Final Tarmac King Road Limestone Mine Environmental Impact Statement Levy County, Florida

Volume I
Summary
Chapters 1-12

U.S. Army Corps of Engineers
Jacksonville District
August 2013

COVER SHEET

Responsible Agency: U.S. Army Corps of Engineers (USACE)

Title: *Final Tarmac King Road Limestone Mine Environmental Impact Statement (King Road EIS)*

Location: Levy County, Florida

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Comments or requests for information can also be submitted on the *King Road EIS* website at *http://www.kingroadeis.com.*

The official closing date for the receipt of comments is 30 days from the date on which the Notice of Availability of this *Final King Road EIS* appears in the *Federal Register*.

***Abstract*:** The USACE is evaluating proposals for limestone mining and related activities in an area of Levy County known as the King Road site. The USACE has analyzed both offsite and onsite alternatives for those that could reasonably satisfy the project purpose, and has carried forward seven alternatives for mining for further detailed analysis, along with a No Action Alternative (Alternative 1). The alternatives include (1) the No Action Alternative; (2) Mining Outlined in Permit Application with Dedicated No Mine Areas in Wetlands and Uplands; (3) Exclusion of Mining or Related Activities West of Butler Road; (4) Mining Outlined in Alternative 3 with Exclusion of Mining and Related Activities Immediately South of Spring Run and in Higher-Quality Wetlands in the North-Central Portion of the Site; (5) Exclusion of Mining or Related Activities Between the Two Southern No Mine Areas; (6) Mining Only West of the Central North-South Aligned No Mine Area; (7) Exclusion of Mining or Related Activities West of the Central North-South Aligned No Mine Area, Between the Two Southern No Mine Areas, and South of Spring Run; and (8) Exclusion of Mining or Related Activities Between the Two Southern No Mine Areas and the Extreme Western Mining Block. Under the No Action Alternative, no mining would be permitted in wetlands within the Tarmac King Road Limestone Mine site. If the proposed mining is not approved, it is expected that the ongoing timbering operations and hunting activities on the site would continue. Under the other alternatives, mining would be permitted on the King Road site in varying degrees over the next 30 to 100 years. The affected environment is primarily the area immediately surrounding the King Road site in eastern Levy County. Analyses indicate that the environmental impacts are closely tied to the number of acres proposed to be mined, with alternatives proposing the largest amount of mining having the largest environmental impacts for most of the areas of concern. The primary discriminators are natural cover types, including wetlands; habitat units; potential impacts on the eastern indigo snake; hydrology; water quality; and socioeconomics. A mitigation plan has been evaluated that could offset many of the potential environmental impacts.

Public Involvement: In preparation of this *King Road EIS*, the USACE considered comments received from the public during a 60-day scoping period ending April 26, 2008. Comments were received via U.S. mail, fax, email, and through the project's website. In addition, comments were taken from two public scoping meetings held on March 26 and 27, 2008, in Levy County, Florida. A summary of comments received is found in Chapter 1, Section 1.7.1.

In addition, the USACE considered comments received from the public on the *Draft King Road EIS*. A Notice of Availability for the *Draft King Road EIS* was issued in the *Federal Register* (77 FR 29617) (see Appendix A) on May 18, 2012. A 60-day public comment period began on May 11, 2012, and ended on July 11, 2012. A public hearing was held in Inglis, Florida, on May 31, 2012, where the USACE accepted both written and oral comments. In addition, the public was encouraged to submit comments via U.S. mail, email, or the *King Road EIS* website. There were 225 comments received from the public and Federal and state agencies during the public comment period, with an additional 11 comment letters received after July 11, 2012. Chapter 1, Section 1.7.2, of this final EIS includes a summary of the public comments on the draft EIS. Comment responses and individual comment letters are included in Appendix I.

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Final Tarmac King Road Limestone Mine Environmental Impact Statement

Summary

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List of Acronyms and Abbreviations

CFR	*Code of Federal Regulations*
CWA	Clean Water Act
EIS	environmental impact statement
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
King Road EIS	*Tarmac King Road Limestone Mine Environmental Impact Statement*
LNP	Levy Nuclear Plant
LNP EIS	*Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2*
NEPA	National Environmental Policy Act
Tarmac	Tarmac America, LLC
TMS	Tarmac Mitigation Site
UMAM	Uniform Mitigation Assessment Method
USACE	U.S. Army Corps of Engineers

SUMMARY

S.1 PROJECT BACKGROUND

The U.S. Army Corps of Engineers (USACE) is examining the potential impacts of the proposed Tarmac King Road limestone mining activities within southern Levy County in west-central Florida. The project involves a Federal action because the fill activities associated with limestone mining in wetlands require authorization through a U.S. Department of the Army permit under Section 404 of the Clean Water Act (CWA) of 1972 (33 U.S.C. 1251 *et seq.*). The USACE Jacksonville District determined that the scope of the proposed Tarmac King Road Limestone Mine could significantly affect the quality of the human and natural environment, and that the CWA Section 404 permit would constitute a major Federal action. Based on these determinations, a draft environmental impact statement (EIS), the *Draft Tarmac King Road Limestone Mine Environmental Impact Statement (King Road EIS)*, was issued in May 2012 pursuant to (1) Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*); (2) the Council on Environmental Quality regulations on preparing EISs (40 CFR 1502.4 *et seq.*); (3) Section 404 of the CWA on permitting disposal sites for dredged or fill material (33 U.S.C. 1344), as amended; and (4) "NEPA Implementing Procedures for the Regulatory Program" (33 CFR 325, Appendix B).

Under Section 404 of the CWA, the USACE was granted authority to issue permits for discharges of dredged or fill material into waters of the United States. The USACE and U.S. Environmental Protection Agency have developed several Memorandums of Agreement clarifying each agency's role in implementing Section 404. The USACE serves as the lead agency for jurisdictional determinations and permit actions and has set forth implementing regulations in Title 33 of the *Code of Federal Regulations* (CFR) Parts 320–332.

A primary purpose of a USACE regulatory program EIS is to provide full and fair discussion of the significant environmental impacts of a proposal or project seeking a USACE permit. The draft and final EISs are used to inform agency decisionmakers and the public of alternatives to an applicant's project that might avoid or minimize adverse impacts or enhance the quality of the human environment. An EIS is not a USACE regulatory decision document. It is used by agency officials in conjunction with other relevant information in a permit application file, including public and agency comments presented in the final EIS, to support the final decision on a permit application. In this instance, Tarmac America, LLC (Tarmac), has filed a permit application to mine areas that include wetlands within Levy County, Florida. Tarmac wants to obtain a Section 404 permit from the USACE to allow Tarmac to discharge dredged or fill material into waters of the United States during its mining process. The mined material would provide construction-grade aggregate for buildings and infrastructure. The proposed mine would be mined over an approximately 100-year period or less, depending on the alternative selected. (See Chapter 2, Section 2.2, of this EIS for a description of the proposed alternatives.) Tarmac is proposing to mitigate the action by restoring, enhancing, and preserving an adjacent wetland area.

S.2 PROJECT LOCATION

The proposed Tarmac King Road Limestone Mine is located along the western Gulf Coast of Florida approximately 80 miles north of Tampa, Florida. The site is located in western Levy County just west of U.S. Route 19, approximately 5 miles north of the town of Inglis, Florida (see Figure S–1).

The overall Tarmac King Road Limestone Mine project involves two parcels of land totaling about 9,277 acres (14.5 square miles), 2,757 acres (4.3 square miles) of which is proposed to be mined. The mining area is on an approximately 4,751-acre (7.4-square-mile) parcel, and the proposed mitigation area is an approximately 4,526-acre (7.1-square-mile) parcel. Both the proposed mine site and mitigation area are shown in Figure S–1. The western portion of the mitigation area abuts the Waccasassa Bay Preserve State Park.

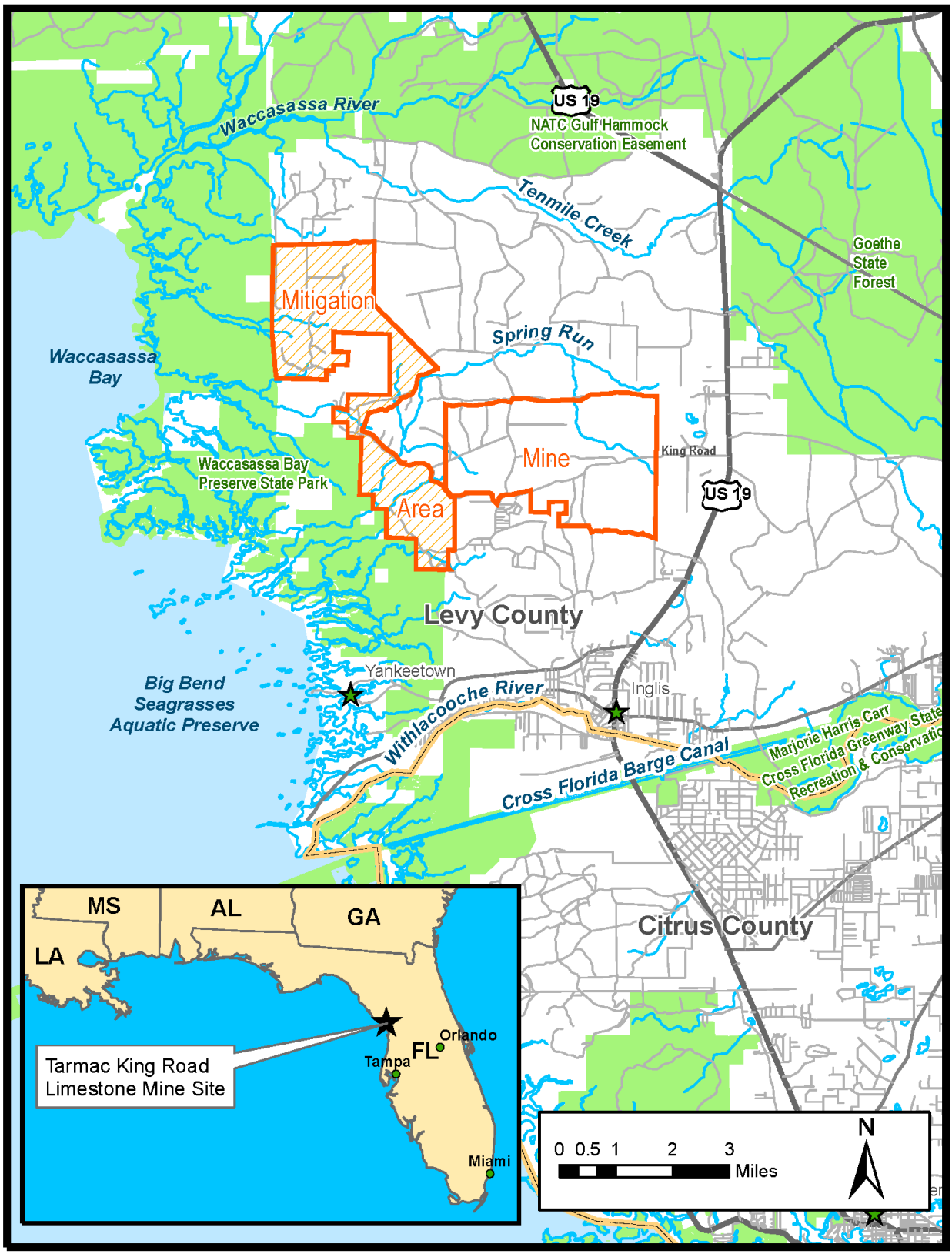

Figure S–1. Proposed Location of Tarmac King Road Limestone Mine and Mitigation Area

Historically, the mining and mitigation sites were primarily native hardwood hammock intermixed with freshwater marshes and flow-ways. The mitigation parcel also includes estuarine marshes. While periodic timbering occurred much earlier, more intensive harvesting of native hardwoods began in the 1950s. As native forests were cleared, they were replaced with planted pine. Today, both the proposed mining and mitigation areas are part of an actively managed timber operation; the majority of these areas are in varying developmental stages of third-generation pine.

S.3 PROJECT PURPOSE AND NEED

The applicant proposed a project purpose that the USACE reviewed and revised. The project purpose as defined by the USACE, and used in this EIS, is to provide a source of affordable construction-grade limestone aggregate, including aggregate that meets Florida Department of Transportation (FDOT) specifications for buildings and infrastructure, to satisfy the long-term public need for high-quality aggregate in west-central Florida.

Aggregate is an essential construction material consisting of granular mineral that can be used alone in construction projects such as bank stabilization projects or that can be mixed with other materials (e.g., a cement bonding medium) to make concrete and asphalt, which are necessary for the construction and maintenance of roads, bridges, buildings, homes, and other infrastructure vital to the Nation's economy. Aggregate can consist of naturally granular material like riverbed gravel or it can consist of rock materials that are crushed to meet a size specification. While different types of rock can be crushed to create aggregate, due to Florida's geology, suitable aggregate materials other than limestone do not naturally occur near the surface. Therefore, limestone is the predominant source of aggregate in Florida.

In 2011, Florida ranked tenth nationally in production and ninth in consumption of crushed rock (limestone and dolomite). These materials support a diversity of industries, including ready mix, block producers, concrete and asphalt road building, and precast concrete construction. In 2011, 82 percent of all crushed rock reported for use in the United States was used as construction materials. In Florida, approximately 44.6 million tons of crushed rock were consumed in 2011. Demand for aggregate materials is primarily dependent on activity in the public and private construction industries, which are influenced heavily by population growth and development. The underlying factors that would support a rise in prices of crushed rock were expected to be present in 2012, especially in and near metropolitan areas.

In Florida in 2010 (the last year for which complete information is available), approximately 3.8 million tons of crushed rock were supplied through Florida's ports, primarily from international sources. Domestic imports from nearby states are more commonly transported by truck or rail. Imports historically needed to meet Florida's demand for high-quality aggregate are further detailed in Chapter 2.

Congress has noted that the mining of such aggregates is "essential for national security, economic well-being and industrial production" (30 U.S.C. 1601). In Florida, aggregates are mined and produced primarily from limestone deposits that are limited in location and quality. The FDOT sets standards and implements testing of mined aggregate materials to ensure public safety and welfare. As described in Chapter 2, there currently are few FDOT-approved limestone mines within or just outside the area the proposed project would serve that produce high-quality, construction-grade aggregate. The USACE recognizes that there has been a public and private need for high-quality construction-grade aggregate in west-central Florida and throughout the state. Over the 7 years from 2006 to 2012, Florida produced over 466 million tons of crushed rock with a peak annual output of 140 million tons in 2006. Commensurate with the construction downturn associated with the recent economic recession, demand for crushed rock is lower now than in the years leading to that peak demand in 2006. Nonetheless, construction of housing units, nonresidential building space, roads and other infrastructure in west-central Florida will still result in the continued need for high-quality construction aggregate. The purpose of this EIS is to evaluate the environmental effects of alternatives to meet this long-term need.

S.4 AGENCY GOAL OR OBJECTIVE FOR THE *KING ROAD EIS*

The objectives of this *King Road EIS* are as follows:

- Evaluate the existing environmental condition and potential future impacts associated with the excavation of limestone from the proposed mine site in Levy County.
- Evaluate the existing socioeconomic condition and potential future impacts associated with the excavation of limestone from the proposed mine site in Levy County.
- Describe and assess alternatives to limestone mining at the proposed site in Levy County (i.e., sources of limestone outside the Levy County area).

S.5 DECISIONS TO BE MADE

Under the proposed action, Tarmac proposes to impact up to 2,068.5 acres of wetlands and 1,818.4 acres of uplands over a period of approximately 100 years. Approximately 4,195 acres of wetlands and 331 acres of uplands in an adjacent area would be restored and/or preserved. In addition, up to 522 acres of wetlands and 329 acres of uplands on the proposed mine parcel would also be preserved. The information compiled in this EIS will be used by the USACE to determine whether the proposed activities should be authorized and permitted by the USACE. The alternatives under consideration are described in Section S.8.1.2 and vary according to timing, mining breadth, mine location, and alternate source of aggregate. The alternatives include the No Action Alternative, the full mine-out plan (100 years of mining), limiting mining in environmentally sensitive areas, shipping aggregate into Florida harbors and/or rail terminals, and mining in other locations in west-central Florida.

S.6 PREFERRED ALTERNATIVE

Council on Environmental Quality regulations at 40 CFR 1502.14(e) require that a preferred alternative or alternatives be identified in the final EIS if one or more exist at the time the final EIS is issued. However, the regulations do not require that a preferred alternative be identified at the time the final EIS is issued. The USACE has not identified a preferred alternative at this time.

S.7 PUBLIC INVOLVEMENT

The process of preparing an EIS provides opportunities for public involvement. These opportunities include the scoping period and the public comment period for the EIS. The scoping period is required by 40 CFR 1501.7, while the public comment period is required by 40 CFR 1503.1.

S.7.1 Scoping

Scoping was conducted for the *King Road EIS* from February 19, 2008, through April 26, 2008. In total, the USACE received approximately 280 comments from 88 interested parties and individuals during the scoping period. This included comments from several Federal, state, and local agencies/officials, including the U.S. Environmental Protection Agency, National Marine Fisheries Service, Florida Department of Agriculture and Consumer Services, Florida Department of Environmental Protection (FDEP), Crystal River City Manager, and the Office of the Mayor and City Commissioners for the Town of Inglis, Florida.

The comments received were divided into the following 10 broad categories and are summarized below:

Water. The majority of comments were related to the potential impact of the Tarmac King Road Limestone Mine on water. Commentors felt strongly that the proposed mine would result in contamination of the local groundwater and their wells. There were also comments expressing concern that with the recent drought in central Florida (relative to March 2008), there was insufficient groundwater supply to operate the mine without impacting their wells or the Town of Inglis' water supply. Others were concerned that the mine would disrupt the natural flow of surface water across the area and to Spring Run. Commentors also expressed concern about the introduction of saltwater into the groundwater and their wells as a result of both mining into the water table and from storm

surge entering open pits or lakes within the mining area. Finally, one commentor thought there was sufficient groundwater supply to operate the mine.

Sensitive Habitat. The second most common issue raised was the potential impact of the mine on sensitive habitat. The majority of the commentors were concerned about impact on aquatic plants and animals and sensitive coastal ecosystems due to runoff from the mining area. Other commentors were concerned about impacts on threatened and endangered species that had been seen on the mine site.

USACE/Tarmac Mistrust. The majority of the commentors on this issue felt that neither the applicant nor the USACE could be trusted to honestly evaluate the environmental impacts in the citizens' best interest. Several commentors expressed distrust for any government agency and said the mine violated local laws. Other commentors mentioned that the applicant was not an American-owned company, provided biased information to its benefit, and did not own the land to be mined.

Social and Economic Impact. Commentors expressed concern for the impact of the mine on activities important to the local culture such as hunting, fishing, and bird watching. The loss of tourism and the negative economic impact on the fishing industry due to pollution from the mine was a concern to other commentors. Several commentors expressed support for the jobs that the mine was going to create in the area.

Impact on Wetlands. The impact on sensitive wetlands in and adjacent to the project site was an issue for a number of commentors. An additional concern was the potential negative impact on the natural evapotransporation in the mining area of the lakes that would be created as part of the mining process.

Transportation. A number of commentors were concerned about the increase in the truck traffic on U.S. Route 19 through the town of Inglis and the safety of the residents. Other commentors were concerned about the dust, noise, and overall air quality impacts of the increased trucking to and from the mine proposed for 12 hours per day, 6 days per week.

Cumulative Impacts. A number of commentors expressed concern over the cumulative environmental impacts of the Tarmac King Road Limestone Mine, as well as the proposed Progress Energy Levy Nuclear Plant (LNP) to the east of U.S. Route 19. Commentors specifically pointed to the amount of groundwater consumption proposed for each facility and the traffic increase during both construction and operation of these facilities as a big issue that must be evaluated.

Need. Commentors raised the issue that the mine was not needed to meet the current local demand as claimed by the applicant. Several commentors pointed to information readily available on the Internet that showed that Florida had exported millions of tons of limestone in the past year (2007) into Georgia and Alabama as evidence that the need is not there. One commentor said that limestone was needed to meet the local construction demand and to help build a hospital and school in Chiefland.

Environmental Damage. Several commentors were concerned about the increase in the greenhouse gases and the effects on global warming that would result from the mine construction and operation. A few commentors stated that the mine would result in significant and/or irreparable environmental damage and should be stopped.

Blasting Impacts. Damage to residents' homes due to blasting at the mine site was the concern of several commentors. Commentors mentioned possible creation of sinkholes as a result of blasting and rock removal as an issue as well.

In addition to these comments, the USACE received a petition signed by 985 Florida citizens urging the city, county, and state agencies to "apply the strictest standards in the evaluation of this proposal" (the Tarmac mine proposal for Levy County).

S.7.2 Public Comments on the *Draft King Road EIS*

NEPA regulations mandate a minimum 45-day public comment period after publication of a draft EIS to provide an opportunity for the public and other stakeholders to comment on the EIS analysis and results. In this case, the USACE allowed for a public comment period of 60 days. The public comment period began on May 11, 2012, and ended on July 11, 2012.

A public hearing was held in Inglis, Florida, on May 31, 2012, and oral comments on the draft EIS were taken. Approximately 80 people attended the hearing. There were 225 comments received from the public and Federal and state agencies during the public comment period. The full text of each comment and the USACE response may be found in Appendix I of this *Final King Road EIS*, along with copies of all comment documents and the meeting transcript.

Purpose and Need

A number of commentors questioned the purpose and need, suggesting that there is more than enough high-quality aggregate available to supply the Primary Market Area, either from local mines or through imports from out-of-state mines. Some commentors were opposed to the 100-year timeframe for the permit and expressed concern that it is not possible to predict the need for aggregate or to analyze the potential impacts that far into the future. Commentors also raised concerns about conflicting land uses, accuracy of the economic analyses, population growth, and product demand projections. In addition, others felt that the mining would have adverse impacts on the health and welfare of the community and ecosystems, and that there would be no benefit to the community from the proposed mining operations.

Alternatives

A number of commentors either expressed support for the No Action Alternative (i.e., no mining) or for Alternative 7 (issuance of a 30-year permit for a smaller mining area) if the No Action Alternative is not selected. Some commentors expressed support for Alternative 7 as their first choice. Some commentors offered opinions about parameters that should be considered when making the decision, expressed opposition to specific alternatives, or suggested that the range of alternatives is not adequate because it did not include factors they consider to be important.

Surface Water

Commentors expressed concern that both surface and groundwater quality could be impaired by the proposed activities, some citing specific water quality parameters that could be affected. Some commentors noted that there would be impacts on humans and sensitive species, that surface water flow patterns would be disrupted, or that surface water and then groundwater could be impacted by saltwater as a result of mining activities. Other commentors suggested that water use would be inconsistent with state water policy and county water plans or that the water quality criteria cited in the EIS be updated to reflect new State of Florida water quality criteria approved by the U.S. Environmental Protection Agency.

Hurricane Surge

Commentors were concerned that the area is particularly vulnerable to tropical storm impacts and that the height or design of the proposed berms would not adequately protect the area from storm surges and subsequent impacts, including saltwater intrusion into the groundwater. Several commentors expressed their opinion that the storm surge risk analysis in the EIS is inadequate because it does not consider the correct probabilities or intensities of storms over the proposed 100-year project duration.

Sea-Level Rise

Commentors were concerned that sea-level rise over the proposed 100-year life of the project would cause inundation in portions of the project area and the mitigation area prior to completion of the project. Other commentors were concerned that the combination of sea-level rise and storm surge was not adequately analyzed in the draft EIS.

Groundwater

A main concern commentors expressed is that too much groundwater would be used for mining activities, which would result in unacceptable drawdown and the aquifer would not be able to support wells for drinking water and other domestic uses. Other concerns were that the quantity of water withdrawn for mining would reduce the level of the aquifer and cause saltwater intrusion, and that the proposed water withdrawal and mining would result in sinkholes forming on nearby properties. Commentors also expressed concerns about the adequacy and accuracy of the groundwater modeling.

Wetlands

Commentors expressed opposition to the project because of wetlands loss, some voicing concerns about destruction of pristine wetlands that they asserted cannot be replaced. There were suggestions that neither Alternative 2 nor 5 can be selected because the potential wetland impacts from either alternative cannot be mitigated and that Alternative 7 is the least environmentally damaging. Commentors also provided opinions that wetlands mitigation does not work or took exception to the proposed mitigation plan and supporting analyses. Commentors raised concerns about sea-level rise potentially impacting the proposed mine and mitigation area and that berms around the site will cause flooding that would cause wildlife to drown or be displaced. Others pointed out that the sea-level rise will impact and destroy wetlands that were approved as mitigation credits for mining. One commentor wanted to know if a permit could be issued for an alternative with a negative Uniform Mitigation Assessment Method (UMAM) score; another asked a question about the goal of the mitigation.

Threatened and Endangered Species

Commentors raised concerns about potential impacts on both federally and state-listed species, some insisting that there are more individuals present on the proposed mining site or nearby than found during U.S. Fish and Wildlife Service and other surveys identified in the EIS.

Vegetation, Wildlife, and Habitat

One commentor was concerned that sinkholes on the site were not surveyed to identify the presence of unique species that use sinkholes as habitat. Other commentors were concerned that existing wildlife and their habitat or potential habitat had not been properly identified and that they and the ecosystem as a whole would not be properly protected during the life of the project. One commentor raised the concern that there could be interactions between humans and black bears on the site that could be detrimental to both and recommended that an electric fence be installed around active mine units to keep the bears out. Another commentor asked that a compendium of biological information for all species present on the site be included in the EIS.

Air Quality

Several commentors were concerned about impacts from heavy truck traffic, specifically, potential carcinogenic effects from diesel exhaust, as well as dust, noise, and fumes degrading air quality along the transportation routes. One commentor expressed concern about using spring water for dust suppression.

Rainfall

Commentors were concerned about water usage given the low rainfall and drought conditions in recent years. Several commentors expressed concern that water budget calculations are incorrect because they are based on rainfall data that are not representative of either the site or existing meteorological conditions and that the impacts of groundwater use were not adequately identified because these analyses overestimated the amount of recharge.

Seismicity/Noise

Commentors noted that the EIS indicated exceedances of state noise and blasting vibration limits during mining activities and were concerned that the proposed mitigation actions were not sufficient to avoid property damage to nearby residences and to provide relief from excessive noise and vibration.

Cultural Resources

A commentor expressed the opinion that the EIS does not fully analyze the impacts of the loss of ecological and cultural values. Another commentor was concerned that increased truck traffic in the vicinity of the Dunnellon Boomtown Historic District would have a negative impact on the annual Boomtown Days celebration, Jazz Up Dunnellon, and other community events.

Socioeconomics

Commentors expressed their concerns that mining would affect tourism in the area. Concerns were related to the potential loss of the natural environment, which would impact ecotourism; and for the noise, pollution, and truck traffic to make the area less attractive for tourism in general. Concerns regarding how the increased traffic would affect the City of Dunnellon, including reducing property values along the truck route, were also raised. Commentors questioned the aggregate demand projections in the EIS and suggested that importing aggregate from outside the Primary Market Area would be a cost-effective and easy option for meeting current and future demand in lieu of mining aggregate locally.

Trucks and Traffic

A number of commentors expressed concerns about the increased traffic volume, especially heavy truck traffic, in and around their hometowns and questioned the inputs and results of the traffic study, especially because there are existing weight restrictions on certain roadways. Both Inglis and Dunnellon were cited as areas in which the quality of life and traffic patterns would be negatively affected. Overall concerns related to difficulties with vehicles or pedestrians crossing roads and highways; traffic safety issues, including bicyclists, children crossing streets in school zones, and an increased number of traffic accidents; increased noise, dust, and road wear; and the effect of the cumulative increase in traffic with other projects such as the LNP.

Costs

Commentors raised concerns about who would be paying for the impacts of the mining operations once mining ceases.

Cumulative Impacts/Direct/Indirect

Several commentors stated their opinions that the cumulative impacts analysis is inadequate because it does not include all potential activities that could affect the proposed action. Other commentors wanted specific areas to be evaluated or evaluated in more detail, in particular cumulative effects on groundwater, traffic, wetlands, floodplains, special aquatic sites, other waters including Outstanding Florida Waters, wildlife habitat, and federally endangered and threatened species.

Miscellaneous

Commentors expressed a variety of concerns, including the need to consider activities occurring in a wider area than evaluated for cumulative impacts; about whether the project was compliant with state or county requirements for berm design and land use; impacts of Tarmac's test dig; future land use in the area; need for financial assurance for potential damages and compensatory mitigation; physical safety concerns for children who might enter the mining area; and the potential 100-year length of the permit and monitoring of impacts over that timeframe. There were requests to involve additional state or Federal agencies. One commentor took exception to the list of environmental documents cited in Section 1.5 of the EIS and another suggested that the EIS should consistently refer to the exact, rather than approximate, size of the project site. Another commentor expressed the concerns of local residents about impacts on water resources, blasting vibration, and increased truck traffic through the community of Inglis. One commentor was of the opinion that the proposed action violates the Coastal Zone Management Act. There were also commentors who complimented the quality and thoroughness of the EIS.

Comments Received After the Public Comment Period

Eleven additional comments were received after the close of the public comment period on July 11, 2012. These comments are not categorized by issue topic, but are listed by date received in the comment response section of Appendix I. Most of the comments are testimony or documents submitted during or as part of the proceedings of Nuclear Regulatory Commission and Atomic Safety and Licensing Board hearings for the proposed LNP. Additional comments were also provided regarding comment period deadlines and information the commentor feels was excluded from or insufficient in the USACE's *Areawide Environmental Impact Statement on Phosphate Mining in the Central Florida Phosphate District*. The commentors are of the opinion that these comments are also relevant to the Tarmac King Road Limestone Mine project and EIS. These commentors expressed opinions about the potential impact of groundwater withdrawal for LNP operations relative to the water table, saltwater intrusion, and the potential to cause sinkholes, adversely affect ecosystems, wetlands and sensitive species, and contribute to other detrimental impacts, and how those impacts should be considered cumulatively in the *King Road EIS* with proposed Tarmac King Road Limestone Mine operations and other mining operations in the area. These and other commentors called for a supplement to the *Draft King Road EIS* to address these concerns.

One commentor stated the opinion that the *Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2 (LNP EIS)* is legally deficient because did not adequately assess impacts on all relevant listed and proposed species under the Endangered Species Act, nor did it adequately address potential impacts of groundwater withdrawal. The commentor is of the opinion that because of these deficiencies in the *LNP EIS*, none of these impacts were included or considered as adverse cumulative effects in the *King Road EIS*, and that a supplement to the *Draft King Road EIS* is therefore required. This commentor also notes that impacts from the Knight Mine must also be considered.

S.8 ALTERNATIVES

S.8.1 Alternatives Analysis

The alternatives analysis identified and evaluated a range of reasonable alternatives that could substantially meet the stated purpose and need for the project. This analysis qualitatively screened both the offsite and onsite options that could feasibly satisfy the need for a source of affordable construction-grade limestone aggregate, including aggregate that meets the FDOT specifications, for buildings and infrastructure to satisfy the long-term public need for aggregate in west-central Florida. The alternatives that could reasonably supply this aggregate were then subjected to further evaluation to consider the impacts that each alternative would have on the human and natural environment.

S.8.1.1 Offsite Alternatives

S.8.1.1.1 Regional Management Alternatives (Use of Mines from Other Regions)

FDOT has developed specifications for aggregate used in its construction projects and a certification program to ensure that only aggregate meeting its specifications is used. This certification process for mining products starts with certification of the mine itself. A mine must first be approved by the FDOT as a supplier of aggregate material; then the products from that mine must meet the specifications for each particular product.

In addition to considering the certification status of a mine and its products and size characteristics of the approved aggregate products, the quality of the material must be considered. There are several limestone formations within six strategic aggregate mining areas throughout Florida, as identified by the FDOT, that serve as the primary sources of limestone in Florida. Not all limestone mines produce suitable material for all uses of crushed rock. Also, chemical composition, such as higher silica content in limestone, can make aggregate harder and more angular so that it has a higher compressive strength and is more usable in asphalt or concrete. In addition to requiring a particular grade aggregate to make a particular product, the use of the product may require that the aggregate have certain chemical characteristics or meet certain quality standards.

Higher-quality Florida limestone is primarily mined from four designated resource areas: the Lake Belt, Charlotte-Lee County, Sumter-Hernando-Citrus County, and the Taylor-Dixie-Big Bend area. The quality of Florida limerock available from non-Lake Belt supply areas has been steadily declining.

Mines Outside of the State of Florida

Alternate sources (domestic and international) of crushed rock are available outside of Florida—the question is determining how practicable it is to obtain material from them. Sources outside of Florida involve their own environmental impacts, economic effects, and additional transportation costs compared with in-state sources.

There are alternative sources of crushed rock that could supply the west-central Florida market. One possibility is to ship limestone from other parts of Florida or limestone or other rock from other states such as Alabama or Georgia.

The cost of shipping rock from other states or other countries into Florida and then transporting the material to the west-central Florida market can be considerable. The average cost to ship aggregate in 2006 (the latest independent data available) ranged from $0.06 per metric ton-mile via rail to $0.13 per metric ton-mile via truck. In 2006, the California Geologic Survey estimated that every mile aggregate is hauled by truck would add a minimum of $0.15 per ton. While there are multiple cost components associated with truck hauling, fuel prices are higher now than in 2006. The U.S. city average for automotive diesel fuel in 2006 was $2.814 per gallon; for 2012, the average was $4.000. Using these costs for a comparison, this translates to a greater than $20 increase in the cost per ton for aggregate shipped via rail and a greater than $41 increase per ton for aggregate trucked from Georgia to Reddick, Florida, the approximate geographical center of the Tarmac Primary Market.[1] If the FDOT were to approve mines in Alabama for use in the Primary Market Area, transportation costs from mines in that state would be similar or higher. Tarmac intends to truck aggregate from the proposed mine to customers within a 70-mile radius (nominally a 100-mile driving radius) of the mine, which would add a maximum of $15 per ton. Trucking costs from the proposed Tarmac King Road Linestone Mine site to Reddick, Florida, would add just over $6 per ton.

In addition to domestic sources of crushed rock, the United States is a large importer of crushed rock. Foreign sources that have been known to supply rock in Florida include Mexico, Canada, and the Bahamas. The amount of rock being imported from these countries is very small compared to the amount of crushed rock being produced in Florida, Georgia, or Alabama. In 2012, imports from these countries amounted to approximately 11.3 percent of the output from these states.

Mines Within the State of Florida

Crushed stone mines (limestone and other aggregates) are operated in 22 counties in Florida. The use of other mines in Florida was given consideration to determine if mining reserves at these other locations could satisfy the west-central Florida supply chain demand for aggregate materials. Trucking costs add approximately $0.15 per ton-mile, substantially increasing the total cost of aggregate sourced from other mines in Florida.

The Florida aggregate supply chain, excluding the south and southeast Florida areas served almost exclusively by aggregate from the Lake Belt mines of Miami-Dade County, was divided into the Tarmac Primary Market and four additional surrounding market areas, listed below:

- Northwest Florida Market
- Orlando Market
- Jacksonville Market
- West Florida Market

[1] This cost is based on the approximate distance between the closest FDOT-approved coarse aggregate mines near Macon, Georgia, and Reddick, Florida. Actual distances between the pick-up and delivery locations may be considerably farther, further increasing costs. Costs for transferring aggregate from rail to truck are not included here; however, trucking costs from the rail terminal in Ocala Florida to Reddick are included in this figure.

Primary Market (Levy, Citrus, and Nearby Counties)

The Primary Market is defined as the 70-mile radius around the proposed Tarmac King Road Limestone Mine site (see Figure S–2). This distance equates to the maximum distance that aggregate can be hauled via truck to consumers before the transportation costs become too high as to not make it viable. This area includes all of Levy, Citrus, Hernando, Marion, Sumter, Alachua, Gilchrist, and Dixie Counties; large portions of Pasco, Lake, Putnam, Bradford, Union, Lafayette, and Columbia Counties; and small portions of Orange, Volusia, Taylor, Suwannee, Clay, Polk, Pinellas, and Hillsborough Counties. Figure S–2 also includes the existing freight railroad in and around the Primary Market.

As of November 12, 2012, there were 32 FDOT-certified mines located in the Primary Market. Four more FDOT-certified mines were located directly outside (within 6 miles) of the Primary Market.

Of the 32 FDOT-certified mines in the Primary Market, 21 produced limerock base; 3 produced screenings and/or sand materials; 3 produced a combination of those materials and/or stone for ditches, draws, pipes, bedding material, and shoreline protection; and 4 produced stone for bedding material and shoreline protection. Only 1 mine in the Primary Market produced coarse aggregate such as #57 or S1A stone (it also produced other stone, sand, and screening products). Of the 4 mines located directly outside of the Primary Market, 1 produced limerock base; 1 produced underdrain filter stone; and 2 produced a combination of screening and/or sand materials, and/or stone for ditches, draws, pipes, bedding material, and shoreline protection.

The National Stone, Sand, and Gravel Association estimates that about 10 tons of aggregates per person are used annually in America. However, this consumption rate is based on averages throughout the United States, includes all aggregates, and could vary widely from state to state. To determine the annual amount of crushed rock per person for Florida and the Tarmac Primary Market Area, population data for 2001–2010 were used in conjunction with the actual Florida crushed rock consumption reported for the same time period.[2] For 2001–2010, the annual crushed rock per person in Florida varied year to year from a minimum of 3.0 tons per person to a maximum of 7.5 tons per person. The 10-year average was 5.3 tons per person.

[2] Estimates of demand in the Primary Market were calculated as a function of the total state population and crushed rock consumption. The state-wide consumption of crushed rock was used to generate a consumption estimate on a per-capita basis. The per-capita consumption rate was then applied to population in the Primary Market Area to yield an estimate of demand. Population projections were developed using data from the 1990, 2000, and 2010 census to extrapolate a linear trend for each county in the market area. The projected demand was then estimated by applying the same per-capita methodology to the projected population of the market area.

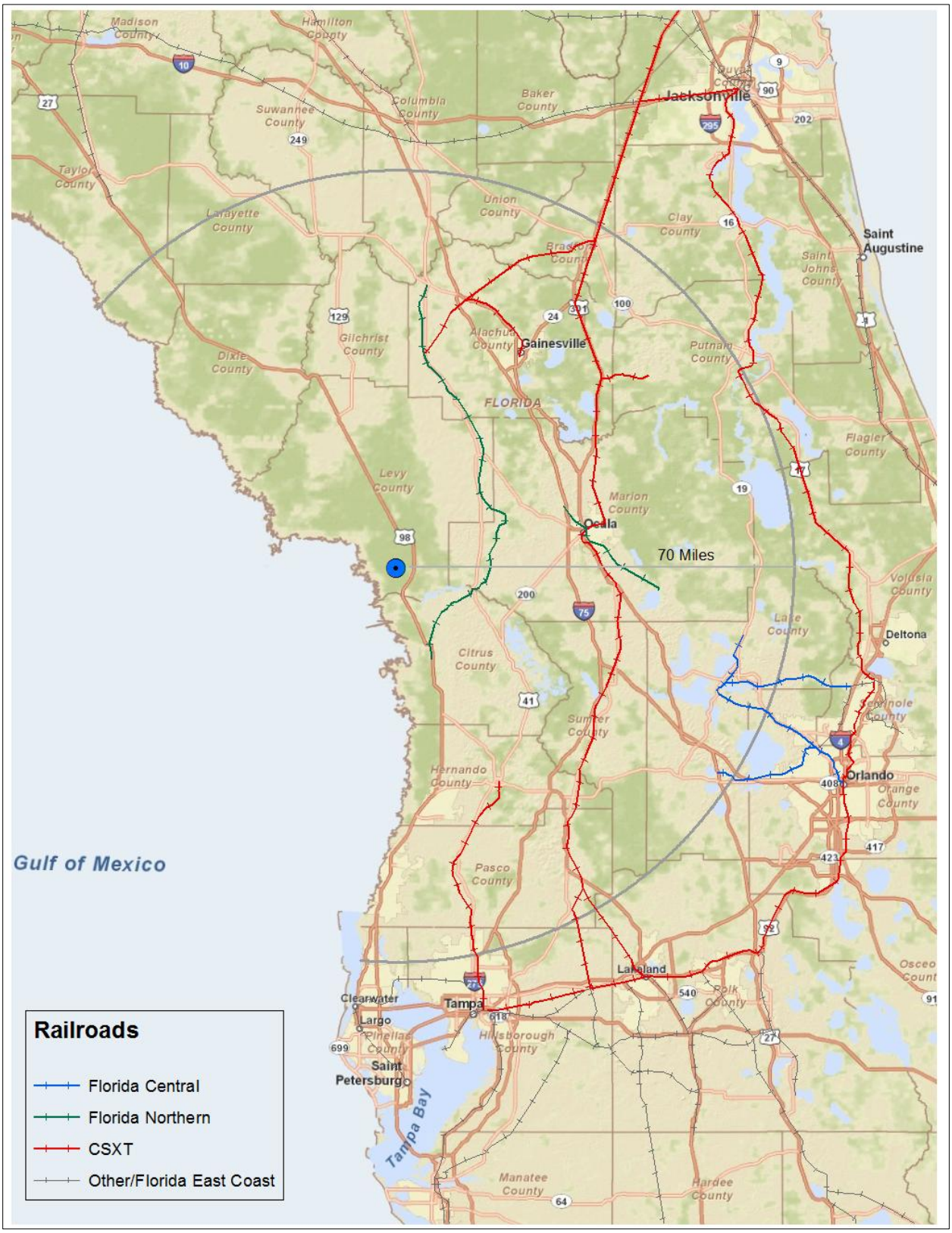

Figure S–2. Tarmac Primary Market – 70-Mile Radius Around Proposed Mine

Table S–1 includes the 2001–2010 averages, and projections of population, and crushed rock average and peak consumption for Florida and the Tarmac Primary Market Area in 2020 and 2050. Consumption of crushed rock within the Primary Market over the last 10 years averaged 11.2 million tons annually, with a peak consumption of 15.9 million tons. At this average level of consumption, it is estimated that the supply of crushed rock in the Primary Market would need to increase by approximately 200,000 tons annually just to keep pace with population growth. At this rate, the annual demand for crushed rock in the Primary Market Area is estimated to increase to 13.1 million tons by the year 2020. If the consumption rate returns to the peak state-wide levels experienced in 2005–2006, the annual demand for crushed rock in the Primary Market could increase to 18.6 million tons by 2020. Similarly, at the average level of consumption, the annual demand for crushed rock in the Primary Market Area is estimated to increase to 19.4 million tons per year by 2050. If the consumption rate returns to the peak state-wide levels experienced in 2005 and 2006, the annual demand for crushed rock in the Primary Market could increase to 27.6 million tons by 2050.

Table S–1. 2001–2010 Averages and Peaks, and Projected Demand for Crushed Rock Based on Current and Projected Population Growth in Florida and the Tarmac Primary Market Area

	2001–2010			2020 Projections			2050 Projections		
	Average Total Population (millions)	Consumption (million tons per year)		Population (millions)	Consumption (million tons per year)		Population (millions)	Consumption (million tons per year)	
		Average	Peak		Average	Peak		Average	Peak
Florida	17.4	98.5	140	21.8	114	162.1	30.6	160.1	227.6
Primary Market	2.0	11.2	15.9	2.5	13.1	18.6	3.7	19.4	27.6

Northwest Florida Market

The Northwest Florida Market includes 16 counties that make up the Florida panhandle. As of November 12, 2012, 13 mines were approved by the FDOT to produce aggregate products. Seven of these mines produced limerock base and 5 mines produced screenings and/or sand materials. One mine produced screenings and/or sand materials and recycled aggregate base. None produced coarse aggregate. Eight mines in Alabama, 2 mines in Georgia, and 1 mine in Louisiana have been approved by the FDOT to provide construction-grade aggregate for the district market area. Of these 11 out-of-state mines, 1 mine produced limerock base, 4 mines produced screenings and/or sand materials, and 1 mine produced stone for bedding material and shoreline protection. Five out-of-state mines produced coarse aggregate, of which 4 also produced other stone and screening products.

Orlando Market (Orange County)

While the Orlando Market is generally considered to be Orange County, material produced within, or sent to, this area from Brevard, Flagler, Lake, Marion, Osceola, Seminole, Sumter, and Volusia Counties was considered in this market analysis. As of November 12, 2012, there were 19 mines in these counties approved by the FDOT. Nine of these mines produced limerock base; 2 mines produced screenings and/or sand materials; 6 mines produced a combination of those materials and/or stone for ditches, drains, pipes, bedding material, and shoreline protection; and 1 mine produced only stone for shoreline protection. One mine produced coarse aggregate, as well as screenings. One of the recycling facilities produced recycled concrete and the second recycling facility produced recycled concrete aggregate base. There is also 1 mine in the Bahamas approved by the FDOT to provide limerock base for this market. In addition, the Lake Belt has historically provided approximately 16 million additional tons per year of aggregate into this market.

Jacksonville Market (St. Johns County)

While the Jacksonville Market is generally considered to be St. Johns County, material produced within, or sent to, this area from Alachua, Baker, Bradford, Clay, Columbia, Dixie, Duval, Gilchrist, Hamilton, Lafayette, Levy, Madison, Nassau, Putnam, Suwannee, Taylor, and Union Counties was considered in this market analysis. As of November 12, 2012, there were 16 mines approved by the FDOT. Nine of these mines produced limerock base; 1 mine produced screenings and/or sand materials; 2 mines produced a combination of those materials and/or stone for ditches, drains, pipes, bedding material, and shoreline protection; and 2 mines produced only stone for shoreline protection. Two mines produced coarse aggregate, as well as other stone, sand, and screening products. There are also 16 mines in Georgia, 1 in North Carolina, 1 in South Carolina, and 1 in Nova Scotia, Canada, that are approved by the FDOT to service the market area. Six of these mines produced screenings and/or sand materials. Thirteen of these out-of-state mines produced coarse aggregate, 11 of which also produced other stone and screening products. In addition, the Lake Belt has historically provided approximately 4 million additional tons per year of aggregate into this market.

West Florida Market (Hillsborough, Pinellas, and Lee Counties)

While the local aggregate market is generally considered to be Hillsborough, Pinellas, and Lee Counties, it also includes Charlotte, Citrus, Collier, De Soto, Glades, Hardee, Hendry, Highlands, Hernando, Manatee, Okeechobee, Pasco, Polk, and Sarasota Counties. As of November 12, 2012, there were 37 mines and 5 recycling facilities approved by the FDOT. Ten mines produced limerock base, 5 mines produced screenings and/or sand materials, and 12 mines produced a combination of those materials and/or stone for ditches, drains, pipes, bedding material, and shoreline protection. Two mines produced stone for ditches, drains, pipes, bedding material, and shoreline protection, and 8 mines produced coarse aggregate, as well as other stone and screening products. Five recycling facilities produced concrete aggregate base. There is also one mine in Puerto Cortes, Honduras, that is approved by the FDOT to provide coarse aggregate and screenings to the West Florida Market. In addition, the Lake Belt has historically provided approximately 2.0 million additional tons per year of aggregate into this market.

Market Summary

In consideration of the current and forecast aggregate supply chain situation, to meet the projected demand over the long term proposed by the applicant (100 years), new mines must be constructed, output from existing mines must be increased, and/or aggregate must be imported from areas outside the Primary Market. The Tarmac King Road Limestone Mine site is proposed to produce just over 3 million tons annually.

Because the mines in the surrounding Florida market areas lack the capacity collectively to produce the quality and/or quantity of aggregate necessary to meet their public needs locally, aggregate must be imported into those markets from other mining areas within or outside of Florida. As a result, obtaining aggregate consistent with FDOT specifications and construction-grade aggregate to satisfy the needs of the Primary Market from the other market areas is not a reasonable alternative.

S.8.1.1.2 Development of New Offsite Rock Mines Instead of the Tarmac King Road Limestone Mine

The construction of new rock mines in other locations as an alternative to the proposed Tarmac King Road Limestone Mine to provide a source of affordable construction-grade limestone aggregate, including aggregate that meets the FDOT specifications, for buildings and infrastructure to satisfy the long-term public need for high-quality aggregate in west-central Florida was considered. Tarmac prepared an alternative analysis describing the company's view of this alternative. Areas covered in Tarmac's report include the following:

- Quality of limestone reserves
- Availability of property for acquisition and use
- Ability to supply the entire west-central Florida market from a single source
- Transportation logistics and cost

- Need to avoid multiple handling of limestone to minimize product losses
- Electric power infrastructure for large dragline equipment

The applicant's conclusions are as follows:

- Only the Avon Park and Suwannee Formations have the potential to produce FDOT-certified limestone aggregate within the market area. The outcrop portions of the Suwannee Formation within the proposed market area are small and only minable in small segments in several surrounding counties, none of which could produce the same amount of FDOT-quality aggregate as at the proposed Tarmac King Road Limestone Mine site.

- The Tarmac King Road Limestone Mine site overburden (the soil material overlying the limestone) averages 2 feet thick, with the Avon Park Formation below it being over 100 feet thick, meaning more aggregate can be mined while disturbing less acreage compared with other locations. The Avon Park Formation in the surrounding counties in the proposed market area is either too deep to economically mine or located in population centers, where mining would be difficult to permit.

- The difficulty in obtaining proper zoning, the expanding population in the areas where the Avon Park Formation would be more easily minable, and unwilling sellers would slow down or even halt any potential alternative site from being considered.

- There were no locations identified that contain the Avon Park Formation, paved roads, and sufficient electric power to make mining feasible.

The USACE reviewed the information provided by Tarmac, and also performed an independent analysis of potential alternative sites for new mines. As discussed in this summary, the USACE found that the practicability of importing aggregate into the Primary Market Area is limited. As described earlier in this section, insufficient supply of high-quality aggregate in the region surrounding the Primary Market Area does not currently allow those areas to be reasonable alternative sources. If additional mines were authorized in those surrounding markets, local demand within the market area for any new mine would be expected to consume the additional aggregate, particularly as the population increases. Permitting and developing new mines in Florida is often difficult and time-consuming. Importing aggregate from mines in other states or countries would not be a reasonable alternative because transportation costs would not allow for an affordable supply of construction-grade and FDOT-approved aggregate.

A review of the Florida Geological Survey Open File Map Series shows that the majority of the Primary Market Area is overlain with unconsolidated sediments or rock formations with smaller proportions of well-indurated (not as hard) limestone such as that found in the Ocala Limestone Formation. Most of the FDOT-certified mines in the Primary Market Area that supply only the lower-quality limerock base material are mining Ocala limestone. The substantially higher proportions of well-indurated limestone found in outcroppings of Avon Park and Suwannee Limestone has led mining companies in the region to focus on these formations to obtain FDOT-quality and construction-grade limestone aggregate. In areas where these outcroppings do not occur, removing the overburden of soil and lower-quality limestone to reach those specific formations requires mining more land area to excavate the same volume of FDOT-certified and construction-grade material. While other limestone formations can contain sections of harder rock, more excavation is required to obtain the same volume of this high-quality material. The additional excavation makes mining of FDOT-certified and construction-grade limestone substantially more costly and does not allow for an affordable source of FDOT-certified and construction-grade limestone; therefore, this alternative was determined to not be a reasonable alternative.

S.8.1.1.3 Shipping Aggregate into the Region Through Florida's Harbors

Approximately 3.8 million tons of crushed rock or aggregate were imported into Florida's ports in 2010 primarily from the Bahamas, Canada, and Mexico. Starting in 2010, a limited amount of crushed rock was imported from Lithuania and Norway. The Ports of Tampa and Jacksonville account for nearly 75 percent of all of the 2010 imports. Imports of crushed rock into Florida ports from 2008 to 2010 decreased approximately 37 percent. During this time, the Port of Jacksonville experienced the

greatest decline in crushed rock imports, followed by Port Canaveral. Of the remaining deepwater ports in Florida, three (Port of St. Petersburg, Port of Key West, and Port St. Joe) take in no imports, and five (Port Everglades, Port of Fort Pierce, Port of Miami, Port of Palm Beach, and Port Fernandina) imported no crushed rock in 2010. However, Port St. Joe is planning an aggregate facility with an estimated capacity of 300,000 tons within 5 years and between 0.5 and 4 million tons within 10 years. In 2011, Port Citrus was added to the Florida Seaport Transportation and Economic Development Council as the 15th deepwater port in Florida. Port facilities do not currently exist there; however, the Citrus County Port Authority is undertaking a feasibility study in an effort to establish a port within the county. The port would be located along the Cross Florida Barge Canal, and the proposed King Road mine is regarded by Citrus County as a high candidate for port recruitment. The lower costs associated with sea transport could expand the potential market area of the proposed mine. Currently, there are no plans for the port to import crushed rock. It will likely be several years before any development begins and materials begin to flow in and out of the port. The depth of the Cross Florida Barge Canal is a limiting factor for vessel size, and the Citrus County Port Authority states that its predominant clients will likely be barge-based operations. This would influence the distance to viable sources and destinations of imports and exports, including limestone aggregate.

There are several ports along the Florida coast that have the capacity to receive additional crushed rock imports. However, all of the ports are outside of the Primary Market, and the cost of transportation of the aggregate from the port to the customer must be added to the cost per ton. In addition, rail access is either limited or not directly available at most ports. As noted previously, aggregate has a low cost-to-weight ratio, and additional handling and transportation compounds the price per ton. Using the costs to ship by truck to the approximate center of the Primary Market (Reddick, Florida), an additional $16.50 per ton would be added to aggregate coming from the Port of Tampa or the Port of Jacksonville (approximately 110 miles), nearly $21 per ton from Port Manatee (approximately 138 miles), and over $21 per ton from Port Canaveral (142 miles). The transportation costs from the proposed King Road Mine site to Reddick would be just over $6 per ton. Other Florida ports, or ports outside of Florida such as Savannah, Georgia, are even greater distances from the Primary Market. Due to the limited rail network, options for shipping via rail from the ports are limited to delivery only to a few end points (i.e., terminals) in the Primary Market such as Gainesville, Ocala, and Orlando. Transportation from there would have to occur via truck, or via additional rail then truck. Where feasible, this would add approximately just under one-half of these above costs per ton, plus unloading and reloading costs, and then any additional truck haul cost to the final destination. Based on these increased transportation costs, shipping aggregate to the west-central market from harbors outside of the Primary Market would not provide an affordable source of construction- and FDOT-grade material, and therefore is not a reasonable alternative.

S.8.1.1.4 Shipping Aggregate into the Region Through Rail Terminals

Shipping aggregate into the Tarmac Primary Market through rail terminals was evaluated as an alternative to the Tarmac King Road Limestone Mine. Currently, Florida has approximately 2,786 miles of mainline track, which are owned by 15 operating line-haul railroads and terminal or switching companies. The Florida rail network in and around the Tarmac Primary Market is included in Figure S–2.

In 2008, approximately 25 million tons of nonmetallic minerals were shipped by rail throughout Florida, with phosphates from central Florida and crushed rock from south Florida composing the majority. Imports by rail of nonmetallic minerals from outside of Florida were mostly from Georgia (3.9 million tons) and Illinois (1.4 million tons).

Providing aggregate to meet long-term demand in the Tarmac Primary Market via rail would require multiple originations and terminations. Aggregate destined for the northern half of the market area would likely have to be shipped via truck, barge, or other rail to the rail terminal in Jacksonville. Aggregate destined for the southern half would likely have to be similarly shipped to Tampa. CSX Transportation rail lines would then ship the aggregate from these two locations to terminals in Orlando, Ocala, Gainesville, and Newberry. The aggregate would then need to be unloaded at the rail termination point into trucks and transported to the customer site. Costs to ship by rail to the approximate center of the Primary Market (Reddick, Florida) would be an additional $6 to $7 per ton added to aggregate coming from either Tampa or Jacksonville to the closest terminal, which is also proximal to Reddick. Transportation from

these terminals in either Gainesville or Ocala to Reddick via truck would range from over $2 to almost $4 additional per ton. Unloading rock from trains and reloading onto trucks would add additional costs. The transportation costs from the proposed King Road Mine site to Reddick would be just over $6 per ton. Based on the limited amount of railroads and terminals within the Tarmac Primary Market (see Figure S–2), the distance of truck travel in addition to the railroad travel for many customers would be extensive. The multiple originations and terminations, in addition to the truck miles traveled, would add substantial costs to the price per ton. Transfers between modes of transportation are also undesirable because repeated handlings can cause breakage, thereby degrading aggregate sizing.

Expansion of the railroad network into and within the Tarmac Primary Market would be required to reduce travel time and transportation costs and make aggregate from outside the area more accessible to customers. Identified projects to increase the capacity and accessibility of railroad facilities at the Ports of Tampa, Canaveral, and Jacksonville are estimated to cost $160 million, but have not been funded as of December 2010.

The limited rail coverage in the Tarmac Primary Market, little to no planned expansion over the next 20 years, and the resultant increase in cost due to multiple transportation modes as discussed in this section, would not allow shipping aggregate into the region by rail to be a reasonable alternative that would provide a long-term, affordable source of construction- and FDOT-grade aggregate.

S.8.1.1.5 Using Other Material to Satisfy Construction Needs

Limestone has historically been the primary type of aggregate used in Florida because there are extensive deposits within the state that yield products suitable for use in the construction industry. Other suitable minerals such as granite are not accessible in Florida in a form or to an extent that supports mining.

Alternatives to mined aggregate, such as recycled concrete or asphalt, may offer feasible alternatives to additional mining. Critical factors affecting the potential for these materials to be widely used as alternatives to newly mined materials are the availability and quality of the recycled materials and the feasibility of reusing them to formulate new end products that meet FDOT specifications or other industry standards. Not all concrete applications allow for 100 percent recycled aggregate content, as certain properties of concrete change as the percentage of recycled content used is increased. Due to the presence of hardened cement paste rather than pure natural stone aggregate, as the percentage of recycled aggregate is increased, shrinkage and water absorption also increases, while wear resistance and the modulus of elasticity of concrete decreases. Therefore, recycled aggregate cannot fully replace virgin natural aggregate material.

Other recycled materials are currently being used in construction; however, supply of these materials is far below that needed to replace stone aggregate. For instance, crushed glass can be used as a component in road construction. In 2010, 11.5 million tons of glass entered the municipal solid waste stream in the United States. Just over 3 million tons of it were recycled, and 90 percent of this was used to make new containers. This relatively small supply, competing demands for these materials, and restricted suitability as total replacements do not allow alternative materials to be a reasonable alternative to mined coarse aggregate.

Because there is not a surplus supply of recycled concrete at this time, any likely increase in recycled concrete would offset only a small portion of the public need for limestone. Many of the same transportation cost and capacity issues described previously for importing virgin aggregate materials would also apply to importing recycled concrete aggregate into Florida. Therefore, recycling of aggregate material would not provide a reasonable alternative to the demand for coarse aggregate material in the Tarmac King Road region.

S.8.1.2 Onsite Alternatives

For the purposes of evaluating a range of mining alternatives, seven mining alternatives were developed that consider varying amounts of mining. These alternatives are evaluated in addition to a No Action Alternative (Alternative 1). The USACE determined that under each alternative, mining would stop when the minable area is fully excavated to the proposed maximum depth of 120 feet, and if a permit is issued, there should be no presumption or expectation of any further USACE authorizations. In other words, if an alternative other than Alternative 1 is determined to be the Preferred Alternative, it would not become 'Phase I' of a multi-layered permit approach. A permit decision based on a Record of Decision would end the regulatory review process, and any additional fill discharges in wetlands beyond what might be authorized under a chosen alternative would not be pre-authorized and should not be expected.

The most expansive mining alternative, Alternative 2, is equivalent to the full mining plan, or the full "mine-out plan" set forth in the applicant's mining plan. The No Action Alternative is identified as Alternative 1 and is placed first in the list of alternatives because it serves as a point of comparison for the other alternatives. Under the No Action Alternative, no CWA Section 404 permits would be issued for mining-related activities at the Tarmac King Road Limestone Mine upon issuance of the Record of Decision for the *Final Tarmac King Road Limestone Mine Environmental Impact Statement*. Alternatives 3 through 8 constitute mining scenarios that fall between Alternatives 1 and 2 in terms of the amount of land that would be mined.

The USACE is neither a proponent nor an opponent of a permit applicant's proposed project (33 CFR 320.1(a)(4)). Therefore, in accordance with Federal regulations, a permit applicant's proposal is identified in an EIS as the "applicant's preferred alternative." The applicant's preferred alternative is the full mine-out plan (Alternative 2).

A detailed description of the eight alternatives is presented below.

S.8.1.2.1 Alternative 1 – No Action

Under the No Action Alternative, no mining would be permitted in wetlands within the Tarmac King Road Limestone Mine site. If the proposed mining is not approved, it is expected that the ongoing timbering operations and hunting activities on the site would continue. The construction industry's needs would have to be satisfied by other limestone mines either within or outside Florida. Evaluation of this alternative includes a groundwater model that depicts current conditions, as well as the impacts of the proposed nearby Progress Energy LNP in the cumulative impacts analysis.

S.8.1.2.2 Alternative 2 – Mining Outlined in Permit Application Less Additional Dedicated No Mine Areas in Wetlands and Uplands

As indicated by the title, this alternative includes all of the mining area outlined in the permit application submitted by the applicant with additional dedicated No Mine Areas in wetland and upland areas adjacent to flow-ways. This is the applicant's preferred alternative.

Under this alternative, 3,898 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the 3,898 acres disturbed, approximately 2,757 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. Approximately 2,069 acres of wetlands would be eliminated under this alternative. Approximately 1,142 of the remaining 1,994 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. The remaining 852 acres include flow-ways, other higher-quality wetlands, and some adjacent uplands to be placed in conservation easements and set aside as "No Mine Areas."

Under Alternative 2, as well as under each of the following six action alternatives, mitigation activities would be conducted on site, as well as on all or portions of an approximately 4,526-acre site adjacent to the Waccasassa Bay State Preserve. If approved, any accompanying permit would require comprehensive monitoring and reporting to demonstrate that mining operations and compensatory

mitigation projects are in compliance with all of the terms and conditions in the permit and that the environmental impacts being realized are consistent with the impacts estimated in this EIS. If the project were found not in compliance, the USACE may take enforcement action, including the suspension or revocation of any issued permit. If environmental impacts were to exceed estimated levels, this would trigger mandatory actions that could include remediation, additional mitigation, or permit modifications.

S.8.1.2.3 Alternative 3 – Exclusion of Mining or Related Activities West of Butler Road

Alternative 3 would reduce total overall wetland impacts, reduce the impacts on areas of higher-quality wetlands, eliminate mining from an area lying within lower-category storm surge zones, and increase the mining distance from higher-quality estuarine and palustrine wetlands along the coastline, some local residences, and state-owned park/reserve lands.

Under this alternative, approximately 2,933 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the approximately 2,933 acres disturbed, approximately 1,884 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. Approximately 1,401 acres of wetlands would be eliminated under this alternative. A portion of the mining area is the same as that for Alternative 2; however, approximately 1,000 acres of mining or related activities west of Butler Road would be excluded. Approximately 1,049 of the remaining 1,515 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. An area containing 466 acres, including flow-ways, other higher-quality wetlands, and some adjacent uplands, would be placed in conservation easements and set aside as No Mine Areas.

S.8.1.2.4 Alternative 4 – Mining Outlined in Alternative 3 with Exclusion of Mining and Related Activities Immediately South of Spring Run and in Higher-Quality Wetlands in the North-Central Portion of the Site

Alternative 4 includes the same perimeter, or footprint, of mining area outlined in Alternative 3 above except a small area south of Spring Run in the northeast corner of the site. This small area was eliminated from the mining footprint to reduce impacts on areas of higher-quality wetlands and to create a larger buffer area between mining and Spring Run. An additional area in the north-central portion of the site would be added to the dedicated No Mine Areas.

Under this alternative, 2,799 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the 2,799 acres disturbed, approximately 1,671 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. Approximately 1,304 acres of wetlands would be eliminated under this alternative. The mining area is nearly the same as that for Alternative 3; however, approximately 66 acres of mining or related activities in higher-quality wetlands found in the north-central portion of the site and another 68 acres in the far northeast corner of the site south of Spring Run would be excluded. Approximately 1,128 of the remaining 1,660 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. An area containing 532 acres, including flow-ways, other higher-quality wetlands, and some adjacent uplands, would be placed in conservation easements and set aside as No Mine Areas.

S.8.1.2.5 Alternative 5 – Exclusion of Mining or Related Activities Between the Two Southern No Mine Areas

Alternative 5 would further reduce total wetland impacts and increase the mining distance from local communities. This alternative would further reduce the mining footprint outlined in Alternative 2 by removing all of the proposed mine area between the two southern No Mine Areas.

Under this alternative, approximately 3,185 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the approximately 3,185 acres disturbed, approximately 2,293 acres would be mined; areas not remaining as lakes at the end of mining

activities would be converted to upland forest. Approximately 1,831 acres of wetlands would be eliminated under this alternative. A portion of the mining area is the same as that for Alternative 2; however, approximately 700 acres of mining or related activities in the area between the two southern No Mine Areas would be excluded. Approximately 892 of the remaining 1,240 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. An area containing 348 acres, including flow-ways, other higher-quality wetlands, and some adjacent uplands, would be placed in conservation easements and set aside as No Mine Areas.

S.8.1.2.6 Alternative 6 – Mining Only West of the Central North-South Aligned No Mine Area

Alternative 6 would further reduce total wetland impacts and impacts on areas of higher-quality wetlands and would increase the mining distance from Spring Run and local communities. This alternative would further reduce the mining footprint outlined in Alternative 2 by allowing mining only west of the central north-south aligned No Mine Area.

Under this alternative, approximately 1,452 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the approximately 1,452 acres disturbed, approximately 1,048 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. Approximately 981 acres of wetlands would be eliminated under this alternative. Approximately 404 of the remaining unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. There are no streams or flow-ways within this alternative's footprint.

S.8.1.2.7 Alternative 7 – Exclusion of Mining or Related Activities West of the Central North-South Aligned No Mine Area, Between the Two Southern No Mine Areas, and South of Spring Run

Alternative 7 would further reduce total wetland impacts and impacts on areas of higher-quality wetlands and the area lying within lower-category storm surge zones and would increase the mining distance from the Gulf of Mexico and the higher-quality estuarine and palustrine wetlands along the coastline, Spring Run, local communities, and state-owned park/reserve lands. This alternative would further reduce the mining footprint outlined in Alternative 2 by removing all of the proposed mine area from west of the central north-south aligned No Mine Area, including the higher-quality wetlands from the north-central portion, as well as removing the mining area between the two southern No Mine Areas and an area in the northeast corner of the site south of Spring Run.

Under this alternative, approximately 1,545 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the approximately 1,545 acres disturbed, approximately 898 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. Approximately 720 acres of wetlands would be eliminated under this alternative. Approximately 647 of the remaining 853 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. An area containing 206 acres, including flow-ways, other higher-quality wetlands, and some adjacent uplands, would be placed in conservation easements and set aside as No Mine Areas.

S.8.1.2.8 Alternative 8 – Exclusion of Mining or Related Activities Between the Two Southern No Mine Areas and the Extreme Western Mining Block

Alternative 8 would further reduce total wetland impacts, impacts on areas of higher-quality wetlands, and the area lying within lower-category storm surge zones and would increase the mining distance from the Gulf of Mexico and the higher-quality estuarine and palustrine wetlands along the coastline and from local communities and state-owned park/reserve lands. This alternative would further reduce the mining footprint outlined in Alternative 5 by removing all of the proposed mine area on the extreme western section of the site.

Under this alternative, approximately 2,772 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the approximately 2,772 acres disturbed, approximately 1,896 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. Approximately 1,517 acres of wetlands would be eliminated under this alternative. Approximately 876 of the remaining 1,361 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. Approximately 485 acres, including flow-ways, other higher-quality wetlands, and some adjacent uplands, would be placed in conservation easements and set aside as No Mine Areas.

S.8.1.3 Alternatives Eliminated from Detailed Evaluation

A number of other alternatives in addition to those fully analyzed in this EIS were proposed during the scoping and evaluation period associated with this EIS. These alternatives were considered by the USACE but were eliminated from detailed evaluation for the reasons discussed below.

- *Mining north of Pumpkin Road (current north boundary).* The high coverage of similar-quality wetlands in this area would merely mean a transfer of impacts with little to no net gain. The area is also closer to Spring Run and therefore less desirable due to potential floodplain impacts. It is also approximately the same distance from the nearby state lands, higher-quality wetlands, and Gulf of Mexico to the west.

- *Mining to east of the power lines (current east boundary).* The same issues regarding a mere shifting of similar impacts described above for the north boundary also apply to the east boundary. In addition, the existing dragline would not be capable of getting to the other side of the power lines without substantial and expensive disassembly. Relocating those power lines would be logistically difficult and expensive; additional environmental impacts would also be involved in the creation of a new power line corridor or expansion of an existing corridor. Finally, mining further east would not allow for much additional space before encroaching upon residential parcels in the area.

- *Mining to greater depths than the 100–120 feet proposed.* Although this proposed alternative could reduce the overall area of the mining required, the technology is not currently available to the applicant to mine deeper than the proposed depth. Also, additional potential impacts on groundwater and saltwater interfaces would have to be evaluated if mining were to exceed the proposed 120-foot depth limit.

S.8.2 Summary of Potentially Significant Impacts

S.8.2.1 Surface Water

Direct and Secondary Impacts from Construction and Mining Activities. All of the proposed alternatives have the potential for impacts on surface waters on and off of the site. Mining activities could result in onsite impacts on intermittent streams and constructed lakes and offsite impacts on receiving watersheds. Implementation of the construction controls and restoration of all disturbed areas upon completion of mining are proposed to minimize the potential for adverse impacts on onsite surface waters, as well as any offsite receiving waters.

Hurricane Probabilities. The proposed Tarmac King Road Limestone Mine site and mitigation sites are a relative small part of the Levy County coastline. The probability of hurricanes and major hurricanes in any given year affecting the sites is below 1 percent in both instances. Over the next 50 years, the probability of one or more hurricanes making landfall on or near the Tarmac King Road Limestone Mine site and mitigation sites is 15 and 27 percent, respectively. For major hurricanes, the 50-year probability drops to 1.6 and 3.2 percent, respectively. Wind gust probabilities associated with major hurricanes were calculated to be the same as for Levy County due to the size of wind fields of major hurricanes being larger than Levy County. However, statistically the Tarmac King Road Limestone Mine site and mitigation sites can expect one or more occurrences of wind gusts greater than 115 miles per hour approximately once every 100 years.

Hurricane Surge Impacts. Hurricanes have the potential to flood the project mine site, including potential for inundation of the western half of the site during Category I and II hurricanes and potential for inundation of the entire project mine site during Category III through V hurricanes. Alternatives 2, 5, 6, and 8 would include mining activities in all hurricane surge zones. Alternatives 3 and 4 would include mining activities in Category II through V hurricane surge zones. Alternative 7 would include mining activities in Category III through V hurricane surge zones. Active mining areas and remaining lakes are proposed to be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the projected Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet National Geodetic Vertical Datum.

Potential for inundation of the temporary and permanent containment berms during Category IV and V hurricanes would exist for all alternatives, with implications for equipment safety/stability and water quality.

Sea-Level Change Impacts. Potential sea-level changes over the life of proposed mining were evaluated using the methodology outlined in USACE Circular EC-1165-2-211. Under Alternatives 2, 5, and 6, using the highest predicted sea-level rise of 5.7 feet results in the extreme southwestern end of the mining site being inundated after approximately 85 years of mining. Much of this potential inundation on the mining site would be in lands preserved as dedicated No Mine Areas. Mining areas in the other action alternatives would not see inundation under any of the 100-year sea-level rise projections. Predicted impacts on the proposed offsite mitigation area for all of the action alternatives (Alternatives 2–8) from sea-level rise over 100 years range from total inundation under the highest predicted rise to no inundation under the lowest predicted rise.

S.8.2.2 Groundwater and Seepage

Alternatives 2, 3, 7, and 8 were modeled and are considered to encompass the range of potential impacts. Minor impacts on groundwater flow would occur across the mine site boundary under Alternatives 2 and 8, with increases in north-to-south seepage over baseline (pre-mining) conditions ranging from 15 to 18 percent under Alternative 2 and from 11 to 16 percent under Alternative 8. Minor decreases in groundwater flow from east to west are also expected to occur under each of the alternatives.

There are no discernible impacts due to mining on groundwater flow across modeled transects outside of the mine site for any of the alternatives.

The maximum change in the average levels of onsite wells as a result of mining among all of the alternatives was a decrease of 0.3 feet under Alternatives 2, 3, and 8. The maximum decrease in water levels on site would have minimal impact on the drawdown of water levels off site, resulting in little to no impact on offsite wetlands.

Baseline groundwater flow east to west across the westernmost offsite modeled transect is 89.4 million gallons per day and showed negligible change due to mining under any of the alternatives. As a result of this continued positive flow, there would be no discernible saltwater intrusion into the groundwater due to mining.

S.8.2.3 Groundwater Quality

The impact of mining on groundwater quality is a concern as planned mining operations would intercept and alter groundwater flow. The assessment of impact on groundwater quality must consider changes as a result of drilling and blasting the rock, rock removal, and refilling of excavated quarries with fill material. These alterations may increase fine sediment concentrations, create conditions that alter the natural geochemistry of the aquifer, and increase the potential of accidental spillages and subsequent introduction of contaminants into groundwater. It is possible that these processes would impact groundwater quality in the vicinity of the mine site and further downgradient as impacted waters migrate away from the site. The potential impact on groundwater quality can be assessed by examining anticipated changes to groundwater turbidity, groundwater geochemistry, and the potential for saltwater

intrusion. Note that these impacts are independent of the alternative implemented but could be minimized or mitigated with proper planning, execution, and monitoring.

