2000										
January	1.31	<0.01	0.35	0.04	0.00	0.00	0.00	0.00	0.00	0.00
February	0.71	0.03	0.28	0.13	0.00	0.00	0.00	0.00	0.00	0.00
March	1.81	0.05	5.92	1.17	0.00	0.00	***0.01***	0.00	0.00	0.00
April	0.46	0.02	0.45	0.07	0.00	0.00	0.04	0.00	0.00	0.00
May	0.42	0.03	0.38	0.17	0.00	0.00	0.00	0.00	0.00	0.00
June	0.52	0.05	0.77	0.09	0.00	0.00	0.00	0.00	0.00	0.00
July	0.28	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
August	0.22	<0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
September	0.26	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
October	0.72	0.02	0.74	0.14	0.00	0.00	0.00	0.00	0.00	0.00
November	UTM[2]	0.06	7.48	9.34	3.58	UTM[2]	0.40	0.44	UTM[2]	0.00
December	1.90	0.03	1.50	0.83	0.10	0.11	0.00	0.03	0.00	0.00
2001										
January	10.10	0.29	10.64	15.50	1.67	1.67	1.30	0.44	0.00	0.00
February	6.68	0.07	5.10	1.37	0.35	<0.01	<0.01	0.11	0.00	0.00
March	UTM[2]	0.14	4.22	3.35	1.60	0.11	0.09	***UTM***[2]	0.00	***0.00***
April	3.30	0.03	2.54	4.40	0.03	0.00	0.00	0.00	0.00	0.00
May	***1.67***	***0.16***	***1.12***	***1.42***	***0.00***	***<0.002***	***0.00***	***0.00***	***0.00***	***0.00***
June	***2.23***	***0.01***	***1.27***	***1.31***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
July	***0.89***	***0.00***	***<0.01***	***0.37***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
August	***UTM***[2]	***0.15***	***14.66***	***2.46***	***0.53***	***0.82***	***1.50***	***UTM***	***0.00***	***0.00***
September	***UTM***[2]	***<0.01***	***1.11***	***1.03***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
October	***UTM***[2]	***<0.01***	***0.90***	***0.50***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
November	***6.68***	***0.03***	***4.66***	***2.99***	***0.08***	***0.11***	***0.00***	***0.00***	***0.00***	***0.00***
December	***3.34***	***0.05***	***2.81***	***4.52***	***0.63***	***0.19***	***0.03***	***0.11***	***0.00***	***0.00***
2002										
January	***UTM***[2]	***0.07***	***2.18***	***2.87***	***0.42***	***0.11***	***<0.01***	***0.04***	***0.00***	***0.00***
February	***2.00***	***0.12***	***1.53***	***2.18***	***0.54***	***0.06***	***0.02***	***0.07***	***0.00***	***0.00***
March	***1.76***	***0.06***	***1.81***	***2.89***	***0.43***	***0.12***	***0.03***	***0.07***	***0.00***	***0.00***
April	***1.00***	***0.05***	***0.75***	***1.43***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
May	***UTM***[2]	***0.02***	***1.11***	***0.42***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
June	***UTM***[2]	***<0.01***	***0.67***	***0.07***	***0.00***	***no data***	***0.00***	***0.00***	***0.00***	***0.00***
July	***UTM***[2]	***0.01***	***0.11***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***
August	***UTM***[2]	***<0.01***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***	***0.00***

Footnotes:

[1]See Figure 3.2-21 for surface water monitoring station locations.
LLS = Lower Little Sandy Creek
UBS = Upper Big Sandy Creek
LBS = Lower Big Sandy Creek
LMY = Lower Middle Yegua Creek
LMC = Lower Mine Creek
LWC = Lower Willow Creek
UWC = Upper Willow Creek
CC = Chocolate Creek
[2]Unable to measure due to very low flow.

Note: Data represents instantaneous point measurements during the month indicated; not monthly average/lows.

Sources: Alcoa 2001b (Volume1) ***; RWHA 2002d.***

Table C-10
***Current* Surface Water Criteria for Classified Stream Segments**

Constituent	Somerville Lake (Segment 1212)	Colorado River above LaGrange (Segment 1434)
Chloride (mg/l)	***75 (100)***	***90 (100)***
Sulfate (mg/l)	***100 (100)***	***60 (100)***
Total dissolved solids (mg/l)	***300 (400)***	***425 (500)***
Dissolved oxygen (mg/l)	5.0	6.0
pH (standard units)	6.5 - 9.0	6.5 - 9.0
Indicator bacteria (number per 100 milliliters)	~~126~~***200***	~~126~~***200***
Temperature (°F)	93	95
~~Biochemical oxygen demand[1] (mg/l)~~	~~no data~~	~~5~~
~~Total suspended solid[1] (mg/l)~~	~~no data~~	~~5~~
~~Ammonia N[1] (mg/l)~~	~~no data~~	~~2~~
~~Total phosphorus[1] (mg/l)~~	~~no data~~	~~1~~

[1]~~Based on a 30-day average.~~[1]***Values in parentheses are proposed.***

Source: TAC 2000a; 1986***; TNRCC 1997.***

Table C-11[1]

Current Surface Water Criteria for Selected Toxic Constituents[1]

(mg/l)

Constituent[2]	Brazos River Basin			Colorado River Basin		
	Aquatic Life - Toxic	Aquatic Life - Chronic	Human Health[3]	Aquatic Life - Toxic	Aquatic Life - Chronic	Human Health[3]
Aluminum, d	991	--	--	991	--	--
Arsenic, d	360	190	0.05	360	190	0.05
Barium, d	--	--	2.0	--	--	2.0
Cadmium, d	49.64 (44.9)	1.48 (3.2)	0.005	61.3 (48.1)	1.72 (3.3)	0.005
Chromium III, d	2,300 (414)	274 (197)	0.1[4]	2,682 (435)	319.6 (207)	0.1[4]
Chromium V, d	16 (15.7)	11 (10.6)	--	16 (15.7)	11 (10.6)	--
Copper, d	26.5 (31.0)	17.2 (22.4)	--	32.9	23.6	--
Lead, d	126.4 (88.6)	4.93 (1.3)	0.005	160.4 (95.7)	1.83 (1.4)	0.005
Mercury, t	2.4	1.3	0.0000122	2.4	1.3	0.0000122
Nickel, d	1,897 (1,255)	210.8 (195.5)	--	2,222 (1,321)	247.0 (205.8)	--
Selenium, t	20	5	0.05	20	5	0.05
Zinc, d	156.5 (149.5)	141.8 (138.5)	--	183.4 (157.3)	166.2 (145.8)	--

[1]This table replaces Table C-11 of the Draft EIS in its entirety.

[1]Current values are for protection of the uses shown, with an assumed water-effects ratio of 1.0. Values in parentheses are proposed.
[2]d = dissolved, t = total.
[3]Public water supplies are uses listed for the study area.
[4]Form not specified for chromium.

Source: TAC 2000a; TNRCC 1997.

Table C-12[1]
Baseline Water Quality Analysis for Area Streams
(Period: April 1999 - August 2002)

Baseline Field Monitoring Station ID[2]	Field Measurements					Laboratory Analyses						
	pH (standard units)	Temperature °C	Conductivity (umhos/cm)	Diss. Oxygen (mg/l)	Turbidity (NTU)	pH (s.u.)	Acidity (mg/l)	Alkalinity (mg/l)	Fluoride (mg/l)	Nitrogen-Ammonia (mg/l)	Conductivity (umhos/cm)	Hardness (mg/l)
Minimum												
CC	6.17	10.1	89	2.8	40	6.20	<1	8	<0.1	0.2	132	36
LBS	6.25	8.3	244	2.4	5	6.70	<1	1	0.1	<0.1	321	115
LC	7.15	20.6	54	5.3	89	7.20	<1	23	0.2	<0.1	59	22
LLS	6.12	9.1	390	2.6	2	6.40	<1	32	0.1	<0.1	415	127
LMC	6.41	7.5	218	2.9	12	6.50	<1	18	0.1	0.2	288	91
LMY	6.11	7.1	241	2.8	6	7.00	<1	39	0.0	0.1	227	72
LWC	6.64	8.0	86	1.1	22	7.00	<1	23	0.1	<0.1	87	34
UBS	6.35	7.1	206	1.4	7	6.70	<1	45	0.0	<0.1	219	67
UWC	6.58	8.5	8	2.7	23	6.70	<1	14	<0.1	0.1	58	23
Maximum												
CC	7.06	22.3	2,820	12.7	425	7.50	10	32	0.8	0.9	3,160	1,060
LBS	8.21	29.0	1,330	10.8	294	8.40	<1	151	0.6	2.3	1,470	420
LC	7.15	20.6	54	5.3	89	7.20	<1	23	0.2	<0.1	59	22
LLS	7.86	29.8	1,260	9.9	82	8.30	<1	149	0.5	3.8	1,400	373
LMC	7.53	23.6	1,870	12.1	162	7.90	<1	69	0.5	0.9	2,180	755
LMY	8.83	32.5	1,610	11.4	682	8.40	<1	191	0.8	0.7	1,780	549
LWC	7.81	29.2	2,000	11.4	610	8.20	<1	107	0.5	0.6	2,220	706
UBS	8.12	31.5	813	9.7	271	8.20	<1	107	0.6	1.4	654	165
UWC	7.45	24.1	894	13.3	1,450	8.30	3	81	0.3	0.7	748	235
Average												
CC	6.64	14.7	1,610	9.5	128	6.88	2	18	0.2	0.5	1,762	642
LBS	7.40	20.7	737	6.5	61	7.77	<1	95	0.4	0.3	742	229
LC	7.15	20.6	54	5.3	89	7.20	<1	23	0.2	<0.1	59	22
LLS	6.96	20.1	734	5.9	25	7.52	<1	79	0.2	0.3	756	205
LMC	6.79	16.4	1,073	7.4	56	7.33	<1	44	0.3	0.4	1,170	404
LMY	7.33	22.0	854	7.1	73	7.82	<1	119	0.3	0.3	854	281
LWC	7.10	17.4	791	7.8	133	7.51	<1	46	0.2	0.3	831	280
UBS	7.18	20.8	502	4.7	40	7.57	<1	78	0.4	0.3	460	137
UWC	7.03	15.4	320	7.0	263	7.33	<1	46	0.1	0.3	334	122

Table C-12[1] (Continued)

Baseline Field Monitoring Station ID[2]	Laboratory Analyses												
	Settleable Solids (mg/l)	Total Dissolved Solids (mg/l)	Total Suspended Solids (mg/l)	Nitrite (N)(mg/l)	Nitrate (N)(mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Potassium (mg/l)	Sodium (mg/l)	Bicarbonate (mg/l)	Carbonate (mg/l)	Chloride (mg/l)	Sulfate (mg/l)
Minimum													
CC	<0.5	130	23	<0.1	<0.1	10	3	5	2	9	<1	4	7
LBS	<0.5	230	7	<0.1	<0.1	34	8	6	21	65	<1	46	27
LC	<0.5	60	4	<0.1	<0.1	6	2	6	1	28	<1	3	3
LLS	<0.5	322	<4	<0.1	<0.1	35	9	6	31	38	<1	66	32
LMC	<0.5	190	7	<0.1	<0.1	24	8	6	19	21	<1	34	75
LMY	<0.5	170	<4	<0.1	<0.1	19	6	5	14	47	<1	27	15
LWC	<0.5	50	16	<0.1	<0.1	9	3	4	4	28	<1	4	3
UBS	<0.5	170	5	<0.1	<0.1	19	5	3	16	55	<1	31	10
UWC	<0.5	50	8	<0.1	<0.1	6	2	5	2	17	<1	0	5
Maximum													
CC	<0.5	2,330	280	<0.1	0.3	302	76	9	250	38	<1	421	1,030
LBS	<0.5	970	137	0.2	65	122	28	9	117	184	5	232	176
LC	<0.5	60	4	<0.1	<0.1	6	2	6	1	28	<1	3	3
LLS	<0.5	1,060	62	0.2	11.2	110	24	10	114	182	<1	241	113
LMC	<0.5	1,860	212	<0.1	0.3	197	64	12	158	84	<1	277	623
LMY	<0.5	1,230	259	0.2	0.8	155	39	11	137	232	5	250	306
LWC	<0.5	1,640	362	<0.1	0.3	191	56	10	165	131	<1	327	553
UBS	<0.5	440	213	<0.1	1.0	46	12	8	54	130	<1	109	40
UWC	<0.5	500	1,008	<5	87	68	16	7	44	99	<1	84	153
Average													
CC	<0.5	1,418	112	<0.1	0.1	182	46	7	146	22	<1	242	603
LBS	<0.5	528	40	<0.1	2.8	66	16	8	62	119	<1	130	8
LC	<0.5	60	4	<0.1	<0.1	6	2	6	1	28	<1	3	3
LLS	<0.5	553	12	<0.1	4.9	58	15	8	66	96	<1	144	59
LMC	<0.5	892	45	<0.1	0.1	105	34	8	87	54	<1	155	329
LMY	<0.5	615	43	<0.1	0.2	79	20	8	69	144	<1	137	116
LWC	<0.5	613	69	<0.1	0.1	76	22	7	62	56	<1	121	195
UBS	<0.5	323	28	<0.1	0.1	37	11	5	35	95	<1	82	23
UWC	<0.5	257	173	<0.1	8.8	35	8	6	17	56	<1	33	64

Table C-12[1] (Continued)

Baseline Field Monitoring Station ID[2]	Laboratory Analyses											
	Total Aluminum (mg/l)	Total Arsenic (mg/l)	Total Barium (mg/l)	Total Cadmium (mg/l)	Total Chromium (mg/l)	Total Iron (mg/l)	Total Lead (mg/l)	Total Manganese (mg/l)	Total Mercury (mg/l)	Total Molybdenum (mg/l)	Total Nickel (mg/l)	Total Selenium (mg/l)
Minimum												
CC	1.0	<0.005	0.06	<0.001	<0.02	1.49	<0.005	0.02	<0.001	<0.05	<0.1	<0.005
LBS	<0.2	<0.005	0.09	<0.001	<0.02	<0.05	<0.005	0.17	<0.001	<0.05	<0.05	<0.005
LC	1.2	<0.005	0.05	<0.001	<0.02	1.07	<0.005	<0.01	<0.001	<0.05	<0.1	<0.005
LLS	<0.1	<0.005	0.1	<0.001	<0.02	0.11	<0.005	0.14	<0.001	<0.05	<0.05	<0.005
LMC	<0.2	<0.005	0.08	<0.001	<0.02	1.87	<0.005	0.1	<0.001	<0.05	<0.05	<0.005
LMY	<0.2	<0.005	0.08	<0.001	<0.02	<0.05	<0.005	0.1	<0.001	<0.05	<0.05	<0.005
LWC	0.1	<0.005	0.06	<0.001	<0.02	1.5	<0.005	0.06	<0.001	<0.05	<0.05	<0.005
UBS	<0.1	<0.005	0.08	<0.001	<0.02	0.11	<0.005	0.18	<0.001	<0.05	<0.1	<0.005
UWC	0.6	<0.005	0.06	<0.001	<0.02	1.12	<0.005	0.03	<0.001	<0.05	<0.05	<0.005
Maximum												
CC	4.6	<0.005	0.14	<0.001	<0.02	22.3	<0.005	4.19	<0.001	<0.05	<0.1	<0.005
LBS	6.2	<0.005	0.2	<0.001	<0.02	5.38	<0.005	1.91	<0.001	<0.05	<0.1	<0.005
LC	1.2	<0.005	0.05	<0.001	<0.02	1.07	<0.005	<0.01	<0.001	<0.05	<0.1	<0.005
LLS	3.3	<0.005	0.21	0.003	<0.02	4.54	<0.005	1.34	<0.001	<0.05	<0.1	<0.005
LMC	9	<0.005	0.19	<0.001	<0.02	6.79	<0.005	8.13	0.001	<0.05	<0.1	<0.005
LMY	7.1	<0.005	0.2	<0.001	<0.02	7.79	<0.005	1.95	<0.001	<0.05	<0.1	<0.005
LWC	23.3	<0.005	0.24	<0.001	<0.02	18.4	0.008	5.31	<0.001	<0.05	<0.1	<0.005
UBS	4.2	<0.005	19	<0.001	<0.02	6.48	<0.005	1.33	<0.001	<0.05	<0.1	<0.005
UWC	18.3	<0.005	0.31	<0.001	0.03	12.8	0.008	1.03	<0.001	<0.05	<0.1	<0.005
Average												
CC	2.4	<0.005	0.09	<0.001	<0.02	9.70	<0.005	2.52	<0.001	<0.05	<0.1	<0.005
LBS	1.6	<0.005	0.15	<0.001	<0.02	1.70	<0.005	0.58	<0.001	<0.05	<0.1	<0.005
LC	1.2	<0.005	0.05	<0.001	<0.02	1.07	<0.005	<0.01	<0.001	<0.05	<0.1	<0.005
LLS	0.4	<0.005	0.13	<0.001	<0.02	1.82	<0.005	0.50	<0.001	<0.05	<0.1	<0.005
LMC	1.5	<0.005	0.13	<0.001	<0.02	4.12	<0.005	2.57	<0.001	<0.05	<0.1	<0.005
LMY	1.8	<0.005	0.14	<0.001	<0.02	2.79	<0.005	0.73	<0.001	<0.05	<0.1	<0.005
LWC	3.4	<0.005	0.14	<0.001	<0.02	4.26	<0.005	1.92	<0.001	<0.05	<0.1	<0.005
UBS	0.7	<0.005	0.64	<0.001	<0.02	1.77	<0.005	0.67	<0.001	<0.05	<0.1	<0.005
UWC	5.1	<0.005	0.18	<0.001	<0.02	4.37	<0.005	0.40	<0.001	<0.05	<0.1	<0.005

Table C-12[1] (Continued)

Baseline Field Monitoring Station ID	Laboratory Analyses											
	Dissolved Aluminum (mg/l)	Dissolved Arsenic (mg/l)	Dissolved Barium (mg/l)	Dissolved Cadmium (mg/l)	Dissolved Chromium (mg/l)	Dissolved Iron (mg/l)	Dissolved Lead (mg/l)	Dissolved Manganese (mg/l)	Dissolved Mercury (mg/l)	Dissolved Molybdenum (mg/l)	Dissolved Nickel (mg/l)	Dissolved Selenium (mg/l)
Minimum												
CC	<0.1	<0.005	0.06	<0.001	<0.02	0.23	<0.005	0.01	<0.001	<0.05	<0.05	<0.005
LBS	<0.1	<0.005	<0.01	<0.001	<0.02	<0.05	<0.005	0.13	<0.001	<0.05	<0.05	<0.005
LC	0.6	<0.005	0.04	<0.001	<0.02	0.34	<0.005	<0.01	<0.001	<0.05	<0.1	<0.005
LLS	<0.1	<0.005	<0.01	<0.001	<0.02	<0.05	<0.005	0.09	<0.001	<0.05	<0.05	<0.005
LMC	<0.1	<0.005	0.06	<0.001	<0.02	0.08	<0.005	0.02	<0.001	<0.05	<0.1	<0.005
LMY	<0.1	<0.005	0.01	<0.001	<0.02	<0.05	<0.005	0.09	<0.001	<0.05	<0.1	<0.005
LWC	<0.1	<0.005	0.05	<0.001	<0.02	<0.05	<0.005	<0.01	<0.001	<0.05	<0.05	<0.005
UBS	<0.1	<0.005	0.01	<0.001	<0.02	<0.05	<0.005	0.17	<0.001	<0.05	<0.1	<0.005
UWC	<0.2	<0.005	0.04	<0.001	<0.02	0.12	<0.005	<0.01	<0.001	<0.05	<0.1	<0.005
Maximum												
CC	0.4	<0.005	0.13	0.003	<0.02	1.24	<0.005	4.03	<0.001	<0.05	<0.1	<0.005
LBS	0.2	0.005	0.8	0.003	<0.02	0.23	<0.005	0.92	<0.001	<0.05	<0.1	<0.005
LC	0.6	<0.005	0.04	<0.001	<0.02	0.34	<0.005	<0.01	<0.001	<0.05	<0.1	<0.005
LLS	0.4	<0.005	0.2	0.002	<0.02	2.32	<0.005	1.28	<0.001	<0.05	<0.1	<0.005
LMC	<0.2	<0.005	0.18	<0.001	<0.02	4.19	<0.005	8.14	<0.001	<0.05	<0.1	<0.005
LMY	0.5	<0.005	0.2	<0.001	<0.02	0.73	<0.005	1.9	<0.001	<0.05	<0.1	<0.005
LWC	0.5	<0.005	0.22	<0.001	<0.02	0.67	<0.005	5.13	<0.001	<0.05	<0.1	<0.005
UBS	2.5	<0.005	0.2	0.003	<0.02	1.28	<0.005	1.09	<0.001	<0.05	<0.1	<0.005
UWC	0.9	<0.005	0.29	<0.001	<0.02	0.59	<0.005	0.66	<0.001	<0.05	<0.1	<0.005
Average												
CC	0.1	<0.005	0.08	<0.001	<0.02	0.55	<0.005	2.44	<0.001	<0.05	<0.05	<0.005
LBS	<0.1	<0.005	0.14	<0.001	<0.02	0.06	<0.005	0.44	<0.001	<0.05	<0.05	<0.005
LC	0.6	<0.005	0.04	<0.001	<0.02	0.34	<0.005	<0.01	<0.001	<0.05	<0.1	<0.005
LLS	<0.1	<0.005	0.12	<0.001	<0.02	0.18	<0.005	0.48	<0.001	<0.05	<0.05	<0.005
LMC	<0.2	<0.005	0.13	<0.001	<0.02	1.42	<0.005	2.50	<0.001	<0.05	<0.1	<0.005
LMY	0.1	<0.005	0.12	<0.001	<0.02	0.20	<0.005	0.67	<0.001	<0.05	<0.1	<0.005
LWC	0.2	<0.005	0.12	<0.001	<0.02	0.27	<0.005	1.77	<0.001	<0.05	<0.1	<0.005
UBS	<0.1	<0.005	0.14	<0.001	<0.02	0.23	<0.005	0.60	<0.001	<0.05	<0.1	<0.005
UWC	0.2	<0.005	0.13	<0.001	<0.02	0.36	<0.005	0.35	<0.001	<0.05	<0.1	<0.005

[1]***This table replaces Table C-12 of the Draft EIS in its entirety.***
[2]See **Figure 3.2-21** of the Draft EIS for stream monitoring station locations.

Source: Alcoa 2000 (Volume 5); ***Hodges 2002d.***

Table C-18
Quarterly Surface Water Quality Monitoring to be Conducted Under the RRC Permit[1]

Acidity	*Electrical conductivity*	*Sodium*
Ammonia Nitrogen	*Electrical conductivity (in field)*	*Sulfate*
Bicarbonate	*Floride*	*Temperature (in field)*
Calcium	*Hardness*	*Total alkalinity*
Carbonate	*Magnesium*	*Total dissolved solids*
Chloride	*Nitrate nitrogen*	*Total iron*
Discharge (in field)	*Oil and Grease*	*Total manganese*
Dissolved iron	*pH*	*Total suspended solids*
Dissolved manganese	*pH (in field)*	
Dissolved oxygen (in field)	*Potassium*	

[1]Field measurements are indicated as such; the remainder would be analyzed in a certified laboratory.

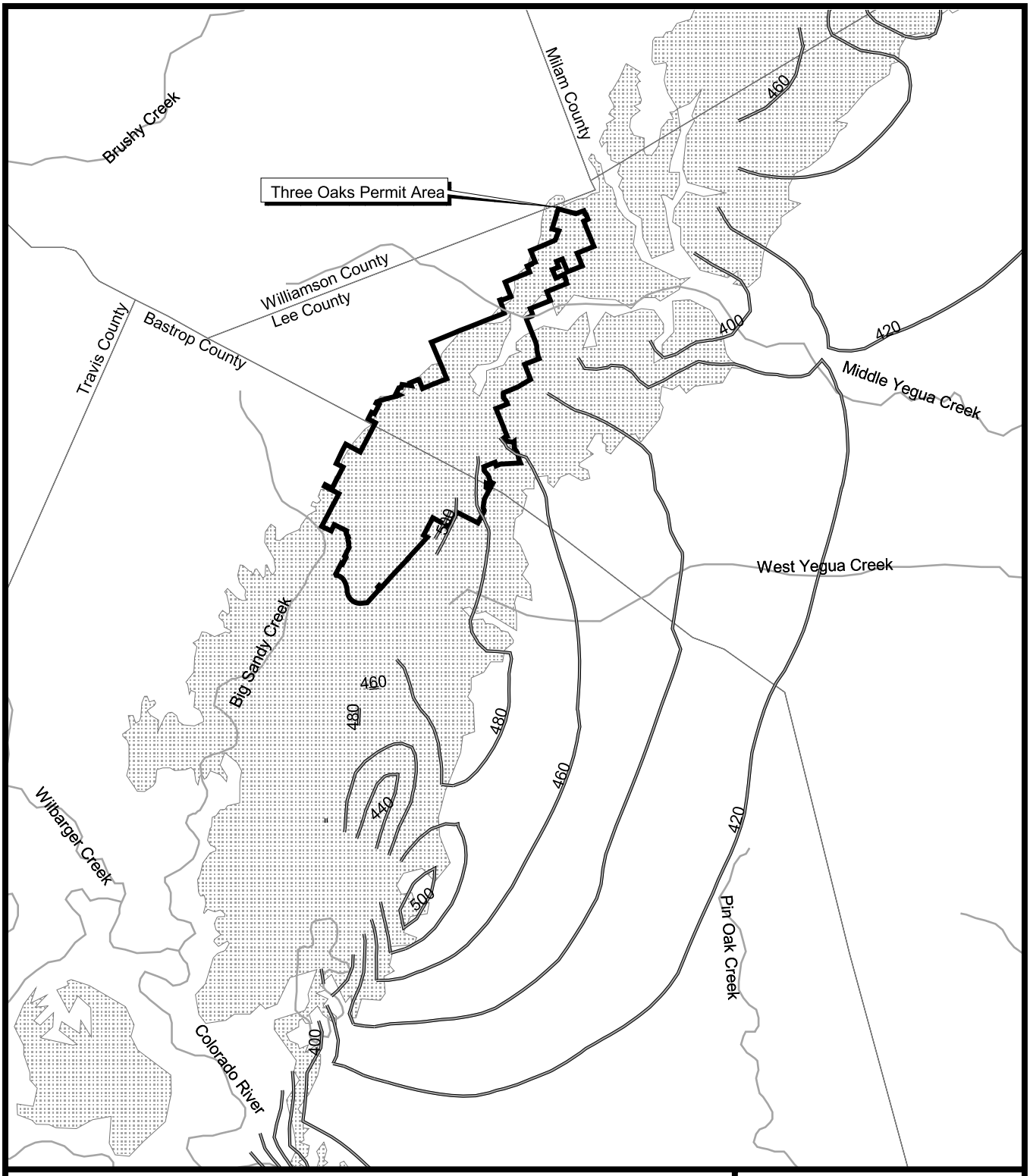
Note: Stream flow measurements would be conducted using either a direct displacement method, a v-notch weir or other suitable measurement structure, or by the velocity-area method using standard methods in a suitable channel section.

Source: Alcoa 2001c (Volume 4).

Table C-19
Annual Surface Water Quality Analyses to be Conducted Under the RRC Permit

Total aluminum	*Total chromium*	*Total nickel*
Total arsenic	*Total lead*	*Total selenium*
Total barium	*Total mercury*	*Total zinc*
Total cadmium	*Total molybdenum*	

Source: Alcoa 2001c (Volume 4).



Three Oaks Mine

Figure C-7
General Groundwater Levels in the Upper Calvert Bluff Aquifer

APPENDIX E

~~DRAFT~~ MITIGATION PLAN FOR THE THREE OAKS MINE

MITIGATION PLAN FOR THE PROPOSED THREE OAKS MINE LEE AND BASTROP COUNTIES, TEXAS USACE PROJECT NUMBER: 199900331 HJN 990022 MI

PREPARED FOR:

ALCOA INC.
ROCKDALE, TEXAS

PREPARED BY:

HORIZON ENVIRONMENTAL SERVICES, INC.

REVISED: 25 MARCH 2003

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INTRODUCTION

The proposed Three Oaks Mine Permit Area contains 161.5 acres of jurisdictional "waters of the US," of which 108.7 acres (67%) are on-channel ponds, 44.1 acres (27%) are ephemeral to intermittent streams, and 8.7 acres (6%) are small, depressional floodplain wetlands.

On-channel ponds on the proposed Three Oaks Mine Permit Area generally range from 0.5 to 5 acres in size and most are heavily utilized by livestock, with highly disturbed edges and little vegetation. Water clarity and quality is usually poor due to high nutrient loading from cattle use. Some ponds in the permit area have lower use by livestock and exhibit vegetated shorelines and aquatic macrophytes. Water clarity and quality in these ponds are significantly improved. Typical shoreline and aquatic vegetation includes smartweed (*Polygonum* sp.), cattail (*Typha* sp.), spikerush (*Eleocharis* sp.), flatsedge (*Cyperus* sp.), rattlebush (*Sesbania* sp.), pondweed (*Potamogeton* sp.), and water-lilies (*Nuphar* sp. and *Nymphae* sp.).

Streams in the Three Oaks Mine Permit Area are predominantly ephemeral, with several being intermittent. Streams are variously vegetated from herbaceous grasslands to mature woodlands. Woodlands occur along many streams as narrow, remnant strips amid cleared pastures or mesquite grasslands. Typical woodland species of these riparian zones include water oak (*Quercus nigra*), post oak (*Q. stellata*), sugar hackberry (*Celtis laevegata*), cedar elm (*Ulmus crassifolia*), yaupon (*Ilex vomitoria*), occasional native pecan (*Carya illinoensis*), and American elm (*Ulmus americana*).

Wetlands in the permit area are typically small depressions associated with stream floodplains ranging in size from a few hundred square feet to 1 or 2 acres. All wetland areas are herbaceous and seasonally inundated or saturated. Typical wetland species include smartweed, flatsedge, spikerush, rattlebush, bulrush (*Juncus* sp.), and sumpweed (*Iva annua*). Black willow (*Salix nigra*), green ash (*Fraxinus pensylvanica*), and buttonbush (*Cephalanthus occidentalis*) occur sporadically in these wetland areas.

The proposed mining and ancillary activities will result in impacts to jurisdictional areas that are short and long term, with some impacts being considered permanent (e.g., permanent stream reroutes). Short-term (or temporal) impacts will result from the mining process, where 3 to 5 years may pass from the point of disturbance until reclaimed areas begin to provide the intended functions and values. Reclamation will be continuously on-going following mining. Long-term impacts will result from certain streams being rerouted multiple times as mining progresses across the landscape; from the loss of mature riparian woodlands (which will take many years to reach maturity); and where long-term facilities and haul roads will exist. Due to the location of some streams relative to the mine blocks, permanent relocation will be necessary, resulting in permanent impacts to portions of those streams.

The overall goal of this mitigation plan is to provide for effective mitigation for short-term, long-term, and permanent impacts through avoidance, minimization, compliance reclamation, and mitigation. Temporal impacts will be mitigated through temporary wetland enhancements within the active mine, as well as through mitigation in 2 dedicated off-site mitigation areas. Long-term impacts will be mitigated through mine reclamation that is focused on the re-creation of high-quality streams and riparian zones, along with ponds and wetlands that are similar or improved from the current condition. Reclamation within the disturbance area will replace “waters of the US” at a minimum ratio of 1:1. The off-site mitigation areas, an approximately 54.1-acre tract encompassing the confluence of Middle Yegua and Mine creeks (totaling 4,204 linear feet [LF]) and a 51.5-acre tract that contains more than 4,955 LF of Big Sandy Creek, will provide high-quality, advance compensation for impacts to riparian and wetland habitats.

1.0 AVOIDANCE AND MINIMIZATION WITH ALTERNATIVES ANALYSIS

1.1 ALTERNATIVE ENERGY SOURCES AND LIGNITE RESERVES

Off-site alternatives considered other than the preferred alternative and the no-action alternative can be separated into 2 groups: a) those that would not directly impact aquatic environments, and b) those that would.

1.1.1 Off-site Alternatives That Would Not Directly Impact Aquatic Environments

The lignite recovered at Three Oaks Mine Permit Area will be used to provide a long-term, economically stable fuel supply for the Rockdale Power Generating Station, which provides electrical power to the Rockdale Aluminum Smelter and the Texas Utilities (TXU) grid system. There are a number of alternate fuels available that can be used at the Rockdale Power Generating Station that would not affect surface waters in the immediate area; however, these have been determined to be economically infeasible. The available options are as follows:

- power purchased from the commercial utility grid
- coal from the western US
- natural gas

Three Oaks Mine lignite can be produced for about $0.95/Million British Thermal Units (MM Btu). Power purchased from the electric grid would cost about the equivalent of $2.70/MM Btu. Natural gas would cost approximately $2.30/MM Btu (calculated using the average cost over the past couple of years) and would have cost as much as $4.00/MM Btu during the summer of 2001. As these recent price fluctuations show, long-term natural gas prices are very unpredictable. Coal from the western US would cost about $1.49/MM Btu, according to an estimate by the US Army Corps of Engineers (USACE). Additionally, transportation contracts with the railroads (necessary for western coal delivery) are for 5-year terms, maximum. These transportation costs are the largest component of the cost of western coal. Consequently, in addition to costing 50% more, the long-term price of western coal is unpredictable due to likely increasing transportation costs.

If long-term fuels costs are greater than $1.25/MM Btu, then aluminum cannot be produced at costs that are competitive on the world market. Consequently, lignite from Three Oaks Mine Permit Area is the only available fuel supply that is economically feasible for aluminum production at the Rockdale smelter. Additionally, local lignite is the only fuel source that is controlled by Alcoa Inc. (Alcoa), meaning that, in addition to being the lowest-cost fuel supply, the costs of this fuel supply can be held stable for decades.

Although these 3 alternatives have been rejected, it should be noted that each of the options listed above has the potential for impacting the aquatic environment at some other location. Power purchased from the utility grid may require additional surface coal mining in other locations within the state, thereby impacting aquatic environments at a different location.

Likewise, the exploration, development, and transportation of additional natural gas reserves will have impacts on aquatic environments and, when coal from the western US is delivered to locations in Texas, rail lines will necessarily traverse aquatic environments. Further, surface coal mining in the western US has impacts to aquatic environments as well.

1.1.2 Off-site Alternatives That Would Impact Aquatic Environments

Lignite fuel sources need to be within a short distance of the power plant to be an economically feasible fuel source, and local lignite reserves are limited to the lignite deposits in the lower Calvert Bluff formation. This limits practical reserve recovery to approximately 20 miles northeast or southwest of the plant. Within these limitations, Alcoa has considered the following:

- continuing its mining operations at the Sandow Mine, mining deeper reserves
- mining lignite reserves located to the north of Sandow Mine, a reserve referred to as the Milam reserve

Alcoa has mined nearly all lignite seams with less than 200 feet of overburden within the Sandow Mine. These lignite seams, however, continue past the 200-foot depth, dipping toward the southeast at a rate of about 100 feet per mile. Alcoa has seriously considered mining deeper at the Sandow Mine to recover these deeper reserves and has evaluated a variety of cost models for this scenario. After deliberation, though, Alcoa does not regard this option to be viable because of safety and economic considerations. Thousands of acres of new reserves would have to be purchased, and a large capital investment would be required to purchase earth-moving equipment capable of such deep mining. Additionally, employee safety due to slope-stability for such deep mine pits would be a major concern in the unconsolidated overburden.

