DRAFT

ENVIRONMENTAL IMPACT STATEMENT SECTION 404, CLEAN WATER ACT

Environmental Evaluation of Existing and Proposed Mining Operations

Occidental Chemical Agricultural Products, Inc.
Hamilton County, Florida

May 1985

Department of the Army, Jacksonville District
Corps of Engineers

DRAFT

ENVIRONMENTAL IMPACT STATEMENT
PERMIT
SECTION 404, CLEAN WATER ACT

Existing and Proposed Phosphate Mining Operations
Occidental Chemical Agricultural Products, Inc.
Hamilton County, Florida

The responsible lead agency is the U.S. Army Engineer District, Jacksonville, Florida. The cooperating agency is the U.S. Environmental Protection Agency.

ABSTRACT

The project area consists of approximately 100,000 acres in Hamilton County, Florida, of which approximately 25,000 acres are characterized as wetlands. The applicant, Occidental Chemical Agricultural Products, Inc. (OXY), is seeking a dredge and fill permit to continue its phosphate mining operations. Four alternative mining plans were developed. Alternative A, the no-action plan, would permit no mining in wetlands, but mining would continue in accessible upland areas. Alternative B would permit the mining of all wetlands containing phosphate reserves. Approximately 9,265 acres of wetlands as well as uplands would be mined or used for mine support under this alternative. Alternative C would permit the mining of only small isolated or weakly/periodically connected wetlands containing reserves. Approximately 2,450 acres of wetlands as well as uplands would be mined under this alternative. Alternative D would permit mining in those areas that require no permit other than a permit from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act. Approximately 8,600 acres of wetlands as well as uplands would be mined under this alternative. The mining of uplands that would take place under any of the alternatives would impact adjoining wetlands to some degree by changing drainage patterns and isolating wetlands. Restored wetlands, after mining is completed, will have greater cultural values and be more efficient in the following wetland functions: hydrological support, flood storage, and water purification. Socioeconomic and natural biological support functions will be reduced initially but will increase as the systems mature. Shoreline protection, habitat for rare, restricted, and relic flora and fauna, and groundwater recharge will be essentially unchanged. On a cumulative basis, reclaimed wetland functions are slightly improved over disturbed wetland functions.

Comments will be accepted until July 15, 1984.

Comments and requests for information on the EIS should be addressed to:

U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232
ATTENTION: Mr. Dan Malanchuk, SAJPD-ES
904/791-1689

Requests for information on permit actions should be addressed to:

U.S. Army Corps of Engineers
P.O. Box 4970
Jacksonville, FL 32232
ATTENTION: Mr. John Hall, SAJRD-P
904/791-1664

Note: Information presented in the Technical Background Document is incorporated by reference in the Draft Environmental Impact Statement.

SUMMARY

Major Conclusions and Findings. The applicant, Occidental Chemical Agricultural Products, Inc. (OXY), is seeking a dredge and fill permit from the U.S. Army Corps of Engineers (Corps) pursuant to Section 404 of the Clean Water Act, as amended, to continue phosphate mining operations at its facilities in Hamilton County, Florida. The project area is approximately 100,000 acres of which approximately 25,000 acres are wetlands. The project area is situated adjacent to the Suwannee River, which is an Outstanding Florida Water. Depending on which alternative is selected, wetlands mined would range from no wetlands mined to 9,200 acres of wetlands mined or disturbed. Uplands would continue to be mined under all alternatives. Restoration would result in acre-for-acre replacement of wetlands, with improvements to the hydrological support, flood storage, and water purification functions and in the cultural values of the wetlands. Although socioeconomic benefits and natural biological support functions will initially be reduced, they will increase as the systems mature. During mining operations, and until restoration is completed, some wetland functions will be reduced or lost for varying lengths of time. There will be some loss of biological resources during the mining operation and some shifts in the floral and faunal makeups of the area after mining is completed. Drainage basin boundaries of Suwannee River tributaries will be altered during mining operations but will be returned to near their original acreage after reclamation.

Area of Controversy. Some agencies have questioned the method used to assess changes in wetland functional values resulting from the various mining alternatives and reclamation. In the initial scoping meeting, the Corps elected to use the Wetlands Evaluation Procedure (WEP) of Reppert et al. (1979), developed by the Corps Institute for Water Resources, to assess wetland functions. WEP allows the assignment of numerical values to wetland functions recognized in 33 CFR 320.4(b)(2). Other agencies misunderstood the manner in which the Corps planned to use WEP and complained that the method failed to adequately evaluate the intrinsic worth of the wetlands on site.

The agencies specifically objected to the use of WEP's functional criteria for shoreline protection, aquatic study areas, and commercial fisheries, because existing wetlands do not provide these functions. However, they failed to recognize that reclaimed wetland systems will provide some of these functions.

In response to agency concerns, the Corps modified WEP as follows:

1. Expanded the rating scale from 1-3 to 1-4 as the Florida Department of Environmental Regulation suggests in their evaluation scheme;

2. Dropped the shoreline protection, aquatic study areas, and commercial fisheries categories;

3. Elevated subfunction categories to function status, thus giving a point spread of 14-56;

4. Continued to sum and average component scores to give function scores (equilibrates functions, regardless of subfunction numbers).

In addition to these modifications to the WEP method, the Corps also agreed to use a newly published procedure, A Method for Wetland Functional Assessment (Adamus 1983) developed for the Federal Highway Administration, which was recommended by other agencies.

Unresolved Issues. The issue relative to the method used to assess changes in wetland functional values is unresolved between the cooperating agencies.

Relationship of Environmental Protection Statutes and Other Environmental Requirements. Table 1 (Section 1.05) summarizes these relationships.

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1.00 PURPOSE OF AND NEED FOR THE PROPOSAL

1.01 Occidental Chemical Agricultural Products, Inc. (OXY) initiated acquisition of phosphate reserves in Hamilton County (Figure 1) in the early 1960's and currently operates two phosphate mines and two agricultural chemical complexes. The Suwannee River Mine and Chemical Complex began production in 1965 and 1966, respectively, and the Swift Creek Mine and Chemical Complex began production in 1975 and 1979, respectively.

1.02 OXY is seeking dredge and fill permits from the U.S. Army Corps of Engineers to carry out phosphate mining operations in 9200 acres of wetlands under Corps jurisdiction pursuant to Section 404 of the Clean Water Act, as amended. During the remaining life of the mines, OXY proposes to mine approximately 26,000 acres of reserves (upland and wetland areas) within the 100,000-acre project area (Figure 2). Wetlands within the Suwannee River 100-yr floodplain are not addressed because they are protected under a previous state agency agreement (Figure 3).

1.03 Phosphate rock produced by the continuing mining operations will be sold for eventual agricultural use or transferred to the existing Suwannee River and Swift Creek fertilizer complexes. The existing production process involves open pit extraction of the phosphate matrix by large draglines, hydraulic transport to the beneficiation plants, separation of the phosphate product from the matrix at the beneficiation plants, and shipment of the product.

1.04 The Corps has asserted discretionary authority over certain wetlands in the Hamilton County project area. The preparation of this Environmental Impact Statement (EIS) was required, under authority of the National Environmental Policy Act of 1969, to address potential impacts on the human environment within the project boundary due to mining operations. Table 1 presents the relationship of the four alternatives to environmental protection statutes and other environmental requirements. This study focuses on all the wetlands in the study area, regardless of jurisdictional status. A previous EIS, published in 1978 under the direction of the U.S. Environmental Protection Agency (EPA) for construction of the Swift Creek Chemical Complex, addressed the impacts of issuing a New Source National Pollutant Discharge Elimination System (NPDES) permit. Both presently existing chemical complexes were addressed in the EPA EIS.

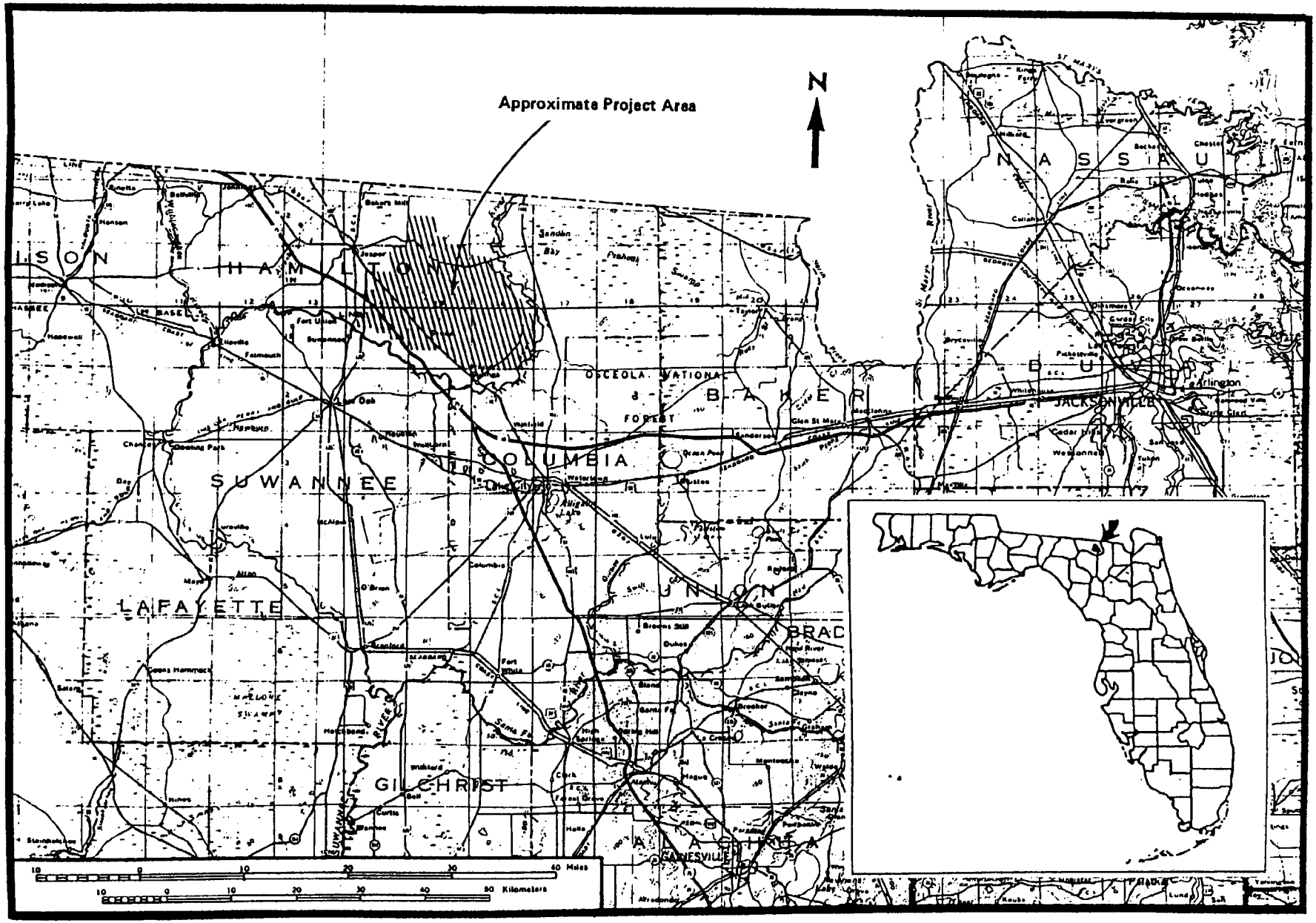


Figure 1. General Location of OXY Project Area.

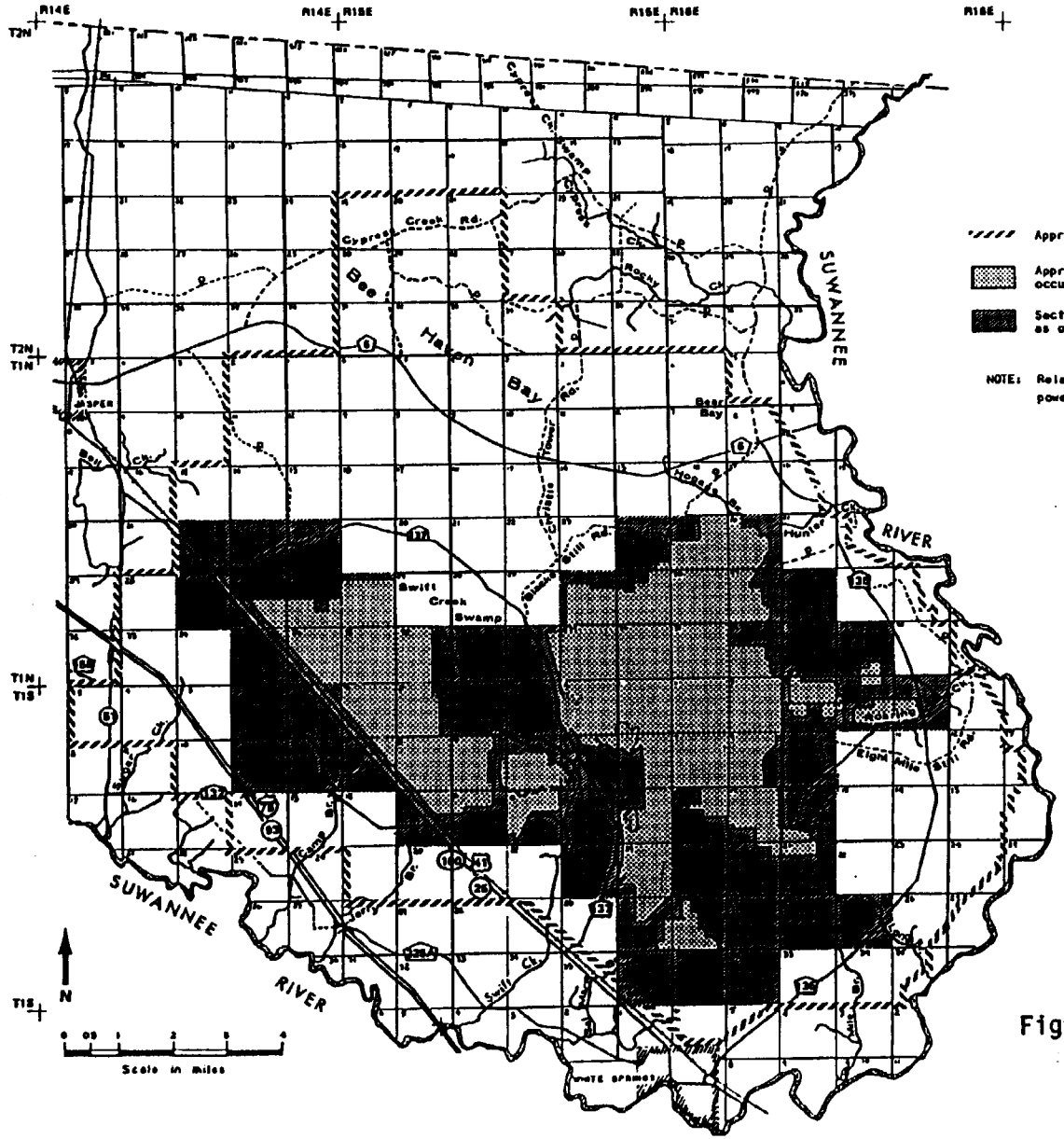
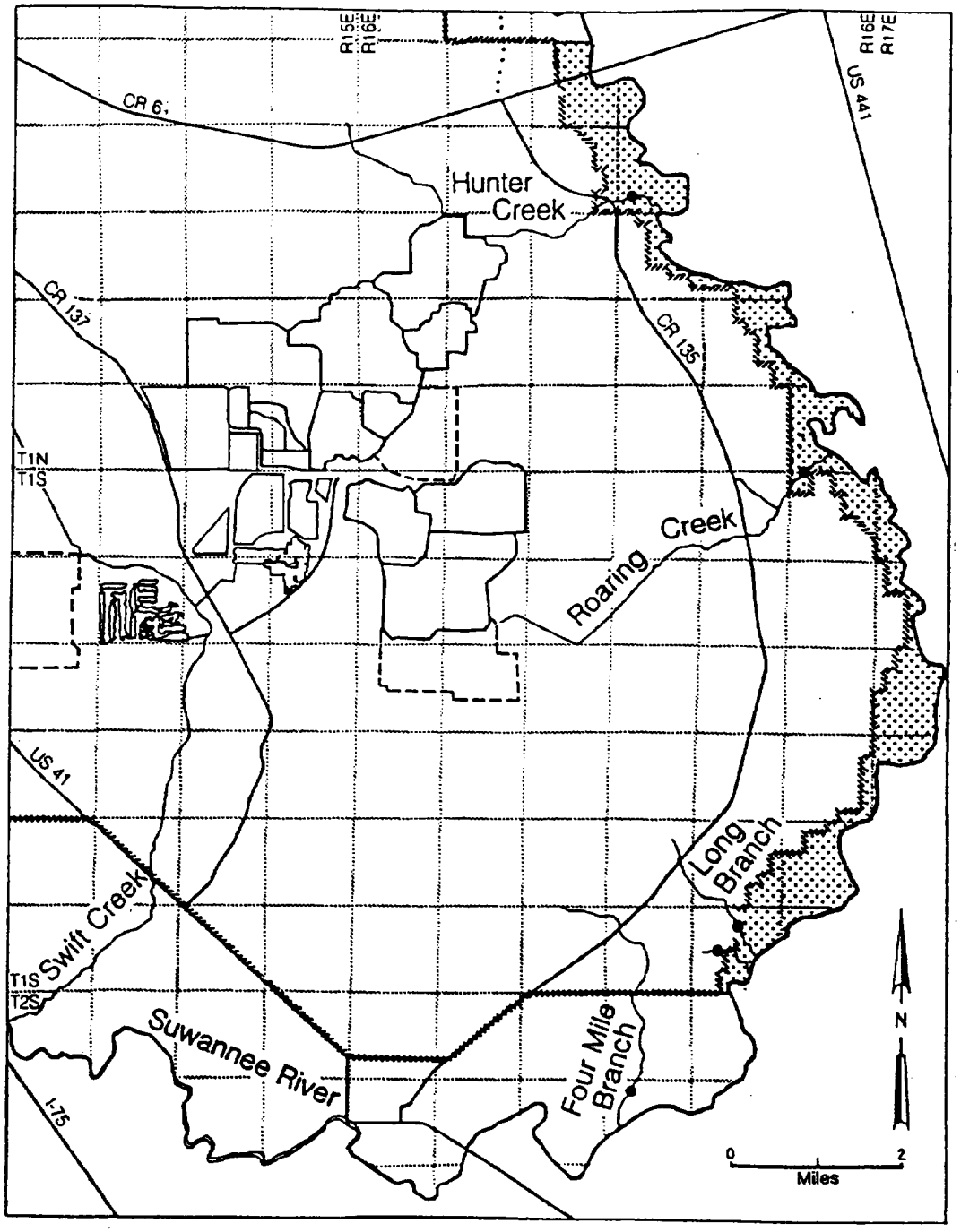


Figure 2. Detailed Map of Project Area.



• 0.5 mi upstream from Suwannee River

100-yr floodplain of Suwannee River
(shown only in areas contiguous to the project boundary)

Figure 3. Approximate Area Within Hamilton County Protected by State Agreement (1973).

Table 1. Relationship of Plans to Environmental Protection Statutes and other Environmental Requirements for Occidental Chemical Agricultural Products Application for a Section 404 Permit.

Study Element	Plan A	Plan B	Plan C	Plan D
FEDERAL STATUTES				
Archaeological and Historic Preservation Act, as amended, 16 U.S.C. 469, et seq.	In compliance	In compliance	In compliance	In compliance
Clean Air Act, as amended, 42 U.S.C. 7401, et. seq.	In compliance	In compliance	In compliance	In compliance
Clean Water Act, as amended (Federal Water Pollution Control Act) 33 U.S.C. 1251, et seq.	In compliance	In compliance	In compliance	In compliance
Coastal Zone Management Act, as amended, 16 U.S.C. 1451, et seq.	N/A	N/A	N/A	N/A
Endangered Species Act, as amended, 16 U.S.C. 1531, et seq.	In compliance	In compliance	In compliance	In compliance
Estuary Protection Act, 16 U.S.C. 1221, et seq.	N/A	N/A	N/A	N/A
Federal Water Project Recreation Act, as amended, 16 U.S.C. 460-1(12), et seq.	N/A	N/A	N/A	N/A
Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661, et seq.	In compliance	In compliance	In compliance	In compliance
Land and Water Conservation Fund Act, as amended, 16 U.S.C. 4601-11, et seq.	N/A	N/A	N/A	N/A
Marine Protection, Research and Sanctuaries Act, 22 U.S.C. 1401, et seq.	N/A	N/A	N/A	N/A
National Historic Preservation Act, as amended, 16 U.S.C. 470a, et seq.	In compliance	In compliance	In compliance	In compliance
National Environmental Policy Act, as amended, 42 U.S.C. 4321, et seq.	In compliance	In compliance	In compliance	In compliance
Rivers and Harbors Act, 33 U.S.C. 401, et seq.	N/A	N/A	N/A	N/A
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	In compliance	In compliance	In compliance	In compliance
Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271, et seq.	N/A	N/A	N/A	N/A

Table 1 (Continued).

Study Element	Plan A	Plan B	Plan C	Plan D
EXECUTIVE ORDERS, MEMORANDA, ETC.				
Floodplain Management (E.O. 11988)	In compliance	In compliance	In compliance	In compliance
Protection of Wetlands (E.O. 11990)	In compliance	In compliance	In compliance	In compliance
Environmental Effects Abroad of Major Federal Actions (E.O. 12114)	N/A	N/A	N/A	N/A
Analysis of Impacts on Prime and Unique Farmlands (CEQ Memorandum, 30 August 1976)	In compliance	In compliance	In compliance	In compliance

NOTES: For each item listed, enter one of the following:

a. Full Compliance. Having met all requirements of the statute, E.O., or other environmental requirements for the current stage of planning.
b. Partial Compliance. Not having met some of the requirements that normally are met in the current stage of planning.
c. Non-Compliance. Violation of a requirement of the statute, E.O., or other environmental requirement.
d. Not Applicable. No requirements for the statute, E.O., or other environmental requirement for the current stage of planning.

2.00 ALTERNATIVES

2.01 Four mining alternatives have been developed which address the continuation of phosphate mining operations in Hamilton County:

Alternative A: No New Mining or Mine Support in Wetlands (no action alternative)

Alternative B: Mining All Wetlands Containing Reserves

Alternative C: Mining Only Small Isolated or Weakly/Periodically Connected Wetlands Containing Reserves

Alternative D: Mining in Areas Requiring Only Corps Permits

In all four alternatives, upland areas containing reserves presently owned or leased by OXY will be mined. Mining, water use, waste disposal, and reclamation, which are all governed by existing regulations, will follow the same procedures currently in use for all four alternatives unless changes in the regulations require different procedures. The alternatives proposed vary in the amount of wetland acreage to be mined and/or utilized for waste disposal activities, ranging from no wetlands mined under Alternative A to 9264 acres of wetlands utilized under Alternative B. Comparative impacts of these alternatives are displayed in Table 2.

2.02 Mining. Mining operations for the four alternatives are similar. Preparation of mining begins with installation of drainage ditches to remove surface water and isolate the mining block (typically 40-acre minimum). Sites are then cleared, and internal ditches, access roads, pipelines, and powerlines are constructed. The overburden and matrix (phosphate-bearing ore) are removed by large walking draglines in a series of parallel cuts 250-330 ft wide. The matrix is placed into slurrying pits and pumped to the beneficiation plant for processing. Matrix slurry lines are located inside the mine area to the extent possible to minimize disturbance to unmined lands.

2.03 Matrix Processing. Each dragline has an independent matrix pumping system to transport matrix slurry to the beneficiation plant. A pit car slurries the matrix using 10,000 gpm of water at 200 psi, and the slurry is pumped through 20 in. (outside diameter) ground level steel pipes. Water for the matrix transportation system comes from the mine's return water systems, drainage systems, or previously mined pits utilized for water conservation.

2.04 Beneficiation. The matrix pumping system discharges the matrix slurry to the beneficiation plant. The slurry material is passed through a series of screens and flotation processes to separate usable phosphate rock product from waste by-products which include mudballs,

Table 2. Comparative Impacts of Alternatives.

Significant EQ Resource	Plan A	Plan B	Plan C	Plan D
Physiographic characteristics	9,884 acres to be mined or disturbed. Soils made more heterogeneous, less stratified, and more dense.	30,587 acres to be mined or disturbed. Soils made more heterogeneous, less stratified, and more dense.	18,626 acres to be mined or disturbed. Soils made more heterogeneous, less stratified, and more dense.	27,861 acres to be mined or disturbed. Soils made more heterogeneous, less stratified, and more dense.
	Drainage basin boundaries changed during mining operations.	Drainage basin boundaries changed during mining operations.	Drainage basin boundaries changed during mining operations.	Drainage basin boundaries changed during mining operations.
Uplands	9,849 acres mined. 3,900 acres of uplands converted to lakes after reclamation.	21,161 acres mined. 7,500 acres of uplands converted to lakes after reclamation.	16,128 acres mined. 5,700 acres of uplands converted to lakes after reclamation.	19,210 acres mined. 6,600 acres of uplands converted to lakes after reclamation.
	Changes in vegetation and faunal makeup as succession takes place after mining operations are concluded.	Changes in vegetation and faunal makeup as succession takes place after mining operations are concluded.	Changes in vegetation and faunal makeup as succession takes place after mining operations are concluded.	Changes in vegetation and faunal makeup as succession takes place after mining operations are concluded.
	Results of HES evaluation generally indicate little to no change in wildlife values, with possible slight increase.	Results of HES evaluation generally indicate little to no change in wildlife values, with possible slight increase.	Results of HES evaluation generally indicate little to no change in wildlife values, with possible slight increase.	Results of HES evaluation generally indicate little to no change in wildlife values, with possible slight increase.
	Loss of upland habitat, flora and fauna.	Loss of upland habitat, flora and fauna.	Loss of upland habitat, flora and fauna.	Loss of upland habitat, flora and fauna.
Wetlands	No wetlands mined.	9,264 acres mined (37% of total).	2,452 acres mined (10% of total).	8,601 acres mined (35% of total).
	No wetlands mined.	Portions of 728 of 1,762 (41%) individual wetlands mined.	Portions of 583 of 1,762 (33%) individual wetlands mined.	Portions of 688 of 1,762 (39%) individual wetlands mined.
	Localized lowering of water table may cause the drying up of some wetlands.	Localized lowering of water table may cause the drying up of some wetlands.	Localized lowering of water table may cause the drying up of some wetlands.	Localized lowering of water table may cause the drying up of some wetlands.

Table 2 (continued).

Significant EQ Resource	Plan A	Plan B	Plan C	Plan D
Wetlands (continued)	No wetlands mined.	Results of evaluations of all factors related to wetlands functions indicate that reclaimed wetlands and associated upland areas will have greater water storage which will decrease downstream flooding potential and periods of low flow. Natural biological system values initially will be lower, but will increase over time.	Results of evaluations of all factors related to wetlands functions indicate that reclaimed wetlands and associated upland areas will have greater water storage which will decrease downstream flooding potential and periods of low flow. Natural biological system values initially will be lower, but will increase over time.	Results of evaluations of all factors related to wetlands functions indicate that reclaimed wetlands and associated upland areas will have greater water storage which will decrease downstream flooding potential and periods of low flow. Natural biological system values initially will be lower, but will increase over time.
	No wetlands mined.	No changes are projected between pre-mining and post-reclamation groundwater recharge or in habitat for rare, restricted, or relic flora and fauna. However, construction of lakes in the area will increase the habitat available for waterfowl, wading birds, fish, and aquatic mammals.	No changes are projected between pre-mining and post-reclamation groundwater recharge or in habitat for rare, restricted, or relic flora and fauna. However, construction of lakes in the area will increase the habitat available for waterfowl, wading birds, fish, and aquatic mammals.	No changes are projected between pre-mining and post-reclamation groundwater recharge or in habitat for rare, restricted, or relic flora and fauna. However, construction of lakes in the area will increase the habitat available for waterfowl, wading birds, fish, and aquatic mammals.
	Changes in faunal makeup as those displaced from disturbed uplands make more extensive use of wetlands.	Changes in vegetation and faunal makeup as succession takes place after restoration is completed.	Changes in vegetation and faunal makeup as succession takes place after restoration is completed.	Changes in vegetation and faunal makeup as succession takes place after restoration is completed.
	No wetlands mining. Acre-for-acre replacement of wetlands after reclamation, for wetlands mined since 1975 and prior to January 1982.	Acre-for-acre replacement of wetlands after reclamation is completed, including wetlands mined since 1975.	Acre-for-acre replacement of wetlands after reclamation is completed, including wetlands mined since 1975.	Acre-for-acre replacement of wetlands after reclamation is completed, including wetlands mined since 1975.

Table 2 (continued).

Significant EQ Resource	Plan A	Plan B	Plan C	Plan D
Wetlands (continued)	No change in existing wetlands.	25.0% (by acreage) of cypress wetlands on site converted to other types of wetlands.	9.3% (by acreage) of cypress wetlands on site converted to other types of wetlands.	26.4% (by acreage) of cypress wetlands on site converted to other types of wetlands.
		32.4% of swamp tupelo wetlands converted to other types.	8.3% of swamp tupelo wetlands converted to other types.	41.2% of swamp tupelo wetlands converted to other types.
		28.4% of bayhead wetlands converted to other types.	No bayhead wetlands converted to other types.	32.8% of bayhead wetlands converted to other types.
		17.6% of scrub/shrub wetlands converted to other types.	0.9% of scrub/shrub wetlands converted to other types.	23.8% of scrub/shrub wetlands converted to other types.
		52.3% of swamp tupelo/ bay/pine wetlands converted to other types.	5.4% of swamp tupelo/ bay/pine wetlands converted to other types.	41.2% of swamp tupelo/ bay/pine wetlands converted to other types.
		25.8% of emergent wetlands converted to other types.	5.8% of emergent wetlands converted to other types.	37.4% of emergent wetlands converted to other types.
		35.7% of cypress/swamp tupelo/bay wetlands converted to other types.	14.5% of cypress/swamp tupelo/bay wetlands converted to other types.	33.5% of cypress/swamp tupelo/bay wetlands converted to other types.
Aquatic Communities	Net increase in habitat for this type of community after restoration is complete (3,900-acre increase).	Net increase in habitat for this type of community after restoration is complete (7,500-acre increase).	Net increase in habitat for this type of community after restoration is complete (5,700-acre increase).	Net increase in habitat for this type of community after restoration is complete (6,600-acre increase).
	Changes in makeup, diversity, etc., that are a result of mining operations perpetuated for 7 years at full complex operating capacity.	Changes perpetuated for 20 years.	Changes perpetuated for 13.5 years.	Changes perpetuated for 18.5 years.
	No loss of streambed habitat.	Temporary loss of at least 31,720 feet of streambed habitat.	No loss of streambed habitat.	No loss of streambed habitat.

Table 2 (continued).