S.8.2.4 Wetlands and Vegetation

Wetlands. All of the alternatives considered in this EIS, except the No Action Alternative, would have some degree of adverse impact on wetland cover types within the Tarmac King Road Limestone Mine area, the primary impact being elimination of wetlands directly by mining activities. Among the other seven alternatives considered in this EIS, the acreage of wetland loss from direct impacts ranges from 2,068.5 acres under Alternative 2 to 720.3 acres under Alternative 7. In addition, without mitigation, Alternatives 2 through 8 would result in wetland functional losses of 427.8 to 1,185.6 units using the UMAM. With implementation of the applicant's proposed compensatory mitigation plan, only Alternatives 2 (–288.4 units) and 5 (–161.2 units) would result in net UMAM functional losses.

Vegetation. All of the alternatives considered in this EIS, except the No Action Alternative, would have some degree of adverse impact on existing vegetation within the mine area, the primary impact being total removal of vegetation. Among the other seven alternatives considered in this EIS, the acreage of potentially impacted vegetation ranges from 3,898.8 acres under Alternative 2 to 1,451.7 acres under Alternative 6. Table S–2 ranks the alternatives from greatest to least in terms of vegetation acreage directly impacted.

Table S–2. Alternatives Ranked in Order of Decreasing Acreage of Vegetation Directly Impacted

Area Impacted	Alternative							
	1	2	3	4	5	6	7	8
Total area impacted	8	1	3	4	2	7	6	5
Total area uplands impacted	8	1	2	3	4	7	6	5
Total area wetlands impacted	8	1	4	5	2	6	7	3

S.8.2.5 Noise

A recent study conducted for Tarmac indicates that the closest residences to potential mining areas are to the south-southwest and are about 515 feet from the potential mining areas. There is the potential for sound levels to marginally exceed 65 decibels A-weighted at these home sites as a result of dragline, crusher, and screening operations at the mining area. Tarmac has committed to providing a 100-foot-wide vegetated buffer in this area to mitigate sound levels and to building berms to a minimum elevation of 19 feet above sea level around all mining areas before excavation begins. This would help minimize any sound emanating from the mining areas.

S.8.2.6 Cultural Resources

Known historical and archaeological sites are identified in the Florida Master Site File. There are no recorded archaeological sites in any of the mining areas. However, there are three identified archeological sites in the mitigation area; Tarmac's mitigation activities, as proposed, would avoid impacts on these sites.

S.8.2.7 Recreation

Under Alternatives 2–8, the area available for hunting would be reduced in the proposed mine and mitigation areas, and the mine area would no longer be available for preservation under the Florida Forever project. The reduced level of hunting within the Tarmac King Road Limestone Mine could shift hunting activities to other portions of the Gulf Hammock Wildlife Management Area or Goethe State Forest, increasing the number of visitors and hunting permits requested in those areas during hunting season.

S.8.2.8 Remaining Environmental Disciplines

The remaining environmental analyses conducted as part of this EIS are not expected to result in potentially significant impacts under any of the proposed alternatives. The areas covered by these analyses include wildlife, topography, geology and soils, seismicity, land use, hazardous and toxic wastes, air quality, aesthetics, socioeconomics, transportation, and environmental justice. The results of these analyses are reported in Chapter 4.

S.9 MITIGATION

As part of the Tarmac King Road Limestone Mine project, Tarmac is proposing to establish a nearby mitigation area to be known as the Tarmac Mitigation Site (TMS), located in the Gulf Hammock Wildlife Management Area in Levy County, Florida. The proposed TMS would consist of approximately 4,526 acres that are currently owned by Plum Creek Timber Company. Tarmac may or may not purchase all or part of the TMS acreage, but would assume management and financial responsibility to ensure that proposed mitigation activities are fully implemented and the site is preserved in perpetuity. Both wetlands and uplands on that parcel have been altered and degraded through silvicultural activities, and there is substantial opportunity to restore and enhance hydric hammocks, swamp forests, and the embedded upland “islands” that support these wetlands. The proposed mitigation plan is intended to restore degraded areas, particularly through the rehabilitation of hydric hammocks that have been converted to pine plantation, and to enhance adjacent lands, including publicly owned offsite areas (Waccasassa Bay State Preserve) through providing buffer and additional landscape support to those areas.

Tarmac has developed a detailed mitigation plan outlining the activities proposed to attain these objectives of restoration and enhancement of natural ecosystems. Projected functional lift calculated using the UMAM would be obtained through habitat restoration and enhancement. A conservation easement would be recorded upon establishment of the TMS and this, combined with mitigation actions, financial assurances, and long-term adaptive management, would ensure that the functions of the TMS are preserved in perpetuity in accordance with 33 CFR Part 332 – Compensatory Mitigation for Losses of Aquatic Resources. The FDEP is proposed as the Grantee of this conservation easement. The USACE, as a third-party beneficiary, would have the right to enforce the terms and conditions of the site protection instrument and would have to approve any modification, amendment, release, or revocation of the conservation easement. Additionally, the USACE would have to review and approve as necessary any additional structures or activities on the property that require approval by the Grantee.

An additional area encompassing approximately 851 acres of “No Mine Area” within the proposed mine parcel would also be placed under a conservation easement with FDEP as the Grantee. Similar restrictions and requirements would be placed on this parcel.

S.9.1 Mitigation Proposed by Tarmac

The objective of the Tarmac mitigation plan is to compensate for projected impacts on wetlands in the Waccasassa River basin that would result from the proposed construction of the Tarmac King Road Limestone Mine project. A majority of the projected impacts of this limestone mine would be in hydric pine plantation and other wetlands that have been disturbed by silviculture and silviculture-related activities such as ditching, road building, and maintenance.

Tarmac’s proposed ecological goals for restoration are threefold:

1. Recreate the landscape mosaic as it appears in 1963 aerial photographs. Timbering activities have disturbed this area since the 1800s; however, the 1963 photographs provide a target landscape that existed immediately preceding conversion of the area to more intensive silviculture land use.

2. Re-establish the species composition and structure of the 1963 plant communities. The communities would resemble reference communities in the coastal Big Bend region of Florida on similar soils and at similar elevations above sea level with respect to life form distribution, vertical stratification, overall special abundance, and patterns of dominance.

3. To the extent practicable and without impacting offsite property owners, rehabilitate natural surface water runoff patterns by filling ditches and erosion areas, eliminating some raised roads, installing equalizer culverts under certain roads, and creating hardened low water crossings in other roads proposed to remain.

Tarmac proposes to provide sufficient financial assurance instruments, formatted to follow Federal guidelines. Once all mitigation activities required by any permit(s) for this project have been completed and released, Tarmac proposes to have title of the TMS transferred to the State of Florida, Board of Trustees of the Internal Improvement Fund. The No Mine Area would remain in the ownership of the current landowner or a subsequent purchaser; conservation easements on those areas would remain in place in perpetuity.

S.9.1.1 Mitigation Activities

The planned mitigation and rehabilitation efforts involve restoring the TMS and No Mine Area to the pre-pine plantation/historical communities. Specifically, efforts entail the restoration/enhancement of approximately 1,821.6 acres of wetlands and 456.2 acres of uplands to the historical Gulf Hammock community type. In addition, all remaining wetlands (2,841.4 acres) and uplands (184.39 acres) that are relatively intact on the two sites would also be preserved. Restoration of native habitats would include the control and eradication of nuisance and/or exotic species. Monitoring of mitigation efforts is proposed to document the effectiveness of the restoration/enhancement activities, to identify and recommend any needed remedial actions, and to measure the progression of the restored/enhanced areas toward meeting the success criteria established for each plant community type as part of the mitigation plan. Both qualitative and quantitative monitoring are proposed to occur annually in the late summer/fall for each plant community to be restored or enhanced.

Additional mitigation would be required to minimize environmental impacts related to implementation of any of the alternatives outside of the No Action Alternative. These mitigation actions are included by resource area in Table S–3.

Table S–3. Proposed Mitigation Actions

Resource Area	Impact	Mitigation Action
Seepage	Minor – 0.3 feet maximum average drawdown in offsite groundwater levels.	No additional mitigation required.
Sea Encroachment		
Storm Surge	Minor – Inundation of the mine site from Category III and lower maximum 100-year hurricane storm surge. Medium – Inundation of the mine site from Category IV and V maximum 100-year hurricane storm surge.	Construction of a 19-foot NGVD perimeter berm around mining areas. Additional mitigation may be required.
Sea Level Rise	Minor – The highest predicted sea-level rise over the life of the proposed mining is 5.7 feet.	Construction of a 19-foot NGVD perimeter berm around mining areas.
Wetlands	Major – Functional losses for Alternatives 3, 4, 6, 7, and 8. Major – Functional losses for Alternatives 2 and 5.	Balanced by functional gains in mitigation areas. Functional gains of mitigation activities not sufficient to offset the loss. Additional mitigation (288 units under Alternative 2 and 161 units under Alternative 5) would be needed from other methods.
Threatened and Endangered Species		
Wood Stork	Minor.	No additional mitigation required
Eastern Indigo Snake	Medium.	Requirements for Tarmac to: Implement protection measures. Complete pre-clearing surveys. Provide qualified observer. Record snake activity. Site road speed limits of 25 miles per hour. Provide notification of dead or injured snakes. Limit take of 3 snakes over 5-year rolling period. Provide annual reporting.
Seismicity	Minor, except southwest corner of mine site (Medium), where vibration from blasting beyond year 40 would result in vibration of 117 percent of the current standard for the nearest residences.	Tarmac would propose mitigation measures beyond year 40 that would result in reduced vibration to below the standard when that area is mined.
Air Quality	Minor – Fugitive dust from haul roads, stockpiles, and conveyor drops.	Water sprays would be employed and roads would be sprayed as necessary to control fugitive dust emissions.
Noise	Minor – Noise levels could briefly exceed 65 dBA for residents near southwest corner of the mine site.	Tarmac would install 100-foot wide vegetation buffer in this area to mitigate noise in addition to the 19-foot NGVD perimeter berm.
Cultural Resources	None – Mine site has no cultural resource sites identified. Minor – Mitigation site has three sites identified.	No additional mitigation required. The Florida State Historic Preservation Officer has approved Tarmac's proposed management measures to ensure that these sites are not disturbed.
Recreation	Minor – Normal recreation activities (hunting, hiking, etc.) would be restricted on the mine site but would be allowed to continue on the mitigation site.	Tarmac would monitor recreation activities and if activities restrict ecological management progress or interferes with success criteria, activities would be discontinued and a plan for correction prepared.
Transportation	Minor.	Tarmac would install left and right turning lanes onto and off of U.S. Route 19.

Key: dBA=decibels A-weighted; NGVD=National Geodetic Vertical Datum.

Final Tarmac King Road Limestone Mine Environmental Impact Statement

Volume I
(Chapters 1–12)

U.S. Army Corps of Engineers
Jacksonville District
August 2013

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List of Acronyms and Abbreviations

µg/L	micrograms per liter
°F	Fahrenheit
BLS	U.S. Bureau of Labor Statistics
BOD	biological oxygen demand
CEQ	Council on Environmental Quality
CFBC	Cross Florida Barge Canal
CFR	*Code of Federal Regulations*
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalence
CREC	Crystal River Energy Complex
CSM	conceptual site model
CSXT	CSX Transportation
CWA	Clean Water Act
CY	calendar year
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Plan
dBA	decibel A-weighted
DO	dissolved oxygen
EFH	Essential Fish Habitat
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
FAC	*Florida Administrative Code*
FAS	Floridan Aquifer System
FCEN	Florida Central Railroad
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FFWCC	Florida Fish and Wildlife Conservation Commission
FEMA	Federal Emergency Management Agency
FGS	Florida Geological Survey
FHL	Florida History, LLC
FLUCCS	Florida Land Use, Cover and Forms Classification System
FMSF	Florida Master Site File
FNAI	Florida Natural Areas Inventory
FNOR	Florida Northern Railroad
FWS	U.S. Fish and Wildlife Service
GDP	gross domestic product
GHB	general head boundary

GHG	greenhouse gas
GIS	geographic information system
HELP	Hydrogeologic Evaluation of Landfill Performance
HUC	Hydrologic Unit Code
K	hydraulic conductivity
King Road EIS	*Tarmac King Road Limestone Mine Environmental Impact Statement*
kV	kilovolt
LIDAR	Light Detection and Ranging
LNP	Levy Nuclear Plant
LNP EIS	*Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2*
MCL	maximum contaminant level
MDL	minimum detection limit
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mm/yr	millimeters per year
MGD	million gallons per day
MODFLOW	modular three-dimensional finite-difference groundwater flow model
mph	miles per hour
MSL	mean sea level
MW	monitoring well
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
NGVD29	National Geodetic Vertical Datum of 1929
NPDES	National Pollutant Discharge Elimination System
NRC	National Research Council
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	nephelometric turbidity units
PAH	polycyclic aromatic hydrocarbon
PCI	Panamerican Consultants, Inc.
PEST	parameter estimation software
PHP	Polk-Hillsborough-Pinellas
PM_n	particulate matter with an aerodynamic diameter less than or equal to *n* micrometers
ppt	part(s) per thousand
PSD	Prevention of Significant Deterioration

QMS	Qualified Mitigation Supervisor
Qu	Quaternary undifferentiated
RFG	Relative Functional Gain
ROD	Record of Decision
ROI	region of influence
SFWMD	South Florida Water Management District
SHPO	State Historic Preservation Officer
SLAMM	Sea-Level Affecting Marshes Model
SMCL	secondary maximum contaminant level
SO_3	sulfur trioxide
STOF	Seminole Tribe of Florida
Strategic Aggregates Study	*Strategic Aggregates Study: Sources, Constraints, and Economic Value of Limestone and Sand in Florida*
SW	Sample Well
T&E	threatened and endangered
Tap	Tertiary Avon Park
Tarmac	Tarmac America, LLC
TDS	total dissolved solids
TMDL	total maximum daily load
TMS	Tarmac Mitigation Site
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids
UMAM	Uniform Mitigation Assessment Method
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VOC	volatile organic compound
WMA	Wildlife Management Area

CHAPTER 1
PROJECT PURPOSE AND NEED

1.1 PROJECT BACKGROUND

The U.S. Army Corps of Engineers (USACE) is examining the potential impacts of the proposed Tarmac King Road limestone mining activities within southern Levy County in west-central Florida. The project involves a Federal action because the fill activities associated with limestone mining in wetlands require authorization through a U.S. Department of the Army permit under Section 404 of the Clean Water Act (CWA) of 1972 (33 U.S.C. 1251 *et seq.*). The USACE Jacksonville District determined that the scope of the proposed Tarmac King Road Limestone Mine could significantly affect the quality of the human and natural environment, and that the CWA Section 404 permit would constitute a major Federal action. Based on these determinations, a draft environmental impact statement (EIS), the *Draft Tarmac King Road Limestone Mine Environmental Impact Statement (King Road EIS)*, was issued in May 2012 pursuant to (1) Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*); (2) the Council on Environmental Quality regulations on preparing EISs (40 CFR 1502.4 *et seq.*); (3) Section 404 of the CWA on permitting disposal sites for dredged or fill material (33 U.S.C. 1344), as amended; and (4) "NEPA Implementing Procedures for the Regulatory Program" (33 CFR 325, Appendix B).

Under Section 404 of the CWA, the USACE was granted authority to issue permits for discharges of dredged or fill material into waters of the United States. The USACE and U.S. Environmental Protection Agency have developed several Memorandums of Agreement clarifying each agency's role in implementing Section 404. The USACE serves as the lead agency for jurisdictional determinations and permit actions and has set forth implementing regulations in Title 33 of the *Code of Federal Regulations* (CFR) Parts 320–332.

A primary purpose of a USACE regulatory program EIS is to provide full and fair discussion of the significant environmental impacts of a proposal or project seeking a USACE permit. The draft and final EISs are used to inform agency decisionmakers and the public of alternatives to an applicant's project that might avoid or minimize adverse impacts or enhance the quality of the human environment. An EIS is not a USACE regulatory decision document. It is used by agency officials in conjunction with other relevant information in a permit application file, including public and agency comments presented in the final EIS, to support the final decision on a permit application. In this instance, Tarmac America, LLC (Tarmac), has filed a permit application to mine areas that include wetlands within Levy County, Florida. Tarmac wants to obtain a Section 404 permit from the USACE to allow Tarmac to discharge dredged or fill material into waters of the United States during its mining process. The mined material would provide construction-grade aggregate for buildings and infrastructure. The proposed mine would be mined over an approximately 100-year period or less, depending on the alternative selected. (See Chapter 2, Section 2.2 of this EIS for a description of the proposed alternatives.) Tarmac is proposing to mitigate the action by restoring, enhancing, and preserving an adjacent wetland area.

1.2 PROJECT LOCATION

The proposed Tarmac King Road Limestone Mine is located along the western Gulf Coast of Florida approximately 80 miles north of Tampa, Florida. The site is located in western Levy County just west of U.S. Route 19, approximately 5 miles north of the town of Inglis, Florida (see Figure 1–1).

The overall Tarmac King Road Limestone Mine project involves two parcels of land totaling about 9,277 acres (14.5 square miles), 2,757 acres (4.3 square miles) of which is proposed to be mined. The mining area is on an approximately 4,751-acre (7.4-square-mile) parcel, and the proposed mitigation area is an approximately 4,526-acre (7.1-square-mile) parcel. The proposed mine site and mitigation area are shown in Figure 1–1. The western portion of the mitigation area abuts the Waccasassa Bay Preserve State Park.

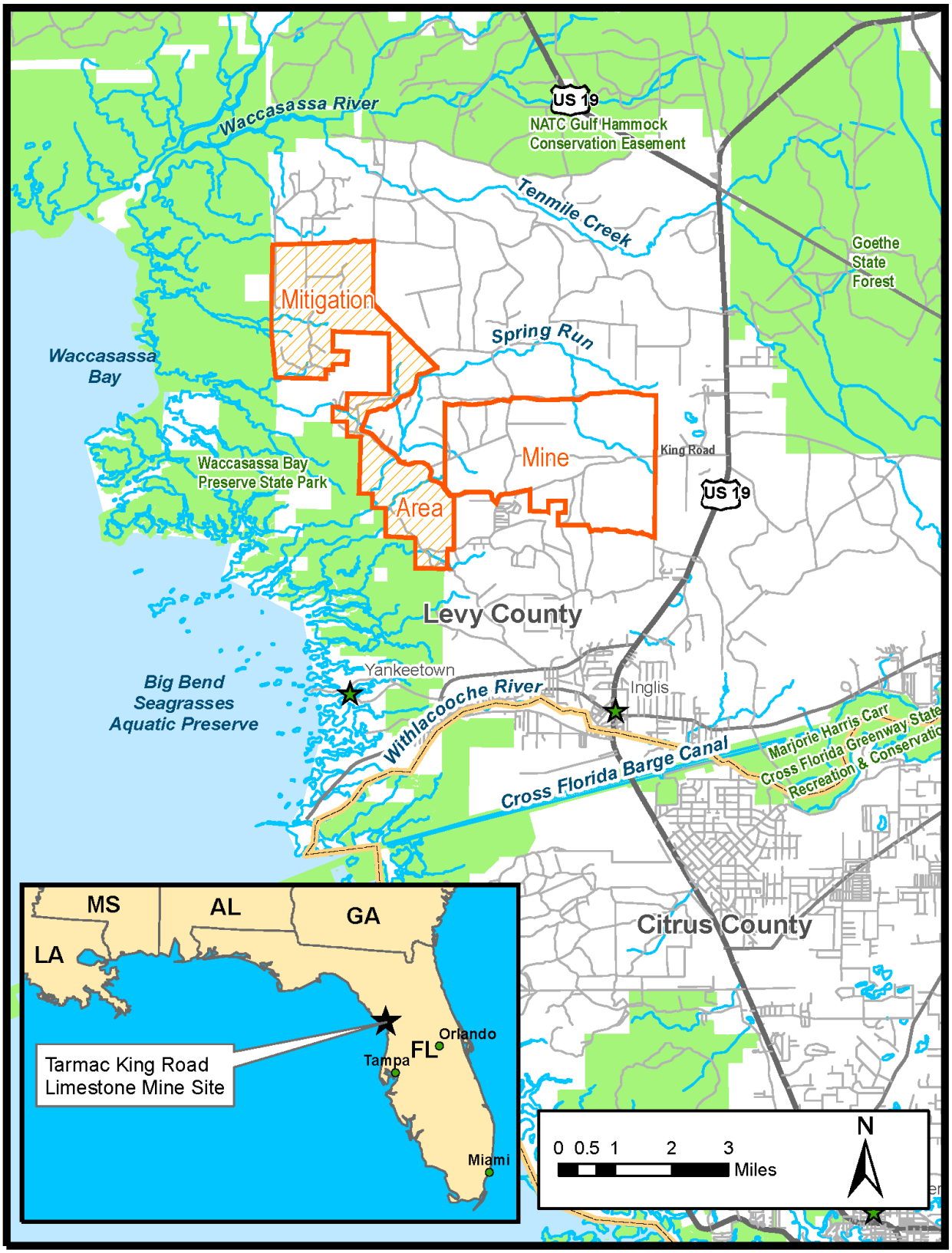


Figure 1–1. Proposed Location of Tarmac King Road Limestone Mine and Mitigation Area

Historically, the mining and mitigation sites were primarily native hardwood hammock intermixed with freshwater marshes and flow-ways. The mitigation parcel also includes estuarine marshes. While periodic timbering occurred much earlier, more intensive harvesting of native hardwoods began in the 1950s. As native forests were cleared, they were replaced with planted pine. Today, both the proposed mining and mitigation areas are part of an actively managed timber operation; the majority of these areas are in varying developmental stages of third-generation pine.

1.3 PROJECT PURPOSE AND NEED

Applicants are encouraged to provide a statement of the proposed activity's purpose and need from their perspective. However, while generally focusing on the applicant's statement, the USACE exercises independent judgment in defining the purpose and need for the project from both the applicant's and a public interest perspective.

The applicant proposed its overall project purpose as "to excavate and provide primarily two types of limestone aggregate – limestone aggregate that meets Florida Department of Transportation (FDOT) specifications and commercial-grade limestone aggregate to be used in buildings and infrastructure. The proposed mine is to provide a major, long-term, regional source of these types of limestone aggregate for Tarmac's and its customers' use in the west-central area of Florida." While the USACE concurred with much of the applicant's statement, it determined that the word "regional" overly narrowed the range of potential alternatives; therefore, this term was excluded from the project purpose. The word "major" was also excluded, as it was determined this term was redundant considering the size of the area the source of aggregate is to satisfy, and the long-term need for this product. The term "affordable" was added by the USACE. This addition was made in recognition of the fact that construction-grade limestone aggregate, including aggregate that meets the FDOT specifications, has made its way to west-central Florida without the applicant's proposed mine being in place. As with nearly any product, aggregate can be transported nearly anywhere; however, additional handling and transportation rapidly compounds costs. This is especially true for aggregate because of its low value-to-weight ratio. It is apparent the applicant's objective is to attempt to meet the demand for this product at a lower cost than current suppliers.

The project purpose as defined by the USACE, and used in this EIS, is to provide a source of affordable construction-grade limestone aggregate, including aggregate that meets FDOT specifications for buildings and infrastructure, to satisfy the long-term public need for high-quality aggregate in west-central Florida.

Aggregate is an essential construction material consisting of granular mineral that can be used alone in construction projects such as bank stabilization projects or that can be mixed with other materials (e.g., a cement bonding medium) to make concrete and asphalt, which are necessary for the construction and maintenance of roads, bridges, buildings, homes, and other infrastructure vital to the Nation's economy. Aggregate can consist of naturally granular material like riverbed gravel or it can consist of rock materials that are crushed to meet a size specification. While different types of rock can be crushed to create aggregate, due to Florida's geology, suitable aggregate materials other than limestone do not naturally occur near the surface. Therefore, limestone is the predominant source of aggregate in Florida.

Coarse aggregate is the desired product created when rock is mined and crushed into smaller rock. Fine aggregates or "screenings" are the byproduct of crushing. The term "crushed stone" is used by the U.S. Geological Survey (USGS) to describe various mining products and to report production statistics. "Crushed stone" is used interchangeably with "crushed rock." Material that is mined to produce coarse aggregate (larger than 0.375 inches in diameter) or fine aggregate (smaller than 0.375 inches) shall be referred to as either "crushed rock" or "aggregate" throughout this document. Material that is mined to produce limerock base, shell rock, or fill will be referred to as "limerock base" throughout this document. Additionally, for the purposes of this document, aggregate produced in Florida mines is presumed to be limestone, while aggregate from outside of Florida may be limestone or another mineral (e.g., granite). In terms of value, crushed rock is Florida's leading nonfuel mineral commodity (USGS 2009).

In 2011, Florida ranked tenth nationally in production and ninth in consumption of crushed rock (USGS 2012a, 2012b). These materials support a diversity of industries, including ready mix, block producers, concrete and asphalt road building, and precast concrete construction. In 2011, 82 percent of all crushed rock reported for use in the United States was used as construction materials (USGS 2012a). In Florida, approximately 44.6 million tons of crushed rock were consumed in 2011 (USGS 2012b). Demand for aggregate materials is primarily dependent on activity in the public and private construction industries, which are influenced heavily by population growth and development. The underlying factors that would support a rise in prices of crushed rock were expected to be present in 2012, especially in and near metropolitan areas (USGS 2012a).

In Florida in 2010, the last year for which complete information is available, approximately 3.8 million tons of crushed rock were supplied through Florida's ports, primarily from international sources (Ports Survey 2011). Domestic imports from nearby states are more commonly transported by truck or rail. Imports historically needed to meet Florida's demand for high-quality aggregate are further detailed in Chapter 2. In 2009, the FDOT consumed approximately one-third to one-half of total highway construction materials in the state; in 2007, the FDOT used approximately one-fourth of total state consumption and was the largest consumer of crushed stone in the state (FDOT 2009).

Congress has noted that the mining of such aggregates is "essential for national security, economic well-being and industrial production" (30 U.S.C. 1601). In Florida, aggregates are mined and produced primarily from limestone deposits that are limited in location and quality. The FDOT sets standards and implements testing of mined aggregate materials to ensure public safety and welfare. As described in Chapter 2, there currently are few FDOT-approved limestone mines within or just outside the area the proposed project would serve that produce high-quality, construction-grade aggregate. A more detailed description of mining capacity in the region is included in Chapter 2. The USACE recognizes that there has been a public and private need for high-quality construction-grade aggregate in west-central Florida and throughout the state. Over the 7 years from 2006 to 2012, Florida produced over 466 million tons of crushed rock, with a peak annual output of 140 million tons in 2006 (USGS 2009, 2010, 2011, 2012b). Commensurate with the construction downturn associated with the recent economic recession, demand for crushed rock is lower now than in the years leading to that peak demand in 2006. Nonetheless, construction of housing units, nonresidential building space, roads and other infrastructure in west-central Florida will still result in the continued need for high-quality construction aggregate. The purpose of this EIS is to evaluate the environmental effects of alternatives to meet this long-term need.

1.4 AGENCY GOAL OR OBJECTIVE FOR THIS EIS

The objectives of this *King Road EIS* are as follows:

- Evaluate the existing environmental condition and potential future impacts associated with the excavation of limestone from the proposed mine site in Levy County.
- Evaluate the existing socioeconomic condition and potential future impacts associated with the excavation of limestone from the proposed mine site in Levy County.
- Describe and assess alternatives to limestone mining at the proposed site in Levy County (i.e., sources of limestone outside the Levy County area).

1.5 RELATED ENVIRONMENTAL DOCUMENTS

A number of environmental documents were evaluated for consideration of relevant issues in this *King Road EIS*. The reports listed below were reviewed for potential applicability to area environmental issues. These reports were utilized to varying degrees in performing the analyses presented in this EIS. Some of the reports were integral to the technical aspects of this EIS (i.e., identification of wetlands on the proposed mine site), while some were relied upon more generally (e.g., to gain perspective as to the regional setting).

- *Groundwater Monitoring Plan, Alternative 7 Mine Plan, Proposed King Road Mine*, Ardaman & Associates, Inc., October 2012

- *Final Environmental Impact Statement for the Combined Licenses for Levy Nuclear Plants Units 1 and 2*, Nuclear Regulatory Commission and U.S. Army Corps of Engineers, NUREG-1941, April 2012

- *Draft Environmental Impact Statement for the Combined Licenses for Levy Nuclear Plants Units 1 and 2*, Nuclear Regulatory Commission and U.S. Army Corps of Engineers, NUREG-1941, August 2010

- *Hydrological and Hydrogeological Evaluation, Proposed King Road Mine, Levy County, Florida*, Ardaman & Associates, Inc., January 2008, Revised April 2010

- *Economic Impact of Mining on Levy County, Florida, A Strategic View*, Richard Weisskoff, Ph.D., February 2010

- *Levy Nuclear Plant Units 1 and 2 Combined License Application*, Progress Energy Florida, Inc., 2008

- *Levy County Comprehensive Plan*, Levy County Planning Department, 2008

- *Surface Water Quality Assessment Baseline Monitoring Tarmac King Road Limestone Mine 2008 Annual Report*, Biological Research Associates, October 2008

- *Wildlife Survey Results, Tarmac King Road Limestone Mine, Levy County, Florida*, Biological Research Associates, September 2008

- *Air Construction Permit Application – Non-Title V Source, Tarmac America, LLC, Inglis, Florida*, Trinity Consultants, August 2008

- *Engineering Report in Support of General Water Use Permit, Proposed King Road Mine, Levy County, Florida*, Ardaman & Associates, Inc., June 2008

- *Vegetative Cover Evaluation for Reference and Enhancement Areas*, Biological Research Associates, April 2008

- *Tarmac Lime-Rock Mine Supplemental Traffic Report*, Grimail Crawford, Inc., January 2008

- *Strategic Aggregates Study: Sources, Constraints, and Economic Value of Limestone and Sand in Florida*, Lampl Herbert Consultants, 2007

- *Tarmac Lime-Rock Mine Traffic Concurrence Study*, Grimail Crawford, Inc., November 2007

- *Mining Impact Assessment Report, King Road Mine, Levy, County, Florida*, Biological Research Associates, October 2007

- *An Archeological and Historical Survey of the Kings Road Mine Project Area in Levy County, Florida*, Panamerican Consultants, Inc., October 2006

- *Potential for Saltwater Intrusion into the Upper Floridan Aquifer, Hernando and Manatee Counties, Florida*, U.S. Geological Survey Water-Resources Investigations Report 88-4171, 1989

- *Geology and Geomorphology of Levy County, Florida*, Frank R. Rupert, Florida Geological Survey, 1988

- *Groundwater Resources of Coastal Citrus, Hernando, and Southwestern Levy Counties, Florida*, U.S. Geological Survey Water-Resources Investigations Report 83-4079, J.D. Fretwell, 1983

1.6 DECISIONS TO BE MADE

Under the proposed action, Tarmac proposes to impact up to 2,068.5 acres of wetlands and 1,818.4 acres of uplands over a period of approximately 100 years. Approximately 4,195 acres of wetlands and 331 acres of uplands in an adjacent area would be restored and/or preserved. In addition, up to 522 acres of wetlands and 329 acres of uplands on the proposed mine parcel would also be preserved. The information compiled in this EIS will be used by the USACE to determine whether the proposed activities should be authorized and permitted by the USACE. The alternatives under consideration are discussed in detail in Chapter 2. The alternatives vary according to timing, mining breadth, mine location, and alternate source of aggregate. The alternatives include the No Action Alternative, the full mine-out plan (100 years of mining), limiting mining in environmentally sensitive areas, shipping aggregate into Florida harbors and/or rail terminals, and mining in other locations in west-central Florida.

1.7 PUBLIC INVOLVEMENT

The process of preparing an EIS provides opportunities for public involvement. These opportunities include the scoping period and the public comment period for the EIS. The scoping period is required by 40 CFR 1501.7, while the public comment period is required by 40 CFR 1503.1. Section 1.7.1 of this chapter summarizes the scoping process and major comments received from the public during the scoping period. Section 1.7.2 summarizes both the public comment process relating to the release of the *Draft King Road EIS* and the comments that were received from the public. Appendix I of this *Final King Road EIS* is the Comment Response Document. All comments received during the public comment period for the *Draft King Road EIS*, the USACE's responses to these comments, and copies of all comment documents are provided in Appendix I. Voluminous documents will be posted on the *King Road EIS* website, and a link will be provided in Appendix I.

1.7.1 Scoping and Issues

A Notice of Intent was published February 19, 2008, in the *Federal Register* (73 FR 9103) (see Appendix A) announcing the USACE's intention to prepare an EIS on the potential impacts of limestone mining within Levy County, Florida. The scoping period was February 19, 2008, through April 26, 2008. A public scoping meeting was held on March 26, 2008, at the Inglis Community Center in Inglis, Florida, and on March 27, 2008, at the Tommy Usher Community Center in Chiefland, Florida. Approximately 100 people attended the Inglis meeting, with 30 people providing oral comments. Approximately 24 people attended the Chiefland meeting, with 9 providing oral comments. Comments received during the scoping period included written comments provided to the USACE at the scoping meetings, comments submitted to the *King Road EIS* website or emailed directly to the USACE, and comments mailed directly to the USACE. No comments were received via fax. In total, the USACE received approximately 280 comments from 88 interested parties and individuals during the scoping period. This included comments from several Federal, state, and local agencies/officials, including the U.S. Environmental Protection Agency, National Marine Fisheries Service, Florida Department of Agriculture and Consumer Services, Florida Department of Environmental Protection, Crystal River City Manager, and the Office of the Mayor and City Commissioners for the Town of Inglis, Florida.

The comments received were divided into 10 broad categories and are summarized below. The number of comments received in each category is listed next to it.

Water *(116)*

Over 40 percent of the comments received pertained to the impact of the Tarmac King Road Limestone Mine on water. Commentors felt strongly that the proposed mine would result in contamination of the local groundwater and their wells. A similar percentage of the comments also detailed concerns that with the recent drought in central Florida (relative to March 2008), there was insufficient groundwater supply to operate the mine without impacting their wells or the Town of Inglis' water supply. Others were concerned that the mine would disrupt the natural flow of surface water across the area and to Spring Run. Commentors also expressed concern about the introduction of saltwater into the groundwater and their wells as a result of both mining into the water table and from

storm surge entering open pits or lakes within the mining area. Finally, one commentor thought there was sufficient groundwater supply to operate the mine.

Sensitive Habitat *(48)*

The second most common issue raised was the potential impact of the mine on sensitive habitat. The majority of the commentors were concerned about impact on aquatic plants and animals and sensitive coastal ecosystems due to runoff from the mining area. Other commentors were concerned about impacts on threatened and endangered species that had been seen on the mine site.

USACE/Tarmac Mistrust *(24)*

The majority of the commentors on this issue felt that neither the applicant nor the USACE could be trusted to honestly evaluate the environmental impacts in the citizens' best interest. Several commentors expressed distrust for any government agency and said the mine violated local laws. Several other commentors mentioned that the applicant was not an American-owned company, provided biased information to its benefit, and did not own the land to be mined.

Social and Economic Impact *(22)*

Commentors expressed concern for the impact of the mine on activities important to the local culture, such as hunting, fishing, and bird watching. The loss of tourism and the negative economic impact on the fishing industry due to pollution from the mine was a concern of other commentors. Three commentors expressed support for the jobs that the mine was going to create in the area.

Impact on Wetlands *(18)*

The impact on sensitive wetlands in and adjacent to the project site was an issue for numerous commentors. An additional concern of commentors was the negative impact of the lakes created as part of the mining process on the natural evapotransporation in the mining area was cited as a concern of several commentors as well.

Transportation *(18)*

Numerous commentors were concerned about the increase in the truck traffic on U.S. Route 19 through the town of Inglis and the safety of the residents. Other commentors were concerned about the dust, noise, and overall air quality impacts of the increased trucking to and from the mine proposed for 12 hours per day, 6 days per week.

Cumulative Impacts *(11)*

A number of commentors expressed concern over the cumulative environmental impacts of the Tarmac King Road Limestone Mine, as well as the proposed Progress Energy Nuclear Plant to the east of U.S. Route 19. Commentors specifically pointed to the amount of groundwater consumption proposed for each facility and the traffic increase during both construction and operation of these facilities as a big issue that must be evaluated.

Need *(10)*

Commentors raised the issue that the mine was not needed to meet the current local demand as claimed by the applicant. Several commentors pointed to information readily available on the Internet that showed that Florida had exported millions of tons of limestone in the past year (2007) into Georgia and Alabama as evidence that the need is not there. One commentor said that limestone was needed to meet the local construction demand and to help build a hospital and school in Chiefland.

Environmental Damage *(10)*

Several commentors were concerned about the increase in the greenhouse gases and the effects on global warming that would result from the mine construction and operation. A few commentors stated that the mine would result in significant and/or irreparable environmental damage and should be stopped.

Blasting Impacts *(5)*

Damage to residents' homes due to blasting at the mine site was the concern of several commentors. Commentors mentioned possible sinkholes as a result of blasting and rock removal as an issue as well.

In addition to the specific scoping comments listed above, the USACE received a petition signed by 985 Florida citizens urging the city, county, and state agencies to "apply the strictest standards in the evaluation of this proposal" (the Tarmac mine proposal for Levy County).

1.7.2 Public Comments on the *Draft King Road EIS*

NEPA regulations mandate a minimum 45-day public comment period after publication of a draft EIS to provide an opportunity for the public and other stakeholders to comment on the EIS analysis and results. In this case, the USACE allowed for a public comment period of 60 days. The public comment period began on May 11, 2012, when the Notice of Availability for the *Draft King Road EIS* was issued in the *Federal Register* (77 FR 29617) (see Appendix A) and ended on July 11, 2012.

A public hearing was held in Inglis, Florida, on May 31, 2012, and oral comments on the draft EIS were taken. Approximately 80 people attended the hearing. A court reporter was present to record the public comments. In addition, the public was encouraged to submit comments via U.S. mail, email, or the *King Road EIS* website. There were 225 comments received from the public and Federal and state agencies during the public comment period.

The remainder of this section is a summary of the comments received during the public comment period by issue topic. The number of comments received for each issue is listed in parentheses. The full text of each comment and the USACE response may be found in Appendix I of this *Final King Road EIS*, along with copies of all comment documents and the meeting transcript.

Purpose and Need (33)

A number of commentors questioned the purpose and need, suggesting that there is more than enough high-quality aggregate available to supply the Primary Market Area, either from local mines or through imports from out-of-state mines. Some commentors were opposed to the 100-year timeframe for the permit and expressed concern that it is not possible to predict the need for aggregate or to analyze the potential impacts that far into the future. Commentors also raised concerns about conflicting land uses, accuracy of the economic analyses, population growth, and product demand projections. In addition, others felt that the mining would have adverse impacts on the health and welfare of the community and ecosystems, and that there would be no benefit to the community from the proposed mining operations.

Alternatives (24)

A number of commentors either expressed support for the No Action Alternative (i.e., no mining) or for Alternative 7 (issuance of a 30-year permit for a smaller mining area) if the No Action Alternative is not selected. Some commentors expressed support for Alternative 7 as their first choice. Some commentors offered opinions about parameters that should be considered when making the decision, expressed opposition to specific alternatives, or suggested that the range of alternatives is not adequate because it did not include factors they consider to be important.

Surface Water (9)

Commentors expressed concern that both surface and groundwater quality could be impaired by the proposed activities, some citing specific water quality parameters that could be affected. Some commentors noted that there would be impacts on humans and sensitive species, that surface water flow patterns would be disrupted, or that surface water and then groundwater could be impacted by saltwater as a result of mining activities. Other commentors suggested that water use would be inconsistent with state water policy and county water plans or that the water quality criteria cited in the EIS be updated to reflect new State of Florida water quality criteria approved by the U.S. Environmental Protection Agency.

Hurricane Surge (16)

Commentors were concerned that the area is particularly vulnerable to tropical storm impacts and that the height or design of the proposed berms would not adequately protect the area from storm surges and subsequent impacts, including saltwater intrusion into the groundwater. Several commentors expressed their opinion that the storm surge risk analysis in the EIS is inadequate because it does not consider the correct probabilities or intensities of storms over the proposed 100-year project duration.

Sea-Level Rise (6)

Commentors were concerned that sea-level rise over the proposed 100-year life of the project would cause inundation in portions of the project area and the mitigation area prior to completion of the project. Other commentors were concerned that the combination of sea-level rise and storm surge was not adequately analyzed in the draft EIS.

Groundwater (31)

A main concern commentors expressed is that too much groundwater would be used for mining activities, which would result in unacceptable drawdown and the aquifer would not be able to support wells for drinking water and other domestic uses. Other concerns were that the quantity of water withdrawn for mining would reduce the level of the aquifer and cause saltwater intrusion, and that the proposed water withdrawal and mining would result in sinkholes forming on nearby properties. Commentors also expressed concerns about the adequacy and accuracy of the groundwater modeling.

Wetlands (14)

Commentors expressed opposition to the project because of wetlands loss, some voicing concerns about destruction of pristine wetlands that they asserted cannot be replaced. There were suggestions that neither Alternative 2 nor 5 can be selected because the potential wetland impacts from either alternative cannot be mitigated and that Alternative 7 is the least environmentally damaging. Commentors also provided opinions that wetlands mitigation does not work or took exception to the proposed mitigation plan and supporting analyses. Commentors raised concerns about sea-level rise potentially impacting the proposed mine and mitigation area and that berms around the site will cause flooding that would cause wildlife to drown or be displaced. Others pointed out that the sea-level rise will impact and destroy wetlands that were approved as mitigation credits for mining. One commentor wanted to know if a permit could be issued for an alternative with a negative Uniform Mitigation Assessment Method score; another asked a question about the goal of the mitigation.

Threatened and Endangered Species (10)

Commentors raised concerns about potential impacts on both federally and state-listed species, some insisting that there are more individuals present on the proposed mining site or nearby than found during U.S. Fish and Wildlife Service and other surveys identified in the EIS.

Vegetation, Wildlife, and Habitat (6)

One commentor was concerned that sinkholes on the site were not surveyed to identify the presence of unique species that use sinkholes as habitat. Other commentors were concerned that existing wildlife and their habitat or potential habitat had not been properly identified and that they and the ecosystem as

a whole would not be properly protected during the life of the project. One commentor raised the concern that there could be interactions between humans and black bears on the site that could be detrimental to both and recommended that an electric fence be installed around active mine units to keep the bears out. Another commentor asked that a compendium of biological information for all species present on the site be included in the EIS.

Air Quality (4)

Several commentors were concerned about impacts from heavy truck traffic, specifically, potential carcinogenic effects from diesel exhaust, as well as dust, noise, and fumes degrading air quality along the transportation routes. One commentor expressed concern about using spring water for dust suppression.

Rainfall (10)

Commentors were concerned about water usage given the low rainfall and drought conditions in recent years. Several commentors expressed concern that water budget calculations are incorrect because they are based on rainfall data that are not representative of either the site or existing meteorological conditions and that the impacts of groundwater use were not adequately identified because these analyses overestimated the amount of recharge.

Seismicity/Noise (4)

Commentors noted that the EIS indicated exceedances of state noise and blasting vibration limits during mining activities and were concerned that the proposed mitigation actions were not sufficient to avoid property damage to nearby residences and to provide relief from excessive noise and vibration.

Cultural Resources (2)

A commentor expressed the opinion that the EIS does not fully analyze the impacts of the loss of ecological and cultural values. Another commentor was concerned that increased truck traffic in the vicinity of the Dunnellon Boomtown Historic District would have a negative impact on the annual Boomtown Days celebration, Jazz Up Dunnellon, and other community events.

Socioeconomics (13)

Commentors expressed their concerns that mining would affect tourism in the area. Concerns were related to the potential loss of the natural environment, which would impact ecotourism; and for the noise, pollution, and truck traffic to make the area less attractive for tourism in general. Concerns regarding how the increased traffic would affect the City of Dunnellon, including reducing property values along the truck route, were also raised. Commentors questioned the aggregate demand projections in the EIS and suggested that importing aggregate from outside the Primary Market Area would be a cost-effective and easy option for meeting current and future demand in lieu of mining aggregate locally.

Trucks and Traffic (16)

A number of commentors expressed concerns about the increased traffic volume, especially heavy truck traffic, in and around their hometowns and questioned the inputs and results of the traffic study, especially because there are existing weight restrictions on certain roadways. Both Inglis and Dunnellon were cited as areas in which the quality of life and traffic patterns would be negatively affected. Overall concerns related to difficulties with vehicles or pedestrians crossing roads and highways; traffic safety issues, including bicyclists, children crossing streets in school zones, and an increased number of traffic accidents; increased noise, dust, and road wear; and the effect of the cumulative increase in traffic with other projects such as the Levy Nuclear Plant.

Costs (4)

Commentors raised concerns about who would be paying for the impacts of the mining operations once mining ceases.

Cumulative Impacts/Direct/Indirect (4)

Several commentors stated their opinions that the cumulative impacts analysis is inadequate because it does not include all potential activities that could affect the proposed action. Other commentors wanted specific areas to be evaluated or evaluated in more detail, in particular cumulative effects on groundwater, traffic, wetlands, floodplains, special aquatic sites, other waters including Outstanding Florida Waters, wildlife habitat, and federally endangered and threatened species.

Miscellaneous (20)

Commentors expressed a variety of concerns, including the need to consider activities occurring in a wider area than evaluated for cumulative impacts; about whether the project was compliant with state or county requirements for berm design and land use; impacts of Tarmac's test dig; future land use in the area; need for financial assurance for potential damages and compensatory mitigation; physical safety concerns for children who might enter the mining area; and the potential 100-year length of the permit and monitoring of impacts over that timeframe. There were requests to involve additional state or Federal agencies. One commentor took exception to the list of environmental documents cited in Section 1.5 of the EIS and another suggested that the EIS should consistently refer to the exact, rather than approximate, size of the project site. Another commentor expressed the concerns of local residents about impacts on water resources, blasting vibration, and increased truck traffic through the community of Inglis. One commentor was of the opinion that the proposed action violates the Coastal Zone Management Act. There were also commentors who complimented the quality and thoroughness of the EIS.

Comments Received After the Public Comment Period

Eleven additional comments were received after the close of the public comment period on July 11, 2012. These comments are not categorized by issue topic, but are listed by date received in the comment response section of Appendix I.

Most of the comments are testimony or documents submitted during or as part of the proceedings of Nuclear Regulatory Commission and Atomic Safety and Licensing Board hearings for the proposed Levy Nuclear Plant. Additional comments were also provided regarding comment period deadlines and information the commentor feels was excluded from or insufficient in the USACE's *Areawide Environmental Impact Statement on Phosphate Mining in the Central Florida Phosphate District*. The commentors are of the opinion that these comments are also relevant to the Tarmac King Road Limestone Mine project and EIS. These commentors expressed opinions about the potential impact of groundwater withdrawal for Levy Nuclear Plant operations relative to the water table, saltwater intrusion, and the potential to cause sinkholes, adversely affect ecosystems, wetlands and sensitive species, and contribute to other detrimental impacts, and how those impacts should be considered cumulatively in the *King Road EIS* with proposed Tarmac King Road Limestone Mine operations and other mining operations in the area. These and other commentors called for a supplement to the *Draft King Road EIS* to address these concerns.

One commentor stated the opinion that the *Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2 (LNP EIS)* is legally deficient because did not adequately assess impacts on all relevant listed and proposed species under the Endangered Species Act, nor did it adequately address potential impacts of groundwater withdrawal. The commentor is of the opinion that because of these deficiencies in the *LNP EIS*, none of these impacts were included or considered as adverse cumulative effects in the *King Road EIS*, and that a supplement to the *Draft King Road EIS* is therefore required. This commentor also notes that impacts from the Knight Mine must also be considered.

1.8 PERMITS, LICENSES, AND ENTITLEMENTS

Listed below are the required environmental permits that have been or will be issued by the USACE, Florida Department of Environmental Protection, and local government agencies that relate to mining activities at the proposed Tarmac King Road Limestone Mine.

- Special Exception #09-07 approved by Levy County Board of County Commissioners, May 3, 2011
- Non Title V Air Permit 0750089, construction permit issued by the Florida Department of Environmental Protection, December 18, 2008, extension granted January 7, 2011
- Environmental Resource Permit, 0244771-002, issued by the Florida Department of Environmental Protection, November 1, 2010
- Excavation and Fill Permit, submitted to Levy County, June 30, 2010
- General Water Use Permit 20013273.000, issued by Southwest Florida Water Management District, June 17, 2010
- Industrial Wastewater Permit FLA663492, issued by the Florida Department of Environmental Protection, January 8, 2010
- Jurisdictional Declaratory Statements, approved by the Florida Department of Environmental Protection, November 16, 2009 (FD 38-276629-001, FD 38-276628-001, FD 38-276624-001, FD 38-0244771-001, FD 38-276630-001)
- Clean Water Act Section 404 Permit for dredge and fill activities in waterways and wetlands, submitted to the USACE, September 14, 2007
- Special Exception #06-07, Dragline Assembly, approved by Levy County Commission, September 4, 2007
- Environmental Resource Permit 44029159.001, Dragline Assembly, approved by Southwest Florida Water Management District, August 16, 2007
- Special Exception #03-05, Test Pit, approved by Levy County Commission, December 6, 2006
- Environmental Resource Permit 44029159.000, Test Pit, approved by Southwest Florida Water Management District, February 22, 2006

1.9 REFERENCES

FDOT (Florida Department of Transportation), 2009, *Strategic Resource Evaluation Study: Highway Construction Materials Aggregate Materials Final Report*, State Materials Office, Gainesville, Florida, September.

Ports Survey, 2011, Responses from Florida Ports to Data Call Questionnaire, September.

USGS (U.S. Geological Survey), 2009, *2007 Minerals Yearbook: Stone (Crushed) (Advance Release)*, accessed through http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/myb1-2007-stonc.pdf.

USGS (U.S. Geological Survey), 2010, *Mineral Industry Surveys, Crushed Stone and Sand and Gravel in the First Quarter, 2010*, June.

USGS (U.S. Geological Survey), 2011, *2010 Mineral Commodity Summaries: Stone (Crushed)*, accessed through http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mcs-2011-stonc.pdf, January.

USGS (U.S. Geological Survey), 2012a, *2011 Mineral Commodity Summaries: Stone (Crushed)*, accessed through http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mcs-2011-stonc.pdf, January.

USGS (U.S. Geological Survey), 2012b, *Mineral Industry Surveys, Crushed Stone and Sand and Gravel, Second Quarter 2012*, accessed through http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mis-2012q2-stonc.pdf, September.

Code of Federal Regulations

33 CFR 320–332, Corps of Engineers, Department of the Army, “General Regulatory Policies.”

40 CFR 1501.7, Council on Environmental Quality, “NEPA and Agency Planning: Scoping.”

40 CFR 1502.4 *et seq*., Council on Environmental Quality, “Environmental Impact Statement: Major Federal Actions Requiring the Preparation of Environmental Impact Statements.”

40 CFR 1503.1, Council on Environmental Quality, “Commenting: Inviting Comments.”

Federal Register

73 FR 9103, Department of Defense, Department of the Army, Corps of Engineers, 2008, “Notice of Intent to Prepare a Draft Environmental Impact Statement on Rock Mining in Wetlands in Levy County, FL,” February 19.

77 FR 29617, Department of Defense, Department of the Army, Corps of Engineers, 2012, “Notice of Availability of the Draft Environmental Impact Statement for the Tarmac King Road Limestone Mine Proposed in Levy County, FL,” May 18.

United States Code

30 U.S.C. 1601 *et seq*., National Materials and Minerals Policy, Research and Development Act of 1980.

33 U.S.C. 1251 *et seq*., Clean Water Act of 1972.

33 U.S.C. 1344, Permits for Dredged or Fill Material.

42 U.S.C. 4321 *et seq*., National Environmental Policy Act of 1969.

CHAPTER 2
ALTERNATIVES

The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) state that alternatives are the heart of the environmental impact statement (EIS) (40 CFR 1502.14).

Title 33 of the *Code of Federal Regulations* (CFR), Part 325, Appendix B, sets forth the NEPA implementing procedures for the U.S. Army Corps of Engineers (USACE) regulatory program. CEQ and USACE regulations require that the Federal decisionmaker perform the following tasks:

- Assess and objectively evaluate all reasonable alternatives, and, for alternatives that were eliminated from detailed study, briefly discuss the reasons for their elimination.

- Disclose the potential environmental consequences of each alternative, including the No Action Alternative and the applicant's preferred alternative (also referred to as the "applicant's proposed project") so that reviewers may evaluate their comparative merits.

The CEQ regulations implementing NEPA (40 CFR 1500–1508) require that all reasonable, feasible, prudent, and practicable alternatives that might accomplish the objectives of a proposed project be identified and evaluated. Therefore, in compliance with NEPA, the USACE independently reviews and analyzes those alternatives that could achieve the purpose and need for the project. An EIS is not a USACE regulatory decision document. It is used by agency officials, in conjunction with other relevant information in a permit application file, including public and agency comments on the final EIS, to inform the final decision on a permit application.

Only reasonable alternatives need to be considered in detail, as specified in 40 CFR Section 1502.14(a). Reasonable alternatives are those that are feasible; such feasibility must focus on the accomplishment of the underlying purpose and need that would be satisfied by the proposed Federal action (permit issuance). Those alternatives that are unavailable to the applicant, whether or not they require Federal action (permits), should normally be included in the analysis of the No Action (denial) Alternative. Such alternatives should be evaluated only to the extent necessary to allow a complete and objective evaluation of the public interest and a fully informed decision regarding the permit application.

This chapter describes the process of identifying and evaluating alternatives for meeting the established purpose and need for the proposed project, which, as discussed in Chapter 1, is to provide a source of affordable construction-grade limestone aggregate, including aggregate that meets the Florida Department of Transportation (FDOT) specifications, for buildings and infrastructure to satisfy the long-term public need for high-quality aggregate in west-central Florida.

2.1 CATEGORIES OF ALTERNATIVES

The analysis of EIS alternatives is an independent examination by the USACE of a range of reasonable alternatives that could meet the purpose and need for the applicant's proposed project, as described in detail in Chapter 1, "Project Purpose and Need." The alternatives that the USACE considered in this analysis can be grouped into offsite and onsite categories of alternatives and a No Action Alternative.

2.1.1 Offsite Alternatives

2.1.1.1 Regional Management Alternatives (Use of Mines from Other Regions)

These alternatives examine the ability of existing mines outside of the proposed Tarmac King Road Limestone Mine to meet the long-term public need for a source of affordable construction-grade limestone aggregate in west-central Florida, including aggregate that meets FDOT specifications.

2.1.1.2 Development of New Offsite Rock Mines Instead of the Tarmac King Road Limestone Mine

This alternative examines the development and construction of new mines within west-central Florida instead of on the proposed Tarmac King Road Limestone Mine site to meet the long-term public need for a source of affordable construction-grade limestone aggregate in west-central Florida, including aggregate that meets FDOT specifications.

2.1.1.3 Shipping Aggregate into the Region Through Florida's Harbors

This alternative evaluates the impacts of shipping limestone from other mines from national or international sources through nearby harbors. This EIS evaluates the viability of this alternative by assessing the port facilities, roads, and cost impacts.

2.1.1.4 Shipping Aggregate into the Region Through Rail Terminals

This alternative evaluates the impacts of shipping limestone from other mines from national sources through nearby rail terminals. This EIS evaluates the viability of this alternative by assessing the rail facilities, roads, and cost impacts.

2.1.1.5 Using Other Material to Satisfy Construction Needs

This alternative examines the use of other materials or construction methods (e.g., recycling of construction material) to satisfy the long-term public need for a source of affordable construction-grade limestone aggregate in west-central Florida, including aggregate that meets FDOT specifications.

2.1.2 Onsite Alternatives

2.1.2.1 Alternatives to Minimize Wetland Impacts at the Tarmac King Road Limestone Mine

These alternatives are designed to meet the need for aggregate consistent with FDOT specifications and for construction-grade aggregate in the west-central Florida region while minimizing impacts on federally jurisdictional wetlands. These alternatives consider reductions in the mining footprint in varying degrees to decrease wetland impacts at the proposed Tarmac King Road Limestone Mine site.

2.1.3 No Action Alternative

To satisfy the intent of NEPA, "NEPA Implementation Procedures for the Regulatory Program" (33 CFR 325, Appendix B), and other environmental laws, the No Action Alternative is carried forward in the analysis of environmental consequences provided in Chapter 4, "Environmental Impacts." Under 33 CFR 325, Appendix B(9)(b)(5)(b), the "no-action" alternative is an alternative which results in no construction requiring a USACE permit. The USACE's permit authority and jurisdiction over the applicant's proposed project site is extensive, including streams and a mosaic of forested wetlands covering a majority of the site. Analyses of alternative sites for comparison and for any potential these alternative sites may have for leading to "no action" while still meeting the project purpose are included in this chapter. Mining only in uplands at the proposed mine site that are accessible without any fill discharges in wetlands or other waters of the United States would reduce the available footprint to a small fraction of the applicant's proposal. In Chapter 3, Figure 3–13 shows that the majority of the 2,147 acres of uplands on the site is surrounded by wetlands and therefore could not be mined without fill discharges in wetlands to construct roads to access them. Accessing only those uplands contiguous with existing roads would limit the potential mining area to potentially less than 10 percent of the total site. Allowing vegetated perimeter and wetland buffers to remain as proposed would further reduce mining area. In addition, the more irregular the shape of the area to be mined, and the further the spacing between mine blocks, the less practicable it becomes to mine that site. Limestone mines in Florida utilize a single large pit, or a series of a few to several large pits, because beginning each pit is more labor- and time-intensive compared with mining an open pit. Moving a dragline, rockcrushers, and other necessary equipment around to scores of small pits scattered thousands of feet apart would substantially reduce the time spent actually extracting limestone compared with mining a series of adjacent large pits. This would slow

production of saleable material considerably, with large gaps of time required for equipment relocation, setup, and new pit construction. Production costs would increase substantially due to this downtime. Mining in this manner would make this site impracticable, and the project purpose would not be met. Therefore, under the No Action Alternative in this analysis, the proposed mine site would not be excavated for mining beyond what has been currently done as part of the test pit exception permit, and the site would remain in its current state as an active timbering operation and hunting area.

2.2 ALTERNATIVES ANALYSIS

The alternatives analysis identified and evaluated a range of reasonable alternatives that could substantially meet the stated purpose and need for the project. This analysis qualitatively screened both the offsite and onsite options that could feasibly satisfy the need for a source of affordable construction-grade limestone aggregate, including aggregate that meets the FDOT specifications for buildings and infrastructure to satisfy the long-term public need for aggregate in west-central Florida. The alternatives that could reasonably supply this aggregate were then subjected to further evaluation to consider the impacts that each alternative would have on the human and natural environment. A detailed alternatives analysis was also provided by Tarmac America, LLC (Tarmac)—the *Report in Support of the Analysis of Practicable Alternatives Pursuant to 40 CFR 230.10* (SAJ-2007-05537-EPS)—and is included as Appendix C of this EIS.

2.2.1 Offsite Alternatives

2.2.1.1 Regional Management Alternatives (Use of Mines from Other Regions)

FDOT has developed specifications for aggregate used in its construction projects and a certification program to ensure that only aggregate meeting its specifications is used. This certification process for mining products starts with certification of the mine itself. A mine must first be approved by the FDOT as a supplier of aggregate material; then the products from that mine must meet the specifications for each particular product. Not all mines seek FDOT certification or seek to compete in markets that require FDOT specifications. However, if a contract requires #57 0.5- to 1.5-inch-diameter coarse limestone aggregate (also known as C-10 grade) that meets FDOT specifications, the contractor must obtain that material from a mine that is certified by the FDOT and has C-10 grade aggregate that meets FDOT specifications. A mine can be FDOT-certified, but if the FDOT has not certified the product from that mine, the mine cannot fulfill that contract.

In addition to considering the certification status of a mine and its products and size characteristics of the approved aggregate products, the quality of the material must be considered. There are several limestone formations within six strategic aggregate mining areas throughout Florida, as identified by the FDOT, that serve as the primary sources of limestone in Florida. Not all limestone mines produce suitable material for all uses of crushed rock. Particle size, shape, and composition are among the properties that affect the suitability of an aggregate deposit for a specific use (USGS 2000). Generally, there are two types of limestone in Florida: hard limestone and soft limestone. Hard limestone yields a range of high-value products, including aggregates and other finished stone materials. Soft limestone is used for lower-value products such as limerock base. This material is regarded as lower-quality and lower-value, as it is suited for fewer construction purposes than hard limestone. Hard limestone is excavated and crushed into various grades (i.e., sizes) that are then sold to be incorporated into construction materials such as concrete and asphalt; it can also be used for limerock base.

Chemical composition, such as higher silica content in limestone, can make aggregate harder and more angular so that it has a higher compressive strength and is more usable in asphalt or concrete. In addition to requiring a particular grade aggregate to make a particular product, the use of the product may require that the aggregate have certain chemical characteristics or meet certain quality standards. For example, if an aggregate material were being used to construct a bridge slab requiring a high-strength concrete (at 10,000 pounds per square inch), the aggregate used to make the bridge slab would have to be stronger and denser than that used to make a concrete slab for a sidewalk. While a mine could change the crushing equipment to modify the grade of material a mine produces, it would not be able to change the chemical components of the aggregate it produces. In some cases, the specifications for the aggregate end products, like asphalt, take the chemical characteristics of the aggregate ingredient into consideration. For example, FDOT specifications for asphalt concrete friction courses (specialized layers

of asphalt lain on the surface of roads) require the use of an aggregate blend that consists of 100 percent crushed granite, 100 percent crushed oolitic limestone, or 100 percent other crushed materials (as approved by the Engineer for friction courses per Rule 14-103.005 of the *Florida Administrative Code*). Aggregate from the Oolitic Formation may be used if it contains a minimum of 12 percent silica material as determined by the Florida Method of Test FM 5-510 and approval by an engineer (FDOT 2010:295). Oolitic limestone comes from the Miami Limestone Formation found at or near the surface of the southeastern tip of Florida.

Some of the limestone mined in Florida is too soft to be used for certain construction purposes, while some deposits yield materials that are unsuitable for even limerock base. A review of the FDOT-certified mines in Florida shows that mines producing sand and/or limerock base materials are far more common than mines producing higher-value fine and coarse aggregates. Additionally, many other mines exist throughout Florida and nearby states that are not FDOT-certified.

Higher-quality Florida limestone is primarily mined from four designated resource areas: the Lake Belt, Charlotte-Lee County, Sumter-Hernando-Citrus County, and the Taylor-Dixie-Big Bend area (FDOT 2009:14). The quality of Florida limerock available from non-Lake Belt supply areas has been steadily declining (FDOT 2007a:2).

Florida mining permits are routinely challenged and delayed; in some cases, judicial decisions may limit access to limestone resources (FDOT 2007a:2).

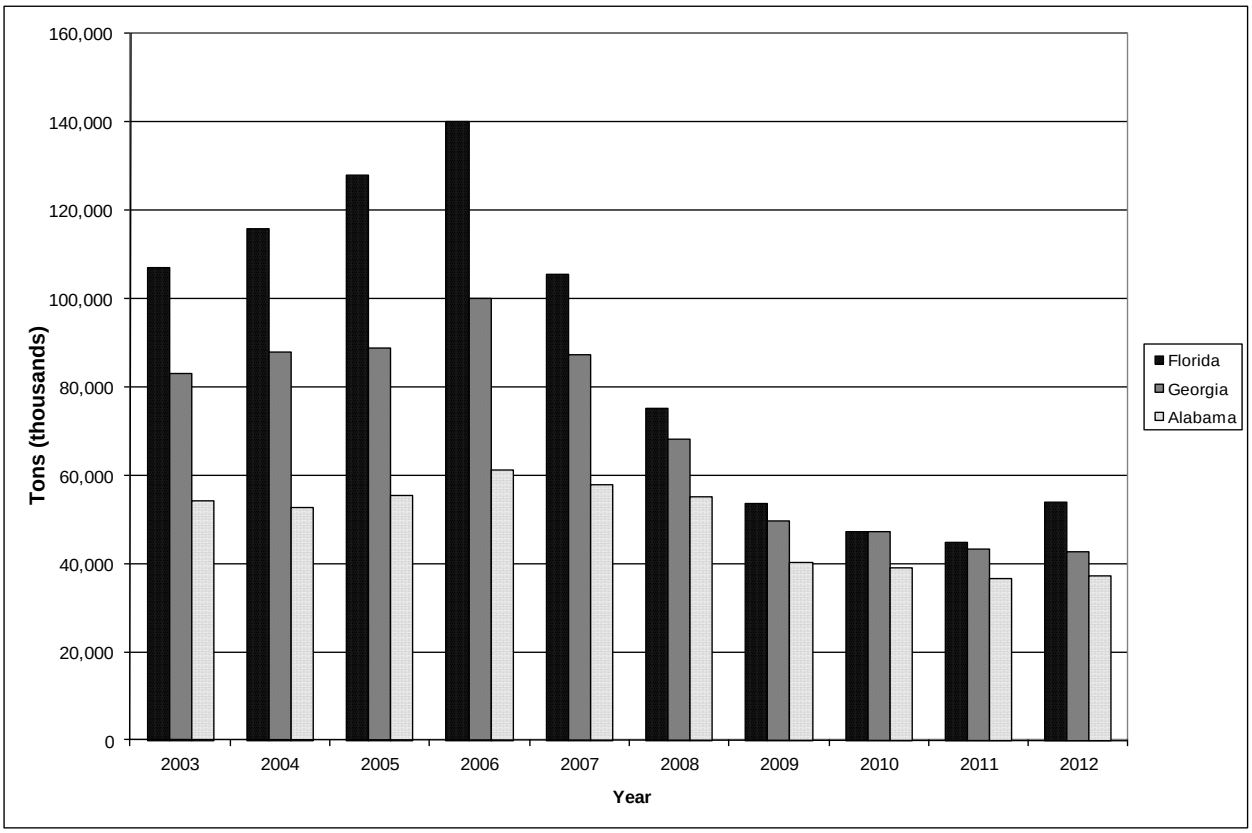
Mines Outside of the State of Florida

Alternate sources (domestic and international) of crushed rock are available outside of Florida—the question is determining how practicable it is to obtain material from them. Sources outside of Florida involve their own environmental impacts, economic effects, and additional transportation costs compared with in-state sources.

There are alternative sources of crushed rock that could supply the west-central Florida market. One possibility is to ship limestone from other parts of Florida or limestone or other rock from other states such as Alabama or Georgia. Figure 2–1 shows the quantity of crushed rock sold or used in Alabama, Georgia, and all of Florida.

The cost of shipping rock from other states or other countries into Florida and then transporting the material to the west-central Florida market can be considerable. Table 2–1 shows the cost per ton and quantity produced by alternative of domestic sources of crushed rock in Florida, Georgia, and Alabama. The prices shown in Table 2–1 represent the value of the rock at the quarry, as compiled by the U.S. Geological Survey. Thus, these costs do not include costs associated with transportation of crushed rock from the quarries to the construction site or point of use. Transportation costs to the point of use can be expected to drive these prices much higher, depending on the distance traveled. As noted in Chapter 1, aggregate has a low cost-to-weight ratio, and additional handling, transfers, and transportation compounds the price per ton. The average cost to ship aggregate in 2006 (the latest independent data available) ranged from $0.06 per metric ton-mile via rail to $0.13 per metric ton-mile via truck (SME 2006). In 2006, the California Geologic Survey estimated that every mile aggregate is hauled by truck would add a minimum of $0.15 per ton (CDOC 2006). While there are multiple cost components associated with truck hauling, fuel prices are higher now than in 2006. The U.S. city average for automotive diesel fuel in 2006 was $2.814 per gallon; in 2012, the average was $4.00 (BLS 2013). Using these costs for a comparison, and without adding in current higher fuel costs, this translates to a greater than $20 increase in the cost per ton for aggregate shipped via rail and a greater than $41 increase per ton for aggregate trucked from Georgia to Reddick, Florida, the approximate geographic center of the Tarmac Primary Market.[1] If the FDOT were to approve mines in Alabama for use in the Primary Market Area, transportation costs from mines in that state would be similar or higher. Tarmac intends to truck aggregate from the proposed mine to customers within a 70-mile radius (nominally a 100-mile driving radius) of the mine, which would add a maximum of $15 per ton to the costs in Table 2–1. Trucking costs from the proposed Tarmac King Road Limestone Mine site to Reddick, Florida, would add just over $6 per ton.

[1] This cost is based on the approximate distance between the closest FDOT-approved coarse aggregate mines near Macon, Georgia, and Reddick, Florida. Actual distances between the pick-up and delivery locations may be considerably farther, further increasing costs. Costs for transferring aggregate from rail to truck are not included here; however, trucking costs from the rail terminal in Ocala Florida to Reddick are included in this figure.



Source: USGS 2004a–c, 2007, 2009a, 2009b, 2010a, 2012, 2013.

Figure 2–1. Crushed Rock Output from Florida, Georgia, and Alabama

As shown in Table 2–1, as demand increased from 2003 to 2006, prices in all states increased. Florida displayed the largest increase over this period—the cost per ton increased by $4.09 per ton, or about 75 percent. Overall, the price per ton across all three states increased $2.67 per ton, or about 47 percent on average, during this period. When demand began to decline from 2007 through 2009, prices in all states continued to increase. Price increases in Georgia over this time period slowed compared with the increases in previous years (USGS 2004a–c, 2007, 2009a, 2009b, 2010a). From 2010 to 2011, the quantity of crushed stone mined in Florida, Georgia, and Alabama continued to decline. The price of crushed stone decreased in Florida and Georgia in 2010; however, the price in Alabama increased slightly over this time. The price of crushed rock in Florida and Alabama increased in 2011, but decreased in Georgia. This contributed to an overall slight increase in the weighted average price of crushed stone in the three-state region when compared to 2010. In 2012, the quantity of crushed stone sold in Florida and Alabama increased for the first time since 2006, while prices continued to decline slightly. At this time, quantities sold in Georgia declined slightly while the cost per ton continued to increase. The weighted average price per ton of crushed stone in the three-state region in 2012 continued to increase year over year.

In addition to domestic sources of crushed rock, the United States is a large importer of crushed rock. Foreign sources that have been known to supply rock in Florida include Mexico, Canada, and the Bahamas. Table 2–2 shows the quantity and cost per ton of rock imported to the United States. It is not possible to determine how much, if any, of the rock being imported into the United States, as shown in this table, is destined for use in the Florida market. As compared to the total shown in Table 2–1, the amount of rock being imported from these countries is very small compared to the amount of crushed rock being produced in Florida, Georgia, or Alabama. In 2012, imports from these countries amounted to approximately 11.3 percent of the output from these states. The prices of the foreign alternatives shown in this table represent the value of the rock at the first port of arrival into the United States, as collected by the U.S. International Trade Commission. Costs associated with transportation of crushed rock from the ports to the point of use will increase the overall cost of imported aggregate, as described below in Section 2.2.1.3. Increased use of granite aggregate within some Florida districts has also slightly increased international imports (FDOT 2009:16).

Table 2–1. Output and Cost per Ton for Other Suppliers Within the United States

State	2003		2004		2005		2006		2007		2008		2009		2010		2011		2012	
	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton
Florida	107,033	$5.48	115,742	$5.88	127,867	$7.90	139,992	$9.57	105,490	$10.62	75,287	$11.85	53,572	$12.00	47,178	$11.62	44,643	$11.92	53,792	$11.75
Georgia	82,893	$6.26	87,853	$6.24	88,956	$7.09	100,089	$8.15	87,302	$9.29	68,232	$9.76	49,714	$10.42	47,289	$9.85	43,320	$10.11	42,659	$10.74
Alabama	54,343	$5.26	52,690	$5.62	55,446	$5.93	61,067	$5.98	57,871	$6.95	55,115	$6.70	40,124	$8.27	39,021	$8.48	36,707	$8.72	37,258	$8.16
Total	**244,270**	**$5.70**	**256,285**	**$5.95**	**272,268**	**$7.24**	**301,148**	**$8.37**	**250,663**	**$9.31**	**198,634**	**$9.70**	**143,409**	**$10.41**	**133,489**	**$10.08**	**124,670**	**$10.35**	**133,709**	**$10.43**

Key: Qty=quantity (thousand tons).
Note: Cost per ton does not include transportation costs from the quarry to the point of use. Total cost per ton presented is a weighted average cost.
Source: USGS 2004a–c, 2007, 2009a, 2009b, 2010a, 2011, 2012, 2013.