Alcoa has also considered mining reserves located northeast of Sandow Mine in Milam County: the Milam reserve. However, property-control issues in recent years have effectively eliminated the Milam reserve as a feasible option. The last company to control the reserve as a logical unit sold individual parcels to many different individuals, and the difficulty of acquiring contiguous parcels of property of the size needed for development of a mine limits the viability of this option. To be able to acquire this property would take more than a decade, yet the Sandow Mine reserves will be depleted in about 2 years.

Further, if the above-considered locations were to be mined, it is highly likely that either option, whether it is the deep Sandow reserves or the Milam reserve, would have a greater impact on aquatic environments than mining at the proposed Three Oaks Mine Permit Area. This is because the Three Oaks Mine Permit Area is located at the drainage divide between the Colorado River and the Brazos River—meaning, essentially, that the site is situated on the top of a hill and has relatively few surface water features. Consequently, there are generally fewer surface-water features per acre at the Three Oaks Mine Permit Area than at either of the alternate locations considered, which are located lower in their respective watersheds. Although Alcoa has conducted no detailed evaluations of the aquatic environments of these locations, a cursory appraisal of US Geological Survey (USGS) quad sheets for these locations confirms this supposition. Also, there is more lignite per acre of land at Three Oaks Mine Permit Area than at either the Sandow or Milam reserves, which reduces the acres of aquatic areas disturbed.

1.2 ON-SITE AVOIDANCE AND MINIMIZATION MEASURES

The areal extent of a surface mine is, by nature, controlled by the distribution of subterranean lignite reserves and the technological processes necessary for recovery. Effective and efficient recovery of these reserves limits the potential minimization of surface disturbance over the reserves. Due to the highly bifurcated nature of the area's surface waters, altering project design to achieve avoidance of impacts to surface water features is not practicable over the area of reserve recovery. However, outside the area of reserve recovery, minimization can and has been achieved within the design of the project. For example, within the entire Three Oaks Mine Permit Area, there are 161.5 acres of "waters of the US," yet the project has been designed to limit disturbance to only 67.4 acres of "waters of the US," leaving nearly 60% of jurisdictional areas undisturbed.

Minimization alternatives incorporated into the project include designing minimally impactive sedimentation ponds that are constructed by excavating the storage capacity from higher-elevation, off-stream locations rather than by amassing storage capacity through dam construction within stream channels and their buffer zones. Similar considerations are incorporated into the design of diversions and diversion berms. Additionally, Alcoa typically uses a number of small, off-channel sedimentation ponds located close to the point of sediment production, rather than using fewer, yet larger, on-stream sedimentation structures located further downstream of the mining activity. This practice avoids in-stream construction of dams and avoids sedimentation of many hundreds of additional feet of streams and channels.

Once Alcoa's water-control plan is in place, engineers and environmental specialists will continually review and modify the plan with an eye toward further revisions that might avoid or minimize impacts to aquatic environments. For instance, in the current water-control scenario, there are 4 perimeter sedimentation ponds (SP-1, SP-2, SP-3, and SP-5) (see Section 8 for more data). Yet, when the plan was first submitted to the Railroad Commission of Texas (RRC) and the Texas Commission on Environmental Quality (TCEQ) (formerly the Texas Natural Resource Conservation Commission), the plan included 5 sedimentation ponds. Staff engineers had determined that, by bringing the blending facility further south, closer to the active mine area, 1 sedimentation pond (SP-4) could be eliminated, thus reducing the size of the disturbance footprint and minimizing the potential for impacts to aquatic environments. Alcoa has sited all ancillary mine buildings and facilities to avoid aquatic environments.

Finally, Alcoa typically designs and constructs haul roads and access roads on high ground, minimizing the number and size of stream crossings, and designs crossing streams at right angles rather than more expedient, yet more impactive, skewed crossings.

1.3 MITIGATION ALTERNATIVES

In addition to the project design alternatives previously addressed, several mitigation options were evaluated. The 3 mitigation options identified include: a) mitigating on the site as impacts occur; b) providing off-site mitigation for anticipated impacts; and c) participating in an "In-Lieu Fee" program.

As this document will address, on-site mitigation that occurs continuously with reclamation can be problematic. Innovative ways to address this problem will be discussed in Section 6.3 of this document.

Off-site mitigation provides a valuable mitigation option due to the breadth of area within the undisturbed portion of the Three Oaks Mine Permit Area and position of the 2 identified off-site mitigation sites downgradient of the disturbance area outfalls. These off-site mitigation sites allow mitigation to be conducted in the affected watersheds and possibly provide a refugia for animals within the disturbance area.

Participation in an "In-Lieu Fee" program is likely not feasible due to the scope of the proposed project. The cost per linear foot of stream channel typically determined to be necessary to conduct appropriate mitigation would be prohibitive for a project of this scale. Additionally, the scope of the required mitigation would likely be beyond the capabilities of the mitigation provider. Finally, if this option were pursued, it is likely that the resultant mitigation may not be within close proximity to project impacts or within the same watersheds (Colorado and Brazos River watersheds).

Therefore, Alcoa has chosen a combination of innovative on-site reclamation and off-site mitigation to provide an effective mitigation plan for necessary project impacts.

2.0 DIRECT AND INDIRECT IMPACTS TO "WATERS OF THE US"

Impacts to jurisdictional "waters of the US" within the proposed Three Oaks Mine Permit Area are considered to be largely temporary based on the proposed reclamation plan, which will accomplish a minimum of a 1:1 [acreage and LF (for streams)] mitigation ratio on the site for all proposed impacts. Impacts to aquatic habitats are predicted to be nominal, as most streams are ephemeral and open water bodies are typically highly disturbed stock tanks within cattle pastures.

Table 2-1 summarizes proposed direct impacts and avoidance in LF and acres (AC). Stream impacts are separated based on their nature and the quality of their associated riparian zones. Stream corridor qualities are represented on Plate 2-1 (Appendix A). The following provides a brief description of the quality designations. Low-quality streams are defined as ephemeral streams that traverse open pastureland and have minimal hydric vegetation or are highly eroded. Medium-quality streams are defined as ephemeral or intermittent streams that have a narrow, relatively undisturbed vegetated corridor (e.g., woodlands, native herbaceous rangelands, or hydric depressions) and that are somewhat stable. Finally, ephemeral or intermittent streams that have a broad, mature riparian corridor vegetated by desirable woodland species are characterized as high quality. Please note that a single riparian corridor may have all 3 quality designations, each describing different reaches of the stream. Wetlands and ponds to be impacted were determined to generally be of low to medium quality.

TABLE 2-1
DIRECT IMPACTS TO "WATERS OF THE US" BY TYPE AND QUALITY

"Waters of the US"	Permit Area		Disturbance Area		Avoidance	
	(LF)	(AC)	(LF)	(AC)	(LF)	(AC)
Stream Low-Quality			51,511	6.7		
Stream Medium-Quality			123,537	13.3		
Stream High-Quality			23,370	3.6		
Subtotal	**348,422**	**44.1**	**198,418**	**23.6**	**150,004**	**20.5**
Wetland		8.7		5.3		3.4
Pond		108.7		38.5		70.2
Total		**161.5**		**67.4**		**94.1**

Minimal indirect impacts are anticipated due to the stringent water-quality standards that must be met during active mining and reclamation. Water-quality standards and protective measures to ensure appropriate treatment of mine discharge are discussed in more detail in Section 8.1. Another indirect impact of mining is the modified hydroperiod of discharge streams during active mining and following mining (to a lesser extent). Modeling predicts that mining will not decrease the quantity of water available to adjacent downstream aquatic habitats, wetlands, or streams (Section 8.2); there may even be a slight increase in water quantity. Peak flows will be decreased, with stream flows extended over a longer time period.

However, stream flow in the area is very erratic, with few aquatic resources, so the minor modification to the hydroperiod is unlikely to have many negative effects and may even help to increase the diversity of habitat somewhat. Much of the land within the disturbance area has been degraded by excessive grazing and poor agricultural process, resulting in highly erosive soils with little moisture-retaining properties. The predicted modified hydroperiod may actually be more similar to the historic "natural" hydroperiod than is the current condition.

Other potential indirect impacts to "waters of the US" are: potential drawdown of the Simsboro Aquifer through mine depressurization and other industrial and municipal uses, and subsequent modifications to surface water features.

3.0 MITIGATION PLAN GOALS AND OBJECTIVES

One of the main goals of this proposed mitigation plan is to provide the maximum on-site, in-kind mitigation practicable within the constraints present. Measures will be taken to ensure appropriate mitigation for short-term, long-term, and permanent impacts within the disturbance area. The proposed mitigation plan incorporates an innovative design for stream channel reclamation, including riparian corridor plantings with floodplain terraces similar to those found in existing mature riparian corridors within the Three Oaks Permit Mine Area. Alcoa seeks to restore stream corridors to as natural a condition as possible within a reasonable time frame for on-site reclamation. Many stream corridors are anticipated to have a higher quality post-reclamation than pre-disturbance.

The primary goal of off-site mitigation is to restore and enhance stream lengths and the associated riparian corridors that are low in the watershed (downgradient of the disturbance area) in both the Colorado and Brazos River watersheds. The stream lengths and floodplains within the mitigation sites will be enhanced/restored, fenced, and deed-protected or placed in a conservation easement to protect them in perpetuity. In addition to the significant water-quality benefits, these mitigation sites may provide a refuge for wildlife displaced during active mining and protect a valuable wildlife corridor in perpetuity. The removal of an on-channel dam within the Big Sandy Mitigation Site is predicted to significantly decrease flooding upgradient of the impoundment along both the Big Sandy and Chocolate creeks. The dam removal should also beneficially affect sediment load and decrease erosion downgradient of the dam. Created wetlands, oxbows, seeps, tributary restoration, etc. at both off-site mitigation areas are also anticipated to increase flood-storage capabilities of the riparian corridors. Planting native trees, shrubs, grasses, wildflowers, and forbs throughout uplands, transition zones, and aquatic areas will greatly restore diversity to these large preserves.

3.1 RECLAMATION

On-site reclamation seeks to improve water quality within the Three Oaks Mine Permit Area by instituting practices superior to the current Best Management Practices (BMPs) and to exceed regulatory requirements for water discharged off of the site. The total LF of streams disturbed (based on the pre-mining condition) will be replaced during final reclamation, and extensive riparian corridor restoration/creation will be conducted. Despite the creation of 2 large end lakes in the post-mining condition, on-site stream reclamation will be able to achieve a 1:1 LF replacement ratio due to the micro-topography created in the post-mining condition. Secondary and potentially tertiary stream channels will be created in dendritic patterns that the existing topography does not provide for. Existing non-jurisdictional erosional cuts through highly degraded soils will be replaced with headwater ephemeral streams in the reclaimed landscape, further increasing potential LF of streams in the reclaimed landscape.

Mitigation ratios for stream impacts will be based on the pre-mining quality of impacted streams. Low-quality ephemeral streams will be mitigated on the site via stream reclamation at a minimum ratio of 1:1 (based on the linear distance of the stream). Medium-quality streams will be mitigated at a minimum ratio of 1.5:1. High-quality streams will be mitigated at a minimum ratio of 2:1. Because it is not possible to increase reclaimed stream length beyond the existing LF, the balance of mitigation (in excess of a 1:1 ratio) will be provided by a combination of stream corridor enhancements (appropriate grading and planting of tree, shrub, and herbaceous species) along reclaimed streams; preservation of high-quality reclaimed stream and riparian corridors via deed-restriction; and the creation, enhancement, restoration, and preservation of stream channel and riparian corridors (including wetlands, seeps, and uplands) within 2 off-site mitigation areas. The reclaimed riparian corridors, as well as the riparian corridors within the 2 off-site mitigation areas, will generally be of significantly higher quality than those currently present.

Herbaceous wetlands will be mitigated at a minimum ratio of 2:1. Restored wetlands will be an integral part of the restored riparian corridors and appropriate plantings of hydrophytic and aquatic vegetation will ensure that desirable native species with wildlife habitat value will dominate these features. Ponds will be reclaimed at a minimum ratio of 1.5:1; however, it is anticipated that the actual ratio is higher.

TABLE 3-1
MITIGATION RATIOS AND ACREAGE TOTALS

"Waters of the US"	**Disturbance Area (LF)**	**(AC)**	**Mitigation Ratio**	**Required Mitigation (LF)**	**(AC)**
Stream Low-Quality	51,511	6.7	1:1	51,511	6.7
Stream Medium-Quality	123,537	13.3	1.5:1	185,306	20.0
Stream High-Quality	23,370	3.6	2:1	46,740	7.2
Stream Subtotal	**198,418**	**23.6**	**N/A**	**283,557**	**33.9**
Wetland	N/A	5.3	2:1	N/A	10.6
Pond	N/A	38.5	1.5:1	N/A	57.8
Total	**198,418**	**67.4**	**N/A**	**283,557**	**102.3**

3.2 OFF-SITE MITIGATION AREAS

In addition to reclamation, impacts will be mitigated by restoring streams and associated riparian corridors at 2 sites outside of the disturbance boundary. One of the mitigation sites is located within an undisturbed portion of the Three Oaks Mine Permit Area. The selected site was determined (with USACE personnel input) to have a very high potential for mitigative value within the Brazos River Watershed. As will be described, the approximately 54.1-acre site is located along Middle Yegua and Mine creeks and will be referred to as the Middle Yegua Mitigation Site (Figure 3-1). The site contains a total of 4,204 LF of stream channel. The mitigation plan for this site will be enacted concurrently with the initiation of active mining. In this manner, mitigation will have demonstrated success prior to the majority of impacts occurring. The mitigation site will restore and enhance an existing riparian corridor that was previously degraded by clearing and heavy cattle use. The entire mitigation site will be protected by a deed restriction to ensure its existence in perpetuity.

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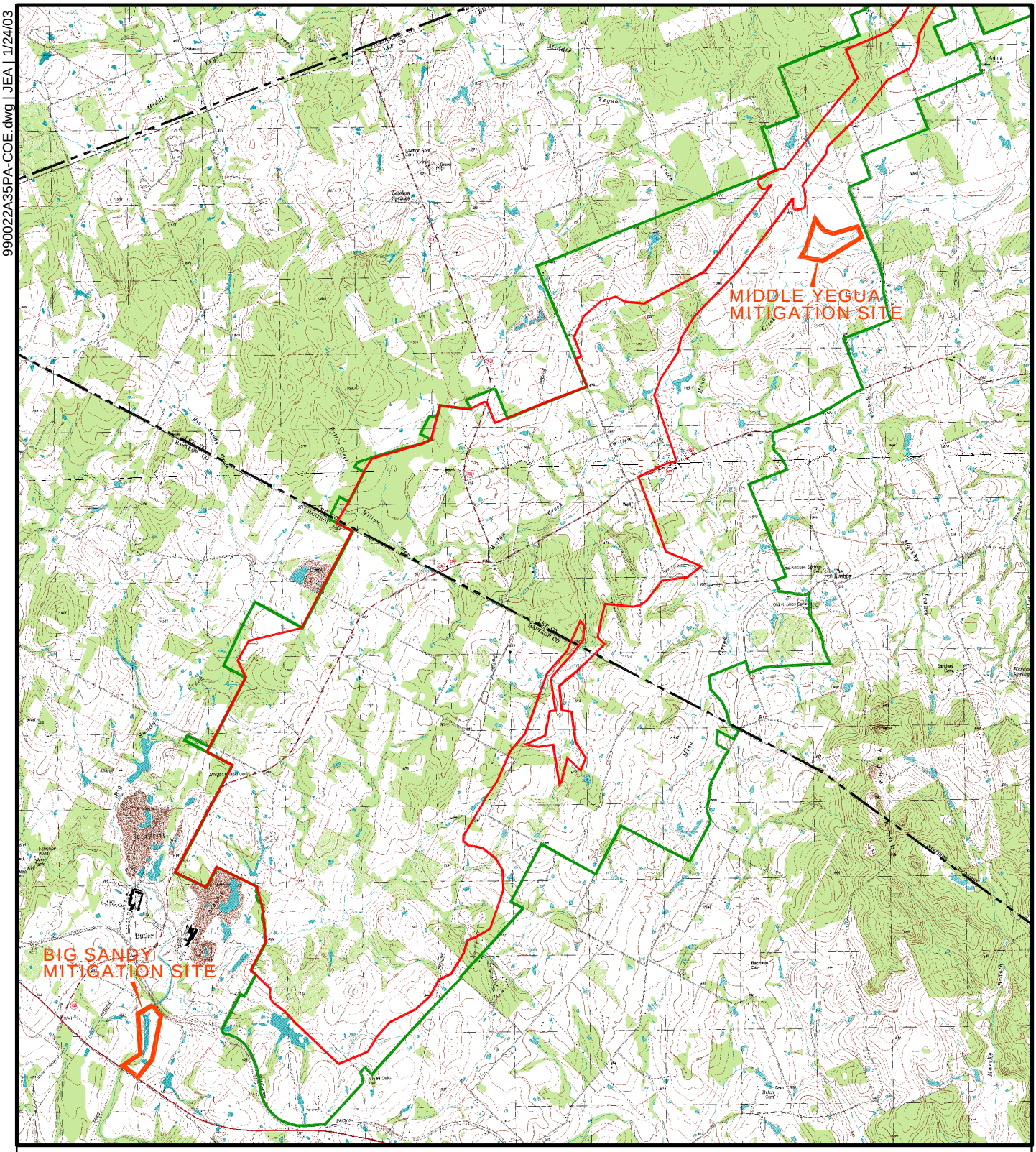

MAP SOURCE:
UNITED STATES GEOLOGICAL SURVEY, 7.5' SERIES, BEAUKISS TEXAS, ELGIN EAST TEXAS, McDADE TEXAS, AND STRUCTURE TEXAS QUADS.

EXPLANATION
- PERMIT BOUNDARY
- DISTURBANCE BOUNDARY
- MITIGATION SITE BOUNDARY

N

0 3000 6000
FEET

Horizon
Environmental Services, Inc.

FIGURE 3-1
OFF-SITE MITIGATION AREAS
MIDDLE YEGUA AND
BIG SANDY MITIGATION SITES
THREE OAKS MINE
BASTROP AND LEE COUNTIES
ALCOA INC.
ROCKDALE, TEXAS
USACE APPLICATION NO. 199900331
JANUARY 23, 2003

"Do Not Scale This Drawing"

An additional site was identified outside of the Three Oaks Mine Permit Area to provide mitigation within the Colorado River Basin. This mitigation site is located a short distance west of the southern tip of the Three Oaks Mine Permit Area (See Figure 3-1). US Highway (US) 290 forms the site's southwestern property boundary, while the Southern Pacific railway tracks form the northeastern property boundary. The 51.5-acre mitigation site encompasses approximately 4,955 LF of Big Sandy Creek and is, therefore, referred to as the Big Sandy Mitigation Site. The proposed mitigation site is presently owned by City Public Services (CPS) of San Antonio; however, Alcoa is in negotiations with them to acquire the site outright. The mitigation plan for this site will be enacted in the first year that mining takes place south of County Road (CR) 102, so the mitigation site will have demonstrated success prior to the majority of impacts occurring in the Colorado River Watershed. The entire mitigation site will be fenced and protected by a deed restriction to ensure its existence in perpetuity.

The mitigation plan seeks to restore and enhance the on-site reach of Big Sandy Creek (a significant section of which is impounded upgradient of an earthen dam) and its riparian corridor (which is largely improved pasture that has been degraded by heavy cattle use). The impoundment appears to have been created to provide a water source for cattle. However, it has eliminated the floodplain terraces within the impounded reach, increased water-quality degradation due to the cattle, and created an erosive, sediment-starved reach of creek downgradient of the dam.

4.0 DESCRIPTION OF OFF-SITE MITIGATION AREAS

4.1 MIDDLE YEGUA MITIGATION SITE

As previously described, the Middle Yegua Mitigation Site is located along reaches of Middle Yegua and Mine creeks. The approximately 54.1-acre mitigation site is situated east of the disturbance area and extends almost to the Three Oaks Mine Permit Area boundary in the central-eastern portion of the proposed Three Oaks Mine (Figure 3-1). This mitigation site was chosen due to its location along Middle Yegua Creek (which will not be directly impacted during mining); the fact that it contains many of the undisturbed wetlands; and the presence of a large floodplain that has natural hydrology for wetland and riparian corridor development (Figure 4-1). This site was previously cleared of most trees except mature pecan and has been used extensively for cattle grazing.

Native pecan is the predominant tree species within the riparian zone. Sugar hackberry, cedar elm, and Eastern red cedar *(Juniperus virginiana*) are also present in low numbers in scattered areas. Due to the minimal canopy coverage (approximately 40%) and heavy cattle grazing, the understory is sparse in most areas. Understory species include yaupon, deciduous holly *(Ilex decidua)*, elbow bush *(Forestiera pubescens)*, mustang grape (*Vitis mustangensis)*, greenbrier, and various grasses. Although the riparian corridor within the proposed mitigation site is currently of medium quality, there are significant enhancement opportunities to improve the overall quality, long-term sustainability, and species composition. Numerous areas within the riparian corridor have an open canopy. These openings (approximately 60% of the total acreage) will be targeted for enhancement with additional tree, shrub, and herbaceous plantings, as well as wetland creation.

4.2 BIG SANDY MITIGATION SITE

As previously described, the 51.5-acre Big Sandy Mitigation Site is located within the Colorado River Watershed in support of the watershed-based mitigation approach (Figure 4-2). This site encompasses approximately 4,955 LF of Big Sandy Creek, which roughly parallels the site's irregular northern property boundary. The mitigation site will provide a broad riparian corridor (a minimum of 500 feet wide to more than 900 feet wide). As with the Middle Yegua Mitigation Site, the proposed Big Sandy Mitigation Site is situated in a strategic position in the watershed to provide maximum additional water-quality treatment benefit for runoff from within the Three Oaks Permit Area's disturbance boundary. Within the mitigation site, a significant portion of Big Sandy Creek has been impounded by an earthen dam. Based on the floodplain's contours downgradient of the dam, the impoundment appears to be largely within the creek's secondary floodplain terrace, forming a broad reservoir well over 1,400 feet long by up to 150 feet wide. Up- and downgradient of the impoundment, Big Sandy Creek varies between 20 and 25 feet wide. Near the dam, the sideslopes of the impoundment are steep, indicating that fill for the dam was likely excavated from the impounded portion of the floodplain. Over a significant distance, the banks of the impoundment become much more gradual (shallow).

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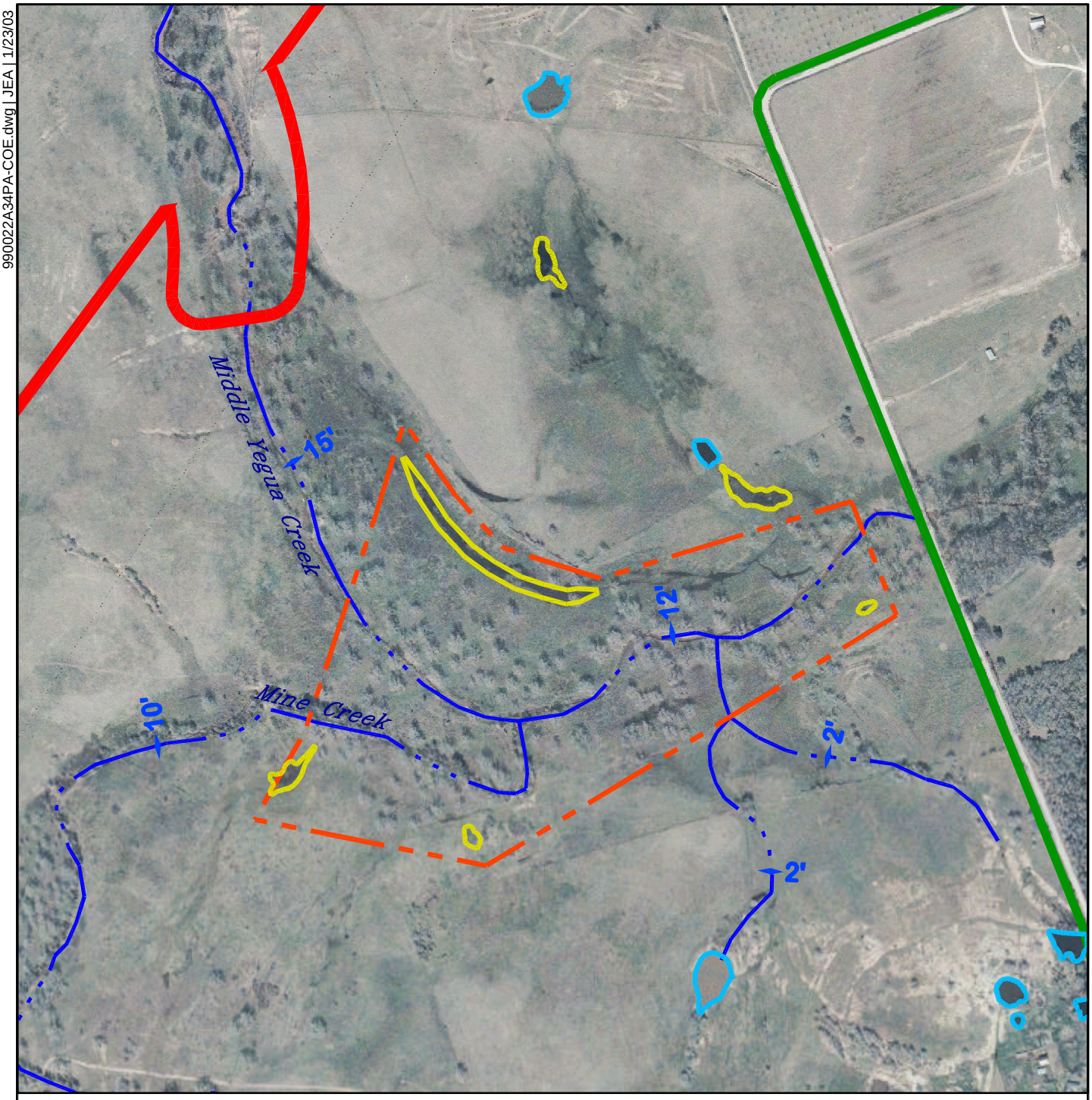

MAP SOURCE:
AERIAL PHOTOGRAPHY:
ALCOA (AUGUST 2001)

EXPLANATION

- THREE OAKS PERMIT BOUNDARY
- DISTURBANCE BOUNDARY
- STREAM
  TOTAL OF 4204 LINEAR FEET
- MITIGATION SITE BOUNDARY
  AREA = APPROX. 54.1 ACRES
- 3' STREAM WIDTH
- STOCK POND
- HERBACEOUS WETLAND

N

0 300 600
FEET

FIGURE 4-1

MIDDLE YEGUA MITIGATION SITE
THREE OAKS MINE
BASTROP AND LEE COUNTIES

ALCOA INC.
ROCKDALE, TEXAS

USACE APPLICATION NO. 199900331
JANUARY 23, 2003

Horizon
Environmental Services, Inc.

"Do Not Scale This Drawing"

"Do Not Scale This Drawing"

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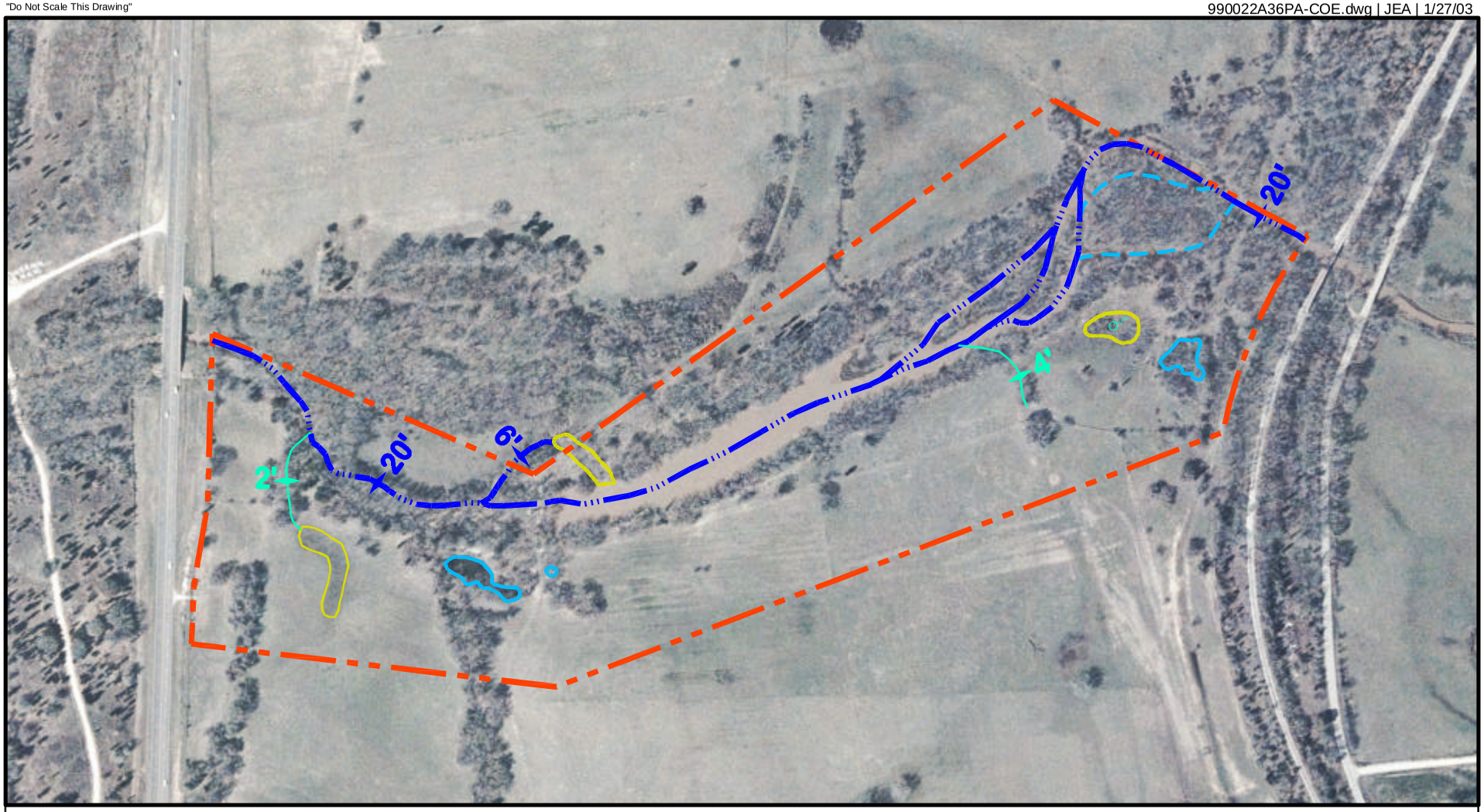


MAP SOURCE:
AERIAL PHOTOGRAPHY SUPPLIED BY ALCOA (2001)

0 200 400
FEET

BASTROP AND LEE COUNTIES

Horizon Environmental Services, Inc.

EXPLANATION

- STREAM TOTAL OF 4955 LINEAR FEET
- MITIGATION SITE BOUNDARY AREA = 51.5 ACRES
- IMPOUNDED AREA
- LOW QUALITY HERBACEOUS WETLAND
- HISTORIC BRAIDED CHANNEL TOTAL OF 945 LINEAR FEET
- SEEP WITH FLOW WAY TOTAL OF 697 LINEAR FEET
- X' STREAM WIDTH

FIGURE 4-2

BIG SANDY MITIGATION SITE
THREE OAKS MINE
BASTROP AND LEE COUNTIES

ALCOA INC
ROCKDALE, TEXAS

USACE APPLICATION NO. 199900331
JANUARY 23, 2003

The narrow, wooded riparian corridor is dominated by mature trees composed primarily of post oak and American elm. The corridor's canopy also contains Eastern red cedar and sugar hackberry, while yaupon, greenbrier, and mustang grape dominate the sparse understory. In the lower reaches of the impoundment there is little hydrophytic vegetation. Cutgrass (*Leersia oryzoides*) was the only species noted during the field investigation on 20 January 2003. The earthen dam that impounds this feature is collapsing and a narrow stream has formed in the floodplain immediately downgradient of the dam. Additionally, an overflow channel has formed on the western edge of the impoundment. At the edge of the impoundment, the overflow forms a 40-foot-wide wetland that quickly tapers to a 6-foot-wide incised channel. Because the majority of the overflow channel is so narrow, the water is fast moving and highly erosive. The overflow, the edge of the impoundment, and the creek channel downgradient of the dam are all lined with discarded brick. In the overflow channel, brick completely obscures the ground; in other areas, it is more thinly distributed. Although the hydrology immediately downgradient of the dam has been changed and the historic creek channel is somewhat obscured, the more evident impacts are to Big Sandy Creek downstream of where the overflow channel empties into the creek. This reach of the creek channel is deeply incised (up to 5 feet), which is likely due to sediment starvation caused by the impoundment.

In the northern portion of the site, Big Sandy Creek is still impounded, but it appears to more closely resemble pre-impoundment conditions. There are several small islands within the braided channel that are densely populated with cutgrass. The northernmost island also contains numerous young saplings. To the east of the existing braided channels are 2 remnant channels through the wooded floodplain. Although the channels are evident in aerial photography, they are significantly impacted by cattle trampling and now form a series of shallow, trampled depressions with no understory vegetation.

Outside of the narrow, wooded riparian corridor, the site is composed of improved pastureland dominated by bermudagrass (*Cynodon dactylon*). Three seeps were identified within the open portion of the site. Two of the seeps empty directly into Big Sandy Creek via short drainages; the third drains by overland sheet flow toward the creek. The southernmost seep originates in a shallow depression dominated by bermudagrass, accompanied by a few hydrophytic species, then flows toward the creek via a herbaceous swale that becomes more channelized as it approaches the wooded corridor. Another one of the seeps forms the headwaters of a narrow drainage. This seep and flow-way has been significantly trampled by cattle and, at the time of the field investigation, was a quagmire of manure and algae. The northernmost seep is located within a shallow depression of the floodplain. The seep is largely vegetated by bermudagrass, but also contains foxtail (*Alopecurus* sp.) and several other hydrophytic species, including flatsedge (*Carex* sp.) and dock (*Rumex* sp.).

Finally, the southern portion of the site is traversed by a historic tributary channel that empties into Big Sandy Creek. The hydrology of this feature has been significantly changed by the construction of a very large on-channel detention pond just east of the site's property boundary and, consequently, the tributary no longer meets jurisdictional criteria. However, a couple of small stock tanks or ponds (identified as impounded areas on Figure 4-2) were excavated on this tributary drainage and continue to detain water for extended periods (perhaps permanently). The impounded areas are very irregularly shaped and the perimeters are dominated by mature trees. No hydrophytic vegetation was noted during the field investigation. An additional shallow, impounded area was noted downgradient of the northernmost seep. This area is likely periodically flooded and is vegetated throughout with young trees.

5.0 JURISDICTIONAL DETERMINATION

"Waters of the US" within Three Oaks Mine Permit Area are composed of streams, stock ponds constructed on-channel, and small, depressional wetlands. Based on the mapped determination, jurisdictional acreages are as follows

Streams with Ordinary High-water Mark (OHWM)	44.1 acres
Ponds with OHWM	108.7 acres
Non-forested Wetlands	8.7 acres
TOTAL	**161.5 acres**

No forested wetlands occur on the site. Plate 2-1 (Appendix A) indicates the jurisdictional "waters of the US" as mapped and ground-verified by Horizon Environmental Assessment, Inc. (Horizon).