Significant EQ Resource	Plan A	Plan B	Plan C	Plan D
Surface water	Peak flows and periods of low flow in Suwannee tributaries reduced.	Peak flows and periods of low flow in Suwannee tributaries reduced.	Peak flows and periods of low flow in Suwannee tributaries reduced.	Peak flows and periods of low flow in Suwannee tributaries reduced.
	Changes in drainage basin boundaries during mining.	Changes in drainage basin boundaries during mining.	Changes in drainage basin boundaries during mining.	Changes in drainage basin boundaries during mining.
Ground water	Ground water withdrawals stopped after 7 years at full production.	Withdrawals stopped after 20 years at full production.	Withdrawals stopped after 13.5 years at full production.	Withdrawals stopped after 18.5 years at full production.
	Base flow in some streams reduced as dewatering operations lower ground water table in vicinity of stream.	Base flow in some streams reduced as dewatering operations lower ground water table in vicinity of stream.	Base flow in some streams reduced as dewatering operations lower ground water table in vicinity of stream.	Base flow in some streams reduced as dewatering operations lower ground water table in vicinity of stream.
	Some increase in hardness of Surficial Aquifer.	Some increase in hardness of Surficial Aquifer.	Some increase in hardness of Surficial Aquifer.	Some increase in hardness of Surficial Aquifer.
Suwannee River	Plant discharges continue for 7 years at full production.	Discharges continue for 20 years.	Discharges continue for 13.5 years.	Discharges continue for 18.5 years.
Suwannee River tributaries	Plant discharges continue for 7 years at full production.	Discharges continue for 20 years.	Discharges continue for 13.5 years.	Discharges continue for 18.5 years.
	No mining in tributaries.	31,720 feet (9.3% of total) of streambeds on site mined.	No mining in tributaries.	No mining in tributaries.
	Changes in sizes of drainage basins during mining.	Changes in sizes of drainage basins during mining.	Changes in sizes of drainage basins during mining.	Changes in sizes of drainage basins during mining.
	Changes in flow regimes of tributaries as sizes of drainage basins are changed.	Changes in flow regimes of tributaries as sizes of drainage basins are changed.	Changes in flow regimes of tributaries as sizes of drainage basins are changed.	Changes in flow regimes of tributaries as sizes of drainage basins are changed.
	Peak flows and periods of low flow reduced after reclamation completed.	Peak flows and periods of low flow reduced after reclamation completed.	Peak flows and periods of low flow reduced after reclamation completed.	Peak flows and periods of low flow reduced after reclamation completed.

Table 2 (continued).

Significant EQ Resource	Plan A	Plan B	Plan C	Plan D
Wildlife	Loss of habitat that is being mined.	Loss of habitat that is being mined.	Loss of habitat that is being mined.	Loss of habitat that is being mined.
	Increase in density of wildlife in undisturbed areas with concomitant increases in predation, disease, etc.	Increase in density of wildlife in undisturbed areas with concomitant increases in predation, disease, etc.	Increase in density of wildlife in undisturbed areas with concomitant increases in predation, disease, etc.	Increase in density of wildlife in undisturbed areas with concomitant increases in predation, disease, etc.
	Increase in habitat diversity once reclamation is completed.	Increase in habitat diversity once reclamation is completed.	Increase in habitat diversity once reclamation is completed.	Increase in habitat diversity once reclamation is completed.
Endangered species	Creation of additional habitat for bald eagle, alligator, wood stork, little blue heron, snowy egret, and tricolored heron.	Creation of additional habitat for bald eagle, alligator, wood stork, little blue heron, snowy egret, and tricolored heron.	Creation of additional habitat for bald eagle, alligator, wood stork, little blue heron, snowy egret, and tricolored heron.	Creation of additional habitat for bald eagle, alligator, wood stork, little blue heron, snowy egret, and tricolored heron.
	Least tern habitat lost after reclamation.	Least tern habitat lost after reclamation.	Least tern habitat lost after reclamation.	Least tern habitat lost after reclamation.
Historic and archaeological resources	No impacts.	No impacts.	No impacts.	No impacts.
Air quality	Localized increases in total suspended particulate matter during period of mine operation.	Localized increases in total suspended particulate matter during period of mine operation.	Localized increases in total suspended particulate matter during period of mine operation.	Localized increases in total suspended particulate matter during period of mine operation.
Radiation	Radiation profile of soil of mined and restored areas will change from one that increases with depth to the ore matrix to one that is uniform with depth. All readings will remain below applicable standards.	Radiation profile of soil of mined and restored areas will change from one that increases with depth to the ore matrix to one that is uniform with depth. All readings will remain below applicable standards.	Radiation profile of soil of mined and restored areas will change from one that increases with depth to the ore matrix to one that is uniform with depth. All readings will remain below applicable standards.	Radiation profile of soil of mined and restored areas will change from one that increases with depth to the ore matrix to one that is uniform with depth. All readings will remain below applicable standards.

Table 2 (continued).

Significant EQ Resource	Plan A	Plan B	Plan C	Plan D
Socioeconomics	Mine life of 7 years at full operating capacity.	Mine life of 20 years at full operating capacity.	Mine life of 13.5 years at full operating capacity.	Mine life of 18.5 years at full operating capacity.
	40,649 local and 67,154 statewide labor-years of employment.	121,158 local and 200,159 statewide labor-years of employment.	81,905 local and 135,311 statewide labor-years of employment.	112,240 local and 185,426 statewide labor-years of employment.

sand tailings, and clays. The sand tailings and mudballs are utilized in the reclamation process.

2.05 Water Use During Mining and Processing. Plant water is recirculated for water conservation, with losses amounting to approximately 10% of total requirements. Losses are due to seepage, product shipping, evaporation, and clay absorption. Water losses from both mines' water systems are made up from deep wells which produce an average of 28 mgd with a daily maximum of 43 mgd. Excess water during periods of heavy precipitation is released from clay settling areas into the recirculating water system and discharged under authorization of the Florida Department of Environmental Regulation (FDER) and EPA permits.

2.06 Waste Disposal. Three major waste by-products of the mining process are considered in the waste disposal plan: 1) waste clay, 2) mudballs, and 3) sand tailings. Waste clays are gravity flowed into diked containment areas (settling areas) where they are retained for consolidation. Mudballs are hydraulically pumped to waste clay settling areas for capping and dam stabilization. Sand tailings are hydraulically pumped to backfill mine cuts, cap waste clay settling areas for reclamation, and use in construction of dams for clay settling areas. All impoundment dams comply with provisions of Chapter 17-9 of the Florida Administrative Code (FAC).

2.07 Gypsum, a by-product of the chemical fertilizer processing operations, is also stored in the project area. All gypsum disposal areas at the Swift Creek Chemical Complex were addressed in the EPA New Source EIS (EPA 1978). Gypsum disposal areas at the Suwannee River Chemical Complex are already existing or are permitted by the FDER for construction. Any future expansions of the existing stacks that may be required that would affect wetlands will be handled through a separate permitting effort.

2.08 Drying, Grinding, and Shipping. Wetrock is transferred either to the chemical plant for further processing or to a dryer and then may be ground. Dry ground and unground rock are shipped by truck or rail to the agricultural market.

2.09 Reclamation. Because OXY has operated in Hamilton County since 1965, its mined lands fall under two sets of state reclamation regulations. Lands mined prior to 1 July 1975 (non-mandatory lands) may be reclaimed under Ch. 16C-17, FAC, regulations, and those mined after that date (mandatory lands) must be reclaimed under Ch. 16C-16, FAC, regulations (see Section 3.3.10.1 of the Technical Background Document [TBD] for summary of rules). Current reclamation types used by OXY and incorporated into the Conceptual Reclamation Plans include: 1) land and lakes, 2) elevated fill, and 3) tailings fill (TBD Section 3.3.10.3).

2.10 Reclamation described under all alternatives includes lands that will be reclaimed as a result of mining which has occurred since July 1975 when mandatory reclamation rules became effective. Approximately 2701 acres of wetlands were mined between July 1975 and January 1982. The tables summarizing reclamation types include these additional 2701 acres which will be reclaimed on an acre-for-acre basis.

2.11 Reclamation will result in creation of uplands, wetlands, and open waterbodies. Reclamation is designed to meet requirements to replace wetlands on an acre-for-acre basis, achieve pre-mining drainage patterns, reduce flooding, and incorporate open waterbody systems. Consideration is also given to creation of fish and wildlife habitat and to future economic land uses such as agriculture and silviculture.

2.12 Mining Alternatives. Acreages of mining, reclamation, and waste disposal areas for the four mining alternatives presented in the following sections were calculated in conjunction with the OXY mines planning computer programs and are based on many variables. Although the numbers appear precise, they are estimates based on the best available information at the time of their calculation. Locations of wetlands within the Suwannee River and Swift Creek mines are shown in Overlays A and B, respectively (TBD Volume I map pocket). The overlays should be used only for general orientation purposes. They are not intended for precise comparison with the mining alternative maps because of their small scale and minor distortions as a result of the reproduction process.

2.13 Alternative A: No Mining or Mine Support in Wetlands (No Action Alternative). Under this mining alternative, no phosphate rock reserves underlying wetlands are proposed to be mined, and no mine support activities are proposed in wetlands. This alternative will result in extraction of 37% and 32% of the mineable reserves on the Suwannee River Mine and Swift Creek Mine, respectively. The remaining reserves underlie wetlands and areas under FDER jurisdiction or uplands that would be unmineable because of their proximity to wetland areas. Table 3 provides a breakdown of the various types of areas that would be affected by this alternative. A total of approximately 9200 acres of uplands will be mined, with an additional 700 acres utilized for waste clay disposal. The mining activities will occur over an 8-10 yr period with a yearly average of 570 acres for the Suwannee River Mine and a yearly average of 520 acres for the Swift Creek Mine (Figures 4 and 5).

2.14 Approximately 9200 acres of waste clay disposal area, 8000 acres of which are already existing or under construction, will be utilized (Table 4, Figures 6 and 7). Mudball waste will be used for capping of waste clay settling areas and dam stabilization in approximately 1900 acres of existing and proposed settling areas (Table 4). Sand tailings will be utilized to backfill mine cuts, cap waste clay settling areas, and stabilize dams (Table 4).

2.15 Reclamation under Alternative A will utilize the three reclamation types previously discussed. Land and lakes will account for approximately 7500 acres, and elevated fill and tailings fill will occupy 9100 acres and 1900 acres, respectively (Table 5, Figures 8 and 9). These reclaimed acreages include lands mined previously as well as those proposed for mining. Reclamation will result in creation of open waterbodies, wetlands, and upland areas.

2.16 Alternative B: Mining All Wetlands Containing Reserves. This mining alternative assumes that all identified phosphate reserves will be mined, including those underlying wetlands within the jurisdictional

Table 3. Acreage of Project Area to be Disturbed Under Mining Alternatives.

Code and Description*	Approx. Acreage	% of Total	Alternative A Acreage Disturbed	Alternative A % of Type	Alternative B Acreage Disturbed	Alternative B % of Type	Alternative C Acreage Disturbed	Alternative C % of Type	Alternative D Acreage Disturbed	Alternative D % of Type
DEVELOPED AREA										
111 Residential, low density	53	<0.1	0	0	2	3.8	3	5.7	2	3.8
112 Residential, med. density	5	<0.1	5	100	5	100	5	100	5	100
114 Mobile homes	18	<0.1	0	0	0	0	0	0	0	0
123 Offices	20	<0.1	0	0	0	0	0	0	0	0
131 Light industrial	13	<0.1	0	0	1	7.7	0	0	0	0
144 Major roads	524	0.5	0	0	62	11.8	0	0	0	0
152 Transmission lines	27	<0.1	0	0	10	37.0	0	0	0	0
162 Religious facilities	3	<0.1	0	0	0	0	0	0	0	0
167 Cemeteries	4	<0.1	0	0	0	0	0	0	0	0
193 Active development	21	<0.1	20	95.2	15	71.4	20	95.2	20	95.2
Subtotal	688	0.7	25	3.6	95	13.8	28	4.1	27	3.9
UPLAND COMMUNITIES										
211 Row crops	3,976	4.0	349	8.8	419	10.5	377	9.5	415	10.4
212 Field crops	2,509	2.5	394	15.7	623	24.8	580	23.1	624	24.9
213 Improved pasture	1,302	1.3	40	3.1	41	3.2	27	2.1	20	1.5
222 Deciduous fruit orchard	1	<0.1	0	0	0	0	0	0	0	0
231 Pecan orchard	1	<0.1	0	0	0	0	0	0	0	0
242 Confined feeding operations	51	<0.1	8	15.7	8	15.7	8	15.7	8	15.7
323 Scrub/brush rangeland	105	0.1	0	0	83	79.1	0	0	0	0
411 Pine flatwoods	3,935	3.9	372	9.4	1,790	45.5	871	22.1	1,616	41.1
422 Other hardwoods	87	<0.1	25	28.7	35	40.2	17	19.5	33	37.9
431 Mixed forest	12,399	12.4	1,080	8.7	2,868	23.1	1,845	14.9	2,665	21.5
441 Planted coniferous forest	24,861	24.8	3,688	14.8	8,247	33.2	7,439	29.9	8,412	33.8
451 Clearcut areas	9,195	9.2	2,709	29.5	4,705	51.2	3,602	39.2	4,509	49.0
741 Scraped areas	8	<0.1	5	62.5	5	62.5	5	62.5	5	62.5
742 Dredge and fill areas	382	0.4	119	31.2	258	67.5	124	32.5	237	62.0
760 Mining and processing	15,379	15.4	1,060	6.9	2,079	13.5	1,233	8.0	666	4.3
Subtotal	74,191	74.0	9,849	13.3	21,161	28.5	16,128	21.7	19,210	25.9
WETLAND COMMUNITIES										
6110 Cypress	1,970	2.0	0	0	492	25.0	183	9.3	521	26.4
6211 Swamp tupelo	775	0.8	0	0	251	32.4	64	8.3	319	41.2
6212 Bayhead	1,322	1.3	0	0	376	28.4	0	0	434	32.8
6213 Scrub/shrub	1,314	1.3	0	0	231	17.6	12	0.9	313	23.8
6311 Cypress/swamp tupelo/bay	12,633	12.6	0	0	4,511	35.7	1,830	14.5	4,252	33.5
6312 Swamp tupelo/bay/pine	6,291	6.3	0	0	3,292	52.3	338	5.4	2,621	41.2
6410 Emergent	430	0.4	0	0	111	25.8	25	5.8	161	37.4
Subtotal	24,735	24.7	0	0	9,264	37.4	2,452	9.9	8,601	34.8
AQUATIC COMMUNITIES										
513 Canals	66	<0.1	2	3.0	43	65.2	0	0	12	18.2
521 Mine pits reclaimed to lakes	17	<0.1	0	0	15	88.2	0	0	0	0
531 Reservoirs	434	0.4	0	0	0	0	10	2.3	5	1.2
561 Ponds	73	<0.1	8	11.0	9	12.3	8	11.0	6	8.2
Subtotal	590	0.6	10	1.7	67	11.4	18	3.1	23	3.9
TOTAL	100,204	100	9,884	9.9	30,587	30.5	18,626	18.6	27,861	27.8

*Based on Florida Land Use and Cover Classification System (Fla. Dept. of Admin. 1976).

NOTE: All acreages, percentages, and totals have been rounded.

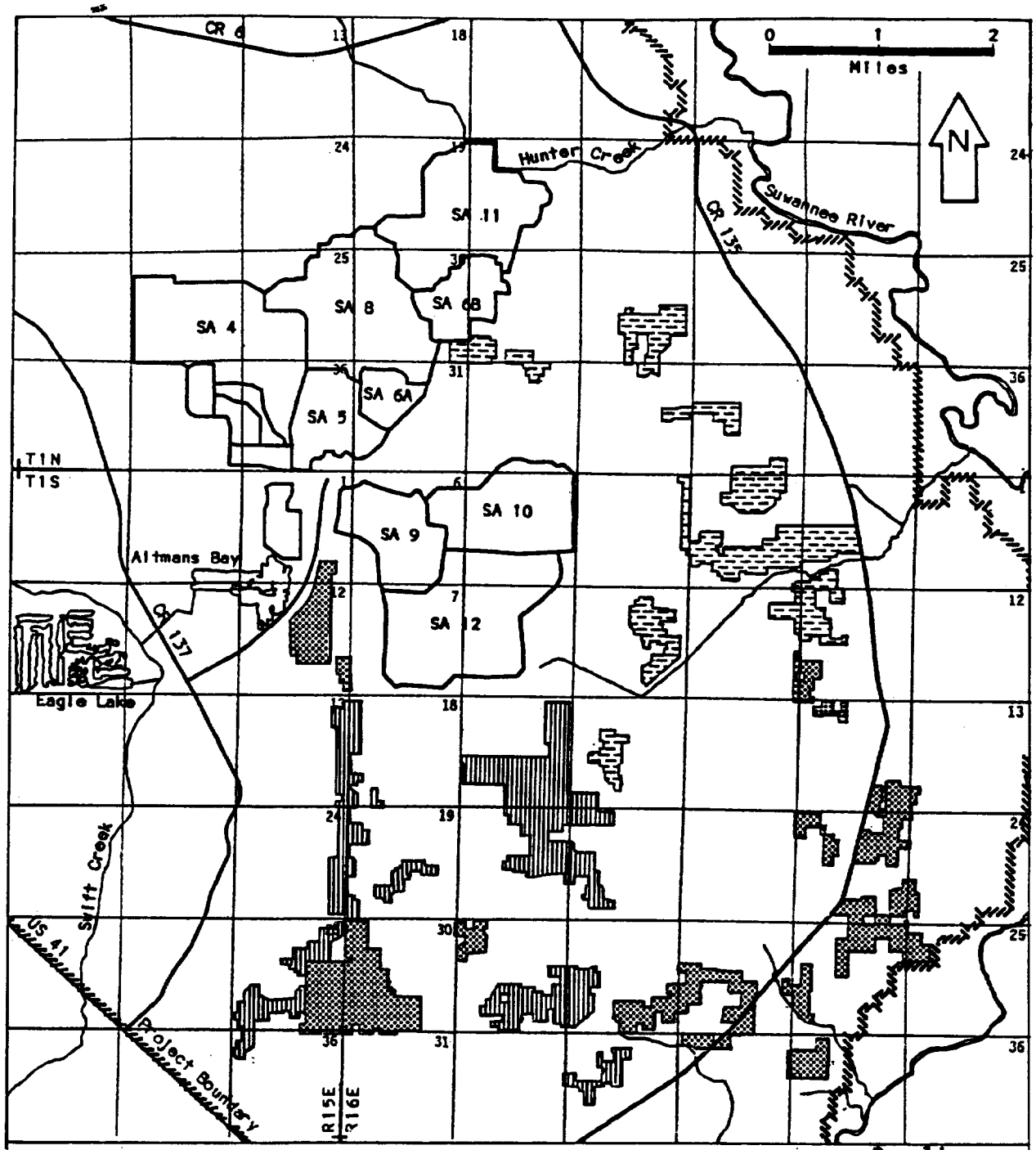


Figure 4.
Mining Areas for Suwannee River Mine, Alternative A:
No Mining or Mine Support in Wetlands.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

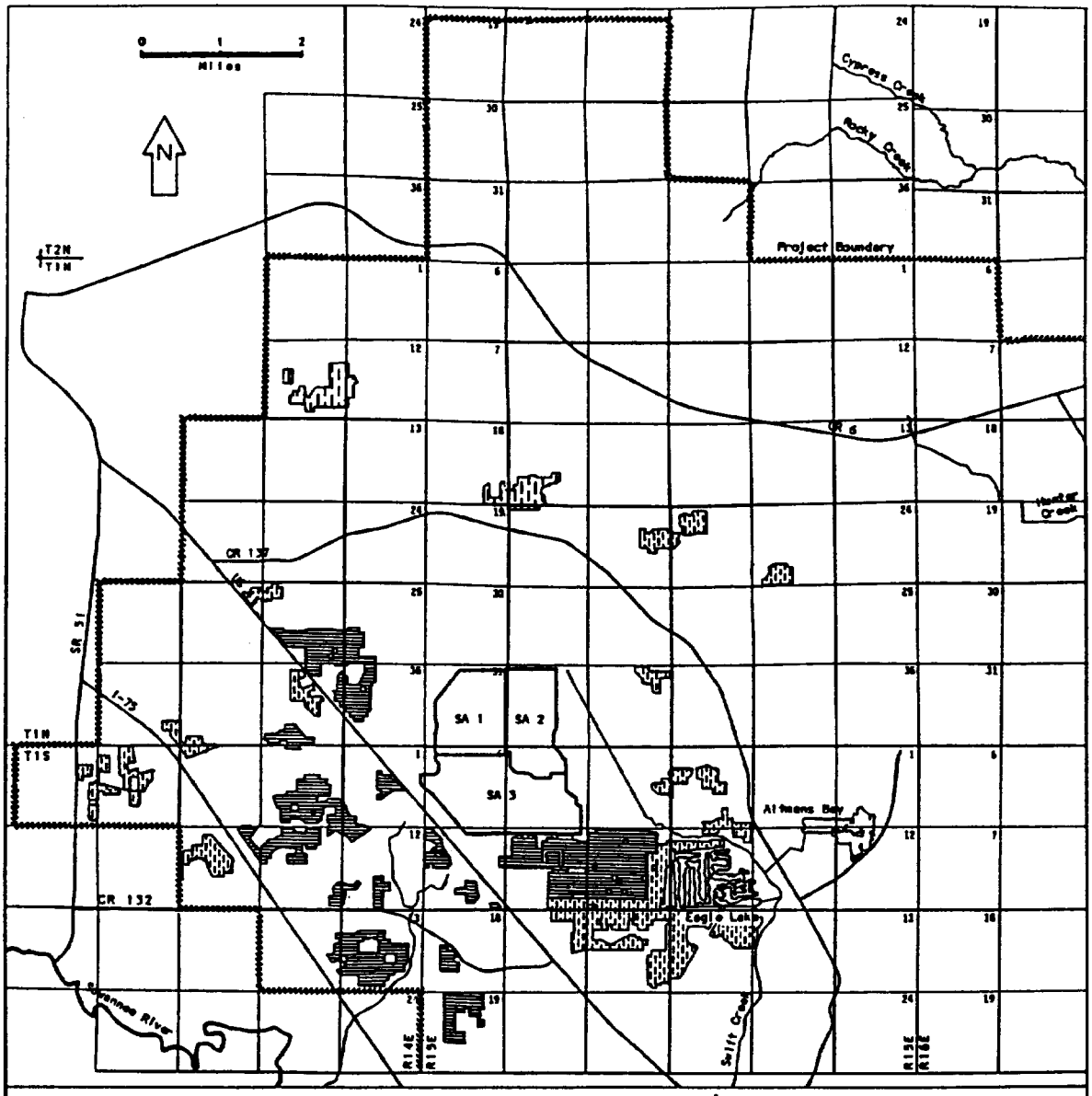


Figure 5.
Mining Areas for Swift Creek Mine, Alternative A: No Mining or Mine Support in Wetlands.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

Table 4. Waste Disposal Acreages by Type and Mining Alternative.

Alternative	Waste Clay		Mudball		Sand Tailings	
	Suwannee River Mine	Swift Creek Mine	Suwannee River Mine	Swift Creek Mine	Suwannee River Mine	Swift Creek Mine
A	6,022	3,130	864	1,060	1,267	1,272
B	11,082	7,120	1,946	4,100	4,781	6,756
C	7,452	4,900	1,287	2,120	2,941	3,250
D	10,797	6,785	1,673	2,740	3,858	7,085

Table 5. Reclamation Acreages by Type and Mining Alternative.[1]

Alternative	Land and Lakes[2]		Tailings Fill		Elevated Fill	
	Suwannee River Mine	Swift Creek Mine	Suwannee River Mine	Swift Creek Mine	Suwannee River Mine	Swift Creek Mine
A	5,097	2,440	450	1,447	6,022	3,040
B	7,370	7,003	2,010	4,356	11,082	7,030
C	6,738	4,308	1,052	2,530	7,452	4,810
D	6,321	6,319	1,911	4,255	10,797	6,695

[1]Includes both mandatory and nonmandatory reclamation lands and assumes that nonmandatory lands will be reclaimed under Chapter 378, FS, and Chapter 16C-17, FAC.

[2]Includes uplands, wetlands, and waterbodies.

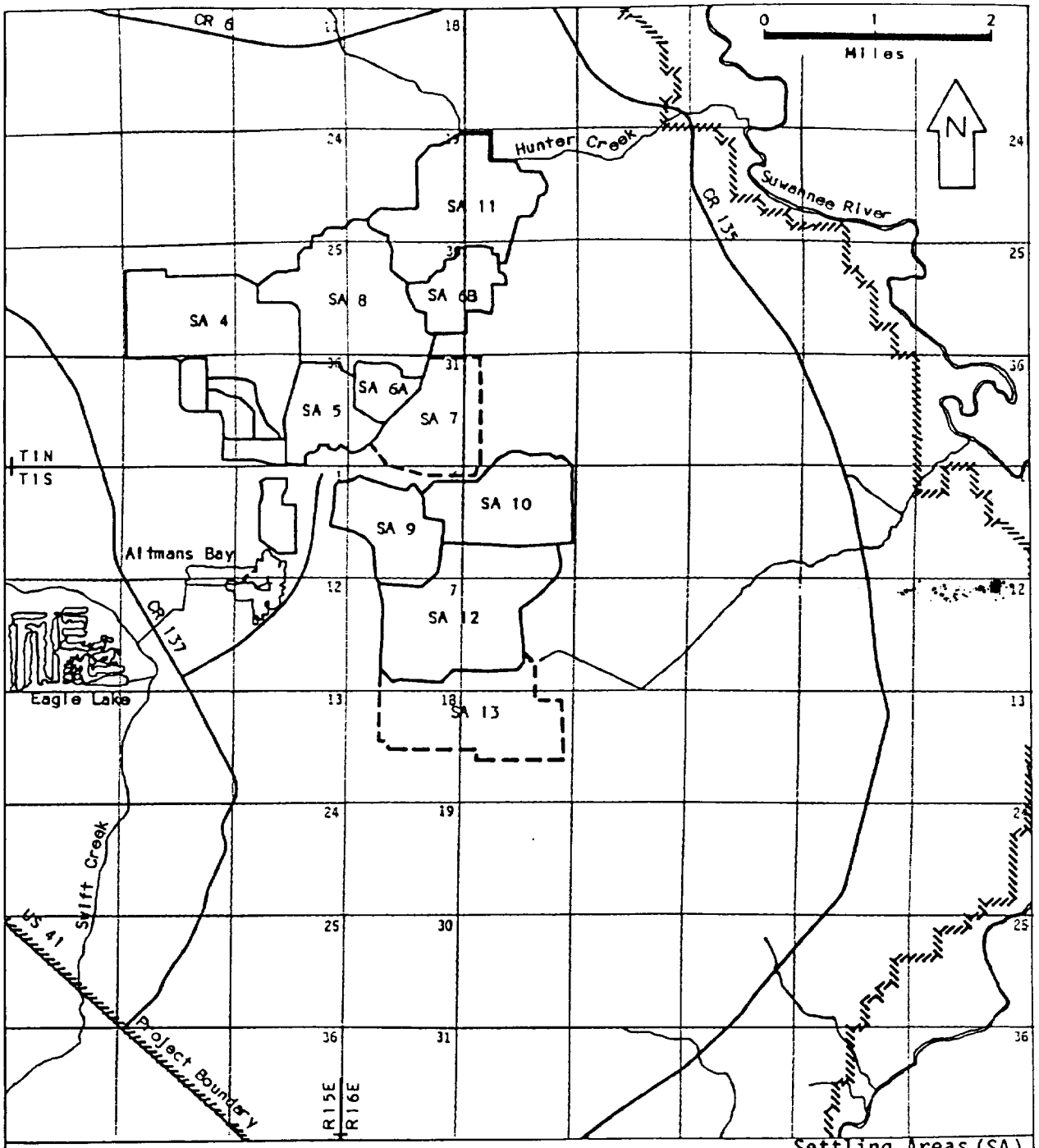


Figure 6.
Waste Clay Disposal Areas for Suwannee River Mine,
Alternative A: No Mining or Mine Support in Wetlands.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

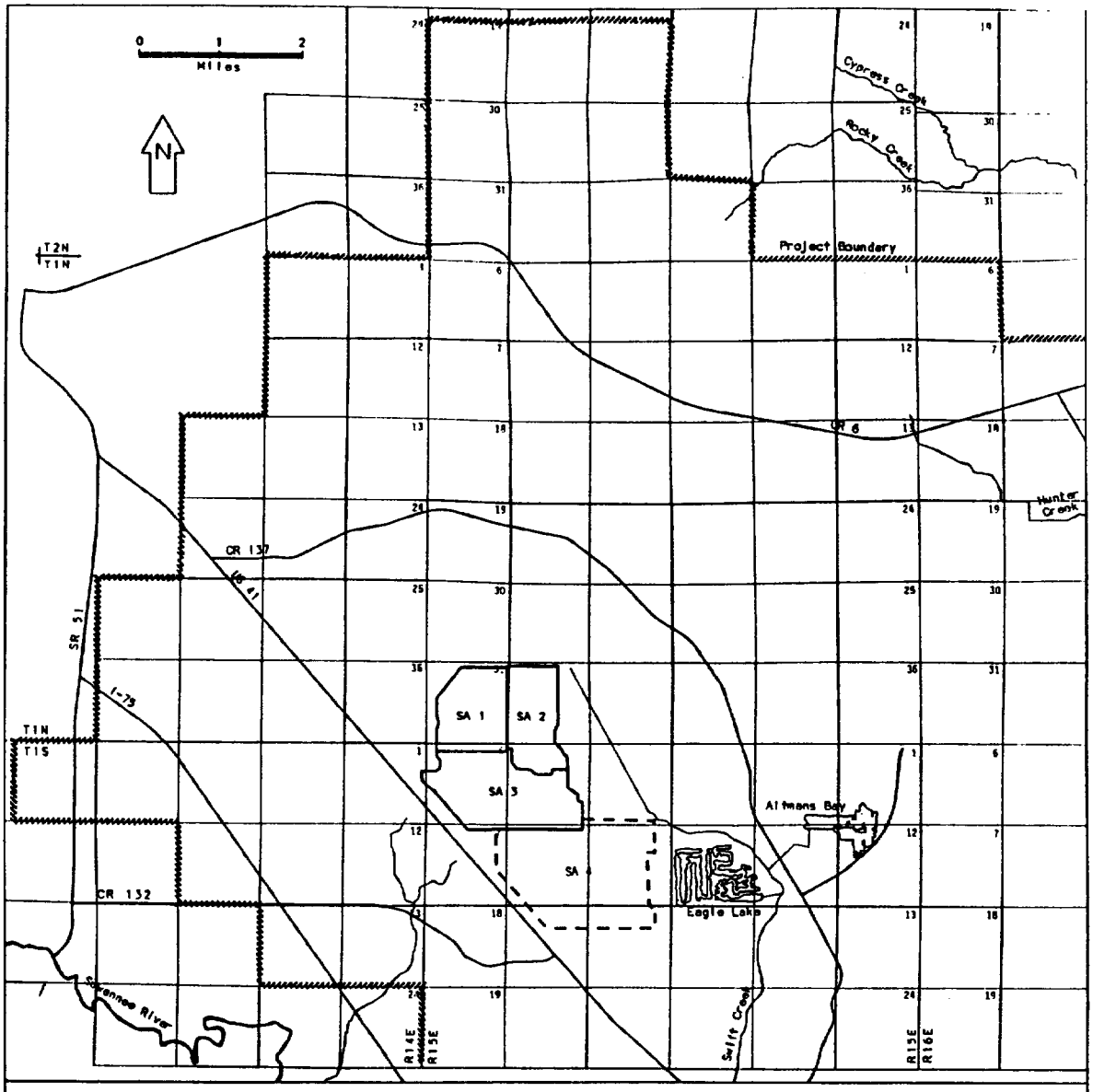


Figure 7.
Waste Clay Disposal Areas for Swift Creek Mine,
Alternative A: No Mining or Mine Support in Wetlands.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

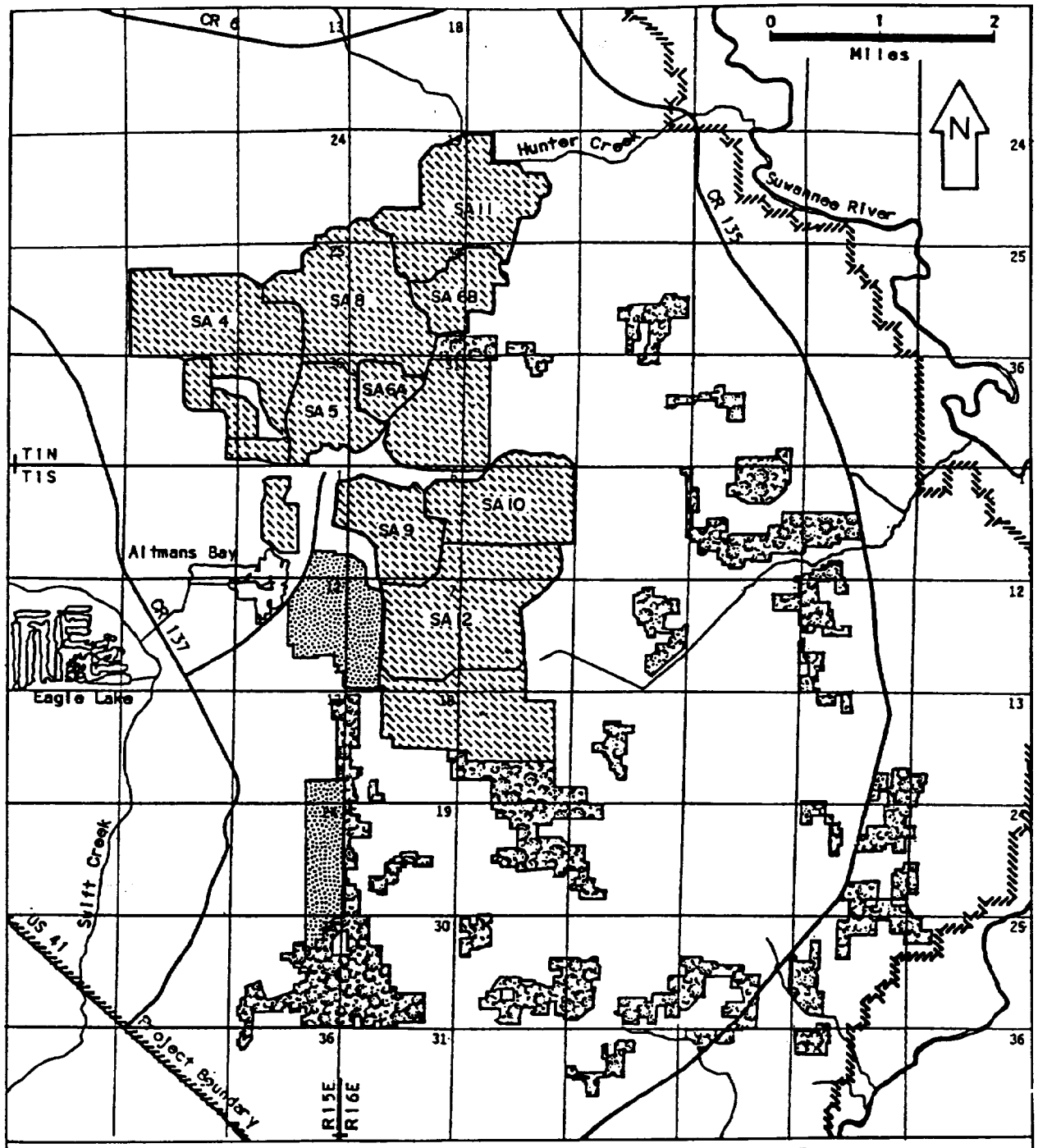


Figure 8.
Reclamation Plan for Suwannee River Mine, Alternative A: No Mining or Mine Support in Wetlands.