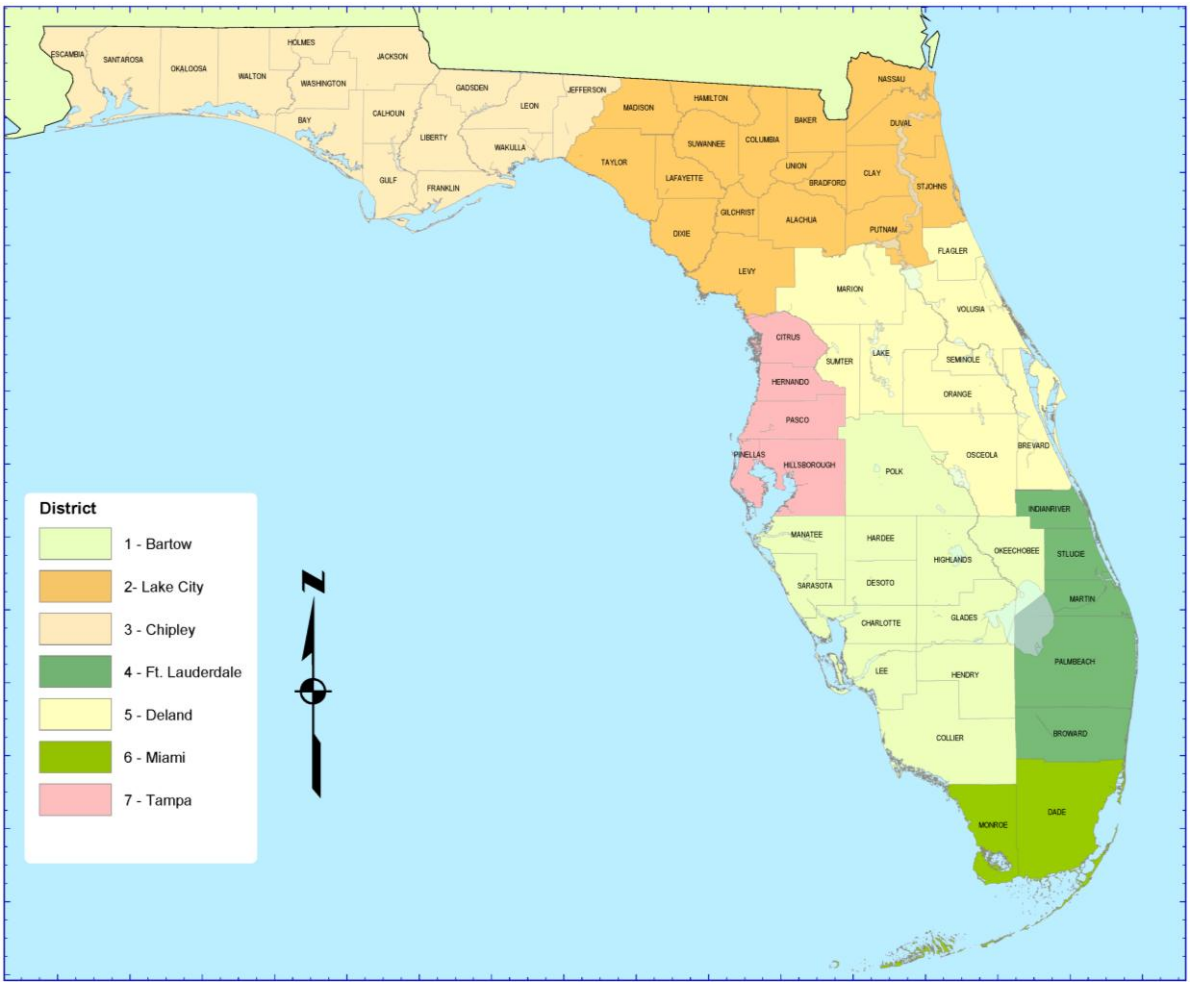
Table 2–2. Output and Cost per Ton for Foreign Suppliers

State	2003		2004		2005		2006		2007		2008		2009		2010		2011		2012	
	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton	Qty	Cost per ton
Canada	6,316	$8.94	6,389	$9.20	7,011	$8.66	6,749	$9.92	6,796	$10.80	7,185	$10.99	5,884	$11.45	5,272	$12.26	5,871	$11.70	6,357	$14.64
Mexico	6,645	$8.01	7,008	$7.24	7,902	$5.94	7,060	$6.14	8,079	$5.95	9,402	$6.41	1,662	$6.35	7,060	$6.52	6,894	$6.60	7,084	$6.59
Bahamas	1,890	$7.61	1,777	$7.83	3,473	$7.58	4,148	$8.57	3,079	$9.53	3,689	$10.49	1,996	$9.15	1,755	$8.53	1,739	$8.77	1,724	$9.07
Total	**14,851**	**$8.35**	**15,174**	**$8.13**	**18,386**	**$7.29**	**17,958**	**$8.12**	**17,953**	**$8.40**	**20,276**	**$8.77**	**9,542**	**$10.08**	**14,087**	**$8.92**	**14,504**	**$8.92**	**15,165**	**$10.25**

Key: Qty=quantity (thousand tons).
Note: Cost per ton is based on the cost, insurance, and freight import value, which represents the landed value at the first port of arrival. It is “Import Charges” plus “Customs Value” and therefore excludes U.S. import duties. Total cost per ton presented is a weighted average cost.
Source: USITC 2012, 2013.

Mines within the State of Florida

Crushed stone mines (limestone and other aggregates) are operated in 22 counties in Florida (USGS 2010b), with significant deposits located in six of the seven multi-county aggregate complexes designated as FDOT districts. These districts are shown in Figure 2–2. The use of other mines in Florida was given consideration to determine if mining reserves at these other locations could satisfy the west-central Florida supply chain demand for aggregate materials. Trucking costs add approximately $0.15 per ton-mile, substantially increasing the total cost of aggregate sourced from other mines in Florida.



Source: Adapted from FDOT 2008.

Figure 2–2. Florida Department of Transportation Districts

The Florida aggregate supply chain, excluding the south and southeast Florida areas served almost exclusively by aggregate from the Lake Belt mines of Miami-Dade County, was divided into the Tarmac Primary Market and four additional surrounding market areas, listed below:

- Northwest Florida Market
- Orlando Market
- Jacksonville Market
- West Florida Market

Primary Market (Levy, Citrus, and Nearby Counties)

The Primary Market is defined as the 70-mile radius around the proposed Tarmac King Road Limestone Mine site (see Figure 2–3). This distance equates to the maximum distance that aggregate can be hauled via truck to consumers before the transportation costs become too high as to not make it viable. This area includes portions of FDOT Districts 1, 2, 5, and 7 and includes all of Levy, Citrus, Hernando, Marion, Sumter, Alachua, Gilchrist, and Dixie Counties; large portions of Pasco, Lake, Putnam, Bradford, Union, Lafayette, and Columbia Counties; and small portions of Orange, Volusia, Taylor, Suwannee, Clay, Polk, Pinellas, and Hillsborough Counties. Figure 2–3 also includes the existing freight railroad in and around the Primary Market.

As of November 12, 2012, there were 32 FDOT-certified mines located in the Primary Market. Four more FDOT-certified mines were located directly outside (within 6 miles) of the Primary Market. The mines located directly outside of the primary market were located in Districts 2, 5, and 7.

Of the 32 FDOT-certified mines in the Primary Market, 21 produced limerock base; 3 produced screenings and/or sand materials; 3 produced a combination of those materials and/or stone for ditches, draws, pipes, bedding material, and shoreline protection; and 4 produced stone for bedding material and shoreline protection. Only one mine in the Primary Market produced coarse aggregate such as #57 or S1A stone (it also produced other stone, sand, and screening products). Of the 4 mines located directly outside of the Primary Market, 1 produced limerock base; 1 produced underdrain filter stone; and 2 produced a combination of screening and/or sand materials, and/or stone for ditches, draws, pipes, bedding material, and shoreline protection (FDOT 2012).

The Holcim U.S. Crystal River Quarry was evaluated as an alternative supply of aggregate in the Primary Market. None of the Holcim mine parcel lies over the mapped Avon Park limestone formation, and a portion of the Holcim site does not fall within the radius from mapped formations used in the applicant's alternatives analysis. Whether through business decision or necessity, the Holcim mine currently transports its limestone product out of the market area to Alabama via barges. The Holcim site is also not available to the applicant as a reasonable alternative to mining the proposed King Road site, as it is owned and operated by a competitor company.

The National Stone, Sand, and Gravel Association (2012) estimates that about 10 tons of aggregates per person are used annually in America. However, this consumption rate is based on averages throughout the United States, includes all aggregates, and could vary widely from state to state. To determine the annual amount of crushed rock per person for Florida and the Tarmac Primary Market Area, population data for 2001–2010 were used in conjunction with the actual Florida crushed rock consumption reported in Table 2–1.[2] For 2001–2010, the annual crushed rock per person in Florida varied year to year from a minimum of 3.0 tons per person to a maximum of 7.5 tons per person. The 10-year average was 5.3 tons per person.

Table 2–3 includes the 2001–2010 averages; and projections of population, and crushed rock average and peak consumption for Florida and the Tarmac Primary Market Area in 2020 and 2050. Consumption of crushed rock within the Primary Market over the last 10 years averaged 11.2 million tons annually, with a peak consumption of 15.9 million tons. At this average level of consumption, it is estimated that the supply of crushed rock in the Primary Market would need to increase by approximately 200,000 tons annually just to keep pace with population growth. At this rate, the annual demand for crushed rock in the Primary Market Area is estimated to increase to 13.1 million tons by the year 2020. If the consumption rate returns to the peak state-wide levels experienced in 2005 and 2006 (see Table 2–1), the annual demand for crushed rock in the Primary Market could increase to 18.6 million tons by 2020. Similarly, at the average level of consumption, the annual demand for crushed rock in the Primary Market Area is estimated to increase to 19.4 million tons per year by 2050. If the consumption rate returns to the peak state-wide levels experienced in 2005 and 2006 (see Table 2–1), the annual demand for crushed rock in the Primary Market could increase to 27.6 million tons by 2050.

[2] Estimates of demand in the Primary Market were calculated as a function of the total state population and crushed rock consumption. The state-wide consumption of crushed rock was used to generate a consumption estimate on a per-capita basis. The per-capita consumption rate was then applied to population in the Primary Market Area to yield an estimate of demand. Population projections were developed using data from the 1990, 2000, and 2010 census to extrapolate a linear trend for each county in the market area. The projected demand was then estimated by applying the same per-capita methodology to the projected population of the market area.

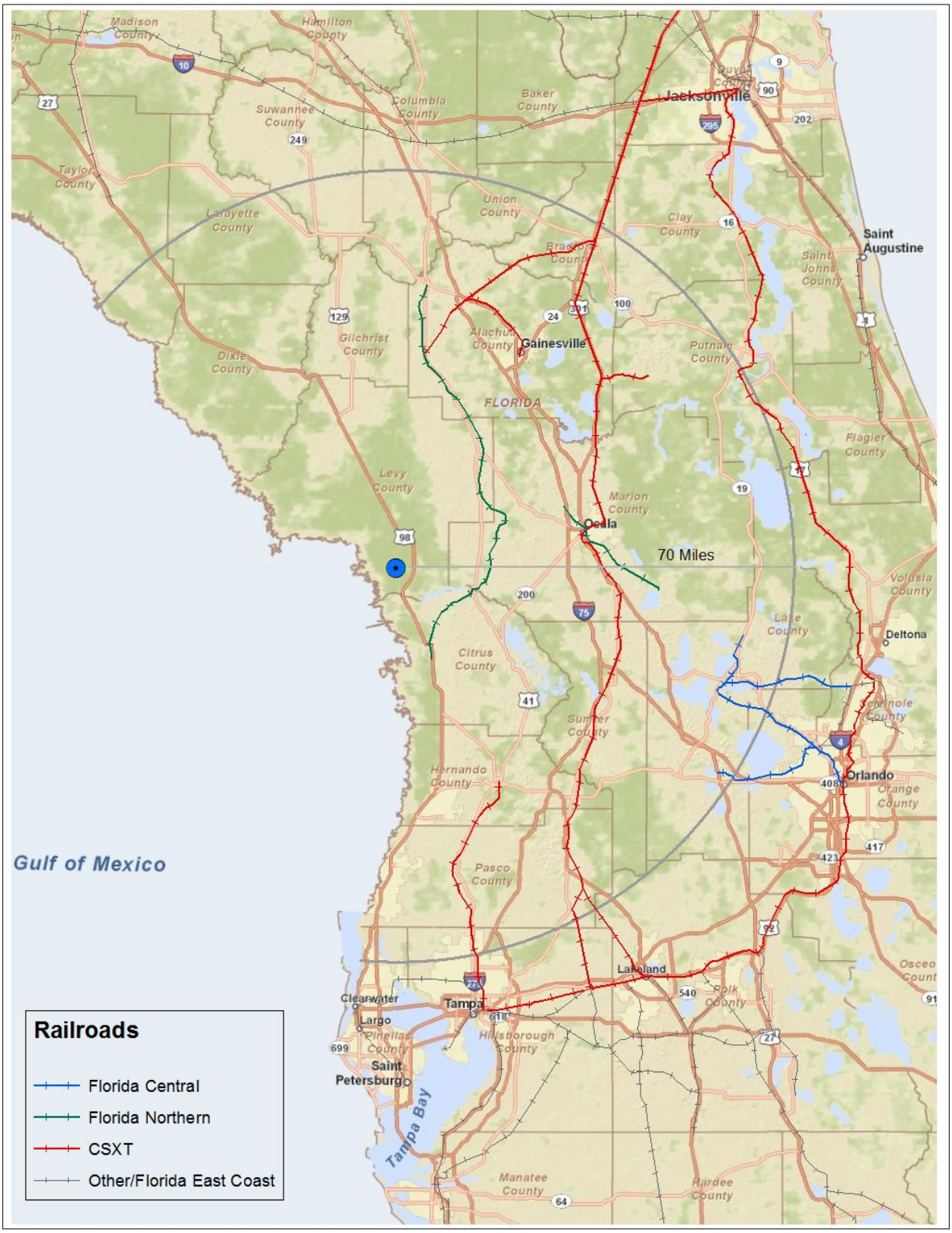


Figure 2–3. Tarmac Primary Market – 70-Mile Radius Around Proposed Mine

Table 2–3. 2001–2010 Averages and Peaks, and Projected Demand for Crushed Rock Based on Current and Projected Population Growth in Florida and the Tarmac Primary Market Area

	2001–2010			2020 Projections			2050 Projections		
	Average Total Population (millions)	Consumption (million tons per year)		Population (millions)	Consumption (million tons per year)		Population (millions)	Consumption (million tons per year)	
		Average	Peak		Average	Peak		Average	Peak
Florida	17.4	98.5	140	21.8	114	162.1	30.6	160.1	227.6
Primary Market	2.0	11.2	15.9	2.5	13.1	18.6	3.7	19.4	27.6

In consideration of the current and forecast aggregate supply chain situation, to meet the projected demand over the long term proposed by the applicant (100 years), new mines must be constructed, output from existing mines must be increased, and/or aggregate must be imported from areas outside the Primary Market. The Tarmac King Road Limestone Mine site is proposed to produce just over 3 million tons annually. The applicant's detailed mining plan is included as Appendix B.

Northwest Florida Market

The Northwest Florida Market, designated by the FDOT as District 3, includes 16 counties that make up the Florida panhandle (see Figure 2–2). As of November 12, 2012, 13 mines in District 3 were approved by the FDOT to produce aggregate products. Seven of these mines produced limerock base and 5 mines produced screenings and/or sand materials. One mine produced screenings and/or sand materials and recycled aggregate base. None produced coarse aggregate. Eight mines in Alabama, 2 mines in Georgia, and 1 mine in Louisiana have been approved by the FDOT to provide construction-grade aggregate for the district market area. Of these 11 out-of-state mines, 1 mine produced limerock base, 4 mines produced screenings and/or sand materials, and 1 mine produced stone for bedding material and shoreline protection. Five out-of-state mines produced coarse aggregate, of which 4 also produced other stone and screening products (FDOT 2012).

Because the mines in the Northwest Florida Market lack the capacity collectively to produce the quality and/or quantity of aggregate necessary to meet the public need within District 3, aggregate is imported from mines in bordering states into Florida. As a result, obtaining aggregate consistent with FDOT specifications and construction-grade aggregate to satisfy the needs of the Primary Market from the Northwest Florida Market is not a reasonable alternative.

Orlando Market (Orange County)

While the Orlando Market is generally considered to be Orange County, material produced within, or sent to, this area could be utilized throughout FDOT District 5, which also includes Brevard, Flagler, Lake, Marion, Osceola, Seminole, Sumter, and Volusia Counties (see Figure 2–2). To ensure a complete analysis, all mines within the FDOT District 5 boundary have been considered as potential providers of aggregate to meet the public demand for FDOT-certified aggregate. Based on the FDOT *Strategic Aggregates Study: Sources, Constraints, and Economic Value of Limestone and Sand in Florida (Strategic Aggregates Study)*, the southern portion of Lake County is a strategic aggregate source for sand, and the western portion of Sumter County is a potential source of coarse aggregate (FDOT 2007a). As of November 12, 2012, there were 19 mines approved by the FDOT in District 5. Nine of these mines produced limerock base; 2 mines produced screenings and/or sand materials; 6 mines produced a combination of those materials and/or stone for ditches, drains, pipes, bedding material, and shoreline protection; and 1 mine produced only stone for shoreline protection. One mine produced coarse aggregate, as well as screenings. One of the recycling facilities produced recycled concrete and the second facility produced recycled concrete aggregate base. There is also 1 mine in the Bahamas approved by the FDOT to provide limerock base for this market (FDOT 2012). In addition, the Lake Belt has historically provided approximately 16 million additional tons per year of aggregate into this market (USACE 2009).

Because the mines in the Orlando Market lack the capacity collectively to produce the quality and/or quantity of aggregate necessary to meet the public need within District 5, aggregate must be imported

from other mining areas within or outside of Florida. As a result, obtaining aggregate consistent with FDOT specifications and construction-grade aggregate to satisfy the needs of the Primary Market from the Orlando Market is not a reasonable alternative.

Jacksonville Market (St. Johns County)

While the Jacksonville Market is generally considered to be St. Johns County, material produced within, or sent to, this area could potentially be utilized throughout FDOT District 2, which also includes Alachua, Baker, Bradford, Clay, Columbia, Dixie, Duval, Gilchrist, Hamilton, Lafayette, Levy, Madison, Nassau, Putnam, Suwannee, Taylor, and Union Counties (see Figure 2–2). To ensure a complete analysis, all mines within the FDOT District 2 boundary have been considered as potential providers of aggregate to meet the public demand for FDOT-certified aggregate. Based on the FDOT *Strategic Aggregates Study*, Taylor and Dixie Counties comprise a strategic aggregate source (FDOT 2007a). As of November 12, 2012, there were 16 mines approved by the FDOT in District 2. Nine of these mines produced limerock base; 1 mine produced screenings and/or sand materials; 2 mines produced a combination of those materials and/or stone for ditches, drains, pipes, bedding material, and shoreline protection; and 2 mines produced only stone for shoreline protection. Two mines produced coarse aggregate, as well as other stone, sand, and screening products. There are also 16 mines in Georgia, 1 in North Carolina, 1 in South Carolina, and 1 in Nova Scotia, Canada, that are approved by the FDOT to service the District 2 market area. Six of these mines produced screenings and/or sand materials. Thirteen of these out-of-state mines produced coarse aggregate, 11 of which also produced other stone and screening products (FDOT 2012). In addition, the Lake Belt has historically provided approximately 4 million additional tons per year of aggregate into this market (USACE 2009).

Because the mines in the Jacksonville Market lack the capacity collectively to produce the quality and/or quantity of aggregate necessary to meet the public need within District 2, aggregate must be imported from other mining areas in the state, as well as some aggregate from out of state. As a result, obtaining aggregate consistent with FDOT specifications and construction-grade aggregate to satisfy the needs of the Primary Market from the Jacksonville Market is not a reasonable alternative.

West Florida Market (Hillsborough, Pinellas, and Lee Counties)

While the local aggregate market is generally considered to be Hillsborough, Pinellas, and Lee Counties, it also generally overlaps with FDOT Districts 1 and 7, which also include Charlotte, Citrus, Collier, De Soto, Glades, Hardee, Hendry, Highlands, Hernando, Manatee, Okeechobee, Pasco, Polk, and Sarasota Counties (see Figure 2–2). To ensure a complete analysis, all mines within the FDOT District 1 and District 7 boundaries have been considered as potential providers of aggregate to meet the public demand for FDOT-certified aggregate. Based on the FDOT *Strategic Aggregates Study*, the Collier and Lee County Complex is one of the six areas in the state considered to be a significant or strategic resource reserve area (FDOT 2007a). There is limited rail south of Manatee County, and mines from the Collier and Lee County Complex generally serve the local six-county area by truck (USACE 2009).

As of November 12, 2012, there were 29 mines and 3 recycling facilities in District 1, and 8 mines and 2 recycling facilities in District 7 approved by the FDOT. In District 1, 5 mines produced limerock base; 5 mines produced screenings and/or sand materials; and 12 mines produced a combination of those materials and/or stone for ditches, drains, pipes, bedding material, and shoreline protection. Seven mines produced coarse aggregate, as well as other stone and screening products. The 3 recycling facilities produced concrete aggregate base (FDOT 2012).

In District 7, 5 mines produced limerock base and 2 mines produced stone for ditches, drains, pipes, bedding material, and shoreline protection. One mine produced coarse aggregate, as well as other stone, sand, and screening products. The recycling facilities produced concrete aggregate base. There is also 1 mine in Puerto Cortes, Honduras, that is approved by the FDOT to provide coarse aggregate and screenings to the West Florida Market (FDOT 2012). In addition, the Lake Belt has historically provided approximately 2.0 million additional tons per year of aggregate into this market (USACE 2009). Mining companies operating within District 7 in the Brooksville area have noted that reserves of hard rock are very limited, with depletion expected between 2014 and 2020 (USACE 2009; Van Sant 2005).

Given the interest in mining in Lee County, in 2007, Lee County undertook a land use study with substantial public involvement. This study included a review of existing rock volume available from the Collier and Lee County Complex compared with projected demand for rock. This study was performed to provide local county commissioners tools to evaluate requests for zoning changes associated with increased mining. Lee County limestone resources vary in thickness from 17 to 30 feet (compared to a thickness of greater than 120 feet at the proposed project site); therefore, mining in Lee County takes as much as seven times more surface area to obtain the same quantity of limestone that could be obtained from the Tarmac King Road Limestone Mine site. As a result of this land use study, it was determined that if Lee County intends to continue providing 80 percent of the area's public need for limestone, the county would need to authorize zoning changes for an additional 821 acres of mining (Lee County 2008). To balance the need for mining against other land uses, including conservation, in 2008, Lee County Commissioners adopted revisions to the *Land Development Code* that imposed additional restrictions on mining in the Density Reduction/Groundwater Resource area. Mining companies that own property in this area have filed suit to challenge the additional restrictions; however, recent rulings have upheld the county's restrictions. Based on these restrictions, the existing mines are not capable of replacing the larger District 1 public need for aggregate.

Because the mines in the West Florida Market lack the capacity collectively to produce the quality and/or quantity of aggregate necessary to meet the public need locally, aggregate must be imported from other mining areas within or outside of Florida. As a result, obtaining aggregate consistent with FDOT specifications and construction-grade aggregate to satisfy the needs of the Primary Market from the West Florida Market is not a reasonable alternative.

2.2.1.2 Development of New Offsite Rock Mines Instead of the Tarmac King Road Limestone Mine

The construction of new rock mines as an alternative to the proposed Tarmac King Road Limestone Mine to provide a source of affordable construction-grade limestone aggregate, including aggregate that meets the FDOT specifications, for buildings and infrastructure to satisfy the long-term public need for high-quality aggregate in west-central Florida was considered. A report describing the applicant's view of this alternative was prepared by Tarmac. Tarmac's *Report in Support of the Analysis of Practicable Alternatives Pursuant to 40 CFR 230.10* (SAJ-2007-05537-EPS) is included as Appendix C of this EIS. Areas covered in Tarmac's report include the following:

- Quality of limestone reserves
- Availability of property for acquisition and use
- Ability to supply the entire west-central Florida market from a single source
- Transportation logistics and cost
- Need to avoid multiple handling of limestone to minimize product losses
- Electric power infrastructure for large dragline equipment

The applicant's conclusions are as follows:

- Only the Avon Park and Suwannee Formations have the potential to produce FDOT-certified limestone aggregate within the market area. The outcrop portions of the Suwannee Formation within the proposed market area are small and only minable in small segments in several surrounding counties, none of which could produce the same amount of FDOT-quality aggregate as at the proposed Tarmac King Road Limestone Mine site.
- The Tarmac King Road Limestone Mine site overburden (the soil material overlying the limestone) averages 2 feet thick, with the Avon Park Formation below it being over 100 feet thick, meaning more aggregate can be mined while disturbing less acreage compared with other locations. The Avon Park Formation in the surrounding counties in the proposed market area is either too deep to economically mine or located in population centers, where mining would be difficult to permit.
- The difficulty in obtaining proper zoning, the expanding population in the areas where the Avon Park Formation would be more easily minable, and unwilling sellers would slow down or even halt any potential alternative site from being considered.

- There were no locations identified that contain the Avon Park Formation, paved roads, and sufficient electric power to make mining feasible.

The USACE reviewed the information provided by Tarmac, and also performed an independent analysis of potential alternative sites for new mines. As discussed in this chapter, the USACE found that the practicability of importing aggregate into the Primary Market Area is limited. As described earlier in this section, insufficient supply of high-quality aggregate in the region surrounding the Primary Market Area does not currently allow those areas to be reasonable alternative sources. If additional mines were authorized in those surrounding markets, local demand within the market area for any new mine would be expected to consume the additional aggregate, particularly as the population increases. Permitting and developing new mines in Florida is often difficult and time-consuming. Importing aggregate from mines in other states or countries would not be a reasonable alternative because, as described in Sections 2.2.1.3 and 2.2.1.4, transportation costs would not allow for an affordable supply of construction-grade and FDOT-approved aggregate.

A review of the Florida Geological Survey (FGS) Open File Map Series shows that the majority of the Primary Market Area is overlain with unconsolidated sediments or rock formations with smaller proportions of well-indurated (hard) limestone such as that found in the Ocala Limestone Formation. Most of the FDOT-certified mines in the Primary Market Area that supply only the lower-quality limerock base material are mining Ocala limestone. The substantially higher proportions of well-indurated limestone found in outcroppings of Avon Park and Suwannee Limestone have led mining companies in the region to focus on these formations to obtain FDOT-quality and construction-grade limestone aggregate. In areas where these outcroppings do not occur, removing the overburden of soil and lower-quality limestone to reach those specific formations requires mining more land area to excavate the same volume of FDOT-certified and construction-grade material. While other limestone formations can contain sections of harder rock, more excavation is required to obtain the same volume of this high-quality material. The additional excavation makes mining of FDOT-certified and construction-grade limestone substantially more costly and does not allow for an affordable source of FDOT-certified and construction-grade limestone; therefore, this alternative was determined to not be a reasonable alternative. The USACE has verified that Tarmac's Figure 3, Avon Park and Suwannee Formation Outcroppings, in Appendix C accurately depicts FGS's locations of these outcroppings in the region.

SUWANNEE FORMATION

Nearly all of the land underlain by outcroppings of the Suwannee Formation in the region is in Taylor, Pasco, Hernando, and Hillsborough Counties. Siting a mine where outcroppings occur in Taylor or Pasco County would not be practicable because these outcroppings are either near the outer edges of, or outside, the Primary Market Area, locations with average driving distances of over 100 miles to the approximate center of the Primary Market (Reddick, Florida). Tarmac intends to truck aggregate from its proposed mine to customers within a maximum 100-mile driving radius, which would add up to $15 per ton to the cost of aggregate. Transportation costs added to aggregate from locations in Taylor or Pasco County would exceed this amount for well over half of the Primary Market Area, including for some of its larger population centers. Mining aggregate in these locations for consumption in the Primary Market Area is not a reasonable alternative because the additional transportation costs make the aggregate increasingly more expensive compared to other sources discussed in this chapter, and therefore not an affordable source of construction- and FDOT-grade aggregate. Outcroppings in Hillsborough County are even farther from the Primary Market, which would involve even higher transportation costs and further reduce the affordability of aggregate that might be mined there.

The majority of Suwannee outcroppings in Hernando County are located in areas that cannot be used for mining under the Hernando County Comprehensive Plan. Hernando County limits mining to the Suwannee outcropping in the north-central portion of the county. Using the Hernando Property Appraiser website (hernando.floridapa.com), the USACE has verified that nearly all parcels in areas of Hernando County where mining is the designated land use are currently owned by mining companies other than Tarmac. A change in land use for a relatively minor expansion of at least one mine there has been recently proposed, but as noted earlier in this section, reserves of hard rock within the area are limited.

A small outcropping of Suwannee limestone also lies near the southeast corner of Citrus County. The Citrus County Comprehensive Plan allows mining in only a small part of this area. Some of the property that allows extractive use under the county's Comprehensive Plan has been mined previously, has multiple owners, is closely surrounded by permanent residences, and totals less than 350 acres. The small size of this area could not meet the project purpose of providing a long-term source of limestone, and in combination with the other factors listed, make this site an unreasonable alternative.

In light of this analysis, mining Suwannee Formation outcroppings would not be a reasonable alternative that could meet the project purpose of providing a long-term source of affordable, construction- and FDOT-grade limestone aggregate.

AVON PARK FORMATION

Avon Park Formation outcroppings are found in Citrus and Levy Counties. The single outcropping in Citrus County lies primarily within an established residential area, including large portions of the Crystal Manor and Crystal Wood Estates subdivisions. Finding enough willing sellers prepared to sell their homes or lots would likely be difficult, as well as costly. Even if only a few owners were not inclined to sell, they would still require road and utility access. This required access and the inparcels created would quickly make mining infeasible. The Citrus County Comprehensive Plan also does not allow mining over most of this outcropping; the small portion where it does allow it is already being mined. These factors combine to make this site an unreasonable alternative.

A review of Natural Resources Conservation Service (NRCS) Web Soil Survey and National Wetlands Inventory data was performed by the USACE for the three Avon Park Formation outcroppings within Levy County. This review was performed to compare potential wetland impacts that could result from constructing a mine at any of these nearby locations. Wetlands coverage varies, but is high in each area mapped as having the Avon Park Formation close to the surface. The USACE made this determination based on fieldwork in 2008–2009 to establish the wetland jurisdiction line on the proposed Tarmac King Road Limestone Mine site. During that fieldwork, the USACE found the National Wetlands Inventory maps often underrepresented the extent of wetland coverage in many areas of the site, and the NRCS soil maps more accurately indicated where wetlands might be present. The NRCS drainage classes of soils range from excessively drained to very poorly drained. Many of the soil types in this region that are classified as poorly or very poorly drained are also hydric soils, which indicate the presence of wetlands. These soil maps were used to approximate wetland coverage. Depictions and associated descriptions for portions of these soil maps are included in Appendix H.

Tarmac's proposed mine at the King Road site would lie partially within the southernmost Avon Park outcropping in Levy County. The remainder of this outcropping is a potential alternative site; this area extends to the north and is bisected by U.S. Route 19. The portion of the outcropping on the eastern side of U.S. Route 19 is relatively narrow and lies within Goethe State Forest. Much of the rest of the portion on the eastern side of U.S. Route 19 is divided into many small individually owned parcels. The portion on the west side contains several perennial streams, including Spring Run, and the second-order Tenmile Creek, as well as at least two springs. The majority of this approximately 3,000-acre area is owned by one entity, and a large power line is present on the site. This area (a portion of which is approximated in Appendix H, Figure H–1) contains a percentage of wetland cover similar to the proposed Tarmac King Road Limestone Mine site with all of the soils mapped as poorly or very poorly drained.

The largest Avon Park Formation outcropping is to the north-northwest of the proposed Tarmac King Road Limestone Mine site and is bisected by U.S. Route 19. The southern half of this outcropping is in conservation lands (NATC Gulf Hammock Conservation Easement), divided into many individually owned parcels, or is the site of a closed limestone mine. This area also contains the Waccasassa and Wekiva Rivers and several large streams, including Mule and Otter Creeks. The northern half of this outcropping (a portion of which is approximated in Appendix H, Figure H–2) contains a large contiguous area (over 10,000 acres) with one landowner. The soils in the northern half are nearly all mapped as poorly or very poorly drained. Road access to U.S. Route 19 appears available. The site does not have large power lines.

The remaining Avon Park Formation outcropping in Levy County is to the northwest of the proposed Tarmac King Road Limestone Mine site. The southernmost portion of this outcropping is also within conservation land or state park boundaries. Road access to U.S. Route 19 via County Route 24 may be available, although it appears that new stream crossings would be required if landowners did not provide easements for site access. Large perennial streams are present in the area, including Rocky Run. Large power lines are not present. Over 9,000 acres in the central portion of this outcropping (a portion of which is approximated in Appendix H, Figure H–3) belong to one landowner. The soils are mapped as poorly drained or very poorly drained.

In areas with many individual property owners, land acquisition would be more time-consuming, uncertain, and costly. One unwilling property owner in a critical location could prevent a site from being developed. It would also be more costly to install any infrastructure components (power lines and roads) not present, when compared with the proposed King Road site, where these components presently exist. Therefore, the higher cost of acquiring and developing those portions of alternative Avon Park Formation sites where there are multiple landowners and infrastructure is lacking would make those areas unreasonable alternatives. However, a portion of each of these alternative Avon Park Formation sites has some combination of features (i.e., large, contiguous, single-owner parcels of land, some of the required infrastructure components) that could allow them to meet the project purpose. Impacts on groundwater flows and quality can be expected to be similar from siting a large mine nearby in the same limestone formation. Most other environmental impacts (i.e., on vegetation, wildlife, noise, and air quality) could also be expected to be similar because the Gulf Hammock habitat types involved, the scope of the project, equipment used, and actions taken would be the same at a nearby location. However, a major impact of the applicant's proposed project would be elimination of large areas of wetlands. The potential for impacts on wetlands, as well as on streams at each of the alternative sites, would be similar to or exceed those for the proposed Tarmac King Road Limestone Mine site. Therefore, these other sites would not be environmentally preferable to the King Road Mine site and would not be considered more reasonable alternatives.

Advantages of the proposed Tarmac King Road Limestone Mine site over alternative sites within the Primary Market include: a single landowner with whom to negotiate, local land use authorization (Levy County Special Exception), the presence of an outcropping of the high-quality Avon Park Formation, minimal overburden depth above limestone (averaging less than 3 feet), relatively few streams, existing power lines capable of powering dragline equipment, access to a major transportation corridor (U.S. Route 19), and comparatively few residences close by. Due to the limited presence of high-quality limestone formations throughout the Primary Market, the potentially equivalent or greater overall environmental impacts that could occur at a new location, the likely similar level of public opinion toward new mining operations, and the significant capital investment necessary for development of sufficient infrastructure, development of alternative sites would not be a less damaging, practicable alternative. In light of the analysis above, the development of new offsite mines in other locations within the Primary Market to satisfy the long-term public need for affordable, FDOT-quality and construction-grade limestone material was not considered a reasonable alternative.

2.2.1.3 Shipping Aggregate into the Region Through Florida's Harbors

As indicated in Table 2–4, approximately 3.8 million tons of crushed rock or aggregate were imported into Florida's ports in 2010 primarily from the Bahamas, Canada, and Mexico. Starting in 2010, a limited amount of crushed rock was imported from Lithuania and Norway. The Ports of Tampa (1.8 million tons) and Jacksonville (1.0 million tons) account for nearly 75 percent of all of the 2010 imports. Imports of crushed rock into Florida ports from 2008 to 2010 decreased approximately 37 percent. During this time, the Port of Jacksonville experienced the greatest decline in crushed rock imports, followed by Port Canaveral. Of the remaining deepwater ports in Florida, three (Port of St. Petersburg, Port of Key West, and Port St. Joe) take in no imports, and five (Port Everglades, Port of Fort Pierce, Port of Miami, Port of Palm Beach, and Port Fernandina) imported no crushed rock in 2010. However, Port St. Joe is planning an aggregate facility with an estimated capacity of 300,000 tons within 5 years and between 0.5 and 4 million tons within 10 years (PSJPA 2008). In 2011, Port Citrus was added to the Florida Seaport Transportation and Economic Development Council as the 15th deepwater port in Florida. Port facilities do not currently exist there; however, the Citrus County Port Authority is undertaking a feasibility study in an effort to establish a port within the county. The port would be located along the Cross Florida Barge Canal, and the proposed King Road mine is regarded by Citrus County as a high candidate for port

recruitment. The lower costs associated with sea transport could expand the potential market area of the proposed mine. Currently, there are no plans for the port to import crushed rock. It will likely be several years before any development begins and materials begin to flow in and out of the port (Citrus County 2012). The depth of the Cross Florida Barge Canal is a limiting factor for vessel size, and the Citrus County Port Authority states that its predominant clients will likely be barge-based operations (CCPA 2013). This would influence the distance to viable sources and destinations of imports and exports, including limestone aggregate. The active Florida ports system is displayed in Figure 2–4.

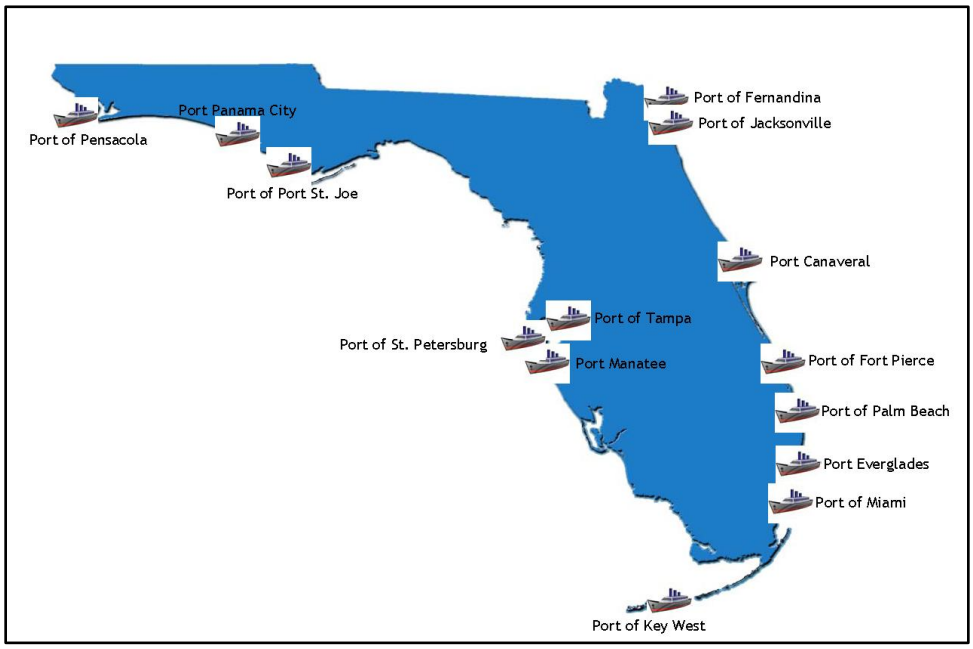
Table 2–4. Crushed Rock Imported into Florida by Port, 2008–2010 (tons)

Port	2008	2009	2010
Port Canaveral	854,742	760,320	424,928
Port of Tampa	2,580,491	1,745,976	1,828,113
Port of Jacksonville	2,124,817	1,120,218	1,030,131
Port of Panama City	86,297	122,793	80,595
Port of Pensacola	160,383	105,232	116,120
Port Manatee	247,824	216,545	364,605
Total	**6,054,553**	**4,071,084**	**3,844,491**

Note: 2011 and 2012 data were requested from each port, but were not available.

In response to increasing pressure on the state's transportation system to plan for alternate supplies of construction materials to offset the potential reduction of mining in southern Florida and to provide alternate sources of supply, several ports are investing in facilities to expand their capacity to handle dry bulk cargo.

Port Canaveral. Port Canaveral has 42 acres of existing aggregate facilities. In 2006, the terminal operator, Ambassador Services, completed a state-of-the-art, 2,800-foot conveyer system with an average discharge rate of 2,200 tons per hour that reduces unloading time from as many as 4 days to an average of 20 hours. Aggregate is brought into the port using large vessels that carry about 40,000 tons. In 2010, the port received 424,928 tons of crushed rock—approximately half of the peak crushed rock imports reached in 2008. Port Canaveral's 2010 imports represented about 11 percent of the state's crushed rock imports. All of the aggregate is transported from the port by truck. Currently, Port Canaveral does not have direct on-port access to rail, but a freight line rail project is in progress; the $50 million project would extend a Florida East Coast rail line spur that currently terminates 6 miles north of the port (Cambridge Systematics 2010).



Source: Florida Ports Council 2010.

Figure 2–4. Active Florida Ports System

Port of Tampa. The Port of Tampa currently has 51 acres of existing aggregate facilities. It is estimated that aggregate facilities at this port are operating at less than half their potential capacity. In 2010, the port received 1,828,113 tons of aggregate, approximately 48 percent of the state's crushed rock imports. From 2008 to 2010, imports of crushed rock at the Port of Tampa decreased approximately 29 percent. As of the third quarter of 2011, aggregate imports at the Port of Tampa were approximately 1.4 million tons (TPA 2011). There are several private materials companies operating at this port that utilize conveyer systems that can unload aggregate ships at up to 4,000 tons per hour. A partnership between the public and private firms is investing in approximately 78 acres of additional aggregate facilities across three terminals, anticipated to become operational in the next 3 to 5 years. Recent slowdowns in the construction industry and decreased demand for aggregates have slowed the development of some new terminals and closed a planned 18-acre terminal that was under development (TPA 2010); however, most terminals remain on track, as demand is expected to increase in the long term. When fully operational, it is expected that the new facilities could receive approximately an additional 7.8 million tons of aggregate annually. Aggregate is transported from the port using a combination of truck and rail. Rail access is available via a CSX Transportation (CSXT) rail connection.

Port of Jacksonville. Importing approximately 1,030,131 tons in 2010, the Port of Jacksonville was the second largest recipient of waterborne shipments of crushed rock in Florida, accounting for approximately 27 percent of the state's crushed rock imports. Shipments of aggregate average approximately 51,250 tons per vessel. Martin Marietta operates a 22-acre aggregate facility on the west side of the Dames Point terminal. The majority of shipments are made by special purpose, self-unloading vessels, while a small percentage is unloaded using shipboard cranes. This facility is not currently equipped with a conveyor system. Cemex operates a 24-acre aggregate facility on the east side of Dames Point, which utilizes a new conveyor system running from the berth, underneath the Dames Point Bridge, to the new bulk facility, where trucks haul the material off (Robas 2008, 2011). Rail access is available at Dames Point through CSXT; however, it would require the addition of a rail spur about 1 mile long.

Port Manatee. Port Manatee has more than 10 acres of existing aggregate facilities. In 2010, 364,605 tons of aggregate, 9.5 percent of the state's crushed rock imports, were imported through these facilities. The aggregate is shipped using a combination of large vessels equipped with shipboard cranes and special purpose, self-unloading ships that average 18,000 tons per load. All of the aggregate is transported from the port by truck. There is rail access nearby, but there are no facilities in place for transport of aggregate by rail.

Port of Panama City. The Port of Panama City specializes in breakbulk cargo, with some dry bulk products. In 2010, 80,595 tons of aggregate, about 2 percent of the state's crushed rock imports, were moved through 4 acres of land designated for the import of aggregates. Although rail access is available, all of this material was transported from the port by truck. Currently, there is no excess space available for additional aggregate facilities and there are no plans to expand such capacity.

Port of Pensacola. Importing 116,120 tons, the Port of Pensacola accounted for approximately 3 percent of Florida's crushed rock imports in 2010. There are currently 5 acres of open storage that could be available for aggregates. Shipments of aggregate at this port are from a combination of large vessels, carrying about 30,000 tons each, and inland barges, carrying about 1,500 tons each. Aggregate is typically unloaded using special purpose, self-unloading ships. This port has direct rail access but, at this time, all crushed rock is transported from the port by truck. Currently, there is no additional expansion space available for aggregate imports and the port has no plans to develop future capacity.

In summary, there are several ports along the Florida coast that have the capacity to receive additional crushed rock imports. However, all of the ports are outside of the Primary Market, and the cost of transportation of the aggregate from the port to the customer must be added to the cost per ton figures in Table 2–2. In addition, rail access is either limited or not directly available at most ports. As noted previously, aggregate has a low cost-to-weight ratio, and additional handling and transportation compounds the price per ton. Using the above costs to ship by truck to the approximate center of the Primary Market (Reddick, Florida), an additional $16.50 per ton would be added to aggregate coming from the Port of Tampa or the Port of Jacksonville (approximately 110 miles), nearly $21 per ton from Port Manatee (approximately 138 miles), and over $21 per ton from Port Canaveral (142 miles). The transportation costs from the proposed Tarmac King Road Limestone Mine site to Reddick would be just

over $6 per ton. Other Florida ports, or ports outside of Florida such as Savannah, Georgia, are even greater distances from the Primary Market. Due to the limited rail network, as described in Section 2.2.1.4, options for shipping via rail from the ports are limited to delivery only to a few end points (i.e., terminals) in the Primary Market such as Gainesville, Ocala, and Orlando. Transportation from there would have to occur via truck, or via additional rail then truck, as described in Section 2.2.1.4. Where feasible, this would add approximately just under one-half of these above costs per ton, plus unloading and reloading costs, and then any additional truck haul cost to the final destination. Based on these increased transportation costs, shipping aggregate to the west-central market from harbors outside of the Primary Market would not provide an affordable source of construction- and FDOT-grade material, and therefore is not a reasonable alternative.

2.2.1.4 Shipping Aggregate into the Region Through Rail Terminals

Shipping aggregate into the Tarmac Primary Market through rail terminals was evaluated as an alternative to the Tarmac King Road Limestone Mine. Currently, Florida has approximately 2,786 miles of mainline track, which are owned by 15 operating line-haul railroads and terminal or switching companies (Cambridge Systematics 2010). The Florida rail network in and around the Tarmac Primary Market is included in Figure 2–3.

In 2008, approximately 25 million tons of nonmetallic minerals were shipped by rail throughout Florida, with phosphates from central Florida and crushed rock from south Florida composing the majority. Imports by rail of nonmetallic minerals from outside of Florida were mostly from Georgia (3.9 million tons) and Illinois (1.4 million tons) (Cambridge Systematics 2010).

CSXT is the largest railroad in Florida, owning more than 53 percent of the track miles (Cambridge Systematics 2010). CSXT has an extensive network throughout Florida, including large terminals in Jacksonville and Tampa, where incoming and outgoing freight can be transferred to other national, regional, and local railroads.

In the Primary Market, CSXT operates a north-south line from Jacksonville to Tampa, with terminals in Ocala and Gainesville, and connection points for two small local railroads. The Florida Northern Railroad (FNOR) connects with the CSXT at Newberry in Alachua County and operates 76 miles of track from High Springs through the extreme western side of Levy County to Red Level Junction in Citrus County. This rail line's largest commodity is coal, which it delivers to the Crystal River Power Plant. FNOR also operates 24 miles of track from Lowell to Candler in Marion County, with an interchange with CSXT in Ocala. The Florida Central Railroad (FCEN) operates 41 miles of track from an interchange with CSXT in Orlando to Umatilla in Lake County. These two lines deliver primarily food-related products, chemicals, lumber, stone, scrap metal, fertilizer, and limestone to approximately 85 customers (Cambridge Systematics 2010).

Providing aggregate to meet long-term demand in the Tarmac Primary Market via rail would require multiple originations and terminations. Aggregate destined for the northern half of the market area would likely have to be shipped via truck, barge, or other rail to the rail terminal in Jacksonville. Aggregate destined for the southern half would likely have to be similarly shipped to Tampa. CSXT rail lines would then ship the aggregate from these two locations to terminals in Orlando, Ocala, Gainesville, and Newberry. If practicable, based on destination, FNOR and FCEN railroads could pick up the shipment for further distribution to terminals within the market area, or it would be transferred from the terminal in trucks from that point. If shipped further by rail, the aggregate would then need to be unloaded at the rail termination point into trucks and transported to the customer site. Using the above costs to ship by rail to the approximate center of the Primary Market (Reddick, Florida), an additional approximately $6 to $7 per ton would be added to aggregate coming from either Tampa or Jacksonville to the closest terminal which is also proximal to Reddick. Transportation from these terminals in either Gainesville or Ocala to Reddick via truck would range from over $2 to almost $4 additional per ton. Unloading rock from trains and reloading onto trucks would add additional costs. The transportation costs from the proposed Tarmac King Road Limestone Mine site to Reddick would be just over $6 per ton. Based on the limited amount of railroads and terminals within the Tarmac Primary Market (see Figure 2–3), the distance of truck travel in addition to the railroad travel for many customers would be extensive. The multiple originations and terminations, in addition to the truck miles traveled, would add substantial costs to the price per ton

outlined in Table 2–1. Transfers between modes of transportation are also undesirable because repeated handlings can cause breakage, thereby degrading aggregate sizing.

Expansion of the railroad network into and within the Tarmac Primary Market would be required to reduce travel time and transportation costs and make aggregate from outside the area more accessible to customers. Identified projects to increase the capacity and accessibility of railroad facilities at the Ports of Tampa, Canaveral, and Jacksonville are estimated to cost $160 million, but have not been funded as of December 2010 (Cambridge Systematics 2010). There are several freight rail projects proposed to the FDOT over the next 5 years to improve capacity or upgrade equipment in the Primary Market. One project is to build a second main CSXT route through Ocala at a cost of $19 million. Other projects are to upgrade 57 miles of existing FCEN railroad track and switches at a total cost of $31 million. Most of these projects are only partially funded and are likely several years from completion. There are no additional plans in the 2010 *Florida Rail System Plan* to add additional freight rail lines in the Primary Market over the next 20 years (Cambridge Systematics 2010).

The limited rail coverage in the Tarmac Primary Market, little to no planned expansion over the next 20 years, and the resultant increase in cost due to multiple transportation modes as discussed in this section, would not allow shipping aggregate into the region by rail to be a reasonable alternative that would provide a long-term, affordable source of construction- and FDOT-grade aggregate.

2.2.1.5 Using Other Material to Satisfy Construction Needs

Limestone has historically been the primary type of aggregate used in Florida because there are extensive deposits within the state that yield products suitable for use in the construction industry. Other suitable minerals such as granite are not accessible in Florida in a form or to an extent that supports mining.

Alternatives to mined aggregate, such as recycled concrete or asphalt, may offer feasible alternatives to additional mining. Critical factors affecting the potential for these materials to be widely used as alternatives to newly mined materials are the availability and quality of the recycled materials and the feasibility of reusing them to formulate new end products that meet FDOT specifications or other industry standards. Not all concrete applications allow for 100 percent recycled aggregate content, as certain properties of concrete change as the percentage of recycled content used is increased. Due to the presence of hardened cement paste rather than pure natural stone aggregate, as the percentage of recycled aggregate is increased, shrinkage and water absorption also increases, while wear resistance and the modulus of elasticity of concrete decreases (Malešev, Radonjanin, Marinković 2010). Therefore, recycled aggregate cannot fully replace virgin natural aggregate material.

In 2006, for all uses, over 143 million tons of crushed stone materials were consumed in Florida, which includes about 10 million tons (7 percent) of recycled aggregate (FDOT 2007b). The recycled material is used almost entirely in association with road projects. Increasing the amount of recycling is an intuitively appealing solution; however, opportunities to increase the recycling rates of obsolete concrete and asphalt resources are limited because asphalt pavement is one of the most heavily recycled materials (FDOT 2007b). A 2006 paper from the University of South Florida notes, “the research is clear that reuse of (asphalt pavement) is approaching 100 percent, and the portion that goes unused each year is usually stockpiled and used the following year.” It was also reported that the reuse of concrete “does not enjoy the same widespread use as reclaimed asphalt pavement on the national level, but that re-use capacity in Florida of reclaimed concrete aggregate (RCA) is also approaching 100 percent” (Ashmawy *et al.* 2006).

In the *Strategic Aggregates Study* (FDOT 2007a), FDOT states:

> Concrete from construction debris is also intensely recycled, but because it is sometimes intermeshed with steel reinforcing and deleterious debris, recovery rates for RCA could be improved. There are strong economic incentives to recycle asphalt pavement. The high price of asphalt, an expensive petroleum derivative, high landfill costs, and the amenability of old pavement to reuse all have created market incentives for intense recycling. These incentives have been in place for many years, thus, rising prices for crushed stone would have little or no impact on the supply of reclaimed asphalt pavement brought onto the market. Concrete is a

little different. In most of Florida, RCA is cheaper than mined aggregate, so market forces encourage recycling. However, it is not as easy to recover as asphalt pavement, so recycling costs are nontrivial.

Other recycled materials are currently being used in construction; however, supply of these materials is far below that needed to replace stone aggregate. For instance, crushed glass can be used as a component in road construction. In 2010, 11.5 million tons of glass entered the municipal solid waste stream in the United States. Just over 3 million tons of it were recycled, and 90 percent of this was used to make new containers (EPA 2012). This relatively small supply, competing demands for these materials, and restricted suitability as total replacements do not allow alternative materials to be a reasonable alternative to mined coarse aggregate.

Because there is not a surplus supply of recycled concrete at this time, any likely increase in recycled concrete would offset only a small portion of the public need for limestone. Many of the same transportation cost and capacity issues described previously for importing virgin aggregate materials would also apply to importing recycled concrete aggregate into Florida. Therefore, recycling of aggregate material would not provide a reasonable alternative to the demand for coarse aggregate material in the Tarmac King Road region.

2.2.2 Onsite Alternatives

For the purposes of evaluating a range of mining alternatives, seven mining alternatives were developed that consider varying amounts of mining. These alternatives are evaluated in addition to a No Action Alternative (Alternative 1). The USACE determined that under each alternative, mining would stop when the minable area is fully excavated to the proposed maximum depth of 120 feet, and if a permit is issued, there should be no presumption or expectation of any further USACE authorizations. In other words, if an alternative other than Alternative 1 is determined to be the Preferred Alternative, it would not become 'Phase I' of a multi-layered permit approach. A permit decision based on a Record of Decision would end the regulatory review process, and any additional fill discharges in wetlands beyond what might be authorized under a chosen alternative would not be pre-authorized and should not be expected.

The most expansive mining alternative, Alternative 2, is equivalent to the full mining plan, or the full "mine-out plan" set forth in the applicant's mining plan (see Appendix B). The No Action Alternative is identified as Alternative 1 and is placed first in the list of alternatives because it serves as a point of comparison for the other alternatives. Under the No Action Alternative, no Clean Water Act Section 404 permits would be issued for mining-related activities at the Tarmac King Road Limestone Mine upon issuance of the Record of Decision for the *Final Tarmac King Road Limestone Mine Environmental Impact Statement*. Alternatives 3 through 8 constitute mining scenarios that fall between Alternatives 1 and 2 in terms of the amount of land that would be mined.

The USACE is neither a proponent nor an opponent of a permit applicant's proposed project (33 CFR 320.1(a)(4)). Therefore, in accordance with Federal regulations, a permit applicant's proposal is identified in an EIS as the "applicant's preferred alternative." The applicant's preferred alternative is the full mine-out plan (Alternative 2).

A detailed description of the eight alternatives is presented below.

2.2.2.1 Alternative 1 – No Action

Under the No Action Alternative, no mining would be permitted in wetlands within the Tarmac King Road Limestone Mine site. If the proposed mining is not approved, it is expected that the ongoing timbering operations and hunting activities on the site would continue. The construction industry's needs would have to be satisfied by other limestone mines either within or outside Florida. Evaluation of this alternative includes a groundwater model that depicts current conditions, as well as the impacts of the proposed nearby Progress Energy Levy Nuclear Plant in the cumulative impacts analysis.

Table 2–5 lists the cover types that currently exist on the Tarmac King Road Limestone Mine site and serves as the baseline for comparison of impacts under Alternatives 2 through 8. Under the No Action Alternative, there would be no change to the existing cover types as a result of mining, and the proposed mining site would remain in its current state as an ongoing timber operation and hunting area.

Table 2–5. Alternative 1 Acreage Changes in Cover Types

Cover Types (FLUCCS Code – Description)	Existing Baseline	Change Due to Mining	At End of Alternative 1
Uplands			
425 - Temperate hardwood	117.9	0	117.9
427 - Live oak	45.5	0	45.5
441 - Coniferous plantation	987.7	0	987.7
443 - Forest regeneration	996.2	0	996.2
Uplands Total	**2,147**	**0**	**2,147**
Wetlands			
530 - Borrow pits	11.0	0	11.0
616a - Deepwater ponds	150.7	0	150.7
616b - Sloughs and intermittent flow-ways	154.3	0	154.3
617 - Mixed wetland hardwoods	158.5	0	158.5
621 - Cypress	1.2	0	1.2
628 - Pine-mesic-oak	213.3	0	213.3
6291 - Hydric coniferous plantation > 8 years	1,121.3	0	1,121.3
6292 - Hydric coniferous plantation < 8 years	495.8	0	495.8
630 - Wetland forested mixed	284.1	0	284.1
Wetlands Total	**2,590**	**0**	**2,590**
Other			
740 - Roads	13	0	13
Roads Total	**13**	**0**	**13**
Lakes created	0.0	0	0.0
Totals (excluding lakes)	**4,751**	**0**	**4,751**

2.2.2.2 Alternative 2 – Mining Outlined in Permit Application with Dedicated No Mine Areas in Wetlands and Uplands

As indicated by the title, this alternative includes all of the mining area outlined in the permit application submitted by the applicant with dedicated No Mine Areas in wetland and upland areas adjacent to flow-ways. The proposed mining area for this alternative is depicted in Figure 2–5. This is the applicant's preferred alternative.

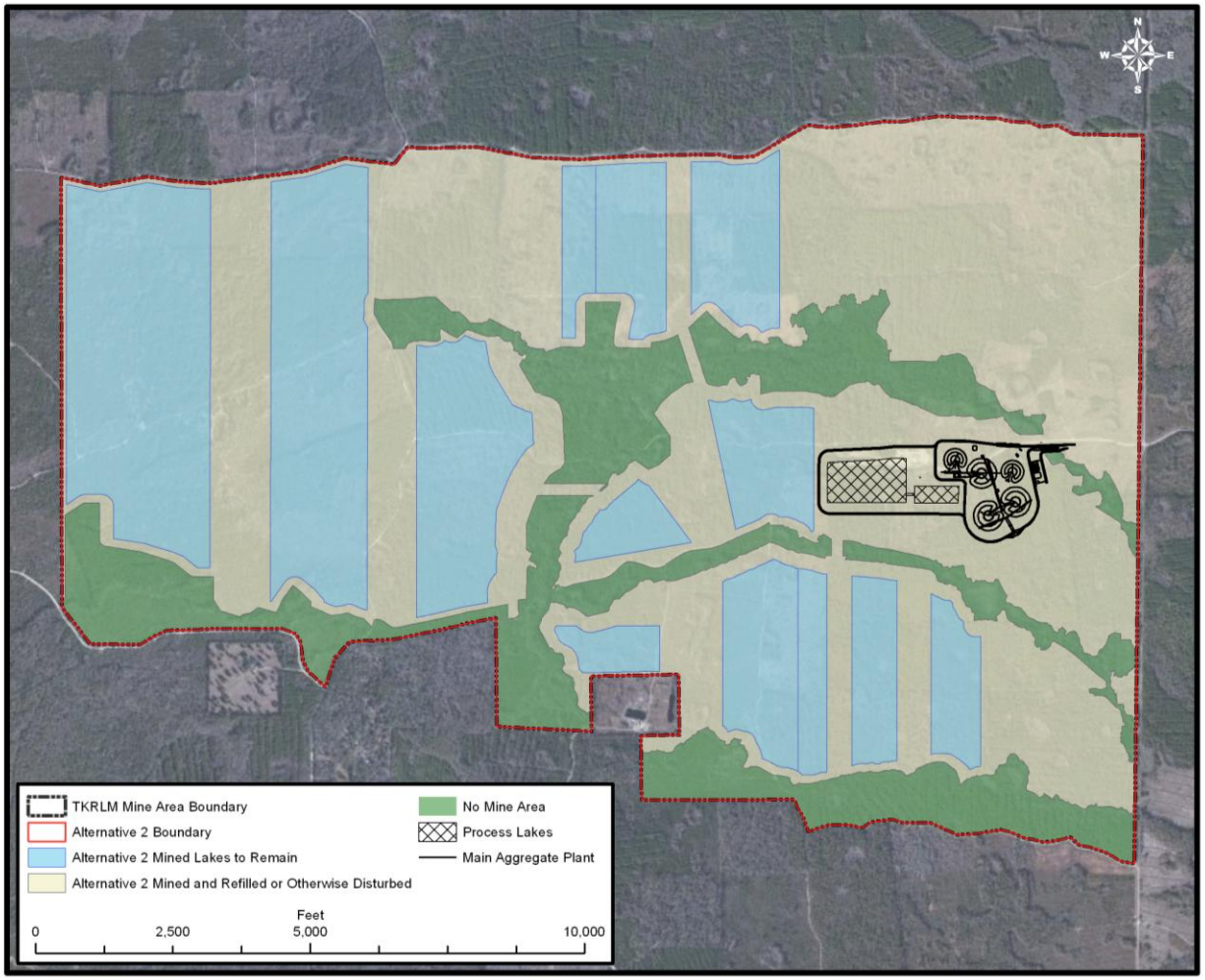


Figure 2–5. Alternative 2 Proposed Mining Plan

Under this alternative, 3,898 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the 3,898 acres disturbed, approximately 2,757 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. Approximately 1,142 of the remaining 1,994 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. The remaining 852 acres include flow-ways, other higher-quality wetlands, and some adjacent uplands to be placed in conservation easements and set aside as “No Mine Areas.” Approximately 25 to 30 acres per year would be mined to a depth of 120 feet below the land surface. Table 2–6 shows the acreages of cover types that would be impacted by this alternative and the amount of lakes created during the life of the alternative.

Table 2–6. Alternative 2 Acreage Changes in Cover Types

Cover Types (FLUCCS Code – Description)	Existing Baseline	Change Due to Mining	At End of Alternative 2
Uplands			
425 - Temperate hardwood	117.9	–44.2	73.7
427 - Live oak	45.5	–45.3	0.2
441 - Coniferous plantation	987.7	–925.0	62.7
443 - Forest regeneration	996.2	–803.9	192.3
Uplands Total	**2,147**	**–1,818**	**329**
Wetlands			
530 - Borrow pits	11.0	–10.8	0.2
616a - Deepwater ponds	150.7	–134.3	16.4
616b - Sloughs and intermittent flow-ways	154.3	–15.7	138.6
617 - Mixed wetland hardwoods	158.5	–115.7	42.8
621 - Cypress	1.2	–1.2	0.0
628 - Pine-mesic-oak	213.3	–135.1	78.2
6291 - Hydric coniferous plantation > 8 years	1,121.3	–1,024.7	96.6
6292 - Hydric coniferous plantation < 8 years	495.8	–439.6	56.2
630 - Wetland forested mixed	284.1	–191.5	92.6
Wetlands Total	**2,590**	**–2,069**	**522**
Other			
740 - Roads	13	–11.8	1.2
Roads Total	**13**	**–12**	**1**
Totals (excluding lakes)	**4,751**	**–3,898**	**852**
Lakes created	0.0	1,506	1,506

Under Alternative 2, as well as under each of the following six action alternatives, mitigation activities would be conducted on site, as well as on all or portions of an approximately 4,526-acre site adjacent to the Waccasassa Bay State Preserve. If approved, any accompanying permit would require comprehensive monitoring and reporting to demonstrate that mining operations and compensatory mitigation projects are in compliance with all of the terms and conditions in the permit and that the environmental impacts being realized are consistent with the impacts estimated in this EIS. If the project were found not in compliance, the USACE may take enforcement action, including the suspension or revocation of any issued permit. If environmental impacts were to exceed estimated levels, this would trigger mandatory actions that could include remediation, additional mitigation, or permit modifications. Chapter 5 details the proposed wetland mitigation plans.

2.2.2.3 Alternative 3 – Exclusion of Mining or Related Activities West of Butler Road

Alternative 3 would reduce total overall wetland impacts, reduce the impacts on areas of higher-quality wetlands, eliminate mining from an area lying within lower-category storm surge zones, and increase the mining distance from higher-quality estuarine and palustrine wetlands along the coastline, some local residences, and state-owned park/reserve lands. The mining area associated with this alternative is depicted in Figure 2–6.

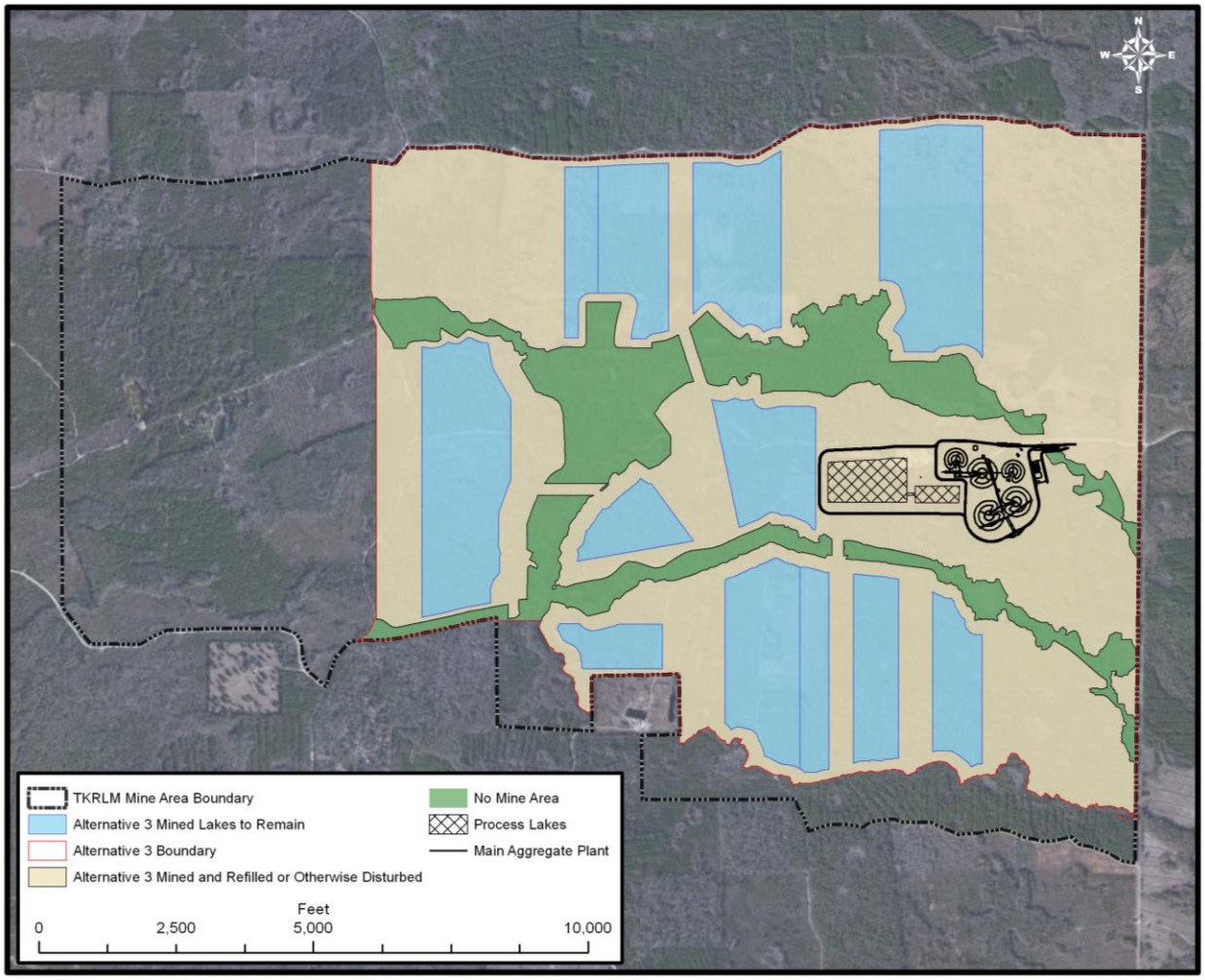


Figure 2–6. Alternative 3 Proposed Mining Plan

Under this alternative, approximately 2,933 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the approximately 2,933 acres disturbed, approximately 1,884 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. A portion of the mining area is the same as that for Alternative 2; however, approximately 1,000 acres of mining or related activities west of Butler Road would be excluded. Approximately 1,049 of the remaining 1,515 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. An area containing 466 acres, including flow-ways, other higher-quality wetlands, and some adjacent uplands, would be placed in conservation easements and set aside as No Mine Areas. Approximately 25 to 30 acres per year would be mined to a depth of 120 feet below the land surface. Table 2–7 shows the acreages of cover types that would be impacted by this alternative and the amount of lakes created during the life of the alternative.

Table 2–7. Alternative 3 Acreage Changes in Cover Types

Cover Types (FLUCCS Code – Description)	Existing Baseline	Change Due to Mining	At End of Alternative 3
Uplands			
425 - Temperate hardwood	117.9	–35.2	82.7
427 - Live oak	45.5	–45.3	0.2
441 - Coniferous plantation	987.7	–768.0	219.7
443 - Forest regeneration	996.2	–674.5	321.7
Uplands Total	**2,147**	**–1,523**	**624**
Wetlands			
530 - Borrow pits	11.0	–1.6	9.4
616a - Deepwater ponds	150.7	–106.3	44.4
616b - Sloughs and intermittent flow-ways	154.3	–12.1	142.2
617 - Mixed wetland hardwoods	158.5	–96.9	61.6
621 - Cypress	1.2	–1.2	0.0
628 - Pine-mesic-oak	213.3	–69.8	143.5
6291 - Hydric coniferous plantation > 8 years	1,121.3	–781.3	340.0
6292 - Hydric coniferous plantation < 8 years	495.8	–206.1	289.7
630 - Wetland forested mixed	284.1	–125.9	158.2
Wetlands Total	**2,590**	**–1,401**	**1,189**
Other			
740 - Roads	13	–8.8	4.2
Roads Total	**13**	**–9**	**4**
Totals (excluding lakes)	**4,751**	**–2,933**	**1,818**
Lakes created	0.0	958	958

2.2.2.4 Alternative 4 – Mining Outlined in Alternative 3 with Exclusion of Mining and Related Activities Immediately South of Spring Run and in Higher-Quality Wetlands in the North-Central Portion of the Site

Alternative 4 includes the same perimeter, or footprint, of mining area outlined in Alternative 3 above except a small area south of Spring Run in the northeast corner of the site. This small area was eliminated from the mining footprint to reduce impacts on areas of higher-quality wetlands and to create a larger buffer area between mining and Spring Run. An additional area in the north-central portion of the site would be added to the dedicated No Mine Areas. The mining area associated with this alternative is depicted in Figure 2–7.

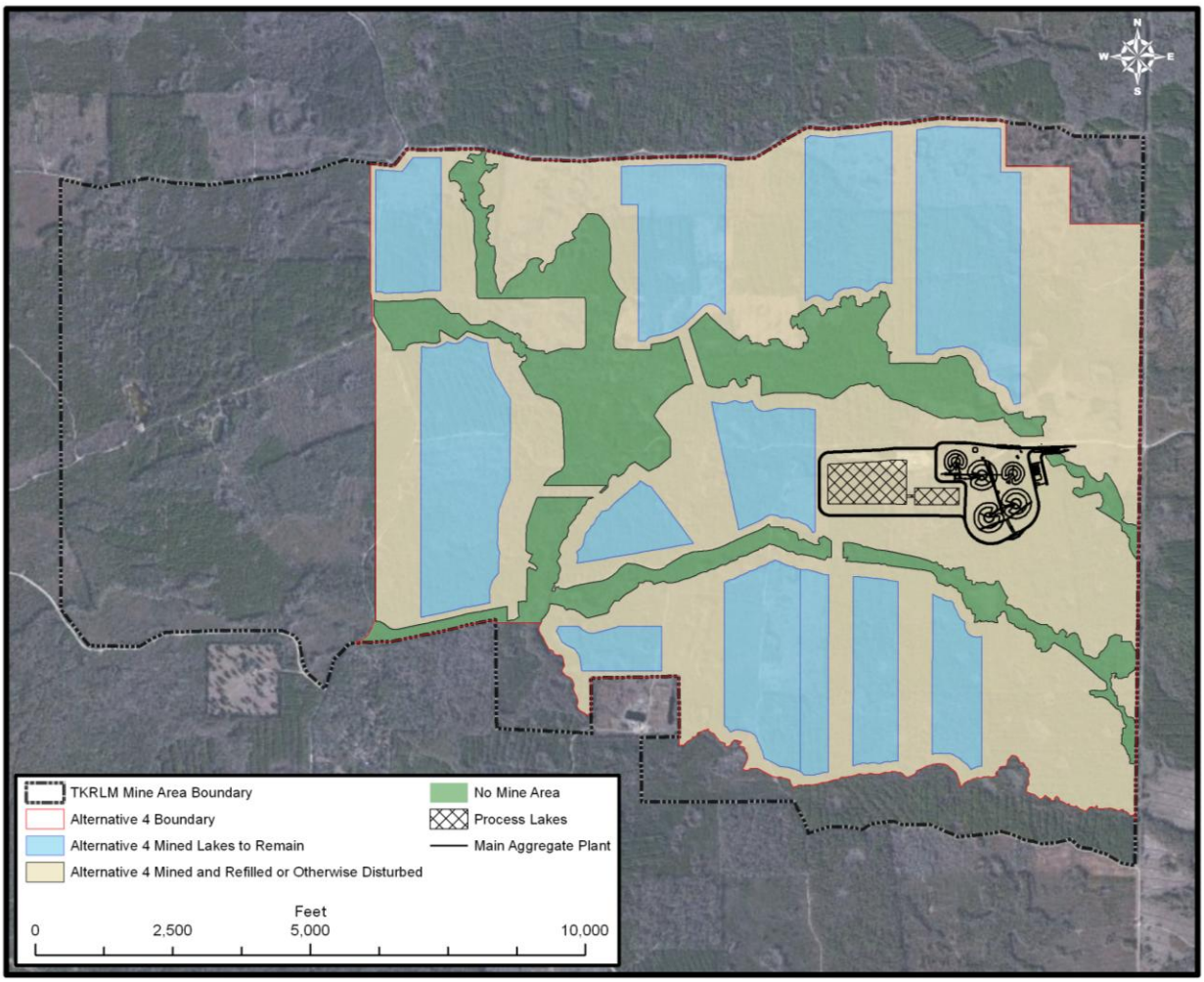


Figure 2–7. Alternative 4 Proposed Mining Plan

Under this alternative, 2,799 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the 2,799 acres disturbed, approximately 1,671 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. The mining area is nearly the same as that for Alternative 3; however, approximately 66 acres of mining or related activities in higher-quality wetlands found in the north-central portion of the site and another 68 acres in the far northeast corner of the site south of Spring Run would be excluded. Approximately 1,128 of the remaining 1,660 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. An area containing 532 acres, including flow-ways, other higher-quality wetlands, and some adjacent uplands, would be placed in conservation easements and set aside as No Mine Areas. Approximately 25 to 30 acres per year would be mined to a depth of 120 feet below the land surface. Table 2–8 shows the acreages of cover types that would be impacted by this alternative and the amount of lakes created during the life of the alternative.