The most widely distributed jurisdictional areas on the subject site are ephemeral and intermittent creeks, tributaries, and drainages with an ordinary high-water mark (OHWM). These jurisdictional areas traverse grassland, mesquite-grassland, upland woodland, and riparian woodland vegetative types throughout the proposed mine area. Typically, riparian vegetation is restricted to the immediate banks of these channels.

Stock ponds on the subject site were determined to be jurisdictional if constructed on a jurisdictional channel. Stock ponds constitute the majority of the jurisdictional areas by acreage. The perimeter of most of the stock ponds evaluated is devoid of vegetation. If herbaceous species did persist in the stock ponds, it was frequently limited to smartweed, spikerush, flatsedge, and rattle-bush. The outer perimeter of the ponds may contain black willow, eastern cottonwood (*Populus deltoides*), sugar hackberry, and/or cedar elm.

Jurisdictional wetlands on the subject site tend to be depressional areas near ephemeral creeks or impounded by stock pond embankments or roadways. Areas determined by Horizon to be wetlands are frequently dominated by herbaceous species such as smartweed, spikerush, flatsedge, and rush (*Juncus* sp.). Occasional canopy species include black willow, eastern cottonwood, sugar hackberry, and cedar elm. The soils are primarily clayey sands with 10YR4/2 and 10YR5/2 matrix colors. Mottles are rare to common throughout the top 12 inches of the soil.

The riparian woodlands on the subject site generally tend to be remnant corridors surrounded by previously cleared land. The most extensive riparian woodlands occurred along Willow, Mine, and Middle Yegua creeks, and tributaries of Big Sandy Creek. Riparian woodlands are typically characterized by a dense overstory canopy and a well-developed understory and shrub layer.

None of the riparian woodland communities evaluated met jurisdictional criteria. Overstory species include native pecan, water oak, American elm, green ash, cedar elm, and sugar hackberry. A variety of vine species, predominately greenbriar, poison ivy (*Toxicodendron radicans*), and grape (*Vitis* sp.) commonly grow on trees in the overstory and understory. The herbaceous vegetation is generally patchy depending on the density of the canopy and abundance of litter. Soils in these areas are typically loamy sands with matrix colors of 10YR 6/3, 10YR 7/4, and 10YR 8/4. Mottling is rare. No obvious evidence of water marks, sediment deposits, or scouring is present.

Field data sheets, as submitted to the USACE with the jurisdictional verification request, are provided in Appendix A.

6.0 DETAILED MITIGATION PLAN

6.1 MITIGATION PLAN OVERVIEW

The proposed mitigation plan will be conducted largely within the Three Oaks Mine Permit Area. The mitigation plan strives to mitigate in kind at a minimum ratio of 1:1 and up to 2:1 for impacts to higher-quality aquatic environments. Measures will be taken to mitigate for short-term, long-term, and permanent impacts within the disturbance area. Due to the on-going nature of mining, short-term impacts will occur throughout the life of the mine. Short-term impacts to be mitigated are defined as the time between disturbance and reclamation of any particular "waters of the US" in the disturbance area. Since reclamation is contemporaneous with mining, short-term impacts should not exceed the area of "waters of the US" that would be disturbed in 3 years of mining. The short-term mitigative measures addressed in this plan include the construction and enhancement of temporary stream channels, wetlands, and ponds that will provide wildlife habitat; improve water quality; and maintain open waterbodies. Proposed enhancements to temporary waterways, wetlands, and aquatic habitats include the following:

- planting American bulrush (*Scirpus americanus* var. *longispicatus*), giant bulrush (*Scirpus californicus*), and smartweed (*Polygonum* spp.) seeds around the perimeter of temporary sedimentation ponds to provide enhanced water-quality treatment and habitat value
- placement of small check-dams or low-sill weirs in drainage channels to sedimentation ponds; the small retention area behind the weirs will be planted with wetland vegetation for additional water-quality treatment and habitat value
- use of depressurization water for the creation of temporary wetlands

In addition to these enhancements and modifications to the mining process, Alcoa will enhance and preserve in perpetuity via a deed restriction the approximately 54.1-acre Middle Yegua Mitigation Site and the 51.5-acre Big Sandy Mitigation Site. The Middle Yegua Mitigation Site portion of the mitigation plan will be initiated during the first year of mining to provide additional short-term mitigation to compensate for impacts in the first years of mining. The Big Sandy Mitigation Site portion of the mitigation plan will be implemented in the first year that mining takes place south of the County Road (CR) 102. Monitoring within the mitigation sites will ensure success prior to the majority of the proposed impacts occurring in the affected watershed.

6.2 TEMPORARY RECLAMATION

6.2.1 Temporary Sedimentation Ponds

As previously stated, numerous temporary sedimentation ponds will be constructed during mining. To increase sediment removal from the water column, American bulrush, giant bulrush, and smartweed seed will be planted around the perimeter of each pond within 60 days of the pond construction.

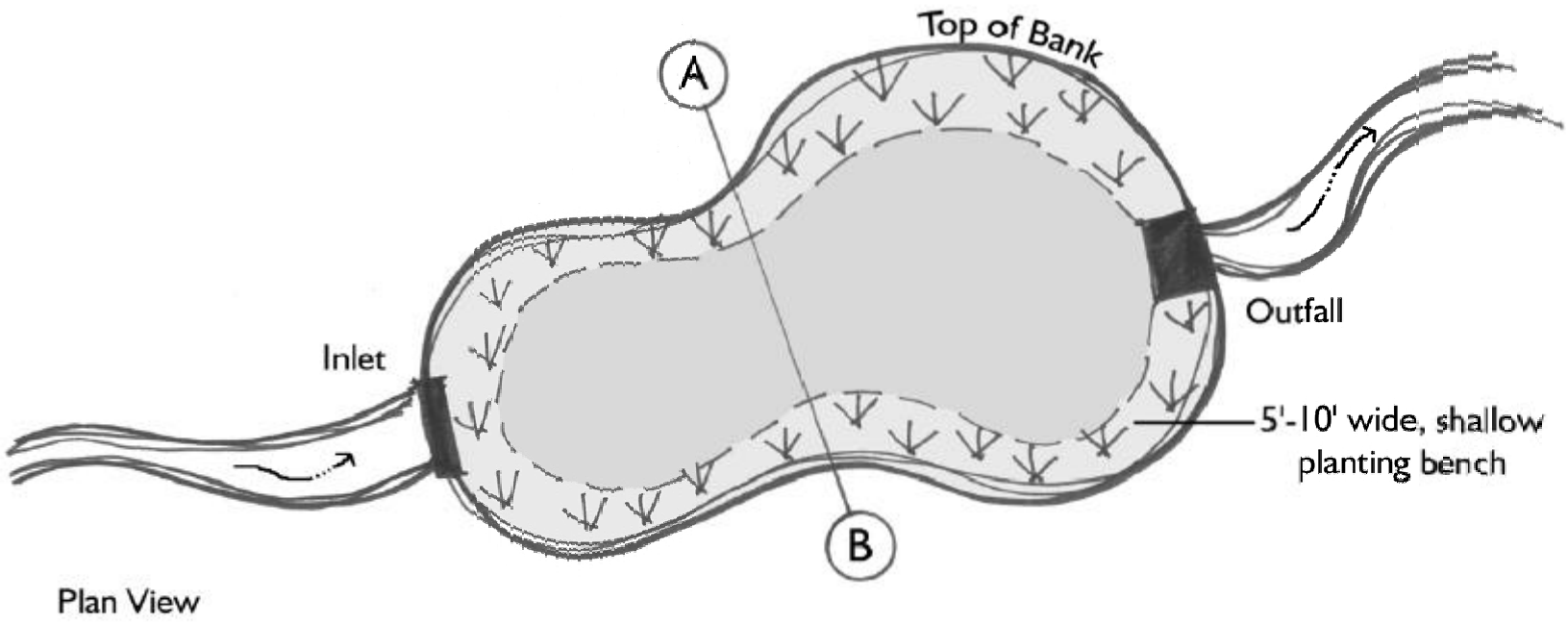
The sedimentation ponds will be constructed with a shallow planting bench 5 to 10 feet wide along the perimeter of the ponds wherever practicable (Figure 6-1). Planting benches will gently grade from the surrounding ground elevation to a depth not to exceed 2.5 feet. Herbaceous plugs (2 inches in diameter) from transplant or nursery-grown stock will be planted on 10-foot centers throughout the shallow planting benches. American bulrush will be the predominant species planted within the planting benches because it is typically not as aggressive as giant bulrush and provides a dense, matted root system capable of stabilizing newly graded areas. Species utilized are restricted to American bulrush, giant bulrush, and smartweed for 2 reasons: 1) these species are prolific and become established very quickly (without the invasive characteristics of other wetland species), spreading via vegetative propagation and seed; and 2) they will vegetate areas having hydrologic regimes ranging from saturated soils to significant inundation. Sturdy stems provide dense stands that significantly slow waters, increase sedimentation rates, and reduce erosion. Most importantly, all 3 species have been proven to have excellent nutrient uptake rates that will significantly increase water-quality outfall from the ponds. Although there are several other species that would be suitable for this application, they would likely be out-competed very quickly by the 2 species of bulrush, and potentially smartweed, which are best suited for the stated purposes.

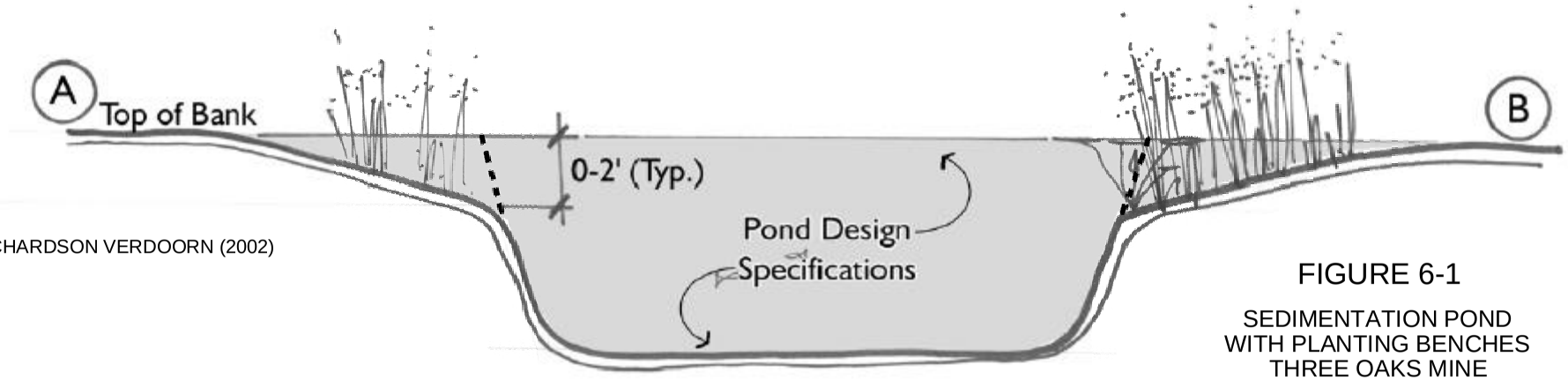
The planting benches will be constructed outside of the original design specifications for each pond and will, therefore, increase the capacity of each pond. If these benches significantly alter RRC designs, they will be constructed and planted after the RRC approves the new design.

6.2.2 Pools in Temporary Stream Channels

During active mining, existing streams on the site are frequently relocated. Constructed stream channels are typically trapezoidal channels that are seeded with upland grasses throughout in an effort to stabilize sideslopes and prevent erosion. Frequently, these constructed stream channels are ephemeral or have a trickle flow in the base of the channel. Excavation of shallow pools (1 to 1.5 feet deep) in the stream channels will create small wetland depressions and improve sediment deposition (Figure 6-2).

The elongated pools will be 20 to 40 feet long, but will not abut stream channel sideslopes in order to reduce the potential for erosion. The pools will be excavated at a minimum of every 500 feet along the constructed temporary stream channels and will be planted with hydrophytic vegetation at a rate of 200 plants per acre. Plants will be bare-root or in planting sleeves from nursery-grown stock. Species to be utilized include spikerush, soft bulrush (*Juncus effusus*), sedge, and flatsedge. Smartweed may also be utilized in these pools, but will typically be seeded utilizing hydromulch or other broadcast techniques. Species selection will be based on plant availability and predicted hydrology within the stream channel.





SOURCE: RICHARDSON VERDOORN (2002)

FIGURE 6-1

SEDIMENTATION POND
WITH PLANTING BENCHES
THREE OAKS MINE
BASTROP AND LEE COUNTIES

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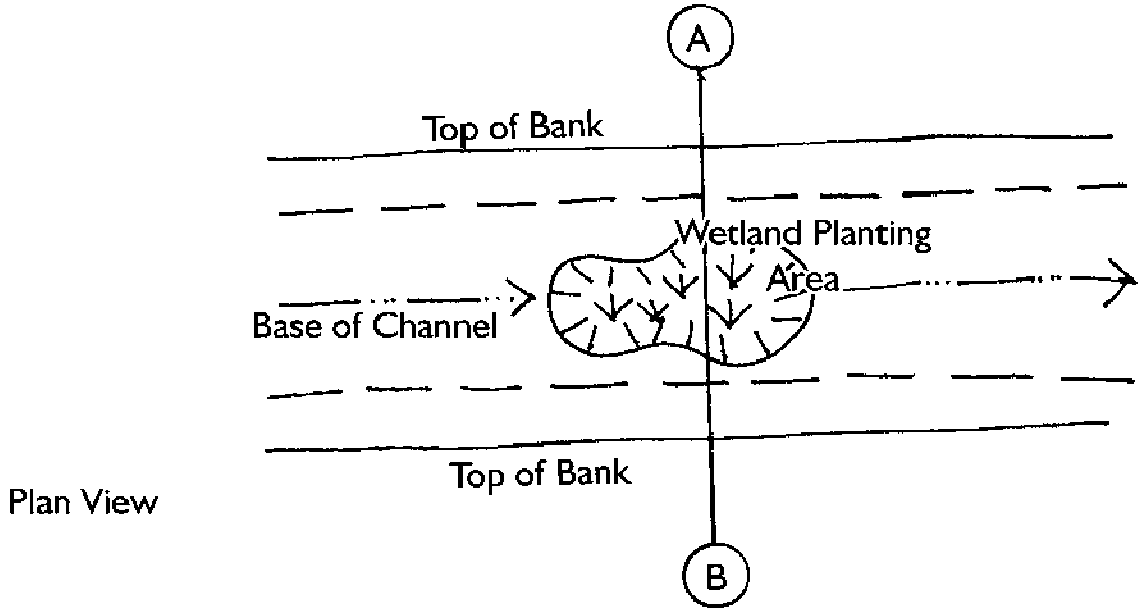
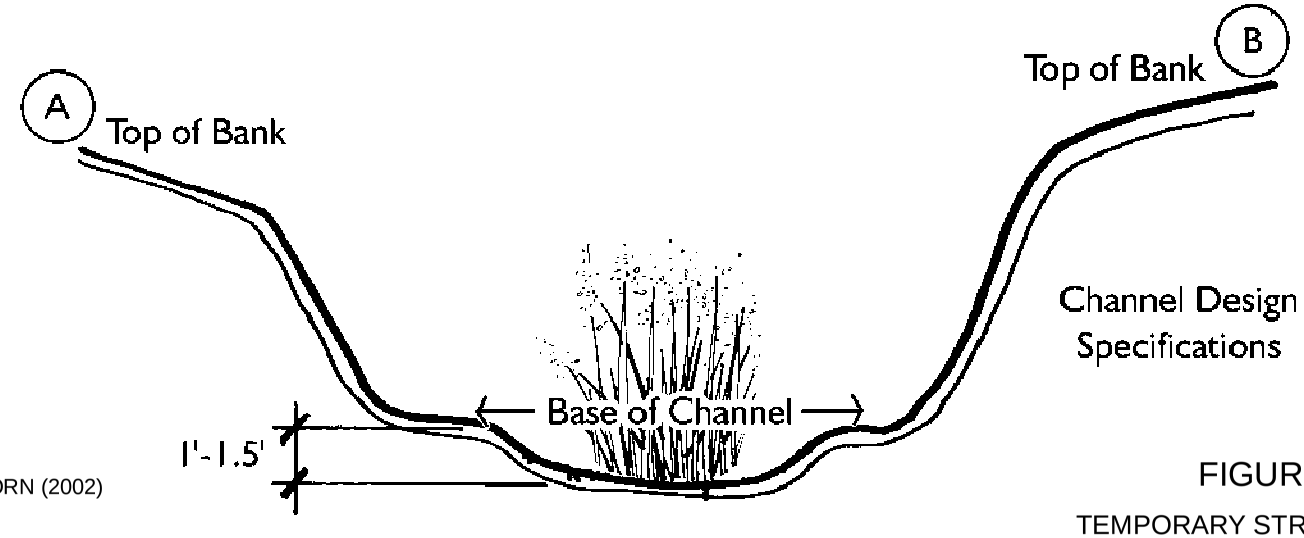


Plan View



Channel Design Specifications

SOURCE: RICHARDSON VERDOORN (2002)

FIGURE 6-2

TEMPORARY STREAM CHANNEL
WITH POOL
THREE OAKS MINE
BASTROP AND LEE COUNTIES

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6.3 FINAL RECLAMATION

6.3.1 Phased Construction for Permanent Streams

As discussed previously, several techniques will be utilized during mining operations to mitigate for short-term impacts. Most of the techniques are aimed at improving water quality and maintaining wildlife habitat in the interim between disturbance and permanent restoration of "waters of the US." Although the temporary stream channels do provide some mitigative value, they typically do not provide as many LF of channel as existed in the pre-mining condition. Additionally, the stream channels are trapezoidal and planted with upland herbaceous vegetation selected primarily for its capacity to prevent erosion. As part of the permanent stream restoration, temporary stream channels will be eliminated and replaced with more natural stream channels and wooded riparian corridors that form a dendritic pattern.

Performing this type of permanent stream channel restoration on an annual basis is not practical due to the linear nature of strip mining. Land is reclaimed in long, linear strips and is highly regulated by the RRC. It is impractical to restore short segments of streams following each linear "cut." Additionally, post-construction contours are somewhat different from pre-mining contours based on the depth and number of seams to be mined. Therefore, Alcoa proposes to delay permanent stream restoration for a period of 3 to 5 years (depending on site-specific conditions and drainage patterns) to enable creation of a stream system with secondary and (potentially tertiary) tributaries within a large, restored drainage basin (watershed). There are several advantages to waiting a few years to perform the permanent stream restoration. The RRC has strict guidelines regulating erosion and settling within restored mine lands. If areas require re-grading or soil amendments, those improvements could be made and would have time to stabilize. By allowing the planted grasses to mature, the permanent stream restoration areas will be much less susceptible to erosion during earth-moving activities, and surface water runoff to the permanent streams will also contain less sediment load. However, the most significant benefit will be to allow enough land to be reclaimed so that significant lengths or reaches of streams (including tributaries) can be constructed. Utilizing this methodology will provide the most natural stream restoration and surface water drainage patterns.

The projected post-mining surface contours for the Three Oaks Mine Permit Area contain numerous gently rolling hills, which lend themselves well to the construction of a dendritic stream system. However, the post-mining contour map provides a very generalized depiction of the surface contours. Although reclaimed land generally follows the post-mining contour maps, actual surface elevations have significant undulations and micro-topography that is not reflected in this type of analysis. Therefore, creation of numerous secondary and potentially tertiary stream channels will be possible, but will be based on site-specific conditions that cannot easily be projected. Although the post-mining landscape includes numerous ponds, pond construction will be minimized or eliminated wherever practicable. Where possible, ponds will be constructed off-channel to help maximize stream length in reclamation and to provide the most natural streams (form and function) possible.

6.3.2 Stream Channel Design

The permanent stream channels will be significantly different from the temporary, trapezoidal channels. Within previously reclaimed areas, stream corridors will be cut into broad, gentle swales that will be created post-mining. Restored streams will meander with a sinuosity that is appropriate for specific site conditions. Typical streams will have a sinuosity of 1.1 to 1.3 (center of floodplain length vs. actual stream length). This sinuosity allows natural meanders in the restored streams that mimic un-impacted streams in the immediate area. All restored streams will be constructed with a minimum of 1 floodplain terrace to mimic natural conditions and to provide for a broad, wooded riparian corridor (Figure 6-3). The base of the floodplain will contain a low-flow channel designed to convey the bank-full discharge, typically defined as the 1.5-year storm event. This design will be utilized for all ephemeral streams and other stream reaches high in the watershed. In larger, more permanent streams or stream reaches low in the watershed, stream design may also include creating braided low-flow channels within a broad stream base (Figure 6-4). Braided low-flow channels will be designed to maximize wet areas within the base of the constructed stream and to minimize erosive forces. Oxbows and small depressional areas will also be incorporated into the base of some reaches of larger, more permanent streams to increase wetland and mesic habitats and to mimic existing braided channels within the area (Figure 6-5). Braided channel design will only be utilized in streams or reaches of streams with appropriate hydrology and surrounding topography.

With the exception of the low-flow channels, the base of the stream will be sparsely planted throughout with herbaceous species to reduce potential erosion prior to stream stabilization. Potential species to be utilized are provided in Table 6-1. Sideslopes from the base of the stream to the lower floodplain terrace will be relatively gentle (flatter than 3 to 1) to reduce potential erosion along the stream banks. The lower floodplain terrace will be designed and constructed at an elevation anticipated to be periodically flooded. Native riparian tree, shrub, and herbaceous species with an appropriate inundation tolerance will be selected from Table 6-1. The floodway, including the lower floodplain terrace (and secondary terrace where appropriate) will be designed to adequately convey the 100-year storm.

In larger streams with appropriate hydrology, an upper floodplain terrace will be created at an elevation predicted to be seasonally flooded. Sideslopes will be gentle (flatter than 4:1). The width of the floodplain terraces will vary greatly based on the size of the stream and site-specific parameters. Both the lower and upper floodplain terraces will be planted with numerous native species to help restore a broad riparian corridor.

6.3.3 Wetland Design

Wetland creation will be performed within the flooplain terraces of larger streams low in the watershed. Most of the wetlands currently present within the disturbance area are related to stock pond impoundments or impoundments caused by elevated, improperly culverted roads. By re-establishing broad, wooded riparian corridors with wetland depressions, many of the important functions and values that wetlands are capable of providing (that are not currently being provided or that are minimally provided) will be reintroduced to the area.

TABLE 6-1
RECOMMENDED SPECIES LIST

HARDWOOD TREES	SCIENTIFIC NAME	PLANTING AREA
Bald Cypress	*Taxodium distichum*	SW, FF
Black Cherry	*Prunus serotina*	SF, UP
Black Hickory	*Carya texana*	UP
Black Walnut	*Juglans nigra*	SF, UP
Blackjack Oak	*Quercus marilandica*	UP
Bur Oak	*Quercus macrocarpa*	SF, UP
Cedar Elm	*Ulmus crassifolia*	SF, UP
Live Oak	*Quercus virginiana*	UP
Mexican Plum	*Prunus mexicana*	UP
Osage Orange	*Maclura pomifera*	UP
Pecan	*Carya illinoensis*	FF, SF, UP
Post Oak	*Quercus stellata*	UP
Red Mulberry	*Morus rubra*	SF, UP
Redbud	*Cercis canadensis*	UP
Shumard Oak	*Quercus shumardii*	SF, UP
Sugarberry	*Celtis laevigata*	SF, UP
Sweetgum	*Liquidambar styraciflua*	SF, UP
Texas Persimmon	*Diospyros texana*	SF, UP
Texas Red Oak	*Quercus buckleyi*	UP
Water Hickory	*Cayra aquatica*	SW, FF
Water Oak	*Quercus nigra*	SF, UP
Winged Elm	*Ulmus alata*	SF, UP

SHRUBS	SCIENTIFIC NAME	PLANTING AREA
American Beautyberry	*Callicarpa americana*	UP
American Elderberry	*Sambucus canadensis*	SF
Azaleas	*Rhododendron* spp.	UP
Bayberry, Waxmyrtle	*Myrica cerifera*	FF, SF, UP
Buttonbush	*Cephalanthus occidentalis*	SW, FF
Carolina Buckthorn	*Rhamnus caroliniana*	SF, UP
Coralberry	*Symphoricarpas orbiculatus*	UP, SF
Deciduous Holly	*Ilex decidua*	SF, UP
Elbowbush	*Foresteria pubescens*	UP
Farkleberry	*Vaccinium arboreum*	SF, UP
Fragrant Sumac	*Rhus aromatica*	SF, UP
Hawthorn	*Crateagus* spp.	SF, UP
Roughleaf Dogwood	*Cornus drummondii*	SF, UP
Shining Sumac	*Rhus copallina*	UP
Yaupon	*Ilex vomitoria*	SF, UP

Table 6-1 continued

VINES	SCIENTIFIC NAME	PLANTING AREA
Carolina Jessamine	*Gelsemium sempervirens*	SF, UP
Dewberry, Blackberry	*Rubus* spp.	SF, UP
Greenbriar	*Smilax* spp.	SF, UP
Peppervine	*Ampelopsis arborea*	SF, UP
Trumpet Creeper	*Bignonia radicans*	SF, UP
Trumpet Honeysuckle	*Lonicera sempervirens*	SF, UP
Virginia Creeper	*Parthenocissous quinquefolia*	SF, UP
Wild Grape	*Vitis* spp.	SF, UP

FORBS	SCIENTIFIC NAME	PLANTING AREA
Beebalm	*Monarda* spp.	UP
Bluebonnets	*Lupinus* spp.	UP
Bundleflower	*Desmanthus* spp.	UP
Common Sunflower	*Helianthus annus*	UP
Coneflower	*Rudbeckia* spp.	UP
Dayflowers	*Commelina* spp.	SF, UP
Engelmann Daisy	*Engelmannia pinnatifida*	UP
Fleabanes	*Erigeron* spp.	SF, UP
Gayfeather	*Liatris* spp.	SF, UP
Heath Aster	*Aster ericoides*	UP
Maximillian Sunflower	*Helianthus maximiliani*	UP
Partridge Pea	*Cassia fasiculata*	SF, UP
Prairie Coneflower	*Ratibida columnaris*	UP
Sensitivebriar	*Schrankia nuttallii*	UP

GRASSES	SCIENTIFIC NAME	PLANTING AREA
Beaked Panicum	*Panicum anceps*	SF
Broomsedge Bluestem	*Andropogon virginicus*	UP
Florida Paspalum	*Paspalum floridanum*	FF, SF
Green Sprangletop	*Leptochloa dubia*	FF, SF
Eastern Gammagrass	*Tripsacum dactyloides*	UP
Indiangrass	*Sorghastrum nutans*	SF, UP
Inland Sea-oats	*Chasmantium latifolium*	UP
Millet (Jungle-rice)	*Echinochloa colonum*	SF
Purpletop	*Tridens flavus*	UP
Rice Cut-grass	*Leersia oryzoides*	FF, SF
Sideoats Grama	*Bouteloua curtipendula*	UP
Switchgrass	*Panicum virgatum*	SF, UP
Virginia Wildrye	*Elymus virginicus*	UP
White-grass	*Leersia virginica*	FF, SS
Wild Millet	*Echinochloa walteri*	SF

Table 6-1 continued

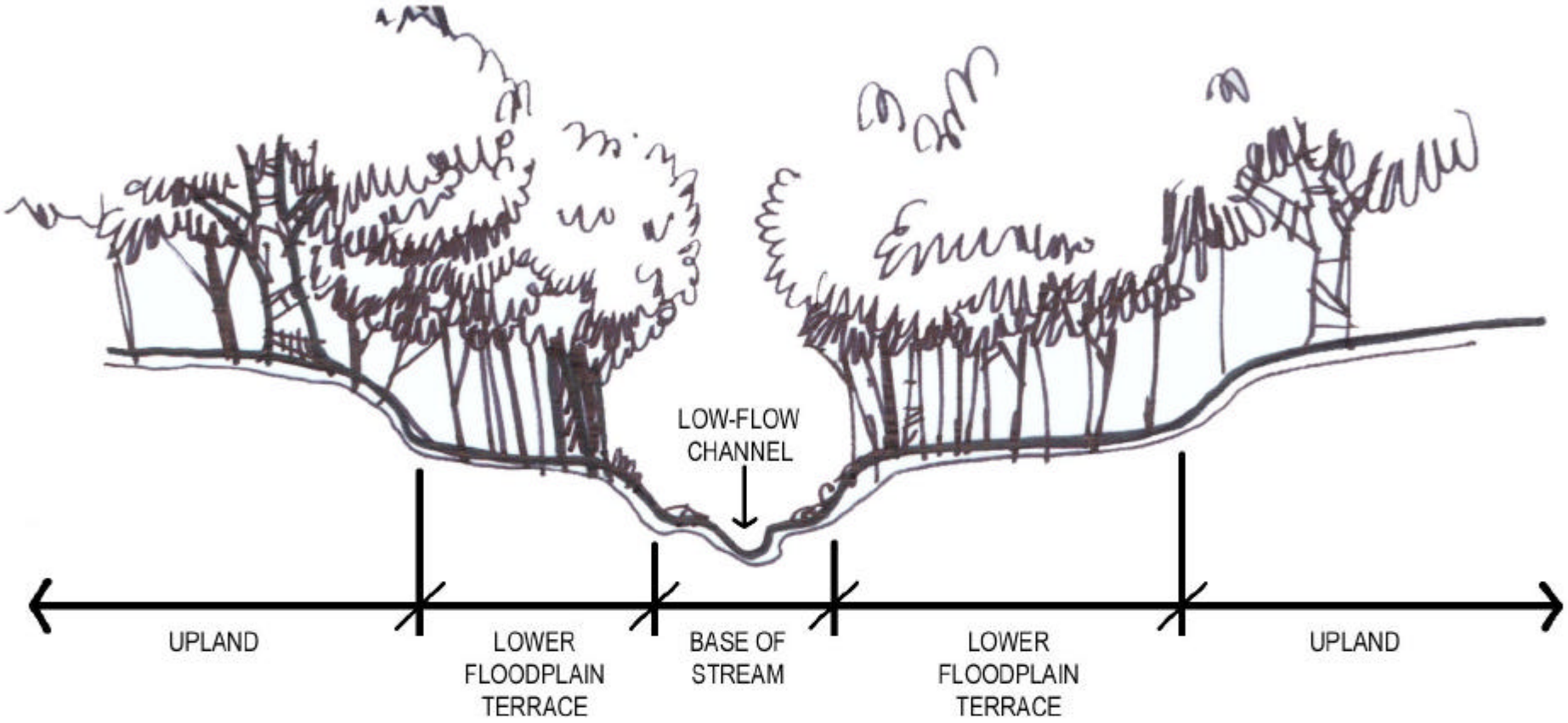
HYDRIC AND AQUATIC	SCIENTIFIC NAME	PLANTING AREA
American Bulrush	*Scirpus americanus* var. *longispicatus*	SW, FF
Arrowhead	*Sagittaria* spp.	SW
Duckweed	*Lemnaceae* spp.	SW
Emory's Sedge	*Carex emoryi*	SW, FF
Flatsedge	*Cyperus* spp.	SW, FF
Giant Bulrush	*Scirpus californicus*	SW, FF
Marsh Millet	*Zizaniopsis miliacea*	SW
Naid	*Najas* spp.	SW
Pondweed	*Potamogeton* spp.	SW
Sedge	*Carex* spp.	SW, FF
Smartweed	*Polygonum* spp.	SW, FF
Soft Rush	*Juncus effusus*	SW, FF
Soft-stem Bulrush	*Scirpus validus*	SW, FF
Spikerush	*Eleocharis* spp.	SW, FF
Water Lotus	*Nelumbo lutea*	SW

SW= standing water FF= frequently flooded SF= seasonally flooded UP= upland

Table Notes:

(1) Where a particular species is not identified for the listed genus, there may be several species that are suitable and available. Only species native to the area will be utilized.

(2) Although 3 species of bulrush and soft rush have been specified, American bulrush will be utilized more extensively. It is typically not as aggressive as giant bulrush, while providing a matted root system capable of stabilizing newly graded slopes better than soft rush and soft-stem rush.



NOTE:

TYPICAL DESIGN FOR EPHEMERAL STREAMS OR OTHER STREAM REACHES HIGH IN THE WATERSHED.

LOW FLOW CHANNEL DESIGNED TO CONVEY THE 1.5 YEAR STORM EVENT.

FIGURE 6-3

TYPICAL STREAM CHANNEL
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

ALCOA, INC.
ROCKDALE, TEXAS

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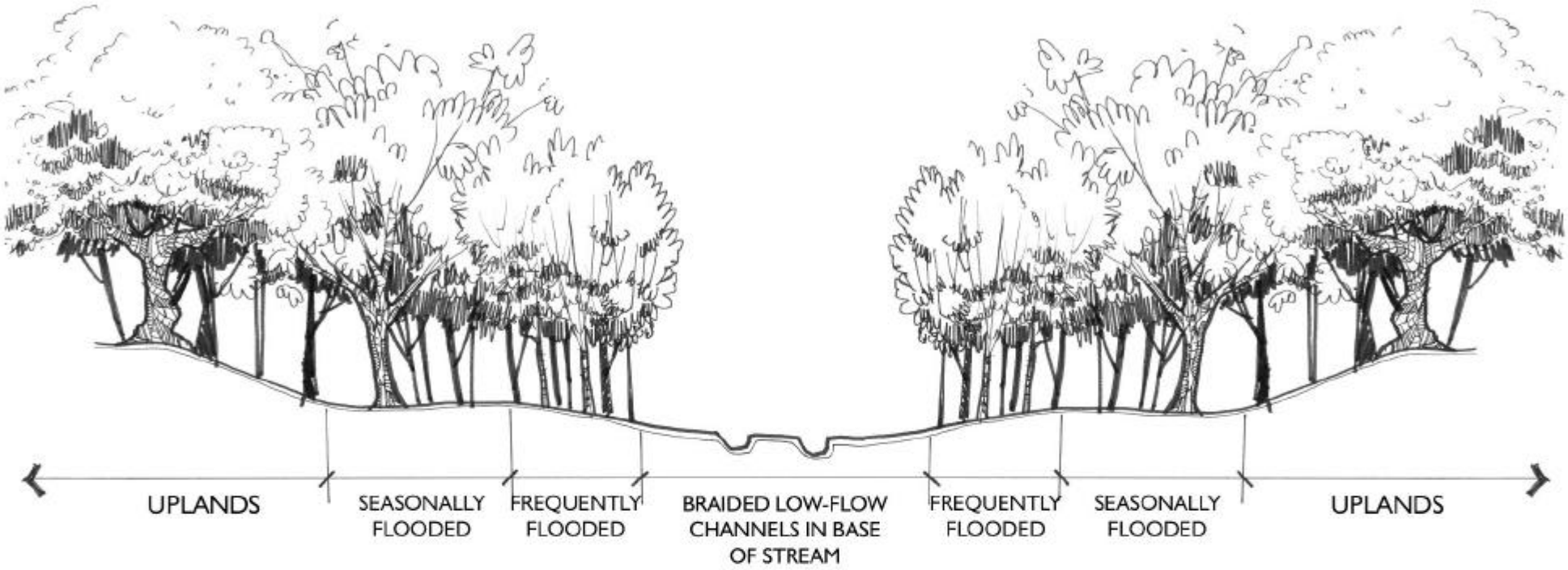

NOTE:

THIS CHANNEL DESIGN TO BE UTILIZED FOR LARGER STREAM REACHES LOW IN THE WATERSHED WITH AN APPROPRIATE HYDROLOGY.