Note:

Includes both mandatory and nonmandatory reclamation lands and assumes that nonmandatory lands will be reclaimed under Chapter 378, FS, and Chapter 16C-17, FAC.

Tails fill

Land & lakes

Elevated fill

SA Clay settling area

Only portions of streams not physically disturbed by mining or mine support activities are shown.

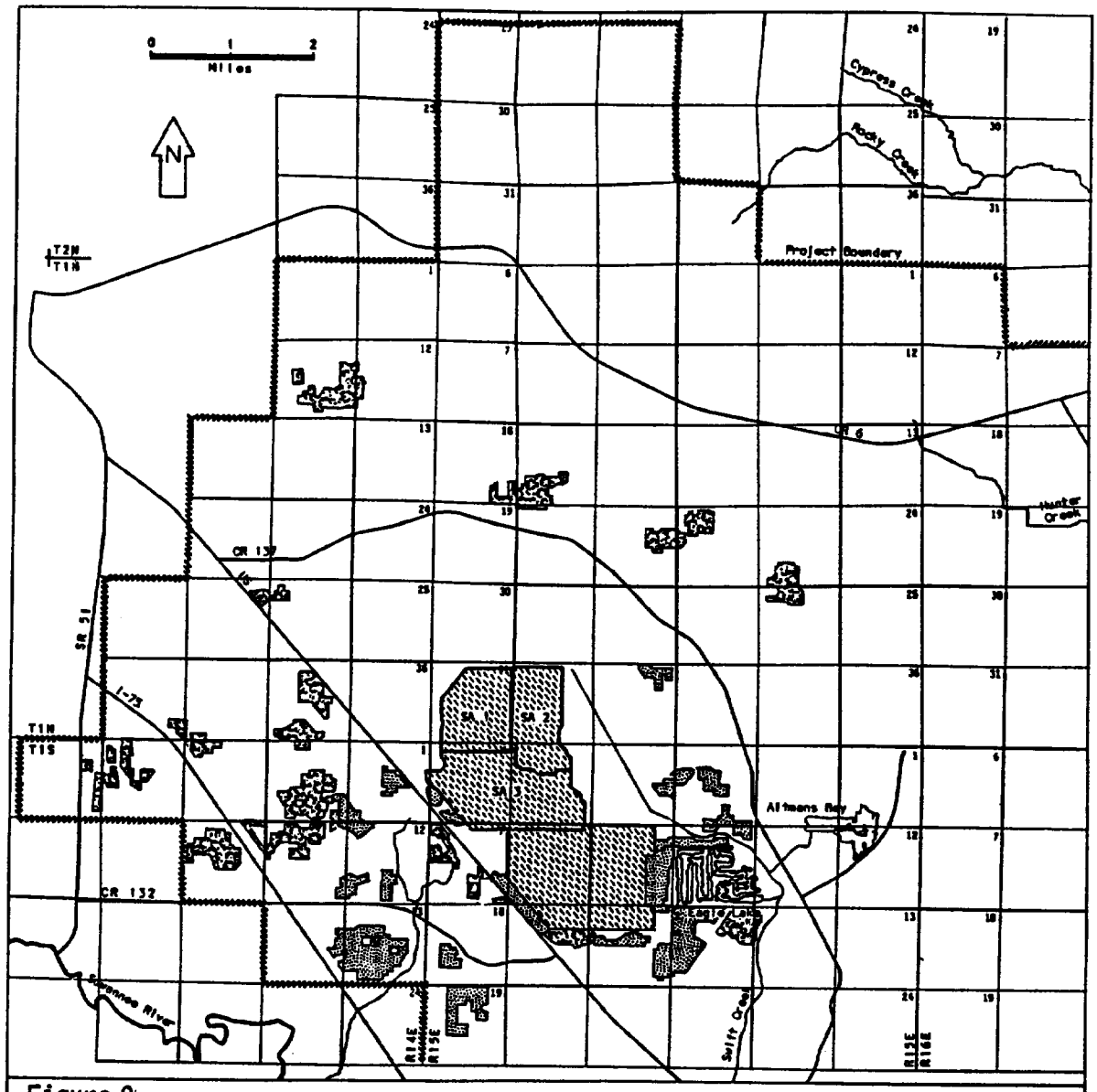


Figure 9.
Reclamation Plan for Swift Creek Mine, Alternative A: No Mining or Mine Support in Wetlands.

Note: Includes both mandatory and nonmandatory reclamation lands and assumes that nonmandatory lands will be reclaimed under Chapter 378, FS, and Chapter 16C-17, FAC.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

authority of the Corps and FDER, but excluding those lands needed for dam construction. Table 3 provides a breakdown of the various types of areas that would be affected by this alternative, which allows maximum recovery of identified phosphate reserves. Approximately 26,000 acres would be mined under this alternative, with an additional 4700 acres utilized for waste clay disposal (Table 3). The mining activities will average 530 acres per year over approximately 21 years for the Suwannee River Mine and 580 acres per year over approximately 26 years for the Swift Creek Mine (Figures 10 and 11). Approximately 18,000 acres of waste clay disposal areas will be utilized, 8000 acres of which are already authorized under existing regulations. Mudball waste will be used for capping approximately 6000 acres. Sand tailings will be utilized for backfill of mine cuts (6300 acres), dam stabilization and construction, and capping (5200 acres) of waste clays (Table 5, Figures 12 and 13). Reclamation will result in acre-for-acre replacement of wetlands mined, as well as creation of open water communities and upland communities. A total of approximately 39,000 acres will be reclaimed (Table 5, Figures 14 and 15). This includes lands previously mined and lands proposed for mining under this alternative.

2.17 Alternative C: Mining Only Small Isolated or Weakly/Periodically Connected Wetlands Containing Reserves. Upland areas containing reserves and wetlands <25 acres in size which are isolated or weakly/periodically connected and containing identified reserves not under FDER claimed jurisdiction will be mined. This will result in extraction of 62% of the reserves on the Suwannee River Mine and 56% of the reserves on the Swift Creek Mine. Table 3 provides a breakdown of the various types of areas that would be affected by this alternative. Approximately 18,600 acres are proposed for mining or mine support, with an average yearly mining rate of 560 acres over approximately 14 years for the Suwannee River Mine and 510 acres over approximately 18 years for the Swift Creek Mine (Table 3, Figures 16 and 17). Waste clay disposal areas will occupy approximately 12,000 acres, 8000 acres of which are already authorized under existing regulations, with mudball caps on 3400 acres. Sand tailings will be utilized for mine-out backfill (3600 acres), dam stabilization, and capping approximately 2200 acres of waste clays (Table 5, Figures 18 and 19). Reclamation will provide acre-for-acre replacement of wetlands. Additionally, open water communities and upland communities will be developed. Reclamation totals for this alternative (27,000 acres) include previously mined lands as well as lands mined under this alternative (Table 5, Figures 20 and 21).

2.18 Alternative D: Mining in Areas Requiring Only ACOE Permits. Upland areas containing reserves and all wetland areas containing reserves, with the exception of those under FDER claimed jurisdiction, will be mined. This will result in extraction and processing of 88% of the reserves on the Suwannee River Mine and 94% of the reserves on the Swift Creek Mine. Table 3 provides a breakdown of the various types of areas that would be affected by this alternative. Approximately 24,000 acres are proposed for mining, with an additional 3700 acres utilized for waste disposal (Table 3, Figures 22 and 23). Average yearly mining rates for the Suwannee River and Swift Creek mines will be 560 acres over approximately 18 years and 580 acres over approximately 25 years,

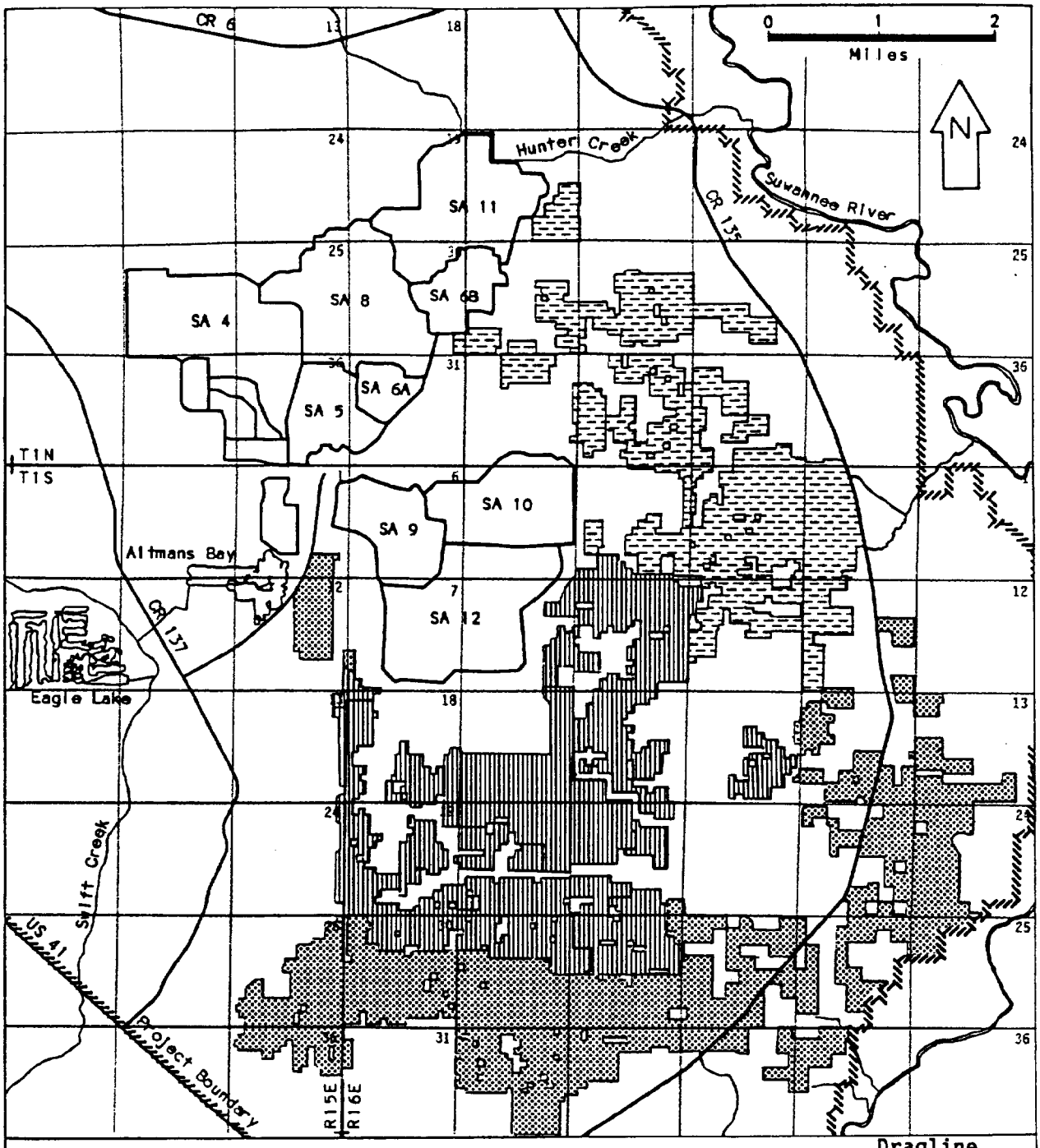


Figure 10.

Mining Areas for Suwannee River Mine, Alternative B: Mining All Wetlands Containing Reserves.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

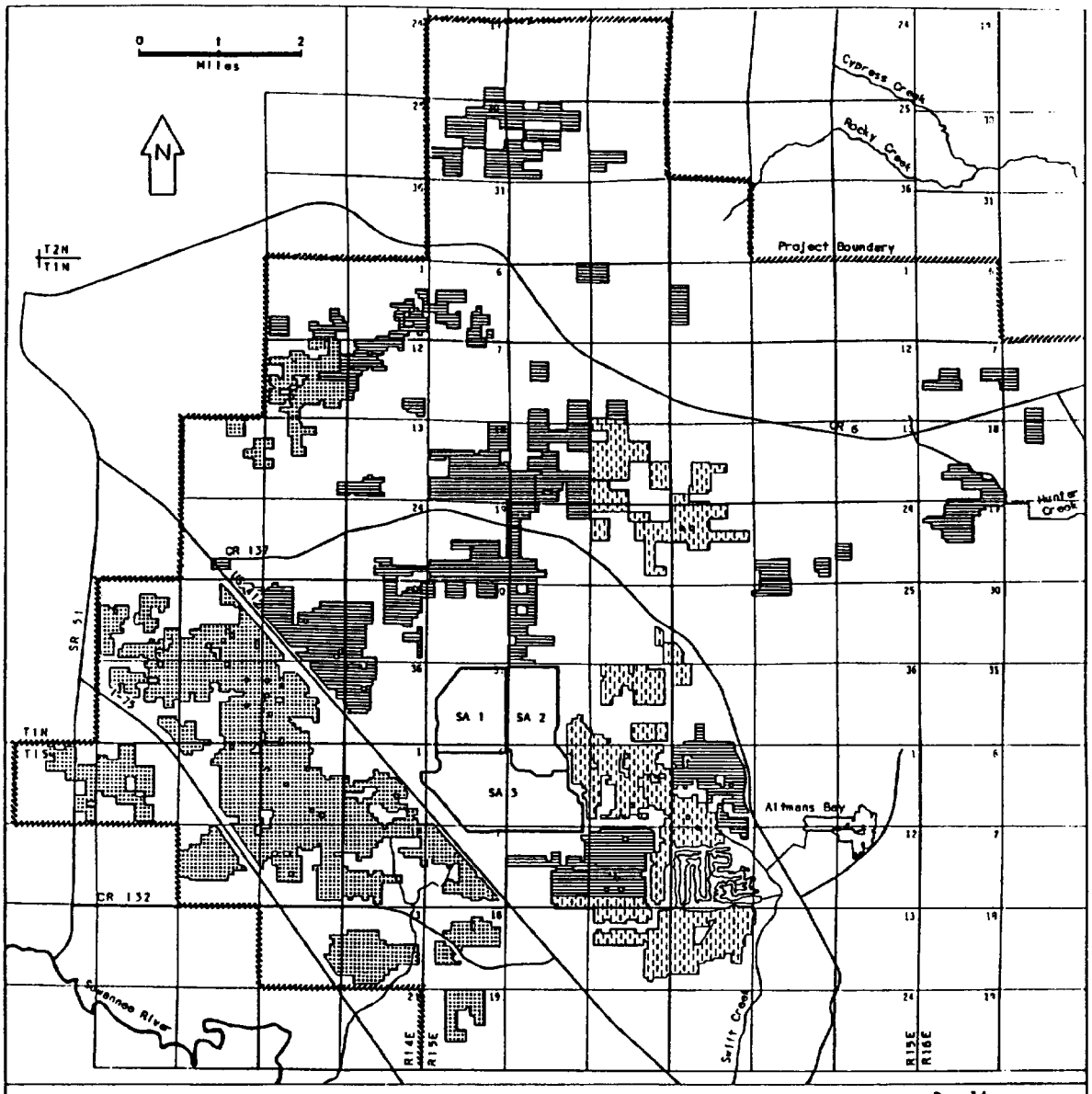


Figure 11.
Mining Areas for Swift Creek Mine, Alternative B:
Mining All Wetlands Containing Reserves.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

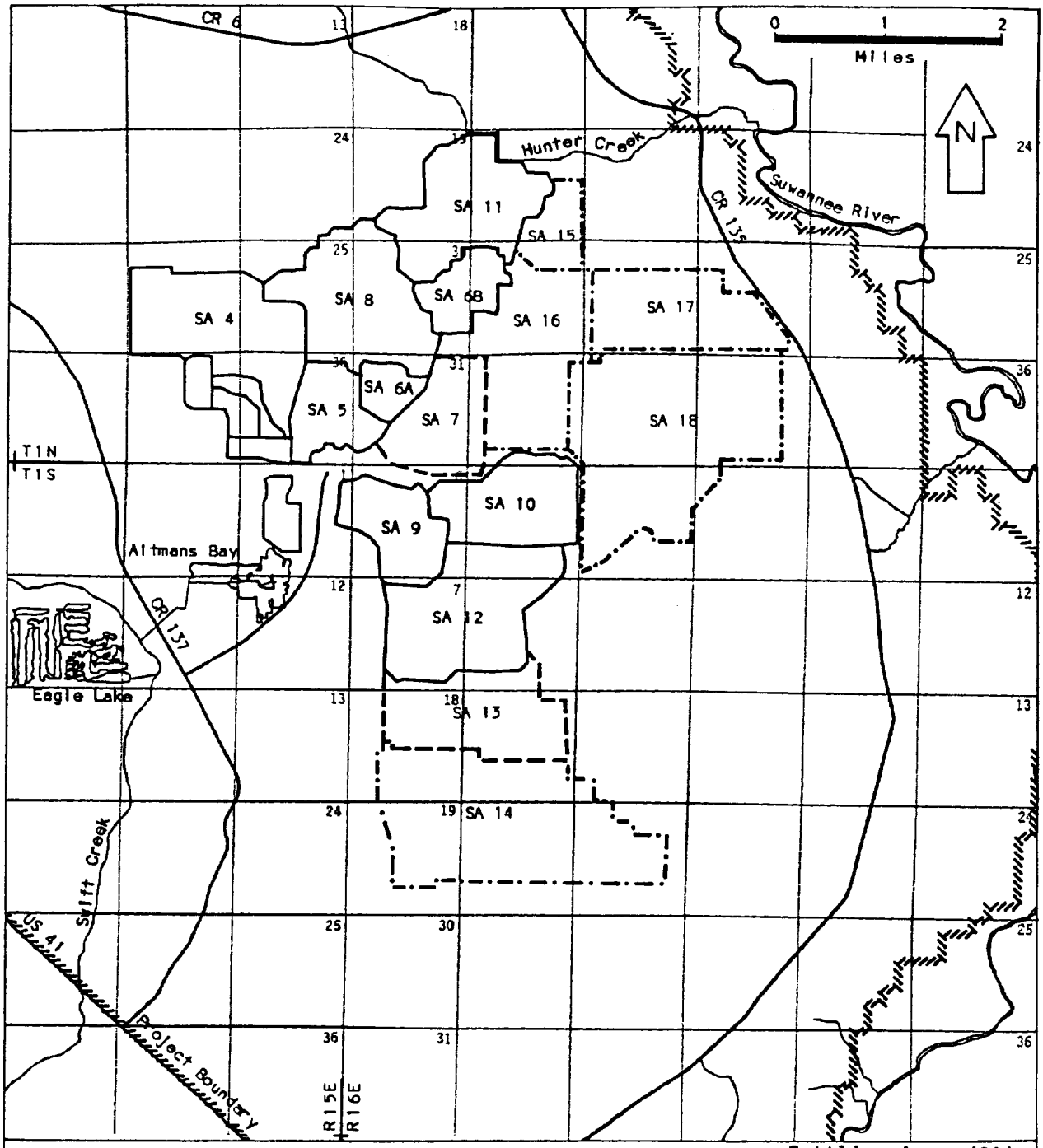


Figure 12.
Waste Clay Disposal Areas for Suwannee River Mine, Alternative B: Mining All Wetlands Containing Reserves.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

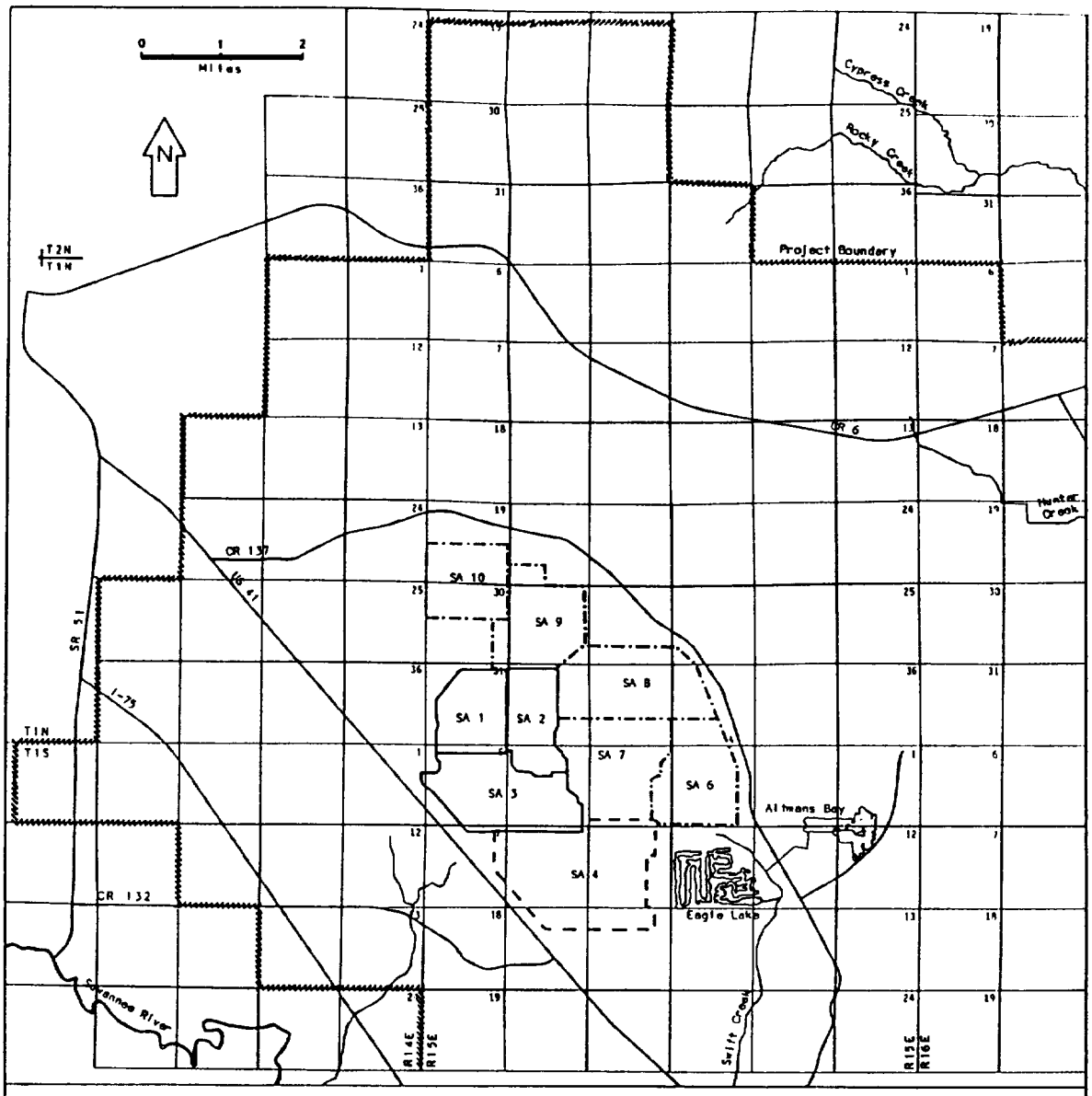


Figure 13.
Waste Clay Disposal Areas for Swift Creek Mine,
Alternative B: Mining All Wetlands Containing Reserves.

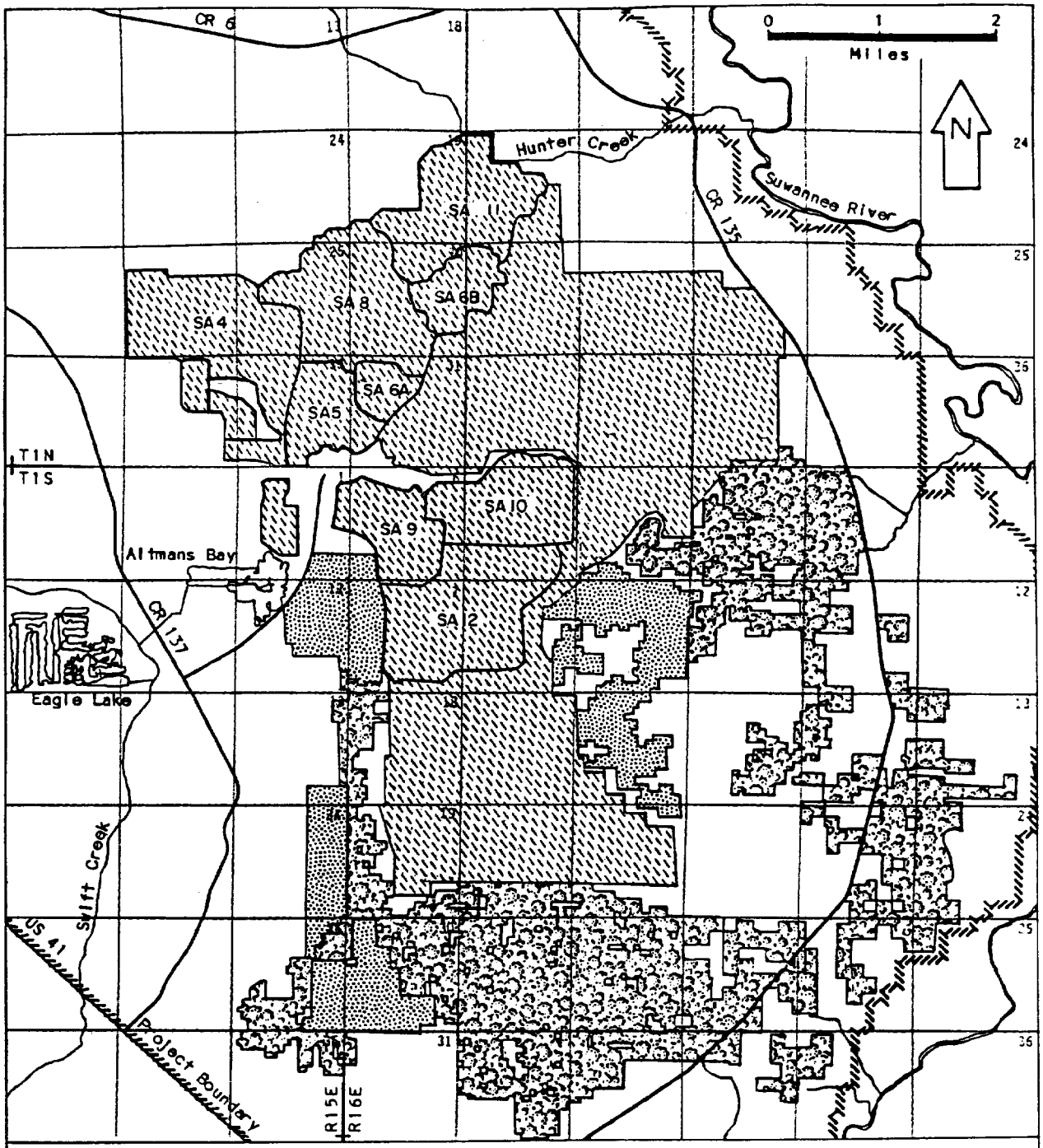


Figure 14.

Reclamation Plan for Suwannee River Mine, Alternative B: Mining All Wetlands Containing Reserves.

Note:
Includes both mandatory and nonmandatory reclamation lands and assumes that nonmandatory lands will be reclaimed under Chapter 378, FS, and Chapter 16C-17, FAC.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

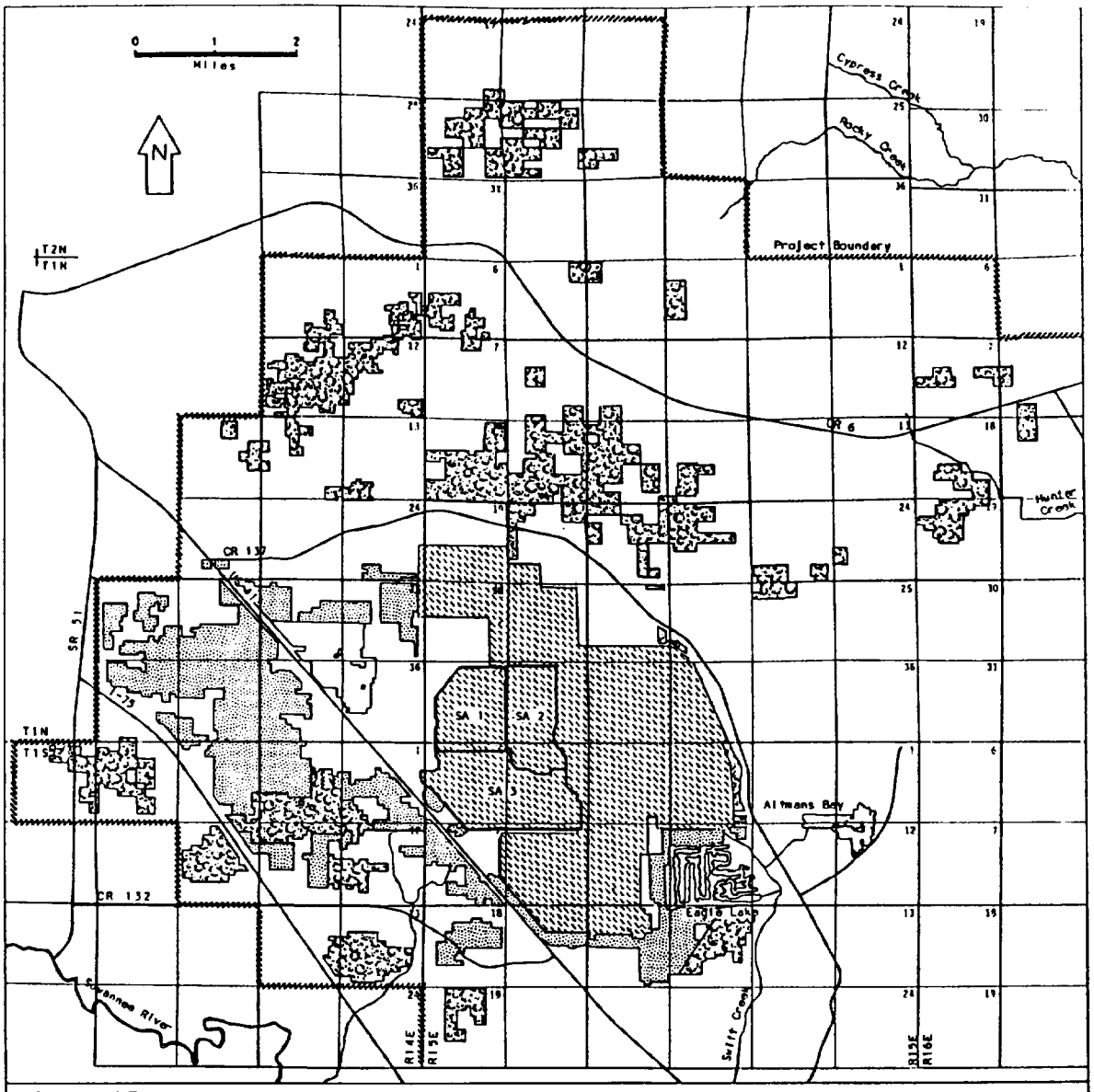


Figure 15.
Reclamation Plan for Swift Creek Mine, Alternative B: Mining All Wetlands Containing Reserves.