Table 2–8. Alternative 4 Acreage Changes in Cover Types

Cover Types (FLUCCS Code – Description)	Existing Baseline	Change Due to Mining	At End of Alternative 4
Uplands			
425 - Temperate hardwood	117.9	–26.9	91.0
427 - Live oak	45.5	–45.3	0.2
441 - Coniferous plantation	987.7	–743.0	244.7
443 - Forest regeneration	996.2	–671.0	325.2
Uplands Total	**2,147**	**–1,486**	**661**
Wetlands			
530 - Borrow pits	11.0	–1.6	9.4
616a - Deepwater ponds	150.7	–101.5	49.2
616b - Sloughs and intermittent flow-ways	154.3	–12.1	142.2
617 - Mixed wetland hardwoods	158.5	–86.8	71.7
621 - Cypress	1.2	–1.2	0.0
628 - Pine-mesic-oak	213.3	–69.8	143.5
6291 - Hydric coniferous plantation > 8 years	1,121.3	–753.7	367.6
6292 - Hydric coniferous plantation < 8 years	495.8	–206.1	289.7
630 - Wetland forested mixed	284.1	–71.2	212.9
Wetlands Total	**2,590**	**–1,304**	**1,286**
Other			
740 - Roads	13	–8.8	4.2
Roads Total	**13**	**–9**	**4**
Totals (excluding lakes)	**4,751**	**–2,799**	**1,952**
Lakes created	0	1,029	1,029

2.2.2.5 Alternative 5 – Exclusion of Mining or Related Activities Between the Two Southern No Mine Areas

Alternative 5 would further reduce total wetland impacts and increase the mining distance from local communities. This alternative would further reduce the mining footprint outlined in Alternative 2 by removing all of the proposed mine area between the two southern No Mine Areas. The mining area associated with this alternative is depicted in Figure 2–8.

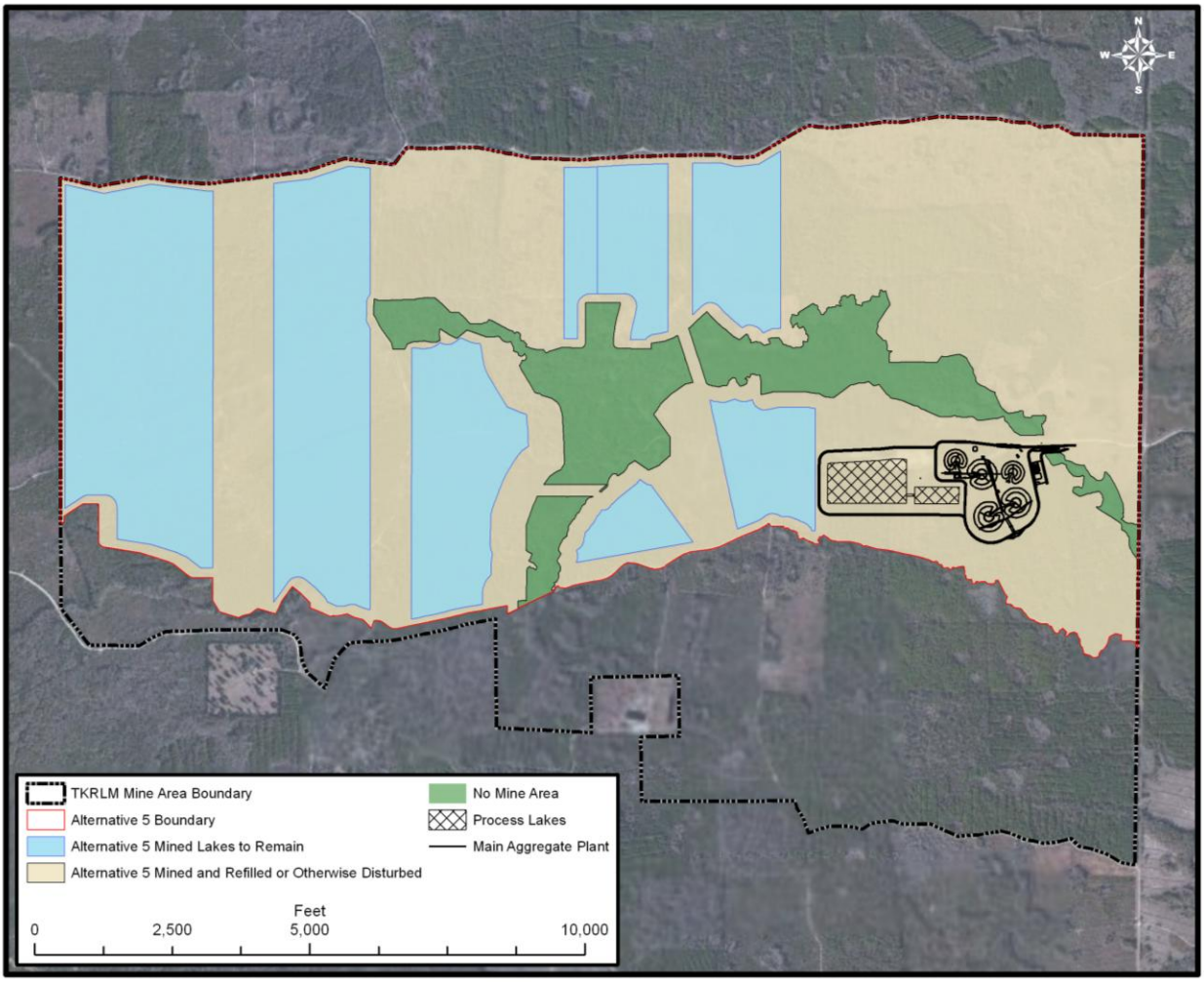


Figure 2–8. Alternative 5 Proposed Mining Plan

Under this alternative, approximately 3,185 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the approximately 3,185 acres disturbed, approximately 2,293 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. A portion of the mining area is the same as that for Alternative 2; however, approximately 700 acres of mining or related activities in the area between the two southern No Mine Areas would be excluded. Approximately 892 of the remaining 1,240 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. An area containing 348 acres, including flow-ways, other higher-quality wetlands, and some adjacent uplands, would be placed in conservation easements and set aside as No Mine Areas. Approximately 25 to 30 acres per year would be mined to a depth of 120 feet below the land surface. Table 2–9 shows the acreages of cover types that would be impacted by this alternative and the amount of lakes created during the life of the alternative.

Table 2–9. Alternative 5 Acreage Changes in Cover Types

Cover Types (FLUCCS Code – Description)	Existing Baseline	Change Due to Mining	At End of Alternative 5
Uplands			
425 - Temperate hardwood	117.9	–38.4	79.5
427 - Live oak	45.5	0.0	45.5
441 - Coniferous plantation	987.7	–848.4	139.3
443 - Forest regeneration	996.2	–457.2	539.0
Uplands Total	**2,147**	**–1,344**	**803**
Wetlands			
530 - Borrow pits	11.0	–9.1	1.9
616a - Deepwater ponds	150.7	–110.0	40.7
616b - Sloughs and intermittent flow-ways	154.3	–13.6	140.7
617 - Mixed wetland hardwoods	158.5	–72.3	86.2
621 - Cypress	1.2	0.0	1.2
628 - Pine-mesic-oak	213.3	–117.9	95.4
6291 - Hydric coniferous plantation > 8 years	1,121.3	–931.7	189.6
6292 - Hydric coniferous plantation < 8 years	495.8	–384.7	111.1
630 - Wetland forested mixed	284.1	–191.4	92.7
Wetlands Total	**2,590**	**–1,831**	**760**
Other			
740 - Roads	13	–10.4	2.6
Roads Total	**13**	**–10**	**3**
Totals (excluding lakes)	**4,751**	**–3,185**	**1,565**
Lakes created	0	1,210	1,210

2.2.2.6 Alternative 6 – Mining Only West of the Central North-South Aligned No Mine Area

Alternative 6 would further reduce total wetland impacts and impacts on areas of higher-quality wetlands and would increase the mining distance from Spring Run and local communities. This alternative would further reduce the mining footprint outlined in Alternative 2 by allowing mining only west of the central north-south aligned No Mine Area. The mining area associated with this alternative is depicted in Figure 2–9.

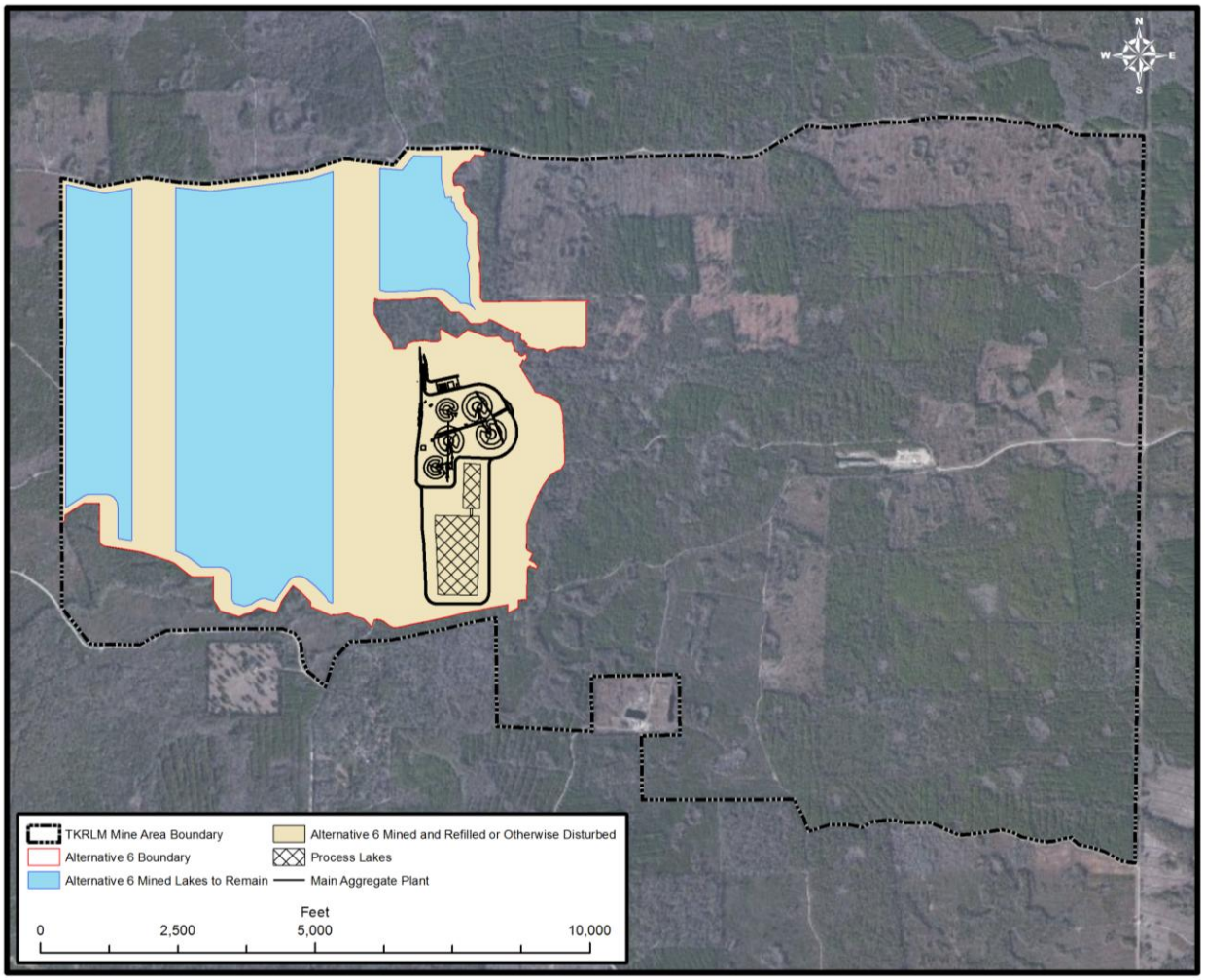


Figure 2–9. Alternative 6 Proposed Mining Plan

Under this alternative, approximately 1,452 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the approximately 1,452 acres disturbed, approximately 1,048 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. Approximately 404 of the remaining unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. There are no streams or flow-ways within this alternative's footprint. Approximately 25 to 30 acres per year would be mined to a depth of 120 feet below the land surface. Table 2–10 shows the acreages of cover types that would be impacted by this alternative and the amount of lakes created during the life of the alternative.

Table 2–10. Alternative 6 Acreage Changes in Cover Types

Cover Types (FLUCCS Code – Description)	Existing Baseline	Change Due to Mining	At End of Alternative 6
Uplands			
425 - Temperate hardwood	117.9	–18.8	99.1
427 - Live oak	45.5	0.0	45.5
441 - Coniferous plantation	987.7	–305.1	682.6
443 - Forest regeneration	996.2	–140.9	855.3
Uplands Total	**2,147**	**–465**	**1,683**
Wetlands			
530 - Borrow pits	11.0	–9.1	1.9
616a - Deepwater ponds	150.7	–38.5	112.2
616b - Sloughs and intermittent flow-ways	154.3	–4.1	150.2
617 - Mixed wetland hardwoods	158.5	–24.8	133.7
621 - Cypress	1.2	0.0	1.2
628 - Pine-mesic-oak	213.3	–108.2	105.1
6291 - Hydric coniferous plantation > 8 years	1,121.3	–430.6	690.7
6292 - Hydric coniferous plantation < 8 years	495.8	–250.6	245.2
630 - Wetland forested mixed	284.1	–115.2	168.9
Wetlands Total	**2,590**	**–981**	**1,609**
Other			
740 - Roads	13	–5.8	7.2
Roads Total	**13**	**–6**	**7**
Totals (excluding lakes)	**4,751**	**–1,452**	**3,299**
Lakes created	0	713	713

2.2.2.7 Alternative 7 – Exclusion of Mining or Related Activities West of the Central North-South Aligned No Mine Area, Between the Two Southern No Mine Areas, and South of Spring Run

Alternative 7 would further reduce total wetland impacts and impacts on areas of higher-quality wetlands and the area lying within lower-category storm surge zones and would increase the mining distance from the Gulf of Mexico and the higher-quality estuarine and palustrine wetlands along the coastline, Spring Run, local communities, and state-owned park/reserve lands. This alternative would further reduce the mining footprint outlined in Alternative 2 by removing all of the proposed mine area from west of the central north-south aligned No Mine Area, including the higher-quality wetlands from the north-central portion, as well as removing the mining area between the two southern No Mine Areas and an area in the northeast corner of the site south of Spring Run. The mining area associated with this alternative is depicted in Figure 2–10.

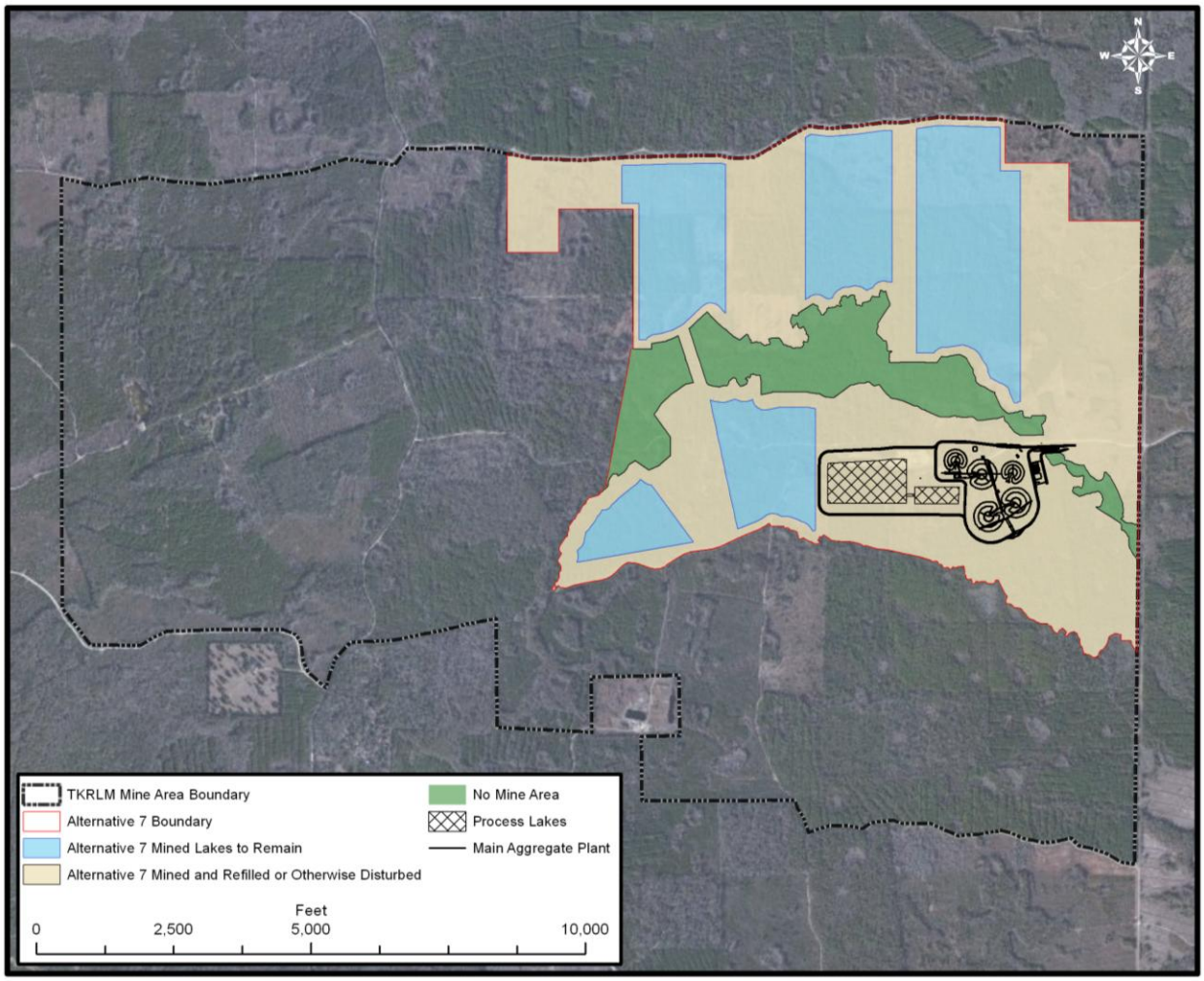


Figure 2–10. Alternative 7 Proposed Mining Plan

Under this alternative, approximately 1,545 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the approximately 1,545 acres disturbed, approximately 898 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. Approximately 647 of the remaining 853 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. An area containing 206 acres, including flow-ways, other higher-quality wetlands, and some adjacent uplands, would be placed in conservation easements and set aside as No Mine Areas. Approximately 25 to 30 acres per year would be mined to a depth of 120 feet below the land surface. Table 2–11 shows the acreages of cover types that would be impacted by this alternative and the amount of lakes created during the life of the alternative.

Table 2–11. Alternative 7 Acreage Changes in Cover Types

Cover Types (FLUCCS Code – Description)	Existing Baseline	Change Due to Mining	At End of Alternative 7
Uplands			
425 - Temperate hardwood	117.9	–4.5	113.4
427 - Live oak	45.5	0.0	45.5
441 - Coniferous plantation	987.7	–502.6	485.1
443 - Forest regeneration	996.2	–313.0	683.2
Uplands Total	**2,147**	**–820**	**1,327**
Wetlands			
530 - Borrow pits	11.0	0.0	11.0
616a - Deepwater ponds	150.7	–64.9	85.8
616b - Sloughs and intermittent flow-ways	154.3	–8.2	146.1
617 - Mixed wetland hardwoods	158.5	–38.0	120.5
621 - Cypress	1.2	0.0	1.2
628 - Pine-mesic-oak	213.3	–9.3	204.0
6291 - Hydric coniferous plantation > 8 years	1,121.3	–447.5	673.8
6292 - Hydric coniferous plantation < 8 years	495.8	–133.1	362.7
630 - Wetland forested mixed	284.1	–19.3	264.8
Wetlands Total	**2,590**	**–720**	**1,870**
Other			
740 - Roads	13	–4.6	8.4
Roads Total	**13**	**–5**	**8**
Totals (excluding lakes)	**4,751**	**–1,545**	**3,206**
Lakes created	0	511	511

2.2.2.8 Alternative 8 – Exclusion of Mining or Related Activities Between the Two Southern No Mine Areas and the Extreme Western Mining Block

Alternative 8 would further reduce total wetland impacts, impacts on areas of higher-quality wetlands, and the area lying within lower-category storm surge zones and would increase the mining distance from the Gulf of Mexico and the higher-quality estuarine and palustrine wetlands along the coastline and from local communities and state-owned park/reserve lands. This alternative would further reduce the mining footprint outlined in Alternative 5 by removing all of the proposed mine area on the extreme western section of the site. The mining area associated with this alternative is depicted in Figure 2–11.

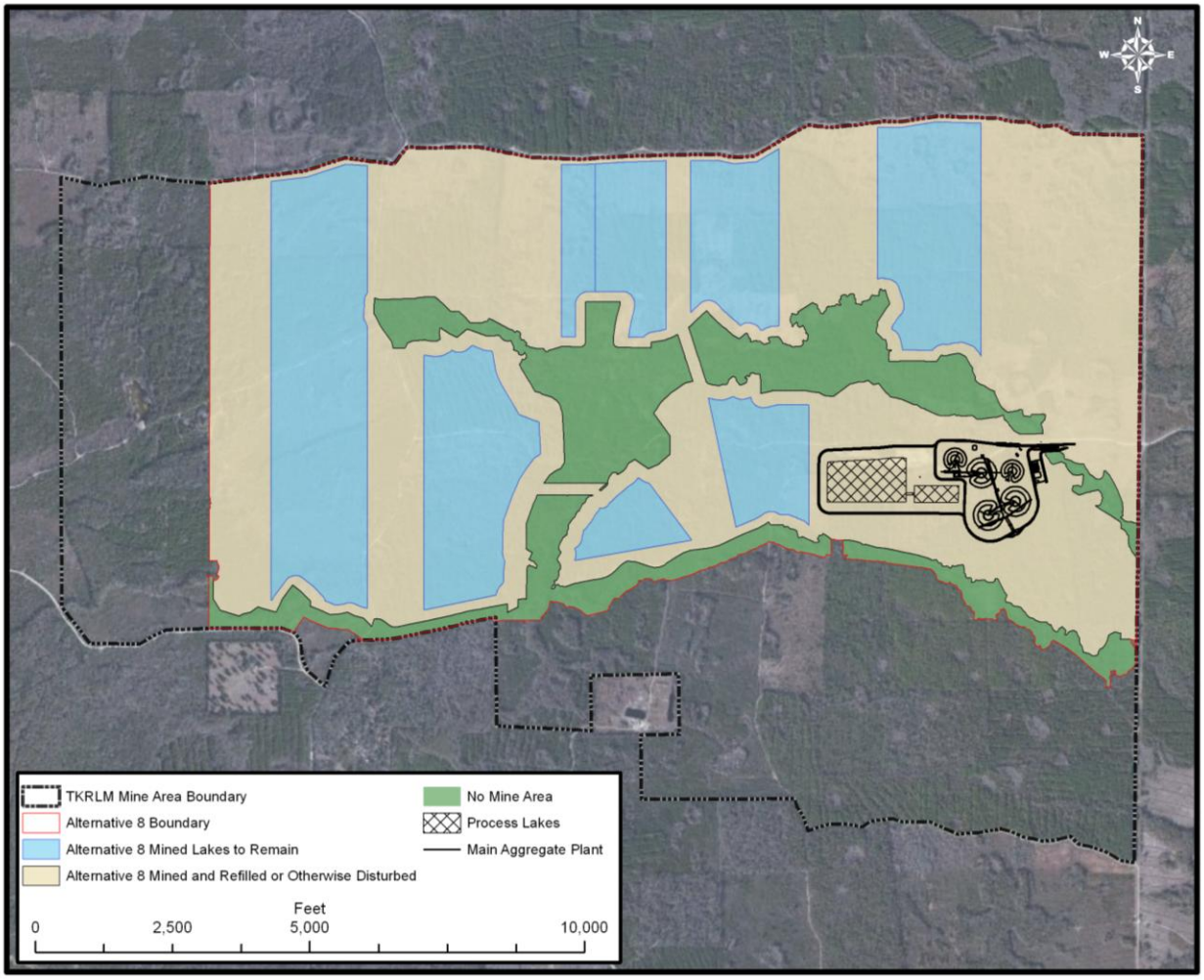


Figure 2–11. Alternative 8 Proposed Mining Plan

Under this alternative, approximately 2,772 of the 4,751 acres in the mining site would be disturbed either by mining or as part of the infrastructure supporting the mine activities. Of the approximately 2,772 acres disturbed, approximately 1,896 acres would be mined; areas not remaining as lakes at the end of mining activities would be converted to upland forest. Approximately 876 of the remaining 1,361 unmined acres would be cleared for road, aggregate transport, and other infrastructure uses and would also be returned to upland forested communities after mining is complete. Approximately 485 acres, including flow-ways, other higher-quality wetlands, and some adjacent uplands, would be placed in conservation easements and set aside as No Mine Areas. Approximately 25 to 30 acres per year would be mined to a depth of 120 feet below the land surface. Table 2–12 shows the acreages of cover types that would be impacted by this alternative and the amount of lakes created during the life of the alternative.

Table 2–12. Alternative 8 Acreage Changes in Cover Types

Cover Types (FLUCCS Code – Description)	Existing Baseline	Change Due to Mining	At End of Alternative 8
Uplands			
425 - Temperate hardwood	117.9	–33.8	84.1
427 - Live oak	45.5	0.0	45.5
441 - Coniferous plantation	987.7	–792.4	195.3
443 - Forest regeneration	996.2	–419.3	576.9
Uplands Total	**2,147**	**–1,296**	**902**
Wetlands			
530 - Borrow pits	11.0	–3.5	7.5
616a - Deepwater ponds	150.7	–100.1	50.6
616b - Sloughs and intermittent flow-ways	154.3	–13.0	141.3
617 - Mixed wetland hardwoods	158.5	–68.7	89.8
621 - Cypress	1.2	0.0	1.2
628 - Pine-mesic-oak	213.3	–98.7	114.6
6291 - Hydric coniferous plantation > 8 years	1,121.3	–852.3	269.0
6292 - Hydric coniferous plantation < 8 years	495.8	–219.1	276.7
630 - Wetland forested mixed	284.1	–161.4	122.7
Wetlands Total	**2,590**	**–1,517**	**1,073**
Other			
740 - Roads	13	–9.5	3.5
Roads Total	**13**	**–10**	**4**
Totals (excluding lakes)	**4,751**	**–2,772**	**1,979**
Lakes created	0	981	981

2.3 ALTERNATIVES ELIMINATED FROM DETAILED EVALUATION

A number of other alternatives in addition to those fully analyzed in this EIS were proposed during the scoping and evaluation period associated with this EIS. These alternatives were considered by the USACE but were eliminated from detailed evaluation for the reasons discussed below.

- *Mining north of Pumpkin Road (current north boundary).* The high coverage of similar-quality wetlands in this area would merely mean a transfer of impacts with little to no net gain. The area is also closer to Spring Run and therefore less desirable due to potential floodplain impacts. It is also approximately the same distance from the nearby state lands, higher-quality wetlands, and Gulf of Mexico to the west.

- *Mining to east of the power lines (current east boundary).* The same issues regarding a mere shifting of similar impacts described above for the north boundary also apply to the east boundary. In addition, the existing dragline would not be capable of getting to the other side of the power lines without substantial and expensive disassembly. Relocating those power lines would be logistically difficult and expensive; additional environmental impacts would also be involved in the creation of a new power line corridor or expansion of an existing corridor. Finally, mining further east would not allow for much additional space before encroaching upon residential parcels in the area.

- *Mining to greater depths than the 100–120 feet proposed.* Although this proposed alternative could reduce the overall area of the mining required, the technology is not currently available to the applicant to mine deeper than the proposed depth. Also, additional potential impacts on groundwater and saltwater interfaces would have to be evaluated if mining were to exceed the proposed 120-foot depth limit.

2.4 SUMMARY OF POTENTIALLY SIGNIFICANT IMPACTS

The following section details a comparison of the alternatives evaluated in this EIS in terms of potentially significant impacts, with the focus on those resource areas that could be most impacted. Given the nature of the alternatives being evaluated and the varying degrees of limestone mining in wetlands and other land cover types, environmental impacts are expected to occur under every alternative except the No Action Alternative. The severity of the impacts relates directly to the number of acres being mined and in some instances to the location of the mining activities relative to the shoreline or adjacent property. A detailed analysis of the potential environmental impacts of each alternative is presented in Chapter 4.

2.4.1 Surface Water

Direct and Secondary Impacts from Construction and Mining Activities. All of the proposed alternatives have the potential for impacts on surface waters on and off of the site. Mining activities could result in onsite impacts on intermittent streams and constructed lakes and offsite impacts on receiving watersheds. Implementation of the construction controls described in Chapter 4, Section 4.3.1, and restoration of all disturbed areas upon completion of mining are proposed to minimize the potential for adverse impacts on onsite surface waters, as well as any offsite receiving waters.

Hurricane Surge Impacts. Hurricanes have the potential to flood the project mine site, as depicted in Chapter 3, Figure 3–3, including potential for inundation of the western half of the site during Category I and II hurricanes and potential for inundation of the entire project mine site during Category III through V hurricanes. Alternatives 2, 5, 6, and 8 would include mining activities in all hurricane surge zones. Alternatives 3 and 4 would include mining activities in Category II through V hurricane surge zones. Alternative 7 would include mining activities in Category III through V hurricane surge zones. Active mining areas and remaining lakes are proposed to be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the projected Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet National Geodetic Vertical Datum.

Potential for inundation of the temporary and permanent containment berms during Category IV and V hurricanes would exist for all alternatives, with implications for equipment safety/stability and water quality (discussed in Chapter 4, Section 4.2.1).

Sea-Level Change Impacts. As discussed in Chapter 3, Section 3.6.2, potential sea-level changes over the life of proposed mining were evaluated using the methodology outlined in USACE Circular EC-1165-2-212 (USACE 2011). Under Alternative 2, using the highest predicted sea-level rise of 5.7 feet results in the extreme southwestern end of the mining site being inundated after approximately 85 years of mining (see Chapter 3, Figures 3–19 and 3–20). At the end of Alternative 2 mining (100 years), approximately 96 acres of the 2,757 acres mined would be impacted under that highest predicted level, with similar acreages affected under Alternatives 5 and 6. Potential implications for water quality include increased salinity and pH in the affected lake and in groundwater flowing towards the Gulf of Mexico. None of the other mining alternatives would be directly affected by projected sea-level rise over this period. However, floodplain and hurricane surge impacts would have to be adjusted accordingly to account for this increase in sea level for all alternatives as impacts could occur in earlier mining years. The proposed mitigation site immediately to the west of the mine site could be impacted over time to varying degrees, dependent upon how much sea-level rise occurs. Mitigation of the potential impacts of sea-level change is addressed in Chapter 5, and includes the construction of berms around mining lakes that would remain in place post-project.

2.4.2 Groundwater and Seepage

A summary of the groundwater and seepage impacts for the modeled alternatives under baseline conditions is presented in Table 2–13. A detailed analysis and description of the individual transects is provided in Chapter 4, Section 4.2.2.

Minor impacts on groundwater flow would occur across the mine site boundary under Alternatives 2 and 8, with increases in north-to-south seepage over baseline (pre-mining) conditions ranging from 15 to 18 percent under Alternative 2 and from 11 to 16 percent under Alternative 8. Minor decreases in groundwater flow from east to west are also expected to occur under each of the alternatives.

There are no discernible impacts due to mining on groundwater flow across transects outside of the mine site for any of the alternatives, with the exception of the southernmost transect (K-K'), where an increase in flow of up to 23 percent was modeled. However, the baseline flow in this area is very small (3.3 million gallons per day), and the maximum change represents an increase of only 0.8 million gallons per day due to mining.

The maximum change in the levels of onsite wells as a result of mining among all of the alternatives was a decrease of 0.3 feet under Alternatives 2, 3, and 8. The maximum decrease in water levels on site would have minimal impact on the drawdown of water levels off site, resulting in little to no impact on offsite wetlands.

Baseline groundwater flow east to west across the westernmost offsite transect (L-L') is 89.4 million gallons per day and showed negligible change due to mining under any of the alternatives. As a result of this continued positive flow, there would be no discernible saltwater intrusion into the groundwater due to mining.

2.4.3 Groundwater Quality

The impact of mining on groundwater is a concern as planned mining operations would intercept and alter groundwater flow. The assessment of impact on groundwater quality must consider changes as a result of drilling and blasting the rock, rock removal, and refilling of excavated quarries with fill material. These alterations may increase fine sediment concentrations, create conditions that alter the natural geochemistry of the aquifer, and increase the potential of accidental spillages and subsequent introduction of contaminants into groundwater. It is possible that these processes would impact groundwater quality in the vicinity of the mine site and further downgradient as impacted waters migrate away from the site. The potential impact on groundwater quality can be assessed by examining anticipated changes to groundwater turbidity, groundwater geochemistry, and the potential for saltwater intrusion. Chapter 4, Section 4.3.2, provides a detailed discussion of potential impacts on the quality of groundwater. Note that these impacts are independent of the alternative implemented but could be minimized or mitigated with proper planning, execution, and monitoring.

Table 2–13. Summary of Modeled Seepage Impacts[a] Compared to Baseline for Calendar Years 2004–2008

Transects for Evaluating Seepage[b]	Seepage Flow Direction	Baseline (MGD)	Alternative 2	Alternative 3	Alternative 7	Alternative 8
			Percentage Change from Baseline at End of Alternative			
Mine-Out Areas Within Mine Site Boundary						
(G-G'+ D-D')	North to South	23.4	18	<A	<A	11
(E-E'+F-F'+H-H')	North to South	9.9	15	<A	<A	16
A-A'	East to West	7.4	<A	<A	<A	<A
B-B'	East to West	16.6	<A	<A	<A	<A
C-C'	East to West	24.4	16	<A	<A	6
Regional Areas Outside Mine Site Boundary						
I-I'	East to West	131.2	<A	<A	<A	<A
J-J'	North to South	94.0	<A	<A	<A	<A
K-K'	North to South	3.3	23[c]	11[c]	9[c]	21[c]
L-L'	East to West	89.4	<A	<A	<A	<A
Other Impacts						
Onsite Wells (maximum change)			< –0.3 feet	< –0.3 feet	0	< –0.3 feet
Adjacent Wetlands (off site)			Minimal	Minimal	None	Minimal
Saltwater Intrusion			No	No	No	No

a See Chapter 4, Section 4.2.2, for discussion on the alternatives chosen for modeling.
b See Chapter 3, Figure 3–10, or Chapter 4, Figure 4–1, for locations of transects.
c Small change to very low baseline flow; maximum change is 0.8 MGD.
Key: <=less than; A=estimated model accuracy of ±5 percent; MGD=million gallons per day.

2.4.4 Wetlands and Vegetation

Wetlands. All of the alternatives considered in this EIS, except the No Action Alternative, would have some degree of adverse impact on wetland cover types within the Tarmac King Road Limestone Mine area, the primary impact being destruction of wetlands by mining activities. Among the other seven alternatives considered in this EIS, the acreage of wetland loss from direct impacts ranges from approximately 2,068.5 acres under Alternative 2 to approximately 720.3 acres under Alternative 7 (see Chapter 4, Table 4–7). In addition, without mitigation, Alternatives 2 through 8 would result in wetland functional losses of 427.8 to 1,185.6 units using the Uniform Mitigation Assessment Method (UMAM). With implementation of the applicant's proposed compensatory mitigation plan outlined in Chapter 5, Section 5.3 (see Table 5–3), only Alternatives 2 (–288.4 units) and 5 (–161.2 units) would result in net UMAM functional losses. Groundwater modeling has been performed to determine any indirect impacts on water levels that may be expected in wetlands in the No Mine Areas within the proposed Tarmac King Road Limestone Mine and in wetlands outside the proposed mine site boundaries. The results of this analysis are discussed in Chapter 4, Section 4.2.2.

Vegetation. All of the alternatives considered in this EIS, except the No Action Alternative, would have some degree of adverse impact on existing vegetation within the mine area, the primary impact being total removal of vegetation. Among the other seven alternatives considered in this EIS, the acreage of potentially impacted vegetation ranges from approximately 3,898.8 acres under Alternative 2 to approximately 1,451.7 acres under Alternative 6. Table 2–14 ranks the alternatives from greatest to least in terms of vegetation acreage directly impacted. During project activities, measures could be taken to manage exotic or invasive species such as the air potato, cogon grass, and the Japanese climbing fern. Preventing the introduction of or managing the spread of these species can be accomplished by identifying and adopting best management practices, including controls on any fill materials or equipment brought into the site, frequent monitoring, and rapidly managing any species found.

Table 2–14. Alternatives Ranked in Order of Decreasing Acreage of Vegetation Directly Impacted

Area Impacted	Alternative							
	1	2	3	4	5	6	7	8
Total area impacted	8	1	3	4	2	7	6	5
Total area uplands impacted	8	1	2	3	4	7	6	5
Total area wetlands impacted	8	1	4	5	2	6	7	3

2.4.5 Noise

Noise impacts associated with rock mining activities include blasting and operating excavators, loaders, trucks, crushing and sorting equipment, and conveying equipment.

A recent study conducted for Tarmac indicates that the closest residences to potential mining areas are to the south-southwest and are about 515 feet from the potential mining areas. There is the potential for sound levels to marginally exceed 65 decibels A-weighted (dBA) at these home sites as a result of dragline, crusher, and screening operations at the mining area. Daytime commercial activity noise above 65 dBA is the level typically considered to be a nuisance by many municipalities in Florida; normal conversational speech is approximately 60 dBA at 1 meter away. Specific noise levels by alternative are not discussed since they are dependent on various factors, including distance, wind speed and direction, and temperature, as well as the particular mining block within an alternative. Therefore, the conclusions in this EIS are based on the highest potential noise levels at the closest residences, and have been applied to all of the proposed alternatives. Tarmac has committed to providing a 100-foot-wide vegetated buffer in this area to mitigate sound levels and to building berms to a minimum elevation of 19 feet above sea level around all mining areas before excavation begins. This would help minimize any sound emanating from the mining areas (Grove 2010:11).

2.4.6 Cultural Resources

Known historical and archaeological sites are identified in the Florida Master Site File. Table 2–15 lists the historical and archaeological sites that could be potentially impacted by the implementation of the alternatives at the proposed Tarmac King Road Limestone Mine and mitigation area. These include some sites that may be eligible for listing in the National Register of Historic Places, as well as those sites that have not yet been fully evaluated by the State Historic Preservation Officer. These sites are all located within the wetland mitigation area. There are no recorded archaeological sites in any of the mining areas.

Table 2–15. Recorded Archaeological Sites Potentially Impacted

Site Number	Name	Type	Impacted by Alternatives
LV00532	Turtle Creek North	Prehistoric midden(s)	2–8[a]
LV00110	Beetree Slough Mound	Prehistoric burial(s)[b]	2–8[a]
LV00468	Crackerville	Habitation (prehistoric)[c]	2–8[a]

[a] Located within the mitigation site.
[b] Contains human remains.
[c] Ineligible for listing in the National Register of Historic Places.
Source: FDHR 2009.

Under all of the action alternatives, known archaeological sites in the mitigation area would be clearly identified to construction personnel prior to land-disturbing activities associated with enhancement activities to ensure that these areas are avoided. If a permit were issued, and the USACE then finds or is notified that the permit area contains a previously unknown potentially eligible historic property which it reasonably expects would be affected by the undertaking, the USACE would initiate the Federal and state coordination required to determine if a recovery effort is warranted or if the site is eligible for listing in the National Register of Historic Places. The USACE would immediately seek voluntary avoidance of construction activities that could affect the historic property pending the results of the coordination. Based on the circumstances of the discovery, equity to all parties, and considerations of the public interest, the district engineer could modify, suspend, or revoke a permit in accordance with 33 CFR 325.7.

2.4.7 Recreation

Under Alternatives 2–8, the area available for hunting would be reduced in the proposed mine and mitigation areas, and the mine area would no longer be available for preservation under the Florida Forever project. The reduced level of hunting within the Tarmac King Road Limestone Mine could shift hunting activities to other portions of the Gulf Hammock Wildlife Management Area or Goethe State Forest, increasing the number of visitors and hunting permits requested in those areas during hunting season.

In association with Alternatives 2–8, the 4,526-acre mitigation area could be turned over to the state. Although no definitive plan currently exists for recreational activities that might be authorized in the proposed mitigation area, it is conceivable that hunting and fishing would be allowed, and some trails could be constructed across the area for hiking, biking, and/or horseback riding. This area could conceivably be preserved by the state as part of the Florida Forever project or managed as an addition to the Waccasassa Bay Preserve State Park.

2.4.8 Remaining Environmental Disciplines

The remaining environmental analyses conducted as part of this EIS are not expected to result in potentially significant impacts under any of the proposed alternatives. The areas covered by these analyses include wildlife, topography, geology and soils, seismicity, land use, hazardous and toxic wastes, air quality, aesthetics, socioeconomics, transportation, and environmental justice. The results of these analyses are reported in Chapter 4.

2.5 REFERENCES

Ashmawy, A., R. McDonald, D. Carreon, and F. Atalay, 2006, *Stabilization of Marginal Soils Using Recycled Materials*, BD-544-4, University of South Florida, Tampa, Florida, February 19.

BLS (Bureau of Labor Statistics), 2013, Consumer Price Index – Average Price Data for Automotive Diesel Fuel Per Gallon, January 2012 through December 2012, accessed through http://www.bls.gov/cpi/#tables, January 16.

Cambridge Systematics (Cambridge Systematics, Inc.), 2010, *The Florida Rail System Plan: Investment Element*, December.

CCPA (Citrus County Port Authority), 2013, *Port Citrus Frequently Asked Questions*, accessed through http://portcitrus.com/faq, June 2.

CDOC (California Department of Conservation), 2006, *Aggregate Availability in California, Map Sheet 52*, California Geological Survey, Sacramento, California.

Citrus County, 2012, *Citrus County Comprehensive Plan*, "Chapter 17 - Port Element," accessed through http://www.bocc.citrus.fl.us/plandev/grcp/comp_plan/chapter_17.pdf, May 8.

EPA (U.S. Environmental Protection Agency), 2012, *Glass Common Wastes and Materials*, "Glass," accessed through http://www.epa.gov/osw/conserve/materials/glass.htm, December 12.

FDHR (Florida Division of Historical Resources), 2009, *Data for Archaeological Sites, Field Surveys, and Standing Structure GIS Data Layers*, Tallahassee, Florida, March.

FDOT (Florida Department of Transportation), 2007a, *Strategic Aggregates Study: Sources, Constraints, and Economic Value of Limestone and Sand in Florida*, March 12.

FDOT (Florida Department of Transportation), 2007b*, Public Road Mileage and Miles Traveled, 2007*, accessed through http://www.dot.state.fl.us/planning/statistics/mileage%2Drpts/Public07.pdf, November 11.

FDOT (Florida Department of Transportation), 2008, *Florida Coordinate Systems and Districts: FDOT Districts, State Plane & UTM Zones*, FDOT Surveying and Mapping Office, Tallahassee, Florida, December 1.

FDOT (Florida Department of Transportation), 2009, *2009 Strategic Resource Evaluation Study: Highway Construction Materials–Aggregate Materials–Final Report*, The Balmoral Group, Gainesville, Florida, September.

FDOT (Florida Department of Transportation), 2010, *Standard Specifications for Road and Bridge Construction*, FM 5-510, Tallahassee, Florida.

FDOT (Florida Department of Transportation), 2012, *Approved Aggregate Products Mines or Terminals*, FDOT State Materials Office, Tallahassee, Florida, November 12.

Florida Ports Council, 2010, *Florida Seaports: Florida Ports*, accessed through http://www.flaports.org, on October 6, 2011.

Grove (Grove Scientific and Engineering Company), 2010, *Tarmac King Road Mine, Levy County, Florida, Potential Sound Impact Study*, Orlando, Florida, March.

Lee County, 2008, *Prospects for Southeast Lee County: Planning for the Density Reduction/Groundwater Resource Area (DR/GR)*: Chapter 3, "Planning Principles," and Appendix B, "Limerock Production and Demand," July.

Malešev, M., V. Radonjanin, and S. Marinković, 2010, "Recycled Concrete as Aggregate for Structural Concrete Production," *Sustainability*, Vol. 2, pp. 1204–1225, April 30.

National Stone, Sand, and Gravel Association, 2012, *What is NSSGA?,* accessed through http://www.nssga.org/communications/whoweare.cfm on March 23.

PSJPA (Port St. Joe Port Authority), 2008, *Port St. Joe Port Master Plan*, accessed through http://www.portofportstjoe.com/port-master-plan.cfm, July.

Robas, V., 2008, Port of Jacksonville, Jacksonville, Florida, personal communication (telephone call) with S. Schatzel, Science Applications International Corporation, Germantown, Maryland, June 4.

Robas, V., 2011, Port of Jacksonville, Jacksonville, Florida, personal communication (telephone call) with S. Schatzel, Science Applications International Corporation, Germantown, Maryland, August 13.

SME (Society of Mining, Metallurgy, and Exploration, Inc.), 2006, *Industrial Minerals & Rocks; Commodities, Markets, and Uses*, 7th Edition, accessed through http://books.google.com/books?id=zNicdkuulE4C&pg=PA592&lpg=PA592&dq=crushed+stone+trucking+costs&source=bl&ots=Nioht_Abqd&sig=_EE1dlMR9kHfGtfsBZ_ana3oA50&hl=en#v=onepage&q=crushed%20stone%20trucking%20costs&f=false, March 5.

TPA (Tampa Port Authority), 2010, personal communication (telephone call) from C. Roberts, Port of Tampa to S. Schatzel, Science Applications International Corporation, Germantown, Maryland, September 15.

TPA (Tampa Port Authority), 2011, *Total Port, Fiscal Year 2011 vs Fiscal Year 2010*, accessed through http://www.tampaport.com/About-TPA/Statistics, August 10.

USACE (U.S. Army Corp of Engineers), 2009*, Final Supplemental Environmental Impact Statement on Rock Mining in the Lake Belt Region of Miami-Dade County, Florida*, Jacksonville District, May.

USACE (U.S. Army Corp of Engineers), 2011, *Water Resource Policies and Authorities Incorporating Sea-Level Change Considerations in Civil Workers Programs*, Circular No. 1165-2-212, October.

USGS (U.S. Geological Survey), 2000, *An Introduction to Sand and Gravel Deposit Models, Front Range Urban Corridor*, accessed through http://rmmcweb.cr.usgs.gov/frontrange/aggregate/aggmodels_intro/aggmodels.htm, July 26.

USGS (U.S. Geological Survey), 2004a, *The Mineral Industry of Alabama,* accessed through http://minerals.usgs.gov/minerals/pubs/state/2004/alstmyb04.pdf.

USGS (U.S. Geological Survey), 2004b, *The Mineral Industry of Florida*, accessed through http://minerals.usgs.gov/minerals/pubs/state/2004/flstmyb04.pdf.

USGS (U.S. Geological Survey), 2004c, *The Mineral Industry of Georgia*, accessed through http://minerals.usgs.gov/minerals/pubs/state/2004/gastmyb04.pdf.

USGS (U.S. Geological Survey), 2007, *2006 Minerals Yearbook: Stone, Crushed*, accessed through http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/myb1-2006-stonc.pdf, November.

USGS (U.S. Geological Survey), 2009a, *2007 Minerals Yearbook: Stone, Crushed* (Advance Release), accessed through http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/myb1-2007-stonc.pdf, January.

USGS (U.S. Geological Survey), 2009b, *2009 Mineral Commodity Summaries: Stone, (Crushed)*, accessed through http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mcs-2009-stonc.pdf, January.

USGS (U.S. Geological Survey), 2010a, *Mineral Industry Surveys, Crushed Stone and Sand and Gravel in the First Quarter 2010*, June.

USGS (U.S. Geological Survey), 2010b, *Mineral Resources On-Line Spatial Data, Active Mines and Plants Database*, accessed through http:tin.er.usgs.gov/mineplant/find-mines.php, April 15.

USGS (U.S. Geological Survey), 2011, *2010 Mineral Commodity Summaries: Stone (Crushed)*, accessed through http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mcs-2011-stonc.pdf, January.

USGS (U.S. Geological Survey), 2012, *Mineral Industry Surveys: Crushed Stone and Sand and Gravel in the Fourth Quarter 2011*, accessed through http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mis-2011q4-stone.pdf, March.

USGS (U.S. Geological Survey), 2013, *Mineral Industry Surveys, Crushed Stone and Sand and Gravel in the First Quarter 2013*, accessed through http://minerals.usgs.gov/minerals, May.

USITC (U.S. International Trade Commission), 2012, USITC Interactive Tariff and Trade DataWeb Version 3.1.0, Report of Quantity and Value of Crushed Rock Imports from the Bahamas, Canada, and Mexico from 2002–2011, accessed through http://www.dataweb.usitc.gov/scripts/user_set.asp on April 10.

USITC (U.S. International Trade Commission), 2013, U.S. Imports for Consumption from Mexico, Bahamas, and Canada, Annual Data for Quantity and Value, HTS-251710: Pebbles, Gravel, Broken or Crushed Stones for Concrete Aggregates, for Road Metalling or Ballast, Shingle and Flint, Whether or not Heat Treated.

Van Sant, W., 2005, "Mining, rock industries carve sizable roles," Tampa Bay Times, http://www.sptimes.com/2005/02/13/Hernando/Mining__rock_industri.shtml February 13.

Code of Federal Regulations

33 CFR 320.1, U.S. Army Corps of Engineers, "General Regulatory Policies: Purpose and Scope."

33 CFR 325, Appendix B, U.S. Army Corps of Engineers, "NEPA Implementation Procedures for the Regulatory Program."

33 CFR 325.7, U.S. Army Corps of Engineers, "Processing of Department of the Army Permits: Modification, Suspension, or Revocation of Permits."

40 CFR 1500–1508, Council on Environmental Quality, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act.

40 CFR 1502.14, Council on Environmental Quality, "Environmental Impact Statement: Alternatives Including the Proposed Action."

Florida Administrative Code

FAC Rule 14-103.005, "Supplemental Source Requirements for Alternate Open-Graded Friction Course (FC) Aggregate."

CHAPTER 3
AFFECTED ENVIRONMENT

This chapter provides a description of the environment that could be affected through actions evaluated in this *Tarmac King Road Limestone Mine Environmental Impact Statement* (*King Road EIS*). The affected environment descriptions provide the context for understanding the environmental consequences described in Chapter 4 of this environmental impact statement (EIS). For the purposes of this analysis, this chapter serves as a baseline from which any environmental changes brought about by implementing the alternatives can be evaluated.

The U.S. Army Corps of Engineers (USACE) evaluated the environmental impacts of the proposed actions within defined regions of influence (ROIs). These ROIs are specific to the resource area evaluated, encompass geographic areas within which any meaningful impact is expected to occur, and can include the areas within which the proposed actions would take place and nearby or distant offsite areas. For example, impacts on historic resources were evaluated within the site boundary, and economic effects such as job and income changes were evaluated within a socioeconomic ROI that includes Levy and Citrus Counties. Brief descriptions of the ROIs for each resource area are given in Table 3–1.

Table 3–1. General Regions of Influence for the Affected Environment

Environmental Resource Area	Region of Influence
Hydrology and water quality	The proposed mining and mitigation areas and surrounding watersheds that could be affected by mining and mitigation activities
Wetlands	The proposed mining and mitigation areas and nearby offsite areas where wetlands could be affected by mining and mitigation activities
Vegetation, wildlife, and habitat	The proposed mining and mitigation areas and nearby offsite areas where vegetation, wildlife, and habitat could be affected by mining and mitigation activities
Geology and soils	The proposed mining and mitigation areas
Land use	The proposed mining and mitigation areas and nearby offsite areas that could be affected by changes in land use
Hazardous and toxic materials and wastes	The proposed mining and mitigation areas and nearby offsite areas where hazardous and toxic materials and wastes are managed that could be affected by mining and mitigation activities
Meteorology and air quality	The proposed mining and mitigation areas and nearby offsite areas within the local air quality control region
Aesthetics	The proposed mining and mitigation areas and surrounding viewsheds
Noise	The proposed mining and mitigation areas, transportation corridors, and nearby offsite areas that could be affected by noise from mining and mitigation activities
Cultural resources	The proposed mining and mitigation areas
Recreation	The proposed mining and mitigation areas and nearby offsite areas that could be affected by changes in recreational use
Socioeconomics	Levy and Citrus Counties, which could be affected by mining and mitigation activities
Environmental justice	Areas within 5 miles of the site boundary that could be affected by mining and mitigation activities

For this EIS, each resource area is described that may be particularly affected by the proposed action. The level of detail varies depending on the potential for impacts resulting from each alternative. A number of site-specific and recent project-specific documents are important sources of information in describing the existing environment; information from these documents is summarized and/or incorporated by reference in this chapter. Numerous other sources of site- and resource-related data were also used in the preparation of this chapter and are cited as appropriate.

3.1 HYDROLOGY

The hydrology of an environment addresses the occurrence, distribution, and movement of all waters (Fetter 1988). The following sections provide a description of each of these components for both surface water and groundwater in the vicinity of the Tarmac King Road Limestone Mine site using both regional and site-specific information.

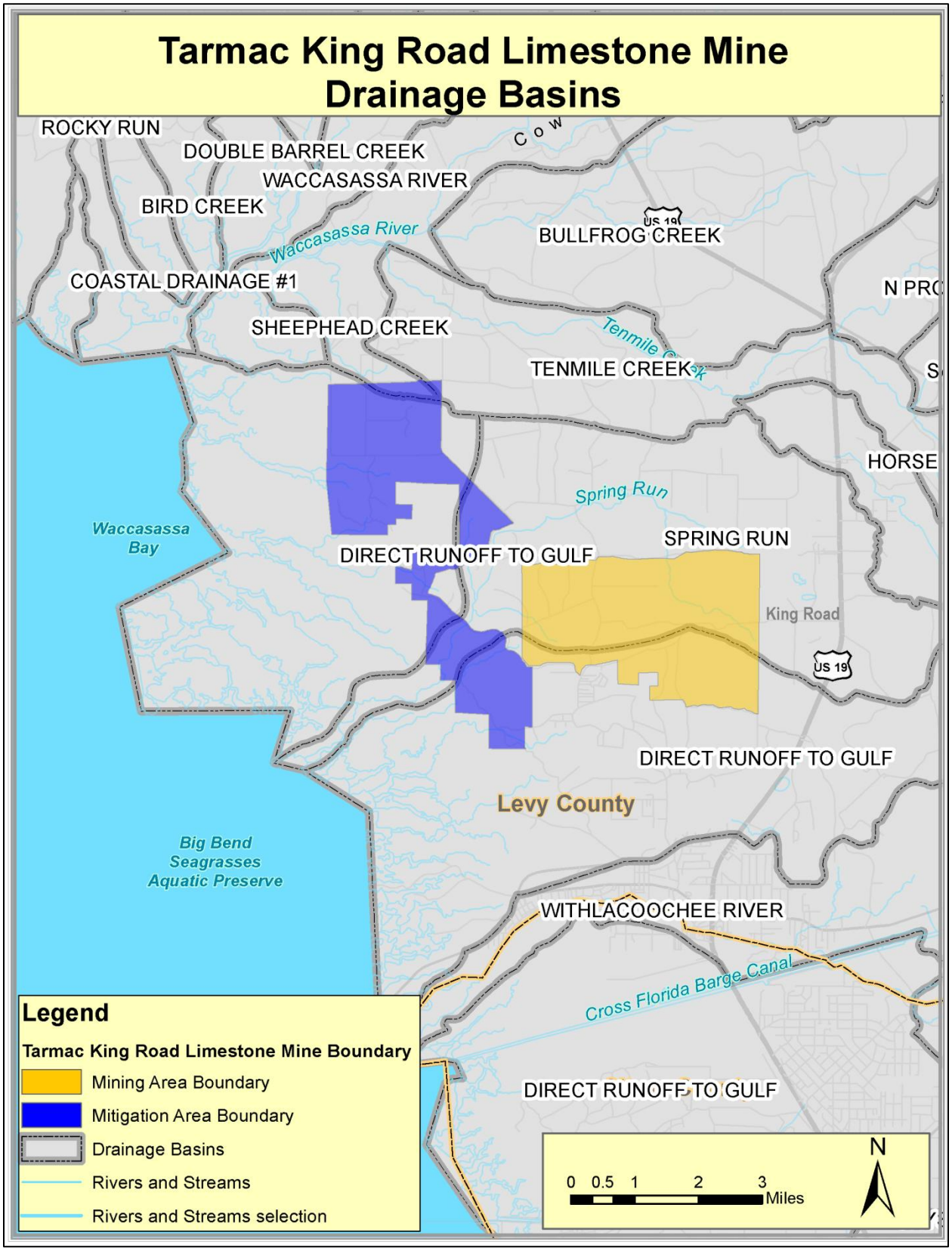
3.1.1 Surface Water

Surface waters at the project site consist of intermittent drainages that intercept the Floridan Aquifer during wet periods. Because of the flat topography and high water table, surface water conditions are dictated by precipitation, evaporation, and transpiration; drainage features; and aquifer properties (Ardaman & Associates 2008a). Stream channels and wetlands experience a high water table during the rainy season (June through September, as described in Section 3.9, “Meteorology and Air Quality”) and following substantial rainfall events but are dry the remainder of the year. Human disturbances such as elevated roadways, ditches, and culverts have resulted in localized alterations in surface hydrology, resulting in increased drainage in some areas and ponding of water along the upstream side of road crossings (Denton and Evans 2008).

Based on topography available on the U.S. Geological Survey (USGS) topographic quadrangle maps, surface runoff generally drains from east to west across the project mine site, and west and/or southwest through the mitigation area. Drainage basins for the region encompassing the project mine site and mitigation area have been mapped by the Southwest Florida Water Management District (see Figure 3–1). The northern portion of the project mine site contains tributaries to Spring Run, which discharges directly to Waccasassa Bay at the Gulf of Mexico shoreline to the west. The southern portion of the project mine site drains to the west (eastern side of site) and southwest (western side of site), contributing to the headwaters of Demory Creek, Thousandmile Creek, and/or Smith Creek, which also drain directly to the Gulf of Mexico shoreline west of the site.

The mitigation area includes land areas that drain to the Demory Creek Gulf shoreline area (southern portion of mitigation area), Spring Run (central portion of mitigation area), shoreline tributaries draining to the Gulf of Mexico north of Spring Run (northern portion of mitigation area), and a small, northern area of contribution to the Waccasassa River drainage basin (including direct discharge to the river and indirect discharge via Tenmile Creek (see Figure 3–1).

The gulf shoreline consists of the Waccasassa Bay Preserve State Park, a 34,064-acre protected area that contains salt marsh, tidal creeks, and wooded islands (FDEP 2005). Additionally, the open waters of Waccasassa Bay are within the Big Bend Seagrasses Aquatic Preserve, over 945,000 acres of seagrass beds, shallow banks, and islands located along 150 miles of the Gulf Coast; the area provides habitat to seabirds and shorebirds; fish; and commercially important shellfish resources, including hard shell clams, oysters, pink shrimp, and blue crab (FDEP 2006). These areas provide important wildlife habitats for fish; shellfish; and federally protected species, such as manatees and bald eagles. Thus, maintaining good water quality conditions for aquatic resources is an important management concern (FDEP 2005).



Source: SWFWMD 2009.

Figure 3–1. Tarmac King Road Limestone Mine Drainage Basins

Mapped floodplains in the vicinity of the project mine site and mitigation area include the Federal Emergency Management Agency (FEMA) 100-year floodplain boundary (A and AE zones) and coastal storm velocity zones (VE zone) (see Figure 3–2) (University of Florida 2011). Both A zones designate 100-year floodplains: the A zone denotes the 100-year floodplain boundary determined using approximate methodologies, and the AE zone represents the boundary based on detailed methods (44 CFR 64.3(a)). The V zones are designated special flood hazard zones in coastal floodplains with probability of experiencing storm surge and storm wave conditions. The VE zones have been mapped based on specific calculations of water surface elevations and storm wave velocities (44 CFR 64.3(a)); the V zone extends from the offshore to the inland limit of a primary frontal dune and consists of the zone subject to high-velocity wave action from storms or seismic sources (FEMA 2009). Approximately one-third of Levy County, 100 square miles, is located in the V zone (Levy County 2008).

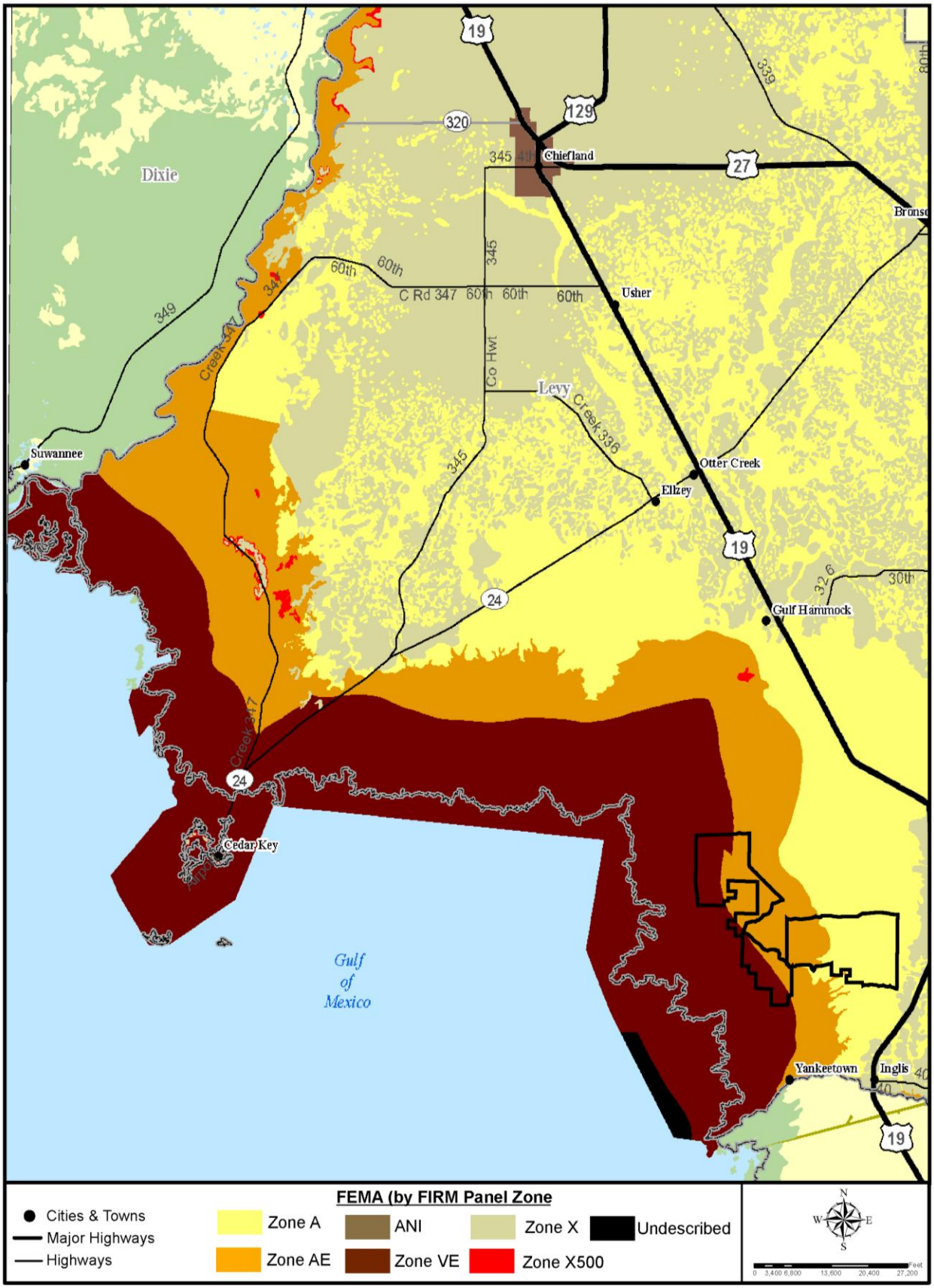
Floodplains serve important functions for flood damage reduction by storing waters that could otherwise flood developed areas, preventing or reducing bank erosion and channel scour, and providing storm buffering in coastal areas. Floodplains also provide unique wildlife habitat based on the close proximity to surface waters and periodic inundation. The vast majority of the Levy County coastline is in a natural state (Levy County 2008) and therefore lacks protective measures such as storm damage reduction and shoreline stabilization features (e.g., dikes, hurricane barriers, revetments).

The western third of the project mine site and roughly the eastern half of the mitigation area are located within the AE zone, as shown in Figure 3–2. Roughly the western half of the mitigation area is contained in the mapped VE zone. Management requirements for floodplains and flood hazard zones include restrictions and/or guidelines regarding permanent fill and structures to prevent hazards to life and property and to prevent adverse modification of the flood damage reduction functions these areas provide.

In addition to the FEMA floodplain data, hurricane storm surge maps have been prepared by the Florida Division of Emergency Management (see Figure 3–3) (FDEM 2009). These indicate that the mitigation area would be subjected to coastal flooding for all categories of hurricane and tropical storms. The entire project mine site would be subjected to coastal flooding during Category III, IV, and V hurricanes, and portions of the site would be subjected to flooding during Category I and II hurricanes and tropical storms.

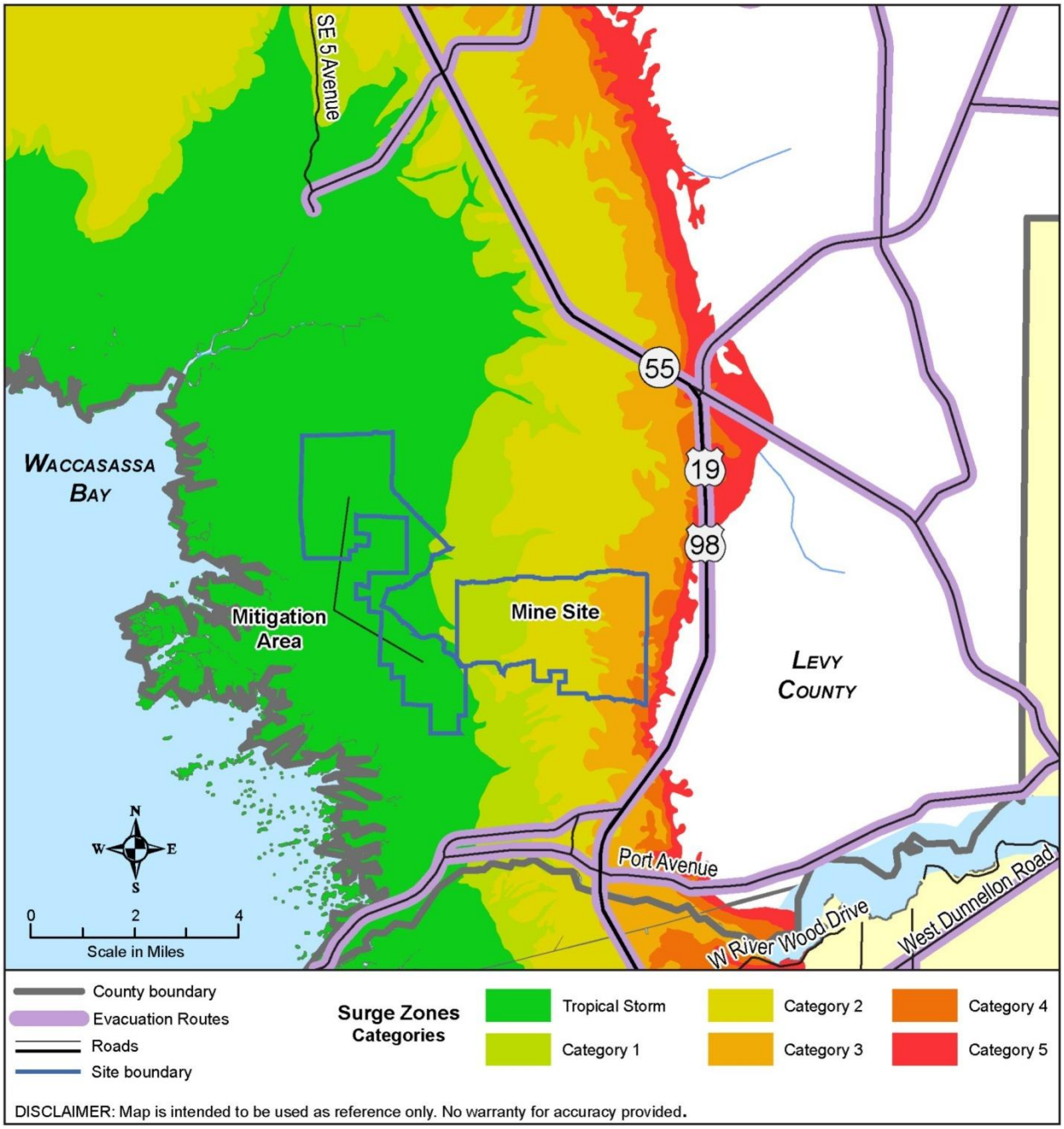
3.1.2 Groundwater

The hydrogeology of an area is determined by the interrelationship of the local geology and the flow of groundwater. In west-central Florida, the hydrogeology of the aquifer is complex, as past geologic processes (e.g., karstification, fracturing) have created an intricate flow network of springs, conduits, and sinkholes. Karstification is a result of the dissolution of limestones or other carbonate rocks that typically enhances the porosity and permeability of an aquifer system, including the development of cavernous flow systems (Florida Geological Survey 1992). The proposed Tarmac King Road Limestone Mine site is within an area of karst topography, indicated by the presence of sinkholes, springs, and poorly developed surface drainage; thus, it is sited in an area of complex groundwater flow.



Source: University of Florida 2011.

Figure 3–2. 100-Year Floodplain Elevation



Source: FDEM 2009.

Figure 3–3. Tropical Storm and Hurricane Surge Limits

3.1.2.1 Regional Hydrogeology

The primary aquifer for west-central Florida, including Levy County, is the Floridan Aquifer System (FAS), a regional aquifer that extends throughout west-central and north Florida into adjoining states. In west-central Florida, the aquifer consists of a thick continuous sequence of carbonate rocks, including all or parts of the Avon Park Formation, Lake City Limestone, Ocala Formation, Suwannee Limestone, and Tampa Limestone and permeable parts of the Hawthorn Formation. Table 3–2 provides the cross-link of stratigraphic units and hydrogeologic units of the regional FAS. The rock intervals are hydraulically connected to varying degrees and have permeability several orders of magnitude greater than the rocks that bound the system above and below (Ryder 1985).

Table 3–2. Generalized Summary of Geologic and Hydrogeologic Units in Central Florida

System	Series		Geologic Unit	Description	Hydrogeologic Unit	
Quaternary	Recent and Pleistocene		Undifferentiated deposits	Predominantly fine sand; interbedded clay, marl shell, limestone, phosphorite	Surficial aquifer	
Tertiary	Pliocene		Undifferentiated deposits	Silty to sandy clay, thin shell beds, and basal limestone beds of variable thickness, phosphatic	Intermediate confining unit	
	Miocene		Hawthorn Group	Limestone, sandy, phosphatic, fossiliferous; sand and clay in lower part in some areas		
	Oligocene		Suwannee Formation	Limestone, sandy limestone, fossiliferous	Floridan Aquifer System	Upper Floridan Aquifer
	Eocene	Late	Ocala Limestone	Limestone, chalky, foraminiferal, dolomitic near bottom		
		Middle	Avon Park Formation	Limestone and hard brown dolomite; intergranular evaporate in lower part in some areas		Middle semi-confining unit
		Early	Oldsmar Formation	Dolomite and limestone, with intergranular gypsum in most areas		Lower Floridan Aquifer
	Paleocene		Cedar Key Formation	Dolomite and limestone with beds of anhydrite	Sub-Floridan confining unit	

Source: Modified from Schiffer 1998.