FIGURE 6-4

CROSS-SECTION OF BRAIDED
STREAM CHANNEL
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

ALCOA, INC.
ROCKDALE, TEXAS

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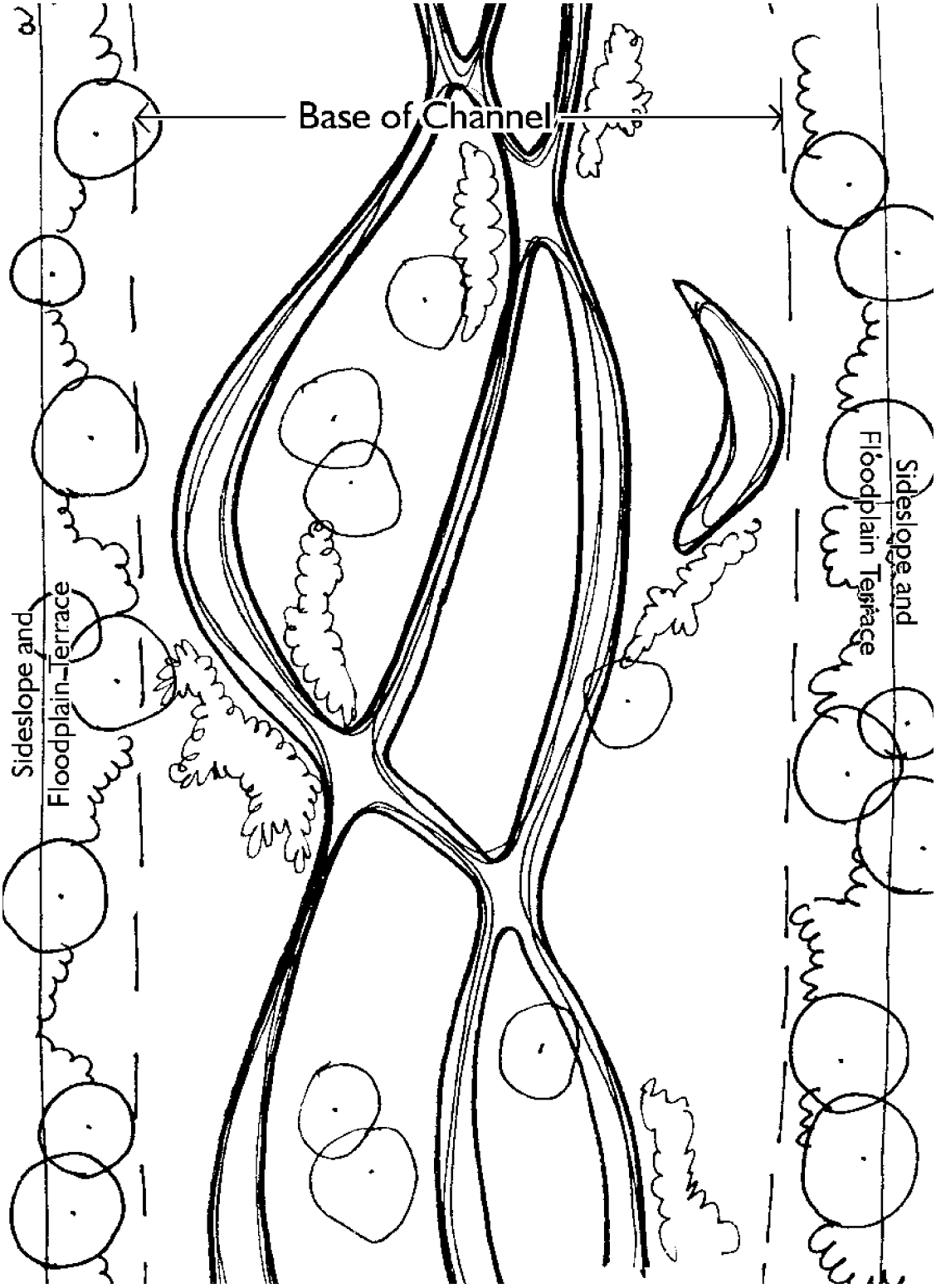

SOURCE: RICHARDSON VERDOORN (2002)

FIGURE 6-5

PLAN VIEW OF
BRAIDED STREAM CHANNEL
THREE OAKS MINE
BASTROP AND LEE COUNTIES

ALCOA INC.
ROCKDALE, TEXAS

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Horizon
Environmental Services, Inc.

Constructed wetlands will be relatively small. Typically, the wetland depressions will be 0.25 to 0.50 acres in size and will not exceed 2.5 feet in depth. The perimeter of the wetlands will be irregular and sideslopes will be gentle (flatter than 5:1) to mimic natural conditions (Figure 6-6). The depressions will be planted throughout with herbaceous species to mimic natural wetlands in the area. Hydrophytic trees and shrubs will be planted around the perimeter of the wetlands to increase habitat diversity and to integrate the wetlands into the upland riparian corridor planting.

6.3.4 Pond Design

Ponds retained or constructed as part of permanent reclamation will be constructed off-channel but within the floodplain. To mimic natural conditions and prevent erosion, sideslopes will be gentle (flatter than 4 to 1). Wherever practicable, ponds will be constructed with a shallow, gently sloping (approximately 10 feet wide, not to exceed 2.5 feet deep) planting bench around their perimeter (Figure 6-7). Planting benches will be vegetated throughout with native hydrophytic and aquatic herbaceous species from Table 6-1. Native tree and shrub species will be scattered throughout the planting benches and may dominate portions of the planting bench in several ponds. As with stream reclamation, the general location and size of ponds can be calculated, but the final placement and configuration will depend on final grading, micro-topography, and surrounding ecosystems.

6.4 DEPRESSURIZATION WATER FOR WETLANDS

Depressurization water may be utilized to subsidize water on an as-needed basis for establishing temporary wetlands and permanent wetland vegetation.

6.5 SUMMARY OF MITIGATION DEBT FOR PERMANENT IMPACTS

As previously determined, the proposed mine plan will impact 198,418 LF of streams. As partial mitigation and to comply with RRC standards, impacted reaches of stream will be restored at a ratio of 1:1 (LF) in final reclamation. Final reclamation strives to approximate pre-construction contours, which will assist with restoring stream channels to their approximately historical flow paths. Due to limited topographic relief at the Three Oaks Mine Permit Area, it is unlikely that any additional stream length (above pre-construction measurements) can legitimately “fit” into the landscape. Therefore, required mitigation at ratios greater than 1 to 1 must be achieved by alternative mitigative measures. Table 6-2 provides the lengths of stream channels, categorized by stream quality, located within the Three Oaks Mine Permit Area disturbance boundary. The table also includes the agreed-upon mitigation ratios and provides calculated mitigation requirements and mitigation debt following on-site reclamation.

TABLE 6-2
MITIGATION RATIOS AND ACREAGE TOTALS

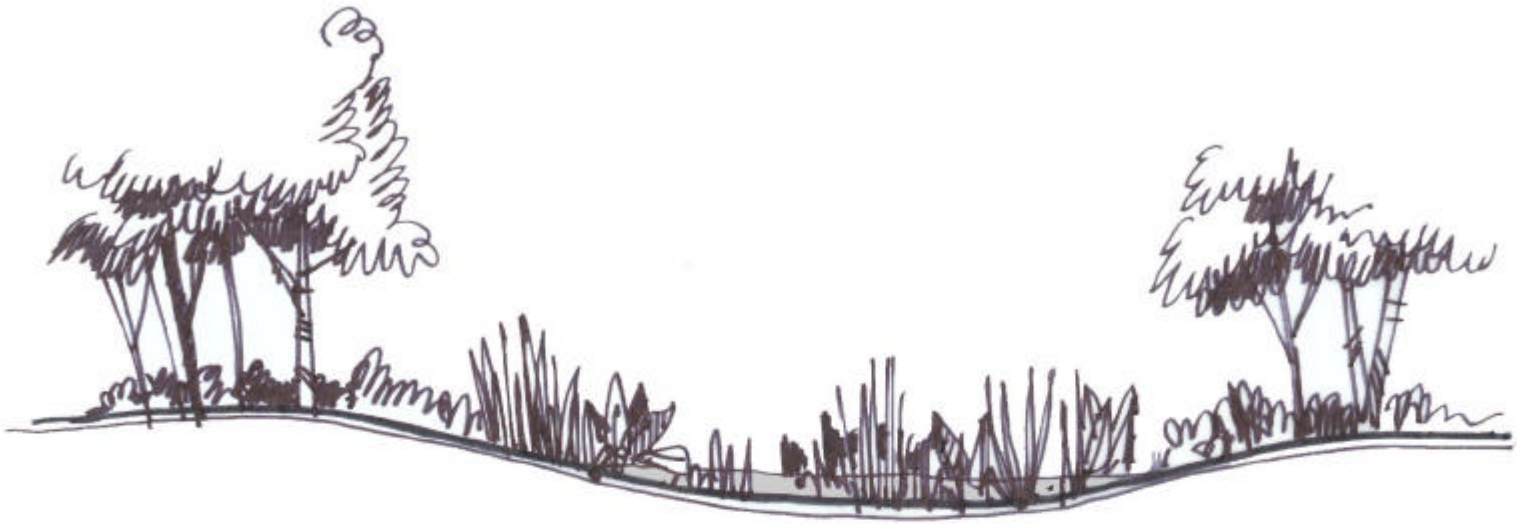
"Waters of the US"	Disturbance Area (LF)	(AC)	Mitigation Ratio	Required Mitigation (LF)	(AC)	Mitigation Debt (LF)	(AC)
Stream Low-Quality	51,511	6.7	1:1	51,511	6.7	0	0
Stream Medium-Quality	123,537	13.3	1.5:1	185,306	20.0	61,769	6.7
Stream High-Quality	23,370	3.6	2:1	46,740	7.2	23,370	3.6
Stream Subtotal	**198,418**	**23.6**	**–**	**–**	**33.9**	**85,139**	**11.3**
Wetland	–	5.3	2 :1	–	10.6	–	5.3
Pond	–	38.5	1.5:1	–	57.8	–	19.3
Total	**198,418**	**67.4**	–	**283,557**	**102.3**	**85,139**	**35.9**

6.6 MIDDLE YEGUA MITIGATION SITE

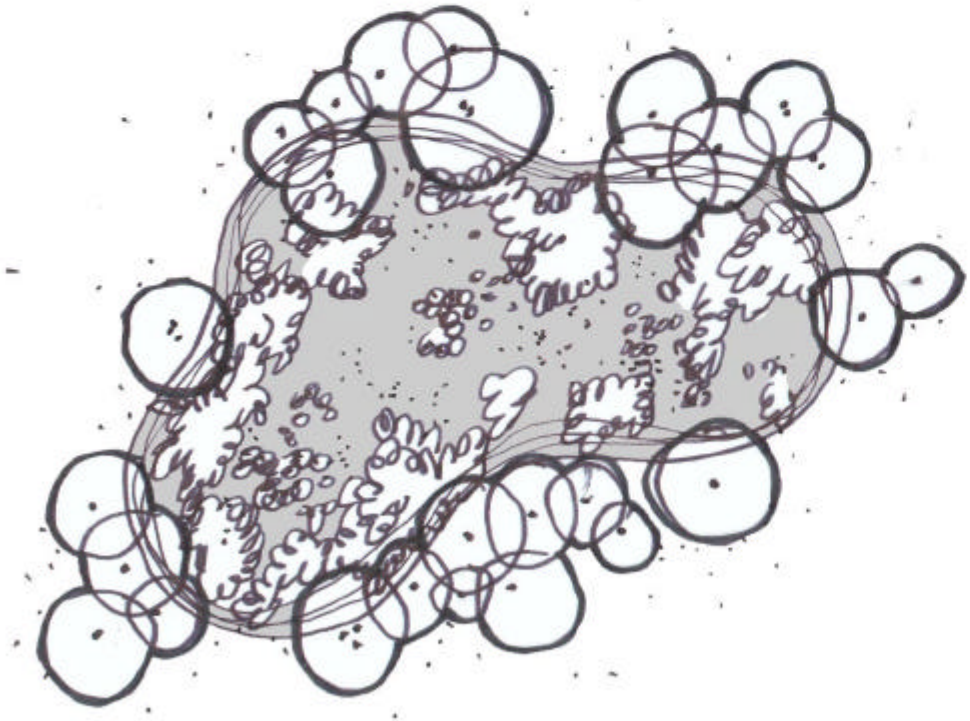
This portion of the mitigation plan will be initiated during the first year of mining to provide additional compensation for short-term impacts in the first years of mining. The grading and planting will be completed within 2 years of receipt of all appropriate permits. Although the riparian corridor within the proposed mitigation site is currently impacted and of medium quality, there are significant enhancement opportunities to improve the overall quality, long-term sustainability, and species composition (Figure 6-8). As will be discussed later, the mitigation site will be surveyed and a fence will be erected to ensure that no further impacts occur due to cattle grazing, etc.

As discussed previously, the mitigation site currently has canopy coverage of approximately 40%, with the sparsely vegetated openings dominated by shrub and herbaceous species. These "openings" (approximately 60% of the total acreage) will be targeted for enhancement. Enhancements include excavating small, shallow depressions within the floodplain, planting herbaceous hydrophytic species within the depressions, adding low rock berms and snag piles, and planting trees and shrubs throughout the corridor to enhance species diversity. The excavated depressions will vary significantly based on site-specific parameters and are projected to occupy approximately 8 acres. An effort will be made to situate the depressions so that mature, desirable trees and shrubs are avoided wherever possible. Some depressions will simulate oxbows, while others will have a more circular shape (Figures 6-9 and 6-10).

Typically, the depressions will be 0.25 to 0.50 acres in size and will not exceed 2.5 feet in depth. Sideslopes will be gentle (flatter than 5:1) to mimic natural conditions. The depressions will be planted with primarily herbaceous species; however, several hydrophytic trees and shrubs will be planted around the perimeter of these features where space allows. Excavated material will be formed into raised islands in the floodplain area (but not within jurisdictional areas) and vegetated with trees and shrubs to create diversity and a refugia. If trees are removed to create the depressions, the resulting logs will be placed in piles in the floodplain to create wildlife habitat and to potentially impound water during high flows.



CROSS-SECTION



PLAN VIEW

NOTE:

BASE OF DEPRESSION NOT TO EXCEED 2.5 FEET

FIGURE 6-6

TYPICAL WETLAND DESIGN
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

ALCOA, INC.
ROCKDALE, TEXAS

USACE APPLICATION NO. 199900331

JANUARY 23, 2003

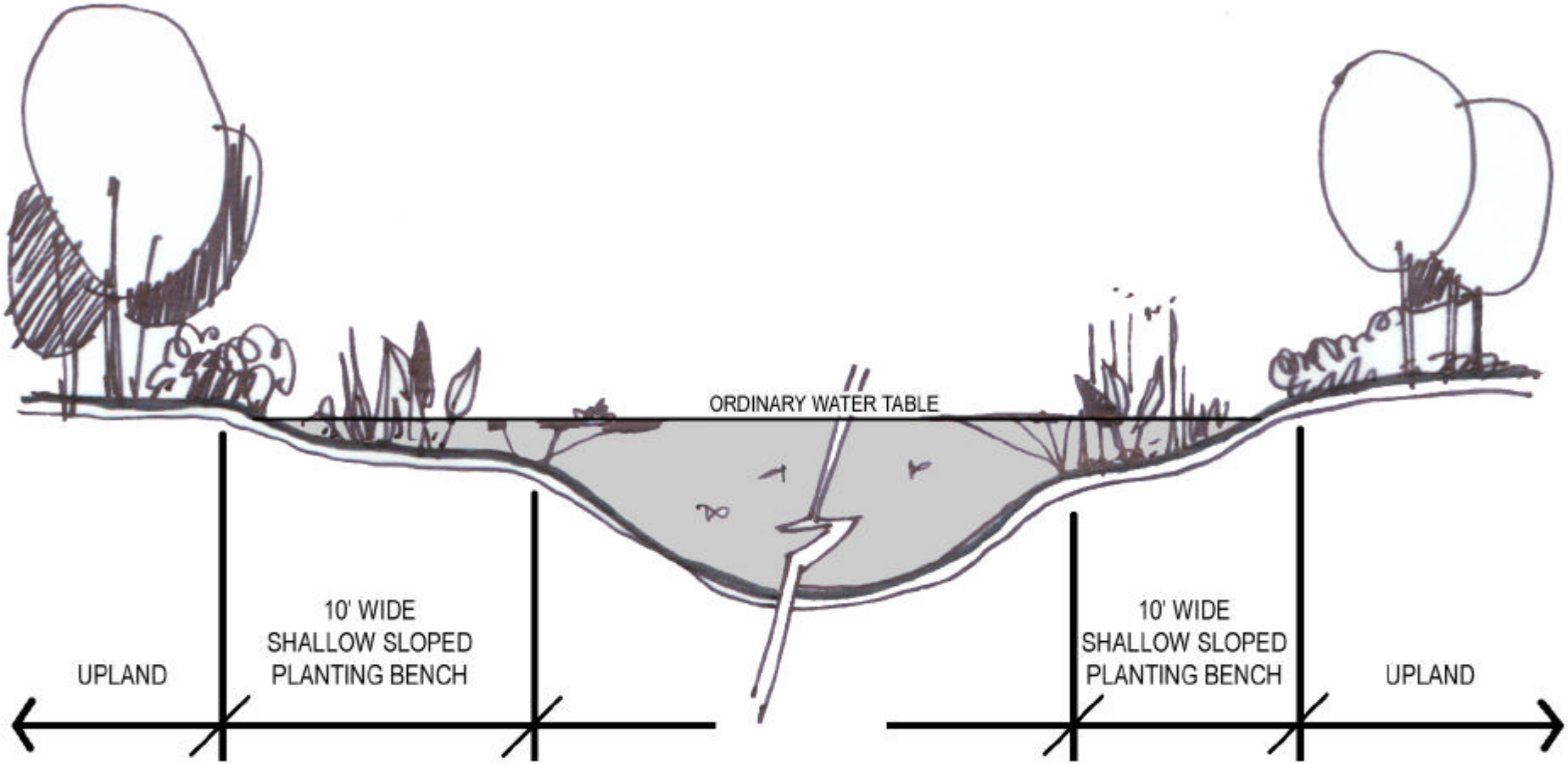


FIGURE 6-7

TYPICAL POND DESIGN
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

ALCOA, INC.
ROCKDALE, TEXAS

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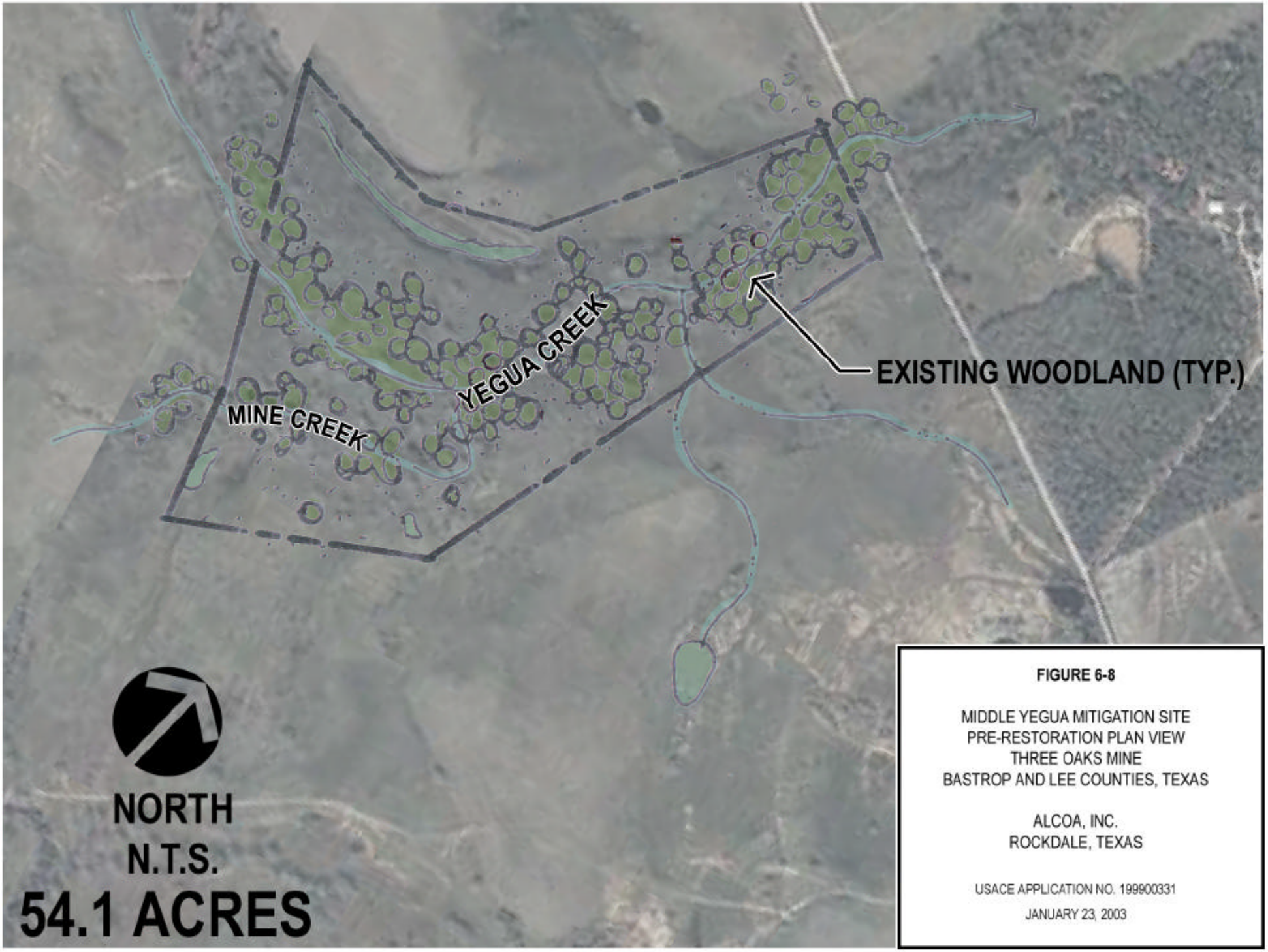

FIGURE 6-8

MIDDLE YEGUA MITIGATION SITE
PRE-RESTORATION PLAN VIEW
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

ALCOA, INC.
ROCKDALE, TEXAS

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JANUARY 23, 2003

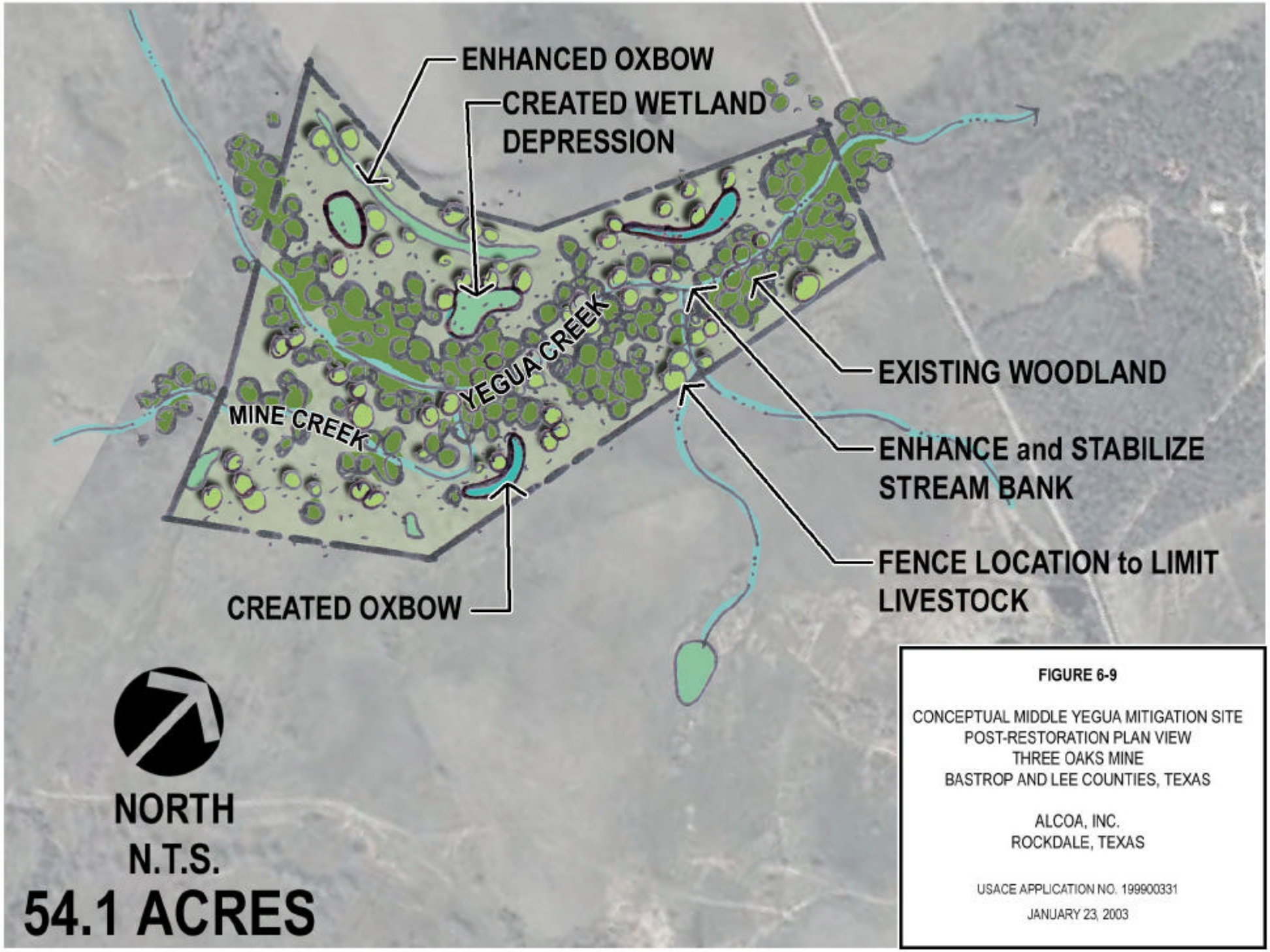


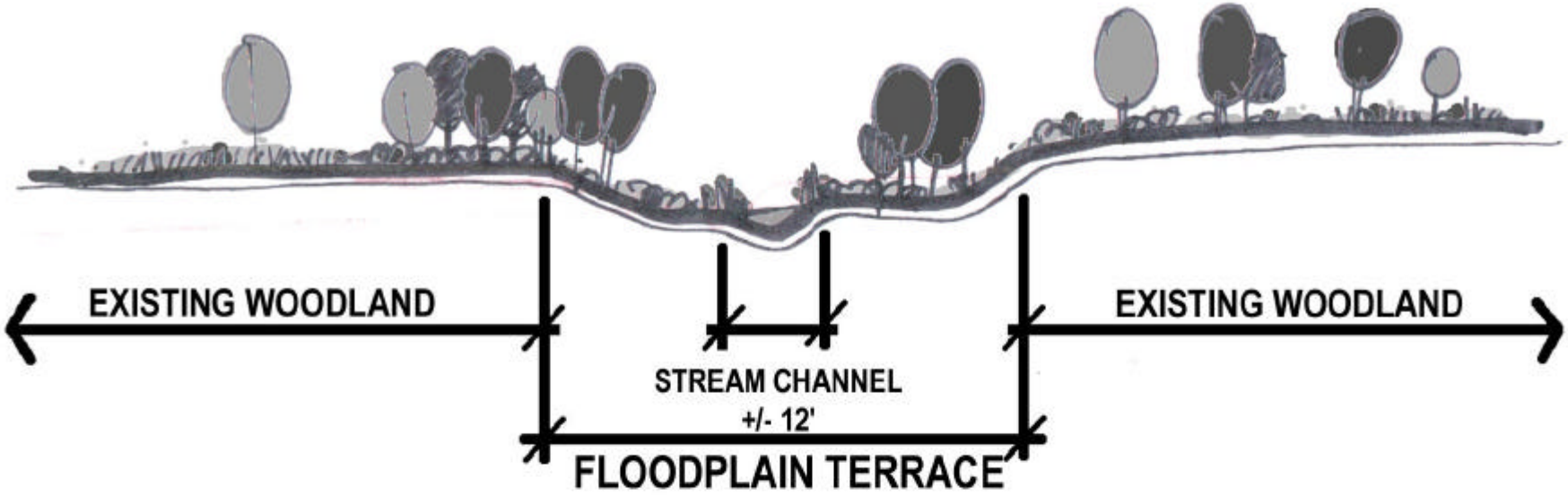
FIGURE 6-9

CONCEPTUAL MIDDLE YEGUA MITIGATION SITE
POST-RESTORATION PLAN VIEW
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

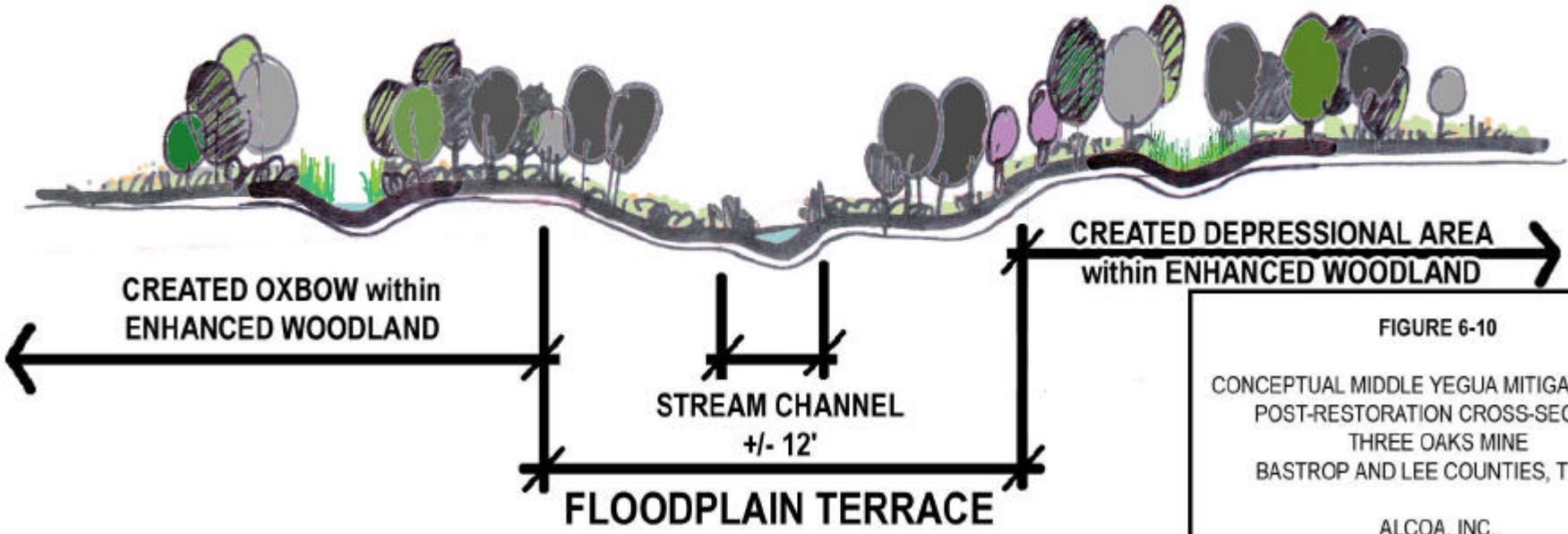
ALCOA, INC.
ROCKDALE, TEXAS

USACE APPLICATION NO. 199900331

JANUARY 23, 2003



EXISTING CONDITIONS CROSS-SECTION



PROPOSED CONDITIONS CROSS-SECTION

FIGURE 6-10

CONCEPTUAL MIDDLE YEGUA MITIGATION SITE
POST-RESTORATION CROSS-SECTION
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

ALCOA, INC.
ROCKDALE, TEXAS

USACE APPLICATION NO. 199900331

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Low rock berms may also be planted parallel to the stream channel to further impound floodwaters. The berms will be up to 12 inches tall and 20 feet long and interspersed throughout the lower terraces perpendicular to the stream channel. The berms will be constructed from a variety of natural, large-diameter rocks native to the site. The berms are intended to detain water to increase the hydroperiod in the area immediately upgradient, so that these areas will support hydrophytic species and eventually develop wetland characteristics.

Based on all of the previously described measures, enacting the mitigation plan will result in significant increases in value, function, and habitat quality of upland and wetland areas, as well as stream channels. Created wetlands will provide additional wildlife habitat, increase species diversity, improve stormwater quality, and increase storage capacity of the floodplain. The removal of cattle will reduce erosion, remove a contaminant source, and increase vegetation species diversity and percentage cover, allowing the reestablishment of wildlife habitat. Tree and shrub plantings will also improve species diversity, create wildlife habitat, reduce erosion potential during flood events, etc. The mitigation site occupies an important position in the landscape because it encompasses stream reaches of 2 major streams immediately downgradient of the disturbance area. Therefore, it is predicted that water quality improvements will be realized for a substantial distance downstream of the mitigation site, especially in the reduction of transported sediments and bacteria and the increase of species diversity via recruitment downgradient. Due to the mitigation site's position in the landscape, the proposed enhancement of the entire site, and the fact that the site will be maintained and protected in perpetuity, the mitigation will have a greater positive effect then comparable mitigation within the disturbance area. Additional benefits to the watershed and downstream reaches of Middle Yegua Creek further increase the value of the proposed mitigation.

6.7 BIG SANDY MITIGATION SITE

This portion of the mitigation plan will be implemented in the first year that mining takes place south of CR 102. Although the riparian corridor within the proposed mitigation site is currently impacted and characterized as low to medium quality, there are significant enhancement opportunities to improve the overall quality, long-term sustainability, width, and species composition (Figure 6-11). The low-quality designation describes reaches of the riparian corridor that have only a narrow band of existing trees with little to no species diversity, an overgrazed and heavily trampled understory, and other perturbations such as bricks along the banks of the stream/impoundment. The riparian corridor is characterized as medium quality in areas with a broader wooded corridor, more mature trees, and greater species diversity (generally downgradient of the impoundment). Unfortunately, most of these areas have also been subjected to over-grazing, trampling, erosion, deposition of bricks, etc.