Note: Includes both mandatory and nonmandatory reclamation lands and assumes that nonmandatory lands will be reclaimed under Chapter 378, FS, and Chapter 16C-17, FAC.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

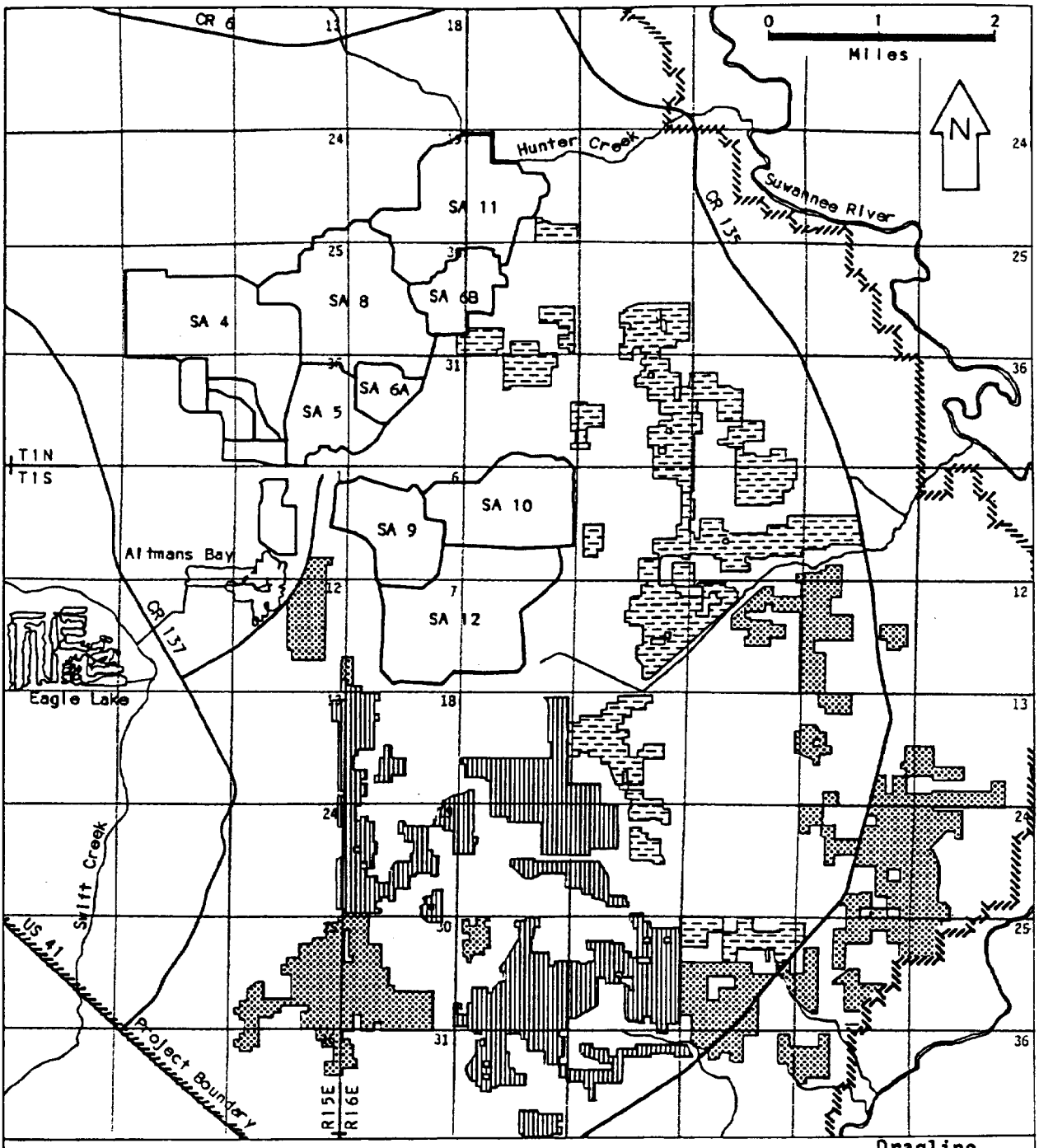


Figure 16.
Mining Areas for Suwannee River Mine, Alternative C: Mining Only Small Isolated or Weakly/Periodically Connected Wetlands Containing Reserves.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

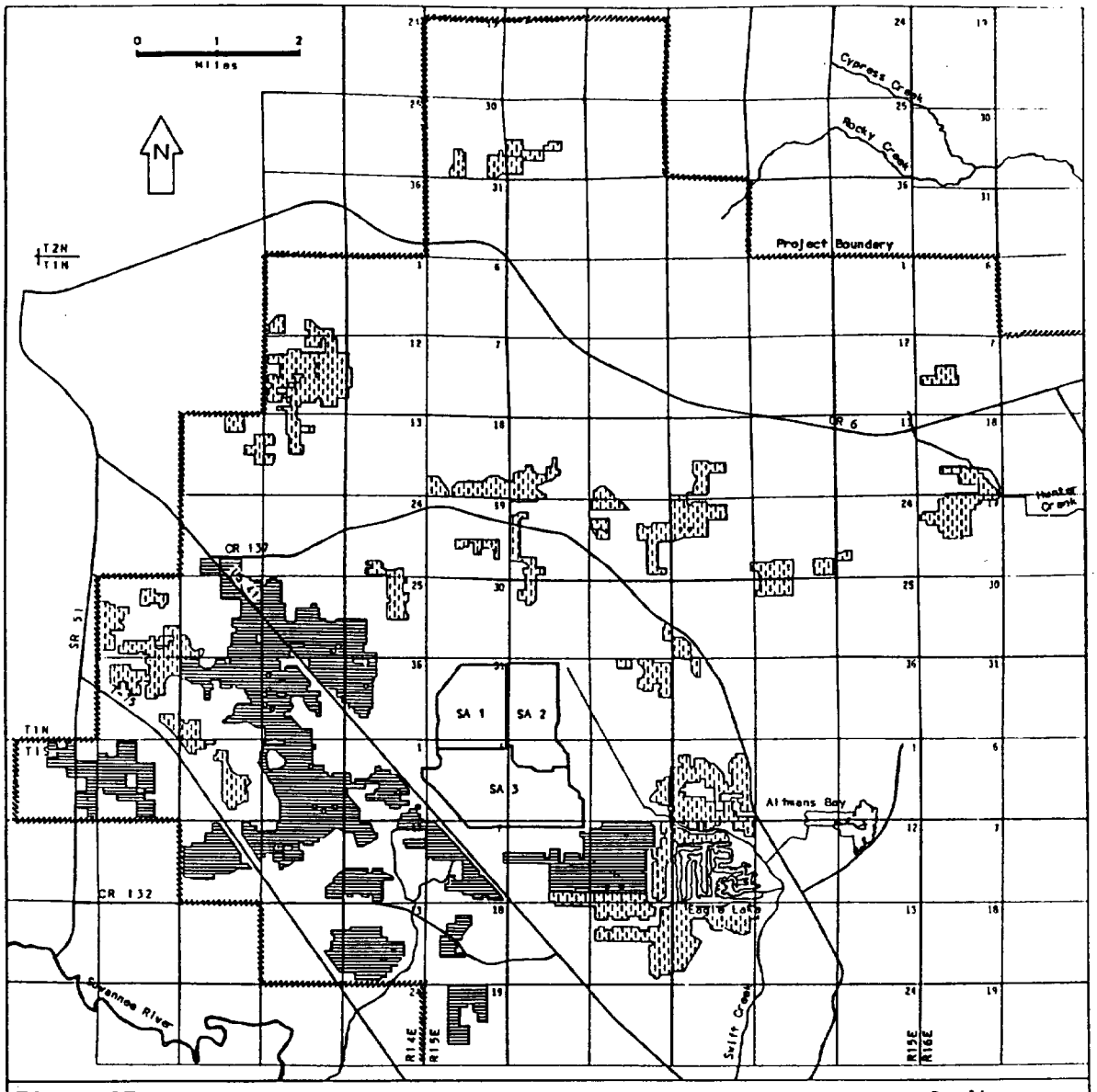


Figure 17.
Mining Areas for Swift Creek Mine, Alternative C: Mining Only Small Isolated or Weakly/Periodically Connected Wetlands Containing Reserves.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

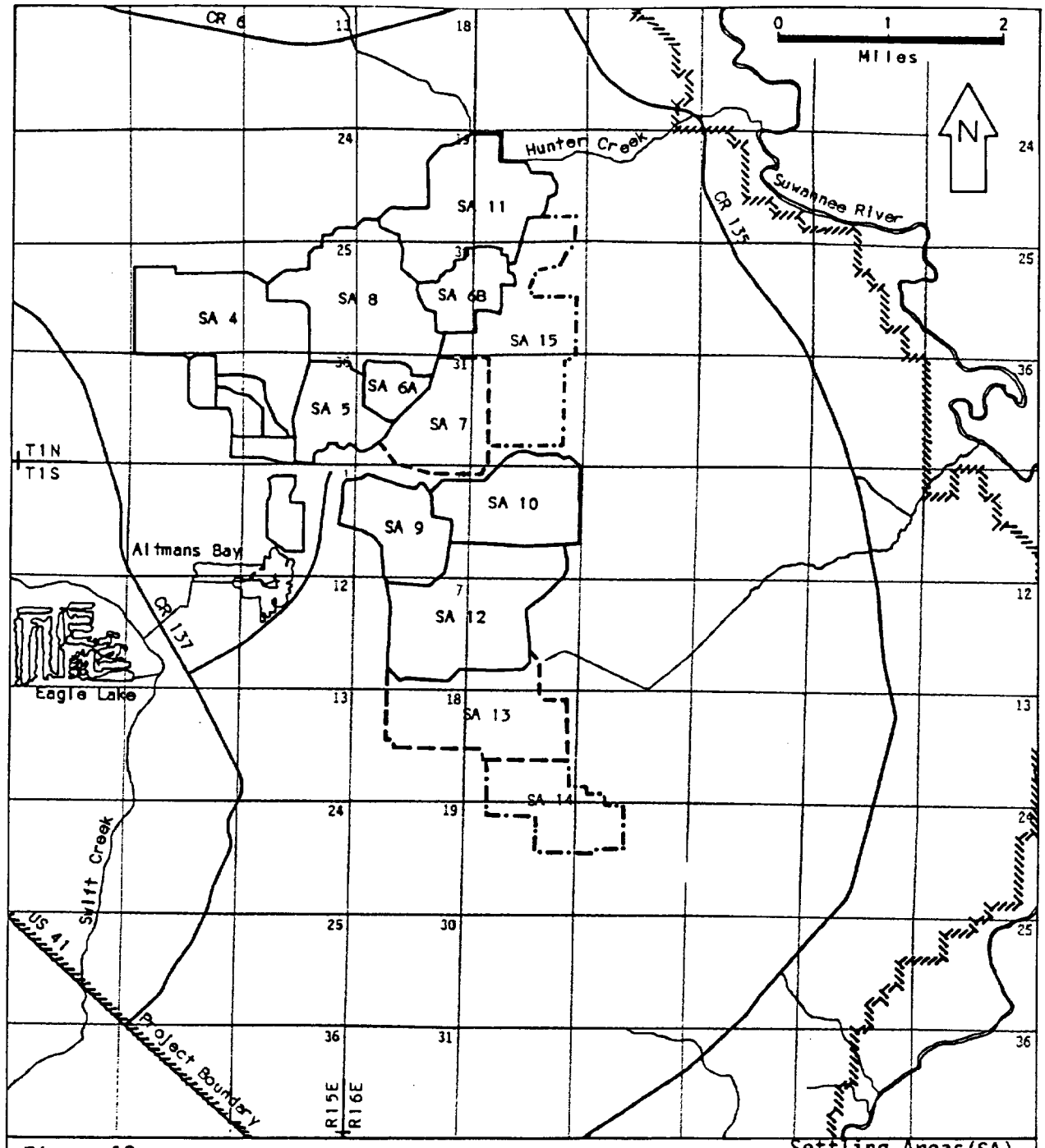


Figure 18.
Waste Clay Disposal Areas for Suwannee River Mine, Alternative C: Mining Only Small Isolated or Weakly/ Periodically Connected Wetlands Containing Reserves.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

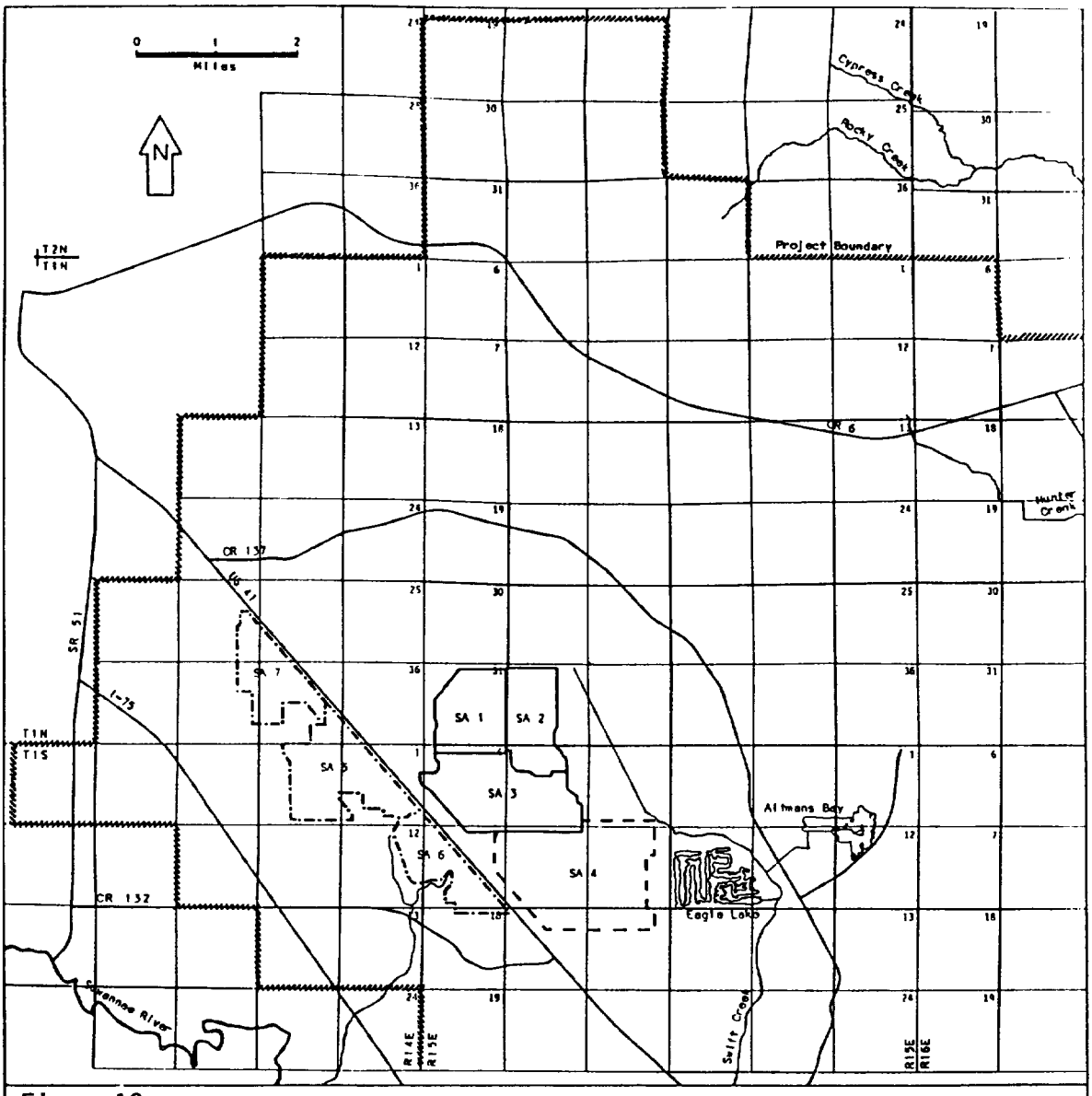


Figure 19.
Waste Clay Disposal Areas for Swift Creek Mine, Alternative C: Mining Only Small Isolated or Weakly/ Periodically Connected Wetlands Containing Reserves.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

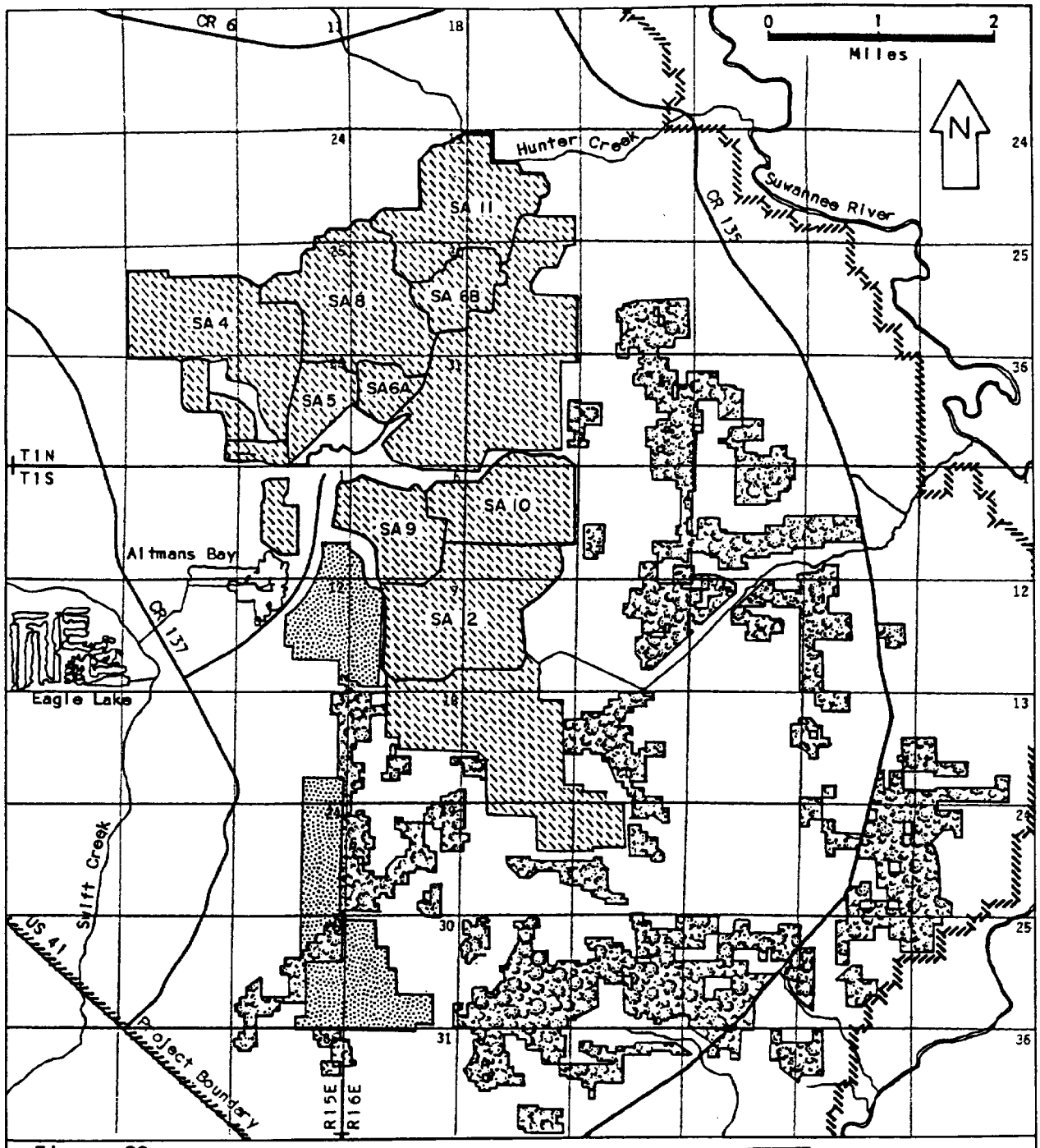


Figure 20.
Reclamation Plan for Suwannee River Mine, Alternative C: Mining Only Small Isolated or Weakly/Periodically Connected Wetlands Containing Reserves.

Note:
Includes both mandatory and nonmandatory reclamation lands and assumes that nonmandatory lands will be reclaimed under Chapter 378, FS, and Chapter 16C-17, FAC.

Tails fill
Land & lakes
Elevated fill
SA Clay settling area

Only portions of streams not physically disturbed by mining or mine support activities are shown.

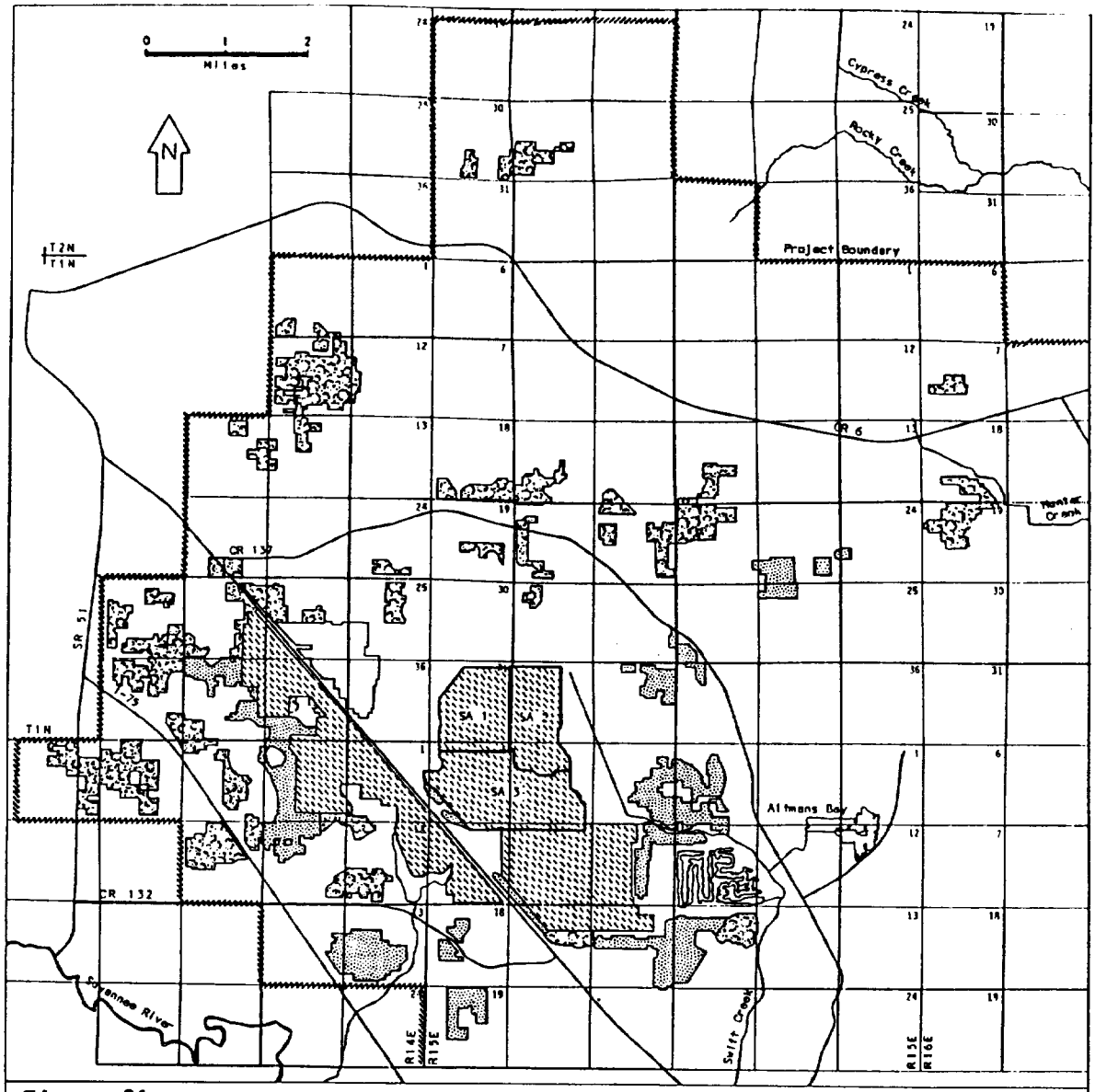


Figure 21.
Reclamation Plan for Swift Creek Mine, Alternative C: Mining Only Small Isolated or Weakly/Periodically Connected Wetlands Containing Reserves.

Note: Includes both mandatory and nonmandatory reclamation lands and assumes that nonmandatory lands will be reclaimed under Chapter 378, FS, and Chapter 16C-17, FAC.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

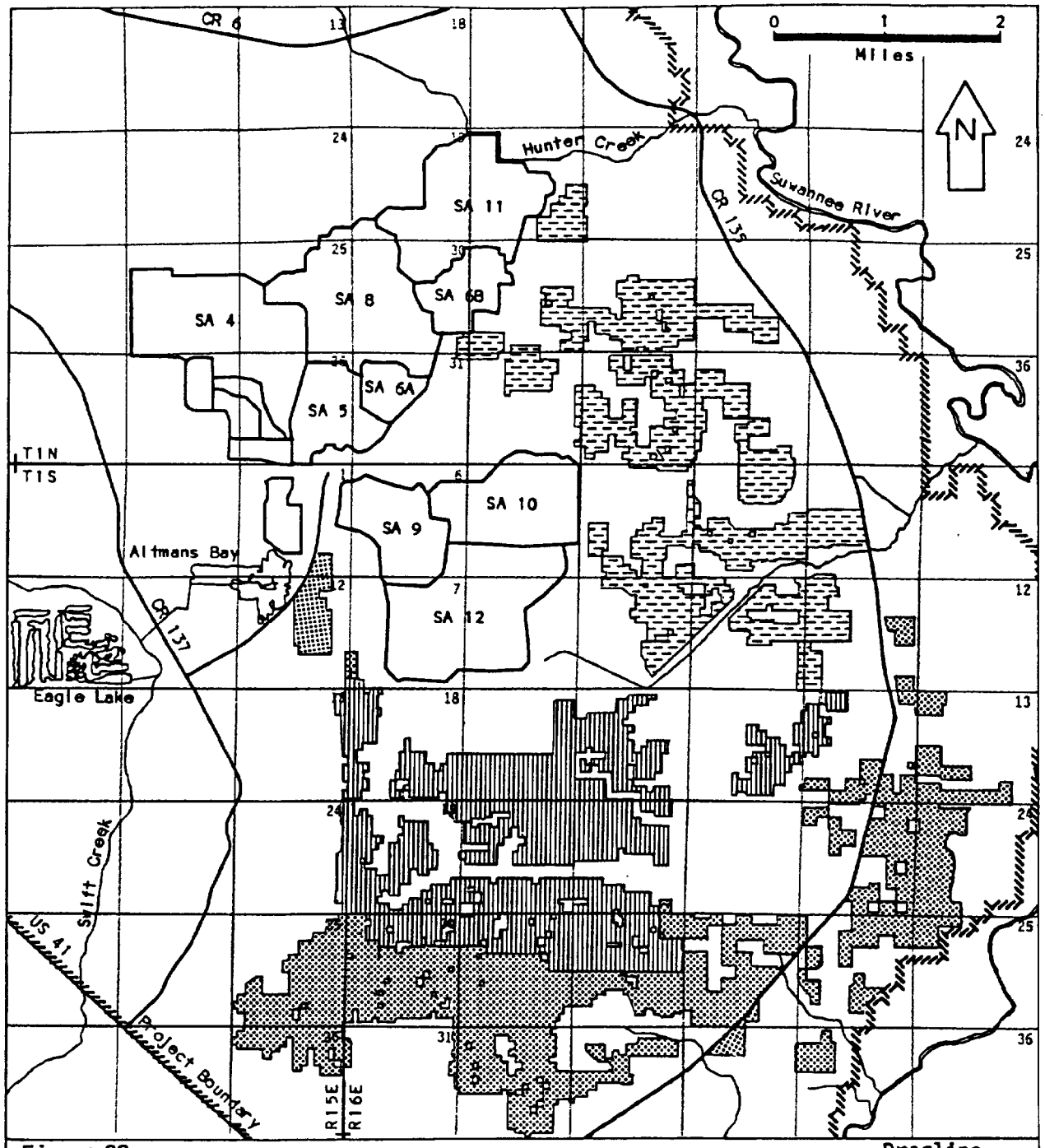


Figure 22.
Mining Areas for Suwannee River Mine, Alternative D:
Mining in Areas Requiring Only ACOE Permits.

Dragline
Number 1
Number 2
Number 3

SA Clay settling area

Only portions of streams not physically disturbed by mining or mine support activities are shown.