The FAS is regionally divided into the Upper and Lower Floridan Aquifer System. The Upper Floridan Aquifer is highly permeable and thus is typically capable of transmitting large volumes of water. This high permeability mostly is due to the widening of fractures and formation of conduits within the aquifer, caused by dissolution of the limestone from infiltrating water. The thick Upper Floridan Aquifer contains freshwater and is separated from the Lower Floridan Aquifer by a confining unit. The Lower Floridan Aquifer generally contains saltwater. The base of the Upper Floridan Aquifer in west-central Florida is generally the first occurrence of vertically persistent, intergranular evaporites (Ryder 1985). As discussed in Section 3.6.3, "West-Central Florida Geology," the Avon Park Formation and Ocala Limestone underlie the Tarmac King Road Limestone Mine site and thus are the aquifer intervals of interest in this EIS.

In Levy County, the Upper FAS begins with the Ocala Limestone which, along with outcroppings of the Avon Park Formation, is at or near the land surface across the proposed Tarmac King Road Limestone Mine site (see Section 3.6.3.1). Ryder (1985) indicates that where the Ocala Formation is at or near the land surface, the permeability of this formation increases, as indicated by its cavernous nature, high recharge rates, and numerous large springs. Permeability is a hydrogeologic term used to quantify the ability of a rock to transmit water. In areas where a thin layer of clastic sediments overlie the FAS, such as the proposed Tarmac King Road Limestone Mine site, the aquifer is unconfined. As thickness of the clastic layer increases, vertical permeability in the sediments decreases, causing local semiconfined conditions to exist (Fretwell 1983). The total thickness of the Upper FAS is approximately 500 feet in Levy County (Ryder 1985).

The regional direction of surface water and groundwater movement in the west-central Florida area is predominantly seaward, as waters flow toward the lower elevations of the coast. Along this flow path, both surface water and groundwater movement are intermingled because of the close hydraulic connection that exists between groundwater and surface water in the region. The intermingling of surface water and groundwater is a result of the relatively rapid recharge of the aquifer; the shallow depth of the groundwater table; and the abundance of springs, which are locations where groundwater discharges to surface water. Recharge to the aquifer occurs directly via rainfall where confining clays are not present and where sinkholes create a direct hydraulic connection to the aquifer system. Discharge from the Upper Floridan Aquifer occurs through spring discharge, upward leakage to the water table, lateral outflow to the Gulf of Mexico, and through groundwater pumpage. Springs that discharge from the Upper

Floridan Aquifer account for a significant part of the mean annual discharge of many streams; for some streams, the discharges are almost entirely springflow (Ryder 1985).

Figure 3–4 depicts the area where the upper FAS is near the land surface with contours depicting the regional potentiometric surface. The potentiometric surface represents a water level elevation (as measured in wells) and indicates the general regional flow direction of groundwater. This map represents water level conditions near the end of the dry season, when groundwater levels usually are at an annual low and withdrawals for agricultural use typically are high (USGS 2007). As shown, water elevation declines from the east toward the west (coastal area) as the groundwater flows to lower elevations. The closed high contours to the east of the Tarmac King Road Limestone Mine site represent a potentiometric "high" area, which is likely a monitoring well placed atop the Brooksville Ridge. Groundwater is predicted to flow at right angles to the water elevation contours; thus, the flow direction is approximately west to southwesterly across the Tarmac King Road Limestone Mine site, with the contour curvature matching the trend of the coastline.

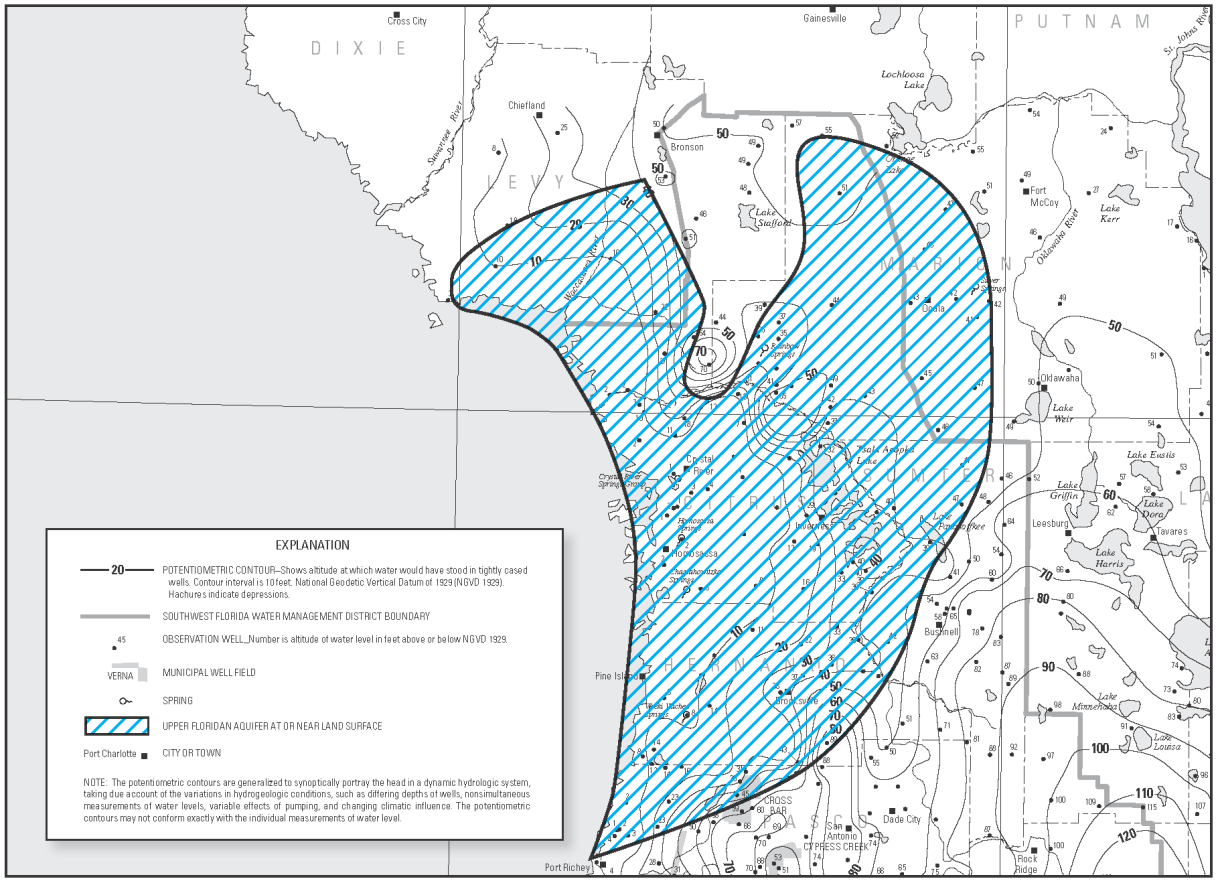


Figure 3–4. Area of Upper Floridan Aquifer System Near the Land Surface

3.1.2.2 Tarmac King Road Limestone Mine Site Hydrogeology

Nine monitoring wells have been installed within the proposed mine site and are designated Monitoring Well 1 (MW-1) to MW-5 and MW-7 to MW-10. One monitoring well has been installed south of the proposed mine site and is designated MW-6. Well and boring locations are indicated in Figure 3–5. MW-1 to MW-6 have been sampled to characterize background water quality at the site and to monitor fluctuations in groundwater level with time. Three of the wells (MW-1, MW-3, and MW-5) were equipped with continuous recorders that measured water level every 4 hours. Water level measurements were recorded continuously from April 2006 to October 2008. Water levels in the remaining wells (MW-2, MW-4, and MW-6) were recorded manually from September 2005 to May 2006 (six measurements) and from October 2007 to April 2008 (five measurements). Table 3–3 provides the average water level elevations in each well and the range of water level fluctuations during the measurement period. Note that the average water levels in MW-1, MW-3, and MW-5 are in the 4.8- to 14-foot range, yet overall water level fluctuations from minimum to maximum are 1.8 to 17.5 feet in elevation range over the measurement period. Statistics calculated from MW-2, MW-4, and MW-6 are not considered as representative due to fewer, widely spaced measurements.

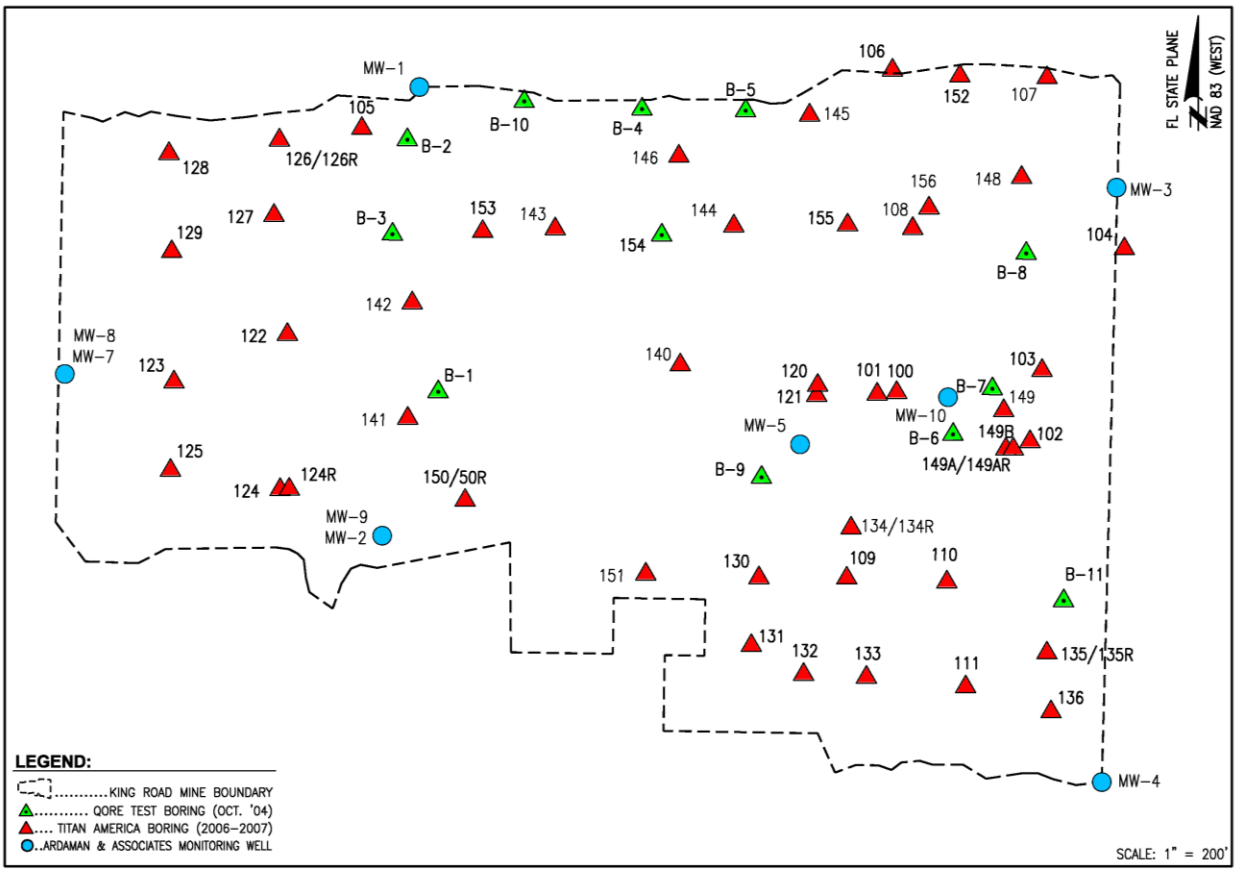


Figure 3–5. Locations of Borings and Monitoring Wells

Table 3–3. Water Level Statistics for Monitoring Wells 1 through 6

Monitoring Well	Well Depth (feet BGS)	Average Water Level Elevation (feet MSL)	Minimum Depth to Water (feet MSL)	Maximum Depth to Water (feet MSL)	Standard Deviation of Depth to Water (feet MSL)
Wells with Continuous Water Level Measurements					
MW-1	20	4.8	1.8	9.1	1.9
MW-3	20	14.3	11. 7	17.5	1.3
MW-5	20	8.5	5.9	12.7	1.6
Wells with Manual Water Level Measurements					
MW-2	20	4.6	2.1	7.7	2.0
MW-4	20	18.6	16.5	21.2	1.6
MW-6	20	10.7	7.4	13.8	2.4

Key: BGS=below ground surface; MSL=mean sea level.

The graphing of continuous water level data from MW-1, MW-3, and MW-5 allows depiction of the seasonal fluctuation in the water table elevation. Figure 3–6 illustrates the rise and fall of water levels during the wet season and the shorter fluctuations due to storm recharge during the drier intervals. In the peninsula area of Florida, half the average annual rainfall usually falls between June and September. The lowest rainfall for most of the state occurs in fall (October and November) and spring (April and May). The period of maximum sustained water table elevation in this graph occurs from January to March.

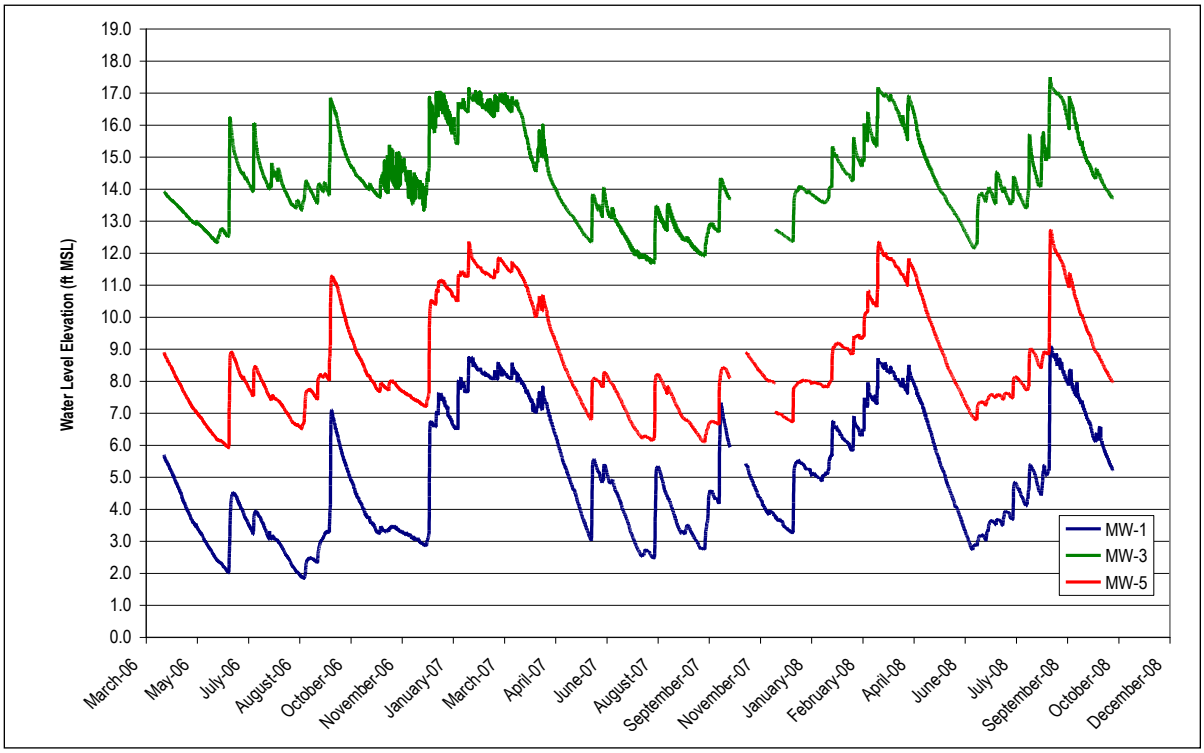


Figure 3–6. Hydrograph of Water Level Fluctuations in Monitoring Wells 1, 3, and 5

The measurement of water levels allows contouring of these values to create potentiometric maps. Figures 3–7 and 3–8 are potentiometric maps for May and September 2006, a time period for which the most well data were available. Based on these maps, the predominant direction of groundwater movement across the site is westward toward the coast. Note the minimal change in gradient (distance between contours) between the two time periods, reflecting a low overall slope to the water table near the coastline.

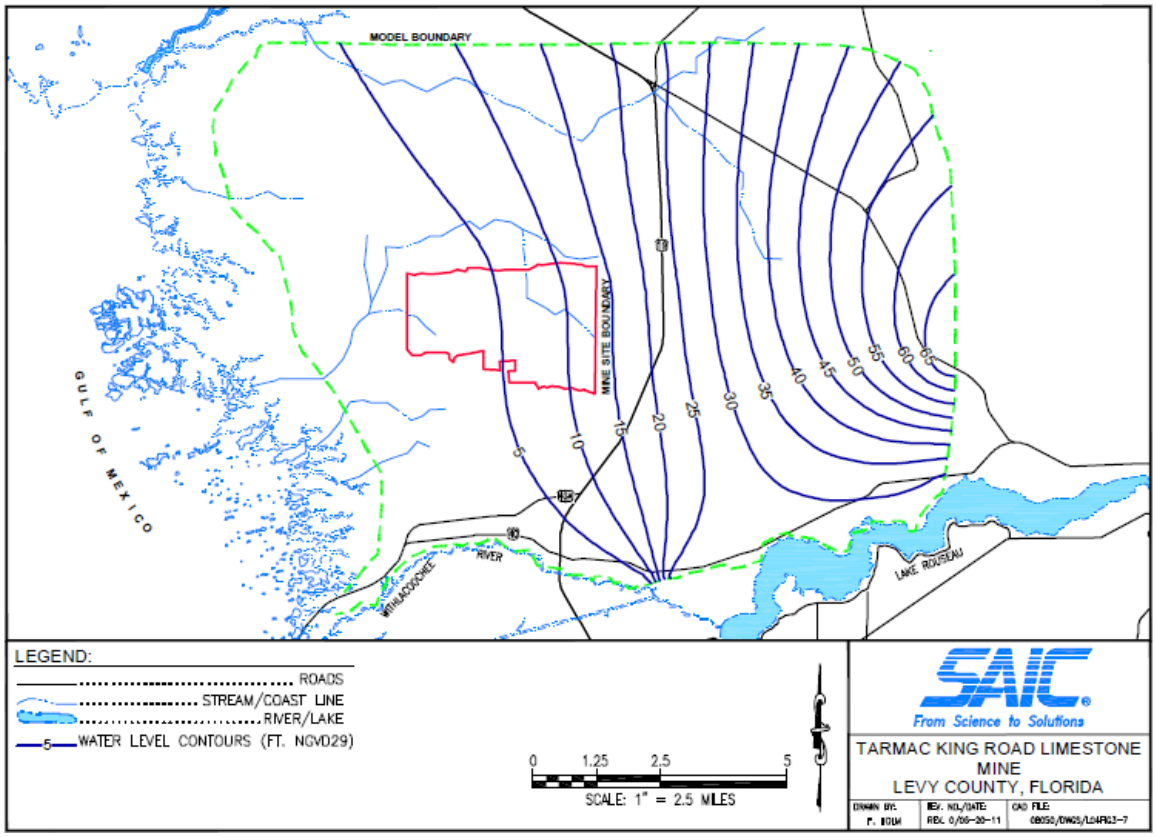


Figure 3–7. Tarmac King Road Limestone Mine Water Level Contours in May 2006

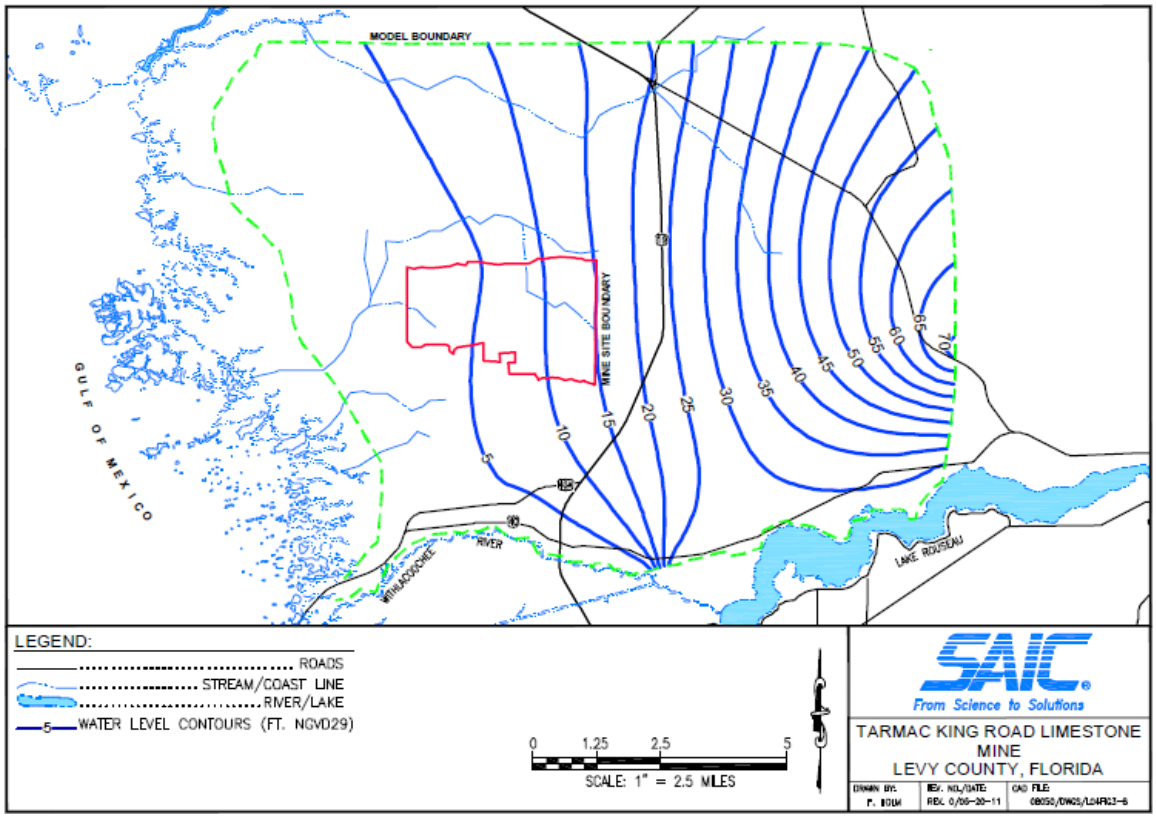


Figure 3–8. Tarmac King Road Limestone Mine Water Level Contours in September 2006

3.1.3 Groundwater Flow Modeling

Groundwater flow models aid in the understanding of site-specific steady state flow systems and provide a basis for performing transient simulations to determine the amount, or rate, of change when conditions are altered. A groundwater flow model was developed to represent the pre-mining transient hydrogeologic system of the Tarmac King Road Limestone Mine site and its surroundings. This model was used to assess the amount of change in baseline conditions (pre-mining) when analyzing different mining scenarios, to evaluate the effect of the numerous mining quarries/lakes on the groundwater flow system, and to aid in the design of mitigation options.

3.1.3.1 Model Construction

The Tarmac King Road Limestone Mine site groundwater flow model was constructed with Groundwater Vistas, Version 5-a, graphical user interface for the USGS-developed MODFLOW [modular three-dimensional finite-difference groundwater flow model] (McDonald and Harbaugh 1988). MODFLOW is a widely used, publicly available flow simulator. The output of MODFLOW was used for determining flow lines using MODPATH, a particle-tracking code. MODPATH is a three-dimensional particle-tracking program developed by USGS (Pollock 1989). The model uses MODFLOW heads and flows to determine particle paths and travel times. Different packages can be added to the MODFLOW program to aid in the simulation of various conditions. One such important package used in the *King Road EIS* groundwater model is the lake package. One of the main purposes of using a groundwater flow model in the EIS analysis is to evaluate the effect of the numerous quarries or lakes (to be created due to rock mining) on the groundwater flow system, specifically seepage changes. To account for the interactions between lakes and the groundwater flow system, the MODFLOW lake package (Wilsnack and Nair 1998) was utilized. The lake package treats lakes as either sources (i.e., able to release water) or sinks (i.e., able to accept groundwater) with respect to groundwater flow and allows stages (water levels) within the lakes to fluctuate with time. Therefore, lake water levels, along with groundwater levels, can be simulated.

In its basic form, the model should be considered as a series of “cells”—a three-dimensional arrangement of blocks that vary in flow properties in the *x*, *y*, and *z* dimensions. The computer simulations executed during model runs perform mathematical calculations to assess the changes in groundwater flow from cell to cell in all three dimensions. The layering construction is the starting point for the assignment of horizontal and vertical properties to all cells in the model domain. The EIS model is configured with six layers that were created using a grid-based graphics program based on the detailed evaluation of mine site borings, the cross sections discussed previously, and available geologic literature. A conceptualization of the subsurface geology is presented in Figure 3–9 and is based on the site cross sections. The figure was constructed to aid in visualization of the groundwater flow model layers and is useful to show the stacking of geologic formations. The figure does not depict the voids, cavities, and caverns that are common in the Ocala Limestone and Avon Park Formation.

To evaluate hydrologic impact on both the regional and local groundwater systems, the EIS model boundary extends far beyond the mining site boundary. The model domain is surrounded by the Gulf of Mexico on the west, the Withlacoochee River and Lake Rousseau on the south, and the topographic and potentiometric high (indicating groundwater divide) on the east (approximately 6 miles from eastern mine site boundary). The northern boundary of the model domain extends to approximately 8 miles from the northern mine site boundary, where rock mining is expected to have no measurable effects on groundwater flow. Within the model boundary, a grid was overlaid to determine configuration of the model cell size in the horizontal plane. To allow for higher-resolution modeling results in the area to be mined, a grid spacing of smaller size was used within the mine site area (i.e., 100 feet × 100 feet). Exterior to the mine site, a gradual increase in grid spacing using an aspect ratio of 1.5 (up to a maximum of 1,000 feet × 1,000 feet) was used. This approach in grid spacing is a balance of having results of sufficient resolution to assess changes in the flow system versus increasing model complexity. As model complexity increases, so will simulation run times and the potential for model computation error or failure.

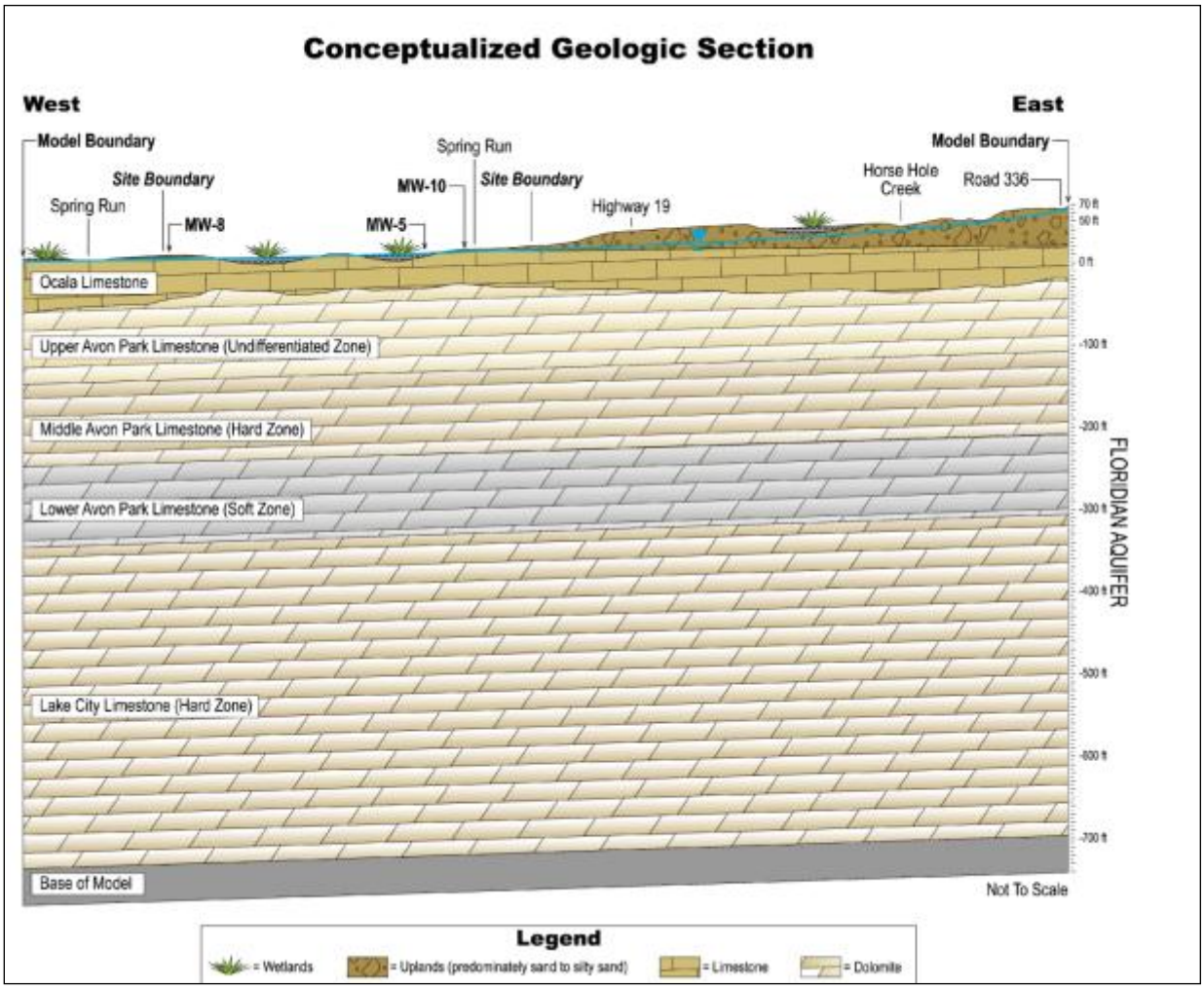


Figure 3–9. Conceptual Geologic Cross Section

Prior to use of any flow model, it must go through a setup and calibration process. A range of hydraulic properties are assigned to model cells with initial values based on the detailed analysis completed for the geologic cross sections, previous site modeling performed by Ardaman & Associates (2008a), and available values from regional flow models. The model is run in a test mode to allow refinement of these values and to ultimately calibrate the model. The calibration process is iterative to allow adjustment of the critical flow parameters. A calibrated model is one considered capable of producing simulated water levels in key target wells within a tolerance range. Several of the mine site and nearby USGS wells are target wells used in this process as water level data are available for the model simulation period.

Appendix D contains further construction details of the groundwater flow model, along with model calibration and results of all the simulations conducted to support this EIS.

3.1.3.2 Transects Used for Mining Alternative Seepage Analysis

Groundwater seepage analysis was performed using the *King Road EIS* groundwater flow model to evaluate the potential effects of adding quarries (due to mining) on the regional and local groundwater systems. As part of this analysis, groundwater seepage through different sections of the model domain was calculated. The selected transects for this analysis are shown in Figure 3–10. A brief description of the selected transects is presented below:

- A-A′: Groundwater seepage from east of the mine site boundary to the west (i.e., seepage from outside to inside through the eastern boundary of the mine site) through the north-south Transect A-A′ and the six layers of the model.

- B-B′: Groundwater seepage from the east to the west (i.e., seepage from inside the mining area through the western boundary of the Alternative 3 mining area) through the north-south Transect B-B′ located at the western edge of the Alternative 3 mining boundary.

- C-C′: Groundwater seepage from the east to the west (i.e., seepage from inside the mining area through the western boundary of the mine site) through the north-south Transect C-C′ located at the western mining boundary.

- D-D′ and G-G′: Groundwater seepage from the north to the south (i.e., seepage from outside to inside the mining area through the northern boundary of the Alternative 2 mining area) through the east-west Transects D-D′ and G-G′ and located at the northern edge of the Alternative 2 mining boundary.

- E-E′, F-F′, and H-H′: Groundwater seepage from the south to the north (i.e., seepage from outside to inside through the southern boundary of the Alternative 2 mining area) through the east-west Transects E-E′, F-F′, and H-H′ and located at the southern edge of the Alternative 2 mining boundary.

- I-I′: Groundwater seepage from the east of the mine site boundary to the west through the north-south Transect I-I′, located approximately 1 mile east of the mine site boundary that starts at the northern boundary of the model domain and ends at the southern boundary of the model domain.

- J-J′: Groundwater seepage from north of the mine site boundary to the west through the east-west Transect J-J′, located approximately 1 mile north of the mine site boundary that starts at Transect I-I′ and ends at the western boundary of the model domain.

- K-K′: Groundwater seepage from south of the mine site boundary to the north through the east-west Transect K-K′, located approximately 1 mile south of the mine site boundary that starts at Transect I-I′ and ends at the western boundary of the model domain.

- L-L′: Groundwater seepage from west of the mine site boundary to the east through the northwest-southeast Transect L-L′, located approximately 1 mile east of the western model boundary that starts at Transect J-J′ and ends at Transect K-K′.

Seepage analysis results representing baseline conditions are presented in Table 3–4. These results are compared against the projected future conditions for different mining alternatives to evaluate potential impacts of limestone mining, which are presented in Chapter 4, Section 4.1.

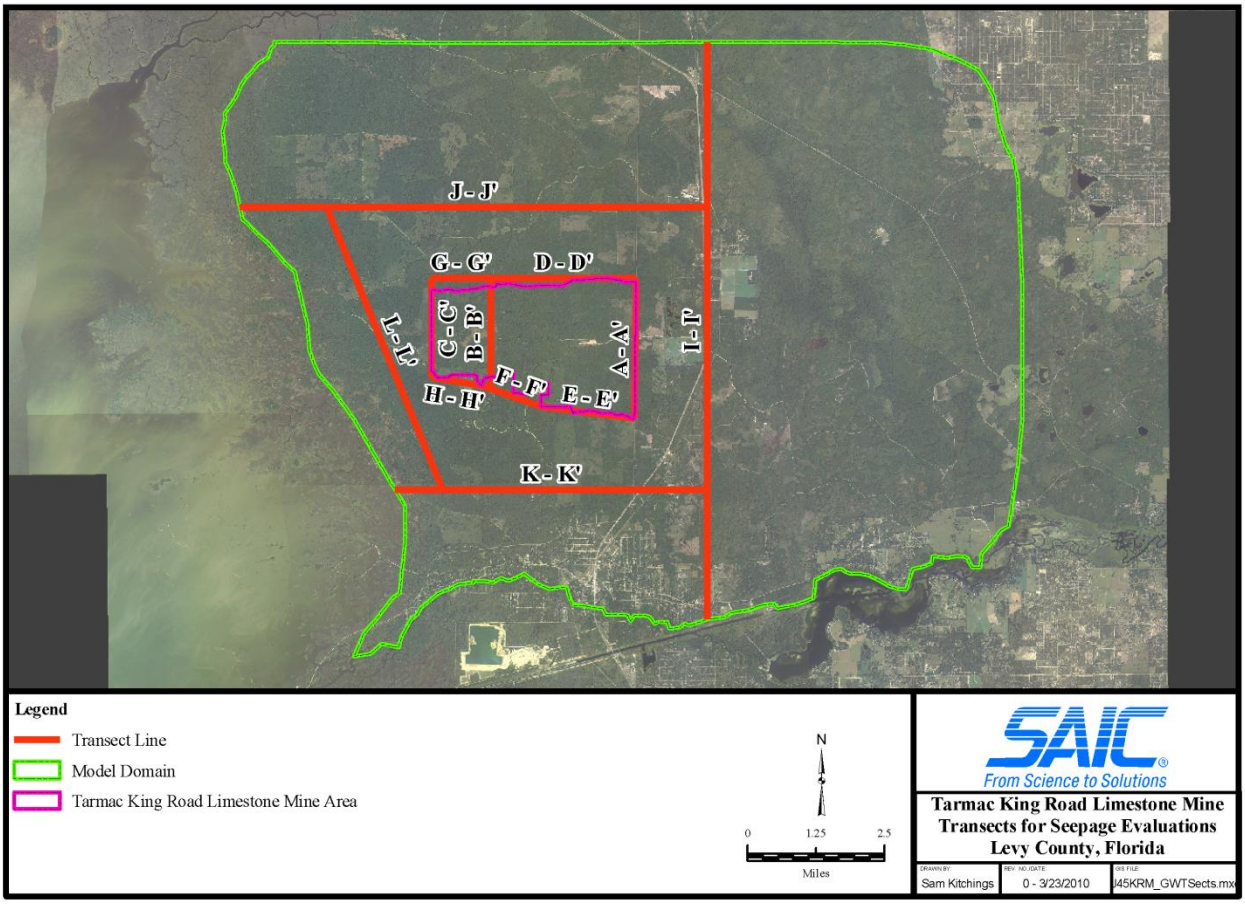


Figure 3–10. Selected Transects Evaluated for Seepage Analysis

Table 3–4. Model-Predicted Seepage Rates from Different Sections Within and Outside of the Tarmac King Road Limestone Mine Site Area for Pre-mining Conditions

Transects for Evaluating Seepage[a]	Seepage Flow Direction	Seepage Rates for the 5-Year Average[b] (MGD)	Seepage Rates for the Dry Period Average[c] (MGD)	Seepage Rates for the Wet Period Average[d] (MGD)
Within and at the Mine Site Boundary				
(G-G′+D-D′)	North to South	23.36	23.27	23.44
(E-E′+F-F′+H-H′)	North to South	9.93	9.46	10.88
A-A′	East to West	7.42	7.04	8.31
B-B′	East to West	16.56	15.81	17.95
C-C′	East to West	24.43	23.4	26.11
Outside the Mine Site Boundary				
I-I′	East to West	131.16	131.01	132.08
J-J′	North to South	93.96	93.81	93.99
K-K′	North to South	3.31	2.04	5.5
L-L′	East to West	89.36	86.31	94

[a] See Figure 3–10 and Section 3.1.3.2 for the location and description of the transects.
[b] Seepage rates for the 5-year average represent the predicted average of 2004 through 2008 (i.e., the period of simulation, excluding the initial period of calendar year 2003).
[c] Seepage rates for the dry period represent the predicted average of January through December 2007.
[d] Seepage rates for the wet period represent the predicted average of January through December 2004.

Key: MGD=million gallons per day.

3.2 WATER QUALITY

3.2.1 Groundwater Quality

The assessment of the chemistry of groundwater at the Tarmac King Road Limestone Mine site was performed by sampling at the groundwater monitoring wells, a test pit, and nearby Little King Spring. Three wells (MW-2, MW-3, and MW-5) and the test pit were sampled twice, and the balance of wells and the Little King Spring were sampled once. The results are presented in Table 3–5 and include several in-field measurements (pH, temperature, conductivity, and turbidity) and analytical laboratory analyses.

Analytical results indicate the major dissolved constituents in the groundwater are calcium, magnesium, and bicarbonate. Several analytes have maximum contaminant levels (MCLs) or secondary maximum contaminant levels (SMCLs) for comparison of well concentrations to regulated limits. Arsenic and iron concentrations exceed their respective MCLs in several samples from the wells sampled in the 10- to 20-foot interval. Certain sulfate samples from the deeper sampled wells (MW-8, MW-9, and MW-10) have measured concentrations above the SMCL with values in the shallower samples well below the MCL (see Table 3–5). This variance reflects the natural changes with depth in the chemistry of the groundwater. Note also the change in total dissolved solids (TDS) values with sample depth. Samples collected from deeper well intervals have higher TDS values (1,800 to >2,000 milligrams per liter [mg/L]), indicating a groundwater environment in which ions are more concentrated in “older” waters.

The past sampling of Little King Spring during 1999 by the Southwest Florida Water Management District provides data to compare with the recent 2007 sampling of the spring and indicates a consistency in field measurements and other analyte concentrations (see Table 3–6). The concentrations of analytes listed in Table 3–6 from 1999 are of the same approximate range as those listed for the spring in Table 3–5 from 2007 and 2008. TDS concentrations, as measured in the 1999 and 2007 samples, indicate the waters emerging from the spring are significantly different than the deeper samples from MW-8, MW-9, and MW-10 and are more similar to the shallower water collected from the 10–20 foot interval of the remaining wells. This correlation implies that the source of the spring waters is not the deeper portions of the aquifer. The water quality data presented here can be considered background values (prior to site development) and used as a baseline for assessing changes to geochemical conditions, if any, due to the proposed mining.

Table 3–5. Sample Results for Tarmac King Road Limestone Mine Monitoring Wells, Test Pit, and Little King Spring

Parameter	Units	MCL	MW-1		MW-2			MW-3			MW-4		MW-5			MW-6	
Sample Interval			10–20 feet		10–20 feet			9–19 feet			10–20 feet		10–20 feet			10–20 feet	
Sample Date			3/24/2008	11/4/2008	3/22/2007	3/24/2008	11/4/2008	3/22/2007	3/24/2008	11/3/2008	3/24/2008	11/3/2008	3/22/2007	3/24/2008	11/3/2008	3/24/2008	11/3/2008
pH (field)	s.u.		6.96	6.60	7.05	6.90	6.90	7.18	6.73	6.50	6.76	6.50	7.06	6.8	6.60	6.72	6.50
Conductivity	µmhos/cm		991	980	732	796	618	748	814	778	1,025	880	886	923	727	1,013	1,043
Temperature	ºC		20.3	22	18.5	20.5	22	18.8	21	23.1	20.2	23.4	18.7	20.3	22.6	20.4	21.9
Turbidity	NTU		1.0	1.5	24.0	0.0	2.2	6.8	0.4	1.8	6.5	4.1	7.0	0.2	0.9	0.3	0.6
Calcium	mg/L		126	132	164	93	85	128	123	130	97	97	122	119	93	103	105
Magnesium	mg/L		38	41	55	23	21	13	12	13	31	32	37	37	28	58	58
Sodium	mg/L	160	11	12	12	11	9	9	9	10	10	10	11	11	7	20	20
Potassium	mg/L		0.5	0.7	0.5	0.2	0.5	0.1	0.1	0.3	0.1	0.3	0.2	0.2	0.5	0.2	0.3
Iron	mg/L	0.3	0.05	0.04	1.97	0.99	0.78	1.15	0.86	1.62	2.19	2.45	0.83	0.95	1.05	0.60	0.64
Alkalinity	mg/L		360	340	330	350	280	340	360	340	370	340	410	420	310	480	460
Chloride	mg/L	250	20	21	16	21	16	15	19	19	23	32	18	22	12	42	42
Sulfate	mg/L	250	120	150	23	22	16	20	24	27	8.3	12	28	29	33	19	18
Fluoride	mg/L	4	0.4	0.4	0.1	0.3	0.2	0.1	0.2	0.2	0.4	0.3	0.3	0.6	0.6	0.8	0.7
Total Nitrogen	mg/L	10	0.7	0.7	0.7	0.0	0.9	0.8	0.4	0.4	0.3	0.3	0.7	0.3	0.3	0.0	0.3
Total Phosphorus	mg/L		0.02	0.02	0.19	0.02	0.04	0.05	0.03	0.04	0.05	0.05	0.02	0.03	0.04	0.02	0.01
Silica	mg/L		5.2	NR	10.0	5.3	NR	6.0	6.1	NR	3.9	NR	10.0	11.0	NR	5.8	NR
TDS	mg/L	500	610	630	NR	400	370	NR	460	460	400	430	NR	470	410	500	570
Arsenic	µg/L	10	10.3	4.0	NR	11.6	4.0	NR	8.5	4.0	8.0	4.0	NR	16.0	7.2	14.9	7.7
Barium	µg/L	2,000	15.9	16.6	NR	9.7	11.0	NR	40.7	51.1	17.9	20.0	NR	14.9	14.8	22.0	25.0
Cadmium	µg/L	5	<0.2	1.1	NR	<0.2	1.1	NR	<0.2	1.1	<0.2	1.1	NR	<0.2	1.1	<0.2	1.1
Chromium	µg/L	100	<1.2	4.5	NR	<1.2	4.5	NR	<1.2	4.5	<1.2	4.5	NR	<1.2	4.5	<1.2	4.5
Lead	µg/L	15	<2.2	1.2	NR	<2.2	1.2	NR	<2.2	1.2	<2.2	1.2	NR	<2.2	1.2	<2.2	1.2
Mercury	µg/L	2	<0.01	0.02	NR	<0.01	0.02	NR	<0.01	0.02	<0.01	0.02	NR	<0.01	0.02	<0.01	0.02
Selenium	µg/L	50	3.5	5.2	NR	4.5	5.2	NR	3.5	5.2	3.5	5.2	NR	3.5	5.2	6.4	5.2
Silver	µg/L	100	<0.4	0.2	NR	<0.4	0.2	NR	<0.4	0.2	<0.4	0.2	NR	<0.4	0.2	<0.4	0.2

Key: <=less than; µg/L=micrograms per liter; µmhos/cm=micromhos per centimeter; ºC=degrees Celsius; MCL=maximum contaminant level; mg/L=milligrams per liter; MW=monitoring well; NR=not reported; NTU=nephelometric turbidity units; s.u.=standard units; TDS=total dissolved solids.

Source: Tarmac 2010a:Volume 2, Section 2.

Table 3–5. Sample Results for Tarmac King Road Limestone Mine Monitoring Wells, Test Pit, and Little King Spring (*continued*)

Parameter	Units	MCL	MW-7		MW-8		MW-9		MW-10		Test Pit	Test Pit		Test Pit	Little King Spring
Sample Interval			140–150 feet		353–373 feet		278–298 feet		286–306 feet		1.5 feet	25 feet		50 feet	Surface
Sample Date			3/24/2008	11/4/2008	3/24/2008	11/4/2008	3/24/2008	11/4/2008	3/24/2008	11/3/2008	3/22/2007	3/22/2007	3/24/2008	3/22/2007	3/22/2007
pH (field)	s.u.		6.72	6.90	7.07	6.80	7.00	6.90	7.29	6.9	7.95	7.48	6.83	7.49	7.35
Conductivity	µmhos/cm		2,180	2,280	2,720	2,940	2,550	2,816	2,030	2,034	568	585	783	578	479
Temperature	ºC		21.5	21.1	21.6	21.4	21.7	21.5	21.6	22	NR	NR	20.2	NR	NR
Turbidity	NTU		1.1	1.2	0.2	1.3	2.3	1.1	0.6	0.3	0.9	21.5	0.0	1.6	0.5
Calcium	mg/L		388	414	497	554	419	531	386	392	68	83	71	70	66
Magnesium	mg/L		92	96	127	141	90	115	69	66	27	34	24	28	18
Sodium	mg/L	160	20	20	30	30	27	25	10	10	7	7	6	7	6
Potassium	mg/L		2.6	2.6	6.1	6.7	2.3	2.7	1.9	1.8	0.6	0.8	0.6	0.7	0.4
Iron	mg/L	0.3	NR	0.57	NR	0.18	NR	0.04	NR	0.07	0.04	0.14	0.01	0.04	0.09
Alkalinity	mg/L		170	170	150	140	170	160	190	180	190	200	220	200	200
Chloride	mg/L	250	34	35	51	53	40	41	15	13	8	8	10	8	9
Sulfate	mg/L	250	1,100	1,200	1,600	1,800	1,500	1,700	1,000	1,100	86	86	99	86	11
Fluoride	mg/L	4	NR	0.8	NR	1.6	NR	1.0	NR	0.7	0.1	0.1	0.3	0.1	0.1
Total Nitrogen	mg/L	10	NR	0.3	NR	0.8	NR	0.5	NR	0.4	0.8	1.1	0.0	1.0	1.4
Total Phosphorus	mg/L		NR	0.04	NR	0.01	NR	0.01	NR	0.01	0.02	0.04	0.02	0.02	0.05
Silica	mg/L		NR	NR	NR	NR	NR	NR	NR	NR	3.4	5.0	2.4	4.5	4.0
TDS	mg/L	500	2,000	2,000	2,500	2,800	2,500	2,600	1,800	1,800	NR	NR	380	NR	NR
Arsenic	µg/L	10	NR	4.0	NR	4.0	NR	4.0	NR	4.0	NR	NR	4.2	NR	NR
Barium	µg/L	2,000	NR	11.0	NR	11.0	NR	12.8	NR	24.5	NR	NR	8.0	NR	NR
Cadmium	µg/L	5	NR	1.1	NR	1.1	NR	1.1	NR	1.1	NR	NR	<0.2	NR	NR
Chromium	µg/L	100	NR	4.5	NR	4.5	NR	4.5	NR	4.5	NR	NR	NR	NR	NR
Lead	µg/L	15	NR	1.2	NR	1.2	NR	1.2	NR	1.2	NR	NR	<2.2	NR	NR
Mercury	µg/L	2	NR	0.02	NR	0.02	NR	0.02	NR	0.02	NR	NR	<0.01	NR	NR
Selenium	µg/L	50	NR	5.2	NR	5.2	NR	5.2	NR	5.2	NR	NR	5.4	NR	NR
Silver	µg/L	100	NR	0.2	NR	0.2	NR	0.2	NR	0.2	NR	NR	<0.4	NR	NR

Key: <=less than; µg/L=micrograms per liter; µmhos/cm=micromhos per centimeter; ºC=degrees Celsius; MCL=maximum contaminant level; mg/L=milligrams per liter; MW=monitoring well; NR=not reported; NTU=nephelometric turbidity units; s.u.=standard units; TDS=total dissolved solids.

Source: Tarmac 2010a:Volume 2, Section 2.

Table 3–6. Historic Sample Results for Big King and Little King Springs

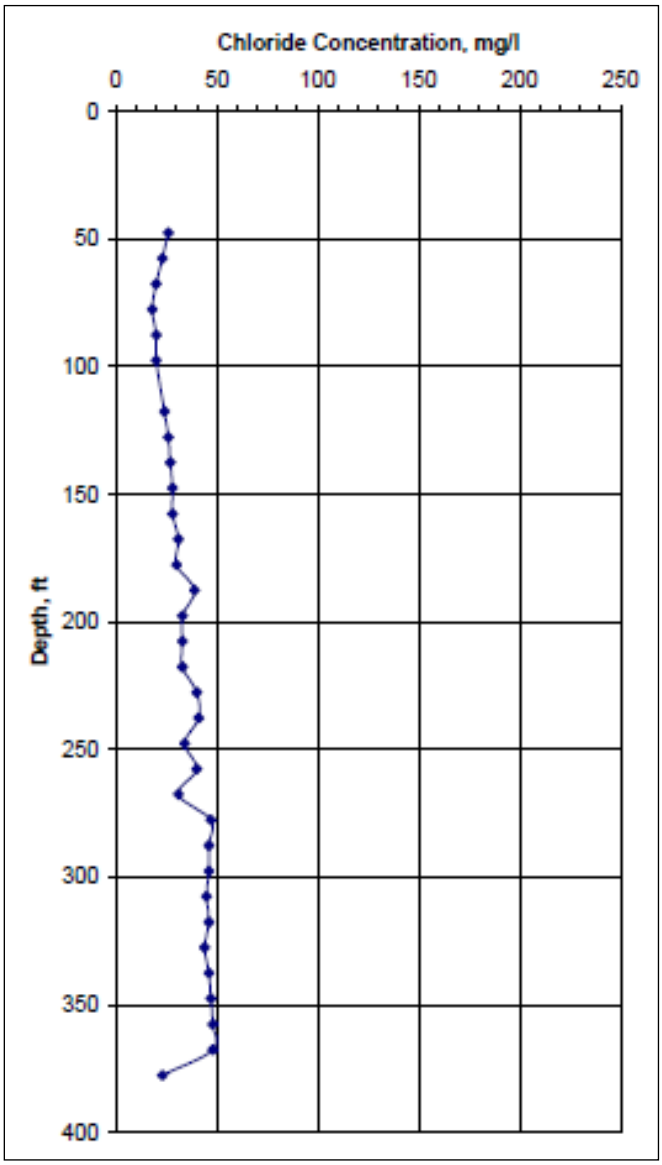
Parameter	Units	Big King Spring	Little King Spring
pH (field)	unit	7.16	7.22
Conductivity	µmhos/cm	493	458
Temperature	ºC	22.9	22.9
Calcium	mg/L	84.2	74.7
Magnesium	mg/L	12.6	15.1
Sodium	mg/L	4.34	3.91
Potassium	mg/L	0.35	0.51
Chloride	mg/L	11.0	7.38
Sulfate	mg/L	16.2	6.45
Total phosphorus	mg/L	0.12	0.12
TDS	mg/L	280	264

Note: Sample date=August 4, 1999.
Key: ºC=degrees Celsius; mg/L=milligrams per liter; µmhos/cm=micromhos per centimeter.
Source: SWFWMD 2001.

The proximity of the mine site to the coastal area prompted an evaluation of the depth to the saltwater interface, that zone in the subsurface where fresh groundwater meets more saline seawater. To evaluate the depth to this interface at the proposed mine site, a test boring (MW-7/MW-8) was drilled on the western property boundary. The boring was advanced using the wire-line coring technique with continuous casing. At selected intervals, after the core was extracted but before the casing was advanced, the well was purged and a groundwater sample was obtained for chloride analysis. Results of the chloride analyses are plotted in Figure 3–11 as a function of depth. As shown, the chloride concentration increases gradually with depth from about 25 milligrams per liter at a depth of 50 feet to about 50 milligrams per liter at a depth of 370 feet (Ardaman & Associates 2008a). Seawater has a chloride concentration of about 19,000 milligrams per liter. Although the interface was not encountered, two deep monitor wells were installed at this location, one with a collection zone between 140 feet and 150 feet (MW-7), and another with a collection zone between 353 feet and 373 feet (MW-8). A sample of the water from the collection zone of MW-7 had a chloride concentration of about 28 milligrams per liter, whereas a sample from the deeper well MW-8 had a concentration of more than 100 milligrams per liter (Ardaman & Associates 2008a). Two additional deep monitors (MW-9 and MW-10) were installed at the locations shown in Figure 3–5. MW-9 and MW-10 are screened between 278 feet and 298 feet and 286 feet and 306 feet, respectively. The chloride concentrations from the screened zone of these two wells were 32 milligrams per liter and 11 milligrams per liter, respectively. Results of this evaluation indicate the saltwater interface is not present at these locations at the total depth drilled. It is expected that mining to the proposed depth of 120 feet would not encounter interface waters.

3.2.2 Surface Water Quality

Surface water quality concerns include the quality of surface waters on and around the site and the quality of marine waters located approximately 4 miles west of the site. Surface water monitoring has been conducted at the project site to characterize existing conditions; this provides a baseline for assessment of water quality impacts from future site uses (Hammond and Robbins 2008). Marine water quality conditions are described in Section 3.2.2.2 using available information on the tidal waters in Waccasassa Bay.



Source: Modified from Ardaman & Associates (2008a).

Figure 3–11. Chloride Concentrations with Depth as Measured in Samples from Monitoring Wells 7 and 8

3.2.2.2 Freshwater Quality

Surface water quality data from the site were collected roughly bimonthly (when surface water was available for sampling) from November 2007 through September 2008 (see Table 3–7; Hammond and Robbins 2008). A total of 13 monitoring stations were established (see Figure 3–12) to document water quality in several different settings at the proposed mining site and the mitigation area. Sample Well 1 (SW-1) through SW-3 are located in surface waters entering the project site along the eastern boundary. SW-4 and SW-5 are located in surface waters exiting the site to the south. SW-6 and SW-7 are surface waters within the project site. SW-8 through SW-11 characterize conditions at the mitigation parcel. SW-12 and SW-13 are located in two springs located to the northeast of the proposed mining area. Results are summarized in Table 3–7 and discussed below.

Table 3–7. Summary of Surface Water Quality Monitoring Results

Parameter	Units	Florida Department of Environmental Protection Class III Water Quality Standard	Number of Samples[a]	Number of Non-Detects	Number of Samples Exceeding Standards[b]	Minimum Concentration[c]	Maximum Concentration
Temperature (all data)	˚C	N/A	36	N/A	N/A	16.9	28.8
January	˚C		3	N/A	N/A	16.9	17.7
March	˚C		13	N/A	N/A	17.7	25.7
May	˚C		2	N/A	N/A	22.2	22.5
July	˚C		2	N/A	N/A	22.4	N/A
August	˚C		13	N/A	N/A	23.2	28.8
November	˚C		1	N/A	N/A	22.4	N/A
pH	Standard Units	6–8.5 (d)	36	N/A	0	6.2	7.6
Turbidity	NTU	≦29 above natural background conditions	36	N/A	N/A	0.5	5.4
Conductivity	µmhos/cm	1,275 (e)	36	0	**1**	171	2,685
Salinity	ppt	N/A	36	0	N/A	0.1	1.4
Dissolved Oxygen	mg/L	5.0 mg/L	36	0	**33**	0.4	8.6
Biological Oxygen Demand	mg/L	(f)	36	21	N/A	BDL (2.4, 2.0)	8.1
Total Suspended Solids	mg/L	N/A	36	11	N/A	BDL (2.0, 5.0)	42
Chlorophyll *a*	mg/m^3	20 (g)	36	26	N/A	BDL (0.5, 2.0)	66
Total Ammonia Nitrogen	mg/L	N/A	36	12	N/A	BDL (0.008, 0.01)	0.22
Nitrate and Nitrite	mg/L	0.35 (g)	36	14	N/A	BDL (0.07, 0.1)	2.0
Kjeldahl Nitrogen	mg/L	N/A	36	4	N/A	BDL (0.04, 0.12)	3.1
Total Nitrogen	mg/L	1.05–1.91 (g)	36	0	N/A	0.02	3.10
Total Phosphorus	mg/L	0.03–0.09 (g)	36	10	N/A	BDL (0.075, 0.02)	0.42
Chloride	mg/L	N/A [250 mg/L (h)]	36	0	N/A [**1**]	8.5	510
Sulfate	mg/L	N/A	36	0	N/A	4.4	420
Oil and Grease	mg/L	≤ 5.0 mg/L (i)	36	32	0	2.2	2.9
Benzene	µg/L	≤ 71.28 µg/L annual average	36	36	N/A	BDL (0.06, 0.6)	N/A
Gross Alpha	pCi/L	≤ 15 pCi/L	36	1	0	BDL (1.3)	2.7

Table 3–7. Summary of Surface Water Quality Monitoring Results (*continued*)

Parameter	Units	Florida Department of Environmental Protection Class III Water Quality Standard		Number of Samples[a]	Number of Non-Detects	Number of Samples Exceeding Standards[b]	Minimum Concentration[c]	Maximum Concentration
Metals			Hardness Corrected Criteria[j]					
Arsenic	µg/L	≤ 50 µg/L	N/A	36	30	0	BDL (4.2, 6.1)	7.8
Cadmium	µg/L	$\underline{\leq}h^{(0.7409[\ln H] - 4.719)}$	≤ 0.76	36	34	**1**	BDL (0.12, 0.8)	1.8
Calcium	mg/L	N/A	N/A	36	0	N/A	22	270
Chromium	µg/L	$\leq h^{(0.819[\ln H]+0.6848)}$	≤ 268.2	36	19	0	BDL (0.6, 1.7)	15
Copper	µg/L	$\leq h^{(0.8545[\ln H] - 1.702)}$	≤ 30.5	36	34	0	BDL (0.5, 2.9)	3.8
Iron	µg/L	≤ 1,000 µg/L	N/A	36	1	**2**	13	13,000
Lead	µg/L	$<h^{(1.273 [\ln H] - 4.705)}$	≤ 18.6	36	33	0	0.16	4.3
Nickel	µg/L	$\leq h^{(0.846[\ln H]+0.0584)}$	≤ 168.5 mg/L	36	33	0	BDL (0.32, 2.2)	3.7
Zinc	µg/L	$\leq h^{(0.8473[\ln H]+0.884}$	≤ 387.8 mg/L	36	12	0	BDL (2.6, 6.6)	26

a Total number of samples collected from 13 different locations between November 2007 and September 2008 (Hammond and Robbins 2008).

b Exceedances are in **bold** text. Values provided in brackets are the number of samples that exceeded the Class I standard where no Class III standard is available; provided for informational purposes although the Class I standard would not apply to the site.

c Values provided in parentheses for undetected concentrations are the range of detection limits reported for all 36 samples.

d Class III water quality criteria for pH contain additional provisions for situations where background is not within the range specified by the numeric criterion.

e Class III water quality criterion for specific conductance: "Shall not be increased more than 50 percent above background or to 1,275 [µmhos/cm], whichever is greater."

f Class III water quality criterion for biological oxygen demand: "Shall not be increased to exceed values which would cause dissolved oxygen to be depressed below the limit established for each class and, in no case, shall it be great enough to produce nuisance conditions."

g Florida Department of Environmental Protection water quality criteria for chlorophyll *a* and nutrients in clear, alkaline lakes from Rule 62-302.531 of the *Florida Administrative Code.* The chlorophyll *a* criterion applies to interpretation of total nitrogen and total phosphorus in lakes; separate values apply to streams in the project area (see text); the nitrate-nitrite criterion applies to springs.

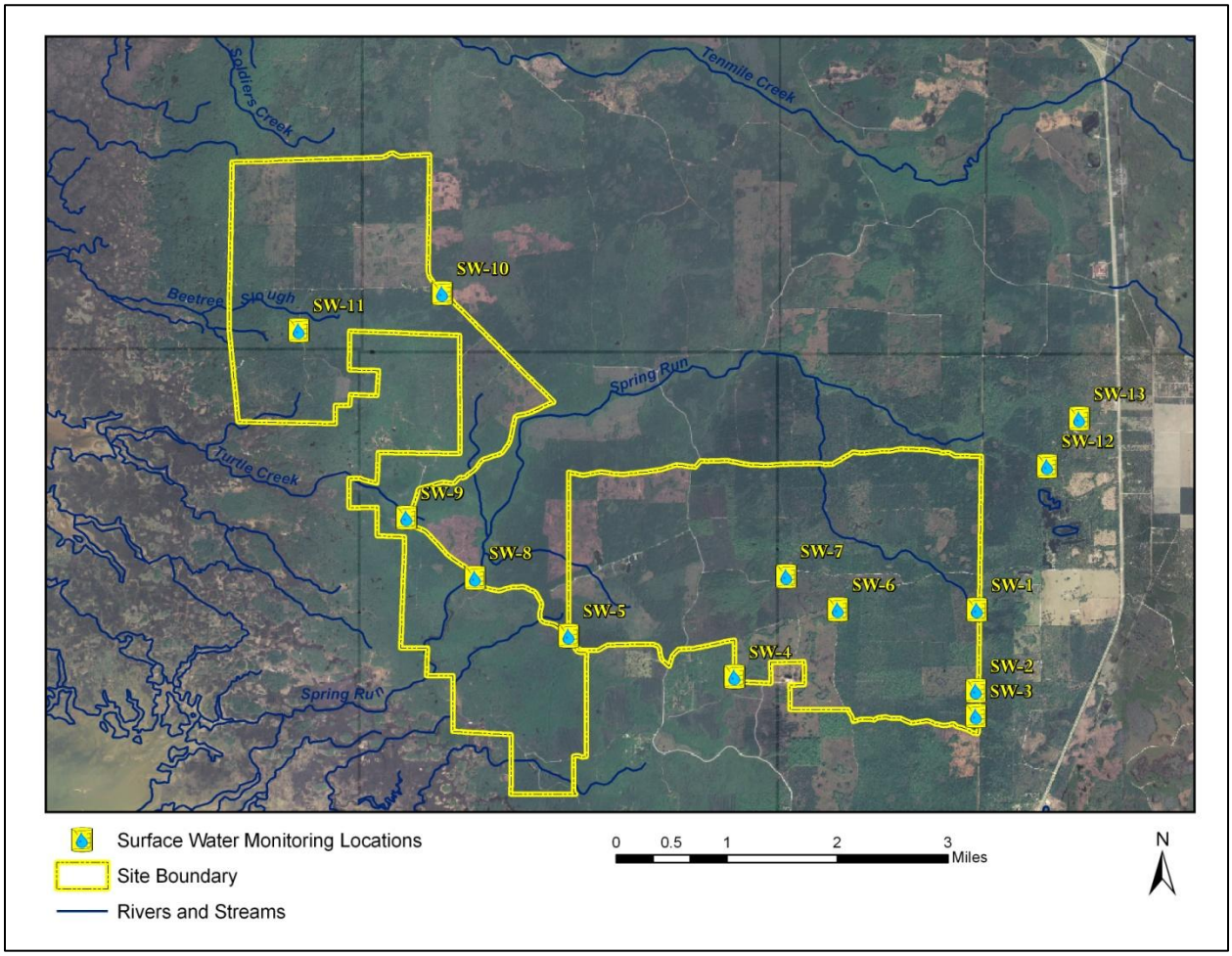
h Class III water quality criterion for chloride not specified; Class I criterion is ≤250 mg/L; criteria for marine waters specify not increased more than 10 percent above background.

i Class III water quality criterion for oils and greases, in addition to the numeric criterion of 5.0 mg/L, include: "No undissolved oil, or visible oil defined as iridescence, shall be present so as to cause taste or odor, or otherwise interfere with the beneficial use of waters."

j Hardness corrections required for the indicated metals. "ln H"' means the natural logarithm of total hardness expressed as mg/L of calcium carbonate ($CaCO_3$). In accordance with Florida Department of Environmental Protection regulations, to calculate the Class III water quality criteria for metals involving equations with hardness, "… the hardness shall be set at 25 mg/L if actual hardness is <25 mg/L and set at 400 mg/L if actual hardness is >400 mg/L." Hardness values for the 36 samples in the data set ranged from 76 to 1,100 mg/L; therefore, a hardness value of 400 mg/L is used to calculate the metals criteria in the table.

Key: ≤=less than or equal to; µg/L=micrograms per liter; µmhos/cm=micromhos per centimeter; BDL=below detection limit; °C=degrees Celsius; mg/L=milligrams per liter; mg/m^3=milligrams per cubic meter; N/A=not applicable; NTU=nephelometric turbidity units; pCi/L=picocuries per liter; ppt=part(s) per thousand.

Source: Hammond and Robbins 2008.



Source: Hammond and Robbins 2008.

Figure 3–12. Surface Water Monitoring Locations

FDEP Surface Water Quality Standards. The Florida Department of Environmental Protection (FDEP) surface water quality standards (FAC Chapter 62-302) were developed to protect present and future beneficial uses of state waters (FDEP 2009a). Existing beneficial uses of surface waters in the state are determined by FDEP, and range from Class I (potable water supplies) to Class V (navigation, utility, and industrial use) (FDEP 2009a). The surface waters on the project site and mitigation site are designated Class III waters, which are those waters protected for recreation and propagation and maintenance of a healthy, well-balanced population of fish and wildlife (FDEP 2009a). The standards include numeric criteria and narrative criteria for some pollutants and conditions (see Table 3–7) (FAC Rule 62-302.530). The state implemented rulemaking to adopt quantitative nutrient water quality standards to protect state waters from the adverse effects of nutrient over-enrichment. FDEP proposed nutrient and chlorophyll *a* standards that were approved by the U.S. Environmental Protection Agency (EPA) on November 30, 2012 (FDEP 2012a). The FDEP criteria will be implemented once EPA rescinds the analogous federally adopted criteria and confirms that the state rules satisfy its requirements under the Clean Water Act. Since the EPA has approved the state standards and is in the process of implementing the remaining procedural steps, the state standards are used for analysis of available surface water quality data here. The discussion of water quality monitoring results includes determinations of whether the standards are met (for numeric standards) and possible implications of non-numeric standards for project impact assessment.

Results of Water Quality Monitoring. Results of water quality monitoring at the project site and mitigation site indicate good water quality with respect to inorganic constituents, including metals, and gross alpha as well as organic constituents, including benzene. Low dissolved oxygen conditions occur throughout the areas sampled and reflect a regional condition. Existing turbidity levels are considered

low, meaning good water clarity. The influence of saltwater is evident in the westernmost stations closest to the Gulf of Mexico, with slightly increased chloride, salinity, and sulfate concentrations at these locations.

Temperature. Temperature ranged from 16.9 to 28.8 degrees Celsius, with the lowest temperatures in January and the highest temperatures in August. The survey data (see Table 3–7) were evaluated for spatial and/or seasonal trends despite a fairly limited number of samples for several months. Besides the expected winter minimum and summer maximum, other seasonal temperature differences were not very distinct, with generally comparable temperature values and/or ranges recorded for March, May, July, and November. While there are FDEP surface water standards pertaining to thermal discharges, there are no FDEP surface water criteria for temperature (FAC Rule 62-302.530).

pH. The values recorded for pH ranged from 6.2 to 7.6, which is within the FDEP surface water standards, which consist of pH values between 6 and 8.5 (see Table 3–7) (FAC Rule 62-302.530).

Turbidity. Turbidity is a measure of light scattering through water that gives an indirect indication of water clarity. Turbidity values were between 0.5 and 5.4 nephelometric turbidity units (NTU). Measurements of NTU are obtained with a nephelometer, which determines how much light is scattered by the suspended solids in the water (EPA 1999). The Class III standard for turbidity limits increases in turbidity to no more than 29 NTU above background levels. While "background" data for the site are not available, the values recorded from this water quality monitoring program could be used in support of development of site-specific background concentrations against which future changes could be compared. Additionally, the values reported in this monitoring program would generally be considered low; that assessment is based on comparison with another southeastern state, South Carolina, which has specified a maximum level of 25 NTU for turbidity for protection of shellfish and aquatic life (SDHEC 2004).

Conductivity and Salinity. Conductivity values ranged from 171 to 2,685 micromhos per centimeter. A single sample exceeded the FDEP Class III water quality standard for conductivity (SW-11, 2,685 micromhos per centimeter) (Hammond and Robbins 2008). This maximum concentration and the next few highest conductivity concentrations from the data set were reported for locations in the mitigation area (SW-5, 704 micromhos per centimeter; SW-8, 707 micromhos per centimeter; and SW-9, 1,037 micromhos per centimeter), which are located closest to the coast (see Figure 3–12), where conductivity concentrations would presumably be influenced by proximity to tidal waters. Salinity values ranged from 0.1 to 1.4 parts per thousand (ppt) (see Table 3–7), with the highest values at sample locations closest to the coast: SW-8 (0.4 ppt), SW-9 (0.5 ppt), and SW-11 (1.4 ppt). There is no FDEP Class III water quality standard for salinity.

Dissolved Oxygen. Dissolved oxygen concentrations ranged from 0.4 to 8.6 mg/L for the data set, with 33 out of 36 samples below the FDEP Class III water quality standard for dissolved oxygen, 5.0 mg/L. Samples in attainment of the standard occurred at SW-3 (6.5 mg/L in March), SW-11 (8.6 mg/L in January), and SW-13 (5.9 mg/L in July); these do not indicate any spatial or temporal trends. The low dissolved oxygen conditions reported in the remainder of the data set are comparable to regional conditions based on low dissolved oxygen in groundwater, the intermittent nature of surface water flow (i.e., lack of flushing, inflow and/or mixing that could increase dissolved oxygen), and warm surface water temperatures.

Biological Oxygen Demand. Biological oxygen demand (BOD) is a measure of the amount of oxygen that bacteria will consume while decomposing organic matter under aerobic conditions (EPA 2006a). BOD directly affects the amount of dissolved oxygen in surface waters. The greater the BOD, the more rapidly oxygen is depleted in the water. This means less oxygen is available to higher forms of aquatic life (EPA 2006a). Sources of BOD can include leaves and woody debris; dead plants and animals; animal manure; effluents from pulp and paper mills, wastewater treatment plants, feedlots, and food-processing plants; failing septic systems; and urban stormwater runoff (EPA 2006a).

BOD from the water quality monitoring program ranged from not detected in 21 out of 36 samples to 8.1 mg/L (see Table 3–7). FDEP Class III water quality standard for BOD states that BOD "shall not be increased to exceed values which would cause dissolved oxygen to be depressed below the limit

established for each class and, in no case, shall it be great enough to produce nuisance conditions" (FAC Rule 62-302.530). Chronic low dissolved oxygen conditions indicate that, at a minimum, any changes to the system that would increase BOD (e.g., increased inputs of organic matter or reduced flushing) would tend to exacerbate low dissolved oxygen conditions that are already generally not in compliance with the dissolved oxygen standard.

Total Suspended Solids. Total suspended solids (TSS) is a measure of particulates in water, which can influence water clarity (see turbidity above), and therefore can affect primary productivity (e.g., algae, submerged aquatic vegetation). TSS concentrations can also have implications for aquatic life, such as providing a food source for filter feeders and serving as a potential source of harm to sensitive stages of aquatic life through smothering or abrasion. TSS values from the water quality monitoring program ranged from not detected to 42 mg/L (see Table 3–7). A total of 11 samples (31 percent) yielded no detection of TSS, and an additional 21 samples (58 percent) indicated low concentrations (less than 10 mg/L). The remaining 4 samples (11 percent) with detections greater than 10 mg/L occurred at four separate locations on two different dates. This suggests infrequent, localized increases that would likely be attributed to localized inputs during episodic occurrences of increased runoff (e.g., erosion, stormwater runoff). There is no FDEP Class III water quality standard for TSS.