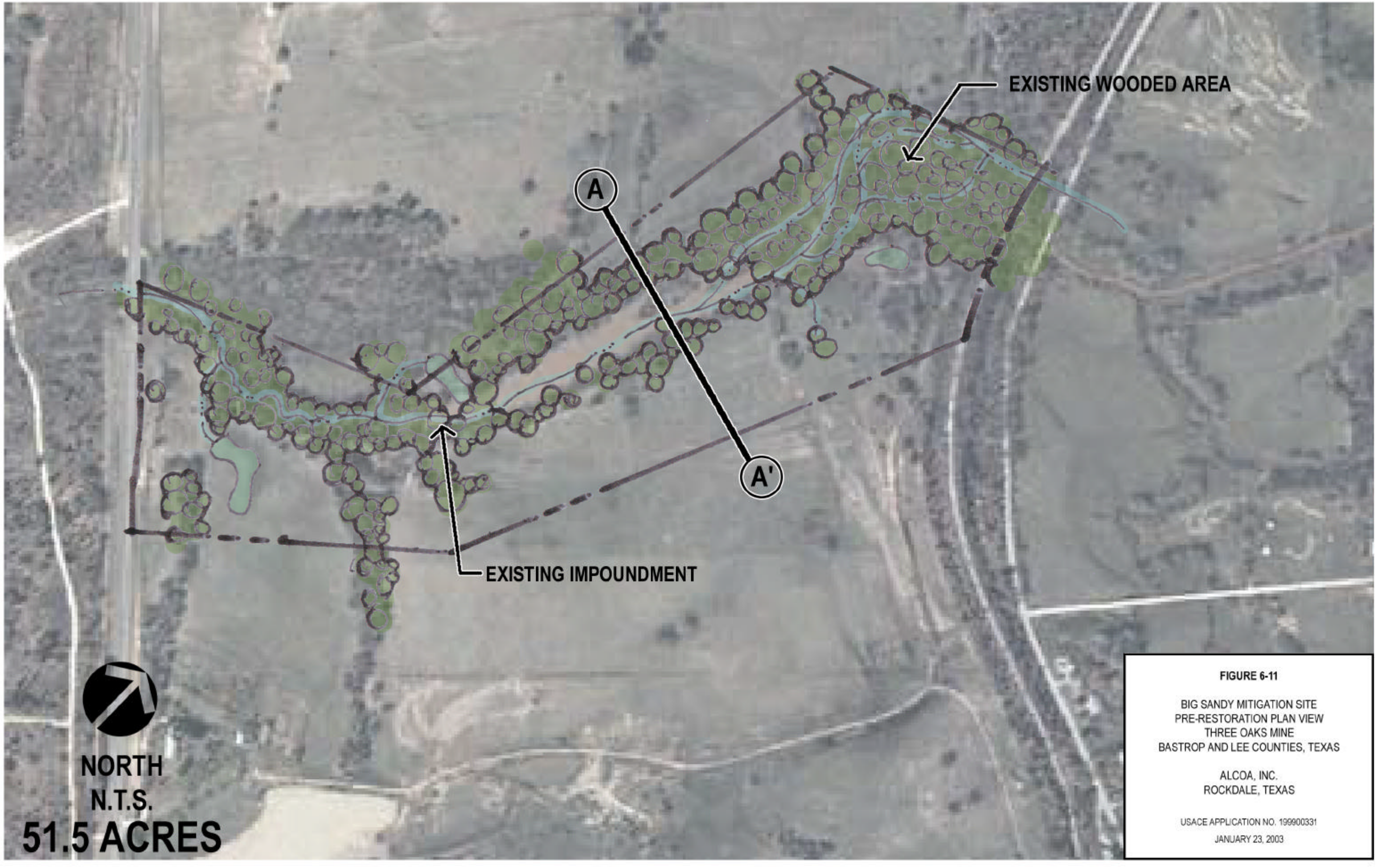


FIGURE 6-11

BIG SANDY MITIGATION SITE
PRE-RESTORATION PLAN VIEW
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

ALCOA, INC.
ROCKDALE, TEXAS

USACE APPLICATION NO. 199900331

JANUARY 23, 2003

As will be discussed later, the mitigation site will be surveyed and a fence will be erected to ensure that no further impacts occur due to cattle grazing, stream modification, etc. A cultural resources investigation will be performed on the site prior to any earthmoving activities to ensure that no significant cultural resources are impacted by the mitigative efforts. To restore Big Sandy Creek, the dam will be removed and the creek channel and 2 floodplain terraces will be restored (Figures 6-12 and 6-13). This will require excavation to remove the earthen impoundment and potential re-contouring of the stream channel and floodplain terraces within the currently impounded reach of the creek. Dam removal will be performed during a period when no rain is expected. Prior to earthmoving activities, water in the impoundment will be drawn down and any flow will be continuously pumped around the dam during excavation. Dam removal and floodplain re-contouring will require a minimum of a back hoe and a bull dozer. The restored, unvegetated floodplain terraces will then be planted with native tree, shrub, and herbaceous species, as described for the Middle Yegua Mitigation Site. BMPs will be utilized during all phases of the restoration work from water level drawdown through re-vegetation to minimize impacts to downgradient reaches. Despite implementation of BMPs, sediment transport and turbidity will likely be increased downgradient of these restoration activities until the stream reaches a sediment transport balance.

Removing the dam will result in significant restoration of more than 1,400 LF of the creek and its floodplain, which had been impacted by the impounded water. The dam removal will also reduce periodic flooding, associated with high rainfall events, up to 0.5 mile upgradient of the dam on both Big Sandy and Chocolate creeks. Removing the dam will also restore a significant portion of the creek's floodplain immediately downgradient of the dam, which is currently by-passed by the brick-lined overflow. Some hyrdophitic vegetation persists in this portion of the floodplain supported by leakage beneath the dam, but the historic creek channel is largely obscured by deposited sediment and organic material. The sediment transport balance will also be restored (by transporting sediments downstream that, under the current conditions, settle out immediately upgradient of the dam), reducing scour and erosion further downgradient. Additionally, the spill-over channel that was the most significantly impacted reach of the existing Big Sandy Creek system will be removed from the creek system. Floodplain terraces will replace this completely brick-lined, narrow, and fast-moving reach of "creek."

Two of the identified seeps were located within pastureland and were dominated by bermudagrass. The seeps and the portion of their flow-ways with appropriate hydrology will be planted with a minimum of 8 hydrophytic, herbaceous species at a rate of 400 per acre. This will enhance approximately 1 acre of existing seep and flow-way. The centrally located seep is within a very narrow, wooded corridor. Removing cattle will improve the system significantly; however, the lower reaches will also be augmented with herbaceous plantings to stabilize the banks and improve water quality.

A tree and shrub planting will also be conducted within uplands in the riparian corridor to broaden it and increase its habitat value. The plantings will be conducted within the broad riparian corridor as described for the Middle Yegua Mitigation Site. The wooded portion of the riparian corridor will be a minimum of 300 feet wide and more than 500 feet wide in the northern portion of the site. An approximately 12-acre portion of the site, not intended to be wooded, will be disked to enhance seed set and planted with an appropriate mix of native tall grasses and wildflowers. The seed mix to be utilized will be a minimum of 5 grasses and 6 wildflowers from the Recommended Grassland Species List (Table 6-3).

TABLE 6-3
RECOMMENDED GRASSLAND SPIECES LIST

NATIVE GRASSES	**SCIENTIFIC NAME**
Big Bluestem	*Andropogon gerardii*
Blue Grama	*Bouteloua gracilis*
Buffalograss	*Buchloe dactyloides*
Bushy Bluestem	*Andropogon glomeratus*
Eastern Gamagrass	*Tripsacum dactyloides*
Green Sprangletop	*Letochloa dubia*
Indiangrass	*Sorghastrum nutans*
Little Bluestem	*Schizachyrium scoparium*
Purple Three-Awn	*Aristida pupurea*
Sideoats Grama	*Bouteloua curtipendula*
Switchgrass	*Panicum virgatum*

TOTAL: 1 LB/1000 SQUARE FEET

WILDFLOWERS	**SCIENTIFIC NAME**
Black-Eyed Susan	*Rudbeckia hirta*
Bluebonnet	*Lupinus texensis*
Bundleflower	*Desmanthus illinoensis*
Clasping Coneflower	*Rudbeckia amplexicaulis*
Coreopsis	*Coreopsis tinctoria*
Cutleaf Daisy	*Engelmannia pinnatifida*
Greenthread	*Thelesperma filifolium*
Huisache Daisy	*Amblyolepis setigera*
Indian Blanket	*Gaillardia pulchella*
Lemon Bee Balm	*Monarda citriodora*
Partridge Pea	*Cassia fasciculata*
Phlox	*Phlox drummondii*
Pink Evening Primrose	*Oenothera speciosa*
Purple Prairie Clover	*Petalostemum purpurea*
Scarlet Sage	*Salvia coccinea*

TOTAL: 1 LB/1000 SQUARE FEET

Note: This list is not exhaustive and is meant to provide a representative sample of the species to be utilized. Additional species may be utilized for the purpose of enhancing the grassland. However, all species utilized will be from a local source (within the State of Texas) and native to the Three Oaks Mine Permit Area.

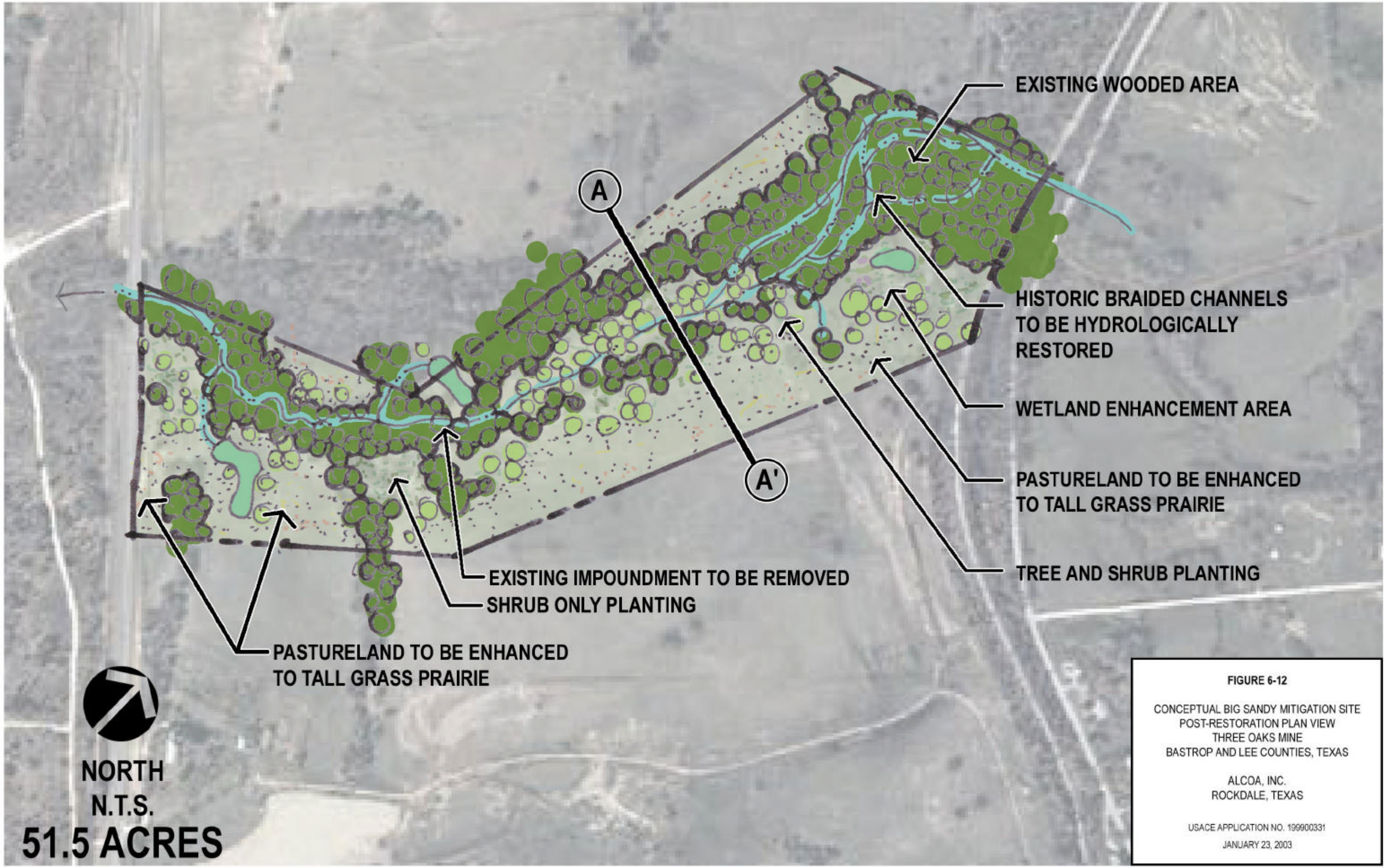


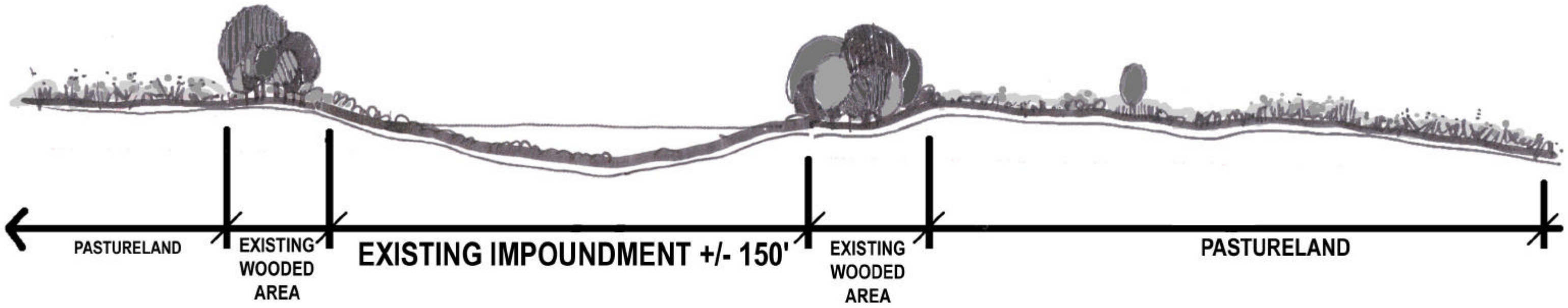
FIGURE 6-12

CONCEPTUAL BIG SANDY MITIGATION SITE
POST-RESTORATION PLAN VIEW
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

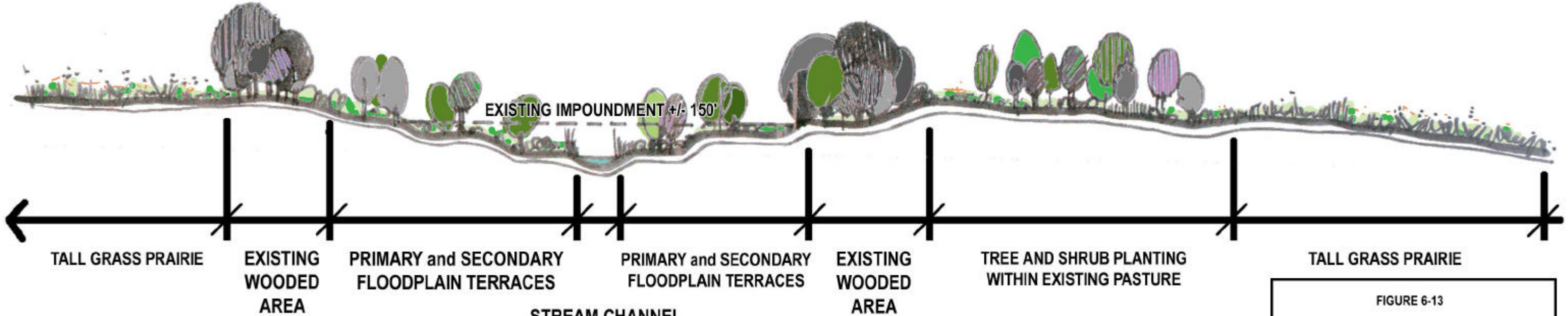
ALCOA, INC.
ROCKDALE, TEXAS

USACE APPLICATION NO. 199900331

JANUARY 23, 2003



EXISTING SECTION A/A'



PROPOSED SECTION A/A'

FIGURE 6-13

CONCEPTUAL BIG SANDY MITIGATION SITE
POST-RESTORATION CROSS-SECTION
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

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ROCKDALE, TEXAS

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As identified on Figure 4-2, the site also contains 3 relatively small, impounded areas that are likely remnant stock tanks that were constructed off-channel. No earth-moving or hydrologic modifications are proposed to enhance these impounded areas due to the mature trees at their perimeters. Although the sideslopes of these features appear to be quite steep beneath the water's surface, a few aquatic species, such as lotus (*Nelumbo* sp.) and pondweed (*Potamogeton* sp.), may be planted in areas deemed appropriate in order to try and increase the diversity and habitat value of these impounded features. No trees will be planted in the immediate area due to the existing mature trees; however, a shrub and herbaceous planting will be conducted at the pond's perimeter in an effort to further increase the "value" of these features. Recommended species from Table 6-1 will be utilized with an emphasis on shade-tolerant species with wildlife feed values such as buttonbush (*Cephalanthus occidentalis*), deciduous holly (*Ilex decidua*), yaupon, American beautyberry (*Callicarpa americana*), and inland sea-oats (*Chasmantium latifolium*).

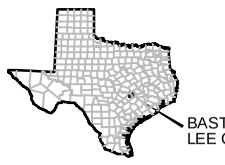
As with the Middle Yegua Mitigation Site, a broad riparian corridor (a minimum of 500 feet wide and up to 800 feet wide) will be fenced and deed-restricted to protect it in perpetuity. Therefore, this mitigation site will provide all of the functions and values of the Middle Yegua Mitigation Site, with the added benefit of restoring more than 1,440 LF of Big Sandy Creek and floodplain upgradient of the dam; reducing the existing flooding problem (and subsequent water-quality degradation) up to 0.5 miles upgradient of the dam on both Big Sandy and Chocolate creeks; restoring the hydrology of several hundred LF of creek immediately downgradient of the dam; removing the highly erosive reach of the overflow channel from the system; hydrologically restoring approximately 945 LF of braided channel; significantly improving the water quality and function of 3 seeps on the site and their drainages (697 LF) that flow to Big Sandy Creek; and enhancing 3 currently low-quality impounded areas on the site. Due to the mitigation site's position in the landscape, the proposed enhancement of the entire site, benefits to the stream both up- and downgradient of the mitigation site, and the fact that the site will be maintained and protected in perpetuity, the proposed mitigation is anticipated to provide much greater ecological benefit than existing low- to medium-quality streams within the disturbance area or existing conditions at the proposed mitigation site.

6.8 DEED RESTRICTED RIPARIAN CORRIDORS WITHIN RECLAIMED AREA

Deed restrictions will be placed over 30,498 LF totaling 70.0 acres (see Section 6.9 for mitigation calculation) of significant reclaimed reaches of Willow and Mine creeks (Figure 6-14). The stream (creek) restoration will be performed to the specifications identified previously for "Innovative Stream Channel Design." Currently, these creeks have an ideal hydrologic setting for a mitigation site. Most reaches of the creeks to be deed restricted are calculated to have appropriate hydrology in their reclaimed state to support 2 floodplain terraces and a 100-foot-wide riparian corridor. They will form an extensive corridor traversing a broad portion of the disturbance area and are generally low in the watershed, so they will provide tertiary treatment for many of the reclaimed tributaries. The deed-restricted corridor is also important in providing a wildlife corridor that traverses a large section of the disturbance boundary and ties together numerous other tributary corridors. During final reclamation, SP-1 will be removed and that reach of the creek will be restored as described, further enhancing the quality of the corridor.

DRAFT BY	JEA 1/28/03	REVISED BY	JEA 2/3/03	DRAWING ID-FILE	990022B13PA-COE

MAP SOURCE:
PROVIDED BY ALCOA, INC. (JANUARY 2003)



BASTROP AND LEE COUNTIES

0 1800 3600
FEET

Horizon Environmental Services, Inc.

"Do Not Scale This Drawing"

EXPLANATION

- RECLAMATION PONDS
- DISTURBANCE BOUNDARY
- THREE OAKS PERMIT AREA BOUNDARY
- OFF-SITE MITIGATION AREA BOUNDARY
- HIGH-QUALITY, DEED-RESTRICTED STREAMS ON ALCOA PROPERTY (13764 LINEAR FEET)
- HIGH-QUALITY, DEED-RESTRICTED STREAMS ON C.P.S. PROPERTY (16734 LINEAR FEET)
- RECLAIMED STREAM AND STREAM LENGTH (LINEAR FEET)

FIGURE 6-14

HIGH-QUALITY, DEED-RESTRICTED
RIPARIAN CORRIDORS
POST MINE RECLAMATION
THREE OAKS MINE
BASTROP AND LEE COUNTIES

ALCOA INC.
ROCKDALE, TEXAS

USACE APPLICATION NO 199900331
JANUARY 28, 2003

The deed-restricted corridors will be surveyed and fenced to delineate them and prevent any unauthorized activity. Appendix B provides a sample deed restriction. Due to the innovative design and resultant water-quality benefits, as well as wildlife habitat benefits, stream lengths with this level of enhancement and protection will have mitigative credit of 2:1.

6.9 SUMMARY OF MITIGATION DEBT FULFILLMENT

The following table (Table 6-4) summarizes the proposed mitigation package.

TABLE 6-4
MITIGATION CALCULATION

Mitigation Category	Mitigation (LF)	Mitigation (AC) stream only	Mitigation Credit (LF)	Mitigation Credit (AC) stream only
Middle Yegua Mitigation Site	4,204	1.0	12,612	2.9
Big Sandy Mitigation Site				
Riparian Corridor Enhancement	4,955	2.8	14,865	8.4
Dam Removal	1,440	0.8	1,440	0.8
Braided Channel Restoration	945	0.4	945	0.4
Seep/flow-way Enhancement	697	0.1	2,091	0.3
Additional High-Quality Stream Mitigation Credits	--	--	8,583	--
Deed Restricted Corridor	22,302	12.8	44,603	25.6
Total	**34,543**	17.9	**85,139**	38.4

The 54.1-acre Middle Yegua Mitigation Site encompasses reaches of both Middle Yegua and Mine creeks and their confluence within a broad floodplain. The floodplain also contains some of the highest-quality wetlands identified within the Three Oaks Permit Area. Stream reaches within the mitigation site are lower in the watershed than those being impacted. Whereas much of the impacted stream length is ephemeral with a narrow riparian corridor, the mitigation site has a more permanent hydroperiod and will have a broad, wooded riparian corridor. However, the Middle Yegua Mitigation Site has been significantly impacted by tree and shrub clearing, over-grazing, and trampling. Previously described mitigative efforts include tree, shrub, and herbaceous plantings; creating wetland depressions and oxbows; and protecting the site in perpetuity via deed restriction. The proposed mitigative actions will create a diversity of high-quality, native riparian habitats within the broad floodplain which will result in both on-site and downstream beneficial effects. The close proximity of the mitigation site to disturbed areas makes it an excellent refugia for temporarily displaced wildlife. Water quality and water storage capacity within the mitigation site should be significantly increased by the mitigative actions proposed, and benefits provided on the site will extend a distance downstream. For example, improved water quality and reduced sediment load in the stream benefits all downstream reaches. Due to the enhancement of the entire 54.1-acre mitigation site, the site's subsequent management and preservation in perpetuity, aquatic resource creation, and ecological benefits downstream of the mitigation site, the 4,204 LF of stream present within the mitigation site is attributed a mitigative value equivalent to12,612 LF relative to existing stream conditions within the disturbance area.

The 51.5-acre Big Sandy Mitigation Site encompasses an estimated 4,955 LF of stream channel, of which more than 1,440 LF is permanently impounded by an earthen dam. As previously described, the riparian corridor is currently low to medium quality and the stream has had many perturbations in addition to the impoundment. Cattle over-grazing and trampling, the creation of maintained bermudagrass pasture, dumping of bricks and other debris, etc. all contribute to the degraded status of the riparian corridor. The proposed tree, shrub, and herbaceous plantings, coupled with the removal of cattle and debris and protection of the site in perpetuity via deed restriction, will significantly improve the ecological function in the stream and riparian corridor both on the site and downstream; therefore, 14,865 LF of credit was attributed to this portion of the mitigation plan. The dam removal provides another significant increase to the function and value of the stream. The impoundment causes flooding on Big Sandy Creek up to 0.5 miles upstream and associated flooding on Chocolate Creek. Floodwaters flush high nutrient areas, causing water-quality degradation following high rainfall events. Sediment-starved reaches of stream immediately below the dam contribute to erosion and incising. Restoration of the stream channel and floodplain terraces will also provide an increase in functional stream length. An additional 1,440 LF of credit was attributed to this portion of the mitigation plan. Restoration of existing, braided channels by reestablishing their hydrology and herbaceous vegetation provides 945 LF of credit because, in their current condition, they provide little value and potentially contribute significantly to the sediment and nutrient load in Big Sandy Creek. Seep/flow-way enhancement not only increases the value of those systems (which are currently highly degraded), but also improves water quality; helps restore the natural hydroperiod of the entire mitigation site—and subsequently Big Sandy Creek; and increases diversity and habitat quality within the riparian corridor. Therefore, an additional 2,091 LF credits were assigned to the Big Sandy Mitigation Site, increasing the site total to 19,341 LF.

Based on these calculations, a total of 31,953 LF of high-quality stream mitigation credit will be generated by the 2 off-site mitigation areas. The total debt (as calculated in Table 6-2) for high-quality mitigation was 23,370 LF, resulting in 8,583 LF of additional high-quality stream mitigation credits, more than needed to satisfy the mitigation debt for impacts to high quality “waters of the US.” Because this high-quality mitigation credit is assigned for restoration and enhancement of streams that are low in the watershed with relatively permanent hydroperiods and broad, diverse riparian corridors, fewer LF of stream corridor is necessary to provide the equivalent functions and values provided by medium-quality streams. Therefore, the additional high-quality credits will be utilized to satisfy mitigation debt associated with impacts to 17,166 LF of medium-quality stream, thereby reducing the mitigation debt for medium-quality streams from 61,769 LF to 44,603 LF.

To fulfill the remaining mitigation debt, deed restrictions will be placed over high-quality reaches of Willow and Mine creeks following reclamation. The deed-restricted corridors will be a minimum of 100 feet wide, encompassing stream and wooded riparian corridors. Willow and Mine creeks were selected for this level of mitigation because they are low in the watershed and are predicted to have extended hydroperiods. Their location also provides a north/south wildlife corridor across most of the Three Oaks Permit Area.

The stream channel design incorporating floodplain terraces and braided channels (where appropriate), coupled with the proposed native planting and deed restriction, will result in the streams providing significantly more ecological functions and values per LF then currently provided by existing medium-quality streams. Therefore, 22,302 LF of high-quality deed-restricted corridors would provide mitigation for 44,603 LF of medium-quality stream debt.

However, the deed restriction will be placed on stream corridors that traverse land with post-reclamation land use that has not yet been determined. It is probable that, due to numerous existing utility easements, coupled with future roadway and easement needs, that portions of the deed-restricted corridor will need to be traversed and subsequently impacted. Therefore, 30,498 LF (the required 22,302 LF plus an additional 8,196 LF) of the creeks will be placed within the deed-restricted corridor. This excess linear footage may be utilized as a "bank" to allow for utility or roadway crossings of the riparian corridor if later deemed necessary. The excess also provides a "buffer" to ensure the success of the required number of LF of reclaimed corridor.

7.0 EXISTING LIENS AND ENCUMBERANCES

There are no known liens on any of the property in the Three Oaks Mine Permit Area. The property is encumbered by numerous right-of-ways (ROWs) and easements for power lines, phone lines, gas lines, water lines, and public roads. Plans are to permanently reroute these utilities and roads around the mining project, but agreements have not been reached with all of the owners of the ROWs and easements. It is possible that some of these easements and ROWs could still exist after mining (the reroute could be temporary). It is not possible to accurately predict which ones might continue to exist.

Alcoa owns a small percentage of the property to be mined. Most of the area to be mined is leased to Alcoa by CPS and others. These leases give Alcoa the right to mine the property and reclaim the land, but no perpetual rights are granted. Similarly, most of the leases obligate Alcoa to use all reasonable efforts to release the lands from the lease for unrestricted use by the owners. However, as a part of its mitigation plan, Alcoa will notify each property owner of the location of "waters of the US" that have been reclaimed on his/her property prior to the release of the property from the mining lease. Alcoa will also notify the USACE of the release of the property and furnish the USACE with the name and address of the current owner.

Alcoa has negotiated an agreement with CPS, such that CPS has agreed to place deed restrictions on the riparian corridors described in Section 6.8. A total of 30,498 LF totaling 70.0 acres of riparian corridor will be deed restricted, with 8,196 LF (18.8 acres) of the corridor being a "bank" for future disturbances, such as road or utility crossings.

Alcoa has also initiated a land swap agreement with CPS in order to obtain ownership of both the Middle Yegua and Big Sandy mitigation sites. Although the land swap has not been finalized, there is no reason to expect that it will not proceed as anticipated. There are no known liens or encumbrances on either proposed mitigation site.

8.0 BEST MANAGEMENT PRACTICES UTILIZED DURING MINING

Measures proposed for protecting adjacent streams, wetlands, and other aquatic areas are twofold:

- those designed to ensure that mine discharges do not degrade downstream water quality such that aquatic habitats are negatively impacted
- those designed to ensure that mine operations do not impact downstream aquatic habitats by causing significant decreases in water quantity

8.1 MINE DISCHARGE PROTECTIVE MEASURES

Alcoa uses a series of sediment-control ponds and diversions to capture and treat water from the active mine areas. Additionally, Alcoa uses a variety of BMPs to minimize sediment contributions from areas disturbed by mining and construction. These practices generally result in water quality discharges from the mine of better quality than the natural stream flow, particularly with respect to sediment loading. A comparison of the existing water quality within the Three Oaks Mine Permit Area to the anticipated water quality of mine discharges follows, as well as a discussion of the water treatment systems and BMPs to be used at the Three Oaks Mine Permit Area.

8.1.1 Baseline Water Quality

Substantial baseline water-quality information was collected from the streams and drainages within the proposed Three Oaks disturbance area. This information is sufficient to assess the quality of water originating from the proposed mine area that is currently available to downstream aquatic habitats. Of the various water-quality constituents monitored, the most likely constituents to be impacted by the proposed surface mining activities are pH, iron, Total Dissolved Solids (TDS), and Total Suspended Solids (TSS).

TABLE 8-1
BASELINE WATER QUALITY SUMMARY

Constituent	Minimum	Maximum	Average
pH	6.1 s.u.	8.8 s.u.	7.1 s.u.
TSS	10.6 mg/l	218 mg/l	58.2 mg/l
TDS	50.0 mg/l	1860 mg/l	475 mg/l
Iron	0.5 mg/l	7.9 mg/l	2.9 mg/l

Of these constituents, benthic organisms are most sensitive to sediment loading (TSS). Suspended solids cause turbidity and reduce the amount of sunlight into the water column, thereby reducing the density of primary producers and limiting photosynthetic activity. Additionally, subsequent deposition of large amounts of sediment can create problems for aquatic organisms by covering up habitat and filling in slow-moving areas of streams. Consequently, the pre-mine TSS concentrations should be compared to anticipated active-mine and post-mine TSS concentrations to assess whether mine discharges would negatively impact adjacent downstream aquatic habitats.

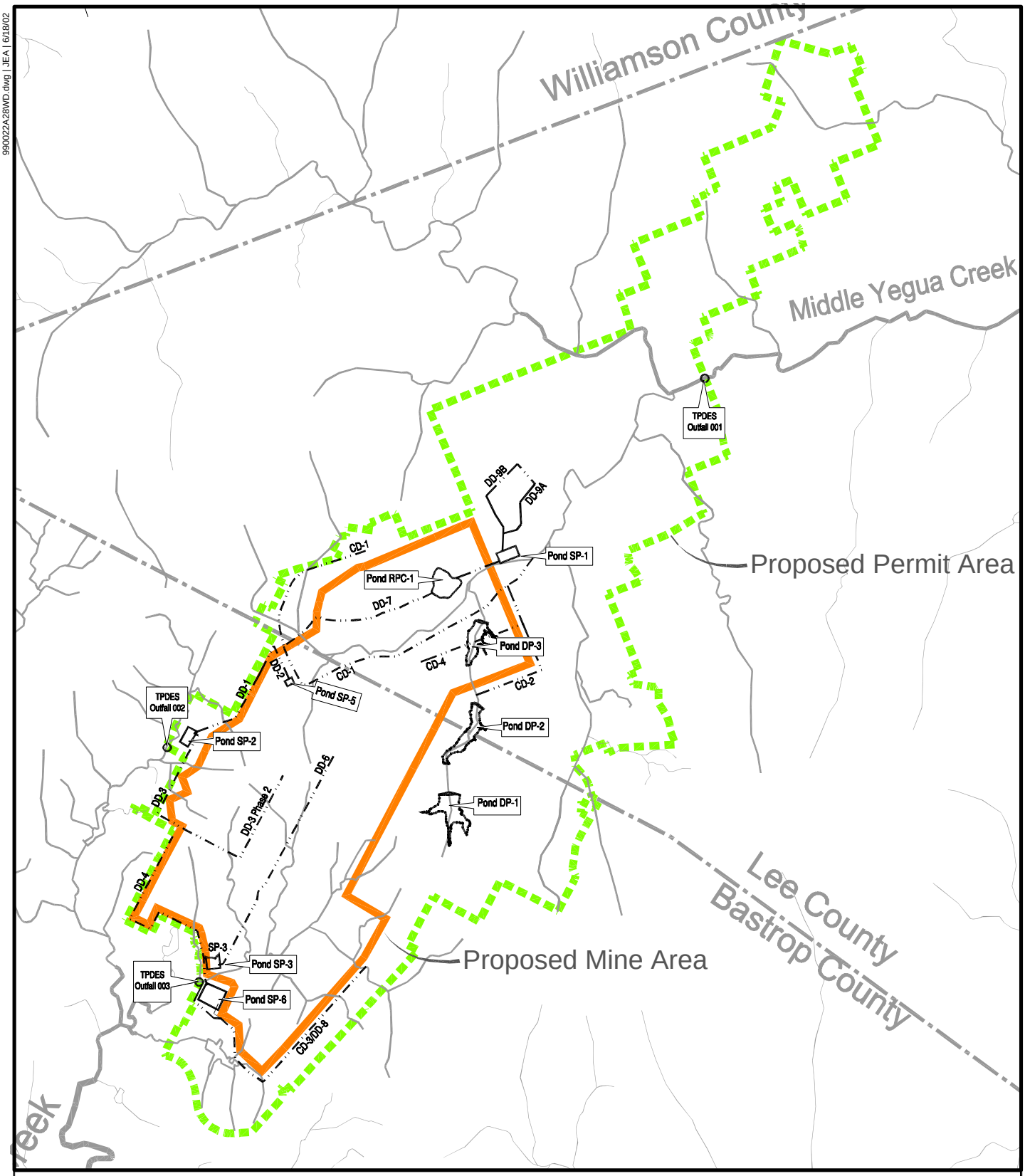
8.1.2 TCEQ Effluent Limitations

Three outfalls have been designated in the Texas Pollution Discharge Elimination System (TPDES) permit application for Three Oaks Mine Permit Area. These outfalls are located on stream channels at the approximate mine permit boundary (Figure 8-1), and they are considered to be "conceptual outfalls." Releases from any sedimentation ponds (managed waters) that are located within the watershed of a "conceptual outfall" will pass through the outfalls. Other waters will also pass through the outfalls, including depressurization releases, stormwater runoff from undisturbed areas, and any naturally occurring baseflow in the stream. Since the designated outfalls are "conceptual outfalls" that pass managed waters as well as large volumes of water from undisturbed areas, specification of flow or quality limits at the outfall is not appropriate. Instead, the TCEQ more appropriately places limitations upon the outfalls of the individual sedimentation ponds, wherever they may be located within the watershed. All discharges from the sedimentation ponds, regardless of the flow rate, are required to comply with quality limitations. During construction and the active mining phase, the effluent monitoring and reporting requirements and the effluent limitations are based on 40 CFR Part 434.45 and are as follows:

TABLE 8-2
EFFLUENT LIMITATIONS

Outfall Number	Pollutant	Daily Average	Daily Maximum
001, 002, and 003	Flow	Report MGD	Report MGD
	TSS	35.0 mg/l	70.0 mg/l
	Iron, Total	3.0 mg/l	6.0 mg/l
	TDS	Report mg/l	Report mg/l
	pH	6.0 s.u. (min)	9.0 s.u.
	Chlorides	Report mg/l	Report mg/l
	Sulfates	Report mg/l	Report mg/l

Thus, the effluent limits stipulated by the TPDES permit ensure that discharges from Three Oaks' sedimentation ponds will have TSS concentrations that are significantly lower than those occurring in the streams naturally. The TPDES permit requires that the maximum TSS concentration be 70 mg/l or less, where the maximum concentration measured during the baseline-monitoring period was 218 mg/l. Likewise, TPDES primary effluent limitations require that the average TSS concentration be 35 mg/l or less, where the baseline average concentration was 58 mg/l. Consequently, if TPDES permit requirements are met, the water quality of mine discharges will not degrade downstream aquatic habitats. When flow is the result of a rainfall event less than a 10-year, 24-hour storm, the effluent limits are 0.5 mg/l settleable solid and a pH of 6 to 9. If the storm event is greater than a 10-year, 24-hour event, the effluent limits are for the pH to be between 6 and 9.