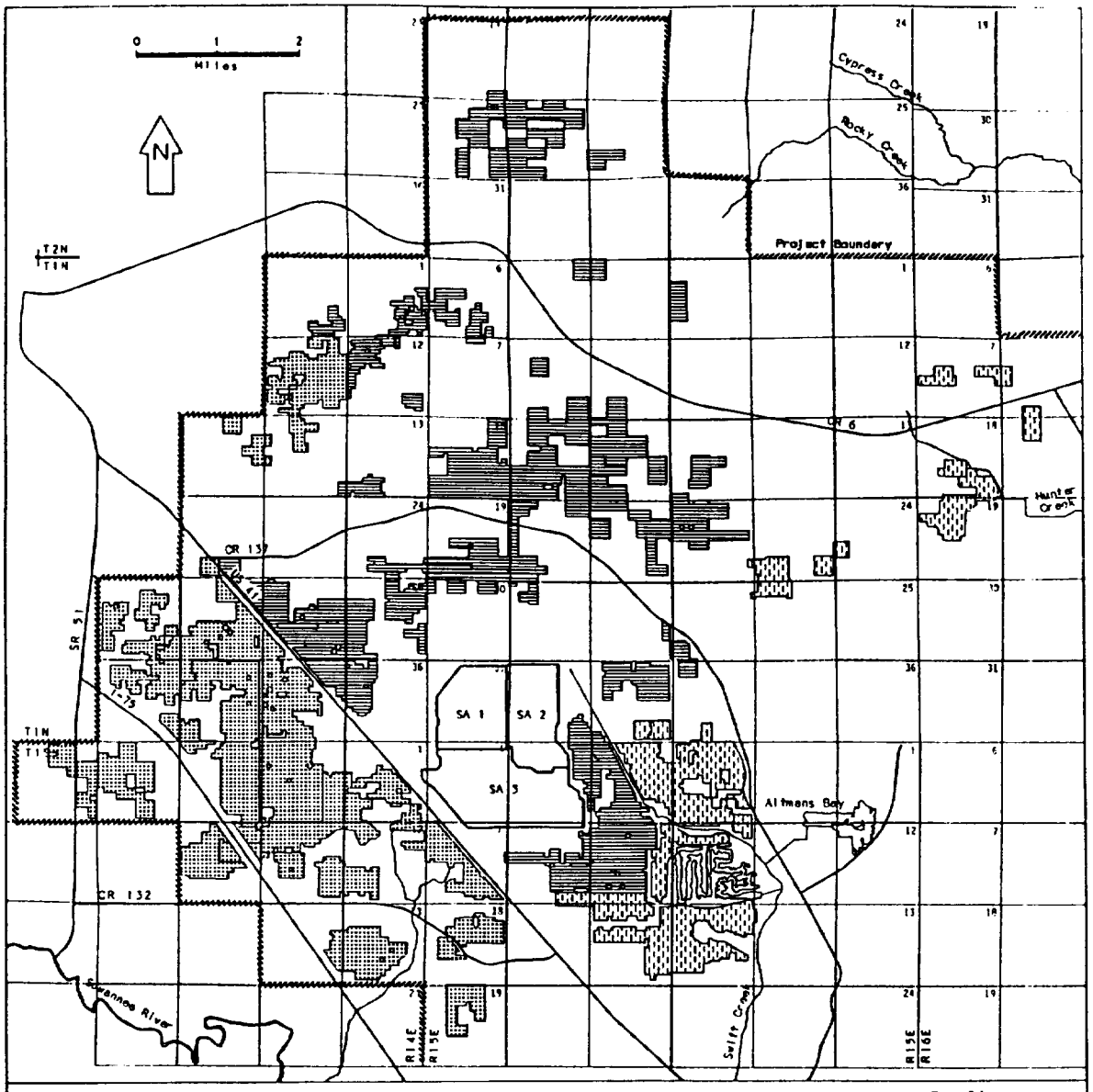


Figure 23.
Mining Areas for Swift Creek Mine, Alternative D:
Mining in Areas Requiring Only ACOE Permits.

respectively. Approximately 18,000 acres of waste clay disposal areas will be utilized, 8000 acres of which are already authorized, with mud-ball caps occupying 4400 acres. Sand tailings will occupy approximately 7000 acres of backfilled mine cuts and be used to cap approximately 3700 acres of waste clay settling areas (Table 4, Figures 24 and 25). A total of 36,000 acres will be reclaimed, including lands previously mined and proposed for mining under this alternative (Table 5, Figures 26 and 27). Wetlands will be replaced on an acre-for-acre basis; open water communities and upland communities will also be created in the reclamation process.

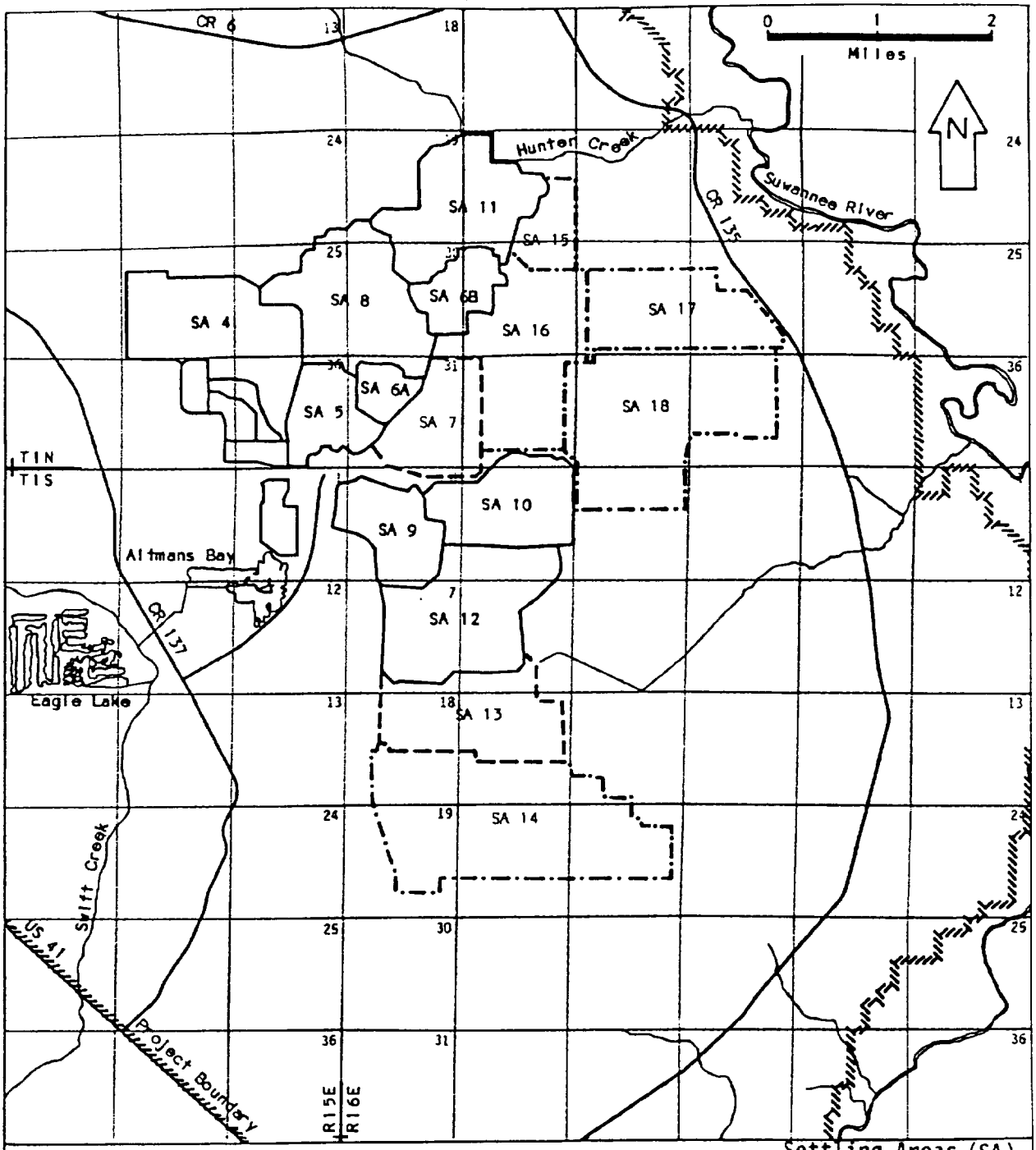


Figure 24.
Waste Clay Disposal Areas for Suwannee River Mine, Alternative D: Mining in Areas Requiring Only ACOE Permits.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

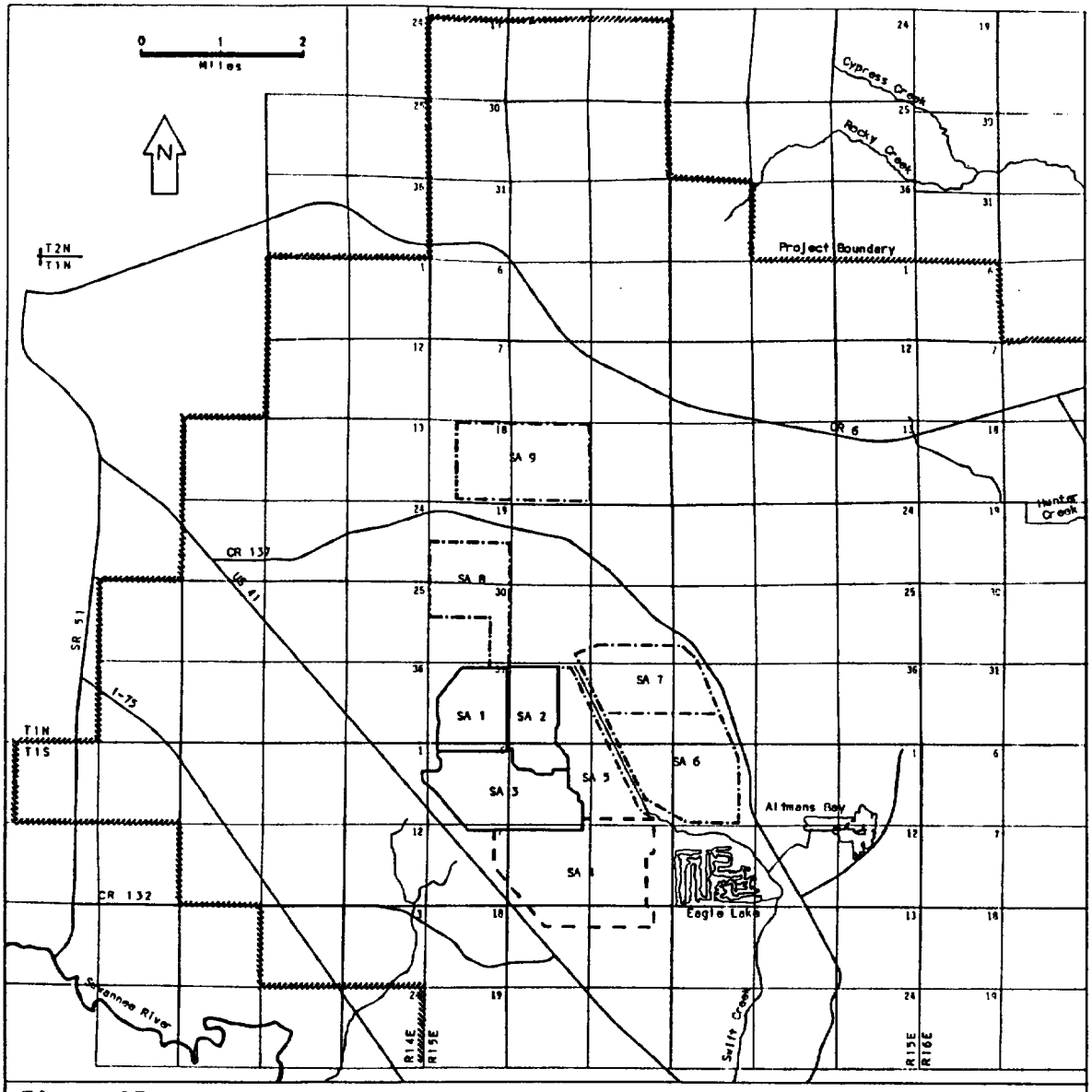


Figure 25.
Waste Clay Disposal Areas for Swift Creek Mine, Alternative D: Mining in Areas Requiring Only ACOE Permits.

Settling Areas(SA)
- Existing
- Under construction
- Proposed

Only portions of streams not physically disturbed by mining or mine support activities are shown.

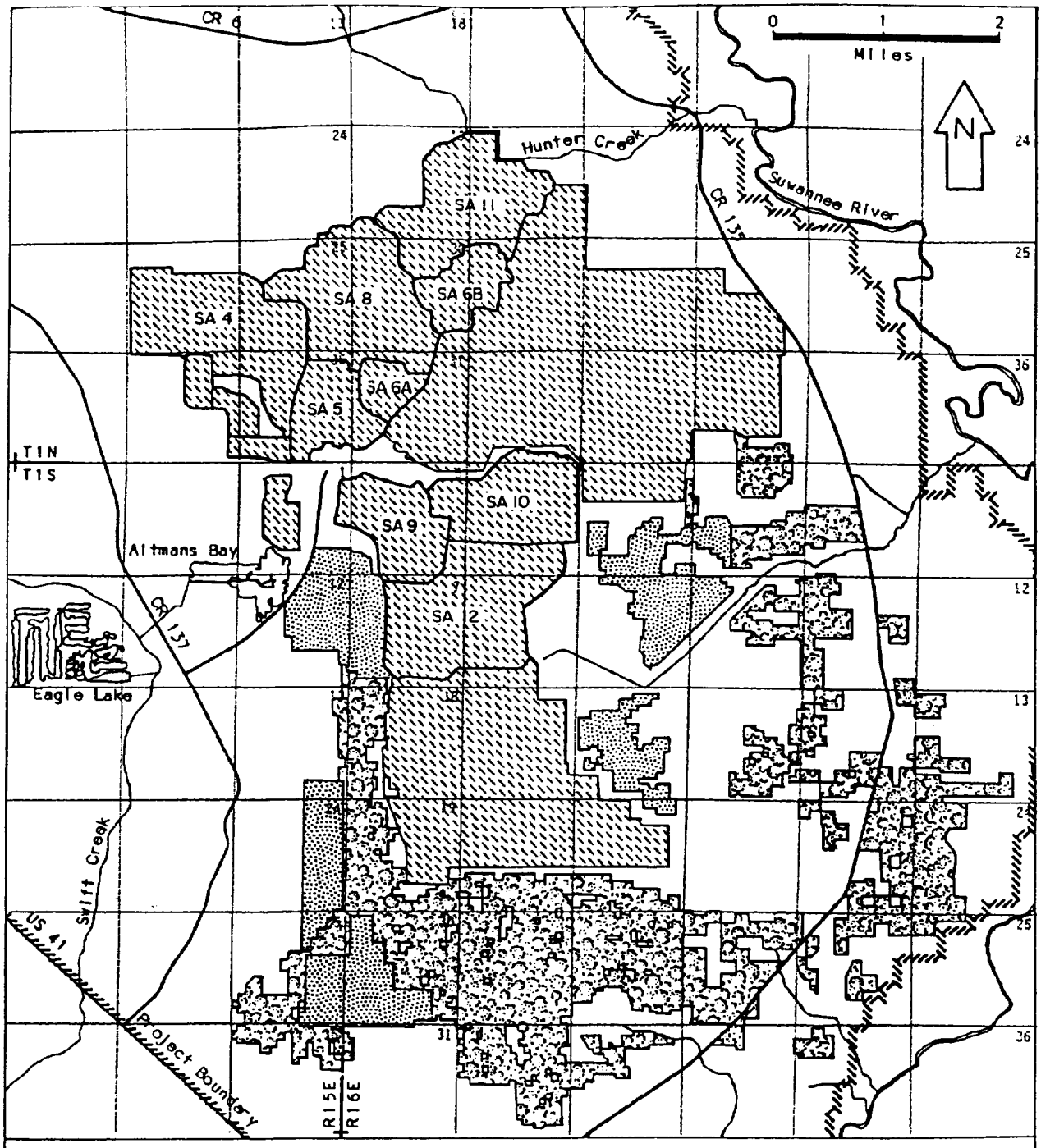


Figure 26.

Reclamation Plan for Suwannee River Mine, Alternative D: Mining in Areas Requiring Only ACOE Permits.

Note:
Includes both mandatory and nonmandatory reclamation lands and assumes that nonmandatory lands will be reclaimed under Chapter 378, FS, and Chapter 16C-17, FAC.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

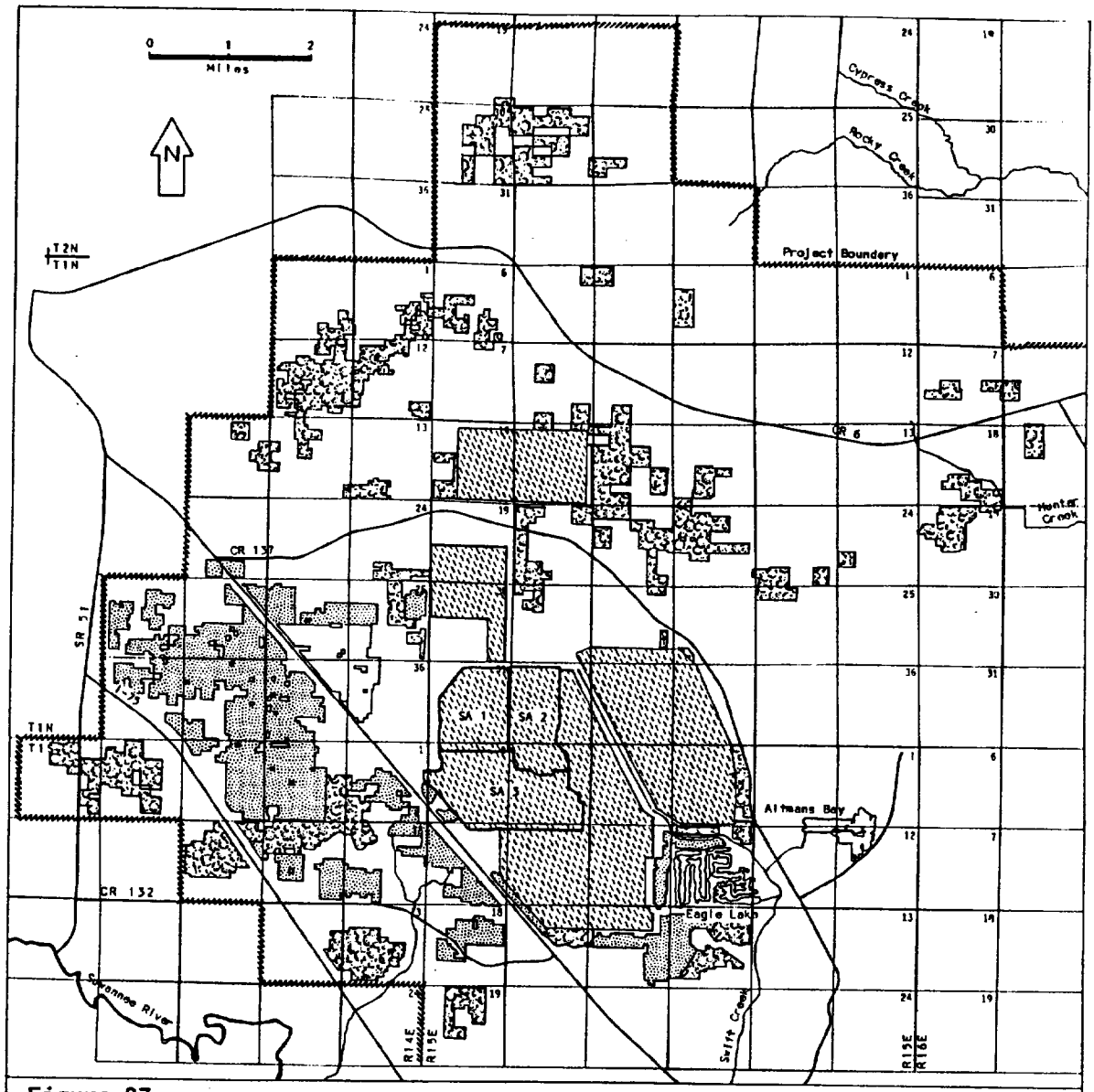


Figure 27.
Reclamation Plan for Swift Creek Mine, Alternative D: Mining in Areas Requiring Only ACOE Permits.

Note: Includes both mandatory and nonmandatory reclamation lands and assumes that nonmandatory lands will be reclaimed under Chapter 378, FS, and Chapter 16C-17, FAC.

Only portions of streams not physically disturbed by mining or mine support activities are shown.

3.00 AFFECTED ENVIRONMENT

3.01 Physiographic Characteristics. The OXY project area is located within the Northern Highlands physiographic region, characterized by a relatively high flat land surface (elevation 125-150 ft NGVD), drained by several young, shallow, low velocity tributaries to the Suwannee River. The Suwannee River and its floodplain are typically between 50 and 100 ft NGVD in the project area. The river has a low broad floodplain north of Rocky Creek, then becomes deeply incised westward from White Springs.

3.02 The stratigraphy of the area is relatively uniform and divided into three units: 1) undifferentiated marine terrace deposits, composed of silty and clayey sand (10-30 ft deep); 2) phosphate matrix (uppermost Hawthorn Formation) and confining beds of the Hawthorn Formation, a sequence of clay, sand, and limestone beds which contain phosphate throughout; and 3) the limestone formations of the Floridan Aquifer, occurring at depths of 125-210 ft. The Suwannee Limestone is the uppermost member of the Floridan Aquifer.

3.03 The predominant soils in the project area belong to the Leon-Mascotte-Rutledge association; the Surrency-Portsmouth association occurs along the Suwannee River. Both are characterized by nearly level, poorly drained, sandy soils underlain by loamy subsoil. Poorly drained organic soils (Brighton-Dorovan) occur in the northeastern part of the project area (Fla. Dept. of Admin. 1975). In terms of suitability as a source of topsoil, most soils in the project area are rated poor. The erosion potential for most soils in the project area is low, even when stripped of vegetation, because of the soil properties and the flatness of the existing slopes, resulting in low flow velocities.

3.04 The susceptibility of the site to sinkhole development is low due to thickness of the sediments overlying the limestone formations of the Floridan Aquifer and the occurrence of "impermeable" beds of clays and silts within these overlying sediments.

3.05 Meteorology and Climatology. The OXY site is characterized by relatively dry winters and rainy summers. Mean monthly rainfall ranges from 2-3 in. during the fall and winter to 6-8 in. during the summer; the long-term average for the site is approximately 54 in. per year. Average annual open water evaporation in Hamilton County is approximately 46 in. per year (Visher and Hughes 1969).

3.06 The annual mean temperature for the OXY area is 69°F (20°C), with extremes ranging from a minimum monthly mean of 45°F (7°C) during December-January-February to a maximum monthly mean of 91°F (33°C) during June-July-August. Annual relative humidity averages 76%. The site seldom experiences strong winds (annual average wind speed is 7 mph), and the probability of severe weather is quite low. The terrain

is level and produces no significant effects on local climatology or meteorology.

3.07 Ecology. Large-scale forest management activities, ongoing mining and reclamation, past logging, fires, and drainage activities have altered the natural flora and fauna of the ecological systems in the project area. Floral and faunal characteristics of the OXY site are described in detail in Section 3.3 of the TBD.

3.08 Upland Communities. Fifteen types of upland communities occupy approximately 74,191 acres (74%) of the project area (Table 3). These communities are categorized into five major land use groups: pineland systems, mixed forests, other hardwoods, croplands/pasture, and mining and processing lands. Pineland systems account for 51% of the upland community, with planted pine the predominant cover type. Xeric oak (other hardwoods) and mixed forest account for 0.1% (87 acres) and 17% (12,399 acres), respectively, of the upland communities. Croplands and pasture occupy 7945 acres (11% of the upland community). Mining and processing lands comprise 15,769 acres (21% of the upland communities).

3.09 Upland Habitat Evaluations. Upland habitats in the project area were evaluated using the Habitat Evaluation System (HES) developed by the Corps (1980). Values ranged from 32.8 to 42.1 (scale of 100) for upland forest habitats and 50.3 to 62.6 and 57.4 to 65.3 for open lands and bottomland forests, respectively (TBD Section 3.3.8). These values were primarily a result of silviculture practices and harvesting schedules.

3.10 Wetland Communities. Wetlands in the project area were identified using the Corps definition of wetlands [33 CFR 323.2(c)]. Seven land use types of wetland communities occur in the project area and account for 24,735 acres (25% of the project area). The wetlands in the project area account for approximately 34% of the wetlands in Hamilton County and 2.3% of the wetlands in the Suwannee River basin. A maximum of 13% of the Hamilton County wetlands and 0.9% of the Suwannee River basin wetlands will be affected by mining and mine support activities under Alternative B. The seven wetland land use types include cypress, swamp tupelo, bayhead, scrub/shrub, cypress/swamp tupelo/bay, swamp tupelo/bay/pine, and emergent. Cypress systems comprise 1970 acres of the project area, whereas swamp tupelo and bayheads occupy 775 acres and 1322 acres, respectively. Scrub/shrub areas occur within the larger bay depressions and occupy 1314 acres. The cypress/swamp tupelo/bay community and swamp tupelo/bay/pine community are the most extensive wetland community types in areal extent (12,633 acres and 6291 acres, respectively). The emergent category comprises only 430 acres of the project area.

3.11 In the project area it is estimated that 1762 individual wetland units comprise approximately 25,000 acres of wetlands in the following size classes:

Size Class (acres)	No. of Individual Wetlands	%
<5	1277	72
>5-10	198	11
>10-25	153	9
>25-50	74	4
>50-75	22	1
>75-100	8	<1
>100	30	2

3.12 The majority, by number (92%), of wetlands are very similar in that they are small (<25 acres), hydrologically isolated or at best weakly/periodically connected, and/or simplistic in vegetation structure and diversity. Larger wetlands (>25 acres) account for only 8% of the wetland units, but comprise 76% of the total acreage.

3.13 To demonstrate the relative magnitude of the effects of alternative actions, the Corps chose to use the Wetlands Evaluation Procedure (WEP) of Reppert et al. (1979), as modified by the Jacksonville District, and the Method for Functional Assessment developed for the Federal Highway Administration (Adamus 1983). The results of these evaluations are provided in Appendix C of the TBD.

3.14 Both evaluation methods rate generally accepted wetland functions recognized in 33 CFR 320.4(b)(2). They are not necessarily used to compare on-site wetlands with other wetlands elsewhere. The methods produce relative values which could be compared to projected values of wetlands reclaimed under various alternative actions. The net difference between present and projected scores can be used to demonstrate the relative impact of a given alternative. The intrinsic value of wetlands may not be determined solely by use of the WEP and Adamus systems.

3.15 Aquatic Communities. Aquatic communities in the project area include small ponds and reservoirs, streams draining the project area, and the Suwannee River. Because of the wide-ranging environmental conditions of the aquatic systems in the area, biological data are extremely variable (see TBD Section 3.3.4). Results of fish surveys in the major waterbodies on site and adjacent to the project site indicate: 1) the Suwannee River basin supports a diverse fish community; 2) the gross structure of the fish community has changed little over the last 20 years; and 3) species composition and abundance are similar in the Suwannee River both above and below Swift Creek, which receives mine and chemical plant discharges. Results of natural substrate benthic macroinvertebrate collections over time indicate community parameters such as diversity and equitability have changed little in the study area since 1977. Comparison of recent artificial substrate (Hester-Dendy) macroinvertebrate data with historical data indicates a decline in diversity and equitability in all ecosystems over time. This trend is apparent in unaffected streams as well as affected streams; thus the trend is probably related to factors other than mining activities.

3.16 Forestry and Agricultural Resources. In the project area, 24,861 acres (25%) are in planted pine. Forestry is the predominant land use in Hamilton County (79% of the total county land use). Agriculture occupies 7945 acres (8%) of the project area. Major row crops in the project area occur along and within a short distance of CR 137, CR 135, and CR 6. The Soil Conservation Service estimates that there are <1000 acres of prime farmland in Hamilton County and that ≤50 acres are in the vicinity of phosphate mining activities. However, these estimates may vary due to the lack of a certified soils map for Hamilton County.

3.17 Game and Migratory Wildlife. A significant portion of the study area is used for hunting, including portions of the Suwannee River Mine. The Occidental Wildlife Management Area provides managed waterfowl hunting on approximately 3000 acres. Game species of importance include white-tailed deer, feral hog, wood duck, and numerous migratory puddle and diving ducks.

3.18 Rare and Endangered Species. Four of the seven federally protected vertebrate species that potentially inhabit the project area were observed on site (TBD Section 3.3.7). Of the fauna protected by the state, eleven vertebrate species were observed in the project area (including the four federally listed species) and include the American alligator, Florida gopher tortoise, wood stork, Southern bald eagle, peregrine falcon, Florida sandhill crane, little blue heron, snowy egret, tricolored heron, least tern, and Florida black bear. Of the plant species protected under Section 581.185, Florida Statutes (Preservation of Native Flora of Florida Act, as revised), two species (pink pawpaw and Chapman's rhododendron) listed as endangered potentially occur in the project area, and other species (included in generic categories, such as ferns, orchids, and hollies) listed as threatened may occur on site. Consultation between the Corps and the U.S. Fish and Wildlife Service (FWS), pursuant to Section 7 of the Endangered Species Act of 1973, as amended, was conducted in 1981. The FWS concurred with the Corps "no effect" determination on federally threatened and endangered species.

3.19 Surface Water Quantity. The analysis of surface water hydrology in the project area in the upper Suwannee River basin was conducted through the use of a computerized continuous simulation model, Hydrological Simulation Program - Fortran (HSPF), developed under the direction of the EPA (Johanson et al. 1984). A detailed discussion of the model and the data used in the modeling effort is contained in Section 3.4.1 of the TBD.

3.20 The computer model was calibrated and verified both on small streams within the project area and for the Suwannee River in the area adjacent to the project area (TBD Sections 3.4.1.2 through 3.4.1.5). Results of the calibration and verification procedures indicated the model was sufficiently calibrated for use in modeling the hydrology of the area streams.

3.21 Twenty years of rainfall and evaporation data were used to drive the model to dynamically simulate flows for the Suwannee River between

CR 6 and Suwannee Springs and for the following creeks in the project area: Rocky Creek, Hunter Creek, Roaring Creek, Long Branch, Four Mile Branch, Swift Creek, and Camp Branch. The results showed the average annual flows from the small streams draining the project area ranged from 3.9 to 69 cfs under pre-mining conditions (TBD Section 6.3). Based on a runoff coefficient of 0.75 cfsm, the entire project area accounts for only 7% of the flow in the Suwannee River at Suwannee Springs on an average annual basis (TBD Section 6.3). The results of the modeling effort are compared with the creeks' post-mining predicted flows in Section 6.3 of the TBD.

3.22 Surface Water Quality. The project area was examined using long-term records from the U.S. Geological Survey (USGS) as well as data collected from November 1979 through March 1982 by OXY consultants. Together the two programs provide an extensive background data base which is discussed in detail in Section 3.4.2 of the TBD.

3.23 Water quality was analyzed at nine stations in the Suwannee River. Recent Suwannee River data (1981-1982) were within, or near, previously measured ranges of data collected since 1971. Water quality upstream of White Springs (Station SR-5) was characterized by high color, low pH, hardness, alkalinity, and conductivity, and low concentrations of sulfate, phosphate, and fluoride. Downstream of White Springs, the OXY Swift Creek discharge and groundwater input increased, causing a shift in the levels of many constituents, such as color, pH, hardness, alkalinity, conductivity, and sulfate. Three constituents associated with mining and the fertilizer chemical plants (phosphate, ammonia, and fluoride) were elevated immediately downstream of Swift Creek and subsequently decreased farther downstream.

3.24 Water quality within a small stream affected by the mining operation (Hunter Creek) was compared with water quality in unaffected streams. Of the six unaffected project area tributaries examined (Rocky Creek, Roaring Creek, Deep Creek, Long Branch, Four Mile Branch, and Camp Branch), the water quality characteristics of Camp Branch were somewhat dissimilar to the other five tributaries which enter the river upstream of White Springs. Upstream of White Springs, water quality was similar among the five tributaries and the river. The only stream which receives only mine discharges, Hunter Creek, differed from the five upper Suwannee tributaries in two major ways:

1) The reduced organic/acidic character of the Hunter Creek water was more similar to the lower Suwannee in pH, hardness, alkalinity, conductivity, and sulfate; however, Hunter Creek levels were higher than those in the unaffected tributaries.

2) Phosphate, ammonia, and fluoride concentrations were higher in Hunter Creek due to the mine discharge. However, mean concentrations of these parameters in the Suwannee River at White Springs (SR-5), downstream of Hunter Creek, were similar to levels in the Suwannee River at Benton (SR-2), upstream of Hunter Creek, which indicates no net effect on the Suwannee River due to the OXY mining discharge to Hunter Creek.

3.25 Naturally occurring deviations from State Water Quality Standards exist for alkalinity, dissolved oxygen, coliform bacteria, and mercury, based on background data for the Suwannee River and unaffected tributaries. Most dissolved oxygen values met the 5.0 mg/l standard in the Suwannee River, whereas many measurements in the unaffected tributaries did not. For the tributaries, 16-77% of the dissolved oxygen measurements did not meet the standard.

3.26 In Hunter Creek, deviations from State Water Quality Standards were similar to those of unaffected streams, except fewer alkalinity values failed to meet the 20 mg/l minimum and a few iron and un-ionized ammonia values exceeded the standards. Data from the unaffected tributaries were used to estimate background to assess the levels of conductivity and pH in Hunter Creek relative to the standards. Based on the estimated background levels, the standards were met more than 93% of the time.

3.27 The effects of the small tributary streams under existing conditions on the Suwannee River were evaluated by examining calculated changes in concentrations for selected parameters in the Suwannee River downstream of typical tributaries.