Chlorophyll *a*. Chlorophyll *a* is a photosynthetic pigment found in plants that provides an indication of algal biomass in the water. Increases in chlorophyll *a* are expected during times of high runoff and periods of warmer temperature. Chlorophyll *a* concentrations recorded during the water quality monitoring program ranged from undetected to 66 milligrams per cubic meter (mg/m^3) (see Table 3–7). A total of 26 out of 36 samples (72 percent) yielded no detections of chlorophyll *a*, and an additional 8 samples (28 percent) yielded detections at low concentrations (less than or equal to 3.2 mg/m^3). The remaining two samples (6 percent) with higher concentrations consisted of isolated occurrences at two different stations; one of these correlated with an elevated TSS concentration and one did not.

The FDEP chlorophyll *a* criterion applies to interpretation of the appropriate criteria for total nitrogen (TN) and total phosphorus (TP). For clear, alkaline lakes (which likely apply to the mined lakes), the chlorophyll *a* criterion is 20 micrograms per liter (µg/L) (equivalent to 20 mg/m^3; from Table 1 in FDEP 2013).

Only one out of 36 surface water samples from the proposed mining site and mitigation area described above had a chlorophyll *a* concentration greater than 20 mg/m^3, sample SW-1, on August 28, 2008, with a concentration of 66 mg/m^3 (see Table 3–7). All remaining samples were well below the FDEP criterion. If the chlorophyll *a* criterion is exceeded more than once in any consecutive 3-year period, the minimum values for TN and TP would apply; otherwise, the maxima from the TN and TP ranges would apply (see nutrient discussion below).

Nutrients. Water quality criteria and monitoring data pertaining to nutrients address phosphorus and nitrogen. Nitrogen occurs in the environment in various forms (for example, nitrate and nitrite), including in reduced form as ammonia. Phosphorus and nitrogen are primary nutrients that are essential to aquatic organisms in surface waters. The narrative Class III surface water standards at *Florida Administrative Code* (FAC) 62-302.530(47)(a) states: "The discharge of nutrients shall continue to be limited as needed to prevent violations of other standards contained in this chapter. Man-induced nutrient enrichment (total nitrogen and phosphorus) shall be considered degradation in relation to the provisions of Rules 62-302.300, 62-302.700, and 62-4.242 of the FAC." FAC 62-302.530(47)(b) continues: "In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna." The state's numeric nutrient criteria for TN and TP are provided in Rule 62-302.531 of the *Florida Administrative Code*, using a hierarchical process that prioritizes the determination of numeric critieria applicable to a given waterbody (FDEP 2013). The hierarchical approach gives preference to site-specific analyses of nutrient loadings, such as a total maximum daily load (TMDL), site-specific alternative criterion, water-quality-based effluent limitation, or other FDEP-approved action that numerically interprets the narrative criterion. In the absence of site-specific analyses based on loadings, criteria based on quantifiable stressor-response relationships between nutrients and biological response are acceptable (i.e., for springs and lakes). For streams, for which quantifiable stressor-response relationships have not been developed, reference-based nutrient

thresholds will apply. For all other waters (wetlands, intermittent streams, South Florida flowing waters), the narrative criteria still apply.

The proposed nutrient criteria for lakes (at FAC Rule 62-302.530(47)(b)) are based on strong stressor-response relationships between TN and TP and phytoplankton response (chlorophyll *a*). For clear, alkaline lakes (<40 platinum cobalt units and >20 mg/L calcium carbonate), which would likely apply to the mined lakes, the annual mean chlorophyll *a* criterion is 20 µg/L; provided this is met, criteria defining the ranges for TN and TP (minimum and maximum annual geometric means) are 1.05–1.91 mg/L for TN and 0.03–0.09 mg/L for TP (FDEP 2013:Table 1). These numeric interpretations for chlorophyll *a*, TN, and TP cannot be exceeded more than once in any consecutive 3-year period. If the chlorophyll *a* criterion is not met, or data to characterize chlorophyll *a* are not available, the minimum values for TN and TP apply.

The FDEP rulemaking includes a nitrate-nitrite criterion for spring vents, which is based on a strong stressor-response relationship between nitrate-nitrite and the presence of nuisance algal mats. The criterion is set at a concentration that would prevent nuisance mats from occurring, and is 0.35 mg/L nitrate-nitrite ($NO_3 + NO_2$) as an annual geometric mean, not to be exceeded more than once in any 3 consecutive calendar year period (FDEP 2013).

For streams where site-specific interpretations are not available, the FDEP criteria for the Florida peninsula area apply to the project site (from Table 2 in FDEP 2013), and consist of a TN threshold of 1.54 mg/L and a TP threshold of 0.12 mg/L; these are considered in conjunction with biological information on the condition of the stream (i.e., chlorophyll *a* levels, algal mats or blooms, nuisance macrophyte growth, and Stream Condition Indices).

Ammonia concentrations ranged from not detected to 0.22 mg/L (see Table 3–7). Ammonia was not detected in 12 of the 36 samples (33 percent), exceeded the FDEP Class III water quality standard (less than or equal to 0.02 mg/L) in 23 out of 36 samples (64 percent), and met the standard in one sample (0.02 mg/L). Ammonia concentrations indicate total ammonia present, which includes free ammonia and ammonium. It is the free ammonia form that can be harmful to wildlife such as fish; the concentration of free ammonia is dependent on water temperature and pH (EPA 2009a). The EPA criteria for ammonia vary by temperature, pH, and fish species to reflect changes in potential for free ammonia to be present and likely presence/occurrence of sensitive fish stages (EPA 2009a). Based on the seasonally inundated nature of surface waters at the project site and mitigation site, concerns regarding water quality impacts on fish may not be relevant. Potential sources of ammonia to surface waters that could exacerbate harmful ammonia conditions in receiving waters off site would include atmospheric deposition from combustion processes and direct surface water inputs and/or runoff from sewage treatment plants, manufacturing processes, agricultural runoff from fertilized fields and livestock, and residential cleaning products and septic systems.

Based on the water quality monitoring data available (see Table 3–7), the lakes would exceed the maxima from the FDEP TN and TP ranges (applicable when chlorophyll *a* is less than 20 mg/m^3) and could exceed the minima when chlorophyll *a* is greater than 20 mg/m^3 on an infrequent basis. In the absence of site-specific interpretations (e.g., TMDL), the lakes would be considered impaired if the TN and/or TP ranges are exceeded more than once in any consecutive 3-year period.

In the lake water quality data (see Table 3–7), TN ranged from 0.02 to 3.1 mg/L; most nitrogen present was in the form of Kjeldahl nitrogen, indicating presence of organic nitrogen (see Table 3–7). Nitrate/nitrate were the predominant nitrogen forms present at the two spring stations (SW-12 and SW-13), indicating prevalence of inorganic nitrogen. A total of six samples collected from SW-12 in different seasons throughout 2007 and 2008 had nitrate/nitrate concentrations ranging from 0.84 to 1.8 mg/L and would therefore be likely to exceed the FDEP criterion of 0.35 mg/L nitrate-nitrite as an annual geometric mean. Four samples from SW-13 had indicated a range of values from undetected to 0.52 mg/L; 3 of the 4 values were greater than 0.35 mg/L and this location would likely also have exceeded the FDEP criterion based on this data set.

For the entire data set (36 samples collected from 13 locations in different months), only one sample exceeded the chlorophyll *a* criterion as discussed in the chlorophyll *a* section above. TN and TP

exceeded the FDEP ranges for that sample. In all, a total of 5 out of 36 samples exceeded the FDEP numeric criterion for TN, 1.91 mg/L (sample values ranged from 1.99 to 3.1 mg/L). A total of 8 out of 36 samples exceeded the FDEP criterion for TP, 0.09 mg/L (sample values ranged from 0.10 to 0.42 mg/L). The relatively low occurrence of discrete samples for which TN and/or TP concentrations exceeded the FDEP standard suggest that if sufficient data were available to calculate an annual geometric mean, the FDEP criteria would likely be met, with the possible exception of a single sample location (SW-1) located along the western mining site boundary.

Nitrogen and phosphorus are naturally occurring nutrients that are essential for plant growth. However, anthropogenic inputs can create imbalances in natural systems and lead to problems such as algal blooms. Anthropogenic inputs of nutrients that could exacerbate nutrient conditions in surface waters at the site would include increased discharges of organic matter, fertilizers, and wastewater.

Chloride. Chloride concentrations ranged from 8.5 to 510 mg/L (see Table 3–7), with the highest values occurring at western stations closest to the Gulf of Mexico; these results are comparable to the higher conductivity and salinity concentrations at the westernmost sampling locations. There is no FDEP Class III water quality standard for chloride, although the criterion for Class I waters, 250 mg/L, provides some basis for comparison of the values reported in the water quality monitoring program. One sample from a western sampling location exceeded the Class I criterion, SW-11, 510 mg/L (see Table 3–7).

Sulfate. Sulfate concentrations ranged from 4.4 to 420 mg/L (see Table 3–7). Saltwater typically has higher sulfate concentrations than freshwater, and the highest concentrations were detected at western sampling locations, closest to the Gulf of Mexico (e.g., SW-8, 60 mg/L; SW-9, 92 mg/L; and SW-11, 420 mg/L). There is no FDEP Class I, II, III, IV, or V water quality standard for sulfate, although that agency maintains a secondary water quality standard of 205 mg/L for drinking water.

Oil and Grease. Oil and grease concentrations ranged from 2.2 to 2.9 mg/L, with all samples below the FDEP Class III water quality standard of 5.0 mg/L (see Table 3–7).

Benzene. Benzene is one of numerous volatile organic compounds that can be present in the environment from a variety of sources in stormwater runoff. The major anthropogenic sources of benzene to the environment are petroleum spills and petroleum combustion (EPA 2006b). Benzene can be produced during limestone blasting when diesel fuel is used as a component of blasting emulsion. However, blasting lubricants that do not generate benzene include mineral oil, which is readily available and gaining broad use in Florida. Benzene concentrations in the water quality monitoring program were below detection limits in all samples (see Table 3–7). The FDEP Class III water quality standard for benzene is less than or equal to an annual average of 71.28 µg/L. While determining an annual average benzene concentration from the monitoring data is not possible, based on lack of any benzene detections and reasonable detection limits (0.06 and 0.6 µg/L), benzene in surface water at the site is not cause for concern.

Gross Alpha. Gross alpha is primarily a concern for human health due to its carcinogenicity. Gross alpha concentrations ranged from not detected to 2.7 picocuries per liter, which were all below the FDEP Class III water quality standard of less than or equal to 15 picocuries per liter (see Table 3–7).

Metals. Nine metals were analyzed: arsenic, cadmium, calcium, chromium, copper, iron, lead, nickel, and zinc. Of these, cadmium, chromium, copper, lead, nickel, and zinc require calculation of the appropriate surface water quality criteria by adjusting for hardness. The hardness-adjusted criteria are provided in Table 3–7. No metal concentrations exceeded the applicable criteria with the exception of one cadmium sample and two iron samples.

Sample SW-12 had a cadmium concentration of 1.8 µg/L, which exceeded the standard of 0.76 µg/L (see Table 3–7). Five other samples collected at this location during the monitoring period had no detections of cadmium. There was one other sample from SW-13 in which cadmium was detected but at a concentration lower than the standard; cadmium was not detected in any other samples in the data set. This indicates that the single exceedance was an isolated occurrence rather than an indication of a chronic or regional condition.

The iron concentrations that exceeded the standard of 1,000 µg/L both occurred in SW-3 (13,000 µg/L and 2,300 µg/L). A third iron sample from the same location was substantially lower (380 µg/L). Iron concentrations for the remainder of the data set were substantially lower, with a maximum concentration of 780 µg/L. These episodic and localized increases in iron at SW-3 could indicate either a natural or anthropogenic source at this location and do not indicate any regional problems with iron concentrations.

According to the Levy County Comprehensive Plan, dissolved metals such as selenium, arsenic, and lead can be a problem in some parts of Florida. They have not been found in estuarine waters, but iron in groundwater has been identified as a problem in some areas, including Cedar Key and Otter Creek (Levy County 2008).

The remaining metals were not detected or were detected at low concentrations with no exceedances of the applicable standards (see Table 3–7).

Microbial Pathogens. No background water quality data are available on microbial pathogens such as waterborne protozoa, viruses, and bacteria that pose risks to human health. These constituents are primarily a concern for potential impacts on the aquifer and downgradient streams because surface waters at the site and/or vicinity are not used for water supply and these organisms do not pose a threat to wildlife. Waterborne pathogens could include coliforms, fecal streptococci, *Cryptosporida*, and *Giardia*. *Cryptosporidium* and *Giardia* are the two most studied organisms known to cause waterborne illnesses in humans. Coliforms and streptococci are found in human and animal feces and are generally not harmful to humans; however, they serve as indicators of sewage contamination and indicate the possible presence of pathogenic bacteria, viruses, and protozoans that also live in human and animal digestive systems. As described in the following discussion about regional studies, the Waccasassa River, located north of the project mine site, is impaired due to fecal coliform contamination (EPA 2013).

Regional Studies. Available water quality monitoring data for the Waccasassa drainage basin indicate that generally water quality can be characterized as fair to good (FDEP 2005). Current threats to water quality include logging activities that increase sediment load and alter hydrologic patterns (from construction of temporary roads and ruts created by vehicles), and increased anthropogenic inputs from residential development and camp sites (FDEP 2005). The EPA Section 303(d) impaired waterbody list includes the Waccasassa River and Sheephead Creek, which are impaired due to fecal coliform, dissolved oxygen, and mercury in fish tissue, and direct runoff to the Gulf, which is impaired due to fecal coliform and mercury in fish tissue (EPA 2013). EPA has indicated that TMDLs are needed for each of these surface waters, but TMDL development has not been initiated (EPA 2013).

Regional water quality data are available from the National Water-Quality Assessment Program instituted by USGS. The program assesses water quality conditions of major river basins and aquifers in the United States; the Waccasassa River drainage area is included in the Georgia-Florida Coastal Plain Study Unit of the program, which consists of the Altamaha River in Georgia and the Suwannee River in Georgia and Florida (USGS 2008). Sampling locations in the Waccasassa River watershed include USGS Station 02313700, located on the Waccasassa River near Gulf Hammock, Florida (USGS 2008). Water quality monitoring data are available from that location for the time period from 1963 to 1977 and have been summarized in the *Progress Energy Florida Levy Nuclear Plant Environmental Report* (PEF 2008). The timeframe for the monitoring data reflects outdated land use conditions, and the data are indicative of riverine conditions as opposed to intermittent streams that occur on the project site. However, the data provide a historical frame of reference for some of the water quality parameters analyzed in the site-specific monitoring program described above.

Dissolved oxygen in the Waccasassa River near Gulf Hammock from 1963 to 1977 ranged from 3.7 to 9.3 mg/L; 17 percent of the samples during the monitoring period did not meet the FDEP water quality criterion of greater than or equal to 5 mg/L (PEF 2008). There were no seasonal trends evident in dissolved oxygen concentrations, with violations of the criterion occurring in February, April, September, August, and October, and each of these months had dissolved oxygen concentrations greater than 5 mg/L in a number of other sampling years (PEF 2008). This indicates dissolved oxygen concentrations lower than the FDEP criterion occurred sporadically in the river channel during the monitoring period, with inconsistent seasonal occurrence though generally occurring in warmer months.

Comparison of nutrient concentrations from the historic Waccasassa River data set (summarized in PEF 2008) with the 2007 site-specific monitoring suggests increased levels of organic nitrogen measured on site in 2007 (Kjeldahl nitrogen maximum of 3.1 mg/L) compared with total organic nitrogen in the river for 1963 to 1977 (maximum of 0.92 mg/L). Similarly, nitrate and nitrite concentrations were greater on site in 2007 (combined concentration maximum of 2.0 mg/L) compared with maxima of 0.04 and 0.021 mg/L for the historical data set values for nitrate and nitrite, respectively. Total phosphorus concentrations were comparable among both data sets (0.03 to 0.55 mg/L historic Waccasassa River data; not detected to 0.42 mg/L for 2007 site-specific surveys).

Total suspended solids from the historical river data set ranged from 1 to 17 mg/L, compared with 2007 site-specific survey data, in which total suspended solids ranged from not detected to 42 mg/L. Metals (arsenic, cadmium, chromium, copper, iron, lead, and zinc) indicated comparable or slightly lower concentrations in the river data compared with the site-specific survey data.

These general comparisons suggest that low dissolved oxygen has been a regional condition for some time, although it has undoubtedly been exacerbated by anthropogenic activities. Increased nutrients, particularly nitrogen, likely contribute to an already stressed system. Generally low concentrations of metals are indicative of a persistence of a generally rural watershed where forestry, agriculture, and scattered residential use are the predominant human influences.

3.2.2.3 Marine Water Quality

Downgradient waters from the site include tidal waters of the Gulf of Mexico that would be classified by FDEP as Class II waters suitable for shellfish production and harvesting and Outstanding Resource Waters associated with protected areas such as parks and preserves, which encompass almost the entirety of Waccasassa Bay. Outstanding Resource Waters are afforded the highest protection (pursuant to FAC Rule 62-302.700) and include the Waccasassa Bay Preserve State Park and Big Bend Seagrasses Aquatic Preserve. All surface runoff from the project site and mitigation site is directed to these Outstanding Resource Waters in the Gulf of Mexico.

Water quality monitoring data were collected at four locations in the Gulf of Mexico from October to December 2007 for the proposed Progress Energy Florida Levy Nuclear Plant (LNP) (PEF 2008). Stations were located at the mouth of the Withlacoochee River and extend out into the gulf approximately 6 miles (PEF 2008). Results indicate that the tidal waters would be considered stressed from an ecological standpoint in terms of dissolved oxygen (concentrations ranged from 3.4 to 7.6 mg/L) and ammonia (average concentrations at four stations ranged from 0.3 to 0.45 mg/L) (PEF 2008).

3.3 WETLANDS

This section discusses delineation and functional assessments for the wetland cover types described in Section 3.4. The delineation of wetlands is important for assessing impacts and for comparing the different alternatives of this *King Road EIS*. It is also necessary for making final decisions on permit applications following completion of and based on the evaluations presented in this EIS.

Regulatory issues pertaining to wetlands are described in Chapter 6 of this EIS, including summaries of the substantive regulatory standards to be applied by the USACE in the review of applications for work in wetlands. The regulations provide the framework for consideration of wetlands in this EIS.

3.3.1 Wetlands Delineation

Both Federal and State of Florida wetland delineation methods consider three parameters: soils, vegetation, and hydrology (FAC Chapter 62-340; USACE 1987). Delineations examine and document soil, vegetation, and hydrologic indicators at representative locations throughout a project site. Conditions are usually evaluated along transects from the wetland interior into the adjacent upland sites to document the location of the wetland boundary. Because of differences between the Federal and Florida wetland regulations (e.g., jurisdiction of hydrologically isolated wetlands and Federal and state wetland plant lists), it is not unusual to have differences in wetland boundaries as defined by the USACE and the state. In some cases, delineation is accomplished using a combination of fieldwork and available

maps; aerial photogrammetry; and existing data sets, such as Natural Resources Conservation Service soil maps and regional land use maps.

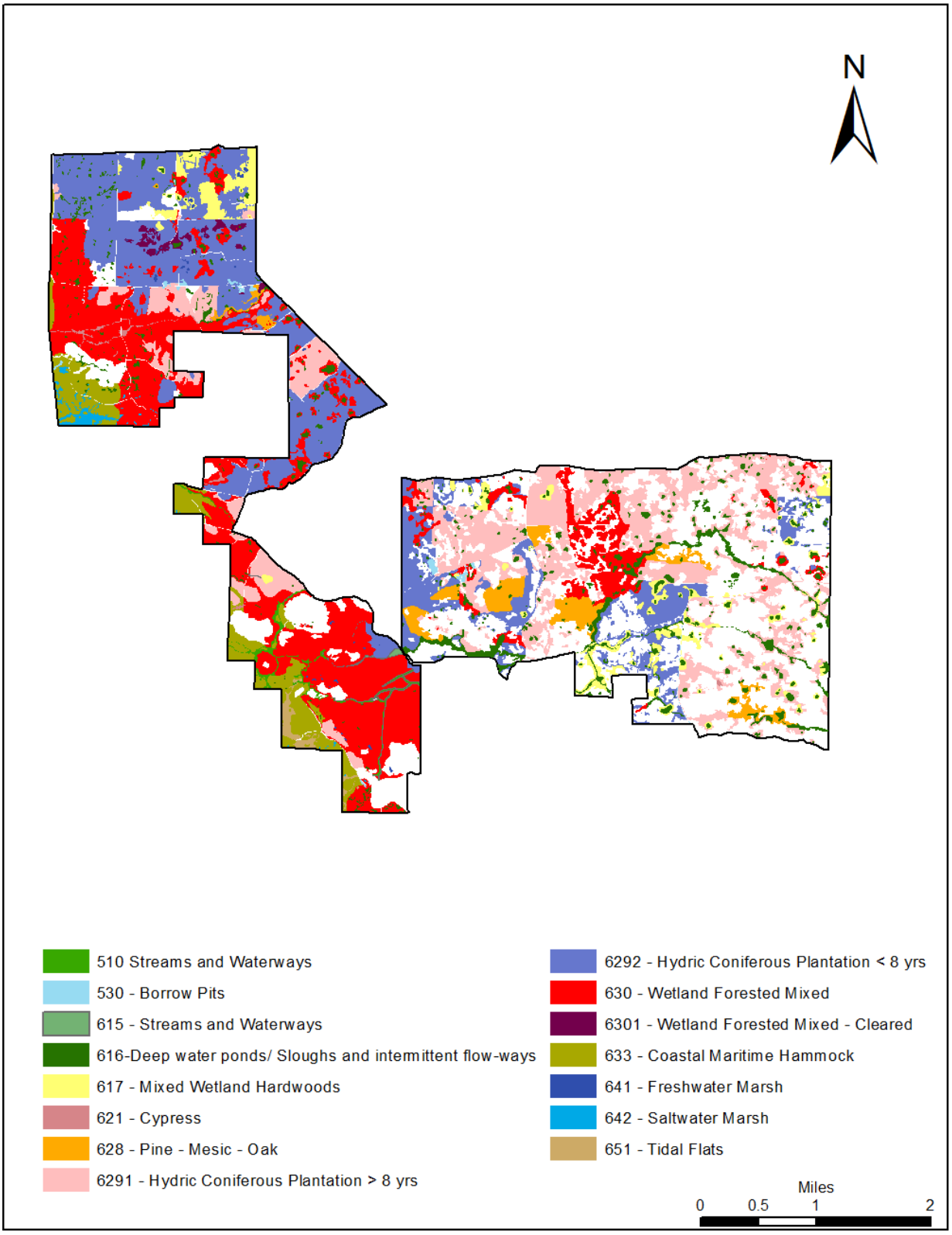
Because of the size of the *King Road EIS* area and large number of wetlands involved, the wetland delineation at the mine site relied on a combination of site-specific fieldwork and existing GIS [geographic information system] and remote-sensing data, including high-resolution infrared photogrammetry and LIDAR [Light Detection and Ranging] imagery. The wetland delineation for the mitigation site relied less on fieldwork and more heavily on existing natural resource and remote-sensing data.

The *King Road EIS* area contains 15 Florida Land Use, Cover, and Forms Classification System (FLUCCS) vegetation cover types that can be considered wetland habitat. Table 3–8 gives the acreage of FLUCCS wetland cover types at the proposed mine and mitigation sites. There are a total of 7,015 acres of wetlands on the approximately 9,275-acre project site (76 percent of the combined mine and mitigation areas), including 19.3 acres of other surface waters (0.1 percent of the total area). Wetland FLUCCS types make up 2,590.3 acres, or 55 percent, of the proposed mine site and 4,108.7 acres, or 91 percent, of the proposed mitigation site. The wetland FLUCCS types that occur in the *King Road EIS* area are predominantly hydric coniferous plantation, wetland forested mixed, coastal maritime hammock, and pine-mesic-oak. Detailed descriptions of *King Road EIS* wetland types are presented in Section 3.4. Figure 3–13 graphically illustrates the information contained within Table 3–8.

Table 3–8. Acreage of Wetlands in the *King Road EIS* Area

FLUCCS Classification	Mine Site (acres)	Mitigation Site (acres)	Total Acres
Hydric coniferous plantation <8 years (6292)	495.8	1,314.6	1,810.4
Wetland forested mixed (630)	284.1	1,601.2	1,885.3
Hydric coniferous plantation >8 years (6291)	1,121.3	345.0	1,466.3
Coastal maritime hammock (633)	N/A	382.9	382.9
Pine-mesic-oak (628)	213.3	20.7	234.0
Deepwater ponds/sloughs and intermittent flow-ways (616)	305.0	101.4	406.4
Mixed wetland hardwoods (617)	158.6	124.7	283.3
Streams and waterways (615)	N/A	22.5	22.5
Saltwater marsh (642)	N/A	36.5	36.5
Wetland forested mixed – cleared (6301)	N/A	43.1	43.1
Tidal flats (651)	N/A	71.3	71.3
Borrow pits (530)	11.0	11.2	22.2
Freshwater marsh (641)	N/A	13.1	13.1
Cypress (621)	1.2	20.5	21.7
Total	**2,590.3**	**4,108.7**	**6,699.0**

Key: <=less than; >=greater than; FLUCCS=Florida Land Use, Cover, and Forms Classification System; *King Road EIS=Tarmac King Road Limestone Mine Environmental Impact Statement*; N/A=not applicable.
Source: Tarmac 2009a, 2010b.



Source: ENTRIX 2009a.

Figure 3–13. Wetlands on the Proposed Tarmac King Road Limestone Mine Site and Mitigation Areas

All wetland boundaries described in the Environmental Resource Permit application were field verified by FDEP (BRA/ENTRIX 2008a). USACE wetland boundaries for the proposed mine site were field verified during multiple site visits in the latter half of 2008 and were approved in late January 2009 (Sarfert 2009).

3.3.2 Wetlands Functional Assessment

The primary purpose of the wetland functional assessment for this *King Road EIS* is to evaluate the condition and functional capacity of wetlands to be impacted by mining activities. Functional assessments describe the condition of wetlands and the degree to which they serve important functions, including flood storage; productivity and nutrient cycling; maintenance of existing hydrologic conditions (e.g., groundwater discharge or recharge); water quality renovation; and wildlife habitat, including foraging, nesting, nursery, cover, and resting areas. Functional assessments may use a quantitative approach (e.g., counts of organisms, stem counts) or qualitative descriptions (e.g., low, medium, high) that can be translated into numeric scores or rankings. Functional assessments provide a way to quantify differences in impacts between higher-value, more pristine wetlands, and lower-value, more degraded wetlands, and thus can be used to compare the benefits and costs of alternatives involving impacts on different amounts of different kinds of wetlands. Functional assessments may also be used to select suitable mitigation to offset permitted wetland impacts to meet the goal of no net loss of wetland function and value.

The functional assessment method selected for this *King Road EIS* is the Uniform Mitigation Assessment Method (UMAM). This method is consistent with USACE permit applications and mitigation determinations within Florida.

UMAM. Title XXVIII, Section 373.414(18), of the *Florida Statutes* directed FDEP and the water management districts, in cooperation with local governments and relevant Federal agencies, to develop a state-wide method to quantify the amount of mitigation required for regulatory permits. The UMAM rule (FAC Chapter 62-345) went into effect on February 2, 2004. Although only the state agencies were required by rule to adopt the method, the USACE Jacksonville District adopted UMAM with some modifications in 2005. While other functional assessment methods are still accepted by the USACE, UMAM is now the primary assessment method for applicants seeking Federal wetland permits in Florida. The USACE uses UMAM to quantify the mitigation needed to offset unavoidable adverse impacts on wetlands and other surface waters and to determine mitigation bank credits awarded and debited.

In general, the USACE Jacksonville District accepts UMAM for Federal wetland regulatory purposes with two major differences between the USACE and FDEP application of UMAM. The USACE uses its own time lag table (projected time period to reach final mitigation goals), rather than the state's time lag table and also does not employ the state's policy of accepting upland buffer areas as directly compensating for wetland impacts.

UMAM Methodology. The UMAM methodology has two parts: Part I is used to identify a wetland's size, landscape position, and the types of functions it should provide, and Part II evaluates the functionality or health of the wetland relative to the functions identified in Part I.

Part I Community Description. Part I describes the assessment area relative to the optimal condition, location, and functions of the native community type being evaluated.

Part II Assessment and Scoring. Part II considers three different parameters for wetland function: Location and Landscape Support, Water Environment, and Community Structure. Each of these parameters is given a score based on the level of benefits the assessment area provides to fish and wildlife. The Location and Landscape Support score evaluates the assessment area's position in the landscape relative to availability, connectivity, and quality of offsite habitats. The Water Environment parameter evaluates water quantity and quality and how those conditions support fish and wildlife. Community Structure evaluates the composition and utility of the vegetative structure of the assessment area. It includes such aspects as age distribution and recruitment, presence and production of desirable and of exotic/invasive plants, and land management practices within the assessment area. Each parameter is examined, recorded, and given a numeric score. Scores range from 0 (inadequate to provide wetland functions) to 10 (optimal, fully supports wetland functions and wildlife).

USACE UMAM Evaluation of *King Road EIS* Area. Because of the large number of individual wetland assessment areas at each site, the permit applicant assigned a UMAM score for each wetland FLUCCS classification. After field review, the USACE revised these scores and evaluated and scored each wetland assessment area individually. Table 3–9 summarizes the average final UMAM scores for each wetland FLUCCS classification within the proposed mine and mitigation sites. The UMAM scores reflect the effects of previous land use in the two areas. Most of the *King Road EIS* area has been used for lumber production since the early 1950s (BRA/Entrix 2008b). Today, the majority of the two sites are part of a timber operation in varying developmental stages of third-generation pine.

Table 3–9. UMAM Scores for FLUCCS Wetlands in the *King Road EIS* Area

FLUCCS Classification	Mine Site Average UMAM Scores	Mitigation Site UMAM Scores
Hydric coniferous plantation <8 years (6292)	0.55	0.57
Wetland forested mixed (630)	0.64	0.66
Hydric coniferous plantation >8 years (6291)	0.54	0.58
Coastal maritime hammock (633)	N/A	0.77
Pine-mesic-oak (628)	0.60	0.68
Deepwater ponds/sloughs and intermittent flow-ways (616)	0.71	0.75
Mixed wetland hardwoods (617)	0.60	0.67
Saltwater marsh (642)	N/A	0.81
Wetland forested mixed – cleared (6301)	N/A	0.60
Tidal flats (651)	N/A	0.86
Borrow pits (530)	0.54	0.55
Freshwater marsh (641)	N/A	0.78
Cypress (621)	0.67	0.70

Key: <=less than; >=greater than; FLUCCS=Florida Land Use, Cover, and Forms Classification System; *King Road EIS=Tarmac King Road Limestone Mine Environmental Impact Statement*; N/A=not applicable; UMAM=Uniform Mitigation Assessment Method.
Source: Sarfert 2010.

The average UMAM scores of the proposed mine site are somewhat lower than those at the proposed mitigation site. The mine site has experienced more intensive forestry operations. At the proposed mine site, 0 percent of the wetlands scored as what can be considered relatively low quality (UMAM scores ≤ 0.4), over 84 percent as moderate quality (UMAM score 0.4 to 0.6), and just under 17 percent as moderately good quality (UMAM scores > 0.6). At the proposed mitigation site, 0 percent of the wetlands scored relatively low quality, 42 percent moderate quality, and 58 percent good quality. The lower UMAM scores of wetlands at the mine site relative to the mitigation site illustrate that wetlands at the proposed mine site are generally somewhat impaired and functioning at a lower capacity than wetlands at the mitigation site.

3.4 VEGETATION

This section includes a description of the vegetative communities in the *King Road EIS* region. This EIS section includes the following:

- A description of the vegetative cover types in the *King Road EIS* region
  - Using site and vegetation transect data collected from Biological Research Associates (ENTRIX, Inc.)
  - Using the FLUCCS classification system
  - Using ecoregion classification systems from EPA and the U.S. Fish and Wildlife Service (FWS)
- Cover type comparison of the *King Road EIS* region and its surrounding landscape
- A review of state-listed plant species recorded in the *King Road EIS* region

The *King Road EIS* region lies completely within the Outer Coastal Plain Mixed Forest Province of the Subtropical Division of the Humid Temperate Domain (Bailey 1995). The Outer Coastal Plain Mixed

Forest Province is characterized by flat and irregular plains leading gently downward toward the sea. Temperate evergreen forest with a well developed understory is typical of the forest type found in this province. Canopy species include members of the laurel and magnolia families, along with evergreen oaks, while common subcanopy species include members of the palm families, along with herbaceous species. At the highest resolution of EPA's Ecoregion Classification System (Griffith, Omernik, and Pierson 2002), the *King Road EIS* region falls within the Gulf Coast Flatwoods. EPA describes the Gulf Coast Flatwoods ecoregion as having "wet, sandy flats and broad depressions that are locally swampy and are usually forested, while some of the better-drained land has been cleared for pasture or crops" (Griffith, Omernik, and Pierson 2002). From the descriptions of the Gulf Coast Flatwoods and Outer Coastal Plain Mixed Forest Province (Bailey 1995; Griffith, Omernik, and Pierson 2002), one can picture what the *King Road EIS* region looked like prior to anthropogenic activities, such as timber harvesting and residential and industrial development.

3.4.1 Description of Vegetative Cover Types and Plant Communities in the *King Road EIS* Region

The *King Road EIS* region was historically characterized by broad expansive flats containing mesic to hydric hammocks with underlying limestone bedrock. For this analysis, the "region" is defined as the greater than 25,000-acre area encompassed by the Lebanon Station and Yankeetown USGS 1:24,000 topographic quadrangles. The *King Road EIS* region is a component of a broader and more extensive system known as the Gulf Hammock, a system consisting of uplands in conjunction with wetlands and interspersed with mesic and hydric hammocks. Although highly altered by silviculture, limerock mining, and other anthropogenic activities, the *King Road EIS* region still contains relics of the Gulf Hammock system, including coastal mesic hammocks, pine flatwoods, and hydric oak hammocks (BRA 2008). The following discussion describes each of the main natural habitat types found within the *King Road EIS* region, including both uplands and wetlands, and Table 3–10 describes the relative areas these habitats occupy within the *King Road EIS* region. Included in this table are the FLUCCS classifications given to each of the habitat types. The FLUCCS classification system developed by the Florida Department of Transportation (FDOT) is useful in a wide variety of land use planning and ecological applications; its application to this *King Road EIS* is further described in Section 3.4.2.

Table 3–10. Habitat Types Within the *King Road EIS* Region

***King Road EIS* Habitat Type (FLUCCS classification)**	**Area Within the *King Road EIS* Region (acres)**
Hydric hammock (630, 6291, 6292, and 6301)	5,580.4
Hydric coastal hammock (633 and 6291)	1,961.6
Hydric oak hammocks (628)	358.4
Mesic hammock (425, 427, and 434)	250.3
Coastal mesic hammock – temperate hardwoods (425)	182.5
Pine flatwoods (no classification – minimal acreage)	0.0

Key: FLUCCS=Florida Land Use, Cover, and Forms Classification System; *King Road EIS=Tarmac King Road Limestone Mine Environmental Impact Statement*.
Source: BRA 2008.

3.4.1.1 Upland Habitat Types

Although the majority of habitat types found within the mine and mitigation areas tend to be associated with wetland communities, several upland habitats also occur within the Tarmac King Road Limestone Mine region. Upland habitat types found in the *King Road EIS* region tend to be slightly higher in elevation and occur on more well drained soils than the wetland habitats described in Section 3.4.1.2. The main upland habitat types found in the region include mesic hammock, coastal mesic hammock – temperate hardwoods, and pine flatwoods (BRA 2008; FNAI 2010).

Mesic Hammock

Mesic hammocks generally consist of upland hardwood forest and upland mixed forest, with a well developed closed canopy. Upland mixed forest contains many of the same species found in an upland hardwood forest, including southern magnolia (*Magnolia grandiflora*), pignut hickory (*Carya glabra*), sweetgum (*Liquidambar styraciflua*), Florida maple (*Acer saccharum* subsp. *floridanum*), devil's walking stick (*Aralia spinosa*), American hornbeam (*Carpinus caroliniana*), redbud (*Cercis canadensis*), flowering dogwood (*Cornus florida*), Carolina holly (*Ilex ambigua*), American holly (*Ilex opaca*), eastern hophornbeam (*Ostrya virginiana*), loblolly pine (*Pinus taeda*), live oak (*Quercus virginiana*), and swamp chestnut oak (*Quercus michauxii*). The main difference between the upland hardwood forest and upland mixed forest mesic hammocks is that the mixed forest tends to have less loblolly pine and other species that tend to occur at higher latitudes. This difference is mainly due to a minor difference in climate owing to the regions where these two forest types occur. The upland hardwood forests occur mainly in the northern panhandle region of the state, and the mixed forests are more common in the northern and central parts of peninsular Florida. Specifically within the *King Road EIS* region, this habitat type occurs in the better drained areas on mainly shallow loamy soils over limestone bedrock (BRA 2008; FNAI 2010).

Coastal Mesic Hammock – Temperate Hardwoods

Within this *King Road EIS* area, coastal mesic hammocks are not as common as the mesic hammock forests described above. Species composition between these two types is similar, although according to a 2008 vegetation survey, the coastal mesic hammock tends to have higher occurrences of coontie (*Zamia pumila*), devil's walking stick, and eastern red cedar (*Juniperus virginiana*). Similar to mesic hammocks, the coastal mesic hammock occurs in the better drained areas within the *King Road EIS* area on mainly shallow loamy soils over limestone bedrock (BRA 2008; FNAI 2010).

Pine Flatwoods

Pine flatwoods are mesic or hydric pine woodlands or mesic shrublands on flat sandy or limestone substrates, often with a hardpan that impedes drainage. They can occur as rolling forests dominated by widely spaced pines with a sparse shrub layer and a dense ground cover of herbs and grasses (FNAI 2010). Pristine mesic pine flatwoods generally consist of open pine canopy with a layer of low shrubs and herbs and experience frequent fires (2–4 year intervals). Small areas of impacted mesic pine flatwoods exist in the *King Road EIS* region. The expected principal canopy tree, longleaf pine (*Pinus palustris*), was nearly absent, with slash pine (*Pinus elliottii*) and loblolly pine dominating the overstory here, along with water and laurel oaks. Typical mesic pine flatwoods shrubs include saw palmetto (*Serenoa repens*), gallberry (*Ilex glabra*), coastal plain staggerbush (*Lyonia fruticosa*), fetterbush (*Lyonia lucida*), dwarf live oak (*Quercus minima*), runner oak (*Q. elliottii*), shiny blueberry (*Vaccinium myrsinites*), Darrow's blueberry (*V. darrowii*), and dwarf huckleberry (*Gaylussacia dumosa*). Most of these shrub species and the expected herbaceous layer of grasses and forbs, including wiregrass (*Aristida stricta* var. *beyrichiana*), dropseeds (*Sporobolus curtissii, S. floridanus*), panicgrasses (*Dichanthelium* spp.), and broomsedges (*Andropogon* spp.), were absent. A 2008 vegetation study of the *King Road EIS* region listed only one occurrence of pine flatwoods within the site and one additional stand immediately off site to the east. Both sites were located on well-drained sandy soils. The study concluded that minimal flatwoods existed on site and that both of the parcels analyzed were overgrown, one severely so (BRA 2008; FNAI 2010).

3.4.1.2 Wetland Habitat Types

Wetland habitat types differ from those upland types described in Section 3.4.1.1 in that they exhibit inundation or saturated conditions in the upper soil profile at a frequency and duration sufficient to support a prevalence of vegetation able to tolerate periods of constant saturation. Specific examples of this habitat type found within the *King Road EIS* region include hydric hammock, hydric coastal hammock, and hydric oak hammock (BRA 2008; FNAI 2010).

Hydric Hammock

The hydric hammock habitat type is characterized by a diverse canopy dominated by pine and hardwood species, such as loblolly pine and laurel oak. Within the *King Road EIS* region, cabbage palm (*Sabal palmetto*) also occurs as a dominant species within the hydric hammock canopy. In a 2008 vegetation study of the *King Road EIS* region, 29 species were identified within hydric hammock canopies, including Carolina ash (*Fraxinus caroliniana*), loblolly pine, and eastern red cedar (*Juniperus virginiana*) (BRA 2008). The species composition of the understory is also diverse and includes the same species found in the canopy, as well as red maple (*Acer rubrum*), wax myrtle (*Myrica cerifera*), yaupon holly (*Ilex vomitoria*), and American hornbeam (*Carpinus caroliniana*). Within the *King Road EIS* region, hydric hammocks occur on low, flat sites, where limestone bedrock is very near the surface and may outcrop. These soils are sandy with an appreciable amount of organic matter and remain saturated for most of the year (BRA 2008; FNAI 2010).

Hydric Coastal Hammock

Hydric coastal hammocks are similar to hydric hammocks in species composition, although with a higher dominance of cabbage palms and eastern red cedar. Hydric coastal hammocks occur along the western edge of the *King Road EIS* region and are close enough to the Gulf of Mexico that they may experience periods of salt or brackish water inundation in cases of extreme storms. The degree of saltwater inundation may play a role in determining whether a habitat develops as a hydric hammock or hydric coastal hammock (BRA 2008; FNAI 2010).

Hydric Oak Hammock

This habitat type occurs mainly on low, flat lands throughout the *King Road EIS* region. The dominant canopy species include laurel oak, water oak (*Quercus nigra*), and live oak, sharing dominance with sweet-gum and red bay (*Persea borbonia*). Beneath the canopy lies a diverse layer of smaller trees and shrubs, including winged elm (*Ulmus alata*), American hornbeam, yaupon holly, red and Florida maple, wax myrtle, and small cabbage palm. Groundcover is generally sparse and includes vines and smaller trees and shrubs also found in the canopy (BRA 2008; FNAI 2010).

3.4.2 Adapting Vegetative Cover Types in the *King Road EIS* Region to the FLUCCS Classification System

The FLUCCS classification system was developed by the FDOT in an attempt to unify land cover data sets and allow for more seamless flow of data between state agencies, local governments, and private enterprises (FDOT 1999). The FLUCCS classification system is used across a wide range of disciplines and applications; however, in this EIS it is primarily used in mitigation assessment and planning.

FLUCCS codes use a three or four digit number to describe various cover types found within the state of Florida. There are four levels of classification, which build on each other in terms of specificity. Class one is the most general of the four levels and begins with an integer ranging from one to eight: 1000 represents urban and built-up areas; 2000, agricultural areas; 3000, rangeland; 4000, upland forests; 5000, water; 6000, wetlands; 7000, barren land; and 8000, transportation, communications, and utilities. The remaining two or three digits describe the cover type in increasing detail (FFWCC 2009a). For example, the Level 1 Class of 4000 describes all cover types considered upland forest; a Level 2 Class of 4200 further refines the cover type as upland hardwood forest; a Level 3 Class of 4270 describes a live-oak upland hardwood forest; and a Level 4 Class of 4271 indicates a live-oak cabbage palm upland hardwood forest. FLUCCS is an open-ended system allowing for expansion of categories as the need arises (FDOT 1999). The applicant developed additional classifications to more closely define certain habitats, including 6291 (hydric coniferous plantation greater than 8 years old), 6292 (hydric coniferous plantation less than 8 years old), and 616a (deepwater ponds). For the purposes of this *King Road EIS*, Class Levels 3 and 4 were used.

Two analyses were performed using FLUCCS codes and their corresponding acreages in and around the Tarmac King Road Limestone Mine site and mitigation areas. Due to limited data availability off site, a different data set had to be used for each analysis. First, Level 3 FLUCCS codes and acreages of each

cover type within the mine and mitigation area were calculated based on thousands of hours of fieldwork and ground truthing (ENTRIX 2009a). The results of this analysis are presented in Table 3–11. Second, cover types found within the mine and mitigation areas were compared with cover types found outside the project area in other undeveloped parts of Levy County. The data used for this analysis were obtained through the Southwest Florida Water Management District's GIS database website (SWFWMD 2010) and in general consisted of Level 2 Class FLUCCS codes. The results of the regional FLUCCS cover type comparison can be found in Table 3–12. Note that the total acreages in the same FLUCCS cover types may differ between these tables due to the differences in calculation methodology of the two available databases.

Table 3–11. Acreage of FLUCCS Cover Types in the *King Road EIS* Area

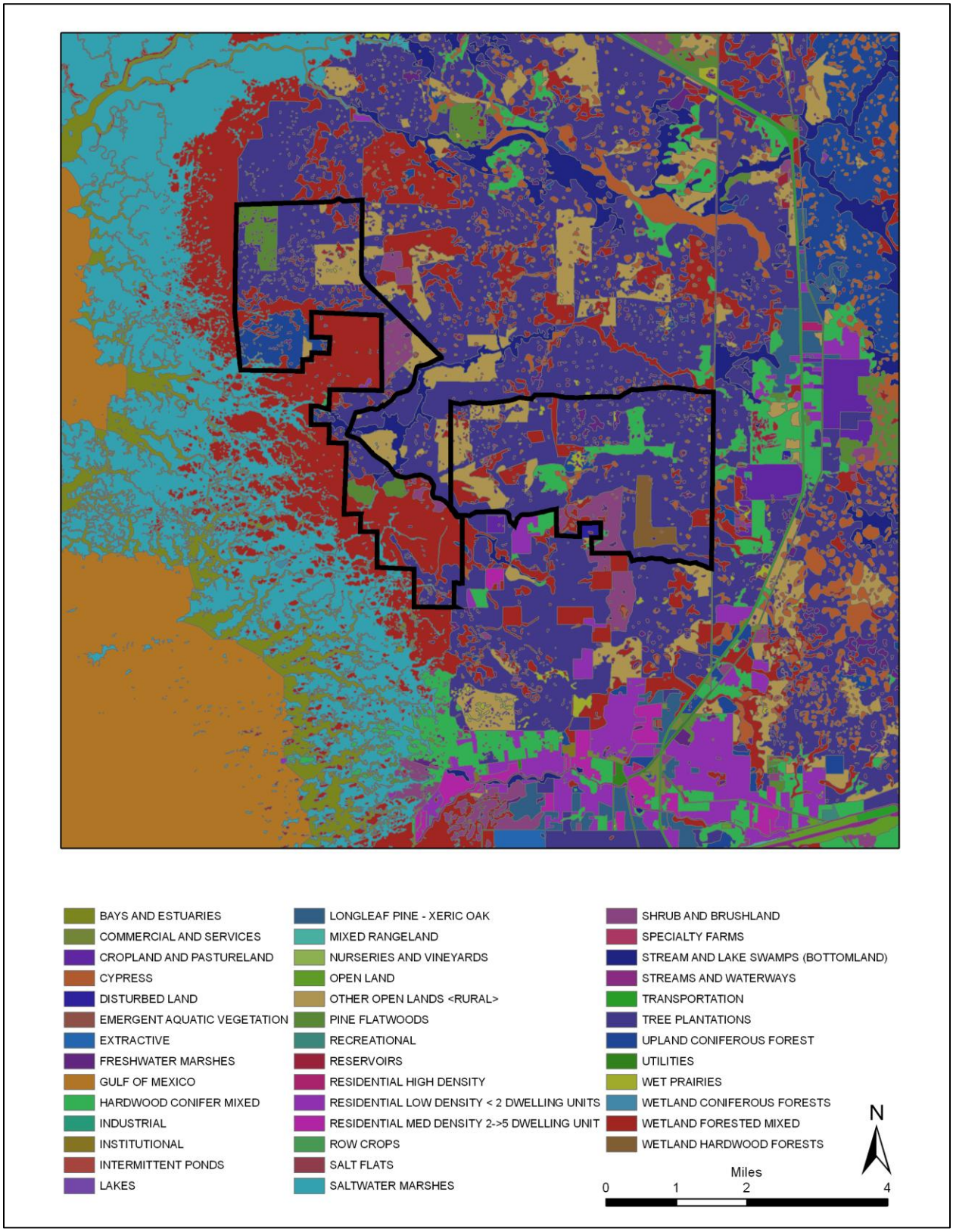
FLUCCS Code	FLUCCS Cover Type	Mine Area (acres)	Mitigation Area (acres)	Total (acres)
Upland				
441	Coniferous plantation	987.7	171.5	1,159.2
443	Forest regeneration	996.2	33.2	1,029.4
425	Temperate hardwood	117.9	104.1	222.0
434	Hardwood conifer mixed	N/A	22.3	22.3
427	Live oak	45.5	N/A	45.5
Wetland				
6292	Hydric coniferous plantation <8 years	495.8	1314.6	1,810.4
630	Wetland forested mixed	284.1	1601.0	1,885.3
6291	Hydric coniferous plantation >8 years	1,121.3	345.0	1,466.3
633	Coastal maritime hammock	N/A	382.9	382.9
628	Pine-mesic-oak	213.3	20.7	234.0
616a	Deepwater ponds	150.7	101.4	252.1
617	Mixed wetland hardwoods	158.6	124.7	283.3
616b	Sloughs and intermittent flow-ways	154.3	N/A	154.3
615	Streams and waterways	N/A	22.5	22.5
642	Saltwater marsh	N/A	36.5	36.5
6301	Wetland forested mixed – cleared	N/A	43.1	43.1
651	Tidal flats	N/A	71.3	71.3
530	Borrow pits	11.0	11.2	22.2
641	Freshwater marsh	N/A	13.1	13.1
621	Cypress	1.2	20.5	21.7
Other				
740	Roads	13.1	86.7	99.5
Total		4,751	4,526	9,277

Key: FLUCCS=Florida Land Use, Cover, and Forms Classification System; *King Road EIS=Tarmac King Road Limestone Mine Environmental Impact Statement*; N/A=not applicable.
Source: Tarmac 2009a, 2010b.

Using the FLUCCS data, the vegetative cover types on the project mine area and mitigation area have been broken down into 21 land use or cover types. Table 3–11 lists these cover types and the acreage of each within the *King Road EIS* area. As the table illustrates, the mine and mitigation areas have similar cover types, but the mitigation area has a greater proportion of wetland types.

3.4.3 Comparison of *King Road EIS* Site to the Surrounding Region

The landscape in the region of the *King Road EIS* grades from drier uplands in the east through wetter, freshwater lowlands to salt marsh along the Gulf Coast. The wetland forest and marshes found in the western portions of the *King Road EIS* area extend beyond the site's western border. Only a small portion of the *King Road EIS* site in the mitigation area extends into the coastal salt marsh. Conversely, eastern portions of the site have more in common with drier upland habitats, such as the upland planted pine and upland hardwood and mixed forest found to the east of the site. Figure 3–14 illustrates the distribution of cover types in the *King Road EIS* area and that the cover types within the *King Road EIS* site are similar to the surrounding region.



Source: SWFWMD 2010.

Figure 3–14. FLUCCS Cover Types for Tarmac King Road Region

The land cover composition of the *King Road EIS* area is similar to that of the surrounding region (see Table 3–12). This area is dominated by the Gulf Hammock Wildlife Management Area (WMA). The *King Road EIS* area includes both the project mine area and the mitigation area. The *King Road EIS* area contains approximately half of the same FLUCCS codes as the region, with those common classifications occurring in similar proportions. The *King Road EIS* area, being significantly smaller, lacks several of the FLUCCS codes associated with local municipalities in the surrounding region and several natural habitat types that do not occur within the *King Road EIS* area.

Table 3–12. Comparison of FLUCCS Cover Types in the *King Road EIS* Region with the Vicinity

FLUCCS Code	FLUCCS Code Description	Regional Study Area (acres)	Percent	*King Road EIS* (acres)	Percent	Percent Difference
1100	Residential Low Density <2 Dwelling Units	2,574.8	4.1	0.2	0.0	-4.1
1200	Residential Medium Density 2->5 Dwelling Unit	684.2	1.1	0.0	0.0	-1.1
1300	Residential High Density	51.2	0.1	0.0	0.0	-0.1
1400	Commercial and Services	152.2	0.2	0.0	0.0	-0.2
1500	Industrial	4.1	0.0	0.0	0.0	0.0
1600	Extractive	586.5	0.9	0.0	0.0	-0.9
1700	Institutional	38.7	0.1	0.0	0.0	-0.1
1800	Recreational	35.8	0.1	0.0	0.0	-0.1
1900	Open Land	1,419.5	2.3	0.0	0.0	-2.3
2100	Cropland and Pastureland	594.8	1.0	0.0	0.0	-1.0
2600	Other Open Lands (Rural)	4,466.5	7.1	710.6	7.6	0.5
3200	Shrub and Brushland	1,504.7	2.4	485.7	5.2	2.8
3300	Mixed Rangeland	38.3	0.1	0.0	0.0	-0.1
4100	Upland Coniferous Forest	1,707.7	2.7	440.5	4.7	2.0
4110	Pine Flatwoods	714.8	1.1	320.9	3.4	2.3
4120	Longleaf Pine – Xeric Oak	1,355.6	2.2	0.0	0.0	-2.2
4340	Hardwood Conifer Mixed	3,744.6	6.0	278.6	3.0	-3.0
4400	Tree Plantations	21,286.1	34.1	4,364	47.1	13.0
5100	Streams and Waterways	336.3	0.5	0.0	0.0	-0.5
5200	Lakes	13.8	0.0	2.8	0.0	0.0
5300	Reservoirs	172.2	0.3	8.9	0.1	-0.2
5400	Bays and Estuaries	942.5	1.5	3.4	0.0	-1.5
6100	Wetland Hardwood Forests	201.1	0.3	201.1	2.2	1.8
6150	Stream and Lake Swamps (Bottomland)	2,001.9	3.2	35.1	0.4	-2.8
6210	Cypress	2,520.6	4.0	119.8	1.3	-2.7
6300	Wetland Forested Mixed	9,264.4	14.8	1,814.0	19.4	4.6
6410	Freshwater Marshes	1,312.9	2.1	344.6	3.7	1.6
6420	Saltwater Marshes	3,622.2	5.8	98.8	1.1	-4.7
6430	Wet Prairies	350.4	0.6	43.2	0.5	-0.1
6440	Emergent Aquatic Vegetation	0.9	0.0	0.0	0.0	0.0
6530	Intermittent Ponds	10.2	0.0	0.0	0.0	0.0
6600	Salt Flats	3.3	0.0	0.0	0.0	0.0
7400	Disturbed Land	59.6	0.1	3.6	0.0	-0.1
8100	Transportation	382.3	0.6	0.0	0.0	-0.6
8300	Utilities	338.4	0.5	0.0	0.0	-0.5
	Totals	**62,493.4**	**100**	**9,276.0**	**100**	

Key: FLUCCS=Florida Land Use, Cover, and Forms Classification System; *King Road EIS=Tarmac King Road Limestone Mine Environmental Impact Statement*.
Source: SWFWMD 2010.

3.4.4 Listed Plant Species

Most species encountered within the *King Road EIS* region are considered relatively common and are not of conservation concern. Although no federally listed plant species have been observed, several species listed by the State of Florida have been recorded. These state-listed species include corkwood (*Leitnera floridana*), cardinalflower (*Lobelia cardinalis*), Angularfruit milkvine (*Matelea gonocarpus*), Florida leaf-flower (*Phyllanthus liebmannianus* subsp. *Platylepis*), browneyed Susan (*Rudbeckia triloba*), and Florida pinkroot (*Spigelea loganioides*). Table 3–13 shows the common name, Federal and state listing status, and the plant communities where these species are likely to be seen (BRA 2008).

Table 3–13. Federally and State-Protected Plant Species Found in the *King Road EIS* Region

Common Name	Scientific Name	Federal Listing Status	State Listing Status	Setting
Corkwood	*Leitnera floridana*	–	Threatened	Natural freshwater wetlands with deep open centers and fairly near the coast
Cardinalflower	*Lobelia cardinalis*	–	Threatened	Large moving water wetland
Angularfruit milkvine	*Matelea gonocarpus*	–	Threatened	Hammock and cutover hammock
Florida leaf-flower	*Phyllanthus liebmannianus* subsp. *platylepis*	–	Endangered	Hammock and cutover hammock
Browneyed Susan	*Rudbeckia triloba*	–	Endangered	Widespread in cleared wet areas
Florida pinkroot	*Spigelea loganioides*	–	Endangered	Mesic/hydric hammock
Pinnate-lobes coneflower	*Rudbeckia triloba* var. *pinnatiloba*	–	Endangered	Upland glades

Key: –=no listing.
Source: BRA 2008.

3.5 WILDLIFE

The vegetation and wetlands in the *King Road EIS* area provide suitable habitat for indigenous wildlife, including threatened and endangered species and species of special concern. Although the *King Road EIS* area has been altered by silviculture, limerock mining, and other anthropogenic activities, the area from the Gulf of Mexico east to U.S. Route 19 from the Waccasassa River south to the Withlacoochee River is of special interest for its ecological significance as wildlife habitat. Much of the region surrounding the *King Road EIS* area is part of the Gulf Hammock WMA. The Florida Fish and Wildlife Conservation Commission's Integrated Wildlife Habitat Ranking System scored the region between 7 and 10 (10 being the highest score) and identified the unprotected lands surrounding Waccasassa Bay Preserve State Park, including the area to the south, as "good habitat" not currently under any type of conservation protection (Endries, Gilbert, and Kautz 2009). The State of Florida's conservation and recreation lands acquisition program, Florida Forever Five Year Plan, includes the lands surrounding the *King Road EIS* area in the Gulf Hammock Project (FDEP 2012b). The 4,750-acre *King Road EIS* area, exclusive of the mitigation area, represents approximately 18.5 percent of the 25,611-acre Gulf Hammock Project area. Wetlands and vegetation in the *King Road EIS* area are described in Sections 3.3 and 3.4, respectively. Wildlife, including threatened and endangered species and state species of special concern, are discussed below.

3.5.1 Indigenous Wildlife

The *King Road EIS* area supports wildlife indigenous to Florida, including birds, mammals, fish, amphibians, reptiles, and invertebrates. The deciduous forest habitats originally found throughout the Gulf Coast Flatwoods (Griffith, Omernik, and Pierson 2002) of the Outer Coastal Plain Mixed Forest Province (Bailey 1995) typically supported three large mammal species indigenous to Florida: Florida panther (*Puma concolor coryi*), Florida black bear (*Ursus americanus floridanus*), and white-tailed deer

(*Odocoileus virginianus*). The Florida panther, a federally and state-listed endangered species, is rare throughout Florida and is not listed by FWS as likely to occur in Levy County (FWS 2011a). No Florida panthers were observed on the Tarmac King Road Limestone Mine or mitigation site during the 2007 and 2008 wildlife survey (ENTRIX 2009b). However, there have been unconfirmed sightings in the area reported by nearby residents over the last few years. While transient male panthers could occur in the area, based on the best available scientific data, a breeding population is not present, as the FWS does not have a confirmed female panther sighting north of the Caloosahatchee River (FWS 2011b). The Florida black bear, a state-listed species, likely occurs in the *King Road EIS* area (FNAI 2009), but was not observed during the wildlife surveys conducted in 2007 and 2008 (ENTRIX 2009b). The white-tailed deer is common. Indigenous small mammals that commonly occur in the forests and wetlands of the southeastern United States and were observed at the site (ENTRIX 2009b) include raccoons (*Procyon lotor*); opossums (*Didelphis virginiana*); squirrels (*Sciurus carolinensis*); rabbits (*Sylvilagus palustris*); and ground-dwelling rodents, such as cotton mice (*Peromyscus gossipinus*), cotton rats (*Sigmodon hispidus*), and eastern wood rats (*Neotoma floridana*). The American alligator (*Alligator mississippiensis*) is the only large reptile, but the mosaic of habitats in the *King Road EIS* area supports many smaller reptiles and amphibians and numerous fish and birds, including the swallow-tailed kite (*Elanoides forficatus*). The Gulf Coast and estuaries of the Withlacoochee River are located approximately 3 miles from the proposed mine site. These areas are designated Essential Fish Habitat (for the Gulf of Mexico, coastal migratory pelagics, stone crab, red drum, shrimp, and reef-fish fisheries), but they are not Habitat Areas of Particular Concern (GMFMC 2005). The proposed project's impacts on the Gulf Hammock dwarf siren (*Pseudobranchus striatus lustricolus*) were also evaluated. This salamander is a subspecies of dwarf siren that has not been observed alive since 1951. While little is known about this particular subspecies, dwarf siren species (*P. striatus* and *P. axanthus*) utilize shallow, still, or slow-moving waters with heavy plant cover (NatureServe 2012), and typically lay their eggs on aquatic herbs such as water hyacinth (*Eichhornia crassipes*) or frog's bit (*Limnobium spongia*) (AmphibiaWeb 2012). These salamanders are restricted to aquatic and wetland habitats and do not traverse uplands, even during wet periods (NatureServe 2012). The habitats that would be most suitable for the Gulf Hammock dwarf siren, while present off site nearby, are unlikely to be found within the proposed mine parcel. The flow-way corridors through the project site are characterized by "flashy" intermittent streams, meaning they flow only periodically and then rapidly in response to rainfall; in any event, these corridors would be avoided by the proposed project except for road crossings. Roadside ditches, borrow ponds, and most depressional, seasonally flooded wetlands within the proposed impact areas contain little emergent aquatic vegetation other than cattail (*Typha spp.*). If this subspecies of dwarf siren has not been extirpated, it is highly unlikely to be found on the project site.

A list of wildlife species observed in the mine and mitigation areas during surveys conducted by Biological Research Associates in 2007 and 2008 is presented in Table 3–14. Due to the *King Road EIS* area's diverse habitats, it supports at least 187 vertebrate wildlife species (ENTRIX 2009b). Wading and other migratory birds have been observed in the *King Road EIS* area and are protected by Federal wildlife laws, such as the Migratory Bird Treaty Act. Species in the *King Road EIS* area protected by the Endangered Species Act of 1973, as amended, are discussed below in Section 3.5.2. Two bald eagle (*Haliaeetus leucocephalus*) nests were located about 0.5 miles north and 2 miles southwest of the *King Road EIS* area, and 11 bald eagles were observed perching on snags or flying over the site (ENTRIX 2010). Eagles are protected under the Migratory Bird Treaty Act, as well as the Lacey Act and the Bald and Golden Eagle Protection Act.

Table 3–14. List of Wildlife Species Present in the Tarmac King Road Limestone Mine and Mitigation Areas

Group Name	Common Name	Scientific Name
Amphibians	Florida cricket frog	*Acris gryllus dorsalis*
	Two-toed amphiuma	*Amphiuma means*
	Oak toad	*Bufo quercicus*
	Southern toad	*Bufo terrestris*
	Greenhouse frog	*Eleutherodactylus planirostris planirostris*
	Cope's grey treefrog	*Hyla chrysoscelis*
	Green treefrog	*Hyla cinerea*
	Squirrel treefrog	*Hyla squirella*
	Peninsula newt	*Notophthalmus viridescens piaropicola*
	Florida chorus frog	*Pseudacris nigrita verrucosa*
	Little grass frog	*Pseudacris ocularis*
	Bullfrog	*Rana catesbeiana*
	Bronze frog	*Rana clamitans clamitans*
	Pig frog	*Rana grylio*
	Southern leopard frog	*Rana sphenocephela*
	Leopard frog tadpoles	*Rana sphenocephela tadpole*
	Unidentified tadpoles	*Unidentified anuran tadpole*
Birds	Red-winged blackbird	*Agelaius phoeniceus*
	Roseate spoonbill	*Ajaia ajaja*
	Anhinga	*Anhinga anhinga*
	Limpkin	*Aramus guarauna*
	Ruby-throated hummingbird	*Archilochus colubris*
	Great egret	*Ardea alba*
	Great blue heron	*Ardea herodia*
	Tufted titmouse	*Baeolophus bicolor*
	Cedar waxwing	*Bombycilla cedrorum*
	American bittern	*Botaurus lentiginosus*
	Great horned owl	*Bubo virginianus*
	Short-tailed hawk	*Buteo brachyurus*
	Red-tailed hawk	*Buteo jamaicensis*
	Red-shouldered hawk	*Buteo lineatus*
	Northern cardinal	*Cardinalis cardinalis*
	Turkey vulture	*Cathartes aura*
	Hermit thrush	*Catharus guttatus*
	Gray-cheeked thrush	*Catharus minimus*
	Swainson's thrush	*Catharus ustulatus*
	Brown creeper	*Certhia americana*
	Belted kingfisher	*Ceryle alcyon*

Table 3–14. List of Wildlife Species Present in the Tarmac King Road Limestone Mine and Mitigation Areas (*continued*)

Group Name	Common Name	Scientific Name
Birds (continued)	Chimney swift	*Chaetura pelagica*
	Northern harrier	*Circus cyaneus*
	Marsh wren	*Cistothorus palustris*
	Northern flicker	*Colaptes auratus*
	Northern bobwhite	*Colinus virginianus*
	Common ground dove	*Columbia passerina*
	Eastern wood-pewee	*Contopus virens*
	Black vulture	*Coragyps atratus*
	American crow	*Corvus brachyrhynchos*
	Fish crow	*Corvus ossifragus*
	Blue jay	*Cyanocitta cristata*
	Yellow-rumped warbler	*Dendroica coronata*
	Prairie warbler	*Dendroica discolor*
	Yellow-throated warbler	*Dendroica dominica*
	Palm warbler	*Dendroica palmarum*
	Pine warbler	*Dendroica pinus*
	Pileated woodpecker	*Dryocopus pileatus*
	Gray catbird	*Dumetella carolinensis*
	Little blue heron	*Egretta caerulea*
	Reddish egret	*Egretta rufescens*
	Snowy egret	*Egretta thula*
	Tricolored heron	*Egretta tricolor*
	Swallow-tailed kite	*Elanoides forficatus*
	White-tailed kite	*Elanus leucarus*
	White ibis	*Eudocimus albus*
	American kestrel	*Falco sparverius*
	American coot	*Fulica americana*
	Common moorhen	*Gallinula chloropus*
	Common yellowthroat	*Geothlypis trichas*
	Bald eagle	*Haliaeetus leucocephalus*
	Barn swallow	*Hirundo rustica*
	Mississippi kite	*Ictinia mississippiensis*
	Loggerhead shrike	*Lanius ludovicianus*
	Swainson’s warbler	*Limnothlypis swainsonii*
	Hooded merganser	*Lophodytes cucullatus*
	Red-bellied woodpecker	*Melanerpes carolinus*
	Red-headed woodpecker	*Melanerpes erythrocephalus*

Table 3–14. List of Wildlife Species Present in the Tarmac King Road Limestone Mine and Mitigation Areas (*continued*)

Group Name	Common Name	Scientific Name
Birds (continued)	Wild turkey	*Meleagris gallopavo*
	Northern mockingbird	*Mimus polyglottos*
	Black-and-white warbler	*Mniotilta varia*
	Wood stork	*Mycteria americana*
	Great crested flycatcher	*Myiarchus crinitus*
	Yellow-crowned night-heron	*Nyctanassa violacea*
	Black-crowned night-heron	*Nycticorax nycticorax*
	Eastern screech-owl	*Otus asio*
	Osprey	*Pandion haliaetus*
	Northern parula	*Parula americana*
	Black-capped chickadee	*Parus atricapillus*
	American white pelican	*Pelecanus erythrorhynchos*
	Downy woodpecker	*Picoides pubescens*
	Hairy woodpecker	*Picoides villosus*
	Eastern towhee	*Pipilo erythrophthalmus*
	Glossy ibis	*Plegadis falcinellus*
	Carolina chickadee	*Poecile carolinensis*
	Blue-gray gnatcatcher	*Polioptila caerulea*
	Purple martin	*Progne subis*
	Prothonotary warbler	*Protonotaria citrea*
	Common grackle	*Quiscalus quiscula*
	Clapper rail	*Rallus longirostris*
	Ruby-crowned kinglet	*Regulus calendula*
	Eastern phoebe	*Sayornis phoebe*
	Ovenbird	*Seiurus aurocapillus*
	American redstart	*Setophaga ruticella*
	Brown-headed nuthatch	*Sitta pusilla*
	Yellow-bellied sapsucker	*Sphyrapicus varius*
	Barred owl	*Strix varia*
	Tree swallow	*Tachycineta bicolor*
	Carolina wren	*Thryothorus ludovicianus*
	Brown thrasher	*Toxostoma rufum*
	Solitary sandpiper	*Tringa solitaria*
	House wren	*Troglodytes aedon*
	American robin	*Turdus migratorius*
	Gray kingbird	*Tyrannus dominicensis*
	Barn owl	*Tyto alba*

Table 3–14. List of Wildlife Species Present in the Tarmac King Road Limestone Mine and Mitigation Areas (*continued*)

Group Name	Common Name	Scientific Name
Birds (continued)	Unidentified warbler	*Unidentified Dandroica*
	Unidentified hummingbird	*Unidentified hummingbird*
	Unidentified thrush	*Unidentified thrush*
	Black-whiskered vireo	*Vireo altiloquus*
	White-eyed vireo	*Vireo griseus*
	Red-eyed vireo	*Vireo olivaceus*
	Blue-headed vireo	*Vireo solitarius*
	Hooded warbler	*Wilsonia citrina*
	Mourning dove	*Zenaida macroura*
Mammals	Coyote	*Canis latrans*
	Nine-banded armadillo	*Dasypus novemcinctus*
	Opossum	*Didelphis virginiana*
	River otter	*Lutra canadensis*
	Bobcat	*Lynx rufus*
	Eastern woodrat	*Neotoma floridana*
	White-tailed deer	*Odocoileus virginianus*
	Rice rat	*Oryzomys palustris*
	Cotton mouse	*Peromyscus gossypinus*
	Raccoon	*Procyon lotor*
	Gray squirrel	*Sciurus carolinensis*
	Cotton rat	*Sigmodon hispidus*
	Feral pig	*Sus scrofa*
	Marsh rabbit	*Sylvilagus palustris*
	Unidentified skunk	*Unidentified skunk*
	Red fox (New World)	*Vulpes fulva*
Fish	Pirate perch	*Aphredoderus sayanus*
	Sheepshead minnow	*Cyprinodon variegatus*
	Lake chubsucker	*Erimyzon sucetta*
	Swamp darter	*Etheostoma fusiforme*
	Golden topminnow	*Fundulus chrysotus*
	Marsh killifish	*Fundulus confluentus*
	Seminole killifish	*Fundulus seminolis*
	Eastern mosquitofish	*Gambusia holbrooki*
	Least killifish	*Heterandria formosa*
	Flagfish	*Jordanella floridae*
	Longnose gar	*Lepisosteus osseus*
	Warmouth	*Lepomis gulosus*

Table 3–14. List of Wildlife Species Present in the Tarmac King Road Limestone Mine and Mitigation Areas (*continued*)

Group Name	Common Name	Scientific Name
Fish (continued)	Bluegill	*Lepomis macrochirus*
	Dollar sunfish	*Lepomis marginatus*
	Redear sunfish	*Lepomis microlophus*
	Spotted sunfish	*Lepomis punctatus*
	Unidentified sunfish	*Lepomis sp.*
	Bluefin killifish	*Lucania goodei*
	Smallmouth bass	*Micropterus dolomieui*
	Largemouth bass	*Micropterus salmoides*
	White mullet (silver mullet)	*Mugil curema*
	Golden shiner	*Notemigonus crysoleucas*
	Sailfin molly	*Poecilia latipinna*
	Redfish	*Sciaenops ocellatus*
	Atlantic needlefish	*Strongylura marina*
Reptiles	Florida cottonmouth	*Agkistrodon piscivorus conanti*
	American alligator	*Alligator mississippiensis*
	Green anole	*Anolis carolinensis*
	Brown anole	*Anolis sagrei*
	Southern black racer	*Coluber constrictor priapus*
	Eastern diamondback rattlesnake	*Crotalus adamanteus*
	Chicken turtle	*Deirochelys reticularia*
	Southern ringneck snake	*Diadophis punctatus punctatus*
	Eastern indigo snake	*Drymarchon corais couperi*
	Gopher tortoise	*Gopherus polyphemus*
	Florida mud turtle	*Kinosternon subrubrum steindachneri*
	Florida kingsnake	*Lampropeltis getula*
	Peninsula intergrade kingsnake	*Lampropeltis getula intergrade*
	Scarlet kingsnake	*Lampropeltis triangulum elapsoides*
	Eastern coral snake	*Micrurus fulvius fulvius*
	Gulf salt marsh snake	*Nerodia clarkii*
	Eastern glass lizard	*Ophisaurus ventralis*
	Five-lined skink	*Plestiodon fasciatus*
	Southeastern five-lined skink	*Plestiodon inexpectatus*
	Florida cooter	*Pseudemys floridana*
	Ground skink	*Scincella lateralis*
	Dusky pygmy rattlesnake	*Sistrurus miliarius barbouri*
	Common musk turtle	*Sternotherus odoratus*
	Stinkpot	*Sternotherus odoratus*

Table 3–14. List of Wildlife Species Present in the Tarmac King Road Limestone Mine and Mitigation Areas (*continued*)

Group Name	Common Name	Scientific Name
Reptiles (continued)	Florida box turtle	*Terrapene carolina bauri*
	Blue stripe ribbon snake	*Thamnophis sauritus nitae*
	Peninsular ribbon snake	*Thamnophis sauritus sackeni*
	Bluestripe garter snake	*Thamnophis sirtalis similis*
	Yellow-bellied slider	*Trachemys scripta scripta*

Source: ENTRIX 2009b.