SOURCE: ALCOA INC. (JUNE 2002)

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0 3500 7000

FEET

FIGURE 8-1

SURFACE WATER CONTROL STRUCTURES
AND PRIMARY DRAINAGES
THREE OAKS MINE
BASTROP AND LEE COUNTIES

ALCOA INC.
ROCKDALE, TEXAS

USACE APPLICATION NO. 199900331
JUNE 18, 2002

Horizon
ENVIRONMENTAL SERVICES, INC.

"Do Not Scale This Drawing"

990022A28WD.dwg | JEA | 6/18/02

8.1.3 Sedimentation Control and Treatment Structures at Three Oaks Mine

Alcoa is certain that discharges from the proposed Three Oaks Mine Permit Area will comply with TPDES effluent limitations. This certainty is based on Alcoa's experience at its existing Sandow Mine, where similar sediment-control methods and treatment structures are used. Alcoa has a good track record of meeting the TPDES effluent water-quality standards for its pond discharges.

Alcoa will construct a number of engineered sedimentation ponds for sediment control and treatment. A system of diversions and ponds around the perimeter of the mine area will ensure that all mine drainage is captured and treated to meet effluent limitations prior to discharge. The locations of these control structures are shown on Figure 8-1. Sediment ponds are identified by the "SP" prefix, detention ponds are identified by the "DP" prefix, and reclamation ponds are identified by the "RP" prefix. The drawing identifies only those ponds and diversions that are necessary for water-control purposes. There will be numerous reclamation ponds in the post-mine landscape that are not shown on Figure 8-1.

The sediment ponds (SP-1, SP-2, SP-3, and SP-5) have been designed to provide sufficient detention time for settling of suspended solids such that the pond effluent will meet the discharge limitations stipulated in the pending TPDES permit application. Texas coal mining regulations require that these ponds be designed to have a minimum of 10 hours of detention time for a storm with a 10-year, 24-hour recurrence interval. Alcoa uses baffles within the sediment ponds, on an as-needed basis, to prevent short-circuiting and to increase the plug-flow detention time. Additionally, Alcoa also may apply flocculants to influent in order to decrease the settling time of suspended particles. The result is that the proposed sedimentation ponds at Three Oaks Mine Permit Area ensure that mine discharges will not degrade water quality, thereby protecting downstream adjacent wetlands, streams, and other aquatic areas.

8.1.4 Best Management Practices

Under some circumstances, construction activities may take place in areas where runoff is not captured and treated by the perimeter sedimentation ponds. This occurs when Alcoa constructs the perimeter sedimentation ponds and diversions for the mine area; when depressurization or monitoring well pads and access roads are constructed outside the mine area; or when road construction and utility reroutes occur outside the mine area. In these cases, Alcoa uses BMPs to control erosion and minimize downstream sedimentation of adjacent areas. BMPs are also used within the mine area to minimize erosion and reduce sediment loading on the sediment treatment ponds. A list of the BMPs to be used at the mine follows:

Temporary Vegetation - Areas that are disturbed by construction are revegetated as quickly as possible following construction activity to help control erosion. Depending upon season and moisture, Alcoa plants either quick-germinating, temporary vegetation or permanent vegetation. Timely revegetation efforts minimize sediment production.

Additionally, timely revegetation saves money that would otherwise be spent repairing erosional rills and gullies and engineered structures such as embankments, terraces, berms, and diversions. Seeding rates for temporary and permanent vegetation are provided in an excerpt of Table 145-3 of the RRC permit application (Appendix C).

Mulch – Alcoa uses mulch spreaders to uniformly distribute mulch on all regraded areas and on most areas disturbed by construction. Mulching stabilizes the soil, aids in moisture conservation, and promotes germination and response of temporary and permanent vegetation. Generally, hay or straw is applied along the contour and mechanically anchored. Application rates vary according to slope and season, although the minimum rate of mulch application is 2 tons per acre. Additionally, wherever and whenever cool season annuals or perennials are planted as temporary vegetation, the temporary vegetation is disked into the top 6 to 8 inches of soil prior to preparation and planting of permanent vegetation. The disked-in vegetation serves as mulch, stabilizing the soil and conserving soil moisture.

Silt Fence – Alcoa uses silt fences to control sediment whenever the potential exists for sediment to leave the permit area without being captured and treated in sedimentation ponds. Primarily, this occurs during the construction of sediment ponds and perimeter water-control diversions. Alcoa adheres to strict standards regarding the construction and use of silt fencing. As soon as practicable following each rainfall event, the silt fencing is inspected by the project engineer or environmental specialists for damage and efficiency, and, if necessary, repairs and modifications are made.

Rock Check Dams – Alcoa uses rock check dams in small diversion ditches and upper drainages to moderate potentially erosive flow velocities and to reduce sediment load by reducing stream-flow energy.

Hay Bale Dike – Alcoa uses hay-bale dikes to moderate flow velocities in upland swales and to trap sediment contained in sheet flow and newly concentrated overland flows. The hay bales are partially embedded and staked in rows perpendicular to the direction of flow.

Retention/Irrigation Systems – Water retained in Alcoa's treatment ponds is to be used for dust suppression and truck washing. This will provide dual processes for removing sediment from mine-area water: treatment (settling) and reuse (dust suppression and truck washing). Alcoa anticipates that the volume of water used for dust suppression and truck washing will exceed the volume of water received from the mine pits and from dewatering operations. Consequently, discharge from treatment ponds will mostly occur during rainfall events, at which time rainfall runoff will dilute any mine-pit water and overburden groundwater remaining in the ponds. These diluted active-mine waters will be treated to comply with TPDES effluent requirements prior to discharge.

Extended Detention Basins – Alcoa uses sediment ponds (extended detention basins) as a primary tool for removing sediment from mine area water. See previous discussion on sediment control and treatment structures at the Three Oaks Mine Permit Area.

Constructed Wetlands – Alcoa will construct its temporary sedimentation structures with littoral shelves for temporary wetlands. Additionally, small wetland areas will be promoted in drainages within the mine area by providing dug-out retention areas behind rock-check dams. See drawings and discussion in Section 6.2 of this report. These temporary wetlands will provide additional evaporation, sedimentation, adsorption, and filtration functions to the ponds and drainages.

8.2 MINE OPERATIONS PROTECTIVE MEASURES

Alcoa has collected a substantial amount of baseline data in order to assess existing surface-water quantities and flow patterns for the proposed mine area. Changes in land cover, soil characteristics, and water-control plans associated with mining have the potential to affect natural runoff patterns and discharge characteristics. These changes, should they occur, may impact downstream aquatic habitats. Significant decreases in water quantity would negatively impact aquatic habitats, and significant increases in water quantity may bolster aquatic habitats. Potential surface water quality concerns were evaluated in detail in Section 146 of the RRC permit application in the "Probable Hydrologic Consequences" evaluation.

Modeling results from this evaluation indicate that the proposed surface water-control plan will aid in sustaining flows downstream of the proposed Three Oaks Mine Permit Area. Generally, the amount of water leaving the Three Oaks Mine Permit Area due to rainfall runoff will be slightly greater than in the pre-mining condition, but the peak flow rates will be diminished. The following table summarizes anticipated changes in water quantity.

TABLE 8-3
ANTICIPATED WATER QUANTITY CHANGES

MIDDLE YEGUA CREEK AT COUNTY ROAD 306
COMPARISON OF BASELINE TO ACTIVE MINING CONDITIONS

Storm Event	Percent Change in Peak Flow Rate	Percent Change in Total Runoff Volume
10-year, 24-hour	-7%	1%
25-year, 24-hour	-6%	1%
50-year, 24-hour	-6%	1%
100-year, 24-hour	-6%	1%

BIG SANDY CREEK AT HIGHWAY 290
COMPARISON OF BASELINE TO ACTIVE MINING CONDITIONS

Storm Event	Percent Change in Peak Flow Rate	Percent Change in Total Runoff Volume
10-year, 24-hour	-3%	2%
25-year, 24-hour	-3%	2%
50-year, 24-hour	-3%	2%
100-year, 24-hour	-3%	2%

MIDDLE YEGUA CREEK AT COUNTY ROAD 306
COMPARISON OF BASELINE TO POST-MINING CONDITIONS

Storm Event	Percent Change in Peak Flow Rate	Percent Change in Total Runoff Volume
10-year, 24-hour	-33%	1%
25-year, 24-hour	-30%	1%
50-year, 24-hour	-29%	1%
100-year, 24-hour	-27%	1%

BIG SANDY CREEK AT HIGHWAY 290
COMPARISON OF BASELINE TO POST-MINING CONDITIONS

Storm Event	Percent Change in Peak Flow Rate	Percent Change in Total Runoff Volume
10-year, 24-hour	-17%	0%
25-year, 24-hour	-17%	0%
50-year, 24-hour	-17%	0%
100-year, 24-hour	-17%	0%

These results indicate that mining will not decrease the quantity of water available to adjacent downstream aquatic habitats, wetlands, or streams. In fact, results indicate that the quantity may increase. Additionally, the projected reductions in peak flows will benefit downstream aquatic habitats. Decreases in peak flow will reduce the potential for erosion and will sustain steam flows for longer periods following rainfall runoff events. Without the sediment ponds and reclamation ponds, storms would generate more extreme discharge and a quicker return to a lower baseline flow. The effect of the ponds is to spread the storm flow through time. Baseline monitoring indicates that stream-flow patterns in the region's creeks and drainages are highly irregular, and that flow is non-existent or very low during many months of the year. Consequently, aquatic habitats, where they do exist, may benefit from sustained flows.

9.0 HYDROLOGY

9.1 OFF-SITE MITIGATION AREAS

As explained in Section 8.2, mining may impact natural runoff patterns and discharge characteristics of the mined area. However, stream modeling results indicate that these changes are not likely to decrease the quantity of water available to adjacent downstream aquatic habitats, wetlands, or streams. To the contrary, modeling results indicate that the quantity of water may increase. Additionally, the projected reductions in peak flows will likely minimize scoring and erosion which is characteristic of existing conditions in many of the streams within the Permit Area. Consequently, streams and wetland areas within the proposed Middle Yegua Mitigation Site (downgradient of SP-5) and Big Sandy Mitigation Site (downgradient of SP-3 and SP-2) would be assured continued appropriate hydrology from the mine area ponds and would only experience minor modifications to peak flows and periodicity of flows.

9.2 SIMSBORO OUTCROP

There are small segments of streams on the Simsboro outcrop northwest of Three Oaks Mine Permit Area that receive ground water contributions. The location of these stream segments are identified in the mine permit application submitted by Alcoa to the RRC. The groundwater contribution to these streams is very limited (typically less than 5 to 10% of the annual flows in these streams) and was estimated to range up to 1.2 cubic feet per second (cfs). These gaining stream segments are characterized by small flows in the base of the stream, with some smaller on-channel impoundments. Typically, the area immediately surrounding the streams is wooded. The current use of these groundwater contributions to stream flow, if any, has been identified as irrigation and livestock use. Downgradient of the gaining stream segments, the streams are intermittent and no surface water user or surface water permit holders are dependent on these groundwater contributions further downstream.

Three Oaks Mine Permit Area depressurization operations, as well as any other Simsboro pumpage in the area, may result in water table decline in the Simsboro outcrop, which may, in turn, reduce groundwater discharge to gaining stream segments. If any of these stream segments experience a reduction in baseflow, it is dependent on many factors, including 1) hydrologic connection of the gaining stream segment to producing well fields; 2) whether the stream segment is supported by the Simsboro water table or a perched zone; 3) land use changes; and 4) recharge conditions. While some of these factors have various levels of scientific predictability, others do not. Careful record keeping and monitoring of mining impacts is important during the mining process as Alcoa develops its impact assessment program, providing for a thorough regulatory agency review of impacts and mitigation. Additional requirements to permit performance standards can be assessed, as needed, to ensure that impacts are accurately evaluated and mitigated.

Under Alcoa's approved RRC mine permit application, Alcoa is required to protect the hydrologic balance from mining impacts and mitigate any water supply of legitimate use that is impacted by the operation. This would include water use associated with these gaining stream segments in the Simsboro outcrop. Actions that could be taken to mitigate reduced stream flows resulting from Alcoa's mining activities include 1) supplementing stream flows through the discharge of mine waters into the gaining stream or other stream segments; 2) supplementing stream flows through a separate water source such as a well; and/or 3) the construction of on-channel or off-channel impoundments. If a legitimate water-use impact is identified, appropriate mitigation measures will be taken as agreed to by Alcoa, the regulatory authority(s), and the landowner.

Alcoa's mitigation evaluations are always dependent on site-specific investigations. Of primary importance is the background or baseline data Alcoa collects prior to the start of mining activities. Background data collection is extensive, comprehensive, and occurs in 2 distinct work efforts. The first work effort is for collection of background data for submittal of a RRC mine permit application. RRC-required data collection for the Three Oaks Mine Permit Area included the inventory of more than 1,000 water wells, seeps, and springs in the area. This work effort also included water well sampling, water use information, depth to water, well depth, and other pertinent information. Similar surveys were done to identify gaining stream segments in the area and included water quality sampling, stream flow estimates, and water use information. In addition, monthly and quarterly stream flow monitoring was conducted in area streams, and quarterly groundwater monitoring data was collected from area groundwater monitoring wells.

Extensive evaluations will also be conducted by Alcoa internally to determine and plan additional data needs required to conduct mining operations. This includes collecting additional background data in specific areas determined to be important for evaluating and assessing impacts on water supplies. Further data-collection activities include monitoring and investigating gaining stream segments, including water-quality and stream-flow monitoring; construction and/or monitoring of wells in areas adjoining gaining stream segments; and other activities deemed necessary to augment previous baseline data. The information collected during these efforts forms the foundation for the establishment of baseline conditions prior to mining and for use in assessing mining impacts to the hydrologic balance.

The following outlines a procedure that Alcoa will initiate if a decline in a stream's water flow is detected. Only in the Simsboro outcrop is there potential for reductions in stream flow resulting from mining operations. Therefore, Alcoa's evaluations will begin with a site visit to determine stream segment location and geologic setting. If the potentially impacted stream segment is in the Simsboro outcrop, then more detailed investigations will be conducted to determine if, in fact, Alcoa operations were the likely cause of the impact. Such studies will include, but are not limited to, the following:

- Geohydrologic investigation including geologic and hydrologic mapping, topographic survey, water-quality sampling, water use and environmental surveys, water level and stream flow measurements and monitoring, test drilling, surface water and groundwater modeling, and recharge and drainage area calculations.
- Landowner surveys including, but not limited to, any previous records on the seeps, springs, or gaining stream segments, interviews with the landowner, adjoining landowners and tenants regarding past observations of the subject stream, and information on use of the water and observed impacts.
- Analysis of background data including any flow measurements, water quality, water level, water use, climatic data, and environmental surveys conducted and appropriate for use in the analysis.
- A detailed description of the timing of mining operations that could have caused an impact, and a detailed timetable of impacts, as reported by the landowner and/or as observed by Alcoa to the impacts reported by the landowner or observed by Alcoa.

Under current RRC regulations, it is Alcoa's obligation to determine whether water supplies have been impacted and, subsequently, to mitigate impacted supplies. Alcoa is required to identify impacts and submit detailed information on these impacts to the RRC on a quarterly basis during the first 2 years of mine-related groundwater pumping, and annually thereafter. These reports will be used to assess mitigation requirements and implement mitigation activities, as well as to compare projected impacts to actual impacts. Additionally, Alcoa has agreed to update and calibrate its groundwater models every 5 years and update projections of impacts over the life of the mine, accordingly. Therefore, throughout the mining process, impacts to the hydrologic balance and ground and surface waters will be continually assessed and appropriate actions will be taken to minimize and mitigate impacts on surface and groundwaters. Alcoa's impact assessment and mitigation efforts will also be continually monitored by the RRC for compliance with applicable regulations.

10.0 SOILS

10.1 RECLAMATION

Post-mine soils in the mine-reclamation area will be constructed from overburden and interburden sources. The reconstructed soils are anticipated to have textures with an improved balance of sand, silt, and clay, and are not expected to display the adverse physical characteristics of the native topsoil, which generally has either excessive sands or excessive clays. In addition, the pH and acid/base relationship in the reconstructed soils is expected to be more advantageous to vegetation than the native topsoils. Based on reclamation procedures at the Sandow Mine, it is anticipated that restoration of productive post-mining land uses will occur.

10.2 MIDDLE YEGUA MITIGATION SITE

Soils have been mapped within the proposed Three Oaks Mine Permit Area, and a detailed soils map is provided in Section 134 of the RRC permit application, Plate 134-1. The predominant soil within the proposed Middle Yegua Mitigation Site is the Sandow series. The Sandow series consists of very deep, moderately well-drained, moderately slowly permeable soils in floodplains of streams. The soil formed mainly in stratified loamy alluvium. Slopes are typically less than 1%, but range from 0 to 2%. The depth of the alluvium is 7 to 15 feet. Brief duration of flooding occurs from 1 to 5 times a year during most years, unless protected.

There are also a few small pockets of the Rader series soils present on nearly level to gently sloping stream terraces or terrace remnants. Slopes range from 0 to 3%.

10.3 BIG SANDY MITIGATION SITE

As mapped by the National Resource Conservation Service's (NRCS) unpublished Soil Survey of Bastrop County, the majority of the Big Sandy Mitigation Site contains Sayers fine sandy loam, which is classified as occasionally flooded. The Sayers series consists of deep, somewhat excessively drained, moderately rapidly permeable soils that formed in alkaline alluvium. The soils are in nearly level to gently undulating floodplains along streams and rivers. Slopes range from 0 to 3%. Soil horizon thickness is approximately 60 inches. Inundation is common.

The northeastern portion of the site contains Axtell series soils. The Axtell series consists of very deep, moderately well-drained, very slowly permeable soils on Pleistocene terraces. The soil formed in slightly acidic to alkaline clayey alluvium. Slopes are dominantly 0 to 5%, but range up to 12%. The soil horizon thickness is more than 80 inches. Inundation is uncommon. Three additional soil types each occupy an inconsequential area along the site's perimeter.

11.0 PLANTING PLAN

11.1 FINAL RECLAMATION PLANTING

In an effort to naturalize the riparian corridors, the lower and upper floodplain terrace (where applicable), and the upland buffer will be planted at a rate sufficient to achieve 140 trees and 60 shrubs per acre at the end of the monitoring period. As specified in Section 6.3.2, stream design includes creating braided low-flow channels within the broad stream channel base or lower floodplain (see Figure 6-5). Although trees and shrubs will not be planted in the stream channels, an effort will be made to create a naturalized area and assist in soil stabilization by planting trees and shrubs on the banks of the stream channels and on upland islands in braided channels, as appropriate. Trees and shrubs will be bare-root seedlings from nursery stock and will be planted by hand within scattered groupings on a minimum of 10-foot centers. A minimum of 8 tree species (no species will comprise more than 30% of the planted trees) and 6 shrub species (no species will comprise more than 30% of the planted shrubs) from the "Recommended Species List" (See Table 6-1) will be planted. Species will be selected so that a minimum of 50% of the planted trees are hard-mast producing. Species will be planted at an appropriate elevation based on their inundation tolerance. Planting area(s) appropriate for each species are specified in Table 6-1.

To additionally enhance floodplain terrace(s) and the upland buffer, a minimum of 5 native grass and forb species will be seeded throughout. Grasses and forbs will be seeded at the rates identified in Appendix C.

11.2 MIDDLE YEGUA MITIGATION SITE PLANTING

Trees and shrubs will be planted at a density sufficient to ensure survivorship of a minimum of 140 trees and 60 shrubs per acre (at the end of the first 5 years of annual monitoring) throughout portions of the mitigation sites intended to become a woodland. A minimum of 10 tree species and 6 shrub species (no species will comprise more than 30%) from the "Recommended Species List" (see Table 6-1) will be planted to increase species diversity, as well as to provide food and habitat for a wider range of wildlife. As in the reclamation planting, 50% or more of the planted seedlings will be from hard-mast producing species. Excavated depressions within the openings will be planted with herbaceous species at a rate of 400 per acre. Herbaceous plants to be planted will be bare root or in planting sleeves from nursery stock. Plants will be planted on a minimum of 3-foot centers within scattered groupings. A minimum of 8 hydrophytic/aquatic species (no species will comprise more than 30%) from the "Recommended Species List" (see Table 6-1) will be planted. Species will be planted at an appropriate elevation based on their inundation tolerance.

11.3 BIG SANDY MITIGATION SITE PLANTING

Trees and shrubs will be planted throughout the restored floodplain and upland portions of the corridor designated as proposed woodlands. Trees and shrubs will be planted at a density sufficient to ensure survivorship of a minimum of 140 trees and 60 shrubs per acre (at the end of the first 5 years of annual monitoring) throughout portions of the mitigation sites intended to become a woodland. A minimum of 8 tree species and 6 shrub species (no species will comprise more than 30%) from the "Recommended Species List" (see Table 6-1) will be planted to increase species diversity, as well as to provide food and habitat for a wider range of wildlife. As in the reclamation planting, 50% or more of the planted seedlings will be from hard-mast producing species.

The wetland enhancement area will comprise an area of the site surrounding an existing seep. A very shallow (less than 1 foot deep) area, approximately 1-acre in size will be excavated around the perimeter of the existing seep and wetland boundary. The excavated depression will then be planted with herbaceous species at a rate of 400 per acre. Herbaceous plants to be planted will be bare root or in planting sleeves from nursery stock. Plants will be planted on a minimum of 3-foot centers within scattered groupings. A minimum of 8 hydrophytic/aquatic species (no species will comprise more than 30%) from the "Recommended Species List" (see Table 6-1) will be planted. Species will be planted at an appropriate elevation based on their inundation tolerance. One hundred additional plants will be planted within the existing wetland border to increase species diversity while minimizing disturbance.

As described above, approximately 17 acres of the existing pasture will be enhanced to restore native tall grasses and wildflowers to the site. Portions of the site to be enhanced as grassland will be disked to enhance seed set and reduce bermudagrass dominance. The seed mix to be utilized will be a minimum of 5 grasses and 6 wildflowers from the recommended "Grassland Species List" (see Table 6-2). The planting rates will be as identified in the table. Although fire is a better method for grassland preparation, it will not be utilized due to the site's proximity to a major roadway US Highway 290 and the Southern Pacific Railway.

12.0 PLANTING SUCCESS CRITERIA

The same planting success criteria will be utilized to evaluate both the reclamation areas and the off-site mitigation areas. It is anticipated that both the reclaimed riparian corridors and the enhanced riparian corridor within the Middle Yegua and Big Sandy mitigation sites will be 75% wooded and 25% herbaceous (including hydric/aquatic). Additionally, the Big Sandy Mitigation Site will include an approximately 12-acre area outside of the wooded riparian corridor that will be enhanced with herbaceous species typical of tall grass prairies. With the exception of a few minor wooded corridors, the tall grass prairie will be composed wholly of native herbaceous vegetation.

12.1 HERBACEOUS VEGETATION

The floodplain terrace(s) will achieve 80% vegetative cover within 5 years after planting. If survival drops below 80%, a supplemental planting will be conducted. The 80% vegetative cover must then be achieved and maintained for 5 consecutive years following the supplemental planting. No dominant species will be non-native, noxious, or invasive (Table 12-1). If nuisance species are found to be in greater concentrations, they will be removed manually or with careful herbicide application. As previously mentioned, if these success criteria are not achieved, the USACE will be consulted with proposed additional measures to achieve the stated success criteria.

TABLE 12-1
MITIGATION SITE NON-NATIVE, NOXIOUS, AND INVASIVE SPECIES LIST

COMMON NAME	SCIENTIFIC NAME
Alligator weed	*Alternanthera philoxeroides*
Chinaberry	*Melia azedarach*
Chinese tallow	*Sapium sebiferum*
Cocklebur	*Xanthium* spp.
Curly pondweed	*Potamogeton crispus*
Eurasian water-milfoil	*Myriophyllum spicatum*
Honey mesquite	*Prosopis glandulosa*
Hydrilla	*Hydrilla verticillata*
Johnsongrass	*Sorghum halapense*
Parrot-feather	*Myriophyllum aquaticum*
Purple loosestrife	*Lythrum salicaria*
Torpedo grass	*Pancium repens*
Uruguay seedbox	*Ludwigia hexapetala*
Water-hyacinth	*Eichhornia crassipes*
Wild taro	*Colocasia esculenta*

Note: The State of Texas has no “State List of Regulated Noxious Weeds.” The above list is taken in large part from the noxious species list documented in the Three Oaks RRC Permit Section 12.145. However, that list is more focused on range management and agricultural needs; some of the native species listed would actually be desirable for a naturalized mitigation site. In addition to range species, the above list identifies several aquatic species that are not part of the RRC Permit list.

12.2 TREES AND SHRUBS

The tree and shrub planting will be deemed successful if a minimum of 140 trees and 60 shrubs per acre survive for 5 consecutive growing seasons following the initial planting. Additionally, more than 50% of the trees will be hard-mast producing. If survival drops below 140 trees and 60 shrubs per acre or there is not sufficient hard-mast producing trees, a supplemental planting will be conducted. The trees and shrubs survival rate / >50% hard-mast producing specification must then be achieved for 5 consecutive years following the supplemental planting. If this success criterion is not achieved, the USACE will be consulted with proposed additional measures to achieve the stated success criteria. The 3 most dominant species of trees and shrubs must be species typically dominant in natural situations and no species will constitute more than 30% of the surviving tree and shrub species.

13.0 PERFORMANCE STANDARDS

Alcoa will be responsible for maintaining the Middle Yegua and Big Sandy mitigation sites until the USACE is satisfied that those components of the site intended to become:

- "waters of the US" meet the definition of a "waters of the US" under the Regulatory Program regulations applicable at the time the project is authorized

- both wetlands and "waters of the US" meet the definition of a wetland under the Regulatory Program regulations applicable at the time the project is authorized

- "waters of the US" are functioning as the intended type of "waters of the US" and at the level of ecological performance prescribed in the mitigation plan

- buffer and riparian zones and other areas integral to the enhancement of the aquatic ecosystem are functioning as the intended type of ecosystem component and at the level of ecological performance prescribed in the mitigation plan

14.0 ECOLOGICAL BENEFITS VS. ADVERSE IMPACTS

Texas A&M University (Texas A&M) was hired by Alcoa to assess wildlife populations within Sandow Mine reclamation and to compare these populations with wildlife populations in the proposed Three Oaks Mine Permit Area. Nova Silvy, Ph.D., a professor in the Department of Wildlife and Fisheries Science, led the university study. Silvy's wildlife census results indicate that species diversification and population are among the ecological benefits that can be expected following mining.

Texas A&M conducted its surveys during May and June of 2000, carrying out a series of wildlife census operations along 15 miles of roads traversing Sandow reclamation. Surveys were taken in the early morning, late evening, and late at night with spotlights and binoculars. Silvy repeated these surveys on 3 different occasions. For comparison, a parallel series of census counts were conducted in the proposed Three Oaks Mine Permit Area.

The number of birds counted on Sandow reclamation was more than twice the number counted on the undisturbed site, and the number of species counted was about 15% greater than those found in the undisturbed site. Additionally, Texas A&M counted 50% more white-tailed deer in the reclamation area than in the comparison area. Additionally, about 240% more raptors were counted in the Sandow reclaim as on the comparison site. These high raptor counts are indicative of a much higher small-mammal population within Sandow reclamation. The biologists also sighted 78 dickcissels in the Sandow reclaim. Dickcissels are a declining grassland bird species in the central US. By comparison, no dickcissels were sighted in the undisturbed areas. Silvy stated that the reclamation at Sandow provides the contiguous native grassland habitat critical to the species survival (a habitat that has been rapidly declining over the past decade). A full report of the findings of this investigation is in Section 133 of the RRC Permit.

At the Sandow Mine, environmental specialists have found that it is entirely possible to reconstruct mined lands such that wildlife return to the area in far greater numbers than existed prior to mining. The Sandow Mine reclamation includes more than 700 acres of water resources, and the disturbed area is reclaimed with nearly 5 times as many water features as existed prior to mining. This ratio is similar to the amount of water resources anticipated at the Three Oaks Mine Permit Area. These new water resources are an essential component for attracting wildlife to mine reclamation areas. Additionally, the Three Oaks Mine Permit Area post-mine landscape will be composed, primarily, of "fish and wildlife" land use—meaning that the large majority of Three Oaks Mine Permit Area will be planted in native species, wooded, and managed for fish and wildlife habitat, while the Sandow Mine reclamation areas are primarily pastureland. Consequently, following reclamation at the Three Oaks Mine, the wildlife diversity and population can be expected to exceed those found at Sandow and by default, pre-mine populations, as well.

15.0 THREATENED OR ENDANGERED SPECIES

The US Fish and Wildlife Service (USFWS) provided a concurrence letter that stated that no federally threatened or endangered species are likely to be adversely affected, nor are any designated critical habitat likely to be adversely modified by the relocation of Farm-to-Market Road (FM) 696/619 or by the mining and related activities conducted within the 16,062-acre proposed Three Oaks Mine Permit Area. Additionally, a second letter was provided by the USFWS on 4 September 2002 to Mr. Wayne Lea of the USACE concurring that, based on information provided in the biological assessment, the proposed project is not likely to adversely affect any federally listed endangered or threatened species. The letter concludes informal consultation pursuant to Section 7 of the Endangered Species Act. Horizon's letter request for the concurrence of “no adverse effect” with the USFWS stamp and date and the second letter concluding Section 7 informal consultation are provided in Appendix D.

16.0 CULTURAL RESOURCES

An extensive cultural resources investigation of the entire Three Oaks Mine Permit Area was prepared by TAS, Inc. from 1999 to 2002, and is provided in Section 125 of the RRC Permit. All cultural resource issues associated with the disturbance area are currently being resolved through the appropriate means with the Texas Historical Commission. The Middle Yegua Mitigation Site will have no impact on cultural resources, as the cultural resources investigation revealed no cultural resource within the mitigation site. Additionally, the fish, wildlife, and vegetation surveys did not indicate any ecologically sensitive areas within the mitigation site. The proposed earth-moving activities and changes in topography required to fulfill the mitigation plan will be so minor that there will be no impact to local or regional hydrology.

Mitigation efforts requiring earth-moving activities at the Big Sandy Mitigation Site will be limited to restoration of the previously disturbed channel and floodplain. A few other shallow depressions may be excavated to enhance or increase wetland area in the floodplain. However, these excavations will occur so low in the floodplain that it is highly unlikely that any cultural resources would be present. If any cultural resources are encountered during mitigation activities earth moving will be halted and a professional archeologist will be hired to investigate, make recommendations, and notify the appropriate regulatory agencies.

17.0 LONG-TERM MANAGEMENT OF MITIGATION SITES

17.1 RECLAMATION

Maintenance in the restored riparian corridors will be limited to erosion control (if required), restoration of original grade should siltation impede water flow, and nuisance species removal. Prior written approval from the USACE will be obtained for activities involving re-grading or significant earth moving within stream channels. Areas will be maintained in their planned post-mine use, at least until the RRC bond is released. By the time RRC final bond release has occurred, the restored riparian corridors will be well established. By condition of the bond release, these areas will have stabilized and will be functioning as their intended use. Following bond release, the land will revert to the stewardship of the landowner. Privately held lands, including CPS holdings, will likely continue to be utilized as reclaimed. Deed-protected riparian corridors will be managed by CPS as stated in the deed restriction. However, no additional funding or monitoring is needed to ensure continued functioning and success, as the riparian corridors will have matured and stabilized and be functioning as intended prior to bond release. Additionally, the deed restriction prevents any un-authorized perturbations. Riparian corridors not protected by deed-restriction will also have achieved sufficient stability and maturity prior to bond release to ensure that streams, wetlands, and on-channel ponds will meet the criteria to be classified as “waters of the US” and will be afforded the same level of regulatory protection as currently exists.

17.2 OFF-SITE MITIGATION AREAS

Long-term management of the mitigation sites will consist primarily of enacting the annual monitoring and reporting plans, accompanied by intensive monitoring utilizing a standard habitat assessment method. The intensive monitoring utilizing a standard habitat assessment method will be conducted to provide baseline data and will then be repeated in 5-year increments to document changes to the mitigation sites. The annual monitoring and the intensive habitat assessments will be continued until the USACE provides written notice that the mitigation sites have achieved the type of “waters of the US” intended. Following successful documentation of the mitigation site’s success and subsequent termination of annual USACE monitoring and reporting, Alcoa will continue to perform an annual visual inspection of the mitigation sites to ensure continued success throughout the life of Three Oaks Mine Permit Area. Alcoa will perform fence repair and other minor maintenance as needed. If a major disturbance occurs, the USACE will be contacted and a course of action will be agreed upon.

Following successful documentation of the mitigation site’s success and subsequent termination of annual USACE monitoring and reporting, Alcoa will likely seek a conservation entity to deed the site. Potential appropriate organizations include The Nature Conservancy, Texas Parks and Wildlife Department, local government entities, Ducks Unlimited, etc. If an appropriate entity can not be identified, a small annuity to cover taxes will be set aside for both Middle Yegua and Big Sandy mitigation sites.

18.0 MITIGATION MONITORING

18.1 ANNUAL MONITORING

Monitoring will include evaluating the hydrology, vegetation, soils, and habitat for aquatic and terrestrial wildlife within the Middle Yegua and Big Sandy mitigation sites and permanent reclamation riparian corridors. Monitoring methods will include both qualitative and quantitative data collection. Monitoring will also include developing a photographic record of the progress of the project. A sample of the "Annual Monitoring Data Sheet Collection Form" to be utilized is provided in Appendix E.

On an annual basis, typical monitoring techniques for both the reclamated riparian corridor and the Middle Yegua Mitigation Site will include:

- vegetative sampling to determine tree and shrub survivorship, % herbaceous cover, species composition, % nuisance species, and recruitment
- monitoring changes in the soil profile (color, texture, redoximorphic features, etc.); monitoring the development of hydric soil characteristics where applicable; representative pits for each community; subsequent assessments should be near pit but not in pit
- noting changes in hydrology and results of monitoring frequency, duration, depth, of inundation or saturation
- photographs will be taken annually at permanent photographic stations established within reclamation and mitigation areas
- documenting wildlife usage observed during the monitoring effort
- documenting other qualitative information concerning snags, coarse woody debris, storm damage, drought damage, indicators of extreme flooding events, etc.

18.2 FIVE-YEAR INTENSIVE MONITORING OF OFF-SITE MITIGATION AREAS

Quantitative data collection is required to accurately characterize the Middle Yegua and Big Sandy mitigation sites prior to initiation of mitigation activities. For each mitigation site, the data collection effort will include herbaceous quadrant sampling within all vegetative communities present. Species present and their relative percent will be noted. A belt tree survey will be conducted in wooded areas. Species present, diameter at breast height, and condition will be recorded. Qualitative sampling of aquatic areas on the site will also be conducted. Aquatic species composition and percent cover will also be recorded. All data collection locations will be documented so future monitoring efforts can sample from the same location. Photographs will be taken at each data sample location to further document existing conditions. Vegetative communities will then be mapped based on aerial photo-interpretation and ground truthing to accurately quantify acreage of various vegetative communities present.