3.28 Rocky and Roaring Creeks. Based on the calculations, discharge from Rocky and Roaring creeks has very slight, if any, effect on the Suwannee River for the parameters measured. For both tributaries, there were no differences between the upstream and downstream river concentrations of total phosphate, fluoride, and sulfate. There is also no difference in the total dissolved solids concentrations above and below Roaring Creek, whereas slight changes in total dissolved solids concentrations occurred in the river at Rocky Creek. For both tributaries, there are only slight changes in total nitrogen and total organic carbon concentrations in the river on some dates and no measurable changes on other dates. Most changes observed downstream from either tributary were slight increases in total nitrogen and total organic carbon.

3.29 Hunter Creek. For the six sampling dates considered, discharge from Hunter Creek did not appreciably affect the concentrations of total nitrogen, total organic carbon, and fluoride in the Suwannee River (TBD Section 3.4.2). The differences between the levels upstream and downstream of the tributary were either zero or were similar to differences observed for the unaffected tributaries (Rocky and Roaring creeks). All changes were increases in downstream concentrations, except for total organic carbon which decreased downstream of Hunter Creek. All changes are insignificant in terms of precision, with the exception of an increase in sulfate on 26 May 1980 from 0 mg/l upstream to 4 mg/l downstream. Although this increase was "measurable," a concentration of 4 mg/l is not expected to have any ecological significance.

3.30 Calculated differences in total phosphate in the river upstream and downstream of Hunter Creek were 0 mg/l for one medium and one high flow collection. Concentrations of phosphate increased downstream of Hunter Creek on the remaining sampling dates, the greatest increase occurring during medium flow. Total phosphate in the Suwannee River downstream of

the confluence with Hunter Creek may at times be higher than background during periods when the flow in the Suwannee River is very low in relationship to the Hunter Creek flow. However, this has not caused a problem in the Suwannee. The absence of excessive growths of aquatic macrophytes and nuisance algal blooms indicates that factors other than phosphate are limiting in the system.

3.31 To evaluate the effect of Hunter Creek on the river under worst-case conditions, water quality data were reviewed for the date with the highest tributary-to-river flow ratio. The difference between the concentration at SR-2 upstream of Hunter Creek and the calculated downstream value was calculated for each parameter. In this extreme case, the Hunter Creek discharge comprised approximately 35% of the river volume immediately downstream. As expected, a greater change in constituents was noted. The increased concentrations immediately downstream of Hunter Creek decreased to background levels at White Springs (SR-5), a distance of 21 river miles, except for total phosphate and fluoride which also decreased but remained elevated compared to background. Based on cumulative frequency curves, it is expected that the river would be this low (approximately 10 cfs) less than 3% of the time.

3.32 Groundwater: Surficial Aquifer. The Surficial Aquifer in the project area has limited, thick, clean, areally-extensive sand deposits. The thicker, sandier zones occur along the east and north-central parts of the project area. Based on drilling data, the Surficial Aquifer is 20-60 ft in thickness, with a typical thickness of 30-40 ft. The elevation of the base is 70-110 ft NGVD, typically 90-110 ft NGVD. The water table is at the top of the Surficial Aquifer and is at or near land surfaces (105-135 ft NGVD) throughout most of the year. Water fluctuation between high and low water table elevations is seldom more than 4 ft. An aquifer test in the Surficial Aquifer yielded a storage coefficient of 0.00075 and transmissivity of approximately 500 sq ft/day. Surficial Aquifer permeability tests performed at 17 wells yielded permeability values of 0.000066-0.0036 cm/sec or 0.22-12.0 ft/day.

3.33 Secondary Artesian Aquifer. The Secondary Artesian Aquifer is not areally-extensive and continuous, and probably consists of a 10-21 ft thick zone. Water levels are lower than in the Surficial Aquifer but higher than in the Floridan Aquifer. Secondary Artesian Aquifer water levels are approximately 60-75 ft NGVD and fluctuate as much or more than Floridan Aquifer water levels. A slug-discharge test yielded a transmissivity value of 3.0 sq ft/day with the hydraulic conductivity calculated to be 0.96 ft/day (0.0003 cm/sec).

3.34 Floridan Aquifer. The Floridan Aquifer is defined as the top of the Suwannee Formation. The elevation at the top of the aquifer ranges from +50 ft NGVD to -50 ft NGVD. The potentiometric surface of the Floridan Aquifer ranges between +40 and +50 ft NGVD, with the regional gradient (flow) trending from east to west across the project area.

3.35 Water levels in two Floridan Aquifer wells (measured Feb.-Apr. 1982) fluctuated approximately 2.8 ft. A slug-discharge test on limestone 140-155 ft below land surface yielded a transmissivity value

of 6.5 sq ft/day. An 18.5 hr pump test on an 800 ft production well yielded a transmissivity value of 190,000 sq ft/day and a coefficient of storage of 0.001.

3.36 Groundwater Quality. The Surficial Aquifer water quality is characterized by relatively high values for sodium, chloride, and potassium, and high nitrate concentrations. Major anions and cations of the Secondary Artesian Aquifer are nearly identical to the calcium-magnesium-bicarbonate Floridan Aquifer water. In addition, the discontinuous Secondary Artesian Aquifer water is characterized by relatively high values for fluoride and orthophosphate. Floridan Aquifer water is characterized by relatively high values for specific conductance, calcium, alkalinity, magnesium, pH, and sulfate.

3.37 Interconnections of Hydrological Systems. Comparisons of the elevation of the top of the Floridan Aquifer to the elevation of the potentiometric surface and general topography of the site indicate that the Floridan Aquifer is, for the most part, under artesian conditions within the project area. Recharge to the Floridan Aquifer from the Surficial Aquifer probably averages 0.1-0.7 in/yr over most of the project area. In the reach of the Suwannee River below White Springs, the recharge rates could approach 4 in/yr at times because of the direct connection between aquifer and stream.

3.38 Air Quality. The potential air pollutant emissions from phosphate rock mining are limited to fugitive particulate matter contributed by clearing, mining, transport of material, and reclamation activities. The air quality monitoring data collected in the vicinity of both the Swift Creek and Suwannee River mines and both chemical complexes show that total suspended particulate matter levels are below standards established by EPA and adopted by FDER (TBD Section 3.5). Quantities of carbon monoxide, nitrogen oxides, volatile organic compounds, and sulfur dioxide, resulting from the exhaust of mobile equipment, are negligible.

3.39 Noise. In the absence of stationary operational plants and mobile, off-road earth-moving equipment, the baseline day/night average noise level was established to be 40 dB. Noise levels for major mobile equipment, including the large draglines which may also be considered as point sources, are 76-85 dBA at 100 ft distance. These impacts are of short duration and localized. Based on noise source data and the noise attenuation rate, the range of existing noise levels more than 1 mi from principal noise sources is 40-55 dB, just slightly greater than baseline levels (TBD Section 3.6).

3.40 Radiation. The data collected for this study show that the levels of radiation exposure experienced as a result of phosphate mining activities are below guidelines established to protect human health and welfare (TBD Section 3.7).

3.41 The external gamma radiation in the OXY project area is approximately 5.2 μR/hr over unaltered dry lands on the site compared to typical Florida background radiation levels of 4.4 to 6.4 μR/hr. Over wetlands and lands with a very high water table the external gamma radiation is lower.

3.42 Uranium and Ra-226 levels in soil samples are highest either just above or in the top of the matrix. The surface soil Ra-226 at the OXY site averages 0.4 pCi/g, whereas the 0-6 ft depth composites average 1.1 pCi/g.

3.43 Gamma logs show highest gamma activity levels at the top of the matrix, with some continued radioactivity through the Hawthorn Formation and with a decrease in activity within the Floridan Aquifer.

3.44 The uranium/thorium ratio in subsurface strata is much greater than the national average, averaging approximately 5 on an activity basis compared with a natural average of approximately 1. The ratio of Ra-226 to Ra-228, daughters of uranium and thorium, respectively, will be the same as the uranium/thorium ratio. As the concentration of Ra-226 in all water samples from the project area was <1 pCi/l, the Ra-228 levels will be 5X lower, or <0.2 pCi/l. The drinking water standard for radium is 5 pCi/l.

3.45 Ra-226 in the matrix is approximately 6.6 pCi/g and <1 pCi/l in OXY surface waters. These values are comparable to other surface waters in unmined areas in Florida. Ra-228 concentrations in surface waters are below normal limits of detection. Low gross alpha levels (<3 pCi/l) indicate that other contributions from alpha emitters (U-238, Th-230, and Po-210) are insignificant.

3.46 Ra-226 concentrations in current recirculating water systems are approximately 7X higher than natural background. For reclaimed lakes, the Ra-226 concentration is approximately 5X higher than natural background. Both of these "impacted" systems are below drinking water standards for Ra-226 and gross alpha.

3.47 Ra-226 concentrations are 0.2-3.0 pCi/l in water table aquifers and approximately 0.3 pCi/l in deep wells. These concentrations are comparable to area data. Low gross alpha data (<9.0 pCi/l) reflect small contributions from other long-lived alpha emitters.

3.48 Media such as fish and turtles have low concentrations of Ra-226, normally ≤0.02 pCi/g with a high of 0.5 pCi/g. Other studies have indicated that the uptake of radioactivity by various elements of the food chain is not an area of concern.

3.49 Historical and Archaeological Resources. A cultural resource assessment of the OXY project area was designed and undertaken to ensure compliance with federal historic preservation mandates. Thirteen new archaeological sites were discovered during the survey of high archaeological site probability areas designated by the Florida Division of Archives, History, and Records Management. Most of the sites are prehistoric habitation sites located on high ground either directly adjacent to the Suwannee River or on upland ridges along tributaries. Based on the findings of the field survey and testing and consultation with the State Historic Preservation Office, none of the sites or cultural resources is considered eligible for listing on the National Register on the basis of archaeological, historical, or architectural significance (TBD Section 3.8).

3.50 Socioeconomics. Socioeconomic impact evaluations normally address the impacts of a new employment source on income growth and resultant impacts on population growth, housing, land use, public services, and ultimately, on the tax structure and social climate of the affected area. In contrast, the alternatives evaluated in this study address the impacts of continuation or curtailment of an existing operation. Alternative A would terminate the OXY operations and associated employment 13-16 years earlier than Alternative B which would allow all phosphate reserves to be recovered and the operation to continue for 21-26 years.

3.51 Although OXY's mining operation is located entirely within Hamilton County, Florida, its economic impacts are felt throughout the state, but more heavily in Hamilton, Columbia, and Suwannee counties, with unique impacts on Duval County. Columbia County has the largest population of the three counties in the immediate impact area, with 35,000 residents in 1980. Suwannee County had 22,287 and Hamilton County had 8761, making it one of Florida's least populated counties (ranking 61st of 67 counties).

3.52 For the three counties, manufacturing represents 27% of the total earnings, government 22%, retail services 24%, with the balance in agriculture, transportation, construction, wholesale, and financial. However, there are major differences in breakdown by county. For example, manufacturing represents 10-16% of earnings in Columbia and Suwannee counties compared to 70% in Hamilton. Government represents 29% of earnings in Columbia County and is the largest single source of income. This is generally reflected in the fiscal structure. More state tax is collected from Hamilton County than from either Columbia or Suwannee counties, yet less is distributed by the state to Hamilton County than to either of the others. The bulk of the tax collections from Hamilton County is directly attributable to the OXY complex.

3.53 Three land use types predominate in Hamilton County: forest and agriculture (77%), mining (3%), and vegetation communities such as upland forests and wetlands (17%) (Barr, Dunlop, and Associates, Inc. 1976).

3.54 Economic Significance of OXY in the Three-County Area and the State of Florida. The company's payroll at full employment of 2150 is approximately $48,200,000 in 1982 dollars (excluding fringe benefits). Approximately 94% of OXY's Florida employees live and spend a substantial part of their income in the three-county area of greatest impact. The distribution of OXY employees by place of residence is: Columbia County, 790; Hamilton, 628; Suwannee, 496; other Florida and Georgia, 236.

3.55 To estimate the impact of OXY's operations in north Florida, input-output multipliers (Burford and Katz 1977, 1981, 1985) were computed based on OXY's payroll and expenditures within Florida and the three-county area (Table 6). There are three levels of economic impact on both the state of Florida and the three-county area. Direct economic impact includes expenditures by OXY for payroll, revenues to Florida

Table 6. Annual Economic Impacts of OXY's North Florida Complex on the State of Florida and the Three-County Impact Area (1982 Dollars).

Type of Impact	Direct	Indirect	Induced	Total
STATE				
Employment[1]	2,150	4,519	3,354	10,023
Revenues to Florida firms[2]	$90,000,000	$23,300,000	$235,200,000	$348,500,000
Income	48,200,000	74,100,000	55,000,000	177,300,000
State taxes	13,500,000	10,300,000	7,700,000	31,500,000
Local taxes	1,900,000	7,500,000	5,500,000[3]	14,900,000
TOTAL[4]	$153,600,000	$115,200,000	$303,400,000	$572,200,000[5]
3-COUNTY AREA				
Employment[1]	2,026	2,480	1,561	6,067
Revenues to local firms[2]	$27,800,000	$13,400,000	$115,600,000	$156,800,000
Income	45,400,000	30,500,000	19,200,000	95,100,000
State taxes	13,500,000	2,900,000	1,800,000	18,200,000
Local taxes	1,900,000	2,600,000	1,700,000[3]	6,200,000
TOTAL[4]	$88,600,000	$49,400,000	$138,300,000	$276,300,000

[1]Labor-years.

[2]These values are residuals which can be interpreted as the total revenues of Florida firms which result from OXY's operations, exclusive of salary and wage payments and state and local taxes. They represent the total of that part of revenues available for purchase of supplies, equipment, and materials, for capital investments, and profits.

[3]In the model applied here, state and local government is included as an integral part of the model.

[4]OXY's own sales are not included in the data shown. OXY's direct purchases from Florida firms and payments of salaries, wages, and taxes are included as direct impacts.

[5]The total impact estimate has a 95% confidence interval of approximately ± $50,000,000.

Source: Data provided by OXY; multipliers computed based on methods cited in Burford and Katz 1977, 1981, 1985.

firms for fuels, power supplies, and equipment, and state and local taxes. Indirect impact results from inter-industry trading by Florida firms in an effort to meet OXY's needs as well as that part of state and local government made possible by OXY's taxes. Induced impact results from the consumer expenditures of OXY's employees and the employees of suppliers in successive rounds until all consumer-serving businesses in the state have been affected to some degree. The total impact on employment, income, and taxes from OXY's operations is therefore several times larger than its direct expenditures. For example, the direct employment of 2150 people at the Hamilton County complex generates an additional 7873 jobs, resulting in a total employment impact on Florida of approximately 10,000 jobs.

3.56 With the multiplier effect, direct taxes of over $15,400,000 result in collection of approximately $46,000,000 in taxes statewide. Direct taxes include a state phosphate severance tax (1982) of $9,500,000 annually at full production. Severance tax is distributed pursuant to statute which prescribes that 50% be designated for the State's Conservation and Recreational Lands trust fund (CARL). CARL funds are used by the state to acquire environmentally sensitive lands. The statute also provides for the return of 5% to Hamilton County.

3.57 In summary, it is estimated that the Hamilton County complex is responsible for approximately $572,200,000 in total economic impact on the Florida economy and $276,300,000 on the three-county area economy. This represents 36% of gross private business, 24% of jobs, and 36% of total salary and wage income in the area.

3.58 Duval County Impacts. Duval County captures a major share of the indirect and induced expenditures, incomes, and employment impacts not contained within the immediate three-county impact area. In addition, a substantial share of the output of the Hamilton County complex is exported through the Port of Jacksonville, with an economic impact of >$23,600,000 on the Jacksonville economy. This represented approximately 3% of the total economic impact associated with the Port of Jacksonville in 1980.

3.59 Public Facilities, Other Services, Transportation. The OXY facilities are largely self-contained with respect to water supply and treatment, fire protection, security, ambulance service, sewage treatment, and health services. OXY produces 16 megawatts of power through a cogeneration facility. Phosphate products are shipped via the Southern Railway Line (Norfolk and Southern), and OXY provides for its internal railroad and road systems. The bulk of all shipments to and from the complex is by rail.

3.60 Recreation. The total land area of publicly-controlled recreational facilities in the local region amounts to 135,700 acres or over 200 sq mi out of 2000 sq mi in the impact area as a whole. The Osceola National Forest in Columbia County accounts for 59% of all recreational land in Hamilton, Columbia, and Suwannee counties. Another 32% is contained in two state wildlife management areas (the Lake Butler Wildlife

Management Area and the Cypress Creek area in Columbia County), and 3000 acres (2%) are contained in the Occidental Wildlife Management Area in Hamilton County.

3.61 Recreational and natural resource activities of the Suwannee River were analyzed using the Corps Recreation and Natural Resource Assessment Criteria (ACOE 1978) (TBD Section 3.10). General recreation of the Suwannee River was evaluated to be moderate utilizing the criteria, primarily due to access, unstable water levels, and shoals. Specific features evaluated included: non-powered boating on flowing water, limited power boating, primitive camping, flora and unique natural feature observation and study, boat fishing, and general hiking.

3.62 Relationship of Proposed Action to Land Use Plans. OXY's mining and reclamation activities are controlled under rules and regulations of local, regional, state, and federal agencies. State regulations require restoration of mined lands to productive ecosystems and land uses similar to those which existed prior to mining (Ch. 16C-16, FAC). Because the project area is rural in nature, it is not within the zoning control of any municipality. However, the mining operations are controlled by the Hamilton County Mining Ordinance (No. 48-81).

4.00 ENVIRONMENTAL CONSEQUENCES

Impacts on the Environment

4.01 Physiographic Characteristics. Regardless of the alternative selected, topography, soils, and land forms in the OXY project area will be affected as a result of overburden and matrix extraction and creation of land and lakes, elevated fill, and tailings fill areas. The difference among alternatives is the areal extent of proposed disturbance, with Alternative A requiring disturbance of the least acreage and Alternative B the most acreage (Table 3). Reclamation activities for all alternatives will create a slightly rolling topography with lakes and wetlands interspersed among uplands.

4.02 The redeposited soil material will be more heterogeneous, less stratified, and less dense than the original soils as a result of mining and reclamation. Compared to natural soils in the project area, reclaimed soils are similar in micronutrients but contain more extractable phosphorus, calcium, and magnesium. This will reduce the need for liming and phosphate fertilizer as compared to the natural soils. Clays in reclaimed material compensate for the decrease in water-holding capacity due to reduced organic matter.

4.03 Regardless of the alternative implemented, drainage basin sizes will change while mining activities are in progress for all alternatives, as lands are incorporated into the mine water management system. Affected streams may be reduced to little or no base flow. Changing flow regimes may result in changes in bed load movement; however, these impacts are temporary as drainage areas will be reclaimed to approximately original size per requirements of Ch. 16C-16, FAC, regardless of the alternative permitted. The difference between alternatives is related only to the total number of acres affected and the duration of mining and reclamation activities (paragraph 2.12ff).

4.04 Upland Communities. Upland communities in the project area will be affected by site preparation, excavation of overburden and matrix, and construction of auxiliary facilities. Mining is conducted in sequence, with only a portion of the mine site disturbed at any one time. Clearing, normally 0.5-1 year prior to mining, will eliminate vegetation from the mine blocks. After excavation of the overburden and matrix, interim vegetation associations will arise as a result of invasion by early successional species, generally within the first year after mining. Reclamation will occur as soon as is practically possible after mining to restore productive vegetation communities through planting and seeding of native plant species. No upland community type will be totally eliminated from the project area by any of the proposed mining alternatives (Table 3). The communities not disturbed by mining or mine support activities will serve as seed sources for revegetation of adjacent mined and reclaimed areas.

4.05 Sequential clearing of mining blocks will allow migration of larger fauna away from active mining areas. However, adjacent habitats may be at carrying capacity; therefore, migration of larger fauna into these adjacent areas could result in more predation, disease, and a decrease in reproduction which would result in population loss. Interim habitats created by excavation and extraction support a number of species, including rare and endangered species. At reclamation, these interim habitats will be physically altered to construct the appropriate reclamation types and for subsequent planting/seeding of vegetation species. The time interval from mining through completion of reclamation varies with the area involved and the type of reclamation. OXY estimates 4.0, 7.3, and 18.4 years, respectively, for land and lakes, tailings fill, and elevated fill reclamation.

4.06 There will be a net loss of upland flora and fauna due to the net loss of upland acreage resulting from creation of lakes and associated wetlands from voids created during mining. This loss of uplands will be realized under all four alternatives, but will be greatest under Alternative B and least under Alternative A.

4.07 The amount of upland community mined and acreage converted to lakes and wetland systems for the four mining alternatives are:

Mining Alternative	Upland Acreage Mined	% of Project Area	Upland Acreage Converted to Lakes	% of Project Area
A	9,800	9.8	3,900	3.9
B	21,000	21.0	7,500	7.5
C	16,000	16.0	5,700	5.7
D	19,000	19.0	6,600	6.6

4.08 Wetland Communities: Probable Impacts of Mining and Reclamation Activities. Wetland communities in the project area will be affected to some extent by mining activities regardless of the alternative selected. Under Alternative A, no wetlands will be mined or utilized for mine support. However, wetlands will be indirectly affected by lowering of local water tables and disruption of local faunal corridors between wetlands. Marketable timber will be harvested regardless of the alternative selected. Under Alternatives B, C, and D, wetlands will be directly disturbed by mining or use for mine support facilities, though no wetland community type will be completely eliminated from the project area (Table 3). Impacts on wetlands flora and fauna for Alternatives B, C, and D will be similar to those discussed for upland communities, with any differences between the proposed alternatives related to the amount of acreage disturbed. Interim wetland habitats created by mining and waste disposal activities will support a number of wetland and aquatic species (TBD Sections 3.3.2.5, 6.2.2.1.1, and 6.2.2.1.3). Interim habitats will be interrupted as reclamation proceeds. The progressive nature of the reclamation may allow some transfer of fauna from the interim habitats into reclaimed habitats. However, some organisms will be eliminated during the reclamation process.

4.09 Under the mining alternative that maximizes reserve recovery (Alternative B), 37% (9264 acres) of the project area wetlands are proposed for disturbance, including portions of the two largest wetlands, Swift Creek Swamp and Bee Haven Bay. Alternatives C and D propose disturbance of 2452 acres (10%) and 8601 acres (35%), respectively, of the project area wetlands. Alternative D also includes disturbance of portions of Swift Creek Swamp and Bee Haven Bay. Disturbed wetlands will be reclaimed on an acre-for-acre basis, with Bee Haven Bay and Swift Creek Swamp being reclaimed also by cover type, e.g., forested wetland acres for forested wetland acres and emergent wetland acres for emergent wetland acres. The undisturbed wetlands will serve as seed and colonizer sources for mined and reclaimed systems. Once restoration is completed, there will be no net loss of wetland acreage in the project area under any of the proposed mining alternatives.

4.10 Reclamation will increase the diversity of wetland types in the overall project area and may increase their ecological and/or functional value. For example: 1) some reclaimed wetlands will be hydrologically connected to other wetlands and surface water systems, providing a better opportunity for detrital transport and dispersal of floral and faunal resources to downstream systems; 2) habitat created in reclaimed wetland systems will support, within a short period, species indigenous to naturally occurring wetlands (Gilbert et al. 1981); 3) specifically designated wildlife areas (approximately 4700 acres) will be created as recommended by the Florida Game and Fresh Water Fish Commission (FGFWFC) (TBD Section 3.3.10); and 4) creation of wetlands along reclaimed lakes will increase littoral zone areas, a limited habitat type in the geographical area, for fish and wildlife habitat.

4.11 Probable Impacts on Wetlands Functions. Functions attributed to wetlands under statutory and administrative authorities, such as Section 404 of the Clean Water Act (PL 92-500, as amended) and the President's May 24, 1977 Executive Order on wetlands protection, include:

- biological functions
- aquatic study areas, sanctuaries, and refuges
- hydrologic support
- shoreline protection
- storm and flood water storage
- groundwater recharge
- water quality enhancement

4.12 Biological functions of wetlands will be affected under Alternatives B, C, and D but not eliminated from the project area, as 63% of the wetlands will not be disturbed under Alternative B, which maximizes reserve recovery. Approximately 90% and 65% of the wetlands will not be disturbed under Alternatives C and D, respectively. No wetlands will be mined or utilized for mine support activities under Alternative A. The value of natural biological functions will be lower in the project area after mining and reclamation, until reclaimed wetland systems mature.

4.13 No wetlands proposed for disturbance are administratively controlled as aquatic study areas, sanctuaries, or refuges, although the FGFWFC administers duck hunting on interim and reclaimed habitats. This

function may be realized at the conclusion of reclamation under Alternative B, as specifically designated wildlife areas will be created, as recommended by the FGFWFC. The hydrologic support function of disturbed wetlands will be eliminated, but acre-for-acre replacement of wetlands and OXY's conceptual reclamation plans (TBD Section 3.3.10) should improve hydrologic support functions by increasing the extent of contiguous and connected wetlands as compared to existing conditions.

4.14 The shoreline protection function is not presently being served to any significant degree in the project area. Littoral zones or zones of fluctuation created in association with land and lakes systems will provide this function to some degree in waterbodies where the prevailing wind fetch is sufficient to generate wave action.

4.15 Storm and flood water storage will be eliminated in disturbed wetland units but, through prudent water management techniques currently practiced by OXY, will be maintained within the overall drainage basins until reclamation has been completed. Storage of water in mine cuts and the recirculation system will offset any temporary loss of storage while the wetlands are disturbed and being reclaimed. Acre-for-acre replacement of wetland acreage and subsequent revegetation, along with creation of lake systems, will result in greater storage capability for storm and flood waters in the project area after reclamation.

4.16 There are presently no significant recharge areas on the project site, although some wetlands may provide a minor localized recharge function to the Surficial Aquifer when the groundwater table is below the level in the wetlands. This function will be lost in disturbed wetlands.

4.17 Reclamation activities will restore water tables in most areas, with the possible exception of elevated fill areas where the Surficial Aquifer will be a relatively tight, non-productive unit (TBD Section 6.5).

4.18 The water quality enhancement function will be lost in disturbed wetlands. This loss should not be significant to the project area because 1) a minimum of 63% of the wetlands will be preserved under Alternative B, which maximizes reserve recovery; 2) disturbed wetlands will be replaced on an acre-for-acre basis; 3) wetland acreage disturbed at any one time will be minimal compared to total wetland acreage; 4) reclamation will occur as soon as practically possible; and 5) the filtration function of reclaimed wetlands should be similar to or possibly better than that of existing systems due to increased wetland contiguity. Even more wetland area will be left in its natural state under Alternatives C and D (90% and 65%, respectively). All waters leaving the project area should meet applicable Class III water quality standards.

4.19 No significant historical or archaeological landmarks are within the wetland areas scheduled for disturbance under Alternatives B, C, or D. None of the wetlands in the project area has a significant sport fishery value, with the exception of reclaimed systems (lakes). Wetlands scheduled for mining and/or mine support activities will be logged for marketable timber prior to disturbance. Logging may be conducted in

wetlands not proposed for disturbance under any of the four mining alternatives. The aesthetic values of larger wetlands partially mined (e.g., Bee Haven Bay if Alternative B or D is selected) will be disrupted until reclamation is complete. Overall, aesthetic values of the project area may be enhanced at post-reclamation, as the slightly rolling topography interspersed with forested uplands, forested and non-forested wetlands, and lakes will provide a greater diversity of habitat types than that which presently exists.

4.20 Special values (e.g., habitat for rare and endangered species) will be reduced for those wetlands scheduled for mining. Interim wetland habitats and reclaimed wetlands will provide habitat for several rare and endangered species (TBD Section 6.2.2).

4.21 Cumulative Impacts of Wetlands Mining. The cumulative impacts of wetlands mining were evaluated by pre-mining drainage areas. No wetlands are proposed for mining or mine support activities under Alternative A. Under the mining alternative that maximizes reserve extraction (Alternative B), approximately 9264 acres (37%) of wetlands identified in the project area are proposed for mining or mine support activities. The percentage of wetland acreage to be affected within each pre-mining drainage area within the project boundary ranges from 0% (Cypress Creek) to 73% (Swift Creek), with average disturbance being 36% (Table 7, Figure 28). Alternative C proposes disturbance to 2452 acres (10%) of the project area wetlands. Disturbance of wetland acres within pre-mining drainage basins ranges from 0 to 44% (Table 8). Approximately 8601 acres of wetlands will be disturbed under Alternative D, with drainage basin wetland disturbance ranging from 0 to 69% (Table 9). Wetlands will not be totally eliminated from any drainage basin within the project boundary under any of the proposed mining alternatives. However, under Alternatives B and D, all wetland units within the project area will be disturbed or partially disturbed in Perimeter Area 5 (Figure 28).

4.22 Of the 1762 individual wetland units identified in the OXY project area, portions of 728 are proposed for mining or mine support activities under Alternative B (Table 10). Under Alternatives C and D, portions of 583 and 688 individual wetland units are proposed for mining or mine support activities.

4.23 With the exception of the >75-100 acre size class, under Alternative B no size class will be completely affected by mining or mine support activities. Primary cumulative impacts associated with mining wetlands may include:

- shifts in populations of wetlands flora and fauna;
- changes in flood storage and storm detention/retention capacity;
- changes in contribution of detrital material to downstream systems (such as major tributaries and the Suwannee River);
- changes in water quality enhancement function; and
- changes in recharge to groundwater.

4.24 Populations of wetlands flora and fauna will be reduced under those alternatives that propose wetland disturbance. Populations will not be

Table 7. Total Wetland Acreage and Number of Individual Wetland Units Within Each Pre-Mining Drainage Area on the OXY Project Site (as of c. 1981) to be Disturbed Under Mining Alternative B.[1]

Drainage Area[2]	Approx. Drainage Area Acreage	Total Wetland Acreage	% of Drainage Area	No. of Wetland Units	% of Total	Wetland Acreage Disturbed	%	No. of Wetland Units Disturbed (total and partial)	%
Camp Branch	4,603	1,096	24	160	9	772	70	122	76
Cypress Creek	143	9	6	8	<1	0	0	0	0
Four Mile Branch	1,887	387	21	53	3	252	65	33	62
Hunter Creek	14,973	2,736	18	242	14	295	11	56	23
Long Branch	2,374	223	9	68	4	113	51	40	59
Ratliff Creek	461	278	60	2	<1	69	25	1	50
Rocky Creek	18,690	9,462	51	333	19	1,731	18	51	15
Roaring Creek	13,539	2,689	20	240	14	1,834	68	155	65
Swift Creek	25,102	4,211	17	256	15	3,088	73	132	52
Sugar Creek	2,144	494	23	54	3	103	21	9	17
Perimeter Area 1	5,039	1,308	26	156	9	401	31	68	44
Perimeter Area 2	859	56	7	12	<1	32	57	3	25
Perimeter Area 3	1,725	172	10	40	2	52	30	6	15
Perimeter Area 4	3,505	708	20	49	3	214	30	18	37
Perimeter Area 5	423	121	29	4	<1	23	19	4	100
Perimeter Area 6	1,695	327	19	34	2	174	53	20	59
Perimeter Area 7	2,362	406	17	36	2	111	27	10	28
Perimeter Area 8	680	52	8	15	<1	0	0	0	0
TOTAL	100,204	24,735	25	1,762	100	9,264	37	728	41

[1]Does not include wetlands within each individual drainage area that are outside of project boundary.
[2]See Figure 28.