3.5.2 Threatened and Endangered Species

This section includes a discussion of known federally and state-listed species that may occur in the *King Road EIS* area. The federally listed threatened and endangered species observed in the area are the wood stork (*Mycteria americana*) and eastern indigo snake (*Drymarchon corais couperi*). These are discussed further below. Suitable habitat for most other protected species listed by FWS as likely occurring in Levy County is not found within the proposed mine and mitigation parcels of the *King Road EIS* area. These species include the Florida scrub jay (*Aphelocoma coeruluscens*), red-cockaded woodpecker (*Picoides borealis*), West Indian manatee (*Trichechus manatus*), and Gulf sturgeon (*Acipenser oxyrinchus desotoi*), as well as several species of sea turtle. Due to this lack of suitable habitat, these species are not anticipated to occur within the mine or mitigation areas. Suitable habitat for the endangered Florida salt marsh vole (*Microtus pennsylvanicus duke-campbelli*) appears to exist only in areas planned for preservation within the proposed mitigation area, but this species has not been observed on the site. The Florida panther was discussed previously in Section 3.5.1. The American alligator experienced rapid recovery under protected status and is no longer listed as threatened or endangered (52 FR 21059).

The Florida black bear is the only state-listed threatened animal species that likely occurs in the *King Road EIS* area (FNAI 2009). The *King Road EIS* area is characterized by the Florida Fish and Wildlife Conservation Commission as “secondary range” for the black bear, meaning the area is important to maintaining movement of bears between areas considered “primary range,” where there is a core population and evidence of reproduction (FFWCC 2009b). The saw palmetto (*Serenoa repens*), upon which the Florida black bear is heavily dependent for food and cover (Maehr *et al.* 2001), is the most common shrub species in the natural mesic hammocks of the *King Road EIS* area (ENTRIX 2009b).

The gopher tortoise (*Gopherus polyphemus*) and short tail snake (*Stilosoma extenuatum*) are state-listed threatened species that potentially occur in the *King Road EIS* area (FNAI 2009). One active gopher tortoise burrow was observed on the far eastern border of the *King Road EIS* area (ENTRIX 2009b), but preferred habitat does not occur in the *King Road EIS* area for the gopher tortoise and species commonly associated with tortoise burrows, namely the gopher frog (*Rana capito*), Florida mouse (*Podomys floridanus*), Florida pine snake (*Pituophis melanoleucus mugitas*), and short tail snake. The gopher tortoise prefers well-drained sandy soils in transitional areas, such as forest and grassy areas (FWS 1990). Although these species are reported to potentially occur in the larger region containing the *King Road EIS* area (FNAI 2009), the preferred habitat for these species is more likely to occur in the uplands to the east where the soil profile is typically thicker before encountering limestone or groundwater.

Wood Stork (*Mycteria americana*)

The wood stork, a federally listed endangered species, has been observed in the *King Road EIS* area (ENTRIX 2009b). In 1984, FWS listed the U.S. breeding population of the wood stork as endangered in the state of Florida under the Endangered Species Act. FWS approved a revised recovery plan for the U.S. wood stork breeding population in 1997. The wood stork’s foraging, nesting, breeding, and habitat preferences are summarized in the *Revised Recovery Plan for the U.S. Breeding Population of the Wood Stork* (FWS 1997). In December 2012, the FWS proposed to reclassify the continental U.S. breeding

population of wood storks from endangered to threatened (77 FR 75947). As of June 19, 2013, no final decision has been rendered.

Two wading bird roosts containing wood storks, as well as great egrets (*Ardea alba*) and white ibises (*Eudocimus albus*), were found in the mitigation area within approximately 2 miles of the mine area (ENTRIX 2009b). Over a 10-month period, Biological Research Associates recorded 20 wood storks each at these two roosting sites, and 78 wood storks overall were observed in the proposed mitigation area. No wood storks were observed foraging in wetlands on the proposed mine site (ENTRIX 2010). Roosting sites with 20 to 25 birds are considered "moderately important" in the revised recovery plan (FWS 1997). The birds not observed at the wood stork roosting sites were likely from the nearby colonies because wood storks generally forage in wetlands within an approximately 6- to 12-mile radius (FWS 1997). FWS uses a 13-mile radius from the colony site for the wood stork colony core foraging area in north Florida (including Levy County), and a 15-mile radius for central Florida (including Citrus County) (FWS 2007). Wood storks prefer to forage for fish in a wide variety of wetland types with open, calm water that is shallow and free of dense vegetation. Additional foraging areas include depressions in cypress heads and swamp sloughs (USACE 2006). Sloughs, intermittent flow-ways, streams, waterways, freshwater marshes, and cypress swamps represent less than 5 percent of the vegetation habitat types in the *King Road EIS* mine and mitigation areas (see Table 3–11).

Wood storks nest colonially in mangrove, cypress, and various other living or dead shrubs or trees located in standing water (swamps) or on islands surrounded by relatively broad expanses of open water. There is no evidence that the two roosting sites in the *King Road EIS* area where wood storks have been observed are breeding colonies, and the roosting sites in the *King Road EIS* area are not being monitored by FWS (FWS 2010). Wood stork nesting colonies were identified in northern Levy County and northern Citrus County (see Figure 3–15); both colonies are located approximately 25 miles from the *King Road EIS* area, and the core foraging areas around these colonies do not reach into the *King Road EIS* area (FWS 2007). Tree islands, willow heads, and other nesting habitats preferred by the wood stork are not abundant in the *King Road EIS* area (see Table 3–11).

Eastern Indigo Snake (***Drymarchon corais couperi***)

The eastern indigo snake was listed as threatened by FWS in 1978. This snake is widely distributed throughout central and southern Florida, but occurs primarily in sandhill habitats in northern Florida and southern Georgia (FWS 1999). The eastern indigo snake prefers upland habitats (FWS 1999). The snakes require shelter from winter cold and desiccating conditions. They prefer gopher tortoise burrows where available, but will use hollowed root channels; hollow logs; or burrows of rodents, armadillo (*Dasypus novemcinctus*), or land crabs (*Cardisoma guanhumi*) (FWS 1999). No critical habitat rules have been published by FWS for the eastern indigo snake. The proposed mining footprint appears to contain suitable habitat for the eastern indigo snake and three specimens were observed: one on the mine site and two immediately east of the mine site (ENTRIX 2010). Protective measures to minimize potential adverse effects on the eastern indigo snake include the creation and distribution of educational materials regarding eastern indigo snake identification, biology, and habitat requirements (FWS 1999).

3.5.3 State Species of Special Concern

The state species of special concern animals found or likely to be found in the *King Road EIS* area include the snowy egret (*Egretta thula*), tricolor heron (*Egretta tricolor*), little blue heron (*Egretta caerulea*), white ibis, reddish egret (*Egretta rufescens*), limpkin (*Aramus guarauna*), roseate spoonbill (*Ajaia ajaja*), and osprey (*Pandion haliaetus*) (FNAI 2009). Two wading bird roosts and an osprey nest occur in the mitigation area (ENTRIX 2009b). Preferred habitat for the fox squirrel, which was not observed at the site (ENTRIX 2009b) but potentially occurs there (FNAI 2009), is more likely to occur in the uplands to the east. The salt marsh habitat for Scott's seaside sparrow (*Ammodramus maritimus peninsulae*), a state species of special concern potentially occurring in the area (FNAI 2009), occurs nearer to the coast, along the western boundaries of the *King Road EIS* area.

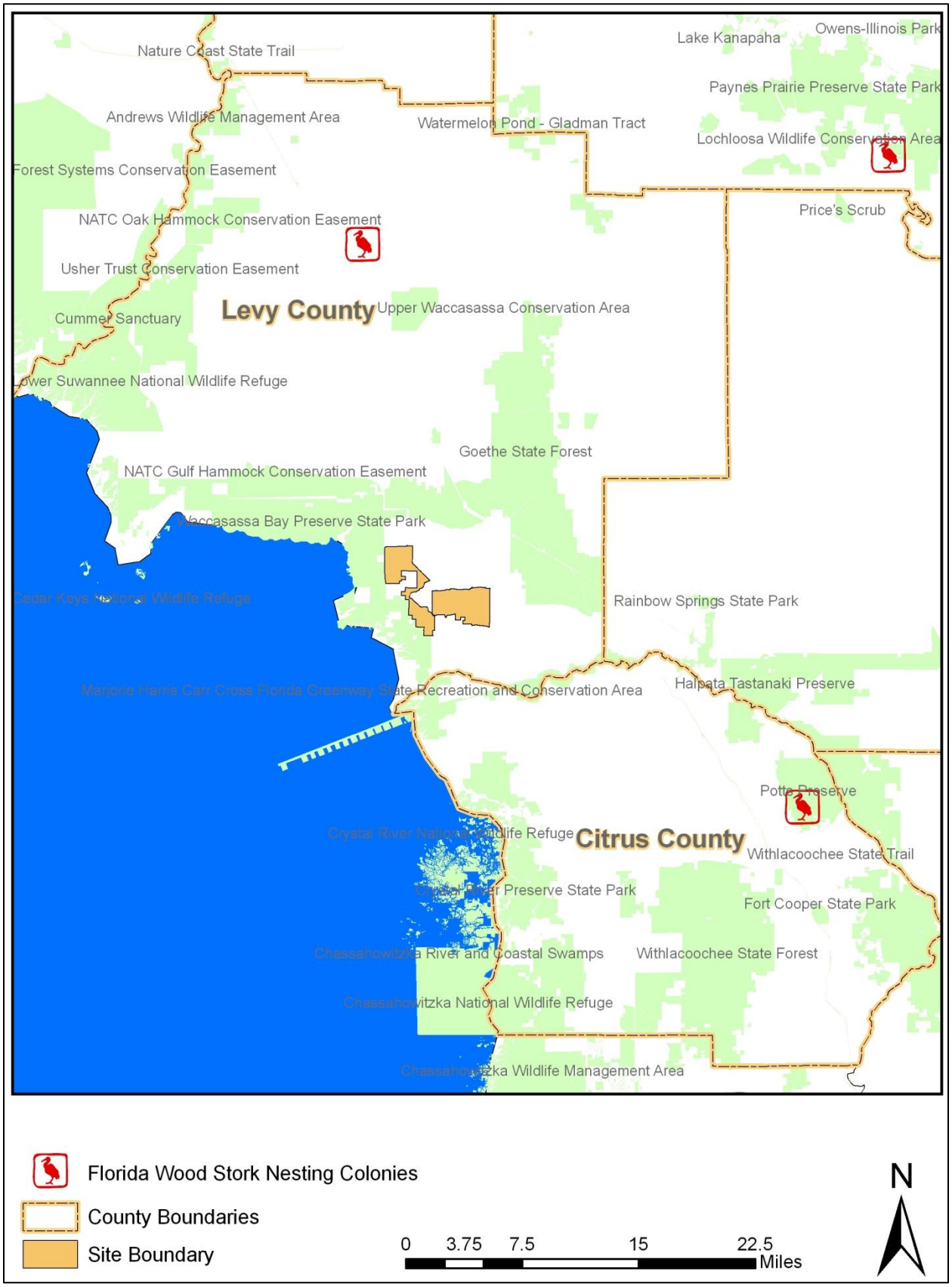


Figure 3–15. U.S. Fish and Wildlife Service Monitored Wood Stork Nesting Colonies

3.6 GEOLOGY AND SOILS

3.6.1 Topography

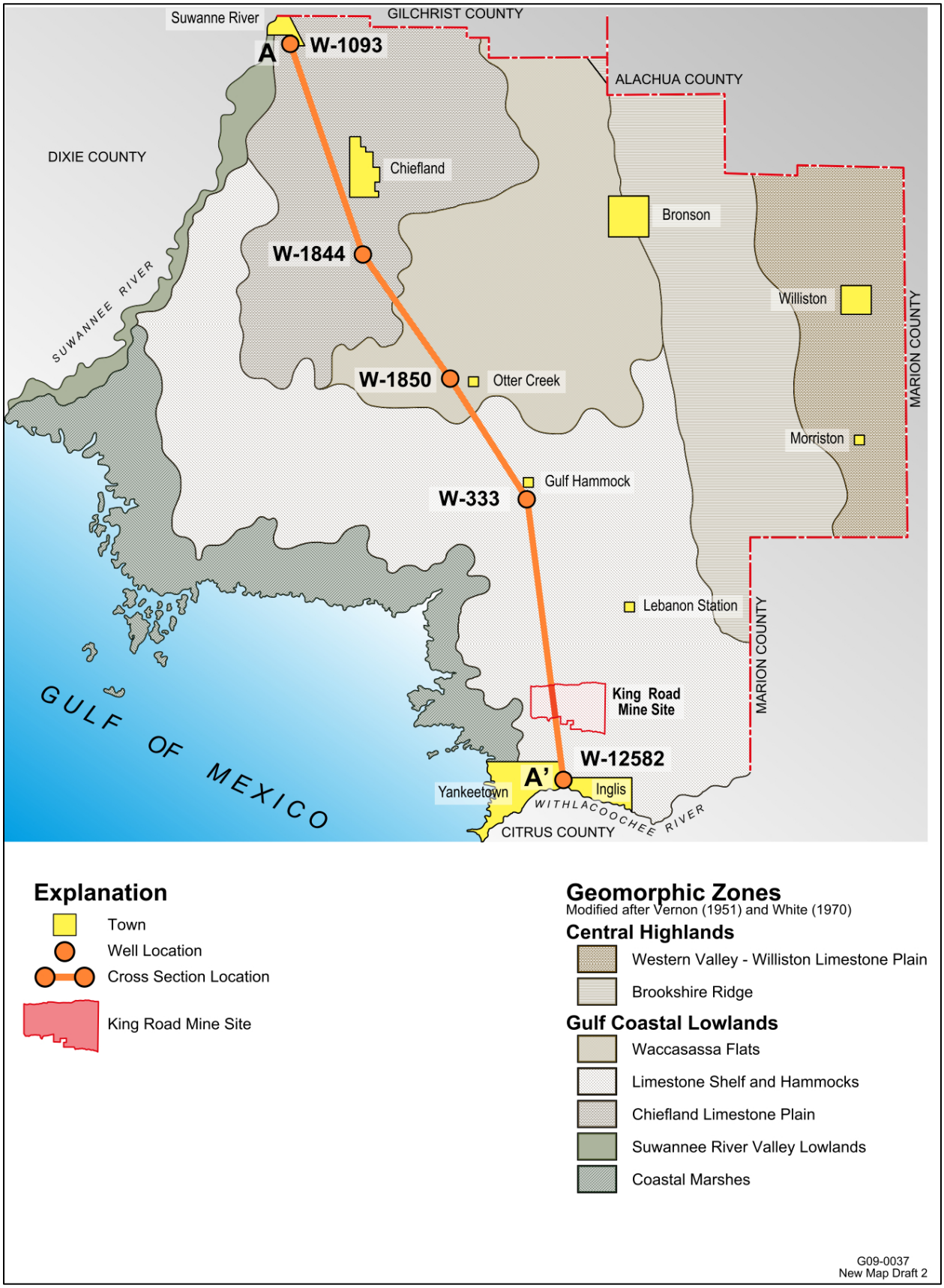
The topography of a landscape is a reflection of the geologic processes that have acted on the land and can be described in terms of the geomorphology of the area. The geomorphology of an area (specifically in the west-central Florida region) reflects the erosion (removal) or addition (deposition) of rock layers, the mechanical and chemical changes to the rock over time (e.g., cementation, fracturing, and dissolution), and the many other geologic processes that occur over spans of geologic time. For example, carbonate type rocks, such as limestones and dolostones that predominate in Florida, are easily dissolved by weak naturally occurring acids in rainwater, thus creating voids, cavities, and caverns in the rock. The result is a landform called karst, which is characterized by the presence of springs and sinkholes and the absence of a well-developed surface-drainage system. As discussed in the following sections, the Tarmac King Road Limestone Mine site is within an area having many landforms indicative of past geologic changes, including karst development.

The Mid-peninsular zone of Florida is subdivided into two geomorphic subzones: the Central Highlands and the Gulf Coastal Lowlands and Hammocks (see Figure 3–16). The Central Highlands are characterized by a series of localized highlands and ridges interspersed with lower-elevation valleys, each of which trend parallel to the coast down the central Florida peninsula (Rupert 1988). Two geomorphic subdivisions of the Central Highlands are present in eastern Levy County: the Western Valley and Brooksville Ridge (see Figure 3–16). The Brooksville Ridge is of interest in this EIS as it lies to the east of the Tarmac King Road Limestone Mine site and within the groundwater model domain, as discussed in Section 3.1. The Brooksville Ridge is a topographic highland in eastern Levy County that trends north to south and comprises sediments, primarily sand. Surface elevations along the ridge range from 60 feet mean sea level (MSL) at the western edge to approximately 135 feet MSL along the crest.

The Gulf Coastal Lowlands and Hammocks geomorphic zone parallels the present coastline and is characterized by broad, flat marine erosional plains underlain by limestone. In the vicinity of Levy County, the Lowlands extend inland from the Gulf of Mexico shoreline a distance of between 15 and 30 miles, terminating at the western edge of the Brooksville Ridge (see Figure 3–16) (Rupert 1988). The sediments in the Lowlands consist of a thin surface veneer of sand and clayey sand that overlies limestone (Lane *et al*. 1988). Elevations within the Gulf Coastal Lowlands and Hammocks zone in Levy County range from 0 feet MSL at the gulf shoreline to about 60 feet MSL near the Brooksville Ridge.

As indicated in Figure 3–16, the Tarmac King Road Limestone Mine site lies within the Limestone Shelf and Hammocks subzone, an area characterized by highly karstic, erosional limestone plain overlain by sand dunes, ridges, and, coast-parallel paleoshoreline sand belts. Numerous artesian springs flow from the near-surface limestone, and, during periods of heavy rainfall, much of the area floods to form a shallow swamp. Drainage from the coastal hammocks occurs through numerous small creeks and sloughs, which flow into the coastal marshes (Rupert 1988).

Examination of the USGS topographic map for the mine site indicates elevations of approximately 15 feet MSL along the eastern edge of the mine, with a very gradual decline to 5 feet MSL to the west. A mapping of the surface topography of the mine site was completed using an aircraft-deployed LIDAR remote-sensing device. This system is capable of collecting topographic elevation data of a high resolution. Data from this survey indicate an average elevation of 11.4 feet across the survey area (e.g., the mine site plus a border area) with a range from 44.5 feet MSL to approximately 0 feet MSL.



Source: Rupert 1988.

Figure 3–16. Geomorphic Zones of Levy County

3.6.2 Sea-Level Change

The actual height of sea level fluctuates slowly based on a number of natural and anthropogenic influences. As the earth goes through natural periods of warming and cooling, the sea level responds accordingly by falling as more ice is formed in the polar ice caps/glaciers and rising when more of these ice caps/glaciers melt. Normally, these warming and cooling periods result in sea-level changes measured in fractions of an inch per year. However, as a result of a combination of natural warming and the increased burning of fossil fuels, the earth's temperature over the last 200 years has been rising slowly. In response, the sea level across the globe has been steadily rising. This rising sea level is expected to continue at the current rate at a minimum and possibly increase as more of the ice in the Polar Regions melts.

Based on the timeframes over which the proposed mining would occur, it is reasonable to evaluate whether sea-level change has the potential to affect the Tarmac King Road Limestone Mine site or mitigation area. Current USACE guidance, USACE Circular EC-1165-2-212 (USACE 2011), indicates whether and how sea-level change considerations should be incorporated in USACE Civil Works programs. The guidance provides an approach for predicting sea-level change based on a range of possible future scenarios, which can then be compared to project conditions to evaluate potential risks. For USACE Civil Works projects, these risks would be considered in the planning and engineering design phase to determine if modifications to accommodate anticipated sea-level change and/or reduce associated risks would be warranted.

The USACE approach acknowledges the high degree of uncertainty in making predictions about future sea-level conditions. Uncertainties are addressed through predictions of sea-level change based on several different possible future scenarios; there are uncertainties in predicting which, if any, of the possible future scenarios could actually occur, and there are uncertainties in pinpointing the magnitude of anticipated changes that would be associated with each scenario. The approach also does not factor in other influences, such as changing rates of local land movements (i.e., approach assumes current documented rates of vertical land motion would continue). Finally, the approach considers change in mean sea level and does not address changes in tide range, storm conditions, and other factors that could affect the influence of the sea on the land above and beyond the location of mean sea level.

The USACE approach provides four scenarios: Baseline, Low, Intermediate, and High. The USACE is directed to consider Baseline, Low, and High for Civil Works projects. Taken in succession, each of these scenarios builds upon the last by including more variables in an effort to refine the predictions of how sea level might change (for example, the melting of Antarctic and Greenland ice caps). As each variable is added, the predicted sea level becomes successively higher, but at the same time includes a higher degree of uncertainty.

This approach has been applied to an evaluation of possible future shoreline locations to assess potential impacts of sea-level change on Tarmac's proposed mining site and mitigation area. This specific application of the USACE guidance requires two steps: (1) implementation of the sea-level change calculations provided in the USACE guidance to determine possible future sea-level rise for baseline (herein termed "low"), low (herein termed "intermediate"), and high sea-level change scenarios for the project area and (2) mapping the predicted sea-level rise conditions on available topographic data with the project site superimposed.

The following is a brief description of each scenario and the variables used.

> The low scenario uses historical data to predict sea-level rise. It assumes that future sea-level rise will increase at a rate consistent with historical data. The mean sea level trend for the region of the Gulf Coast that lies adjacent to the Tarmac mining and mitigation areas was determined based on historical tide data from the U.S. tide station located closest to the project site, which is the Cedar Key, Florida, tide station (No. 8727520). The mean sea level trend for this location is an increase of 1.80 ± 0.19 millimeters per year (mm/yr) (95 percent confidence intervals), based on monthly mean sea level data from 1914 to 2006 (NOAA 2011). Compared to eustatic sea level rise of 1.7 mm/yr, the regional value indicates vertical land subsidence of 0.1 mm/year (1.8 mm/yr – 1.7 mm/yr).

Vertical land subsidence results in an effective increased rate of inundation by the rising global sea level.

The intermediate scenario depicts a more rapid rate of sea-level rise. It includes such variables as the most recent predictions in global temperature change from the Intergovernmental Panel on Climate Change, as well as predictions from the National Research Council (NRC). This scenario predicts changes in sea level using NRC Curve I plus the added effect of localized vertical land movement. Information provided in the USACE guidance document was used to generate approximate 95 percent confidence intervals for this scenario.

The high scenario depicts the greatest rate of sea-level rise. In addition to considering the Intergovernmental Panel on Climate Change, NRC data, and vertical land movement, this scenario also takes into account potential ice melt from glaciers in Antarctica and Greenland. This scenario predicts changes in sea level using NRC Curve III plus the added effect of localized vertical land movement. There were insufficient data to calculate the 95 percent confidence intervals for this scenario. Based on the uncertainties in the NRC curve, the 95 percent confidence intervals for the high scenario are expected to be larger than for the other scenarios.

For each scenario, low, intermediate, and high potential sea-level change, the rise in sea level for the coast in the vicinity of the project area was predicted for timeframes of 10, 25, 50, 75, and 100 years from the expected commencement of mining activities in 2012. To most accurately relate predicted sea-level change to available topography, the total timeframes for use in the USACE equations were calculated from the date of the most recent, available topography data, or 2007. Predicted sea-level rise for each model scenario for each project timeframe is shown in Table 3–15.

Table 3–15. Predicted Sea-Level Change for Project Area for Various Timeframes Following Project Start

Project Timeframe	Sea-Level Rise Scenario					
	High	**High-Corrected Regional Tide Datum**	**Intermediate (95% CI)**	**Intermediate-Corrected Regional Tide Datum**	**Low (95% CI)**	**Low-Corrected Regional Tide Datum**
10 years	0.11 m	0.04 m	0.05 m (± 0.025)	–0.02 m (± 0.025)	0.027 m (± 0.0029)	–0.05 m (± 0.0029)
	0.37 ft	0.14 ft	0.15 ft (± 0.082)	–0.08 ft (± 0.082)	0.089 ft (± 0.009)	–0.15 ft (± 0.009)
25 years	0.27 m	0.20 m	0.10 m (± 0.05)	0.03 m (± 0.05)	0.054 m (± 0.057)	–0.02 m (± 0.057)
	0.89 ft	0.66 ft	0.34 ft (± 0.16)	0.11 ft (± 0.16)	0.18 ft (± 0.019)	–0.06 ft (± 0.019)
50 years	0.64 m	0.57 m	0.22 m (± 0.085)	0.16 m (± 0.085)	0.099 m (± 0.001)	0.02 m (± 0.001)
	2.1 ft	1.87 ft	0.74 ft (± 0.28)	0.51 ft (± 0.28)	0.32 ft (± 0.034)	0.08 ft (± 0.034)
75 years	1.12 m	1.06 m	0.37 m (± 0.11)	0.30 m (± 0.11)	0.144 m (± 0.015)	0.07 m (± 0.015)
	3.7 ft	3.47 ft	1.2 ft (± 0.37)	0.97 ft (± 0.37)	0.47 ft (± 0.005)	0.22 ft (± 0.005)
100 years	1.74 m	1.67 m	0.55 m (± 0.14)	0.48 m (± 0.14)	0.19 m (± 0.002)	0.11 m (± 0.002)
	5.7 ft	5.47 ft	1.82 ft (± 0.45)	1.59 ft (± 0.45)	0.62 ft (± 0.065)	0.36 ft (± 0.065)

Key: %=percent; CI=confidence interval; ft=feet; m=meters.
Note: 10-year changes were not depicted graphically because they would not be visible at the resolution of the figures.

The current sea level along the coastline bordering the Tarmac King Road Limestone Mine site is depicted in Figure 3–1. The current coastline is more than 1.7 miles from the closest point to the Tarmac mitigation area and nearly 4 miles from the Tarmac King Road Limestone Mine site. However, the immediate coastal plain is relatively flat, rising only around 1 foot between the coast and the mitigation area.

The predicted sea-level rise increments for each scenario and project timeframe were plotted on a topographic map for the region generated with FDEP 2007 LIDAR elevation data downloaded from the National Oceanic and Atmospheric Administration Digital Coast website and imported into ArcMap 10. The elevation data were provided in feet with reference to the North American Vertical Datum of 1988 (NAVD88), and have a vertical resolution of 0.6 feet. The elevation points were converted into shapefile format, and the individual elevation values associated with each scenario and time period were extracted from the data set and contoured.

Correlating the NAVD88 datum with the regional tidal datum requires use of a correction factor that is available from National Oceanic and Atmospheric Administration data. Specifically, the correction for this location (based on the Cedar Key, Florida, tide gage) is –0.23 feet (from NOAA 2005). This means that to depict projected sea-level rise accurately with respect to regional mean sea level, contours based on the original topographic data would need to be corrected or the predicted shoreline locations would need to be shifted waterward for a vertical relief change of 0.23 feet. This was not done on the graphs but would result in a small shift in location of each of the predicted shorelines to the left or waterward on each figure. Table 3–15 presents predicted shoreline elevations according to the NAVD88 datum, as well as the regional corrected tidal datum so the difference in elevations can be compared.

The predicted sea-level contours for the low, intermediate, and high scenarios 25, 50, 75, and 100 years from the start of mining are depicted in Figures 3–17 through 3–20. Note that sea-level contours are not presented graphically at 10 years because the predicted rise is too small to be discernible. The 95 percent confidence intervals for the low and intermediate scenarios are not presented because they are small and within the accuracy of the line itself.

Results indicate no overlap of the predicted shoreline with the mitigation or mining area boundary for any of the timeframes evaluated for the low sea-level rise scenario.

For the intermediate sea-level rise scenario, the predicted shoreline would have a slight overlap with the western boundary of the mitigation area by the 75-year project timeframe (see Figure 3–19), with a slight westward movement through year 100 (see Figure 3–20). The overlap could be characterized as slight with respect to the entire mitigation area, with small areas of overlap occurring in both the northern and southern portions of the mitigation area.

For the high sea-level rise scenario, the predicted shoreline would be located in close proximity to the western mitigation boundary in the 25-year project timeframe (see Figure 3–17). It would overlap with the mitigation area by the 50-year timeframe (see Figure 3–18), with successively greater encroachment for the 75-year (see Figure 3–19) and 100-year (see Figure 3–20) timeframes. For the 100-year timeframe, the predicted shoreline would encompass the entire mitigation area and a small portion of the mining area. This potential impact on mining is discussed further in Chapter 4, Section 4.2.1.

The towns of Yankeetown and Inglis are located just south of the locations shown on Figures 3–17 through 3–20. Extrapolation of the contours further south would indicate that Yankeetown would be impacted by a sea-level rise of approximately 2.0 feet. This would occur within the first 50 years of mining for the highest scenario and between 75 and 100 years for the intermediate scenario. Inglis would not be directly impacted in any of the scenarios due to its height above sea level (approximately 10 feet).

The high degree of uncertainty in the sea-level change predictions is evident in the differences in projected shorelines for the low, intermediate, and high scenarios. This makes it problematic to incorporate the predictions into planning and/or configuration of the mitigation areas for the project. Relying on the worst-case predictions could be overly conservative and eliminate viable, valuable, and potentially long-lasting habitat improvements in the proposed mitigation area. Overlap of the predicted shoreline with the westernmost edge of the mitigation area is not predicted to occur under any of the sea-level change scenarios until the 50-year project timeframe (for the high or worst-case scenario only in this timeframe). Additionally, the predicted shoreline would not overlap with the mitigation area boundary at all for the low sea-level rise scenario for any timeframe up to and including 100 years, and for the intermediate sea-level rise scenario would only result in slight overlap with the western boundary of the mitigation area in the 100-year timeframe. This means that it would be suitable to consider an adaptive management approach to sequential implementation of the mitigation plan. Such an approach would consist of adjusting sea-level rise predictions through time based on the most current data and re-evaluating the potential for impacts on the mitigation area.

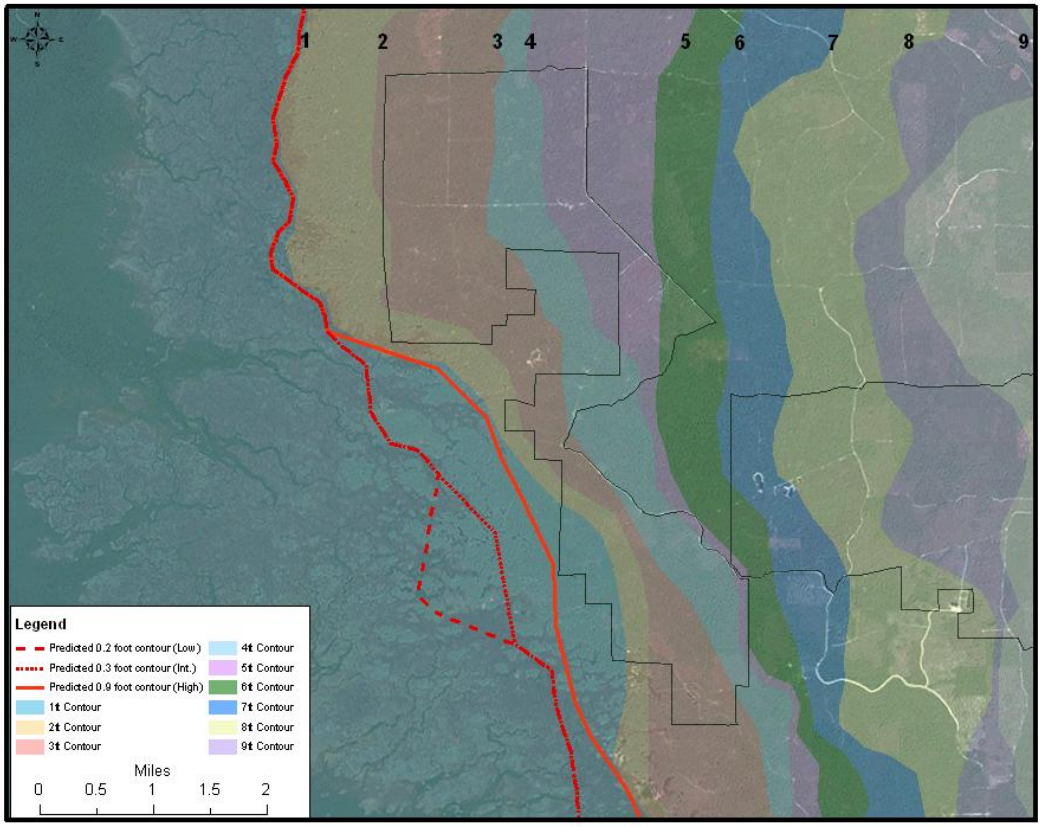


Figure 3–17. Predicted Sea-Level Contours at 25 Years for Scenarios: Low, Intermediate, and High

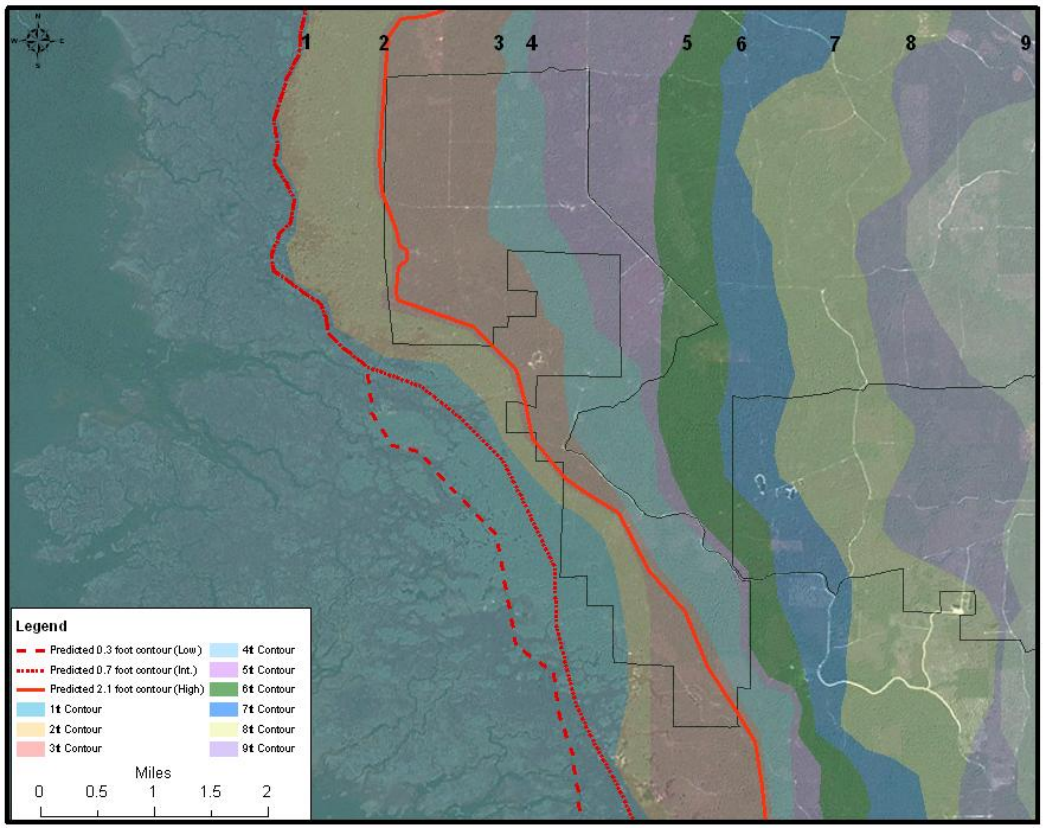


Figure 3–18. Predicted Sea-Level Contours at 50 Years for Scenarios: Low, Intermediate, and High

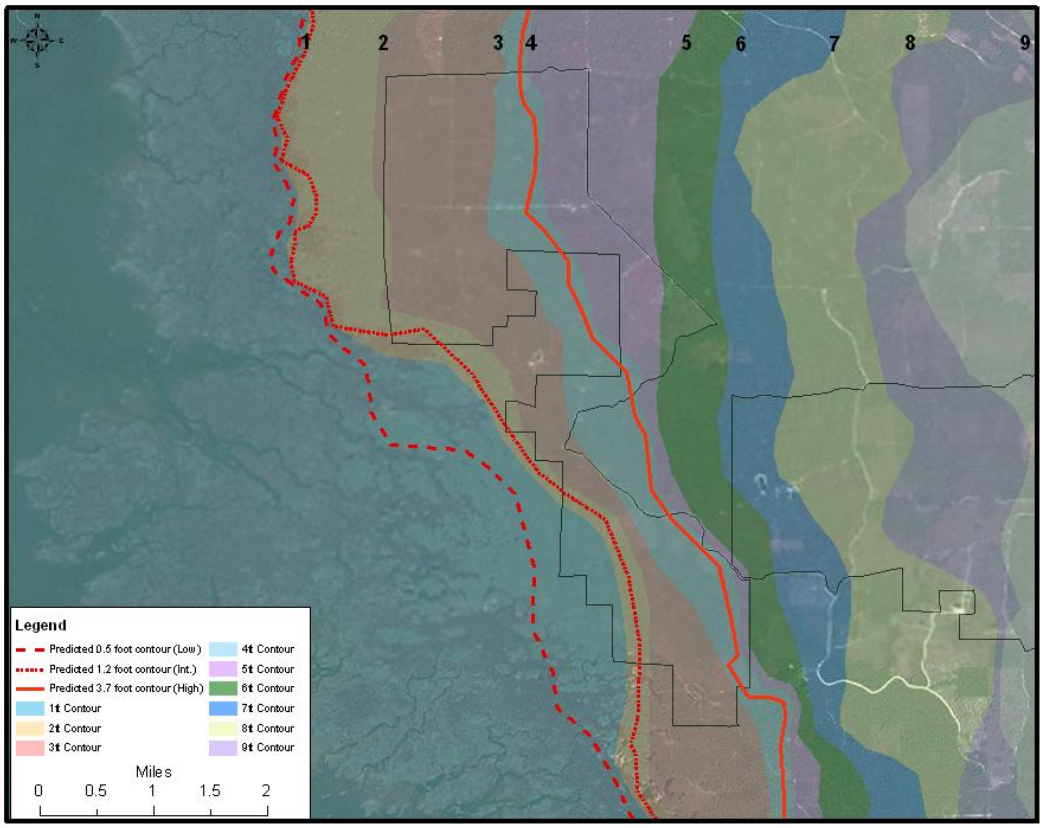


Figure 3–19. Predicted Sea-Level Contours at 75 Years for Scenarios: Low, Intermediate, and High

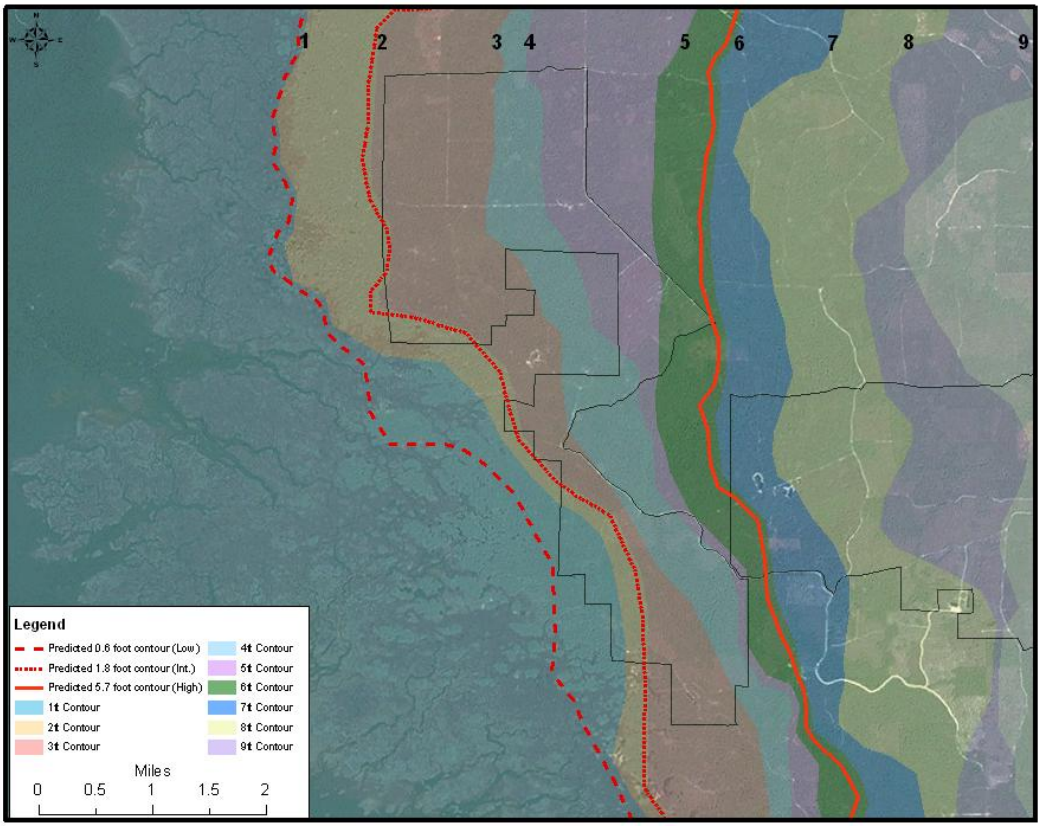


Figure 3–20. Predicted Sea-Level Contours at 100 Years for Scenarios: Low, Intermediate, and High

The shoreline change predictions computed here were compared to a figure (Kincaid 2009) showing a predicted year 2100 shoreline with respect to the mining and mitigation areas based on a predicted sea-level rise of 5.9 feet. That figure depicted the year 2100 shoreline inundating between one-third and one-half of the mitigation area. That figure was plotted on topographic data referenced to the National Geodetic Vertical Datum of 1929 (NGVD29). Differences between that figure and the 100-year shoreline provided in Figure 3–20 could be due to several factors. It is possible that the regional tidal datum correction was not applied to the figure in Kincaid (2009), which would have resulted in a shift of the projected shoreline by 0.5 vertical feet to the right; this would result in a prediction of increased inundation of the mitigation area and would be more comparable to the results for the worst-case scenario predicted here. It is also evident that there are differences in the topography from the two different data sets used; differences in contouring and also vertical resolution of the data would contribute to differences in comparisons between the two data sets.

Results of the shoreline change analysis cannot be directly correlated with predictions of future coastal habitat areas (e.g., Geselbracht *et al.* 2011). However, for any actual future shoreline location (mean sea level) there would be a range of intertidal habitats located to either side. Determining the width of that intertidal zone would require use of a different approach such as the SLAMM [Sea-Level Affecting Marshes Model] used in Geselbracht *et al.* (2011). Determining whether a future shoreline would be located within or in close proximity to the mitigation areas or mining site provides a first-order level of analysis of potential impacts. Given the uncertainty in where that future shoreline location may actually occur, predictions of future tidal ranges are uncertain as well.

3.6.3 West-Central Florida Geology

The modern Florida peninsula is the exposed part of a limestone platform formed by deposition of a thick sequence of sediments during multiple episodes of sea-level change. The platform is underlain by as much as 20,000 feet of sediments on a basement of igneous and sedimentary rock. Carbonate sedimentation (e.g., limestone and dolostone) predominated on most of the platform in the geologic past from the mid-Jurassic to mid-Oligocene time period (Scott 2001). The inflow of sediments bearing more siliciclastics (e.g., sand and silt) occurred over much of the platform during the mid-Oligocene to Holocene time period. Numerous disconformities (gaps in the geologic record) in the subsurface layers indicate periods of non-deposition and erosion in the stratigraphic section, the result of long-duration sea-level fluctuations.

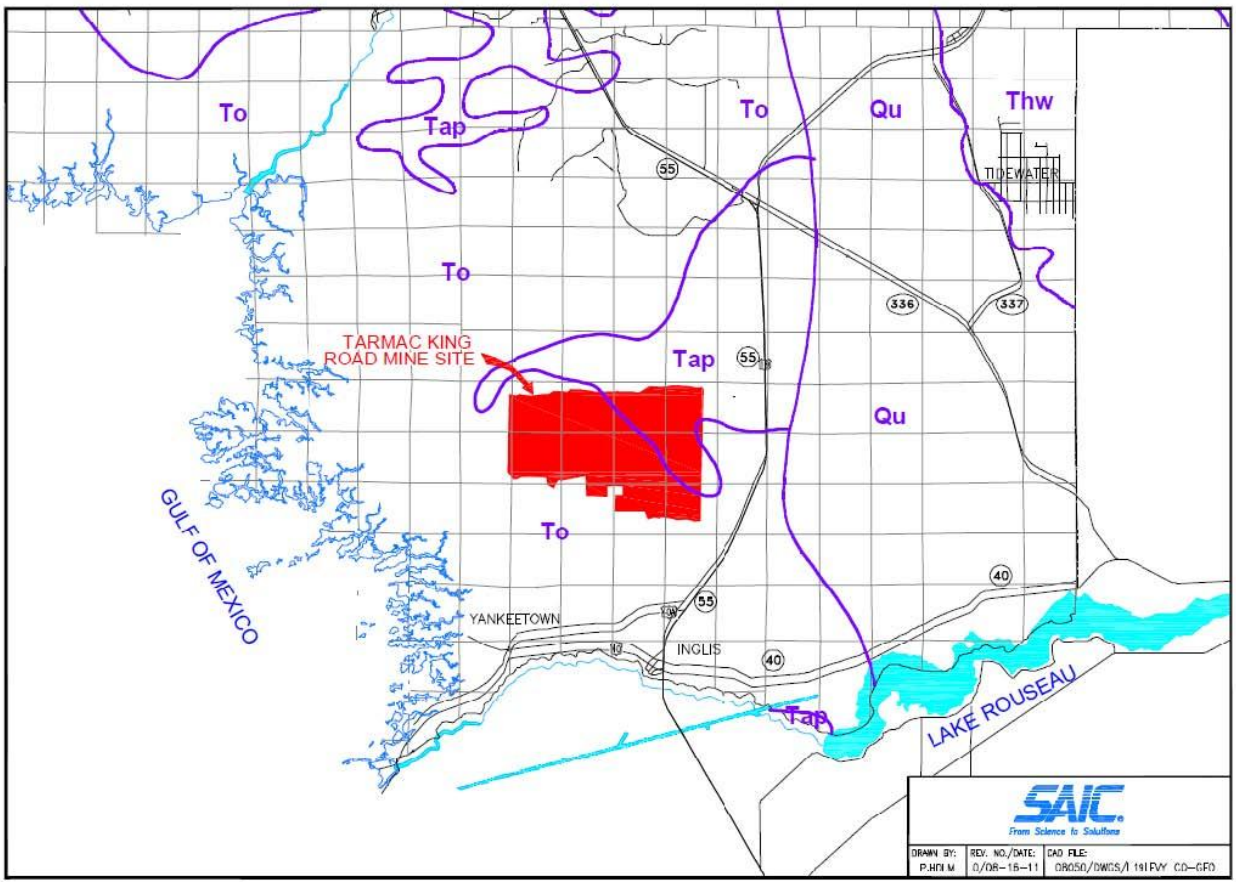
The west-central Florida area, specifically Levy County and the surrounding area, is underlain by a thick sequence of sedimentary rock, consisting of loosely consolidated sand, silt, clay, and more consolidated and hardened limestone and dolostone. Table 3–2 presents a generalized alignment of the geologic column for the west-central Florida area. Older rock formations are listed at the bottom with younger (in geologic time) formations progressing upward in the table.

The geologic formations of interest at the Tarmac King Road Limestone Mine site, progressing from oldest to youngest in geologic time, are the Middle Eocene Avon Park Formation, Late Eocene Ocala Limestone, and the Pliocene-Pleistocene to Recent undifferentiated deposits. The intervening geologic time series of the Oligocene and Miocene are missing in this area as these geologic times represent intervals of predominant erosion; therefore, no sediments were deposited and preserved.

3.6.3.1 Levy County and Mine Site Area Geology

The rock underlying Levy County and the Tarmac King Road Limestone Mine site consists of layers of three distinct ages: the Eocene Series Avon Park Formation, Ocala Limestone, and the Plio-Pleistocene Series undifferentiated sands. The following discussion draws heavily from the 1988 Florida Geological Survey reports on the geology and geomorphology of Levy County (Rupert 1988) and the descriptions provided with the Geologic Map of Florida (Scott 2001).

Figure 3–21 is extracted from *The Geologic Map of Levy County* (Florida Geological Survey 1992) with an overlay of the mine site outline. As shown, the area to be mined overlies the Tap and To areas. Tap is an abbreviation of the geologic formation name of Tertiary, Middle Eocene Avon Park with To indicating the Upper Eocene Ocala Formation. In relative geologic time scale, the Ocala Limestone is younger than the Avon Park Formation (e.g., deposited more recently than the Avon Park Formation); therefore, the Ocala Limestone typically overlies the Avon Park Formation. The youngest deposits in the map area are those designated as Qu, the undifferentiated Quaternary (Plio-Pleistocene Series) sediments that form a thin layer above the Tap and To areas. Table 3–2 illustrates the relative order of these units in geologic time.



Key: Qu=Quaternary undifferentiated; Tap=Tertiary Avon Park Formation; Thw=Tertiary Hawthorne Group (weathered/reworked); To=Ocala Limestone.
Source: Adapted from Florida Geological Survey 1992.

Figure 3–21. Geologic Map of Levy County and Mine Site Area

Various studies of Florida and Levy County geology contain the following lithologic descriptions of the Quaternary deposits, Ocala Limestone, and Avon Park Formation. A lithologic description includes the rock's typical physical properties in terms of color, hardness, major minerals, minor minerals, and distinguishing features, such as the presence of fossils.

Quaternary (Recent and Plio-Pleistocene-age) deposits consist of:

- "…light gray, tan, brown to black, unconsolidated to poorly consolidated, clean to clayey, silty, unfossiliferous, variably organic-bearing sands to blue-green to olive green, poorly to moderately consolidated, sandy, silty clays." (Open File Report 80, *Text to Accompany the Geologic Map of Levy County* [Scott 2001])

Ocala Limestone consists of:

- "….white to light gray to light orange limestone with diverse fossil assemblage. Accessory constituents include organics, clay, dolomite and chert." (Open File Report 81, *Lithostratigraphic and Hydrostratigraphic Cross Sections Through Levy-Marion to Pasco Counties, Southwest Florida* [Arthur, Lee, and Li 2001])

- "…nearly pure limestones and occasional dolostones. The lower member is composed of a white to cream-colored, fine to medium grained, poorly to moderately indurated, very fossiliferous limestone (grainstone and packstone). The upper member is white, poorly to well indurated, poorly sorted, very fossiliferous limestone." (Open File Report 80, *Text to Accompany the Geologic Map of Levy County* [Scott 2001])

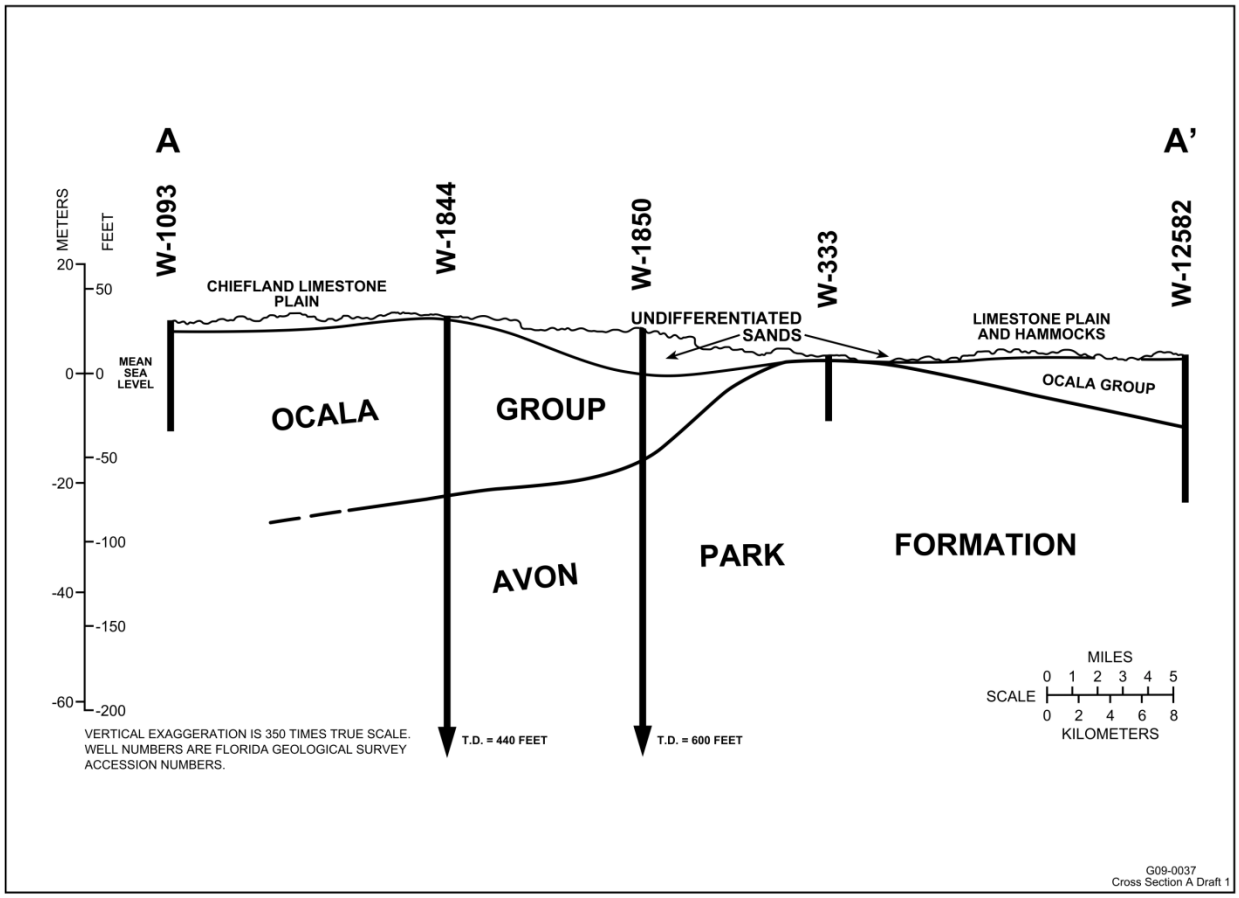
The Avon Park Formation consists of:

- "…of variably fossiliferous limestone. These limestones are interbedded with tan to brown, very poorly indurated to well indurated, very fine to medium crystalline, fossiliferous dolostones containing small quantities of organic material and peat." (Open File Report 80, *Text to Accompany the Geologic Map of Levy County* [Scott 2001])

- "…typically tan to buff to brown dolomite, frequently interbedded with white to light cream to yellowish gray limestones, and dolomitic limestones, and containing varying amounts of peat, lignite, and plan remains." (Open File Report 19, *Geology and Geomorphology of Levy County*, Florida [Rupert 1988])

- "…light gray to brown dolostones to cream to light-orange limestone with minor clay beds and dispersed organic laminations. Accessory minerals include chert, pyrite, and gypsum, with gypsum becoming more abundant with depth." (Open File Report 81, *Lithostratigraphic and Hydrostratigraphic Cross Sections Through Levy-Marion to Pasco Counties, Southwest Florida* [Arthur, Lee, and Li 2001])

A simplified cross-section model of the subsurface geology in Levy County is presented in Figure 3–22. Along this line of section, the Tarmac King Road Limestone Mine site should be placed south of Boring Well 333 and north of Boring Well 12582 in the Limestone Plain and Hammocks area. Notice the deepest wells penetrate but do not pass through the Avon Park Formation in this area.



Source: Rupert 1988.

Figure 3–22. Geologic Cross Section Depicting Relationship of Ocala Limestone (formerly Ocala Group) and Avon Park Formation

The oldest rock typically penetrated by water wells and likely to be encountered in the deepest rock quarry is the Middle Eocene age Avon Park Formation. The entire Middle Eocene is a time period of approximately 38 million years ago. The top of the Avon Park Formation varies in depth from surface outcrop to nearly 150 feet deep in northern and eastern Levy County. Wells drilled for oil exploration have penetrated the full thickness of the Avon Park Formation under Levy County with a range of approximately 800 to 1,100 feet. The economic importance of the Avon Park Formation is that it is reasonably durable and occurs directly beneath the Ocala Limestone in the northwest peninsula in Dixie, Citrus, and Levy Counties and throughout the Florida peninsula and the eastern panhandle. In most areas, the Avon Park Formation is too deep to be surface mined, but in Levy and Citrus Counties, several mining operations are removing this unit along with the overlying Ocala Limestone (FDOT 2007). As discussed in the following section, the Avon Park Formation is an important unit of the FAS.

As indicated in Figure 3–22, the Ocala Limestone overlies the Avon Park Formation and is therefore considered younger in geologic age (approximately 34 million years old). Ocala Limestone underlies almost all of Florida but is found at the land surface only in a small portion of the state where overburden is thin. In many areas, the surface of the Ocala Limestone has been deeply weathered by the removal of the soluble calcium carbonate by groundwater. Thickness of the Ocala Limestone under Levy County averages approximately 100 feet yet may be thinned in local areas by erosion in the geologic past. The depth to the irregular and highly solutioned top of the Ocala Limestone is generally less than 50 feet below land surface; however, in western Levy County, a thin layer of sand covers the limestone and exposures in the form of limestone boulders and pinnacle are common (Rupert 1988).

The Recent and Plio-Pleistocene-age deposits differ from underlying Ocala Limestone and deeper Avon Park Formation in not being a limestone-dominated interval. The lithology of the formation is highly variable, consisting of silicified limestone float, silicified wood, and occasional vertebrate fossils in a matrix

of cream to gray to greenish gray clays and phosphatic clays and quartz sandy phosphatic clay. As these sediments were deposited on the eroded, highly karstic surface of the Ocala Group, they have a highly variable thickness. These sediments are present as a thin layer all over Levy County; in the western part of the county, the sands are generally less than 20 feet thick and overlie the Ocala Group limestone.

3.6.4 Tarmac King Road Limestone Mine Site Soils

The soils of Levy County have been previously mapped based on patterns of soils (major units and minor units), relief, and drainage. The *Soil Survey of Levy County* (USDA 1996, 2010) provides detailed descriptions of soils and a general map that allows depiction of soil types in the Tarmac King Road Limestone Mine site, as shown in Figure 3–23. The soil survey describes the soils of the coastal limestone shelf area, in which the Tarmac King Road Limestone Mine site lies, as very poorly drained to somewhat poorly drained and as being sandy and loamy (USDA 1996). They occupy about 16 percent of Levy County and include the Wekiva, Demory, and Waccasassa soils. The soils found at the Tarmac King Road Limestone Mine site include the Wekiva, Demory, Waccasassa, and Chobee. The Waccasassa-Demory Complex occupies the majority of the site. A soil complex consists of two or more soils in such an intricate pattern or in such a small area they cannot be shown separately on a soil map.

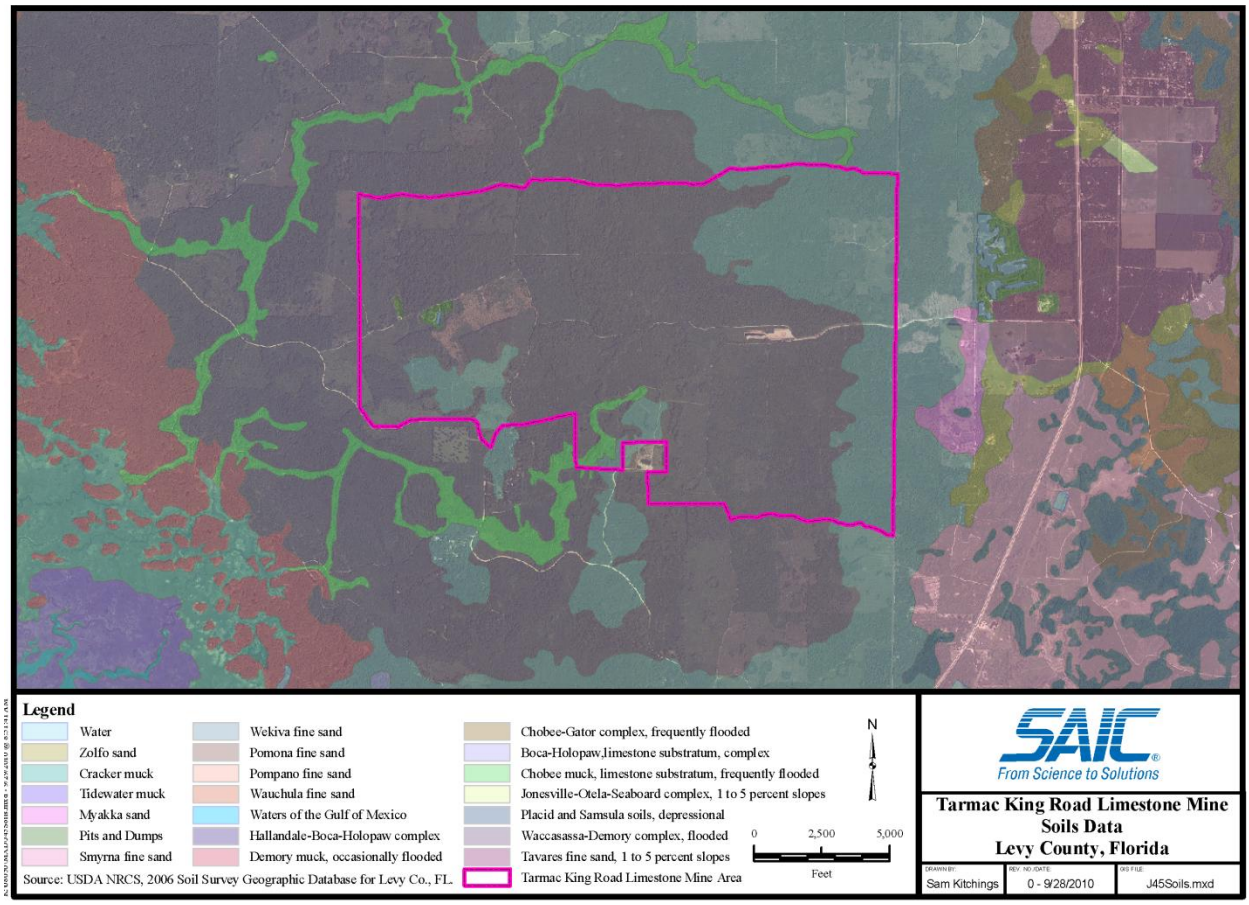


Figure 3–23. Tarmac King Road Limestone Mine Area Soils

Wekiva Fine Sand – These soils are shallow to moderately deep over bedrock and are not flooded. Typically, the surface layer is very dark gray fine sand about 4 inches thick. The subsurface layer to a depth of about 9 inches is grayish-brown fine sand. The subsoil to a depth of approximately 18 inches is yellowish-brown sandy clay loam. This soil type is found primarily along the eastern margin of the proposed mine site.

Waccasassa-Demory Complex – Waccasassa soils are shallow or very shallow over bedrock and are subject to rare flooding. Typically, the surface is covered by several inches of undecomposed leaf litter. The surface layer is very dark, grayish brown sandy clay loam to approximately 2 inches thick. The

subsoil to a depth of 12 inches is dark yellowish brown sandy clay loam. Demory soils are shallow or very shallow over bedrock and occasionally flooded. Typically, the surface layer is muck approximately 3 inches thick. The subsurface layer, to a depth of approximately 7 inches, is very dark grayish-brown sandy clay loam. The underlying material to a depth of approximately 9 inches is dark grayish-brown sandy clay loam.

Chobee Fine Sandy Loam – The Chobee series soils consist of deep or very deep, very poorly drained, frequently flooded soils that formed in loamy alluvial sediments. These soils are associated with Demory, Waccasassa, and Wekiva soils. An isolated area of this soil type was identified within the proposed mine area.

3.6.5 Seismicity

The Florida Plateau, located on the passive margin of the North American Plate, is characterized as a geologically and tectonically stable region (Lane 1994). Historically, Florida has experienced minimal earthquake activity. The active faults in Charleston, South Carolina, and the seismically active areas in the Caribbean were likely the source of approximately 30 tremors reported throughout Florida from 1727–1978 (Lane 1994). No earthquake has ever had its epicenter beneath Florida, although several have been felt in the state. The most recent earthquake to be felt occurred on September 10, 2006. It was a magnitude 6 with its epicenter in the Gulf of Mexico and was not linked to any specific fault (Florida Geological Survey 2010).

Seismic hazard maps for the southeastern United States indicate an earthquake peak horizontal ground acceleration of 0.02 *g*, with a 2 percent probability of exceedance in 50 years (USGS 2008). The hazard map suggests that Florida represents no reasonable expectation for seismic activity.

3.7 LAND USE

The Tarmac King Road Limestone Mine site consists of approximately 4,750 acres, or 7.5 square miles, located in southern Levy County, Florida, within the Gulf Hammock WMA (see Figure 3–24). The Tarmac King Road Limestone Mine is located approximately 5 miles north of Inglis, Florida, and is approximately 1.3 miles west of U.S. Route 19/98. King Road, the project site's main road, accessible by U.S. Route 19/98, runs east-west through the property. The 4,526-acre mitigation area is located adjacent to the Waccasassa Bay Preserve State Park (see Figure 3–24).

The project site consists of undeveloped land with the major land use in silvicultural (forestry) practices. Plum Creek Timber Company owns and manages the project site as part of the Gulf Hammock WMA in partnership with the Florida Fish and Wildlife Conservation Commission (FFWCC 2009c). The hunting season is the only time public access to the project site is granted: access requires appropriate licenses, permits, and stamps. A Progress Energy Florida power line is located directly adjacent to the project's eastern boundary (see Figure 3–24).

The 4,526-acre mitigation site, located adjacent to the Waccasassa Bay Preserve State Park's eastern border and adjacent to the southwestern boundary of the project mine site (see Figure 3–24), primarily consists of hydric coniferous plantations and coastal maritime hammock and provides habitat for a variety of birds, mammals, reptiles and invertebrates (a detailed discussion of the native vegetation and wildlife is included in Sections 3.4 and 3.5, respectively). Plum Creek Timber Company has stopped all harvesting of timber from the mitigation area (Tarmac King Road Mine Site Permit Application 2008) pending a decision on approval of the Tarmac King Road Limestone Mine. Land use of the surrounding project and mitigation site are detailed below:

- Silvicultural Practices – Silvicultural activities border most of the project area and continue through most of the WMA. Plum Creek Timber Company grows, harvests, and sells primarily softwood pine in the project area. The surrounding lands of the project area are in various stages of pine plantation, and the growth cycle for pine forests is an average of 25 years from planting to harvest (Plum Creek 2008).

- Rural Residential and Agricultural – Scattered rural residential areas surround the project boundary throughout the WMA. Rural residential and agricultural lots occur immediately south of, and also within a half-mile east of the project site just west of U.S. Route 19/98 (see Figure 3–24).

- Mining – A 36-acre inactive limerock mine is directly south of the project site. A larger, active mine exists approximately 4.2 miles south of the project site. A third, even larger mine exists approximately 5.8 miles south of the project site.

- Crystal River Energy Complex – The approximately 4,750-acre plant site is located approximately 8 miles south of the Tarmac King Road Limestone Mine project site and 3 miles south of the Withlacoochee River.

- Progress Energy Florida Levy Nuclear Plant – The 3,100-acre LNP site is located approximately 1.5 miles southeast of the Tarmac King Road Limestone Mine's southern boundary, directly east of U.S. Route 19/98 and approximately 4 miles north of the Levy-Citrus County border, (see Figure 3–24). The plant is in the application stage for a combined license for two pressurized-water nuclear power reactors. If approved, the site could be in operation by 2016 (PEF 2008). Currently, there is minimal construction occurring on the plant site.

Surrounding state-managed lands include the following:

- Gulf Hammock WMA – The Gulf Hammock WMA is an approximately 25,600-acre area, consisting mainly of hydric hammock plantations, in southwest Levy County (DSLSA, RCLS, and FNAI 2004). Both the Tarmac King Road Limestone Mine project site and mitigation area are partially enclosed within the WMA (see Figure 3–24). The WMA provides habitat for native wildlife such as birds, mammals, fish, amphibians, reptiles, and invertebrates. Section 3.5 further discusses wildlife relative to the project site and surrounding lands. Section 3.13 details recreational use of this WMA.

- Waccasassa Bay Preserve State Park – The Waccasassa Bay Preserve State Park covers over 32,000 acres of land; the park is adjacent to the mitigation area and approximately 1.4 miles west of the mine project site (see Figure 3–24). Section 3.13 details recreational use of the park.

- Big Bend Seagrasses Aquatic Preserve – The Big Bend Seagrasses Aquatic Preserve covers approximately 945,000 acres of undeveloped and submerged seagrasses near the western boundary of the Waccasassa Bay Preserve State Park (see Figure 3–24). The boundaries of the preserve include all tidal lands, islands, seagrass beds, shallow banks, and submerged bottoms from the mean high water line and extend 9 miles into the Gulf of Mexico (FDEP 2009b).

- Goethe State Forest – The approximately 53,000 acres of the Goethe State Forest include 45,000 acres of WMA (see Figure 3–24). The Goethe State Forest is located approximately 2 miles east of the Tarmac King Road Limestone Mine, directly north of the LNP site and east of U.S. Route 19 (FDEP 2009b).

The project site and mitigation site land use is zoned Forestry/Rural Residential. The zoning is for forest use and low-density residential use at 1 unit per 20 continuous acres (Romero 2011).

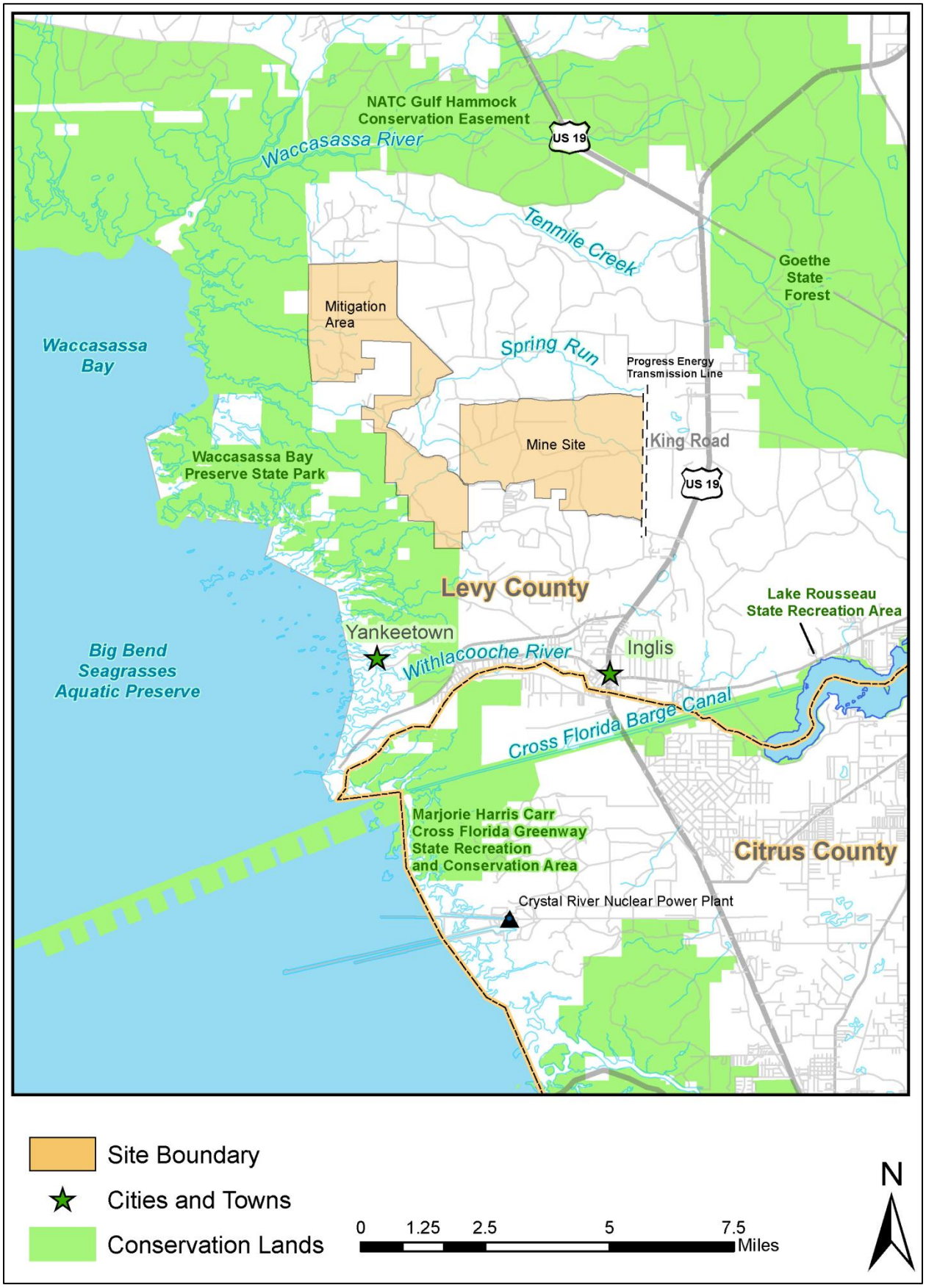


Figure 3–24. Surrounding Land Use

3.8 HAZARDOUS AND TOXIC WASTES

This section describes the hazardous and toxic materials used and wastes produced within the mine and mitigation sites and the immediately surrounding areas. This section includes a discussion of hazardous waste facility compliance, storage tanks, and the use of herbicides and pesticides.

The EPA's Superfund Site Information database reports that there are three sites in Levy County. One of these, the Barker Chemical site, is located in Inglis adjacent to the Withlacoochee River. This site has been investigated, soils have been removed, and the site is not considered an apparent public health hazard (ATSDR 2008). The other two sites are the Romarc Industries site in Williston and the Ashcroft Mercury Spill Site in Trenton. Both of these sites had removal actions completed in 2006 and are not considered public health hazards (EPA 2011).