In addition to the required annual monitoring, a second quantitative assessment will be conducted 5 years after the initial mitigation efforts. If the mitigation site has achieved the stated performance standards (Section 13.0) then a letter will be submitted to the USACE (accompanying the quantitative monitoring report) requesting written confirmation that monitoring can be discontinued at that site. If a mitigation site has not achieved the stated goals within the first 5 years, then an additional intensive monitoring event will be performed for that site for 10 years from the initial mitigation efforts.

19.0 REPORTING PROGRAM

The permittee will designate a responsible party or position, in writing, to coordinate with the USACE on mitigation monitoring and compliance. The permittee will establish a self-monitoring program that includes annual written compliance reports to the USACE due October 1 of each year.

The mitigation monitoring and reporting will be conducted for a minimum of 5 years, but will be continued until written confirmation from the USACE is received that the mine reclamation, Middle Yegua Mitigation Site, and Big Sandy Mitigation Site have met the stated success criteria and are on the way to developing the intended type of functions. Although monitoring reports for the 3 areas will be submitted as a single report, each area will be evaluated independently because they will likely achieve the established success criteria (and thereby be released from further monitoring) at different rates. The first annual report will describe pre-construction (baseline) conditions of the disturbance area and mitigation sites and proposed activities (mining impacts, reclamation, and mitigation) for the upcoming year. Subsequent annual reports will address schedule changes and provide a summary of all activities that occurred during the reporting period.

Each compliance report will include, at a minimum, the following information:

- a description of any changes in the construction or mitigation plan implementation schedule
- a summary of activities that occurred during the reporting period, including demonstration of the permittee's compliance with the permit conditions, and documentation of the progress and/or completion of all authorized work, including mitigation plan activities in meeting performance standards and planting success
- demonstration that the permittee is in compliance with all permit conditions
- documentation of the progress and/or completion of all authorized work, including mitigation plan activities
- a tally of the project's actual impacts to "waters of the US"
- documentation of the use of BMPs for erosion control
- documentation of the use of BMPs for the protection of adjacent aquatic sites during construction
- photographs, maps, and drawings to support the written components of the mitigation plan

20.0 MITIGATION SPECIALIST QUALIFICATIONS

As of the writing of this proposed mitigation plan, Mr. Marty Irwin, senior environmental specialist at Alcoa, would be the appointed mitigation specialist responsible for overseeing the implementation of the mitigation plan at the Middle Yegua and Big Sandy mitigation sites. Mr. Irwin would also be responsible for overseeing the mitigation monitoring, annual reporting, and future maintenance within the mitigation sites and reclamation areas. Mr. Irwin attended Texas Tech, where he earned a Bachelor of Science degree in Range Management and a second Bachelor of Science degree in Wildlife Management. Mr. Irwin has been employed by Sandow Mine for 15 years and has performed a wide range of tasks within the mine reclamation group.

If Mr. Irwin leaves this position, Alcoa will notify the USACE in writing within 60 days. Individuals in this position will have a minimum of a Bachelor of Science degree in a related field and 2 years experience in reclamation or wetlands and/or habitat mitigation.

In addition to Mr. Irwin's oversight, Alcoa will enlist a mitigation/restoration specialist to consult on the stream restoration location and configuration, as well as final wetland and pond design and location. As part of this task, the mitigation/restoration specialist will be responsible for tracking impacts to "waters of the US" and ensuring that on-site mitigation stays current with the mitigation "debt," as outlined in this mitigation plan. The mitigation/restoration specialist will also be responsible for conducting the initial intensive monitoring of the off-site mitigation areas to provide baseline data and the subsequent intensive monitoring event(s) until USACE written confirmation of success is received. At Alcoa's request, the mitigation/restoration specialist may participate in the annual monitoring as well, either as oversight or to conduct the entire monitoring.

21.0 MITIGATION PLAN IMPLEMENTATION SCHEDULE

21.1 RECLAMATION

Temporary enhancements for both sedimentation ponds and temporary stream channels will be utilized throughout the life of mine. The physical enhancement features will be a part of the construction process. Plantings will be performed during the spring and early summer. If features are constructed in the fall or winter, planting will be conducted as soon as the weather permits the following spring. The deed restriction will be placed over the 30,498 LF of reclaimed Willow and Mine Creeks prior to final RRC bond release.

21.2 OFF-SITE MITIGATION AREAS

As stated in Section 6.1, the Middle Yegua Mitigation Site portion of the mitigation plan will be initiated during the first year of mining. The Big Sandy Mitigation Site portion of the mitigation plan will be implemented in the first year that mining takes place south of County Road 102.

22.0 DEED RESTRICTION

Alcoa proposes to place a deed restriction over both the Middle Yegua and Big Sandy mitigation sites to protect them from impacts in perpetuity. The perimeters of the mitigation sites will be surveyed and fenced. Alcoa will provide a copy of the recorded deed restrictions to the USACE within 90 days of completion of the initial planting and enhancement activities for each site. The deed restriction will be based on the example provided in Appendix B. The deed restrictions will specify that:

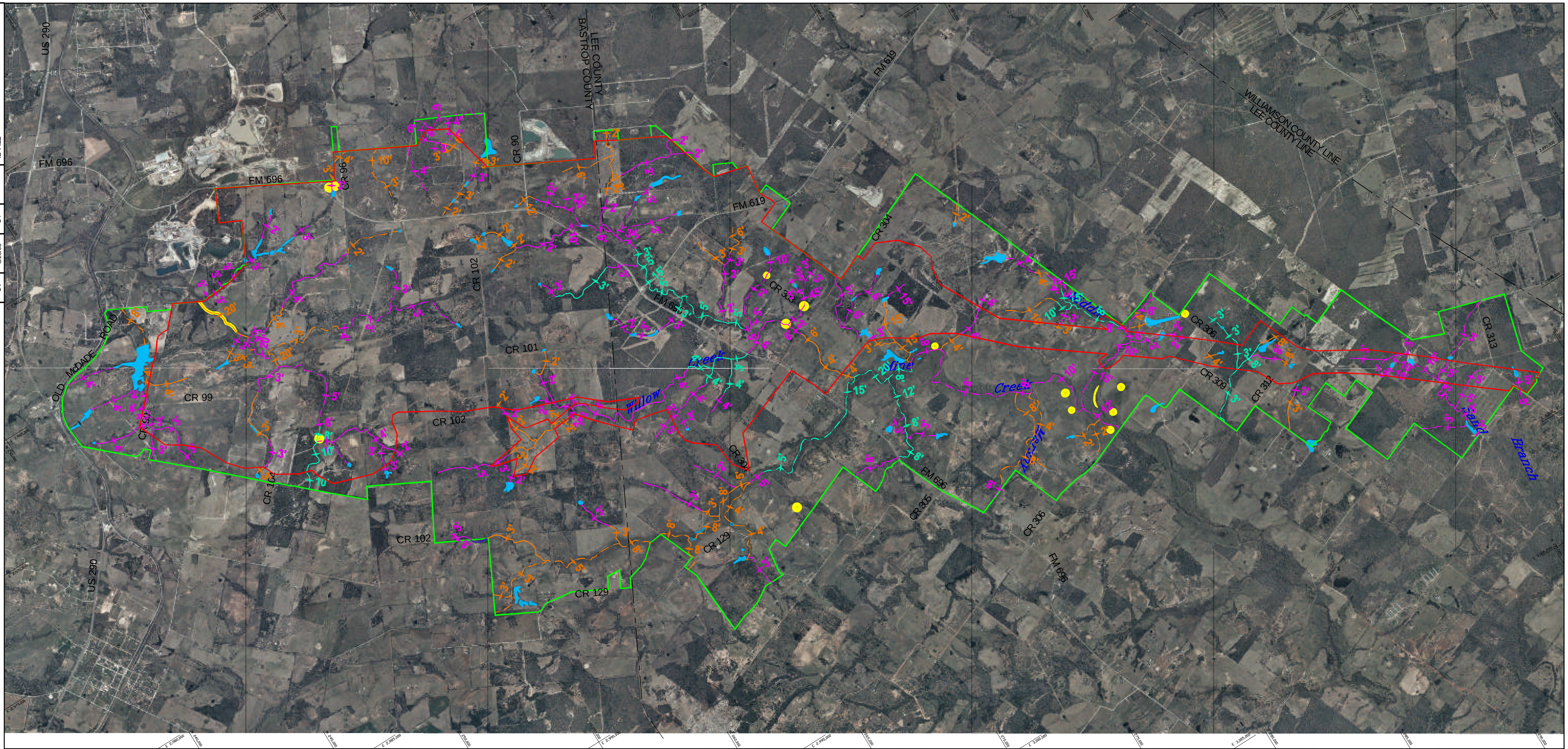
- the area shall not be disturbed, except by those activities that would not adversely affect the intended extent, condition, and function of the mitigation area or those activities specifically provided for in the USACE-approved mitigation plan or in the special conditions of the Department of Army (USACE) authorization

- the restriction shall not be modified or removed from the deed without the written approval of the USACE

- conveyance of any interest in the property shall be subject to the deed restriction

APPENDIX A

JURISDICTIONAL "WATERS OF THE US" (PLATE 2-1) AND USACE DATA SHEETS



MAP SOURCE:

1. TxDOT COUNTY FILES FROM TEXAS NATURAL RESOURCES INFORMATION SYSTEMS (1997)
2. AERIAL PHOTOGRAPHY – ALCOA (AUGUST 2001)

Horizon Environmental Services, Inc.

"Do Not Scale This Drawing"

EXPLANATION

(dash-dot line)	COUNTY BOUNDARY
FM 696	ROAD IDENTIFICATION
(green line)	THREE OAKS PERMIT MINE AREA
(red line)	DISTURBANCE AREA
(orange line)	LOW QUALITY STREAM
(magenta line)	MEDIUM QUALITY STREAM
(cyan line)	HIGH QUALITY STREAM
3'	STREAM WIDTH
(blue)	STOCK PONDS
(yellow)	WETLANDS

0 2200 4400
FEET

PLATE 2-1
SHEET 1 OF 2

JURISDICTIONAL WATERS OF THE U.S.
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

ALCOA INC.
ROCKDALE, TEXAS

USACE APPLICATION NO. 199900331
JUNE 18, 2002

DRAFT BY	REVISED BY	DRAWING ID-FILE
JEA 3/20/03		990022B14WD Sht 1 of 2

DRAFT BY:	REVISED BY:		DRAWING ID-FILE
JEA 3/20/03			990022B14WD

MAP SOURCE:

1. TxDOT COUNTY FILES FROM TEXAS NATURAL RESOURCES INFORMATION SYSTEMS (1997)
2. AERIAL PHOTOGRAPHY – ALCOA (AUGUST 2001)

EXPLANATION

- COUNTY BOUNDARY
- FM 696 — ROAD IDENTIFICATION
- THREE OAKS PERMIT MINE AREA
- DISTURBANCE AREA
- LOW QUALITY STREAM
- MEDIUM QUALITY STREAM
- HIGH QUALITY STREAM
- 3' — STREAM WIDTH
- STOCK PONDS
- WETLANDS

0 2200 4400
FEET

PLATE 2-1
SHEET 2 OF 2

JURISDICTIONAL WATERS OF THE U.S.
THREE OAKS MINE
BASTROP AND LEE COUNTIES, TEXAS

ALCOA INC.
ROCKDALE, TEXAS

USACE APPLICATION NO. 199900331
JUNE 18, 2002

Horizon Environmental Services, Inc.

"Do Not Scale This Drawing"

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 2 June 1999
Applicant/Owner: Alcoa Inc — County: Bastrop
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: Depressional wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS-1
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Eleocharis* sp.	H	OBL-FACW	9.		
2. *Juncus effusus*	H	OBL	10.		
3. *Polygonum* sp.	H	FACW+	11.		
4. *Xanthium strumarium*	H	FAC-	12.		
5. *Sesbania drummundii*	H	FACW	13.		
6. *Ulmus crassifolia*	C	FAC	14.		
7. *Iva annua*	H	FAC	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 88%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ---- (inches)
Depth to Free Water in Pit: ---- (inches)
Depth to Saturated Soil: ---- (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
X Water Marks
___ Drift Lines
___ Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Marginally meets jurisdictional criteria.

SOILS

DS-1

Map Unit Name
(Series and Phase): Tabor fine sandy loam

Drainage Class: moderately well drained

Taxonomy (Subgroup): Aquic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 5/2	10YR 4/6	abundant/distinct	10YR 3/1 streaks

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine Date: 2 June 1999
Applicant/Owner: Alcoa Inc County: Bastrop
Investigator: Valerie Enck/Clay Fischer State: TX

Do normal circumstances exist on site? **(Yes)** No Community ID: Wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** Transect ID:
Is the area a potential Problem Area? Yes **(No)** Plot ID: DS-2
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Polygonum* sp.	H	FACW+	9.		
2. *Potamogeton* sp.	H	OBL	10.		
3. *Hydrolea ovata*	H	OBL	11.		
4. *Ludwigia* sp.	H	OBL	12.		
5. *Cyperus* sp.	H	OBL-FAC	13.		
6. *Pluchea* sp.	H	OBL-FAC	14.		
7. *Salix nigra*	C	FACW+	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: 12 (inches)
Depth to Free Water in Pit: ---- (inches)
Depth to Saturated Soil: ---- (inches)

Wetland Hydrology Indicators:
Primary Indicators:
X Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-2

Map Unit Name
(Series and Phase): Axtell fine sandy loam

Drainage Class: moderate to well drained

Taxonomy (Subgroup): Udertic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 4/1	10YR 4/6	abundant/distinct	clay

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? (Circle) **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 2 June 1999
Applicant/Owner: Alcoa Inc — County: Bastrop
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site?	**(Yes)**	No	Community ID: on-channel stock tank
Is the site significantly disturbed (atypical situation)?	Yes	**(No)**	Transect ID:
Is the area a potential Problem Area? (if needed, explain on reverse)	Yes	**(No)**	Plot ID: DS-3

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Polygonum* sp.	H	FACW+	9.		
2. *Sagittaria latifolia*	H	OBL	10.		
3. *Eleocharis* sp.	H	OBL-FACW	11.		
4. *Juncus effusus*	H	OBL	12.		
5. *Hydrolea ovata*	H	OBL	13.		
6. *Sesbania drummondii*	S	FACW	14.		
7. *Carex* sp.	H	OBL-FAC	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Field Observations

Depth of Surface Water: 12 (inches)

Depth to Free Water in Pit: ----- (inches)

Depth to Saturated Soil: ----- (inches)

Wetland Hydrology Indicators:
Primary Indicators:
- X Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-3

Map Unit Name
(Series and Phase): Axtell fine sandy loam

Drainage Class: moderate to well drained

Taxonomy (Subgroup): Udertic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 4/2	10YR 4/6	abundant/distinct	sandy clay

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? (Circle) **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 2 June 1999
Applicant/Owner: Alcoa Inc — County: Bastrop
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: Upland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS-4
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Opuntia stricta*	H	FACU	9.		
2. *Smilax bona-nox*	H	FAC	10.		
3. *Rubus trivalis*	H	FAC	11.		
4. *Ilex vomitoria*	S	FAC-	12.		
5. *Ulmus crassifolia*	C	FAC	13.		
6. *Juniperus virginiana*	S	FACU-	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 50%

Remarks: Marginally meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: --- (inches)

Depth to Free Water in Pit: >12 (inches)

Depth to Saturated Soil: >12 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

SOILS

DS-4

Map Unit Name
(Series and Phase): Axtell fine sandy loam

Drainage Class: moderate to well drained

Field Observations
Taxonomy (Subgroup): Udertic Paleustalfs

Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches) Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	10YR 6/3			sandy loam

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? Yes **(No)** (Circle)
Hydric Soils Present? Yes **(No)** Is this Sampling Point Within a Wetland? Yes **(No)**

Remarks: Does not meet jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 2 June 1999
Applicant/Owner: Alcoa Inc — County: Bastrop
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: Upland woodland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 5
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Rubus trivalis*	V	FAC	9. *Maclura pomifera*	C	UPL
2. *Smilax bona-nox*	V	FAC	10.		
3. *Amphelopsis arborea*	H	FAC	11.		
4. *Pluchea* sp.	H	OBL-FAC	12.		
5. *Callicarpa americana*	H	FACU	13.		
6. *Sesbania drummundii*	S	FACW	14.		
7. *Ulmus crassifolia*	C	FAC	15.		
8. *Bumelia lanuginosa*	C	FACU	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 67%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ---- (inches)

Depth to Free Water in Pit: >12 (inches)

Depth to Saturated Soil: >12 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

SOILS

DS-5

Map Unit Name
(Series and Phase): Tabor fine sandy loam

Drainage Class: moderately well drained

Taxonomy (Subgroup): Aquic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	-	10YR 5/4	10YR 5/6	common/indistinct	Loamy sand

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? Yes **(No)** (Circle)
Hydric Soils Present? Yes **(No)** Is this Sampling Point Within a Wetland? Yes **(No)**

Remarks: Does not meet jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 2 June 1999
Applicant/Owner: Alcoa Inc — County: Bastrop
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: Upland woodland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS-6
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Rubus trivalis*	V	FAC	9.		
2. *Amphelopsis arborea*	V	FAC	10.		
3. *Sesbania drummundii*	H	FACW	11.		
4. *Bumelia lanuginosa*	C	FACU	12.		
5. *Opuntia stricta*	H	FACU	13.		
6. *Juniperus virginiana*	S	FACU-	14.		
7. Quercus stellata	C	NA	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 43%

Remarks: Does not meet jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: **C** (inches)

Depth to Free Water in Pit: >12 (inches)

Depth to Saturated Soil: >12 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

SOILS

DS-6

Map Unit Name
(Series and Phase): Tabor fine sandy loam

Drainage Class: moderately well drained

Field Observations

Taxonomy (Subgroup): Aquic Paleustalfs

Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	-	10YR 6/3			sandy

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes **(No)** (Circle)

Wetland Hydrology Present? Yes **(No)** (Circle)

Hydric Soils Present? Yes **(No)**

Is this Sampling Point Within a Wetland? Yes **(No)**

Remarks: Does not meet jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 2 June 1999
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: Upland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS-7
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Schizachyrium scoparium*	H	FACU+	9.		
2. *Sesbania drummundii*	H	FACW	11.		
4. *Opuntia stricta*	H	FACU	12.		
5. *Prosopis glandulosa*	S	FACU-	13.		
6. *Juniperus virginiana*	S	FACU-	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 20%

Remarks: Does not meet jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ---- (inches)

Depth to Free Water in Pit: >12 (inches)

Depth to Saturated Soil: >12 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

SOILS

DS-7

Map Unit Name
(Series and Phase): Edge fine sandy loam

Drainage Class: well drained

Taxonomy (Subgroup): Iudic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches) Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 8"	10YR 8/4			sandy
8 - 12"	10YR 7/4			sandy

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
___	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes **(No)** (Circle)
Wetland Hydrology Present? Yes **(No)** (Circle)
Hydric Soils Present? Yes **(No)**

Is this Sampling Point Within a Wetland? Yes **(No)**

Remarks: Does not meet jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 2 June 1999
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: On-channel stock tank
Is the site significantly disturbed (atypical situation)? **(Yes)** No — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS-8
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Populus deltoides*	C	FAC	9.		
2. *Salix nigra*	C	FACW+	10.		
3. *Typha* sp.	H	OBL	11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100% — 100%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: 24 (inches)

Depth to Free Water in Pit: --- (inches)

Depth to Saturated Soil: --- (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
X Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-8

Map Unit Name
(Series and Phase): Axtell fine sandy loam

Drainage Class: moderate to well drained

Taxonomy (Subgroup): Udertic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"		10YR 6/2			Sandy

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Wetland pond (300' X 150') is located in a clay pit and the soil is very disturbed.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine Date: 2 June 1999
Applicant/Owner: Alcoa Inc County: Lee
Investigator: Valerie Enck/Clay Fischer State: TX

Do normal circumstances exist on site? **(Yes)** No Community ID: on-channel stock tank
Is the site significantly disturbed (atypical situation)? Yes **(No)** Transect ID:
Is the area a potential Problem Area? Yes **(No)** Plot ID: DS-9
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Eleocharis* sp.	H	OBL-FACW	9.		
2. *Polygonum* sp.	H	FACW+	10.		
3. *Cyperus* sp.	H	OBL-FAC	11.		
4. *Hydrolea ovata*	H	OBL	12.		
5. *Cynodon dactylon*	H	FACU+	13.		
6. *Sesbania drummundii*	H	FACW	14.		
7. *Salix nigra*	C	FACW+	15.		
8. *Ulmus crassifolia*	C	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 87%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: 24 (inches)

Depth to Free Water in Pit: ---- (inches)

Depth to Saturated Soil: ---- (inches)

Wetland Hydrology Indicators:
Primary Indicators:
X Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-9

Map Unit Name
(Series and Phase): Axtell fine sandy loam

Drainage Class: moderate to well drained

Taxonomy (Subgroup): Udertic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"		10YR 4/2	10YR 4/6	few/distinct	clay

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine Date: 2 June 1999
Applicant/Owner: Alcoa Inc County: Lee
Investigator: Valerie Enck/Clay Fischer State: TX

Do normal circumstances exist on site? **(Yes)** No Community ID: Upland
Is the site significantly disturbed (atypical situation)? Yes **(No)** Transect ID:
Is the area a potential Problem Area? Yes **(No)** Plot ID: DS-10
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Smilax bona-nox*	V	FAC	9.		
2. *Cynodon dactylon*	H	FACU+	10.		
3. *Iva annua*	H	FAC	11.		
4. *Ulmus crassifolia*	C	FAC	12.		
5. *Prosopis glandulosa*	S	FACU-	13.		
6. *Juniperus virginiana*	S	FACU-	14.		
7. *Quercus stellata*	C	NA	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 43%

Remarks: Does not meet jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ---- (inches)

Depth to Free Water in Pit: >12 (inches)

Depth to Saturated Soil: >12 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

SOILS

DS-10

Map Unit Name
(Series and Phase): Axtell fine sandy loam

Drainage Class: moderate to well drained

Field Observations
Taxonomy (Subgroup): Udertic Paleustalfs

Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"		10YR 6/3			sandy silty loam

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes **(No)** (Circle)
Wetland Hydrology Present? Yes **(No)** (Circle)
Hydric Soils Present? Yes **(No)**

Is this Sampling Point Within a Wetland? Yes **(No)**

Remarks: Does not meet jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 3 June 1999
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: on-channel stock tank
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS-11
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Eleocharis* sp.	H	OBL-FACW	9.		
2. *Cyperus* sp.	H	OBL-FAC	10.		
3. *Polygonum* sp.	H	FACW+	11.		
4. *Xanthium strumarium*	H	FAC-	12.		
5. *Spirodela* sp.	H	OBL	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 80%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: 24 (inches)

Depth to Free Water in Pit: ----- (inches)

Depth to Saturated Soil: ----- (inches)

Wetland Hydrology Indicators:
Primary Indicators:
X Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-11

Map Unit Name
(Series and Phase): Edge fine sandy loam

Drainage Class: well drained

Field Observations
Taxonomy (Subgroup): Iudic Paleustalfs

Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"		10YR 4/2	10YR 6/1	few/distinct	

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 3 June 1999
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: Wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS-12
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Eleocharis* sp.	H	OBL-FACW	9.		
2. *Carex* sp.	H	OBL-FAC	10.		
3. *Polygonum* sp.	H	FACW+	11.		
4. *Juncus* sp.	H	OBL-FAC	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: 12 (inches)

Depth to Free Water in Pit: ---- (inches)

Depth to Saturated Soil: ---- (inches)

Wetland Hydrology Indicators:
Primary Indicators:
X Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks:

SOILS

DS-12

Map Unit Name
(Series and Phase): Edge fine sandy loam

Drainage Class: well drained

Taxonomy (Subgroup): Iudic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"		10YR 4/2	10YR 6/1	few/distinct	

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 3 June 1999
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: Wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS-13
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Polygonum* sp.	H	FACW+	9.		
2. *Scirpus* sp.	H	OBL-NI	10.		
3. *Juncus* sp.	H	OBL-FAC	11.		
4. *Hydrolea ovata*	H	OBL	12.		
5. *Alopecurus* sp.	H	OBL-FACW	13.		
6. *Panicum* sp.	H	OBL-FACU	14.		
7. *Salix nigra*	C	FACW+	15.		
8. *Ulmus crassifolia*	C	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 87%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: 24 (inches)

Depth to Free Water in Pit: ---- (inches)

Depth to Saturated Soil: ---- (inches)

Wetland Hydrology Indicators:
Primary Indicators:
X Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-13

Map Unit Name
(Series and Phase): Edge fine sandy loam

Drainage Class: well drained

Taxonomy (Subgroup): Iudic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"		10YR 4/2	10YR 6/1	few/distinct	

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine
Date: 7 March 2000
Applicant/Owner: Alcoa Inc
County: Bastrop
Investigator: Valerie Enck/Clay Fisher
State: Texas

	(Circle)			
Do normal circumstances exist on site?	**(Yes)**	No	Community ID:	Mesquite grassland
Is the site significantly disturbed (a typical situation)?	Yes	**(No)**	Transect ID:	
Is the area a potential Problem Area?	Yes	**(No)**	Plot ID:	DS - 14

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Prosopsis glandulosa*	C	FACU-	9.		
2. *Prosopsis glandulosa*	S	FACU-	10.		
3. *Solanum sp.*	H	FAC-	11.		
4. *Aristida sp.*	H	FACU	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, FAC, FAC+ 0%

Remarks: Does not meet jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Field Observations

Depth of Surface Water:	------	(inches)
Depth to Free Water in Pit:	>12	(inches)
Depth to Saturated Soil:	>12	(inches)

Wetland Hydrology Indicators:

Primary Indicators:
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- Oxidized Root Channels in Upper 12 Inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

SOILS DS-14

Map Unit Name (Series and Phase): Tabor fine sandy loam

Drainage Class: moderately well drained

Taxonomy (Subgroup): Aquic Paleustalfs

Field Observations Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0-12		10 YR 6/3	NA		sandy loam

Hydro Soil Indicators:

	Histosol		Concretions
	Histic Epipedon		High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor		Organic Streaking in Sandy Soils
	Aquic Moisture Regime		Listed on Local Hydric Soils List
	Reducing Conditions		Listed on National Hydric Soils List
____	Gleyed or Low-Chrome Colors	____	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	**(No)**	Is this Sampling Point Within a Wetland?	Yes	**(No)**
Wetland Hydrology Present?	Yes	**(No)**			
Hydric Soils Present?	Yes	**(No)**			

Remarks: Does not meet jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine
Applicant/Owner: Alcoa Inc
Investigator: Valerie Enck/Clay Fischer
Date: 8 March 2000
County: Lee
State: Texas

	(Circle)			
Do normal circumstances exist on site?	**(Yes)**	No	Community ID:	Grassland
Is the site significantly disturbed (a typical situation)?	Yes	**(No)**	Transect ID:	
Is the area a potential Problem Area?	Yes	**(No)**	Plot ID:	DS - 15

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Cynodon dactylon*	H	FACU+	9.		
2. *Prosopsis glandulosa*	S	FACU-	10.		
3. *Paspalum plicatulum*	H	FAC	11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, FAC, FAC+ 33%

Remarks: Does not meet jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- Aerial Photographs
- Other
- X No Recorded Data Available

Field Observations

Depth of Surface Water:	---	(inches)
Depth to Free Water in Pit:	>12	(inches)
Depth to Saturated Soil:	>12	(inches)

Wetland Hydrology Indicators:

Primary Indicators:
- Inundated
- Saturated in Upper 12 Inches
- Water Marks
- Drift Lines
- Sediment Deposits
- Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- Oxidized Root Channels in Upper 12 Inches
- Water-Stained Leaves
- Local Soil Survey Data
- FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

SOILS DS-15

Map Unit Name (Series and Phase):	Axtell fine sandy loam	Drainage Class:	moderate to well drained
Taxonomy (Subgroup):	Udertic Paleustalfs	Field Observations Confirm Mapped Type?	Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0-12		10 YR 6/3	NA		sandy silty loam

Hydro Soil Indicators:

	Histosol		Concretions
	Histic Epipedon		High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor		Organic Streaking in Sandy Soils
	Aquic Moisture Regime		Listed on Local Hydric Soils List
	Reducing Conditions		Listed on National Hydric Soils List
____	Gleyed or Low-Chrome Colors	____	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	**(No)**	Is this Sampling Point Within a Wetland?	Yes	**(No)**
Wetland Hydrology Present?	Yes	**(No)**			
Hydric Soils Present?	Yes	**(No)**			

Remarks: Does not meet jurisdictional criteria.

Horizon
ENVIRONMENTAL SERVICES, INC.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine
Applicant/Owner: Alcoa Inc
Investigator: Valerie Enck/Clay Fischer

Date: 8 March 2000
County: Lee
State: TX

Do normal circumstances exist on site?	(Yes)	No	Community ID: Riparian woodland
Is the site significantly disturbed (atypical situation)?	Yes	(No)	Transect ID:
Is the area a potential Problem Area? (if needed, explain on reverse)	Yes	(No)	Plot ID: DS-16

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Ulmus crassifolia*	C	FAC	9. *Stellaria media*	H	FACU-
2. *Acer negundo*	C	FACW-	10. *Leersia virginica*	H	FACW
3. *Celtis laevigata*	C	FAC	11.		
4. *Ilex vomitoria*	S	FAC-	12.		
5. *Callicarpa americana*	S	FACU	13.		
6. *Smilax bona-nox*	V	FAC	14.		
7. *Parthenocissus quinquefolia*	V	FAC	15.		
8. *Toxicodendron radicans*	V	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 60%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ___ (inches)
Depth to Free Water in Pit: >12. (inches)
Depth to Saturated Soil: >12. (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

Horizon
ENVIRONMENTAL SERVICES, INC.

SOILS

DS-16

Map Unit Name
(Series and Phase): Sayers fine sandy loam

Drainage Class: excessively drained

Field Observations
Taxonomy (Subgroup): Ludic Paleustalfs

Confirm Mapped Type? Yes (No)

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"		10YR 5/3	10YR 4/4	common/distinct	

Hydro Soil Indicators:

___	Histosol	___	Concretions
___	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
___	Sulfidic Odor	___	Organic Streaking in Sandy Soils
___	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
___	Reducing Conditions	___	Listed on National Hydric Soils List
___	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No)

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks: Does not meet jurisdictional criteria.

Horizon
ENVIRONMENTAL SERVICES, INC.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine
Applicant/Owner: Alcoa Inc
Investigator: Valerie Enck/Clay Fischer
Date: 8 March 2000
County: Lee
State: TX

Do normal circumstances exist on site?	(Yes)	No	Community ID: Upland woodland
Is the site significantly disturbed (atypical situation)?	Yes	(No)	Transect ID:
Is the area a potential Problem Area? (if needed, explain on reverse)	Yes	(No)	Plot ID: DS-17

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Quercus stellata*	C	NA	9.		
2. *Ilex vomitoria*	S	FAC-	10.		
3. *Juniperus virginiana*	S	FACU-	11.		
4. *Opuntia stricta*	H	FACU	12.		
5. *Smilax bona-nox*	V	FAC	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 33%

Remarks: Does not meet jurisdictional criteria.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ____ (inches)
Depth to Free Water in Pit: >12 (inches)
Depth to Saturated Soil: >12 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

Horizon
ENVIRONMENTAL SERVICES, INC.

SOILS

DS-17

Map Unit Name
(Series and Phase): Tabor fine sandy loam

Drainage Class: moderately well drained

Taxonomy (Subgroup): Aquic Paleustalfs

Field Observations
Confirm Mapped Type? Yes (No)

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"		10YR 6/3			sandy

Hydro Soil Indicators:

___	Histosol	___	Concretions
___	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
___	Sulfidic Odor	___	Organic Streaking in Sandy Soils
___	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
___	Reducing Conditions	___	Listed on National Hydric Soils List
___	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	(No)	(Circle)		
Wetland Hydrology Present?	Yes	(No)			(Circle)
Hydric Soils Present?	Yes	(No)		Is this Sampling Point Within a Wetland?	Yes (No)

Remarks: Does not meet jurisdictional criteria.

Approved by HQUSACE 3/92

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ENVIRONMENTAL SERVICES, INC.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 8 March 2000
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Valerie Enck/Clay Fischer — State: TX

Do normal circumstances exist on site?	(Yes)	No	Community ID: Upland woodland
Is the site significantly disturbed (atypical situation)?	Yes	(No)	Transect ID:
Is the area a potential Problem Area? (if needed, explain on reverse)	Yes	(No)	Plot ID: DS - 18

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Quercus stellata*	C	NA	9.		
2. *Ilex vomitoria*	S	FAC-	10.		
3. *Juniperus virginiana*	S	FACU-	11.		
4. *Opuntia stricta*	H	FACU	12.		
5. *Smilax bona-nox*	V	FAC	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 25%

Remarks: Does not meet jurisdictional criteria.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ___ (inches)
Depth to Free Water in Pit: >12 (inches)
Depth to Saturated Soil: >12 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

Horizon
ENVIRONMENTAL SERVICES, INC.

SOILS

DS-18

Map Unit Name
(Series and Phase): Axtell fine sandy loam

Drainage Class: moderate to well drained

Field Observations
Taxonomy (Subgroup): Udertic Paleustalfs

Confirm Mapped Type? Yes (No)

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"		10YR 6/3			sandy silty loam

Hydro Soil Indicators:

___	Histosol	___	Concretions
___	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
___	Sulfidic Odor	___	Organic Streaking in Sandy Soils
___	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
___	Reducing Conditions	___	Listed on National Hydric Soils List
___	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	(No)	(Circle)
Wetland Hydrology Present?	Yes	(No)	(Circle)
Hydric Soils Present?	Yes	(No)	(Circle)

Is this Sampling Point Within a Wetland? Yes (No)

Remarks: Does not meet jurisdictional criteria.