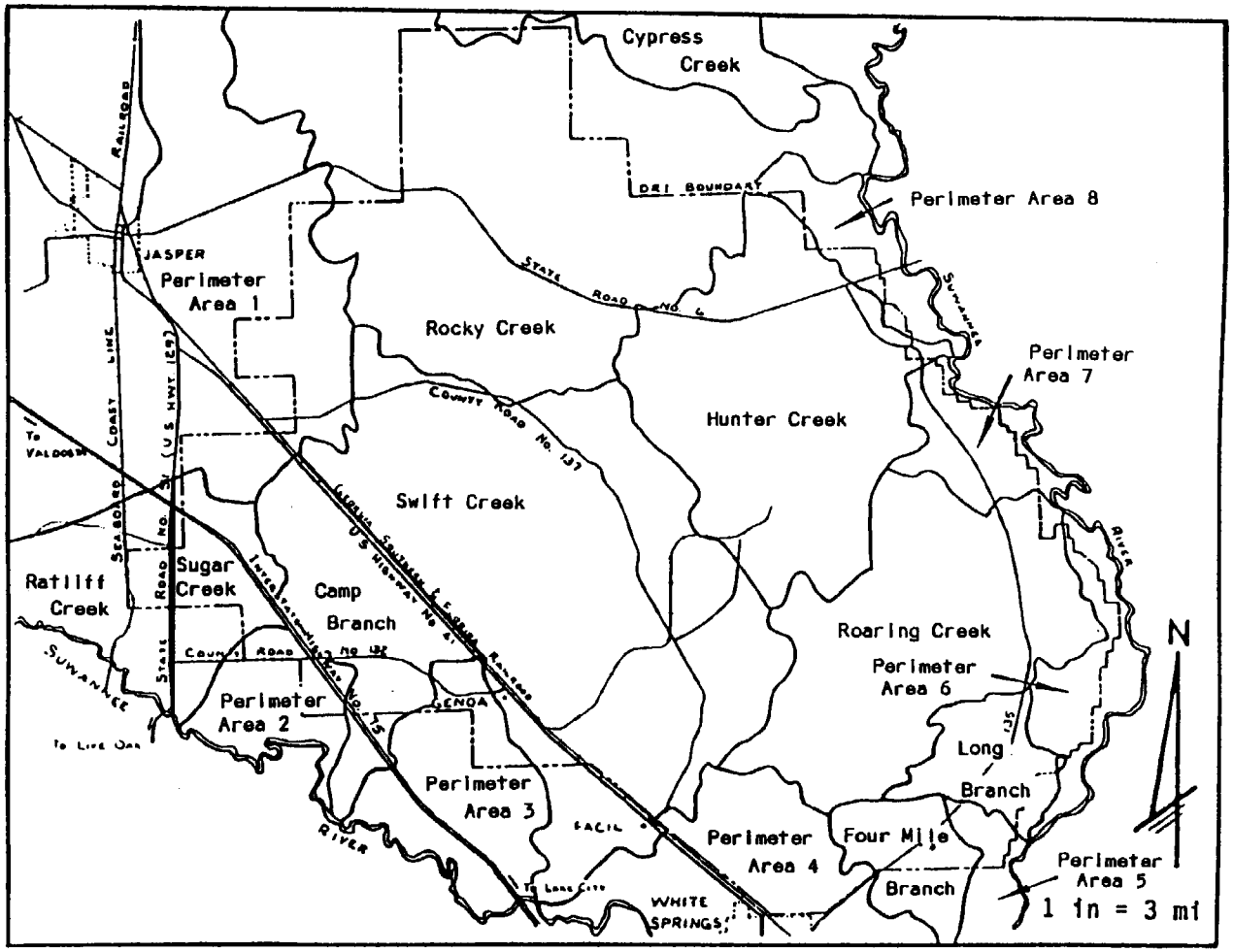


Figure 28. Pre-Mining Drainage Patterns.

Table 8. Total Wetland Acreage and Number of Individual Wetland Units Within Each Pre-Mining Drainage Area on the OXY Project Site (as of c. 1981) to be Disturbed Under Mining Alternative C.[1]

Drainage Area[2]	Approx. Drainage Area Acreage	Total Wetland Acreage	% of Drainage Area	No. of Wetland Units	% of Total	Wetland Acreage Disturbed	%	No. of Wetland Units Disturbed (total and partial)	%
Camp Branch	4,603	1,096	24	160	9	346	32	108	68
Cypress Creek	143	9	6	8	<1	0	0	0	0
Four Mile Branch	1,887	387	21	53	3	97	25	29	55
Hunter Creek	14,973	2,736	18	242	14	221	8	48	20
Long Branch	2,374	223	9	68	4	98	44	35	51
Ratliff Creek	461	278	60	2	<1	0	0	0	0
Rocky Creek	18,690	9,462	51	333	19	76	<1	14	4
Roaring Creek	13,539	2,689	20	240	14	668	25	131	55
Swift Creek	25,102	4,211	17	256	15	424	10	101	39
Sugar Creek	2,144	494	23	54	3	94	19	8	15
Perimeter Area 1	5,039	1,308	26	156	9	200	15	67	43
Perimeter Area 2	859	56	7	12	<1	13	23	2	17
Perimeter Area 3	1,725	172	10	40	2	13	8	3	8
Perimeter Area 4	3,505	708	20	49	3	36	5	12	24
Perimeter Area 5	423	121	29	4	<1	16	13	2	50
Perimeter Area 6	1,695	327	19	34	2	123	38	20	59
Perimeter Area 7	2,362	406	17	36	2	27	7	3	8
Perimeter Area 8	680	52	8	15	<1	0	0	0	0
TOTAL	100,204	24,735	25	1,762	100	2,452	10	583	33

[1]Does not include wetlands within each individual drainage area that are outside of project boundary.
[2]See Figure 28.

Table 9. Total Wetland Acreage and Number of Individual Wetland Units Within Each Pre-Mining Drainage Area on the OXY Project Site (as of c. 1981) to be Disturbed Under Mining Alternative D.[1]

Drainage Area[2]	Approx. Drainage Area Acreage	Total Wetland Acreage	% of Drainage Area	No. of Wetland Units	% of Total	Wetland Acreage Disturbed	%	No. of Wetland Units Disturbed (total and partial)	%
Camp Branch	4,603	1,096	24	160	9	733	67	118	74
Cypress Creek	143	9	6	8	<1	0	0	0	0
Four Mile Branch	1,887	387	21	53	3	217	56	32	60
Hunter Creek	14,973	2,736	18	242	14	273	10	53	22
Long Branch	2,374	223	9	68	4	97	43	31	46
Ratliff Creek	461	278	60	2	<1	69	25	1	50
Rocky Creek	18,690	9,462	51	333	19	1,731	18	51	15
Roaring Creek	13,539	2,689	20	240	14	1,451	54	148	62
Swift Creek	25,102	4,211	17	256	15	2,920	69	116	45
Sugar Creek	2,144	494	23	54	3	103	21	9	17
Perimeter Area 1	5,039	1,308	26	156	9	401	31	68	44
Perimeter Area 2	859	56	7	12	<1	32	57	3	25
Perimeter Area 3	1,725	172	10	40	2	52	30	6	15
Perimeter Area 4	3,505	708	20	49	3	214	30	18	37
Perimeter Area 5	423	121	29	4	<1	23	19	4	100
Perimeter Area 6	1,695	327	19	34	2	174	53	20	59
Perimeter Area 7	2,362	406	17	36	2	111	27	10	28
Perimeter Area 8	680	52	8	15	<1	0	0	0	0
TOTAL	100,204	24,735	25	1,762	100	8,601	35	688	39

[1]Does not include wetlands within each individual drainage area that are outside of project boundary.
[2]See Figure 28.

Table 10. Number of Wetland Units, by Size Class Interval, Proposed for Disturbance Under Each of the Four Mining Alternatives.

Size Class Interval	No. of Individual Wetland Units	Alternative A		Alternative B		Alternative C		Alternative D	
		No. Wetland Units Affected	%	No. Wetland Units Affected	%	No. Wetland Units Affected	%	No. Wetland Units Affected	%
<5	1277	0	0	456	36	445	35	445	35
>5-10	198	0	0	121	61	80	40	108	55
>10-25	153	0	0	73	48	58	38	63	41
>25-50	74	0	0	39	53	0	0	36	49
>50-75	22	0	0	12	55	0	0	16	73
>75-100	8	0	0	8	100	0	0	3	38
>100	30	0	0	19	63	0	0	17	57
Total	1762	0	0	728	41	583	33	688	39

eliminated from the project area under any of the proposed mining alternatives, as the majority of wetland acreage and individual wetland units will not be affected even under the mining alternative that maximizes reserve extraction (Alternative B). Even though reclamation will provide for acre-for-acre replacement of affected wetlands, populations may be reduced after reclamation until systems mature. Population levels may shift (increases for some species and decreases for others), with an overall increase in species diversity due to creation of new wetland systems presently limited or not occurring in the project area.

4.25 The flood and storm storage/retention capacity of affected wetlands will be altered in the project area. This will impact flow regimes in major tributaries in the project area during mining. Flow regimes will be altered under all four mining alternatives, as water is diverted from its natural drainage area to the mine water management system until post-reclamation. Post-reclamation flows will approximate pre-mining flows as required by Ch. 16C-16, FAC (TBD Section 6.3).

4.26 During mining, flow of detrital material from affected wetlands to downstream areas will be reduced, particularly in portions of tributaries that are hydrologically linked to wetland systems. Based on drift data (TBD Sections 3.3.4.2 and 3.4.2.3), the majority of detrital material generally is utilized within the immediate area, with a small percentage transported downstream. Additionally, on a regional basis, the tributaries in the project area generally do not contribute significantly to the Suwannee River (TBD Sections 3.3.4.2 and 3.4.2.3). At post-reclamation, reclaimed wetlands will be more strongly hydrologically connected to the existing wetlands.

4.27 Wetlands in the project area may provide a water quality enhancement function by nutrient uptake and filtering of overland runoff. This function will be eliminated in wetlands mined or used for mine support activities. The areas mined will be inside the mine water management system until post-reclamation. During mining, the runoff normally first received by wetlands will be collected in ditches and either used in the mining process or discharged through a permitted discharge into an onsite tributary. Discharge water will meet water quality permit criteria.

4.28 The project area wetlands do not provide a significant groundwater recharge function. Although they probably serve a localized recharge and discharge function, on a regional scale the elimination of this function in affected wetlands will not be significant. Reclaimed lands will be able to provide this function in the project area similar to existing conditions.

4.29 Wetlands Disturbance and Reclamation Schedule. Under Alternative A, no direct elimination of wetlands is proposed (Table 11). However, approximately 2071 acres of wetlands will be reclaimed to account for wetlands mined between July 1975 and January 1982. Alternative B, which maximizes reserve recovery, proposes disturbance of 9264 acres of wetlands, with reclamation restoring 11,335 acres. Alternatives C and D propose disturbance of 2452 acres and 8601 acres, respectively, with reclamation restoring 4523 acres of wetlands for Alternative C and 10,672 acres for Alternative D.

Table 11. Schedule of Wetland Acres[1] to be Disturbed and Reclaimed for the Proposed Mining Alternatives.

Cover Type	Alternative A						
	Yr 5	Yr 10	Yr 15	Yr 20	Yr 25	Yr 30	Total
DISTURBED							
Cypress (6110)	0	0	0	0	0	0	0
Swamp tupelo (6211)	0	0	0	0	0	0	0
Bayhead (6212)	0	0	0	0	0	0	0
Scrub/shrub (6213)	0	0	0	0	0	0	0
Cypress/swamp tupelo/bay (6311)	0	0	0	0	0	0	0
Swamp tupelo/bay/pine (6312)	0	0	0	0	0	0	0
Emergent (6410)	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Cumulative summary	0	0	0	0	0	0	0
RECLAIMED							
Land and lakes[2]	436	643	253	0	0	0	1332
Elevated fill[3]	26	131	582	0	0	0	739
Tailings fill[3]	0	0	0	0	0	0	0
Total	462	774	835	0	0	0	2071
Cumulative summary[4]	462	1236	2071	2071	2071	2071	2071

Table 11 (Continued).

Cover Type	Alternative B						
	Yr 5	Yr 10	Yr 15	Yr 20	Yr 25	Yr 30	Total
DISTURBED							
Cypress (6110)	17	77	53	125	220	0	492
Swamp tupelo (6211)	27	42	98	4	79	1	251
Bayhead (6212)	0	244	74	1	57	0	376
Scrub/shrub (6213)	0	50	64	117	0	0	231
Cypress/swamp tupelo/bay (6311)	675	1,065	1,372	949	429	21	4,511
Swamp tupelo/bay/pine (6312)	1,040	1,432	619	182	19	0	3,292
Emergent (6410)	10	34	44	14	9	0	111
Total	1,769	2,944	2,324	1,392	813	22	9,264
Cumulative summary	1,769	4,713	7,037	8,429	9,242	9,264	9,264
RECLAIMED							
Land and lakes[2]	240	395	497	427	620	255	2,434
Elevated fill[3]	119	331	1,122	1,029	2,812	1,174	6,587
Tailings fill[3]	0	343	820	705	213	233	2,314
Total	359	1,069	2,439	2,161	3,645	1,662	11,335
Cumulative summary[4]	359	1,428	3,867	6,028	9,673	11,335	11,335

Table 11 (Continued).

Cover Type	Alternative C						
	Yr 5	Yr 10	Yr 15	Yr 20	Yr 25	Yr 30	Total
DISTURBED							
Cypress (6110)	0	1	1	181	0	0	183
Swamp tupelo (6211)	0	39	6	19	0	0	64
Bayhead (6212)	0	0	0	0	0	0	0
Scrub/shrub (6213)	0	2	10	0	0	0	12
Cypress/swamp tupelo/bay (6311)	634	473	527	196	0	0	1,830
Swamp tupelo/bay/pine (6312)	193	73	72	0	0	0	338
Emergent (6410)	1	10	14	0	0	0	25
Total	828	598	630	396	0	0	2,452
Cumulative summary	828	1,426	2,056	2,452	2,452	2,452	2,452
RECLAIMED							
Land and lakes[2]	280	408	671	457	82	0	1,898
Elevated fill[3]	70	230	732	1,224	369	0	2,625
Tailings fill[3]	0	0	0	0	0	0	0
Total	350	638	1,403	1,681	451	0	4,523
Cumulative summary[4]	350	988	2,391	4,072	4,523	4,523	4,523

Table 11 (Continued).

Cover Type	Alternative D						
	Yr 5	Yr 10	Yr 15	Yr 20	Yr 25	Yr 30	Total
DISTURBED							
Cypress (6110)	0	69	181	52	219	0	521
Swamp tupelo (6211)	0	29	146	144	0	0	319
Bayhead (6212)	24	25	245	138	2	0	434
Scrub/shrub (6213)	16	8	109	156	24	0	313
Cypress/swamp tupelo/bay (6311)	663	1080	1,175	837	477	0	4,232
Swamp tupelo/bay/pine (6312)	933	772	225	551	140	0	2,621
Emergent (6410)	8	5	19	121	8	0	161
Total	1,644	1,988	2,100	1,999	870	0	8,601
Cumulative summary	1,644	3,632	5,732	7,731	8,601	8,601	8,601
RECLAIMED							
Land and lakes[2]	252	323	472	500	382	226	2,155
Elevated fill[3]	118	353	1,327	547	3,102	850	6,297
Tailings fill[3]	0	416	629	818	318	39	2,220
Total	370	1,092	2,428	1,865	3,802	1,115	10,672
Cumulative summary[4]	370	1,462	3,890	5,755	9,557	10,672	10,672

[1]Includes both mandatory and nonmandatory reclamation lands and assumes that nonmandatory lands will be reclaimed under Chapter 378, FS, and Chapter 16C-17, FAC.
[2]Wetlands portion (zone of fluctuation) of land and lakes reclamation type; includes approximately 117 acres of wetlands created in previous land and lakes reclamation.
[3]Wetlands portion of reclamation type.
[4]Includes acre-for-acre replacement of wetlands mined since 1975 and prior to January 1982.

4.30 As of June 1983, OXY completed over 1200 acres of mandatory reclamation. However, no reclamation has been completed under the existing reclamation regulations (Ch. 16C-16, FAC). OXY's Conceptual Reclamation Plan, which must be approved prior to consideration of annual reclamation plans, was approved by the Florida Department of Natural Resources on 20 March 1984. The approval was challenged by a third party, and the challenge is pending.

4.31 Previous rules did not require any wetlands reclamation. However, OXY has reclaimed some wetland areas (approximately 100 acres) in conjunction with the reclaimed lakes. These areas are still relatively young but appear to have good survival and growth (TBD Section 3.3.10.6).

4.32 Aquatic Communities. Mining will temporarily disrupt the floral and faunal components of aquatic communities in mine areas, including canals, mine pits, reservoirs, and ponds. Under Alternative B portions of several tributary streams are also proposed for mining (Table 12). The tributary streams will be reclaimed, and a net increase in aquatic habitat over that presently in the project area will result for all the proposed mining alternatives.

4.33 Impacts of mining on the Suwannee River are not considered significant. Contributions of detritus to the Suwannee River should not be altered significantly, as contributions of tributary streams in the project area are relatively insignificant on a regional scale. Additionally, major floodplain (100-yr) areas of the Suwannee River and tributaries for at least 0.5 mi upstream of each tributary's confluence with the Suwannee River will not be disturbed.

4.34 OXY water discharge to the Suwannee River will not change under any of the proposed mining alternatives. Studies of macroinvertebrate and fish communities indicate no adverse effects on these biological components for the present OXY discharge, and no adverse effects on these components from future OXY discharges are anticipated (TBD Section 6.2.3.1).

4.35 Forestry and Agricultural Resources. No prime or unique farmland will be affected by any of the proposed mining alternatives. Although agricultural and silvicultural lands will be disturbed, none will be completely eliminated. These land use types will be restored by reclamation activities; thus, impacts will be confined to temporary, short-term unavailability of lands for agricultural and silvicultural use for all four proposed mining alternatives.

4.36 Game and Migratory Wildlife. No lands currently within the Cypress Creek Wildlife Management Area are proposed for mining under any of the proposed alternatives. Reclamation will provide a net increase in aquatic habitats under all proposed mining alternatives which will benefit migratory waterfowl. Creation of these aquatic systems has resulted in a net increase in the number of bird species (30% of the expected total) occurring in the project area (TBD Section 6.2.5).

4.37 Rare and Endangered Species. Impacts on rare and endangered species occurring or potentially occurring in the project area are, for the

Table 12. Number of Linear Feet of Stream Channel Disturbed by the Mining Process Under Alternative B.[1]

Stream	Total Length	Undisturbed		Disturbed	
		ft	%	ft	%
Camp Branch	29,900	27,600	92.3	2,300	7.7
Cypress Creek	14,200	14,200	100.0	0	0
Four Mile Branch	18,300	14,610	79.8	3,690	20.2
Hogans Branch	9,215	6,015	65.3	3,200	34.7
Hunter Creek	16,872	16,872	100.0	0	0
Jerry Branch	14,000	14,000	100.0	0	0
Long Branch	19,450	15,150	77.9	4,300	22.1
Poucher Branch	18,800	18,800	100.0	0	0
Ratliff Creek	13,400	13,400	100.0	0	0
Roaring Creek	32,450	14,550	44.8	17,900	55.2
Rocky Creek	35,900	35,900	100.0	0	0
Sal Marie Branch	28,000	28,000	100.0	0	0
Sugar Creek	3,200	3,200	100.0	0	0
Swift Creek[2]	37,370	37,040	99.1	330	0.9
Unnamed Branch 1	7,400	7,400	100.0	0	0
Unnamed Branch 2	13,400	13,400	100.0	0	0
Unnamed Branch 3	11,000	11,000	100.0	0	0
Unnamed Branch 4	3,000	3,000	100.0	0	0
Unnamed Branch 5	3,000	3,000	100.0	0	0
Unnamed Branch 6	8,800	8,800	100.0	0	0
Unnamed Branch 7	3,800	3,800	100.0	0	0
TOTAL	341,457	309,737	90.7	31,720	9.3

[1]These measurements include the entire length of some streams that may be only partially within the project boundary. Not included in these measurements are drainage ditches, side channels, and streams that do not flow directly into the Suwannee River, i.e., they may discharge into swamps.

[2]Does not include Swift Creek Canal which will also be mined and reclaimed.

most part, minimal under all proposed mining alternatives and in many cases may be beneficial. For example, mining and reclamation activities will create open water areas used by the American alligator, wood stork, little blue heron, snowy egret, and tricolored heron. Creation of sand tailings habitat as part of the mining process will also benefit the least tern until these areas are restored. The Florida black bear, as well as other terrestrial species, may experience habitat loss. Populations of legally protected flora on site may be reduced. The U.S. Fish and Wildlife Service has also concurred that proposed mining will not significantly affect threatened and endangered species on the site (consultation by the U.S. Army Corps of Engineers pursuant to Section 7 of the Endangered Species Act of 1973, as amended, TBD Section 3.3.7).

4.38 Surface Water Quantity. Surface water quantity impacts were addressed using the HSPF model (TBD Section 3.4.1). Based on sensitivity analysis (TBD Section 3.4.1), the model parameters most sensitive to changes in the system due to mining were adjusted to reflect the changed conditions after reclamation. The model was then run with 20 years of input data to simulate post-reclamation hydrological conditions. Results of the post-reclamation computer analyses indicated little change in average annual runoff from the modeled streams under all four mining alternatives (Table 13).

4.39 The duration analyses for the small streams showed good agreement between the distribution of flows from areas prior to mining and the same areas after reclamation (Figures 6.3-13 through 6.3-19 of the TBD). The major impact of mining and reclamation on surface water hydrology will be to reduce the peak flows and the duration and number of low flow periods.

4.40 Surface Water Quality. OXY's mining operations have the potential to affect water quality in the following ways under all four mining alternatives:

1) discharge of mine process wastewater
2) discharge of disturbed area runoff
3) diversion of surface flows from streams
4) matrix line ruptures
5) failure of waste clay settling area dikes
6) discharge from reclaimed lakes

4.41 Discharge of Mine Process Water. The discharge of mine process water has occurred almost continuously for approximately 16 years of mining upland, wetland, and aquatic habitats, and no significant environmental problems have been identified. Discharges currently flow to Swift and Hunter creeks. Regardless of the alternative chosen, the discharges will continue to Hunter and Swift creeks and new discharges will be needed as the mine area expands. Water quality within Swift and Hunter creeks should not significantly change due to additional mining under any of the proposed mining alternatives.

4.42 It is impossible to predict which new creeks would receive mining discharges in the future, as a result of NPDES permitting procedures,

Table 13. Flow Statistics for Small Drainage Areas.

Drainage Area	Pre-Mining Conditions				Post-Mining Conditions*			
	Acres	Q mean (cfs)	Q max (cfs)	s (cfs)	Acres	Q mean (cfs)	Q max (cfs)	s (cfs)
Rocky Creek	51,806	68.8	3,285	131.9	51,645	68.4	2,169	108.8
Hunter Creek	15,280	20.3	968.9	38.9	14,435	19.1	238.8	25.6
Roaring Creek	13,744	18.3	871.5	34.4	14,801	19.4	144.7	20.8
Long Branch	2,913	3.9	184.7	7.4	2,913	3.9	39.2	4.8
Four Mile Branch	2,931	3.9	185.9	7.5	2,931	3.9	74.0	5.3
Swift Creek	27,134	36.0	1,720.6	69.1	26,964	34.4	371.4	43.4
Camp Branch	5,499	7.3	348.7	13.9	6,235	8.1	89.0	10.3
Suwannee River at White Springs	1,606,859	2,219	38,260	3,011	1,606,816	2,219	37,990	2,994
Suwannee River at Suwannee Springs	1,714,760	2,362	39,730	3,166	1,714,869	2,360	39,390	3,136

*Under Alternative B.

Q = flow.

s = standard deviation.

and what the permit conditions would be. Therefore, the impacts relative to any potential new discharge points are not addressed as part of this analysis.

4.43 Discharge of Disturbed Area Runoff. As OXY's mine operations expand, more area will be included within the perimeter ditching system and more drainage area will be isolated from the various creeks because rainfall runoff from disturbed areas must be discharged through permitted NPDES outfalls. OXY proposes to apply for permits to allow discharge of this type water to the creeks to which it naturally flowed.

4.44 Diversion of Surface Flow from Streams. During mining, the mine area must be isolated from its drainage area with perimeter ditches to avoid turbid runoff to a stream or wetlands not permitted for disturbance. Isolation of a portion of a stream's drainage area decreases flow within the stream. If NPDES permits cannot be obtained to discharge the water to the creek draining the disturbed area, it will have to be diverted to a currently permitted discharge point.

4.45 If no new NPDES outfalls are permitted, water diverted from the various drainage areas will be routed to either Swift Creek or Hunter Creek. The increased flow will dilute historical nutrient concentrations but will not significantly change the present water quality of these two streams. The water quality impact due to the expected reduced flow in the streams from which the flows are diverted will be negligible.

4.46 Matrix Line Ruptures. OXY has operated slurry pumping systems for 18 years without any significant matrix line ruptures. The probability of matrix line ruptures having a significant impact on area streams is very low, and because of the distance of matrix lines from the Suwannee River, no impact on the river should occur.

4.47 Failure of Waste Clay Settling Area Dikes. The likelihood of dike failure is remote, as foundation, soil conditions, and dike material are thoroughly inspected and monitored during the construction and active life of waste clay settling areas. The construction and maintenance of earthen dams for settling areas are in accordance with regulations of the FDER (Ch. 17-9, FAC), and no failures have occurred at waste clay settling areas since the 1971 revisions to this rule. Thus, the potential for any impacts on either the area streams or the Suwannee River is remote.

4.48 Water Quality of Reclaimed Lakes. As part of their reclamation process, OXY will construct a number of lakes within the project area. Approximately 30% (2250 acres under Alternative B) of these lake systems will consist of reclaimed forested wetlands which will add detrital material to the lakes, thus contributing a brownish stain to the lake water. The amount of detrital material contributed to the lakes will depend on the size, maturity, and location of the forested areas. Based on historical data from OXY's reclaimed lakes and analogous data from old phosphate lakes in central Florida, water quality within all the lakes should be good but will vary depending on the type of input the lake receives. Reclaimed lakes presently in existence are used as a final "polishing" step in OXY's water management system. Some of the

reclaimed lakes to be built in the future will be tied into this system and will receive water from the chemical and beneficiation operations. Some of the lakes will receive mine-related discharges in addition to natural area runoff, and still others will receive only disturbed area runoff or perhaps runoff from reclaimed lands and natural areas. The processing operations will continue to discharge to reclaimed lakes regardless of the mining alternative selected, and water quality impacts on reclaimed lakes due to wetlands mining will be negligible.

4.49 Lakes Receiving Mine Discharge. Water quality within reclaimed lakes receiving only mining-related discharge is represented by that in Altmans Bay and Section 13 Lake (Tables 3.4-32, 3.4-33, and 3.4-34, TBD Section 3.4.2). Altmans Bay and Section 13 Lake historically have had acceptable water quality and continue to support good fish populations. The lakes typically meet all applicable water quality standards. The few alkalinity exceedances are related to the naturally low pH of the swamp and pinelands drainage. Ammonia is elevated in the lakes due to natural conditions and the ammonia used in processing operations. Additional wetlands mining under Alternatives B, C, or D will not increase this level and should therefore have no additional impact. The ammonia levels have not resulted in any fish kills within the reclaimed lakes.

4.50 Some low dissolved oxygen values were due to a relatively high percentage of the lake being covered by mats of water hyacinths, which occur in many natural lakes and streams in Florida. The periods of low dissolved oxygen have not caused fish kills, and no significant water quality impacts have been experienced. In these lakes and other types of reclaimed lakes, deeper portions of the lakes may periodically experience low dissolved oxygen. This is not expected to be a problem, as there are more than adequate areas of the lakes with good dissolved oxygen levels, as evidenced by the good fishing in abandoned and reclaimed mine pits.

4.51 Lakes Receiving Only Rainfall and Runoff. The third type of reclaimed lake which will be constructed are lakes which will receive only rainfall and rainfall runoff from reclaimed or natural areas. Water quality of reclaimed lakes will vary depending on their input. Those lakes not receiving a high percentage of their water from wetlands and/or pineland areas will probably be more autotrophic and discharges will provide more primary production (e.g., phytoplankton) to the receiving streams. From a biological standpoint, this should benefit instream aquatic communities by increasing productivity and providing a pH more suitable for most aquatic organisms (Boyd 1979).

4.52 Because relatively large areas drain to the reclaimed lakes, periodically flushing the lakes, the lake water quality should begin to reflect the characteristics of the water flowing into it after cessation of mining and reclamation. Due to the relatively high percentage of wetlands and planted pine areas that will drain to the lakes after reclamation is completed, the water quality of the lakes should be typical of that found in soft, brown water, tannic lakes. The nutrient levels in the lakes will begin to decline after the processing input ceases and as lower nutrient water begins to flush the lakes. The lake sediments contain phosphate which may be gradually released over time; however, as

additional sedimentation occurs, the sediments with relatively high phosphate levels will be buried and the phosphate will be immobilized (tied up) permanently.

4.53 Impacts on the Suwannee River. During mining under any of the proposed alternatives, impacts on the Suwannee River should remain relatively constant and not change appreciably from those presently experienced under existing conditions. Additional wetlands mining under Alternatives B, C, or D will not increase the nutrient loadings to the Suwannee River except to the extent that it extends OXY's operations over time. The majority of the nutrient loadings discharged from OXY's operations come from the beneficiation and chemical processing operations. These operations are not expected to increase in capacity or number due to any of the proposed mining alternatives. All four mining alternatives are based on normal operation of the plants until the reserves are expended, so their effects on nutrient levels should remain relatively constant until shutdown of the plants. Therefore, the magnitude of water quality impacts on the Suwannee River can be estimated by examining the impact that OXY's current mining discharge to Hunter Creek has on the river (TBD Section 3.4.2.3). In 1980, the Suwannee River was redesignated as an Outstanding Florida Water. In its report in support of the redesignation, FDER found that after approximately 15 years of mining operations, including mining of upland, wetland, and aquatic habitats, the Suwannee River water quality was among the best in the state (FDER 1980).

4.54 Post-Reclamation Impacts. After mining ceases and reclamation is completed, water quality in the Suwannee River, area tributaries, and unaffected and reclaimed wetlands should approximate pre-mining characteristics.

4.55 Reclaimed Wetlands. The majority of wetlands within the OXY project area will not be mined under any of the proposed mining alternatives. Even under Alternative B, which maximizes reserve recovery, approximately 63% of the wetlands in the project area will not be disturbed by mining or mine support activities. Water quality within these undisturbed areas should not change. Therefore, under Alternatives B and D, a minimum of approximately 15,500 and 16,000 wetland acres, respectively, not proposed for disturbance will be available to provide the same water quality function after mining as they did prior to mining. Under Alternative C, approximately 22,000 acres would be left undisturbed.

4.56 It is expected that the reclaimed wetlands will modify water quality in varying degrees, depending on their maturity. For example, when initially planted, forested wetlands will not provide humic and tannic acids or color to the water until the organic matter in the litter accumulates. However, the surrounding pine flatwoods and unmined wetlands will continue to provide this function.

4.57 The newly established wetlands may provide more of a water purification function than the older wetlands due to the rapid growth of the

young plants. Direct rainfall and rainfall runoff from surrounding areas will be the only water that reclaimed wetlands will receive after cessation of mining and completion of reclamation. Therefore, water quality within the reclaimed wetlands should meet all applicable FDER Class III water quality standards.

4.58 Reclaimed Lakes. After the process-related discharges to the reclaimed lakes cease and reclamation is complete, water quality in the reclaimed lakes should begin to reflect the characteristics of their drainage. Flow into the lakes will begin to flush the lakes with low phosphate waters, and release of phosphate from the lake sediments will decrease with time, as the lake bottom becomes covered by sedimentation, thus immobilizing minerals in the lake bottom. This gradual process will vary with the lake, but will cover several years. Thus, the water quality of the reclaimed lakes will be that characteristic of lakes receiving only rainfall and runoff from reclaimed and natural areas (TBD Section 6.4.1.6).

4.59 Streams. After reclamation is complete, there will be approximately the same amount of area draining to each creek as prior to mining. Flows within the streams will be similar to pre-mining flows (TBD Section 6.3). Water quality within the area streams will be controlled largely by drainage type (TBD Section 6.4, Table 6.4-3). Those streams receiving the highest percentage of their drainage from reclaimed lakes will have the greatest potential for change in water quality.