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine Date: 8 March 2000
Applicant/Owner: Alcoa Inc County: Bastrop
Investigator: Valerie Enck/Clay Fischer State: TX

Do normal circumstances exist on site? **(Yes)** No Community ID: Wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** Transect ID:
Is the area a potential Problem Area? Yes **(No)** Plot ID: DS - 19
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Salix nigra*	C	FACW+	9.		
2. *Ulmus crassifolia*	C	FAC	10.		
3. *Sesbania drummundii*	S	FACW	11.		
4. *Xanthium strumarium*	H	FAC-	12.		
5. *Ilex vomitoria*	S	FAC-	13.		
6. *Rumex* sp.	H	FACW--FAC	14.		
7. *Iva annua*	H	FAC	15.		
8. *Smilax bona-nox*	H	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 75%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ----- (inches)

Depth to Free Water in Pit: >12 (inches)

Depth to Saturated Soil: >12 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
X Water Marks
___ Drift Lines
___ Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-19

Map Unit Name
(Series and Phase): Sayers fine sandy loam

Drainage Class: excessively drained

Taxonomy (Subgroup): Typic Ustifluvents

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 5/2	10YR 4/3	common/distinct	

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks: Meets jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 9 March 2000
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Valerie Enck/Zane Homesley — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 20
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Eleocharis* sp.	H	OBL-FACW	9.		
2. *Cyperus* sp.	H	OBL-FAC	10.		
3. *Juncus* sp.	H	OBL-FAC	11.		
4. *Andropogon glomeratus*	H	FACW+	12.		
5. *Sesbania drummundii*	S	FACW	13.		
6. *Salix nigra*	C	FACW+	14.		
7. *Typha* sp.	H	OBL	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 100%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ---- (inches)
Depth to Free Water in Pit: >12 (inches)
Depth to Saturated Soil: >12 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
X Water Marks
___ Drift Lines
___ Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-20

Map Unit Name
(Series and Phase): Sayers fine sandy loam

Drainage Class: excessively drained

Taxonomy (Subgroup): Typic Ustifluvents

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 5/2	10YR 4/3	common/distinct	

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks: Meets jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 9 March 2000
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Valerie Enck/Zane Homesley — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 21
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Eleocharis* sp.	H	OBL-FACW	9.		
2. *Andropogon glomeratus*	H	FACW+	10.		
3. *Juncus* sp.	H	OBL-FAC	11.		
4. *Sesbania drummundii*	S	FACW	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC 100%
(excluding FAC-) 100%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ---- (inches)

Depth to Free Water in Pit: >12 (inches)

Depth to Saturated Soil: >12 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
X Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-21

Map Unit Name
(Series and Phase): Sayers fine sandy loam

Drainage Class: excessively drained

Taxonomy (Subgroup): Typic Ustifluvents

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 5/2	10YR 4/3	common/distinct	

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks: Meets jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 9 March 2000
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Valerie Enck/Zane Homesley — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 22
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1. *Polygonum* sp.	H	FACW+	9.			
2. *Rubus trivalis*	H	FAC	10.			
3. *Juncus* sp.	H	OBL-FAC	11.			
4. *Sesbania drummundii*	S	FACW	12.			
5.			13.			
6.			14.			
7.			15.			
8.			16.			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: --- (inches)

Depth to Free Water in Pit: >12 (inches)

Depth to Saturated Soil: 2 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
X Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-22

Map Unit Name
(Series and Phase): Tabor fine sandy loam

Drainage Class: moderately well drained

Taxonomy (Subgroup): Aquic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 3/4	NA		Some streaking/mucky sand

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	X	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
___	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks: Meets jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 9 March 2000
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Valerie Enck/Zane Homesley — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 23
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Polygonum* sp.	H	FACW+	9.		
2. *Cyperus alternifolius*	H	FACW+	10.		
3. *Juncus* sp.	H	OBL-FAC	11.		
4. *Andropogon glomeratus*	H	FACW+	12.		
5. *Eleocharis* sp.	H	OBL-FACW	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-) 100%

Remarks: Meets jurisdictional criteria.

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: ---- (inches)

Depth to Free Water in Pit: >12 (inches)

Depth to Saturated Soil: 3 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
X Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
X Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

SOILS

DS-23

Map Unit Name
(Series and Phase): Tabor fine sandy loam

Drainage Class: moderately well drained

Taxonomy (Subgroup): Aquic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 3/4	NA		Some streaking/mucky sand

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	X	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
___	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Meets jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks: Meets jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 22 May 2000
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Lee Sherrod — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 38
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Salix nigra*	T	FACW+	9. *Eleocharis* sp.	H	OBL
2. *Iva annua*	H	FAC	10. *Cardiospermum* sp.	H	FAC
3. *Alopecurus carolinianus*	H	FACW	11. *Pluchea* sp.	H	FACW+
4. *Setaria* Sp.	H	FAC - FACW	12.		
5. *Ambrosia trifida*	H	FAC	13.		
6. *Carex* Sp.	H	OBL - FAC	14.		
7. *Juncus* Sp.	H	OBL - FACW	15.		
8. *Polygunum* sp.	H	FACW+	16.		

Percent of Dominant Species that are OBL, FACW, FAC, FAC+ (excluding FAC-) 100%

Remarks

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
X Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: 0 (inches)
Depth to Free Water in Pit: >18 (inches)
Depth to Saturated Soil: >18 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
X Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: wet area averages 20 - 25" wide; site is adjacent to middle Yegua Creek, old meander scar depressed 2-3'

SOILS

DS-38

Map Unit Name
(Series and Phase): Edge fine sandy loam

Drainage Class: well drained

Taxonomy (Subgroup): Ludic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 4/1 - 4/2	NA	many/distinct	clay loam

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 22 May 2000
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Lee Sherrod — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: Upland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 39
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Smilax bona-nox*	H	FAC	9. *Pluchea fortida*	H	FACW+
2. *Prosopis glandulosa*	S	FACU	10.		
3. *Rafbida columnaris*	H	NL	11.		
4. *Carya Illinoinensis*	T	FAC+	12.		
5. *Gleditsia triacanthos*	T	FAC	13.		
6.*Cynodon dactylis*	H	FACU+	14.		
7.*Ruelia* sp.	H	NI - FACW	15.		
8. *Sasbania drummondii*	S	FACW	16.		

Percent of Dominant Species that are OBL, FACW, FAC, FAC+ 45%

Remarks: Does not meet jurisdictional criteria based on *Ratbida columnaris* (Mexican hat) being an upland species.

HYDROLOGY

Recorded Data (Describe in Remarks):
- Stream, Lake, or Tide Gauge
- X Aerial Photographs
- Other
- X No Recorded Data Available

Field Observations

Depth of Surface Water: 0 (inches)

Depth to Free Water in Pit: 0 (inches)

Depth to Saturated Soil: <18 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

SOILS

DS-39

Map Unit Name
(Series and Phase): Normangee clay loam

Drainage Class: moderately well drained

Taxonomy (Subgroup): Thermic Udertic Haplustafs

Field Observations
Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 4/2			clay loam

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
___	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does not meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes **(No)** (Circle)
Wetland Hydrology Present? Yes **(No)** (Circle)
Hydric Soils Present? Yes **(No)** Is this Sampling Point Within a Wetland? Yes **(No)**

Remarks: Meets jurisdictional criteria.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 22 May 2000
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Lee Sherrod — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 40
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Polygonum* sp.	H	FACW+	9.		
2. *Iva annua*	H	FACW	10.		
3. *Echinochloa* sp.	H	FACW+ to OBL	11.		
4. *Eryngiurn* sp.	H	FACW+	12.		
5. Carex sp.	H	OBL-FAC	13.		
6.*Juncus* sp.	H	OBL-FAC	14.		
7.*Solanum* sp.	H	FACU+ to UPL	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, FAC, FAC+ 86%

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- _X_ Aerial Photographs
- ___ Other
- _X_ No Recorded Data Available

Field Observations
- Depth of Surface Water: 0 (inches)
- Depth to Free Water in Pit: >18 (inches)
- Depth to Saturated Soil: >18 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- _X_ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- _X_ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: wet area averages 50' wide and 500' long; site is adjacent to middle Yegua Creek, old meander scar of mine creek, incised 6" - 1'.

SOILS

DS-40

Map Unit Name
(Series and Phase): Edge fine sandy loam

Drainage Class: well drained

Taxonomy (Subgroup): Ludic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 4/1 to 4/2	SY 4/4 to 4/6		loamy clay

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 22 May 2000
Applicant/Owner: Alcoa Inc — County: Lee
Investigator: Lee Sherrod — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 41
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Echinochloa* sp.	H	OBL - FACW+	9.		
2.			10.		
3.			11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, FAC, FAC+ 100%

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
X Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: 0 (inches)

Depth to Free Water in Pit: >18 (inches)

Depth to Saturated Soil: >18 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
X Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: small excavated depression ~50' X 25', impounded, saturated, algae on surface, top 2" organic layer

SOILS

DS-41

Map Unit Name
(Series and Phase): Edge fine sandy loam

Drainage Class well drained

Taxonomy (Subgroup): Ludic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 6/3	10YR 4/6	mucky/distinct	

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks: Does meet jurisdictional criteria.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 22 May 2000
Applicant/Owner: Alcoa Inc — County: Bastrop
Investigator: Lee Sherrod — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 42
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Juncus* sp.	H	OBL - FACW	9.		
2. *Ludwigia* sp.	H	OBL	10.		
3. *Hydrokea* sp.	H	OBL	11.		
4.			12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW, FAC, FAC+ 100%

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
X Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: 0 (inches)

Depth to Free Water in Pit: >18 (inches)

Depth to Saturated Soil: >18 (inches)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
X Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: small excavated depression ~30' X 150'

SOILS

DS-42

Map Unit Name
(Series and Phase): Edge fine sandy loam

Drainage Class well drained

Taxonomy (Subgroup): Ludic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 4/1 - 4/2	10YR 5/2 5YR 4/6		sand

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Three Oaks Mine — Date: 22 May 2000
Applicant/Owner: Alcoa Inc — County: Bastrop
Investigator: Lee Sherrod — State: TX

Do normal circumstances exist on site? **(Yes)** No — Community ID: wetland
Is the site significantly disturbed (atypical situation)? Yes **(No)** — Transect ID:
Is the area a potential Problem Area? Yes **(No)** — Plot ID: DS - 43
(if needed, explain on reverse)

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Polygonum* sp.	H	FACW+	9. *Fraxinus pennsylavnica*	T	FACW-
2. *Juncus effusus*	H	OBL	10. *Cephalanthus occidentalis*	S	OBL
3. *Sasbania* sp.	S	FACW	11.		
4. *Pluchea* sp.	H	FACW+	12.		
5. *Echinochloa* sp.	H	OBL - FACW+	13.		
6. *Eleocharis* sp.	H	OBL - FACW	14.		
7. *Carex* sp.	H	OBL - FAC	15.		
8. *Ulmus rubra*	T	FAC	16.		

Percent of Dominant Species that are OBL, FACW, FAC, FAC+ 100%

Remarks:

HYDROLOGY

Recorded Data (Describe in Remarks):
Stream, Lake, or Tide Gauge
X Aerial Photographs
Other
X No Recorded Data Available

Field Observations

Depth of Surface Water: 0-2 (inches)
Depth to Free Water in Pit: --- (inches)
Depth to Saturated Soil: --- (inches)

Wetland Hydrology Indicators:
Primary Indicators:
X Inundated
X Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
X Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
X Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: wetland fringe along creek, average width 25'

SOILS

DS-43

Map Unit Name
(Series and Phase): Edge fine sandy loam

Drainage Class well drained

Taxonomy (Subgroup): Ludic Paleustalfs

Field Observations
Confirm Mapped Type? Yes **(No)**

PROFILE DESCRIPTION:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, Etc.
0 - 12"	--	10YR 4/1	5YR 4/6 , 2.5YR 2.5/0	heavy	silty clay

Hydro Soil Indicators:

	Histosol	___	Concretions
	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
	Sulfidic Odor	___	Organic Streaking in Sandy Soils
	Aquic Moisture Regime	___	Listed on Local Hydric Soils List
	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chrome Colors	___	Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? **(Yes)** No (Circle)
Wetland Hydrology Present? **(Yes)** No (Circle)
Hydric Soils Present? **(Yes)** No

Is this Sampling Point Within a Wetland? **(Yes)** No

Remarks:

APPENDIX B

EXAMPLE DEED RESTRICTION

NOTICE OF RESTRICTION

STATE OF TEXAS

KNOW ALL MEN BY THESE PRESENTS THAT:

COUNTY OF LEE

Alcoa is the owner of that real property more particularly described and shown in Exhibit A (hereinafter the "Property) attached hereto and made hereof. The 54.1-acre Property is also referenced in "The Mitigation Plan For Three Oaks Mine". The Property is subject to special conditions of Department of the Army Section 404 Permit Number ___, dated ____, or a revision thereof. One of the special conditions of the referenced permit requires restrictions be placed on the deed for the Property for the purpose of providing compensation for adverse impacts to waters of the United States. Any purchaser of all or any part of the Property, or any person having an interest in or proposing to acquire interest in all or part of the Property, or any person proposing to develop or improve all or any part of the Property are as follows:

1) The Property is hereby dedicated in perpetuity as "a waters of the US mitigation area" associated with mining activities on Three Oaks Mine. The Property will not be disturbed, except by those activities that would not adversely affect the intended extent, condition, and function of the mitigation area or by those activities specifically provided for in the approved mitigation plan or in the special conditions for this permit. Disturbance of the dedicated property may require Department of the Army authorization.

2) This restriction may not be removed or revised without obtaining a modification of the aforementioned Department of the Army authorization and prior written approval of the Department of the Army. Permit modifications may be granted only by the USACE.

This notice of restriction does not grant any property rights or exclusive privileges.

EXECUTED THIS ___ day of _____, 2003.

BY:_____

SUBSCRIBED AND SWORN TO BEFORE ME by _____, on this the ___ day of _____, 2003, to certify which witness my hand and seal of office.

_____
Notary Public in and for the State of Texas

My commission expires:_____
Printed Name of Notary:_____

APPENDIX C

HERBACEOUS PLANTING SPECIFICATIONS INCLUDING SEEDING RATES

HERBACEOUS PLANTING SPECIFICATIONS
INCLUDING SEEDING RATES
(excerpt from Railroad Commision of Texas Permit Table .145-3 "Perennial Herbaceous Species Planting")

COMMON NAME	PLANTING DATES (optimum)	PLANTING DATES (maximum)	DEPTH (inches)	RATE (lbs/acre)
Forbs				
Partridge Pea	3/1 to 4/1	2/1 to 6/15	1/2 to 1	1 to 40 COMM
Bundleflower	9/15 to 10/15	9/1 to 11/15	1/2 to 1	1 to 15 PLS
Sunflower:	3/1 to 4/1	2/1 to 6/15	1/4 to 1/2	0.5 to 7 PLS
Common				
Maximillian				
Native Wildflower Mix:	3/1 to 4/1	2/1 to 6/15	1/4 to 1/2	0.5 to 10 PLS
Bluebonnets				
Beebalm				
Coneflower				
Dayflowers				
Engelmann Daisy				
Fleabanes				
Gayfeather				
Heath Aster				
Prairie Coneflower				
Sensitivebriar				
Grasses				
Beaked Panicum	3/1 to 4/1	2/1 to 6/15	1/4 to 1/2	1 to 6 PLS
Bluestem:	3/1 to 4/1	2/1 to 6/15	1/4 to 3/4	2 to 8 PLS
Big				
Broomsedge				
Bushy				
Little				
Eastern Gammagrass	3/1 to 4/1	2/1 to 6/15	1/4 to 1/2	2 to 6 PLS
Florida Paspalum	3/1 to 4/1	2/1 to 6/15	1/4 to 1/2	2 to 6 PLS
Grama:	3/1 to 4/1	2/1 to 6/15	1/4 to 1/2	2 to 8 PLS
Sideoats				
Blue				
Green Sprangletop	3/1 to 4/1	2/1 to 6/15	1/4 to 1/2	1.5 to 6 PLS
Indiangrass	3/1 to 4/1	2/1 to 6/15	1/4 to 1/2	2 to 6 PLS
Inland Sea-oats	3/1 to 3/31	2/1 to 6/15	1/4 to 1/2	2 to 6 PLS
Millet:	3/15 to 6/15	3/1 to 7/31	1 to 2	15 COMM
Jungle-rice				
Wild				
Purple Three-awn	3/1 to 3/31	2/1 to 6/15	1/4 to 1/2	2 to 6 PLS
Purpletop	3/1 to 3/31	2/1 to 6/15	1/4 to 1/2	2 to 5 PLS
Rice Cut-grass	3/1 to 3/31	2/1 to 6/15	1/4 to 1/2	2 to 6 PLS
Switchgrass	3/1 to 4/1	2/1 to 6/15	1/4 to 1/2	0.5 to 6 PLS
Virginia Wildrye	9/15 to 10/15	9/1 to 11/30	1/4 to 1/2	2 to 6 PLS
White-grass	3/1 to 3/31	2/1 to 6/15	1/4 to 1/2	2 to 6 PLS

Notes:

1. PLS = Pure Live Seed and COMM = Commercial
2. Planting dates other than maximum may be used if seedbed is favorable and there is at least six weeks prior to killing frost or high temperatures.
3. Actual planting rates will vary depending on method of planting utilized, i.e. drilled, broadcast, or row planting.
4. Planting rates for Inland Sea-oats, Purple Three-awn, Rice cut-grass, and White-grass were not included in Table .145-3
5. Although this table identifies switchgrass seeding rates to vary from 0.5 to 6PLS/acre, seeding rates within on-site and off-site USACE mitigation areas will not exceed 3 PLS/acre.
6. Seeding rate for native wildflower mix will likely be increased in off-site mitigation areas.

APPENDIX D

USFWS CORRESPONDENCE

JW

United States Department of the Interior

FISH AND WILDLIFE SERVICE
10711 Burnet Road, Suite 200
Austin, Texas 78758
(512) 490-0057

September 4, 2002

Wayne A. Lea
Department of the Army
Corps of Engineers-Fort Worth District
P.O. Box 17300
Fort Worth, Texas 76102

Consultation #: 2-15-00-I-1002

Dear Mr. Lea:

We are responding to your August 9, 2002, letter in which you transmitted a biological assessment regarding the Aluminum Company of America's (Alcoa) proposed construction and operation of the Three Oaks Mine (Project Number 199900331) in Bastrop and Lee counties, Texas. This project requires a permit under Section 404 of the Clean Water Act from your agency. Based on information provided in this biological assessment, we concur with your determination that the proposed project is not likely to adversely affect any federally listed endangered or threatened species.

This letter concludes informal consultation pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act). Please recognize, however, that should any changes occur to the proposed project or should any information become available that indicates the proposed project may adversely impact federally listed species you should contact our office and reinitiate consultation pursuant to section 7 of the Act as necessary. We recommend you coordinate any proposed modifications to the project or new information through our office as soon as possible to determine the appropriate level of consultation needed.

We appreciate the opportunity to cooperate with you in protecting and recovering federally listed species occurring in Texas. For additional questions regarding this project, please contact Paige Najvar of this office at 512-490-0057, extension 229 or the above address. Please refer to the consultation number listed above in any future correspondence regarding this project.

Sincerely,

E. Dan Whitehead

for William Seawell
Acting Field Supervisor

SEP 09 2002

Horizon

Corporate Headquarters: Austin, TX

Offices:
Beaumont, TX
Houston, TX
Karnes City, TX
Pittsburg, TX
San Antonio, TX
Shreveport, LA
Ann Arbor, MI
Canton, MI

10 June 2002

Ms. Page Nejvar
U.S. Fish and Wildlife Service
10711 Burnet Road, Suite 200
Austin, Texas 78758

Re: Alcoa Three Oaks Mine and Reroute of FM 696/619, Bastrop and Lee Counties
HJN 990022

Dear Page:

Per our meeting on May 30th concerning the reroute of FM 696/619 and the Alcoa Three Oaks Mine, this letter is provided to request your review of the Environmental Assessment for the relocation of 696/619 and to provide concurrence that neither the relocation of FM696/619 nor the proposed Three Oaks Mine are likely to adversely affect any federally listed threatened or endangered species or cause adverse modification to any designated Critical Habitat. Results of four years of intensive surveys for the endangered Houston toad (*Bufo hustonensis*) on the 16,062 acre Three Oaks Mine Permit Area and surrounding area were provided along with the Environmental Assessment. The reroute of FM 696/619 is also contained within the study area of these surveys. The results of the studies indicate that the Houston toad is not likely to occur on the Calvert Bluff geologic formation and is restricted to the Carrizo formation and other deep sand formations to the east of the proposed mine site and road relocations. All proposed mining and ancillary activities, including the road relocations, will occur on the Calvert Bluff and Simsboro formations several miles west of any known Houston toad occurrences on the Carrizo. Designated critical habitat for the Houston toad does not occur within the Three Oaks Mine Permit Area nor within the proposed relocation area for FM 696-619. Furthermore, as stated in the 2001 Houston toad summary report, hydrogeologic studies conducted as part of the mine permitting effort indicate that depressurization of the Simsboro and dewatering of local Calvert Bluff groundwaters during mining will not adversely affect groundwater in the Carrizo aquifer which may support Houston toads. These hydrogeologic studies and modeling have been independently evaluated and verified by the U.S. Geological Survey (USGS) and the Department of the Interior, Office of Surface Mining (OSM). Based on this evidence, it is unlikely that the Houston toad will be adversely affected or its designated critical habitat will be adversely modified.

Other federally listed species of potential occurrence in the project vicinity include several migratory bird species, including the bald eagle, interior least tern, whooping crane, and piping plover (list attached). Suitable habitat for these species does not exist in the Three Oaks Mine Permit Area. These species might occur in the area only as short-term transients during migration. Adverse affects would not be expected.

It is noted that the Texas Parks and Wildlife Department, Texas Biological and Conservation Data Base lists the federally endangered Navasota ladies-tresses (*Spiranthes parksii*) as a possible species for Lee County. The Service does not recognize this species for Lee County and the leading experts on this species agree that Lee County is not within the range of this species.

Based on this information, we request your concurrence that no federally listed threatened or endangered species are likely to be adversely affected, nor any designated critical habitat is likely to be adversely modified by the relocation of FM 696/619 or the mining and related activities to be conducted within the 16,062 acre proposed Three Oaks Mine Permit Area. It is understood that if at some point in the future, mining activities should create conditions favorable for bald eagles, interior least terns or any other federally listed species such that those species are attracted to active areas of the mine where adverse affects could then occur, Alcoa Inc will consult with the Service for prudent conservation and management measures to avoid incidental take.

Countersignature of this letter shall suffice for your concurrence. Please call if you have any questions.

Thank you for your assistance.

Sincerely,

Lee Sherrod

C. Lee Sherrod
Principal

Sigrid J. Vosler 6/12/02

Concurrence By: Date
For U.S. Fish and Wildlife Service

c: Laurie Thering, Alcoa Inc
Mike Green, Alcoa Inc

APPENDIX E

ANNUAL MONITORING DATA COLLECTION FORM

ANNUAL MONITORING DATA SHEET COLLECTION FORM
FOR MITIGATION AREAS

Date: _____
Mitigation Site: _____
Investigator: _____
Data Sample Location: _____
Community Type: _____

VEGETATION

Tree Species Present	% Composition	Planted vs. Recruit
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____

Number of Trees Originally Planted at this Site: _____
Estimated % Survivorship: _____

Shrub Species Present	% Composition	Planted vs. Recruit
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____

Number of Shrubs Originally Planted at this Site: _____
Estimated % Survivorship: _____

Herbaceous Species Present	% Composition	Planted vs. Recruit
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____

Number of Herbaceous Plants Originally Planted at this Site: _____
Estimated % Cover in this Area: _____

Noxious, Non-Native, or Invasive Species Present **% Composition**

1. _____ _____
2. _____ _____
3. _____ _____
4. _____ _____
5. _____ _____

Estimated % Cover in this Area: _____

Recommended Control Measures (if applicable): _____

_____

HYDROLOGY

Waters of the US

Length of Defined Channel _____

Width to OHWM _____

Approximate Flow/Depth _____

Meanders in Channel YES NO

Braided Channel YES NO

Erosion HIGH MODERATE LOW

Wetlands

Depth to saturation _____

Inundation depth _____

Sediment deposits YES NO

Water marks YES NO

Erosion HIGH MODERATE LOW

SOILS

Mapped Soil Series _____

Texture _____

Matrix Color (Munsell) _____

Mottle Color (Munsell) _____

Mottle Abundance _____

Oxidized Root Channels YES NO

Sulfidic Odor YES NO

WILDLIFE

	Type/Species	Sighting/Signs of Use
Aquatic Invertebrates	_____	_____
	_____	_____
	_____	_____
Herpetofauna	_____	_____
	_____	_____
	_____	_____
Avian	_____	_____
	_____	_____
	_____	_____
Mammals	_____	_____
	_____	_____

QUALITATIVE INFORMATION

Debris in stream/wetland
Natural _____
Waste/Trash _____
Riffle Complexes YES NO
Pools YES NO
Storm/Flooding Damage _____

_____

PHOTOGRAPH DOCUMENTATION

Permanent Panoramic Photo Station # _____

Photos #

_____
_____
_____
_____
_____
_____

Photos of other features (i.e., vegetation, hydrology, soils, wildlife, qualitative information)

Photo #	Description
____	_____
____	_____
____	_____
____	_____
____	_____
____	_____

REMARKS, COMMENTS, RECOMMENDATIONS

Notes in this section should include comments concerning whether the ecosystem is functioning as intended. Any other details concerning vegetation success/maintenance; hydrology; soil profile changes; wildlife use; riffle complex and pool development; and recommendations to increase the success of the mitigation site should be included. These may be discussed in the detailed mitigation report filed annually.

APPENDIX F

FISH AND WILDLIFE RESOURCES

Table F-4
Summary of Wildlife, Fish, Herptile, and Invertibrate Species of Special Concern

Common Name (Scientific Name)	Federal Status[1]	State Status[1]	Range and Habitat Associations	Potential for Occurrence Within the *Study and Cumulative Effects Area*	Eliminated from Detailed Analysis	References
Invertebrates						
Leonora's dancer (*Argia leonorae*)	SOC	---	In Texas, this species is uncommon but widely distributed; known to occur within the Brazos, Guadalupe, Rio Grande, and San Antonio watersheds. Little is known of this species' life history. However, adults have been documented along small streams and seeps such as "muddy banked rivulets" and in areas that contain scattered "sedge-ridden swales." Larvae have not been identified. Breeding Season: unknown, adults emerge from mid-May to mid-September.	Low to Moderate. This species is not known to occur within the study area or cumulative effects area; this species has been documented within Williamson County.	No.	Odonata Central (No date)
Fishes						
Guadalupe bass (*Micropterus treculi*)	SOC	Rare	Central Texas. Inhabits streams of the northern and eastern Edwards Plateau including portions of the Brazos, Colorado, Guadalupe, and San Antonio River drainages. Inhabits riffles, runs, and pools with gravel and cobble substrates in small- to medium-sized rivers. Spawning Period: March through June.	Low to Moderate. Suitable riverine habitat does not occur within the permit area. However, this species is known to occur within the Colorado River near the confluence with Big Sandy Creek within the study and cumulative effects area.	No.	Hubbs et al. 1991; Mosier 2002; Page and Burr 1991
Sharpnose shiner (*Notropis oxyrhynchus*)	SOC	---	Endemic to the Brazos River. Inhabits shallow, moderately flowing waters over sand substrates in broad, open channels.	Low. Suitable habitat for this species does not occur within the study area or cumulative effects area.	Yes. The potential occurrence of this species within the study area or cumulative effects area is extremely unlikely.	Hubbs et al. 1991; Moss and Mayes 1993

Table F-4 (Continued)

Common Name (Scientific Name)	Federal Status[1]	State Status[1]	Range and Habitat Associations	Potential for Occurrence Within the *Study and Cumulative Effects Area*	Eliminated from Detailed Analysis	References
Smalleye shiner (*Notropis buccula*)	SOC	---	Native to the upper and middle Brazos River drainage. Inhabits shallow, moderately flowing waters over sand substrates in broad, open channels.	None. Suitable habitat for this species does not occur within the study area or cumulative effects area. A recent survey failed to locate the species downstream of Young County, approximately 280 miles north of the project area.	Yes. The potential occurrence of this species within the study area or cumulative effects area is extremely unlikely.	Hubbs et al. 1991; Moss and Mayes 1993
Amphibians						
Buttercup Creek salamander (*Eurycea* sp.)	SOC	---	Edwards Plateau of Travis and Williamson Counties. Inhabits aquatic habitat within springs and caves. This species is associated with the groundwater from the Edwards Group.	None. The study and cumulative effects areas occur east of Edwards Plateau, and water in these areas does not originate from the Edwards Group.	Yes. This species would not occur within the study area or cumulative effects area.	BEG 1995; Chippindale et al. 2000
Jollyville Plateau salamander (*Eurycea tonkawae*)	SOC	Rare	Edwards Plateau of Travis and Williamson Counties. Inhabits aquatic habitat within springs and caves. This species is associated with the groundwater from the Edwards Group.	None. The study and cumulative effects areas occur east of Edwards Plateau, and water in these areas does not originate from the Edwards Group.	Yes. This species would not occur within the study area or cumulative effects area.	BEG 1995; Chippindale et al. 2000
Reptiles						
Spot-tailed earless lizard (*Holbrookia lacerata*)	---	Rare	This species occupies the Edwards Plateau and suitable habitats within southern Texas. Inhabits dry uplands with sparse, low-growing vegetation.	Low. The study area and cumulative effects area occur east of its known range.	Yes. The potential occurrence of this species within the study area or cumulative effects area is extremely unlikely.	Garrett and Barker 1987

Table F-4 (Continued)

Common Name (Scientific Name)	Federal Status[1]	State Status[1]	Range and Habitat Associations	Potential for Occurrence Within the *Study and Cumulative Effects Area*	Eliminated from Detailed Analysis	References
Texas garter snake (*Thamnophis sirtalis annectens*)	SOC	Rare	Central Texas and north central Texas. Occupies grasslands and shrub/scrub habitats that are typically associated with wet or moist microhabitats near water.	Low to Moderate. The permit area occurs just east of the subspecies' known range. However, it is possible that this subspecies could occur within suitable habitats in the study area (including the permit area) and cumulative effects area.	No.	Werler and Dixon 2000
Birds						
Audubon's oriole (*Icterus graduacauda audubonii*)	SOC	---	Rare to uncommon permanent resident in south Texas north to Duval, Goliad, and Val Verde Counties and would be considered as an accidental elsewhere. Inhabits upland and riparian woodlands with a shrubby understory.	Low. The study area occurs outside of range of this species. Potential to occur infrequently in the study area and cumulative effects as an accidental.	Yes. The potential occurrence of this species within the study area or cumulative effects area is extremely unlikely.	TOS 1995
Bachman's sparrow (*Aimophila aestivalis*)	SOC	---	Uncommon permanent resident of pine forests of east Texas west to approximately Leon and Van Zandt Counties; isolated record for Lee County. Prefers drier pine woodlands with a grassy understory.	Low. The study and cumulative effects areas occur outside of the range of this species. The permit area lacks suitable habitat. Occurrence by this species in the study area or cumulative effects would be considered accidental.	Yes. The potential occurrence of this species within the study area or cumulative effects area is extremely unlikely.	NGS 1987; TOS 1995

Table F-4 (Continued)

Common Name (Scientific Name)	Federal Status[1]	State Status[1]	Range and Habitat Associations	Potential for Occurrence Within the *Study and Cumulative Effects Area*	Eliminated from Detailed Analysis	References
Henslow's sparrow (*Ammodramus henslowii*)	---	Rare	Rare to uncommon migrant and winter resident in eastern third of Texas, generally west to Balcones Escarpment. Winter habitat consists of grasslands and savannas or open woodlands with grassy understory.	Moderate. Potential to occur infrequently in the study area and cumulative effects area during migration or as a winter resident.	No.	TOS 1995
Loggerhead shrike (*Lanius ludovicianus*)	SOC	---	Permanent resident throughout Texas, except portions of South Texas Plains where it occurs during the non-breeding season. Typically occupies open areas dominated by grasses and/or forbs, interspersed with shrubs or trees. Breeding season: mid-February through July.	High. Very likely to occur within the study area and cumulative effects area as a permanent resident in suitable habitats.	No.	TOS 1995
Reddish egret (*Egretta rufescens*)	SOC	---	Portions of the U.S. Gulf coast including Texas. Prefers saltwater beaches and bays and infrequently occurs in inland wetland habitats.	Low to Moderate. Potential to infrequently occur within the study area and cumulative effects area as an accidental summer, fall, or winter visitor. This species has been documented within Bastrop County.	No.	Alcoa 2001c (Volume 3); Kutac and Caran 1994; NGS 1987
White-faced ibis (*Plegadis chihi*)	SOC	---	Common resident along Texas coast and scattered breeding records for north, central, and west Texas; rare to uncommon post-breeding visitor and migrant throughout most of Texas. Primarily associated with freshwater marshes, wet meadows, and rice fields.	Moderate. Potential to occur infrequently within the study area and cumulative effects area as a migrant. This species has been documented within Bastrop County.	No.	NGS 1987; Texas On-line Clearing House 2002; TOS 1995

Table F-4 (Continued)

Common Name (Scientific Name)	Federal Status[1]	State Status[1]	Range and Habitat Associations	Potential for Occurrence Within the *Study and Cumulative Effects Area*	Eliminated from Detailed Analysis	References
Mammals						
Elliot's short-tailed shrew (*Blarina hylophaga hylophaga*)	---	Rare	Known from Bastrop County (at Bastrop State Park) and Montague County (along the Texas/Oklahoma border). Typical habitat includes small stands of live oak, grassy areas with loblolly pine overstory, and grassy areas near post oak stands. Burrows occur in soft, damp soils, under leaf litter, and under logs.	Low. Habitat in the study area generally is not typical of that supporting this species. However, some portions of the cumulative effects area within Bastrop County may support some shrew habitat.	No.	Davis and Schmidly 1994; Dronen and Simmons 1990; Baumgardner et al. 1992; TXBCD 2001
Cave myotis (*Myotis velifer*)	SOC	Rare	Occurs throughout much of Texas excluding east Texas and parts of the Panhandle. Roosts in relatively large colonies, primarily within caves, but also is known to roost in rock crevices, old buildings, carports, bridges, and abandoned cliff swallow nests.	Moderate. This species potentially could occur within the study area and cumulative effects area. This species has been documented within Bastrop County.	No.	Davis and Schmidly 1994
Plains spotted skunk (*Spilogale putorius interrupta*)	SOC	Rare	Occurs throughout much of eastern and northern Texas. Occupies wooded areas and tall-grass prairies. Preferred denning habitat includes rocky canyons, rock outcrops, and beneath manmade features such as homes and buildings.	Moderate. This subspecies potentially could occur within the study area and cumulative effects area. This subspecies has been documented within Bastrop County.	No.	Davis and Schmidly 1994

[1]SOC = Species of Concern: Species for which USFWS believes that there is some information showing evidence of vulnerability but not enough data to support listing at this time.
Rare = Species considered rare by TPWD but which have no regulatory listing status within the agency.
--- = Not listed by this agency as potentially occurring in Bastrop, Lee, Milam, or Williamson Counties.

Source for status information: TBCDS 2001; USFWS 2002.

APPENDIX G

U.S FISH AND WILDLIFE SERVICE CONCURRENCE LETTER

JW

United States Department of the Interior

FISH AND WILDLIFE SERVICE
10711 Burnet Road, Suite 200
Austin, Texas 78758
(512) 490-0057

September 4, 2002

Wayne A. Lea
Department of the Army
Corps of Engineers–Fort Worth District
P.O. Box 17300
Fort Worth, Texas 76102

Consultation #: 2-15-00-I-1002

Dear Mr. Lea:

We are responding to your August 9, 2002, letter in which you transmitted a biological assessment regarding the Aluminum Company of America's (Alcoa) proposed construction and operation of the Three Oaks Mine (Project Number 199900331) in Bastrop and Lee counties, Texas. This project requires a permit under Section 404 of the Clean Water Act from your agency. Based on information provided in this biological assessment, we concur with your determination that the proposed project is not likely to adversely affect any federally listed endangered or threatened species.

This letter concludes informal consultation pursuant to section 7 of the Endangered Species Act of 1973, as amended (Act). Please recognize, however, that should any changes occur to the proposed project or should any information become available that indicates the proposed project may adversely impact federally listed species you should contact our office and reinitiate consultation pursuant to section 7 of the Act as necessary. We recommend you coordinate any proposed modifications to the project or new information through our office as soon as possible to determine the appropriate level of consultation needed.

We appreciate the opportunity to cooperate with you in protecting and recovering federally listed species occurring in Texas. For additional questions regarding this project, please contact Paige Najvar of this office at 512-490-0057, extension 229 or the above address. Please refer to the consultation number listed above in any future correspondence regarding this project.

Sincerely,

E. Dan Whitehead

for William Seawell
Acting Field Supervisor

SEP 09 2002