4.60 Stream water quality will be impacted under all the proposed mining alternatives; impacts will be greatest under Alternative B because more area will be disturbed and reclaimed. However, ≥50% of all stream drainage areas will be left undisturbed by mining, with the exception of Roaring Creek. Water quality impacts could result from mining and reclamation of the upper reaches of stream channels under Alternative B; however, <10% of the stream channels will be disturbed or mined and reclaimed. The lower sections of the streams will not be disturbed in any case. The potential water quality impacts of stream reclamation are related to differences in water depths, flow velocities, and substrates between pre- and post-reclamation streams. As the actual design of the reclaimed streams is not known at this point, it is difficult to predict impacts on water quality. The changes in land forms and the increased percentage of lakes within a stream's drainage may cause slightly higher nutrient levels in the streams due to the gradual release of nutrients tied up in bottom sediments and sediments from reclaimed lakes which have received nutrients from processing operations. However, the permitting process will insure that all state water quality standards will be met in the streams after completion of mining and reclamation.

4.61 Concentrations of parameters normally associated with phosphate operations will decrease after the cessation of mining and reclamation, and the streams will begin to reflect the characteristics of the drainage. Unaffected wetlands will continue to contribute the same type water to the streams. The reclaimed lands and lakes will produce good quality water; thus, the water quality should improve within these

streams which have historically received discharges from processing operations.

4.62 The Suwannee River. Water quality within the Suwannee River should not be significantly changed by discharges from OXY's reclaimed lands. The relative annual volume of water flowing into the Suwannee River after reclamation will closely approximate pre-mining amounts (TBD Section 6.3). Runoff from reclaimed areas should yield good quality water relatively low in nutrients. Over half of the project area will not be disturbed, including over 60% of the wetlands on site. Therefore, only about 2% of the Suwannee River's drainage as measured at Suwannee Springs will be affected. In addition, the disturbance will occur over a period of approximately 10, 26, 18, and 25 years, respectively, for Alternatives A, B, C, and D.

4.63 An example of a "worst case" situation demonstrates the potential effect of changes in phosphate levels on water quality within the Suwannee River and shows the effect OXY may have on water quality in the river after mining. It is assumed that a "worst case" situation would include the following conditions: 1) all major named streams in the OXY project area have phosphate levels of 1.0 mg/l as the result of receiving mining effluents; 2) their combined projected post-reclamation annual flows are approximately 157 cfs; 3) the phosphate level in the Suwannee River is approximately 0.2 mg/l (Table 3.4-14, TBD Section 3.4.2); and 4) annual average flow in the river is 2360 cfs. Under these conditions, the increase in phosphate levels in the Suwannee River at Suwannee Springs, as a result of contributions from major streams in the OXY project area, would be only 0.05 mg/l. The average phosphate level at Suwannee Springs during November 1979-March 1982 (Table 3.4-14, TBD Section 3.4.2) was approximately 10X higher than the predicted 0.25 mg/l phosphate level in this example, and no problems were reported even at this higher level. The higher level was due to OXY's chemical discharges. For comparative purposes, the mean phosphate level during the November 1979-March 1982 period was 0.07 mg/l in the Suwannee River at the CR-6 bridge. At Branford (SR-20), the total phosphate concentration was 0.34 mg/l as P. Half of the sampling period experienced above average rainfall while the second half experienced below average rainfall. Rainfall over the entire period was very near the average annual rainfall of approximately 54 in. The Swift Creek Mine was operating 7 days a week during this period except in January-March 1982 when it was on a 5-day-a-week schedule.

4.64 Groundwater. Groundwater parameters potentially affected by mining include deep well withdrawal, recharge to the Floridan Aquifer, groundwater table levels, baseflow to streams, and groundwater quality. The magnitude of drawdowns resulting from deep well withdrawal is not considered significant. No change in withdrawal rates from that presently occurring is anticipated. There will be a slight increase in local (immediate project area) recharge to the Floridan Aquifer of <1.5 mgd during mining compared to pre-mining conditions due to decreased head difference in the aquifers caused by deep well withdrawals (TBD Section 6.5.1.2). This slight increase in local recharge to the

Floridan Aquifer over the project area will not have a significant impact on groundwater resources. The magnitude of effects on groundwater table levels associated with mining operations is dependent on many factors. No known adverse drawdown impacts have been identified as a result of present mining operations, and there are mitigative measures that can be taken, should adverse impacts become evident (TBD Section 10.0). Even though baseflow is not considered a major contribution to streamflow, mining could affect base flow contribution during dewatering. This will increase the groundwater contribution, and hence flow, to surface waters permitted for discharge of mine waters. No water quality changes are anticipated in the Secondary Artesian and Floridan aquifers for any of the proposed mining alternatives. Water quality changes in the Surficial Aquifer will be subtle. Impacts are limited to a potential increase in hardness within the Surficial Aquifer as a result of groundwater seepage from mining operations.

4.65 Air Quality. The probable impact on ambient air quality is a localized, temporary increase in total suspended particulate (TSP) matter levels during mining. These levels, for both the annual and 24-hour time periods, meet ambient air quality standards developed by EPA and adopted by FDER, with annual particulate matter levels near background measured in similar geographic areas in the State of Florida. Maximum 24-hour TSP matter levels result from fugitive emissions typical of mining or agricultural activities. After conclusion of the mining operation and assuming agricultural use of the lands, the maximum TSP matter levels will remain essentially the same.

4.66 Radiation. The natural profile of radioactivity, which shows an increasing level of radioactivity with depth, will be altered by mining and reclamation. The degree of alteration will depend on the reclamation practices and the materials used for reclamation. The alterations may result in changes in the concentrations of radionuclides in the soil, terrestrial gamma radiation levels, levels of radioactivity in surface water and groundwater, and levels of airborne radioactivity.

4.67 Measurements made at sites previously mined and reclaimed by OXY have shown that, following mining and reclamation, the radiation profile becomes more or less uniform with depth. As a result, the near-surface (0-6 ft) radioactivity will generally be higher than it was before mining. The increase in the near-surface radioactivity will result in increases in terrestrial gamma radiation and in the near-surface Ra-226 concentration. The increased levels, however, will be well below guidelines for these parameters established by the Florida Department of Health and Rehabilitative Services, EPA, and the International Commission on Radiation Protection and will be similar in magnitude to naturally occurring levels in the United States.

4.68 Historical and Archaeological Resources. None of the archaeological or historical sites in the project area are of cultural significance and due to their disturbed conditions are not recommended for preservation or impact mitigation. Based on the cultural resource assessment of the OXY project site and agency review of the area for archaeological site occurrence and significance, no adverse impacts on

the historical and archaeological resources of the project area are predicted for any of the proposed mining alternatives (TBD Section 3.8).

4.69 Socioeconomics. The original long-term plans for the Hamilton County complex called for the mining of 30,587 acres, including 9264 acres of Corps-defined wetlands, over 21-26 years (Alternative B). If this alternative is not permitted, OXY operations will be curtailed at the complex.

4.70 Prohibition of wetlands mining (Alternative A) will decrease the life of the Hamilton County operation by 62%. Mining only small isolated or weakly/periodically connected wetlands containing reserves (Alternative C) will decrease the life by 34%. Mining only in areas requiring Corps permits (Alternative D) will decrease the life by 5%.

4.71 The company's original development plans were initiated in 1964, and the bulk of their phosphate reserves was acquired by 1975. The reserves are scheduled to support the Suwannee River Chemical Complex, constructed in 1966, and the Swift Creek Chemical Complex, constructed in 1979.

4.72 An Overview of Socioeconomic Impacts. Continued operation of the Hamilton County complex is of significance to the economy of Hamilton, Columbia, and Suwannee counties in northeast Florida as well as the State of Florida. For example, approximately 24% of all jobs in the three-county area is attributable directly or indirectly to OXY as is 36% of the total salary and wage incomes.

4.73 Socioeconomic impact evaluations are normally concerned with new facilities, the introduction of new employment, the subsequent increase that these jobs cause to population growth, and the resultant increased demands on public services such as education, public safety, health, and welfare, which ultimately have an impact on the public tax structure and social climate of the area. In contrast, this evaluation concerns an ongoing operation, and no alternative is anticipated to significantly increase employment.

4.74 Under Alternative A, no wetlands would be mined or used for mine support activities. Thus, only those areas designated as uplands and containing reserves presently owned or leased by OXY will be mined or disturbed (about 9884 acres). At full operating schedules under this alternative, all reserves currently identified as economic to mine will be depleted in 8-10 years.

4.75 Under Alternative B, approximately 30,587 acres will be mined or disturbed, including the 9884 acres in Alternative A and 9264 acres of Corps-defined wetlands. Under this alternative, reserves will be depleted in approximately 21-26 years. Alternatives C and D are intermediate, with about 18,626 and 27,861 acres, respectively, to be mined or disturbed, containing 2452 and 8601 acres, respectively, of Corps-defined wetlands. Under these alternatives, the mines will be depleted in 14-18 years and 18-25 years, respectively.

4.76 Summary of Statewide and Local Impacts. The following economic impacts of the Hamilton County complex (Tables 3.9-7 and 3.9-9, TBD Section 3.9) were computed using methodology cited in Section 3.9.1 of the TBD, based on direct annual OXY impacts on income of $48,200,000, on taxes of $15,400,000, and on revenues to Florida firms of $90,000,000 and a full employment of 2150 (all dollar amounts are in 1982 dollars and cover direct, indirect, and induced impacts).

4.77 Total Annual Florida Impacts

1) On full-time equivalent jobs to Florida citizens - 10,023.

2) On incomes to Florida residents - $177,300,000.

3) On state taxes - $31,500,000.

4) On local taxes - $14,900,000.

5) On revenue to Florida firms - $348,500,000. This is net revenue to firms, excluding state and local taxes and salaries and wages. It represents that part of revenue which is used to purchase supplies, equipment, and materials, and for capital investments and profits.

6) Total on the State of Florida (excluding OXY sales) - $572,200,000. It should be noted that the methodology used is subject to a maximum error of about $50,000,000 in this estimate (TBD Section 6.9).

4.78 Total Annual Local Impacts

1) On full-time equivalent jobs for the residents of Columbia, Hamilton, and Suwannee counties - 6067 or about 24% of all employment in the three counties in 1980.

2) On incomes to the residents of Columbia, Hamilton, and Suwannee counties - $95,100,000 or some 28% of all earned income in the three counties in 1981 (36% of wage and salary income).

3) On local taxes in Columbia, Hamilton, and Suwannee counties - $6,200,000 or about 32% of all local government revenues in the three counties in the 1981-1982 fiscal year.

4) On revenue to local firms in Columbia, Hamilton, and Suwannee counties - $156,800,000. It represents the total revenues of area firms which result from OXY's operations, excluding salary and wage payments and state and local taxes.

5) Total on Columbia, Hamilton, and Suwannee counties (excluding OXY sales) - $276,300,000 (TBD Section 6.9).

4.79 Table 14 summarizes the measurable economic contributions of each alternative. Undisturbed wetland acres containing reserves for the four alternatives are:

Table 14. Total Direct, Indirect, and Induced Measurable Positive Economic Impacts of Four Alternatives.

Type of Impact	Statewide	Local
Annual Impacts		
Jobs (labor-years)	10,023	6,067
Revenues to Florida firms	$348,500,000	$156,800,000
Incomes to people	177,300,000	95,100,000
State taxes	31,500,000	18,200,000
Local taxes	14,900,000	6,200,000
Total impact	$572,200,000	$276,300,000
Alternative A: Equivalent to approx. 7 Years of Full Operation		
Jobs (labor-years)	67,154	40,649
Revenues to Florida firms	$2,332,270,000	$1,050,560,000
Incomes to people	1,190,590,000	637,170,000
State taxes	211,050,000	121,940,000
Local taxes	99,830,000	41,540,000
Total impact	$3,833,740,000	$1,851,210,000
Alternative B: Equivalent to approx. 20 Years of Full Operation		
Jobs (labor-years)	200,159	121,158
Revenues to Florida firms	$6,951,522,000	$3,131,292,000
Incomes to people	3,548,670,000	1,899,150,000
State taxes	629,055,000	363,454,000
Local taxes	297,553,000	123,814,000
Total impact	$11,426,800,000	$5,517,710,000
Alternative C: Equivalent to approx. 13.5 Years of Full Operation		
Jobs (labor-years)	135,311	81,905
Revenues to Florida firms	$4,699,350,000	$2,116,800,000
Incomes to people	2,398,950,000	1,283,850,000
State taxes	425,250,000	245,700,000
Local taxes	201,150,000	83,700,000
Total impact	$7,724,700,000	$3,730,050,000
Alternative D: Equivalent to approx. 18.5 Years of Full Operation		
Jobs (labor-years)	185,426	112,240
Revenues to Florida firms	$6,439,850,000	$2,900,800,000
Incomes to people	3,287,450,000	1,759,350,000
State taxes	582,750,000	336,700,000
Local taxes	275,650,000	114,700,000
Total impact	$10,585,700,000	$5,111,550,000

Alternative A - 9264
Alternative B - 0
Alternative C - 6812
Alternative D - 663

4.80 Under any alternative the mining operation will eventually cease. Considering the economics of this study, it is anticipated that this will occur at the Suwannee River Mine after about 19 years and at the Swift Creek Mine after about 24 years. It is expected that the negative impacts at this time will be mitigated primarily through time and planning.

4.81 First the mine-out will be phased, allowing, for example, a gradual relocation of personnel. Second, while OXY's direct employment in 1980 represented 8.2% of the total three-county employment, it is projected that it will represent only 4.4% in 2010. Third, many who now work at this facility will reach retirement age, and these income impacts will not be lost for those who will stay in the area. It follows that the longer the facility is in operation, the less will be the negative impact at mine-out and the longer the economic benefits will be received.

4.82 Economic factors not considered above are:

- OXY revenues of >$130,000,000 per year to out-of-state firms and the feedback effects of those revenues through their expenditures in Florida.
- Capital improvement outlays of approximately $20,000,000 per year.
- Employee fringe benefits of about 30% of payroll and the multiplier effects of these on the economy (e.g., medical insurance payments to local medical firms and hospitals).
- Loss of potential retirement benefits.
- Federal taxes paid by OXY and those resulting from indirect and induced economic impacts and the feedback effects of federal expenditures in Florida.
- Increased costs of unemployment compensation, welfare payments, and social services.
- Loss of an export product for the U.S., thus negatively impacting the national balance of trade and decreasing the export volume in the Port of Jacksonville.
- Adverse impacts on retail and service businesses, housing, social and financial institutions, population, and on Duval County, as described in Section 6.9 of the TBD.

4.83 Whichever alternative is selected, the impacts will be of about equal relative magnitude in all three counties. Hamilton County is more directly affected than either of the other counties in terms of local

tax collections. But the other two, especially Columbia County, will be more heavily affected in absolute terms with respect to sales of businesses, income, and employment.

4.84 Effects on International Balance of Payments and Balance of Trade. The loss of an export product for the U.S. will negatively impact the balance of trade and decrease export volume in the Port of Jacksonville. Most of the product of OXY's North Florida complex is currently exported. In addition to OXY's shipments to the Soviet Union in exchange for nitrogen fertilizers and potash, OXY's sales in the international market amount to approximately $100 million per year. While this amount is a small part of total U.S. exports, its loss would further impact the negative balance of trade situation faced by the United States. For example, exports minus imports in 1980 were $8 billion; in 1984, this may reverse to a negative $45 billion at the first quarter rate.

4.85 Recreation and Natural Resources of the Suwannee River. Recreation and natural resource features of the Suwannee River will not be impacted under any of the four proposed mining alternatives. No mining or mine support facilities will be conducted within the Suwannee River or its 100-year floodplain. Current discharges from mining and processing activities into tributaries of the Suwannee River have not had a significant impact on the recreational features of the river. No significant changes in water quality, which would potentially impact recreation and natural resource features, are anticipated under any of the proposed mining alternatives.

Unavoidable Adverse Environmental Impacts

4.86 Physiographic Characteristics. Potential erosion, dust from unvegetated areas, and local dramatic changes in topography and soil characteristics are anticipated as a result of mining. Drainage basin sizes will change during the active mining phase as portions are included within mine water management areas. This may have an adverse impact on streamflows until the areas are reclaimed and drainage patterns restored to the greatest extent possible.

4.87 Ecology: Uplands. Unavoidable impacts on upland communities include reductions in flora and fauna populations due to mining and population shifts (increases in some species and decreases in others) due to net loss of upland acreage and conversion to aquatic and wetland systems during reclamation as a result of the void created by mineral extraction.

4.88 Wetlands. Impacts on wetlands flora and fauna will be similar to impacts on uplands communities. Reclamation will replace wetland communities on an acre-for-acre basis. Population shifts may occur due to creation of wetland systems (e.g., lake edge wetlands) which are presently limited in the project area. Population levels of fauna may be reduced until reclaimed systems mature. Although functional values attributed to wetlands will be lost in those wetlands mined, reclamation and mitigation measures will aid in the restoration of these values at post-mining.

4.89 Aquatic Communities. Mining of aquatic habitats will result in temporary reductions in associated flora and fauna. Addition of interim habitats during mining and creation of reclaimed lakes and other aquatic systems will result in a net increase in aquatic habitats under all mining alternatives. Perhaps the greatest impact on stream communities will be the mining of upper reaches of several tributary channels under proposed Mining Alternative B. These stream channels will be reclaimed to produce viable, productive lotic habitats. There will be a temporary reduction in streamflow as portions of the basin are mined and water diverted through the mine water management system. Reclamation will restore the drainage basins to approximately their original areas.

4.90 Forestry and Agricultural Resources. There will be a gradual but temporary decrease in acreage of productive forestry and agricultural land during mining and a potential loss of timber which may not be marketable at the time of clearing. Reclamation should restore productive forestry and some agricultural operations on reclaimed lands (Blue 1981, Gooding 1981).

4.91 Game and Migratory Wildlife. Populations of game and migratory species will be reduced during mining. Reclamation activities are planned to restore terrestrial and wetland habitats, and the greater diversity of habitats after reclamation should increase populations of many species.

4.92 Rare and Endangered Species. Some populations will decline as a result of mining, whereas others may actually increase; however, the regional status of these species should not be impacted.

4.93 Surface Water Quantity. Unavoidable environmental impacts on surface water quantity resources include 1) temporary flow reduction during mining in drainage basins, 2) increased flows in streams receiving discharges, and 3) decreased flows in streams not receiving discharges. However, the overall contribution of water to the Suwannee River will remain the same, as water is diverted and not lost. Reclamation should restore tributary flows to near pre-mining conditions. Computer simulations indicate the maximum change in average flow of all small stream drainage areas will be <6% due to reclamation (TBD Section 6.3). Impacts on the Suwannee River water budget as a result of mining and reclamation will be minor.

4.94 Surface Water Quality. Adverse impacts on water quality include possible turbidity problems, if water is not adequately clarified prior to discharge, and an increase in dissolved solids content from increased Surficial Aquifer contributions to surface waters. These impacts are considered minor (TBD Section 7.4). The slightly higher pH and nutrients in mine waters routed to reclaimed lakes may result in increased growth of phytoplankton communities. This change is considered insignificant.

4.95 Groundwater. Unavoidable groundwater impacts during mining include possible lowering of the water table adjacent to a mining operation and decreased baseflow to tributaries not receiving groundwater from the dewatering operation. However, existing design principles have been effective in mitigating these impacts (TBD Section 10.0).

4.96 Air Quality. A temporary increase in total suspended particulate matter levels in the vicinity of the mining activities is anticipated. Levels should return to areawide background levels when reclamation is completed. This temporary increase will not threaten ambient air quality standards.

4.97 Radiation. The magnitude of the radiological impacts resulting from the four mining alternatives will be similar to that resulting from previous OXY mining. The increased levels of radioactivity are well within applicable guidelines and proposed standards and are similar to naturally occurring levels of radioactivity in other areas of the United States.

4.98 Historical and Archaeological Resources. No unavoidable adverse impacts on the archaeological or historical resources of the project area are predicted for any of the proposed alternatives.

4.99 Socioeconomics. There are no unavoidable adverse economic impacts except that under any alternative, the mining operation will eventually cease, but the longer the facility is in operation, the longer the economic benefits will be received. Of the alternatives considered, Alternative A would have the least positive economic impact on the area due to the shortened mine and production life. Alternative B would have the most positive economic impact on the area by maximizing reserve recovery, thereby maintaining mine and production life for a longer period of time. Alternatives C and D would result in economic impacts intermediate to A and B.

Relationship Between Short-Term Use and Long-Term Productivity

4.100 Physiography and Ecology. The productive capability of reclaimed upland systems for forestry and agriculture will be similar to existing systems. Creation of lakes and associated wetland areas after mining will result in a net increase in productivity as compared to pre-mining conditions and will increase the habitat diversity and species diversity in the area. The reclaimed lakes will provide more habitat for fish, lentic macroinvertebrates, and species associated with lake margins and littoral zones such as reptiles, amphibians, wading birds, ducks, and macroinvertebrates. There will also be additional habitat available for populations of game and migratory species and any rare and endangered species that use aquatic habitats. Nesting success of least terns has increased as a result of creation of suitable nesting habitat during past mining activities; however, this habitat is usually not available after restoration.

4.101 Water Resources. Mining and reclamation activities will temporarily disturb tributaries, drainage basins, and flows in the project area; no significant impacts on the Suwannee River are anticipated. The projected changes between pre-mining and post-reclamation annual average flows for the tributary drainage basins range from 0 to 1.9 cfs or 0 to 11% (TBD Section 6.3.3). Peak discharge and large fluctuations in land surface runoff will be reduced because the reclaimed lakes will serve as flow regulators. Therefore, the probabilities of both extremely low

flow and extremely high flow periods are reduced. Reduction in peak flow will reduce flood damage and pollutant washoff, whereas reduction in low flow periods will result in more water during the dry season.

4.102 If additional NPDES permits were to be granted for discharging mine waters, the chemical composition of the newly permitted streams would be similar to that presently exhibited by Hunter Creek. There may also be a slight, though regionally insignificant, reduction in detrital input to the tributaries on site as a result of mining upper reaches of some streams. After shutdown of the chemical and beneficiation operations and their discharges, water quality in the area will improve. Reclaimed lakes, which are connected to water courses, will provide greater primary productivity and enhance water quality by filtering nutrients and allowing settling of suspended solids.

4.103 Socioeconomics. Continuation of mining under Alternative B will provide continued employment and sustain OXY's economic contributions to the long-term economic growth of Hamilton, Columbia, and Suwannee counties and to the state for over 20 years. Under Alternative A, this period will be foreshortened by about 13 years, under Alternative C by 6.5 years, and under Alternative D by 1.5 years.

Irreversible and Irretrievable Commitment of Resources

4.104 Physiography and Ecology. OXY's identified reserves total about 96 million metric tons. Over the mine life of the various alternatives, recovery of reserves ranges from 38% for Alternative A to 100% for Alternative B. Alternatives C and D will result in recovery of 66% and 95% of the reserves, respectively.

4.105 Assuming lakes will occupy 3.9-7.5% of the project area after reclamation, potential silvicultural or agricultural land use will be lost (paragraph 4.07). Mining will also result in the loss of individual fauna, vegetation, and unmarketable timber not harvested in affected areas, temporary habitat destruction, replacement of some upland habitat with lake systems, and temporary alteration of the functions provided by wetlands and aquatic systems.

4.106 Water Resources. There will be no irreversible or irretrievable commitments of surface water resources as a result of mining and reclamation. In waste clay disposal areas, the transmissive zones of the Surficial Aquifer (matrix) would be removed and replaced with a relatively tight, non-productive unit. This would involve approximately 9152 acres (9% of the project area) under Alternative A and 18,202 acres (18% of the project area) for Alternative B. Alternatives C and D would entail 12,352 acres (12%) and 17,582 acres (17%), respectively.

4.107 Phosphate Reserves. The U.S. phosphate industry could continue at a 1981 production rate of 53 million metric tons for the next 106 years assuming the reserve base becomes economic to mine. This base of 5700 million metric tons includes: reserves (1300 million metric tons), marginal reserves, and part of the demonstrated and currently subeconomic resources. Not included is phosphate which cannot be mined and processed with present technology (U.S. Bureau of Mines 1981).

4.108 OXY's reserves total 95.8 million metric tons and are 7.4% of the U.S. reserves and 0.7% of world reserves. Florida reserves are 550 million metric tons, or 42.3% of U.S. reserves and 3.9% of world reserves. The U.S. phosphate rock reserves are 9.3% of the world reserves (TBD Section 9.9).

4.109 Means to Mitigate Adverse Environmental Impacts. In all the proposed alternatives, mining will be conducted as an incremental process with reclamation occurring as soon as is practically possible. The undisturbed portions of the communities will function as biological reservoirs for seeding and colonization of adjacent reclaimed areas.

4.110 There will be a net loss of upland acreage as a result of mining and reclamation, but this will be countered by the creation of ecologically productive lake systems which can also be used for fishing and hunting. The conceptual reclamation plans will mitigate environmental impacts on ecological resources by focusing on restoration of streams, acre-for-acre replacement of wetlands, creation of productive land uses, such as agriculture and silviculture as well as specially-designated wildlife areas, and revegetation of all lands mined and/or utilized for mine support activities under the proposed mining alternatives.

4.111 Erosion and sedimentation can be effectively controlled by:

- immediate recontouring and revegetation of bare soil;
- reducing the velocity and controlling the flow of runoff;
- detaining runoff on site to trap sediments; and
- releasing runoff safely to downstream areas.

All of these practices are currently used by OXY in existing operations through reclamation activities and mine water management systems.

4.112 Induced recharge to the Surficial Aquifer from deep well withdrawals, pumped waters from the dewatering operation, or surface drainage can limit the horizontal distance from a mine cut influenced by dewatering. The recharge can be injected into the aquifer by direct discharge to the potentially affected wetland or surface waterbody, discharge into a surface ditch system, or discharge into shallow wells. Water level control structures to limit outflows and drainage conveyance systems to transfer water are used for inducing recharge to the Surficial Aquifer either by bringing water into an area or retaining water that normally would be discharged from an area. As the recharge areas could be considered a point source discharge, this process would be subject to permitting requirements, which could limit the use of induced recharge as a viable mitigation alternative.

4.113 The impact of phosphate rock mining and associated activities on ambient air quality is mitigated by hydraulically transporting the phosphate matrix from the mine to the beneficiation plant, by hydraulically transporting tailings from the beneficiation plant back to the mined-out areas, and by reclamation practices that will minimize wind erosion of barren lands.

4.114 The negative socioeconomic impacts of Alternative A as compared to Alternative B cannot be fully mitigated. The impacts might be softened through development of alternative employment sources and a relocation assistance program.

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6.00 LIST OF PREPARERS

Name	Discipline	Experience	Contribution
Dan Malanchuk, M.S.		8 years EIS studies	EIS Coordination
Gerald L. Atmar, Ph.D.		14 years EIS studies	EIS Supervision
John A. Davis, Ph.D.	Water resources, wetlands evaluation	10 years experience in management of large-scale multi-disciplinary monitoring projects and impact assessments	Surface Water Quantity/ Quality, Wetlands Evaluation, Coordination of TBD
Stephen R. Adams, M.A.	Zoology, wetlands ecology	10 years experience in data management and analysis, habitat evaluations, rare and endangered species investigations	Ecology, Wetlands Evaluation
Ivan B. Chou, P.E.	Hydrological engineering	12 years experience in water quality and quantity modeling, coastal and oceanographic engineering	Surface Water Quantity
Henry H. Seagle, Jr., Ph.D.	Aquatic ecology	10 years experience in sampling, taxonomy, and analysis of aquatic communities	Aquatic Communities
William Coulombe, B.S.	Water quality	10 years experience in water quality and biological sampling and analysis	Surface Water Quality
Lewis L. Yarlett, M.S.	Forestry, range management	35 years experience in plant community characterization and photointerpretation	Vegetation Mapping/ Classification
Jerre A. Stallcup, M.A.	Zoology	10 years experience in ecological analysis, impact assessments, and technical writing	Document Production

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Name	Discipline	Experience	Contribution
John E. Garlanger, Ph.D., P.E.	Geotechnical engineering	20 years experience in subsurface investigations for mining and waste disposal	Groundwater
Herbert G. Stangland, P.E.	Hydrology, civil engineering	20 years experience in groundwater and hydrological investigations	Geology, Soils
John B. Koogler, Ph.D.	Environmental engineering, air quality management	20 years experience in air quality management and impact assessments	Climatology, Air Quality, Noise
W. Emmett Boich, Jr., Ph.D.	Sanitary engineering	25 years experience in radiation studies and environmental impact assessments	Radiation
James J. Miller, M.A.	Anthropology	15 years experience in archaeological surveys, impact assessments, and environmental/landscape history documentation	Historical and Archaeological Resources
Roger L. Burford, Ph.D.	Economics and statistics	25 years experience in economic impact, feasibility, cost-benefit studies, and economic projection models	Socioeconomics

7.00 PUBLIC INVOLVEMENT

7.01 A scoping meeting was held for all interested parties at the Jacksonville District office on 5 June 1981. On 28 August 1981, the Corps requested that the U.S. Environmental Protection Agency, the Florida Department of Natural Resources, and the Florida Department of Environmental Regulation cooperate in the preparation of the Wetlands Mining EIS. All three agencies agreed to cooperate. All three agencies, along with other interested parties, have reviewed all or part of the data gathered during the preparation of this document. The Plan of Study for the EIS was circulated among interested parties on 3 November 1981 to solicit comments.

7.02 In March 1984 a Preliminary Draft of the TBD (PDTBD) was forwarded to the EPA, FDER, FDNR, and the FGFWFC for their review and comments. On April 27, 1984 a workshop was held with these agencies in order to solicit comments on the PDTBD. Subsequent to the workshop and written comments, the Corps decided to modify the WEP method to address concerns raised by reviewing agencies and notified the agencies of these modifications.

7.03 A public meeting is planned. The time and location of this meeting is yet to be determined.

7.04 Required coordination was accomplished and is continuing with state and federal agencies.

8.00 STATEMENT RECIPIENTS

Federal

Advisory Council on Historic Preservation
U.S. Army Corps of Engineers
U.S. Department of Agriculture
- Agriculture Stabilization and Conservation Service
- Forest Service
- Soil Conservation Service

U.S. Department of Commerce
U.S. Department of Energy
U.S. Department of Health and Human Services
- Centers for Disease Control

U.S. Department of Housing and Urban Development
U.S. Department of Interior
- Bureau of Mines
- Bureau of Outdoor Recreation
- Fish and Wildlife Service
- Geological Survey
- National Park Service
- Office of Environmental Project Review

U.S. Department of Transportation
- Coast Guard
- Federal Highway Administration

U.S. Environmental Protection Agency
U.S. Federal Emergency Management Administration
U.S. Federal Energy Administration
U.S. Federal Maritime Commission

State

Florida Department of Environmental Regulation
Florida Department of Natural Resources
Florida Department of State
Florida Department of Transportation
Florida Game and Fresh Water Fish Commission
Office of the Governor
State Planning and Development Clearing House

Local

Columbia County Chamber of Commerce
Columbia County Commission
Hamilton County Commission
North Central Florida Regional Planning Council
Soil and Water Conservation District Office
Suwannee County Commission

Local (continued)

Suwannee County Development Authority
Suwannee River Authority
Suwannee River Water Management District

Others

Breedlove, Dennis & Associates
CF Industries, Inc.
Carlton, Fields et al.
Environmental Defense Fund
Florida Audubon Society
Florida Conservation Foundation, Inc.
Florida Defenders of the Environment
Florida Phosphate Council
Florida Wildlife Federation
Four Rivers Audubon Society
Holland & Knight
Issak Walton League of America, Inc.
Lake City Community College
Miami Herald
National Audubon Society
Occidental Chemical Agricultural Products, Inc.
Owens-Illinois
Sierra Club
Suwannee River Citizens Association
Suwannee River Coalition
Suwannee River Regional Library
Texasgulf Chemicals Company
The Longboat Observer
University of Florida

A mailing list of these groups and individuals is being maintained at the Corps district office (SAJPD-ES) and may be consulted on request.

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