3.8.1 Hazardous Waste Permits

Hazardous waste is regulated by the Federal Government through Title 40 of the *Code of Federal Regulations*, Parts 260–271. The State of Florida has adopted by reference portions of the Federal regulations into its *Florida Administrative Code* Chapter 62-730.

FDEP maintains a GIS database accessible to the public that shows the name and location of facilities registered with FDEP that generate, store, or process hazardous waste (FDEP 2010a). This database was used to determine facilities around the mine site identified as hazardous waste generators. There are no facilities within 1 mile of the mine site that have an EPA hazardous waste identification number. There is one waste handler, an automotive related business, located about 1 mile south of the mine site on U.S. Route 19. The nearest small-quantity generator, a food store, is located in Inglis. There are no treaters, storers, or disposers reported in Levy County. There are currently no large-quantity generators of hazardous waste within 15 miles of the site. A large-quantity generator is defined as a facility that generates 2,200 pounds or more per month of hazardous waste, or more than 2.2 pounds per month of acutely hazardous waste**.** A small-quantity generator generates between 220 and 2,200 pounds per month of hazardous waste (40 CFR 262). A conditionally exempt small-quantity generator generates 220 pounds or less per month of hazardous waste, or 2.2 pounds or less per month of acutely hazardous waste (40 CFR 261.5).

There are potential risks to water quality from fuel spills, lubricants, and synthetic chemical and petrochemical solvents used and stored at mining sites and other facilities. Nearby mining sites include the Gulf Rock Limerock Mine directly south of project area and two larger mines (Cemex Inglis Quarry and Holcim Mine) approximately 4.2 miles and 5.8 miles south of the mine site. Another risk is the potential for fuel spills associated with traffic and traffic accidents.

The King Road Special Exception Application states that there are no dump sites, landfills, or effluent ponds within 3 miles of the project area (Tarmac 2008).

3.8.2 Storage Tanks

No underground storage tanks are present on the Tarmac King Road Limestone Mine site. There are eight underground storage tanks approved for use by FDEP in Inglis and three underground storage tanks that have been closed in place. These are all gasoline, kerosene, and diesel fuel storage tanks (FDEP 2010b, 2010c).

3.8.3 Herbicide and Pesticide Use

The regulation of herbicides and pesticides is handled by the State of Florida through Title XXXII of the *Florida Statutes*, Chapter 487. Herbicides have been used for invasive species eradication within the Waccasassa Bay Preserve State Park (BIPM 2004:157, 158). Herbicides may also be used in the area for control of vegetation in power line rights-of-way.

3.9 METEOROLOGY AND AIR QUALITY

3.9.1 Meteorology

The Tarmac King Road Limestone Mine area of west-central Florida lies within the extreme southern portion of the Northern Hemisphere's humid subtropical climate zone and is characterized by long, hot, humid summers and mild, dry winters. The chief factors governing west-central Florida's climate are land and water distribution, prevailing winds, storms, pressure systems, and ocean currents (NCDC 2009). Differences in climate become very apparent, even within climate zones, depending on location. For instance, temperatures near the western coast of Florida, such as the Tarmac King Road Limestone Mine area, are typically several degrees cooler during the day and warmer during the night in the summer than those at locations 10–20 miles inland. Similarly, wind speeds are generally higher along the coast than inland, and the wind direction is often impacted by sea breeze interactions along the immediate shore.

3.9.1.1 Meteorological Conditions

Meteorological data, including average temperatures, humidity, wind direction and speed, and rainfall, were examined from three meteorological stations in Florida: two first-order meteorological observation reporting stations, Gainesville and Tampa, and one cooperative weather station, Usher Tower. Gainesville is located approximately 47 miles northeast of the project site; Tampa is located 78 miles south of the project site; and Usher Tower is located approximately 12 miles northwest of the project site.

Data for a 10-year period, 1997–2006, were examined at the nearest meteorological station, Usher Tower, for rainfall and temperatures and then compared to the 30-year climatological average of the station. Additional rainfall data were examined from the Inglis Lock Station maintained by the Southwest Florida Water Management District, approximately 4 miles south of the mine site. Humidity, wind direction, and wind speed data were reviewed for the Gainesville and Tampa meteorological stations. The following details the typical weather associated with the Tarmac King Road Limestone Mine area:

- Temperatures range from average highs around 92 degrees Fahrenheit (ºF) in July and August to average lows around 44 ºF in January. An extreme high temperature of 105 ºF was recorded at Usher Tower in 1989 and an extreme low of 9 ºF in 1985, but these are rare occurrences (NCDC 2009).

- Relative humidity is normally high because of the tropical climate and proximity to the warm ocean waters. The 44-year average daily relative humidity at the Tampa meteorological site peaks at 77 percent in August and September and drops to 68 percent in April and May. At the Gainesville meteorological station, the 24-year average daily relative humidity peaks at 79 percent in September and drops to only 69 percent in April and May (NCDC 2009).

- Average wind speeds are 8.3 miles per hour (mph), with the lightest winds (6.9 mph) occurring in August and the strongest (9.4 mph) occurring in March. The land/sea breeze interactions become apparent as average wind speeds decrease further inland at the Gainesville meteorological station, where wind speeds only average 6.3 mph. Wind directions are predominantly from the west 50 percent of the time (March through August) at the Gainesville meteorological station and from the east through northeast 83 percent of the time at the Tampa meteorological station (NCDC 2009). The local climate of coastal land-water-inlet interaction of Tampa is also seen, resulting in average wind directions out of the east through northeast.

- Due to the tropical nature of the climate, rainfall varies by month and can vary widely over short distances. Recent precipitation data were examined for a 10-year period, 1997–2006, and then compared to the average monthly precipitation over a 30-year period. The 30-year average annual precipitation at Usher Tower is 59.65 inches; Gainesville, 50.81 inches; and Tampa, 47.52 inches (SERCC 2009). The Inglis Lock Station reported an average annual rainfall from 2000–2008 of 49.67 inches (SWFWMD 2010). The wet season for the Tarmac King Road Limestone Mine area generally occurs from June through September. Over 53 percent of the annual rainfall on average occurs during this period, with monthly averages of 8 and 9 inches, respectively, in July and August. Conversely, December averages only a little above 3 inches

(NCDC 2009). Year-to-year variances in the amount of rain also are significant. At the Usher Tower site, over the 10-year period examined, 2004 was the wettest year, with over 74 inches of rain recorded, whereas 2000 was the driest, with only about 42 inches of rain recorded. The 74 inches of rain that fell at the Usher Tower site in 2004 is above the average of 57 inches during the 10-year period examined. The 74 inches of rain recorded in 2004 can be directly linked to the rainfall associated with four hurricanes that made landfall in Florida (SERCC 2009).

- Afternoon air mass thunderstorms occur frequently in the spring and summer season given the tropical nature of the climate. More severe weather, such as tropical storms and tornadoes, occurs less frequently but can have a larger impact on the region. In 2004 and 2005 alone, nine hurricanes, Arlene, Charlie, Dennis, Frances, Ivan, Jeanne, Katrina, Tammy, and Wilma, made landfall in Florida. From 1950 through 2006, 96 hurricanes made landfall in Florida, an average of 1.7 per year (AOML 2009). Additionally, tornadoes have occurred 22 times since 1968 in Levy County, Florida, with the most recent event occurring in 2000 along U.S. Route 19 near the Gulf Hammock WMA (NCDC 2009).

3.9.1.2 Hurricane Probabilities

Klotzbach and Gray (2012) recently developed a methodology for calculating tropical cyclone landfall and wind gust probabilities for the entire coastline—from Texas to Maine. Eleven regions were created based on their frequency of intense or major hurricane landfalls from 1900–1999. Landfall and wind gust probabilities were then calculated based on historical hurricane and tropical storm records for each region from 1888 through 2006. Region 4 includes the 10 coastal counties in Florida from Bay County in the Panhandle eastward to Citrus County, including Levy County. Probabilities of one or more events were then calculated for each county in the region based on length of coastline relative to the region. Probabilities of landfall were calculated for any hurricanes (categories I–V), major or intense hurricanes (categories III, IV, and V), as well as the probable occurrence of major hurricane wind gusts (>115 mph). Table 3–16 includes the probabilities for Levy County (Klotzbach and Gray 2012). The probability of a hurricane making landfall in Levy County in any given year is less than 2 percent. Major hurricane probability in Levy County in any year is only 0.2 percent. Over the next 50 years, the probability of one or more hurricanes making landfall in Levy County is 58 percent for any hurricane and just under 9 percent for major hurricanes. Wind gust probabilities associated with major hurricanes were calculated to be 1.4 percent for any year and 55.4 percent over the next 50 years.

The proposed Tarmac King Road Limestone Mine site and mitigation sites are a relative small part of the Levy County coastline. Probabilities were calculated using the Klotzbach and Gray 2012 methodology for the fraction of the coastline immediately adjacent to the Tarmac King Road Limestone Mine site and mitigation site (see Table 3–16). The probability of hurricanes and major hurricanes in any given year affecting the sites is below 1 percent in both instances. Over the next 50 years, the probability of one or more hurricanes making landfall on or near the Tarmac King Road Limestone Mine site and mitigation sites is 15 and 27 percent respectively. For major hurricanes, the 50-year probability drops to 1.6 and 3.2 percent, respectively. Wind gust probabilities associated with major hurricanes were calculated to be the same as for Levy County due to the size of wind fields of major hurricanes being larger than Levy County. However, statistically the Tarmac King Road Limestone Mine site and mitigation site can expect one or more occurrences of wind gusts greater than 115 mph approximately once every 100 years.

Table 3–16. Probabilities of Hurricanes, Major Hurricanes, and Wind Gusts in Excess of 115 Miles Per Hour Impacting Levy County and the Tarmac King Road Limestone Mine

	Probabilities (Percentage)					
	One or More Occurrences in Any Year			One or More Occurrences in 50 Years		
	Category I or Higher	Category III or Higher	Wind Gusts >115 mph	Category I or Higher	Category III or Higher	Wind Gusts >115 mph
Levy County	1.5	0.2	1.4	58.1	8.7	55.4
Mine Site	0.3	<0.1	1.4	14.5	1.6	55.4
Mitigation Site	0.6	0.1	1.4	27.0	3.2	55.4

Source: Klotzbach and Gray 2012.

3.9.1.3 Evapotranspiration

Evapotranspiration is the combined process of evaporation from land and water surfaces and transpiration from plants. It is the means by which the bulk of the area's rainfall is returned to the atmosphere and plays a role in the climate in the region. The delicate balance between rainfall and evapotranspiration contributes to the hydrology system of west-central Florida. Evaporation from landforms and water surfaces and transpiration from vegetation are functions of solar radiation, temperature, wind speed, humidity, atmospheric pressure, characteristics of the surrounding environment, and vegetation type and condition.

The landcover of the Tarmac King Road Limestone Mine project area generally include uplands and wetlands. The upland and wetland vegetative landform types have been characterized as upland wetlands in an evapotranspiration analysis. Ardaman & Associates (2008b) generated Table 3–17 based on data from numerous sources.

Table 3–17. Average Annual Evapotranspiration (inches)

Landform	South-Central Florida	North-Central Florida
Class A pan	74–76	66–68
Irrigated golf course	58–62	53–56
Lakes and ponds	50–52	45–47
Riparian wetlands	47–49	42–44
Upland wetlands	42–44	38–40
Flatwoods	37–39	34–36
Xeric uplands	34–36	31–33
Paved or roofed areas	8–10	7–9

Source: Ardaman & Associates 2008b.

The average evapotranspiration rate for north-central Florida is 38.5 inches per year (Levy County 2008), including open water evaporation, evaporation from soil, and transpiration from plants. Monthly evaporation rates are presented in Table 3–18 and are based on the pan evaporation data from the nearest National Oceanic and Atmospheric Administration station (Gainesville). The evapotranspiration rate recorded at the Inglis Lock Station from 2000–2008 was approximately 44 inches per year (SWFWMD 2010). This is consistent with the average annual evapotranspiration for upland wetlands in Table 3–17. On average, with annual precipitation ranging from approximately 50 inches near the mine site (see Section 3.9.1.1) and total evapotranspiration in the region totaling around 44 inches, approximately 6 inches of precipitation annually runs off or otherwise serves as recharge to the hydrological system.

Table 3–18. Average Monthly Evaporation (inches)

Month	Evaporation
January	3.32
February	4.01
March	5.10
April	5.29
May	5.35
June	4.77
July	4.40
August	3.98
September	3.31
October	2.78
November	2.41
December	2.70
Total	**47.42**

Source: Ardaman & Associates 2008b.

3.9.2 Air Quality

The air quality is described as good for all criteria pollutants in the Tarmac King Road Limestone Mine area in EPA's *National Air Quality Status and Trends Through 2007* (EPA 2008a). Air quality monitoring data for 2005 indicate that Levy County met the ambient standards of all pollutants for Federal and state ambient air quality standards (EPA 2009b). National Ambient Air Quality Standards (NAAQS) and Florida ambient standards are summarized in Table 3–19. National primary air quality standards define levels of air quality judged necessary, with an adequate margin of safety, to protect public health. National secondary ambient air quality standards define levels of air quality judged necessary to protect public welfare from any known or anticipated adverse effects of a pollutant.

Prevention of Significant Deterioration Areas

Class I – Areas, including national parks and wilderness areas, where the preservation of clean air is particularly important.

Class II – Areas not designated as Class I, where the allowable incremental increase in air pollutant concentrations is less stringent than for Class I areas.

Prevention of Significant Deterioration regulations were established to prevent significant deterioration of air quality in areas that already meet the ambient air quality standards by limiting the cumulative increases in air pollutant concentrations through the permitting process.

The nearest air quality monitoring stations to the Tarmac King Road Limestone Mine are located in Gainesville, Florida, approximately 50 miles northeast of the project site and in Marion County, approximately 37 miles east of the project site. A 2002 EPA database of criteria pollutants shows no major stationary sources of criteria pollutants in Levy County, Florida (EPA 2008b). Some sources of stationary air pollutants in Levy County include a petroleum refining facility in Gulf Hammock, a rubber and plastics products facility in Williston, and an electric gas and sanitary service facility in Archer (EPA 2008b). The 2002 air emissions reported for Levy County show three stationary sources of emissions of volatile organic compounds, all less than 1 percent of the total emissions for the county (EPA 2008b).

In Citrus and Marion Counties, Progress Energy Florida, an electric services facility, and Royal Oak Enterprises, a wood product facility, were identified as significant sources of stationary air pollution. Progress Energy Florida, in Citrus County, was shown to be a significant stationary point source for all criteria pollutants, with the exception of particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$). Royal Oak Enterprises in Marion County was shown to be a significant stationary source of air pollution for volatile organic compounds, particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}), and $PM_{2.5}$ (EPA 2008b).

Table 3–19. Ambient Air Quality Standards

Pollutant	Averaging Period	Concentration (micrograms per cubic meter)
Carbon monoxide	8 hours 1 hour	10,000[a] 40,000[a]
Lead	Quarterly	1.5[a]
Nitrogen dioxide	Annual 1 hour	100[a] 188[b]
Ozone	8 hours 1 hour	147[b, c] 157[b, c] 235[d]
PM_{10}	Annual 24 hours	50[e] 150[a]
$PM_{2.5}$	Annual 24 hours	15[b] 35[b]
Sulfur dioxide	Annual 24 hours 3 hours 1 hour	60[a] 260[a] 1,300[a] 200[b]

[a] Federal and state standard.
[b] Federal standard, not yet adopted by the state.
[c] The 8-hour 157-microgram-per-cubic-meter standard remains in effect until the U.S. Environmental Protection Agency completes implementation of the 147-microgram-per-cubic-meter standard.
[d] State standard.
[e] State standard; the Federal PM_{10} standard has been revoked.
Note: The more stringent of the Federal and state standards is presented if both exist for the averaging period. National Ambient Air Quality Standards (40 CFR 50), other than those for ozone, particulate matter, lead, and those based on annual averages, are not to be exceeded more than once per year. The 24-hour PM_{10} standard is attained when the standard is not exceeded more than once per year over a 3-year average. The annual arithmetic mean PM_{10} standard is attained when the expected annual arithmetic mean concentration is less than or equal to the standard. The annual $PM_{2.5}$ standard is met when the 3-year average of the weighted annual mean concentrations does not exceed the standard. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of the 98th percentile of the 24-hour concentrations does not exceed the standard. The 1-hour nitrogen dioxide standard is attained when the 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentration is less than or equal to the standard value. The 8-hour ozone standard is attained when the 3-year average of the annual fourth-highest daily maximum 8-hour average concentration is less than or equal to the standard value.
Key: PM_n=particulate matter with an aerodynamic diameter less than or equal to *n* micrometers.
Source: 40 CFR 50; FAC Rule 62-204.240.

Prevention of significant deterioration regulations are applicable “to new major sources or major modifications at existing sources for pollutants where the area the source is located is in attainment or unclassifiable with the NAAQS” (EPA 2009c).

The Tarmac King Road Limestone Mine area is within an area currently designated as an attainment area for all criteria air pollutants (40 CFR 81.310; FAC Rule 62-204.340).

Greenhouse gases (GHGs) currently produced on the Tarmac King Road Limestone Mine site are mostly related to the current timber harvesting activities. These gases are mostly carbon dioxide (CO_2), but could also include small amounts of methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Emissions of these GHGs are normally presented using a common metric, CO_2 equivalence (CO_2e), which indicates the relative contribution of each gas, per unit mass, to global average radiative forcing on a global warming potential weighted basis (CCS 2008).

GHG emissions for the Tarmac King Road Limestone Mine site are either direct or indirect. Direct emissions are those GHGs that can be attributed to logging operations, including haul trucks, saws, and specialized equipment, as well as the contribution of employees traveling to and from the site. Indirect emissions are those associated with deforestation and the resultant annual removal of the carbon sequestered in the forest canopy.

The estimated annual GHG emissions for the timbering operation on the current Tarmac King Road Limestone Mine site is included in Table 3–20 and is approximately 6,200 metric tons of CO_2e (Trinity Consultants 2010). For comparison, in 2005, activities in Florida accounted for approximately 337 million metric tons of CO_2e emissions (CCS 2008). The King Road site's current contribution to Florida's GHG emissions is less than 0.02 percent.

Table 3–20. Current Estimated Annual Greenhouse Gas Emissions Summary for the Tarmac King Road Limestone Mine Site

Emissions Source Category	Total Emissions (Metric Tons CO_2e)
Direct Emissions from Mobile Combustion	
Logging Operations	725.92
Employee Commutes	111.62
Direct Fugitive Emissions from Air Conditioning Equipment	6.24
Indirect Emissions – Deforestation	5,376.80
Total Emissions	**6,221**

Key: CO_2e=carbon dioxide equivalence.
Source: Trinity Consultants 2010.

There are currently no Federal, state (Florida), or local (Levy County) regulations limiting GHG emissions by any industry. However, rules under consideration by EPA would exempt sources that emit GHGs below an annual threshold of 25,000 metric tons of CO_2e (Trinity Consultants 2010).

3.10 AESTHETICS

Aesthetics is the term used to describe the physical characteristics of a landscape that determine its scenic quality in relevant value to the viewing public. The aesthetics of a site or region can be dictated by natural features such as landforms, water surfaces, and vegetation, and manmade elements such as buildings, bridges, landscaping, and fences. The aesthetic condition of a site would be described as specific landscape scenes as viewed from various perspectives. Attributes used to describe the visual resource value of an area include landscape character, perceived aesthetic value, and uniqueness.

The project mine site and mitigation area consist of forested lands with areas of more recent human disturbance that include cleared areas and roads. The regional terrain is flat, dropping approximately 15 feet from east to west over 3.75 miles across the project mine site, and less than 10 feet across the mitigation site. Both parcels of land contain a mosaic of upland and wetland areas. The project mine site and mitigation area include natural wetland and upland forests, mature pine plantation, young pine plantation, and more recently disturbed areas. Disturbed areas include recently cleared areas with bare earth and debris from timber harvesting activities and areas where vegetation is becoming reestablished. Views are more expansive in cleared areas but are generally limited to the forest line at the limits of cleared areas. Tree heights vary from less than 8 feet to more than 50 feet (Denton and Evans 2008). There are several small manmade ponds on the western third of the mine site that likely exist due to borrow activities for onsite road construction. There are no lakes or rivers on the project mine site or mitigation area. Stream channels occur, including tributaries to Spring Run throughout the northern half of the project mine site and traversing the mitigation area.

The project mine site and mitigation area include a few acres of cypress swamps, which are seasonally inundated and have a dense canopy that shades the ground surface and limits understory growth. The ground surface is hummocky with dense litter deposits and downed trees and limbs. Hardwood wetland areas have more open canopies that allow development of a dense, diverse understory of shrubs such as cabbage palm, blueberry, dogwood, and myrtle (Denton and Evans 2008). Pine plantation tracts are

dominated by varying densities of pines often planted in straight rows that have a different visual effect than natural forest vegetation.

The project mine site and mitigation area are surrounded predominantly by forested land (see Figure 3–24). The southern boundary of the project mine site is predominantly forested land as well, although there are small areas of disturbed land (e.g., an approximately 36-acre commercial mining site located along the central south border of the parcel) and rural residential land (see Figure 3–24). There is a power line located adjacent to the east of the project mine site that provides a distinct break in the surrounding forest cover. There are larger tracts of rural residential development located east of the project mine site boundary along U.S. Route 19, with between 1,000 and 2,000 feet of forested land separating the mine site from these areas (see Figure 3–24). The forested lands surrounding the project mine site and mitigation area along the north and west sides are dissected by a sparse network of access roads. Denser road networks occur in commercial and residential areas to the east and south of the site. Public use occurs in the lands surrounding the project mine site and mitigation area, including vehicle use of the roads and recreational use of the forested areas (i.e., hunting). Views of the project mine site for people conducting these activities would be of fairly uniform, dense forested land and/or smaller tracts of cleared land with varying degrees of recovery from past land disturbance. These would not be considered high-value or unique landscapes for this region.

The project mine site and mitigation areas are located within the Gulf Hammock WMA. As described in Section 3.7, "Land Use," the Gulf Hammock WMA consists of 25,600 acres of forested land that is managed for wildlife resources and timber harvest and is used for hunting (FFWCC 2009c).

Other state parks and recreational areas occur in the region. The closest of these recreational lands includes the Goethe State Forest, located at least 2 miles northeast of the project mine site; the Gulf Hammock Conservation Easement, approximately 6 miles north; and the Waccasassa Bay Preserve State Park, approximately 2 miles west of the project mine site. The west side of the mitigation area is adjacent to the eastern boundary of the Waccasassa Bay Preserve State Park.

3.11 NOISE

Noise is considered to be unpleasant, loud, annoying, or confusing sounds to humans. The area around the Tarmac King Road Limestone Mine site is rural in character, consisting of rural residential areas and timberland (see Section 3.7). Nearby noise-sensitive areas include residences, schools, and recreation areas. The nearest residences are to the south of the proposed project site, near Butler Road. The nearest school is in Yankeetown about 2.7 miles south of the mine site. The nearest recreation area is the Waccasassa Bay Preserve State Park to the west. The nearest residences and other noise-sensitive areas are identified in Table 3–21. More specific details are provided in the noise study located in Appendix K.

Table 3–21. Existing Nearby Vibration and Noise-Sensitive Receptors

Distance to Nearest Sensitive Receptor	Sensitive Receptor
2,500 feet east	Residences along SE 72nd Court, south of King Road
3,100 feet northeast	Residences along SE 72nd Court, north of King Road
3,400 feet northeast	Florida Sheriff's Caruth Camp on U.S. Route 19 (residential/educational)
9,500 feet south	Residences north of County Road 40A, near U.S. Route 19
500 feet south	Residences along Butler Road
5,300 feet southwest	Recreational – Waccasassa Bay Preserve State Park
14,300 feet southwest	School – Yankeetown Elementary

Note: Distances are measured from the Tarmac King Road Limestone Mine site boundary.
Source: BRA 2007; Tarmac 2009b.

Although the receptor most often considered in evaluating the noise environment is human, sound and vibrations may also be perceived by animals. Limited information is available about how different wildlife species may process these sensations or how certain species may react to them. Wildlife is discussed in more detail in Section 3.5.

Concerns about damage that may be caused by ground vibrations as a result of the use of explosives are related to sensitive architectural receptors and other buildings. No historically or archaeologically sensitive receptors have been identified in the Tarmac King Road Limestone Mine site area (see Section 3.12).

Existing sources of noise in the area away from the more urban communities to the south consist primarily of vehicles on highways (U.S. Route 19) and rural roads. Other noise-producing activities include hunting, boating, silviculture, and agriculture. Currently, the nearest mining operations to the Tarmac King Road Limestone Mine site are the inactive Gulf Rock Limerock Mine directly south of the project area and the Cemex Inglis Quarry and Holcin mine approximately 4.3 miles and 5.8 miles south of the mine site.

Noise measurement data have been collected around the proposed LNP site on the east side of U.S. Route 19. The environmental report for this project concluded that noise levels were very low, as expected for a rural area (PEF 2008). Rural, undeveloped areas typically have noise levels, measured as day-night average sound level, in the range of 35 to 55 decibels A-weighted (dBA) (EPA 1974). Sound levels have been estimated to be about 66 dBA (1-hour energy-equivalent sound level) at 100 feet from U.S. Route 19 based on the existing peak hour traffic at King Road (Tarmac 2008).

Florida State noise regulations found in Title XXIII, Sections 316.293 and 316.3045, of the *Florida Statutes* focus on the control of vehicle noise. Other noise regulations are left to the counties and local governments. Levy County noise regulations limit noise levels encroaching on adjacent properties by land use category. However, mining activities in rural residential areas are exempt from these limits (*Code of Ordinances of Levy County*, Section 50-719).

3.12 CULTURAL RESOURCES

A cultural resources assessment survey of the Tarmac King Road Limestone Mine site (Panamerican Consultants, Inc. 2006) and the historical and cultural resource investigation information presented in the license application for the LNP (NRC 2010; PEF 2008) provide information for the area around the mine and mitigation sites. An assessment of the mine site was conducted to identify archaeological sites, historic structures, and historic features and to assess their potential for eligibility for listing in the National Register of Historic Places. The Progress Energy Florida license application provides additional information for the area near the Tarmac King Road Limestone Mine site. An evaluation of cultural resources for the *Waccasassa Bay Preserve State Park Unit Management Plan* (FDEP 2005:20, 21) provides information for the area west of the mitigation site.

Native American groups have inhabited Florida for at least 14,000 years. Although several Native American tribes may have used the area around the Tarmac King Road Limestone Mine site, no known land holdings by federally or state-recognized Native American tribes have been identified (NRC 2010:2-170; PEF 2008:2-471).

A review of the Florida Division of Historic Resources Florida Master Site File (FMSF) for the Gulf Hammock evaluation identified one archaeological site, known as the Bee Tree Slough Mound (registered as 8LV110), as a prehistoric burial mound and midden. The area included in the Gulf Hammock evaluation included the mine and mitigation sites. This evaluation reported that several archaeological surveys just west of the Gulf Hammock indicate that the “ecotone between the salt marches and uplands” is expected to have a moderate-to-high probability of holding significant archaeological sites. Lands east of this interface between salt marsh and woodlands would possess only a low-to-moderate probability of holding any significant archaeological sites, except possibly areas along streams (DSLSA, RCLS, and FNAI 2004:15).

Archaeological surveys indicate the presence of three culturally significant sites within the proposed Tarmac King Road Limestone Mine project site; all three are located within the proposed mitigation area and appear on the FMSF (FDHR 2010). Eleven additional sites were identified within 1 mile of the project area, including prehistoric midden, homestead, prehistoric habitation, prehistoric burial mound, prehistoric campsite, artifact scatter low-density, historic refuse/dump, and prehistoric shell midden sites, as well as

three cemeteries. No bridges, sites listed in the National Register of Historic Places, resource groups, or structures were identified. Table 3–22 describes the archaeological sites found within the mitigation area.

Table 3–22. Recorded Archaeological Sites Within the Tarmac King Road Limestone Mine Site

Site No.	Name	Disposition	Type	Notes
LV00532	Turtle Creek North	Not evaluated by SHPO	Prehistoric midden(s)	
LV00110	Beetree Slough Mound	Not evaluated by SHPO	Prehistoric burial(s)	Contains human remains
LV00468	Crackerville	Not evaluated by SHPO	Habitation (prehistoric)	

Key: SHPO=State Historic Preservation Officer.
Source: FDHR 2010.

Historic plat maps were checked for possibly early historic use of the site, and the FMSF records dated January 2006 were searched. These searches did not identify any previously recorded archaeological sites, historic structures, resources listed in the National Register of Historic Places, bridges, resource groups, or cemeteries within the Tarmac King Road Limestone Mine site or within 1 mile of the site (Panamerican Consultants, Inc. 2006:1, 4).

An archaeological and historical survey of the Tarmac King Road Limestone Mine site was conducted in 2006; this survey included the excavation of 494 shovel tests across the project area and a pedestrian survey for standing structures. One shovel test was positive for cultural material. No other archaeological sites or features or historic structures were found on the site during that survey (Panamerican Consultants, Inc. 2006:20). The archaeological and historical survey was also reviewed by the Tribal Historic Preservation Office of the Seminole Tribe of Florida (STOF) during consultation between STOF and the USACE. The STOF advised the USACE that the archaeological surveying done for the site was satisfactory (STOF 2012).

A review of FMSF records reported for the *Progress Energy Levy Nuclear Plant Environmental Report* for previously surveyed structures showed three cemeteries between U.S. Route 19 and the eastern boundary of the Tarmac King Road Limestone Mine site that have not been evaluated by the State Historic Preservation Officer (PEF 2008:2-498, 2-595–2-605).

The evaluation of cultural resources for the *Waccasassa Bay Preserve State Park Unit Management Plan* reported extensive cultural resources within the park, including 80 archaeological sites. These included shell middens and aboriginal sites, including camps, lithic scatters, village/habitation sites, and burial mounds. Historical resources reported within the preserve include remnants of a salt works (FDEP 2005:20, 21).

3.13 RECREATION

The Proposed Mine Site

The approximately 4,750-acre Tarmac King Road Limestone Mine site is part of the Gulf Hammock WMA, managed by the Florida Fish and Wildlife Conservation Commission in conjunction with Plum Creek Timber Company (FFWCC 2009c). The existing recreational opportunities within the project site are very limited. Currently, hunting is the sole recreational activity occurring on the project site. The designated entrances to the hunting area are Butler Road and King Road.

The Proposed Mitigation Site

The approximately 4,526-acre mitigation site, located adjacent to the Waccasassa Bay Preserve State Park's eastern border and encompassed in the Gulf Hammock WMA, provides limited recreational activity as well. As at the proposed mine site, hunting is currently the only recreational activity at the mitigation site. The surrounding recreational opportunities of the project and mitigation areas are limited to the Gulf Hammock WMA, Waccasassa Bay Preserve State Park, and Goethe State Forest, but a variety of recreational activities are offered within these areas.

The Gulf Hammock WMA is an approximately 25,600-acre area, consisting mainly of undeveloped land, in southwest Levy County. Both the Tarmac King Road Limestone Mine project site and mitigation area are partially enclosed within the WMA. Hunting is the primary recreational opportunity occurring within the WMA. The following may be hunted in season: deer with at least one antler 5 inches or more in length, wild hog with a shoulder height of 15 inches or more, gray squirrel, quail, rabbit, raccoon, opossum, armadillo, beaver, coyote, skunk, nutria, bobcat, otter and migratory birds in season (FFWCC 2011). According to the Gulf Hammock evaluation report of 2004, as part of the Florida Forever project, a small part of the WMA, less than 3 percent, could exist as prioritized trail opportunities (DSLSA, RCLS, and FNAI 2004).

The Waccasassa Bay Preserve State Park covers over 32,000 acres of land and is located approximately 3 miles west of the project site and adjacent to the mitigation area. The park offers various recreational activities, such as saltwater and freshwater fishing, canoeing, boating, wildlife viewing (by boating or canoeing), and primitive camping.

The approximately 53,000-acre Goethe State Forest is located approximately 2 miles east of the Tarmac King Road Limestone Mine site. Recreational opportunities in the park include nature walk trails, picnicking, hiking, fishing, hunting, wildlife viewing, camping, bicycle trails, and horseback riding.

3.14 SOCIOECONOMICS

Socioeconomics in this EIS refers to economic activity in the ROI. The ROI is the area potentially affected by the proposed mining activities, identified in this section as Levy and Citrus Counties. These counties were chosen as the ROI due to the local employment dynamics of southern Levy County, where the proposed mine will be located. This section describes the socioeconomic conditions of the two-county area identified as the ROI.

3.14.1 Population

Florida and the two-county ROI have been growing rapidly. Between 1970 and 2010, the state's population nearly tripled, increasing from 6.8 million to 18.8 million, resulting in an annual growth rate of 2.6 percent over the 40-year period. Over the same period, the two-county ROI experienced higher growth. The population of the ROI increased from approximately 32,000 to approximately 182,000, an average annual rate of 4.4 percent (Census 2011). In 2010, Levy and Citrus Counties were ranked the 47th and 32nd largest counties, respectively, in the state of Florida in terms of population. Although the total population of the ROI continues to grow, from 2000 to 2009, the natural growth rate (births minus deaths) in both counties was negative. The vast majority of population increase over this time is attributable to net domestic migration (Census 2010a). The population of the two-county ROI and Florida from 1970 to 2009 is shown in Table 3–23.

Table 3–23. Populations of Citrus and Levy Counties, Florida

Year	Citrus County	Levy County	ROI	Florida
1970	19,196	12,756	31,952	6,789,443
1980	54,703	19,870	74,573	9,746,324
1990	93,515	25,923	119,438	12,937,926
2000	118,085	34,450	152,535	15,982,378
2010	141,236	40,801	182,037	18,801,310

Key: ROI=region of influence.
Source: Census 2009a, 2011.

Figure 3–25 shows the annual population growth rates of the ROI, the state of Florida, and the United States by decade since 1970 (Census 2009a, 2011). As shown in this figure, in each period, the two-county ROI's and Florida's growth rates have exceeded that for the United States. This figure also shows that the annual growth rates for the ROI and Florida have been steadily declining since 1970; however, both growth rates continue to remain high compared to the entire Nation.

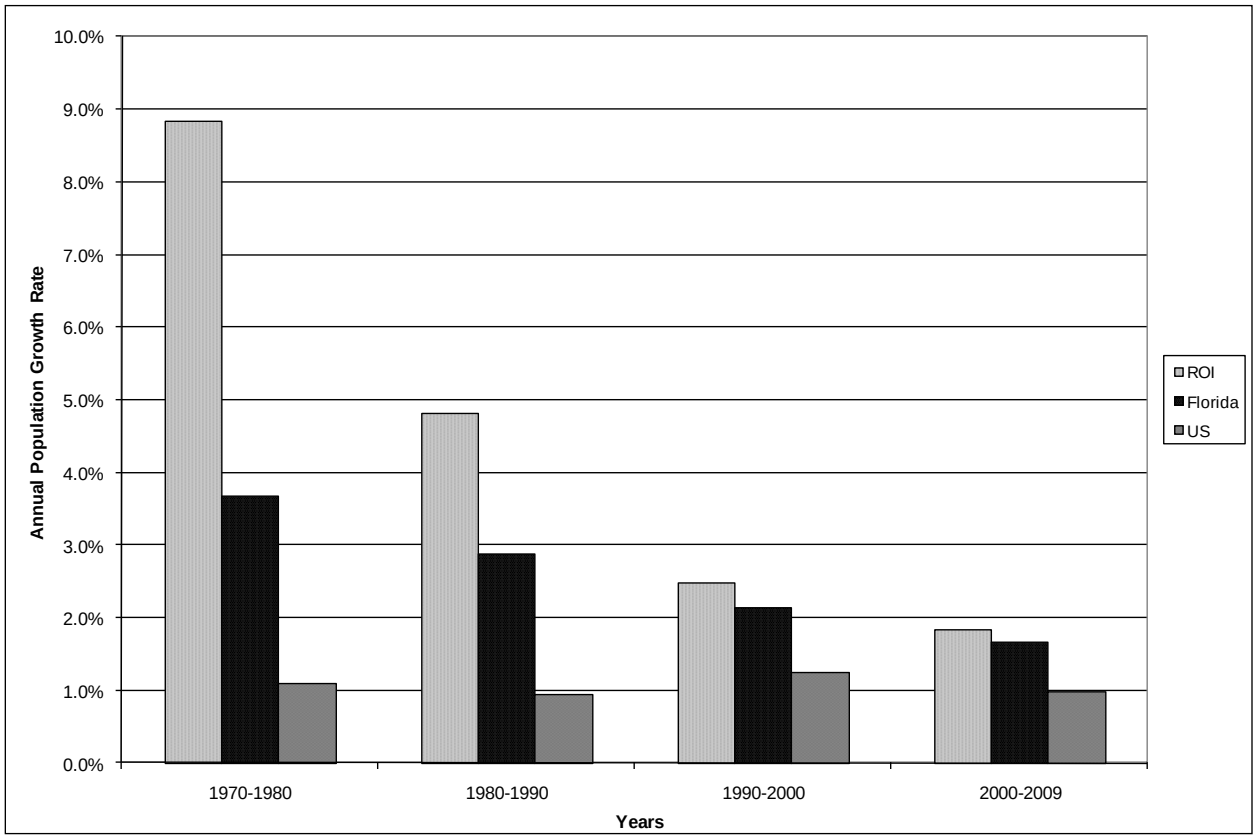


Figure 3–25. Annual Population Growth Rates of the Two-County Region of Influence, the State of Florida, and the United States

3.14.2 Economic Output

In 1970, Florida ranked as the ninth largest state in the Nation in terms of economic output, with a gross domestic product of approximately $31 billion, or about 3 percent of the national total of $1.0 trillion (BEA 2011a, 2011b). As shown in Table 3–24, by 2010, Florida's economy had grown to become the fourth largest in terms of economic output, trailing only California, Texas, and New York, with a state gross domestic product of approximately $748 billion, or about 5.1 percent of the national total of $14.6 trillion (BEA 2011a, 2011b). From 1970 through 2008, Florida's economic output increased by a factor of 24; during the same period, the Nation's increased by a factor of 14. Thus, Florida's economy has been growing 1.7 times faster than the Nation's since 1970.

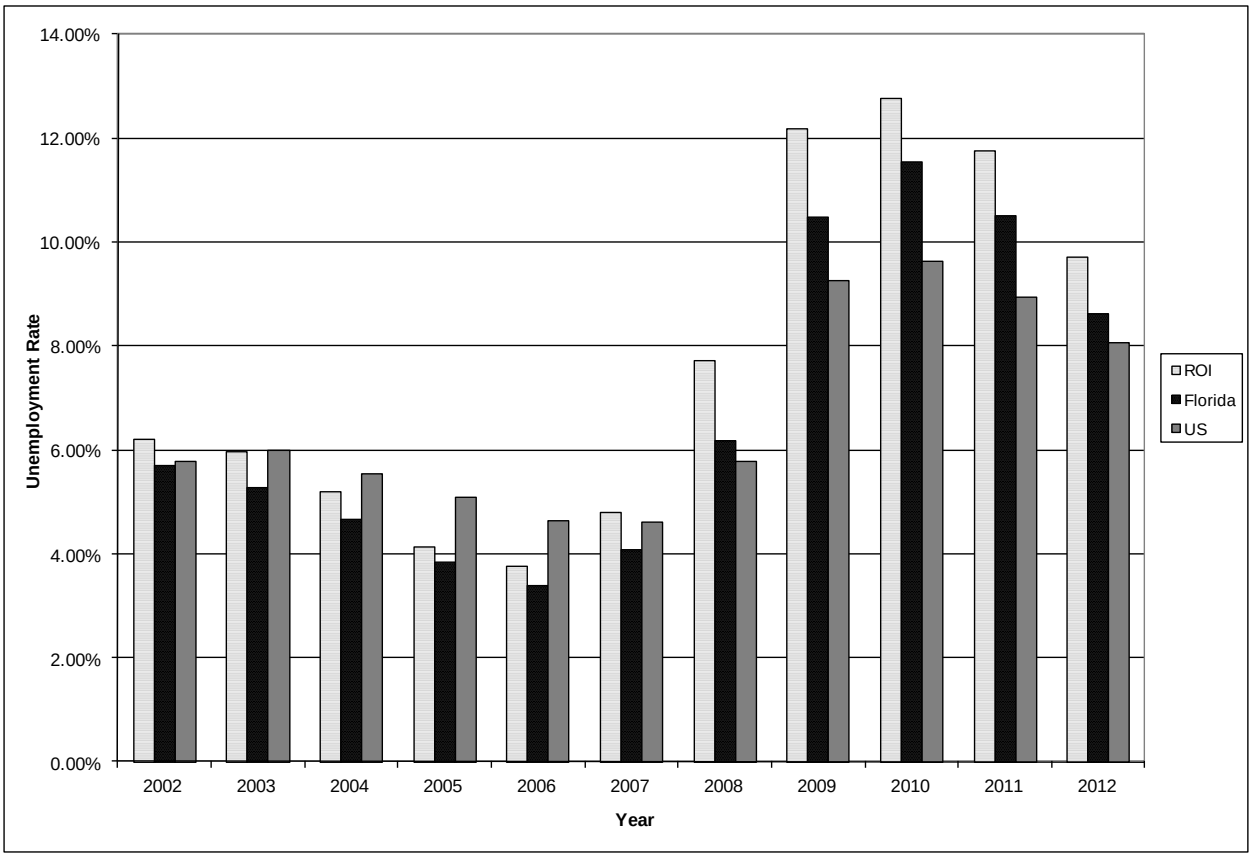
Table 3–24. Florida Gross Domestic Product Compared to the United States (in millions)

Year	United States	Florida	National Rank
1970	$1,011,966	$30,757	9th
1980	$2,719,134	$100,627	8th
1990	$5,674,013	$257,242	5th
2000	$9,884,171	$481,115	4th
2005	$12,554,538	$680,277	4th
2006	$13,310,937	$730,191	4th
2007	$13,969,323	$759,572	4th
2008	$14,270,462	$747,770	4th
2009	$14,014,849	$732,782	4th
2010	$14,551,782	$747,735	4th

Source: BEA 2011a, 2011b.

3.14.3 Employment and Regional Economic Characteristics

From 2002 through 2006, employment growth exceeded annual civilian labor force growth in the ROI and Florida, leading to a drop in the unemployment rate, as shown in Figure 3–26. ROI employment during this period grew approximately 4.4 percent per year, approximately 18 percent faster than the civilian labor force growth of 3.7 percent per year. The state's employment growth rate increased approximately 3.0 percent annually, 26 percent faster than the Florida civilian labor force growth rate of 2.4 percent. Throughout 2007 and 2008, growth of the civilian labor force began to exceed employment growth for both the ROI and the state, leading to increased unemployment rates. In 2009, employment in the ROI and Florida experienced a sharp decrease, while the labor force decreased only slightly, leading to unemployment rates of over 10 percent. Employment in the ROI began to grow in 2010; however, employment growth was outpaced by growth in the labor market, leading to a persistently high unemployment rate. During this time, the unemployment rate of Florida increased due to a slight decrease in employment and a labor force that remained largely unchanged. In 2011, the unemployment rate of the ROI decreased for the first time since 2006 primarily due to decreases in the labor force. The unemployment rate for Florida decreased in 2011 due to increased employment. By 2012, the unemployment rates for both the ROI and Florida fell back below 10 percent primarily due to employment growth outpacing growth in the labor force. Employment and civilian labor force levels for the two-county ROI and Florida are shown in Table 3–25.



Source: FDEO 2013a.

Figure 3–26. Unemployment Rates for the Two-County Region of Influence, the State of Florida, and the United States

Table 3–25. Civilian Labor Force and Employment in the Two-County Region of Influence and the State of Florida

Year	Citrus and Levy Counties (ROI)				Florida			
	Civilian Labor Force	Rate of Change	Employment	Rate of Change	Civilian Labor Force	Rate of Change	Employment	Rate of Change
2002	60,548		56,800		8,077,000		7,617,000	
2003	62,438	3.1%	58,716	3.4%	8,219,000	1.8%	7,786,000	2.2%
2004	63,374	1.5%	60,088	2.3%	8,389,000	2.1%	7,998,000	2.7%
2005	66,822	5.4%	64,062	6.6%	8,631,000	2.9%	8,300,000	3.8%
2006	70,055	4.8%	67,419	5.2%	8,889,000	3.0%	8,588,000	3.5%
2007	71,952	2.7%	68,499	1.6%	9,088,000	2.2%	8,717,000	1.5%
2008	74,492	3.5%	68,744	0.4%	9,231,000	1.6%	8,660,000	–0.7%
2009	73,191	–1.7%	64,276	–6.5%	9,197,000	–0.4%	8,232,000	–4.9%
2010	75,387	3.0%	65,774	2.3%	9,224,000	0.3%	8,159,000	–0.9%
2011	73,149	–3.0%	64,548	–1.9%	9,249,000	0.3%	8,278,000	1.5%
2012	73,266	0.2%	66,150	2.5%	9,369,000	1.3%	8,562,000	3.4%

Key: %=percent; ROI=region of influence.
Source: FDEO 2013a.

From 2002 through 2006, the unemployment rates in the two-county ROI and Florida dropped steadily, as shown in Figure 3–26. In 2007, unemployment rates increased over 2006 levels in the ROI and the state. From 2002 through 2012, the unemployment rate of Florida was consistently lower than that of the ROI. In 2002, the ROI unemployment rate was higher than the national average; however, since that time, the ROI unemployment rate has been consistently lower than the national average until 2007, when it began to exceed the national average once again. This trend continued through 2012, with an unemployment rate for the ROI of 9.7 percent. In 2008, Florida's unemployment rate also surpassed the national average, and by 2012 was approximately 8.6 percent. By comparison, in 2012, the U.S. unemployment rate decreased to 8.1 percent (FDEO 2013a). From 2002 to 2012, the ROI civilian labor force increased by approximately 21 percent and the number of people employed in the ROI increased by about 16 percent (FDEO 2013a). From 2002 to 2012, Florida's civilian labor force and total employment increased by approximately 16 percent and 12 percent, respectively.

Through 2010, the largest industry in the ROI was education and health services, accounting for approximately 31 percent of employment. The next leading industries were trade, transportation, and utilities (24 percent); leisure and hospitality (10 percent); and professional and business services (8 percent). Natural resources and mining accounted for approximately 2.5 percent of employment in the ROI (FDEO 2013b). Employment by industry in the two-county ROI is shown in Table 3–26.

Table 3–26. Employment by Industry in the Two-County Region of Influence, December 2011

Industry	Citrus County	Levy County	ROI	Percentage
Natural resources and mining	203	766	969	2.5
Construction	2,281	791	3,072	7.8
Manufacturing	436	428	864	2.2
Trade, transportation, and utilities	7,499	1,807	9,306	23.6
Information	428	53	481	1.2
Financial activities	1,056	334	1,390	3.5
Professional and business services	2,823	337	3,160	8.0
Education and health services	10,677	1,755	12,432	31.5
Leisure and hospitality	3,249	835	4,084	10.3
Other services	881	137	1,018	2.6
Public administration	1,770	928	2,698	6.8
Total	**31,303**	**8,171**	**39,474**	**100.0**

Key: ROI=region of influence.
Source: FDEO 2013b.

3.14.4 Housing

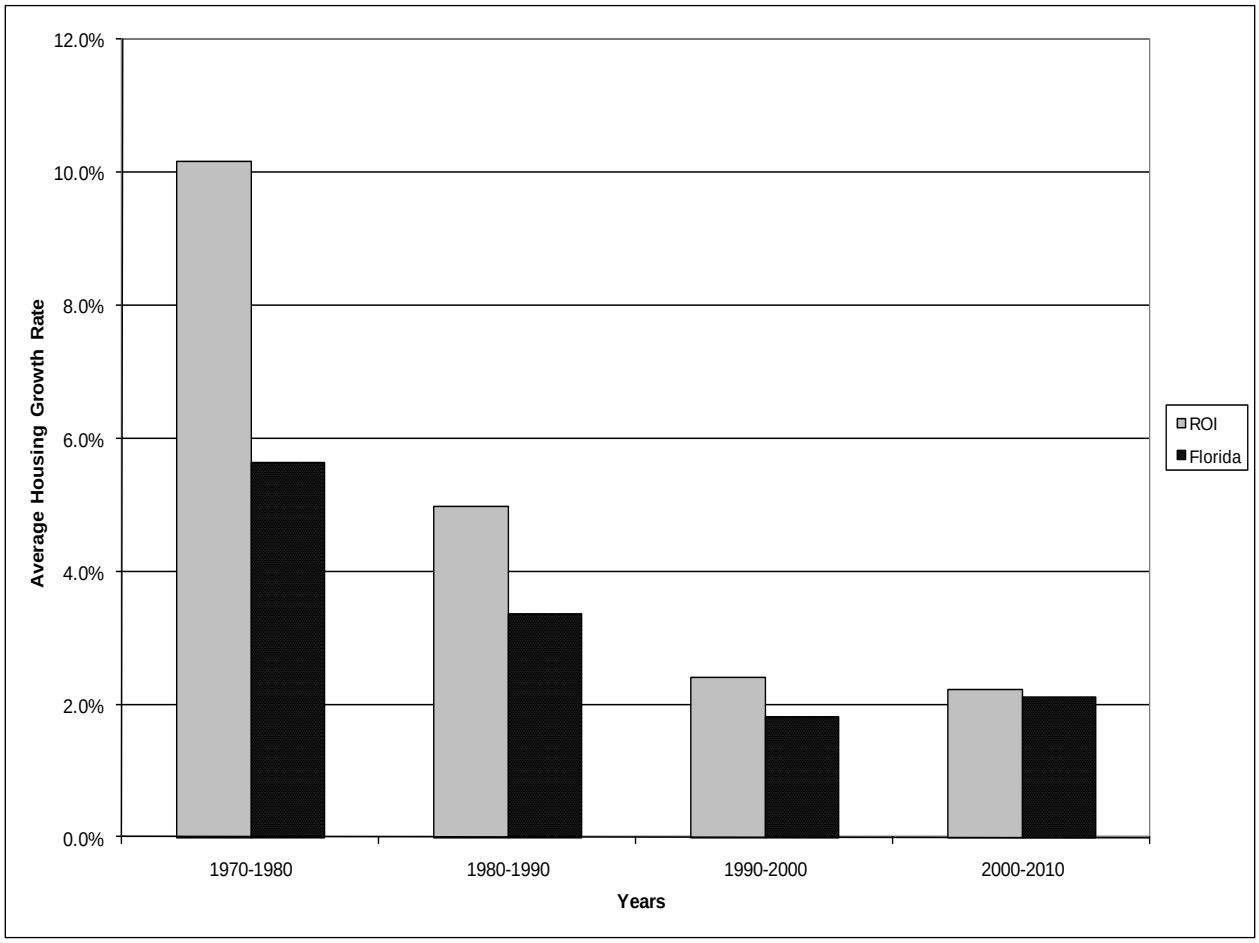
From 1970 to 2010, Florida added approximately 6.5 million new housing units (Census 2009a, 2011). The average pace of new housing construction in the state was approximately 162,000 units per year, for an average annual growth rate of 3.2 percent, approximately 0.6 percent greater than the state's population growth rate. During the same period, the two-county ROI added approximately 84,000 new housing units (Census 2009a, 2011), averaging approximately 2,100 new units per year for an annual growth rate of 4.9 percent, approximately 0.4 percent greater than the ROI's population growth rate over the same period.

Building a typical residential subdivision requires approximately 300 tons of crushed rock per home (NCGS 2007). Using this figure, from 1970 to 2010, housing construction in the ROI required an average of approximately 627,000 tons of crushed rock per year. The estimated amount of crushed rock used for housing construction in the ROI during this time accounted for approximately 1.3 percent of the total amount of crushed rock used for housing construction throughout Florida. Housing growth trends for the ROI and the state are shown in Table 3–27 and Figure 3–27. Starting in 2006, housing permits began to fall off throughout the state, as shown in Figure 3–28, as a result of a slowdown in the economy within the state and throughout the country. Based on historical trends, this slowdown is likely to be temporary in nature, although it may last for several years based on current predictions. The number of housing units is expected to begin to grow again as the economy begins to rebound from its current slowdown.

Table 3–27. Region of Influence and Florida Housing Units, 1970–2010

Year	Citrus County	Levy County	ROI	Florida
1970	9,769	4,760	14,529	2,527,596
1980	29,195	9,068	38,263	4,378,691
1990	49,854	12,307	62,161	6,100,262
2000	62,204	16,570	78,774	7,302,947
2010	78,026	20,123	98,149	8,989,580

Key: ROI=region of influence.
Source: Census 2009a, 2011.



Source: Census 2009a, 2009b.

Figure 3–27. Annual Percentage Increase in the Number of Housing Units in the Region of Influence and the State of Florida

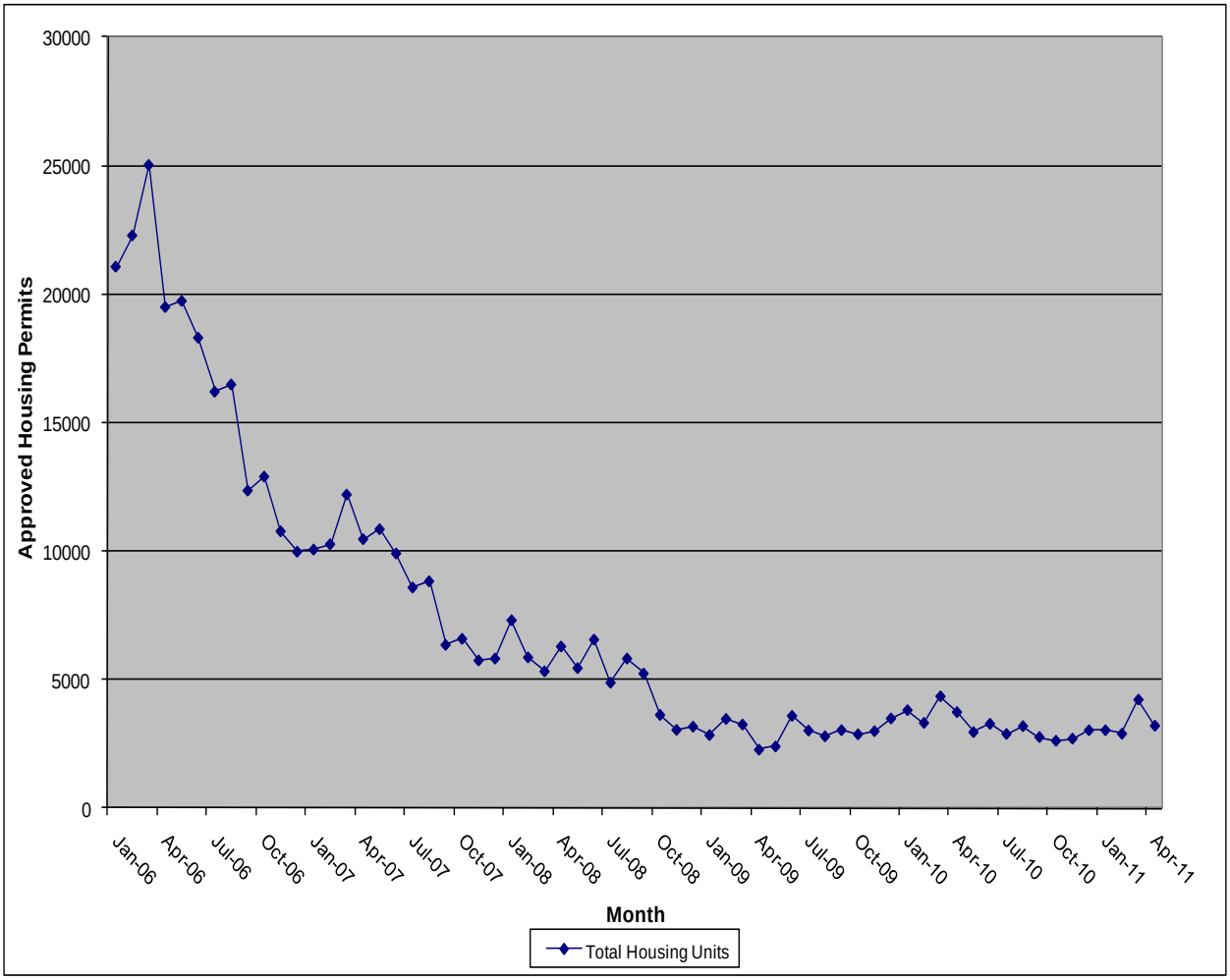


Figure 3–28. Approved Housing Permits in Florida (January 2006–April 2011)

3.14.5 Transportation

The proposed mine in southern Levy County would potentially distribute crushed rock by truck within a 70-mile radius, as depicted in Figure 3–29. Therefore, it is assumed that FDOT Districts 2, 5, and 7 could benefit from materials produced at the mine. The FDOT districts are displayed in Chapter 2, Figure 2–2. In 1991, Florida had 109,373 centerline miles (centerline miles are defined as the length of road regardless of the number of lanes) of roads, including 51,839 in FDOT Districts 2, 5, and 7. In 1991, the two-county ROI had 3,361 centerline miles (FDOT 2011a). By 2010, the state and FDOT Districts 2, 5, and 7 had built another 12,329 and 8,401 centerline miles of new roads, respectively, increases of 11 percent and 16 percent since 1991. During that same period, 456 centerline miles of new roads were built in the ROI, increasing by 14 percent compared to 1991 (FDOT 2011a). From 1991 through 2008, the state added approximately 650 centerline miles of new roads per year, growing at an annual rate of approximately 0.6 percent. FDOT Districts 2, 5, and 7 added approximately 440 centerline miles per year, growing at an annual rate of 0.8 percent. Over the same period, the two-county ROI added approximately 24 centerline miles of new roads per year, an annual growth rate of about 0.7 percent.

It is estimated that building 1 mile of road one lane wide requires approximately 20,000 tons of crushed rock (FDOT 2008). In 2010 alone, FDOT Districts 2, 5, and 7 added 562 lane miles, requiring an estimated 11 million tons of crushed rock (FDOT 2011a, 2011b, 2011c). During this time, 6 lane miles of new roads were constructed in the two-county ROI, requiring an estimated 120,000 tons of crushed rock.

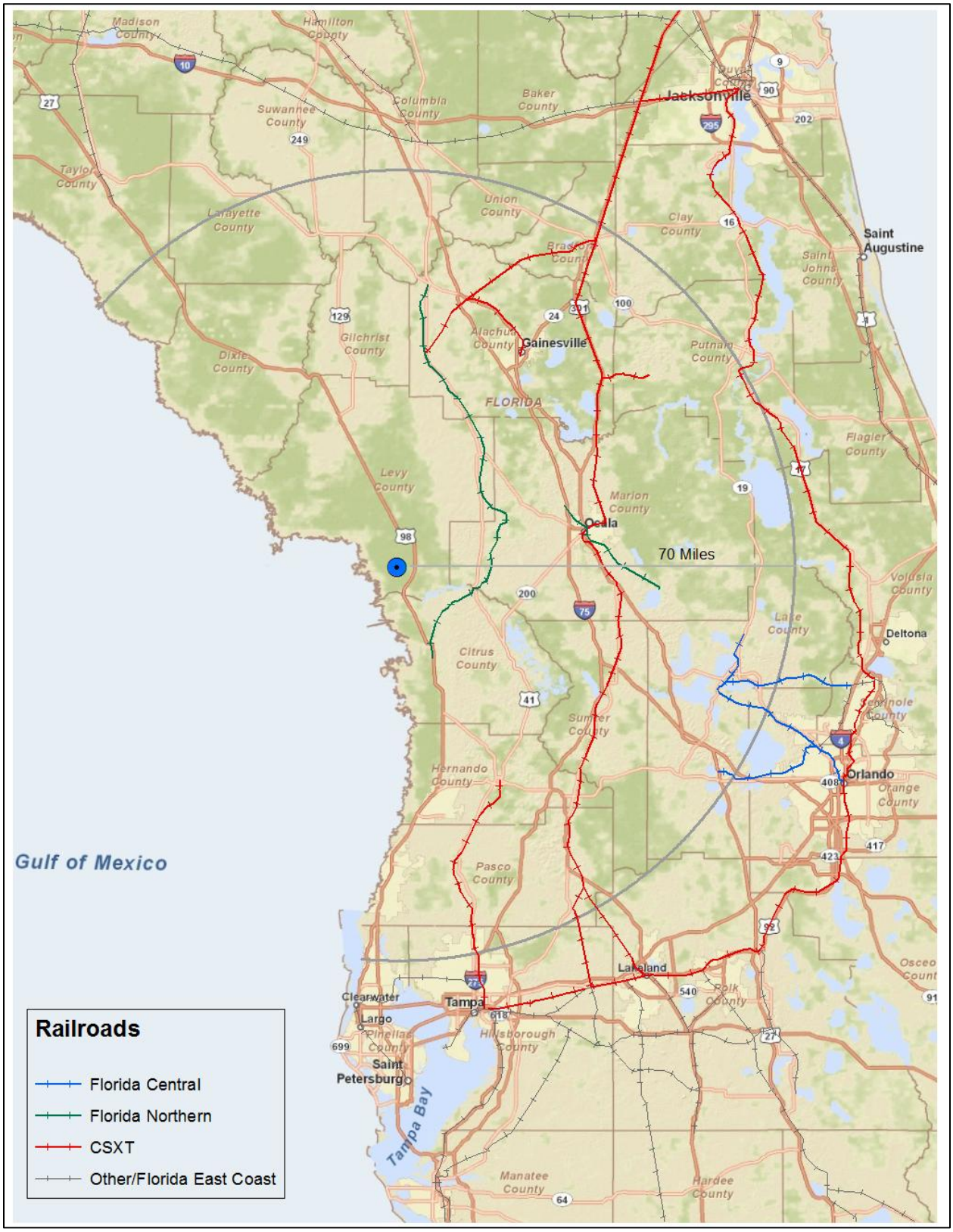
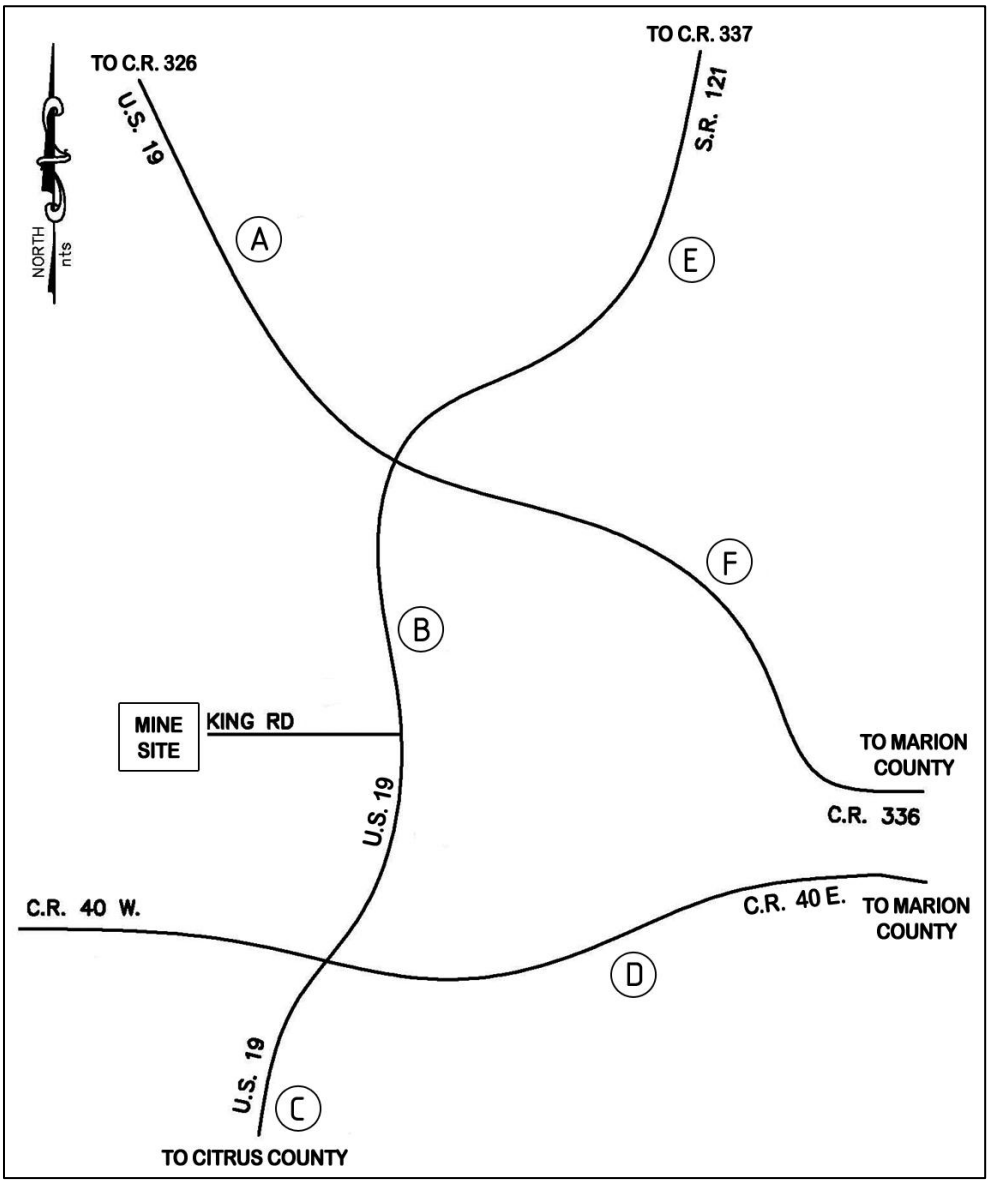


Figure 3–29. 70-Mile Radius from Tarmac King Road Limestone Mine Site for Limestone Delivery by Truck

The area in the immediate vicinity of the Tarmac King Road Limestone Mine Site is rural with limited access to main roads. The main access roads leading from the site that would be available for distribution of limestone to markets within the 70-mile radius are shown in Figure 3–30. The mine site is located on King Road, whose only main access is via U.S. Route 19, a four-lane highway that runs north-south through Levy County. Additional access roads include State Route 121 and County Road 336, which intersect U.S. Route 19 approximately 5 miles northwest of the mine site. County Road 40 intersects U.S. Route 19 in Inglis, approximately 6 miles south of the mine site.



Source: Lincks & Associates 2010.

Figure 3–30. Traffic Study Locations (A through F) Along Main Roads Leading to and from the Tarmac King Road Limestone Mine Site

Traffic studies were initiated at six key points along the main roads in the vicinity of the mine site to determine the existing vehicle load. Specific details and results of the studies are included in Appendix J. Lincks & Associates (2010) conducted 3 days of 24-hour machine counts at the following locations the week of December 15, 2009:

A. U.S. Route 19 between County Road 326 and State Route 121

B. U.S. Route 19 between State Route 121 and County Road 40

C. U.S. Route 19 between County Road 40 and Citrus County

D. County Road 40 between U.S. Route 19 and Marion County

E. State Route 121 between U.S. Route 19 and County Road 337

F. County Road 336 between State Route 121 and Marion County

Peak hourly traffic volume for the morning and afternoon is summarized in Table 3–28. U.S. Route 19 south of the Inglis intersection with County Road 40 carries the largest peak hourly volume for both the morning and the afternoon and is likely due to residents of Inglis traveling to the City of Crystal River, as well as to the Crystal River Nuclear Plant, for work. Current peak hourly traffic volumes at all six locations range from less than 5 percent of the peak hourly capacities for the county and state routes to a maximum of 35 percent of the peak hourly capacities for U.S. Route 19. The traffic volume near the mine site entrance road on U.S. Route 19 peaked at 18 percent of capacity during the study.

Table 3–28. Peak Hour Peak Season Background Traffic

Roadway	From	To	Period	2009 Peak Hour Peak Season Traffic			Peak Hour Capacity
				NB/EB	SB/WB	Total	
U.S. 19	C.R. 326	S.R. 121	AM	119	87	206	2,390
			PM	149	158	307	2,390
U.S. 19	S.R. 121	C.R. 40	AM	174	124	298	2,390
			PM	213	221	434	2,390
U.S. 19	C.R. 40	Citrus County	AM	279	258	537	2,390
			PM	451	366	817	2,390
C.R. 40	U.S. 19	Marion County	AM	140	93	233	1,390
			PM	139	195	334	1,390
S.R. 121	U.S. 19	C.R. 337	AM	56	66	122	1,390
			PM	75	73	148	1,390
C.R. 336	S.R. 121	Marion County	AM	19	26	45	1,390
			PM	27	22	49	1,390

Key: C.R.=county road; EB=eastbound; NB=northbound; SB=southbound; S.R.=state route; U.S.=U.S. route; WB=westbound.
Source: Lincks & Associates 2010:Tables 3 and 4.

3.14.6 Ecotourism

The primary objective of ecotourism is to provide an ecologically and economically sustainable model where people can visit pristine and relatively undisturbed natural areas while attempting to minimize the impacts from tourism on the natural environment. Activities associated with ecotourism such as hiking, camping, and boating are generally low impact in nature and can help provide funding for ecological conservation. There are a variety of ecotourism opportunities in Levy County, including the Lower Suwannee National Wildlife Refuge, the Devil's Hammock WMA, and the Cedar Keys National Wildlife Refuge, in addition to several state parks.

As discussed in Sections 3.7 and 3.13, most of the *King Road EIS* area has been used for lumber production since the early 1950s (BRA/Entrix 2008b). Today, the majority of the area is part of a timber operation in varying developmental stages of third-generation pine. The hunting season is the only time public access to the project site is granted; access requires appropriate licenses, permits, and stamps. As a result of the ongoing timbering operation and the limited public access, the project site is not considered an ecotourism area.

3.15 ENVIRONMENTAL JUSTICE

Under Executive Order 12898, Federal agencies are responsible for identifying and addressing potential disproportionately high and adverse human health and environmental effects on minority and low-income populations. Minority persons are those who identify themselves as Hispanic or Latino, Asian, Black or

African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or multiracial (with at least one race designated as a minority race under Council on Environmental Quality guidelines [CEQ 1997]). Persons whose income is below the Federal poverty threshold are designated as low income.

Disproportionately high and adverse human health effects occur when the risk or rate of exposure to an environmental hazard for a minority or low-income population is significant (as defined by the National Environmental Policy Act) and appreciably exceeds the risk or exposure rate for the general population or for another appropriate comparison group (CEQ 1997). A disproportionately high environmental impact that is significant refers to an impact or risk of an impact on the natural or physical environment in a low-income or minority community that appreciably exceeds the environmental impact on the larger community. Such effects may include ecological, cultural, human health, economic, or social impacts. An adverse environmental impact is an impact that is determined to be both harmful and significant.

For the environmental justice analysis for this EIS, a 5-mile zone surrounding the Tarmac King Road Limestone Mine site border was examined. This 5-mile zone is mainly composed of an area within Levy County and, to a lesser degree, an area within Citrus County. The impacts of the proposed Tarmac King Road Limestone Mine are expected to be greatest in this area, as it is closest to the source of potential impacts. Impacts are expected to be less further away from the mine site.

3.15.1 Demographics

The majority of Levy County's population is composed of white non-Hispanics. As shown in Table 3–29, in 2010, approximately 81 percent of the county's population was nonminority and only 19 percent of the population was minority. In total, persons who indicated that they were Hispanic composed approximately 7 percent of the population. In Citrus County, the population is predominantly (approximately 90 percent) composed of nonminorities. The total number of persons identifying themselves as Hispanic accounted for 5 percent of the county's population, as shown in the table. By comparison, the minority population in Florida composed 42 percent of the state's population, while, for the Nation as a whole, minorities made up 36 percent of the population.

Table 3–29. Levy and Citrus County Demographic Profiles, 2010

Population Group	Levy County (number of people)	Levy County (percentage)	Citrus County (number of people)	Citrus County (percentage)	Both Counties (number of people)	Both Counties (percentage)
Minority						
Black or African American[a]	3,832	9	3,987	3	7,819	4
American Indian and Alaska Native[a]	170	0	482	0	652	0
Asian[a]	229	1	1,996	1	2,225	1
Native Hawaiian and Other Pacific Islander[a]	24	0	38	0	62	0
Some other race[a]	879	2	1,106	1	1,985	1
Two or more[a]	791	2	2,277	2	3,068	2
White Hispanic[a]	1918	5	4,801	3	6,719	4
Total Minority	**7,843**	19	**14,687**	10	**22,530**	12
White Non-Hispanic	32,958	81	126,549	90	159,507	88
Total	**40,801**	100	**141,236**	100	**182,037**	100
Total Hispanic	**3,047**	7	**6,584**	5	9,631	5

[a] Includes persons who may have also indicated that they are Hispanic.
Source: Census 2011.

The minority population in Levy and Citrus Counties has been relatively steady over the past few decades, as shown in Figures 3–31 and 3–32. In 1980, minority groups accounted for approximately 8.4 percent of the counties' population. By 2010, minorities increased to 12.4 percent of the counties' population (Census 2011). Over the same period, Florida's minority population increased from 23.3 percent to 42.1 percent and the Nation's minority population increased from 20.3 percent to 36.3 percent of the total population.

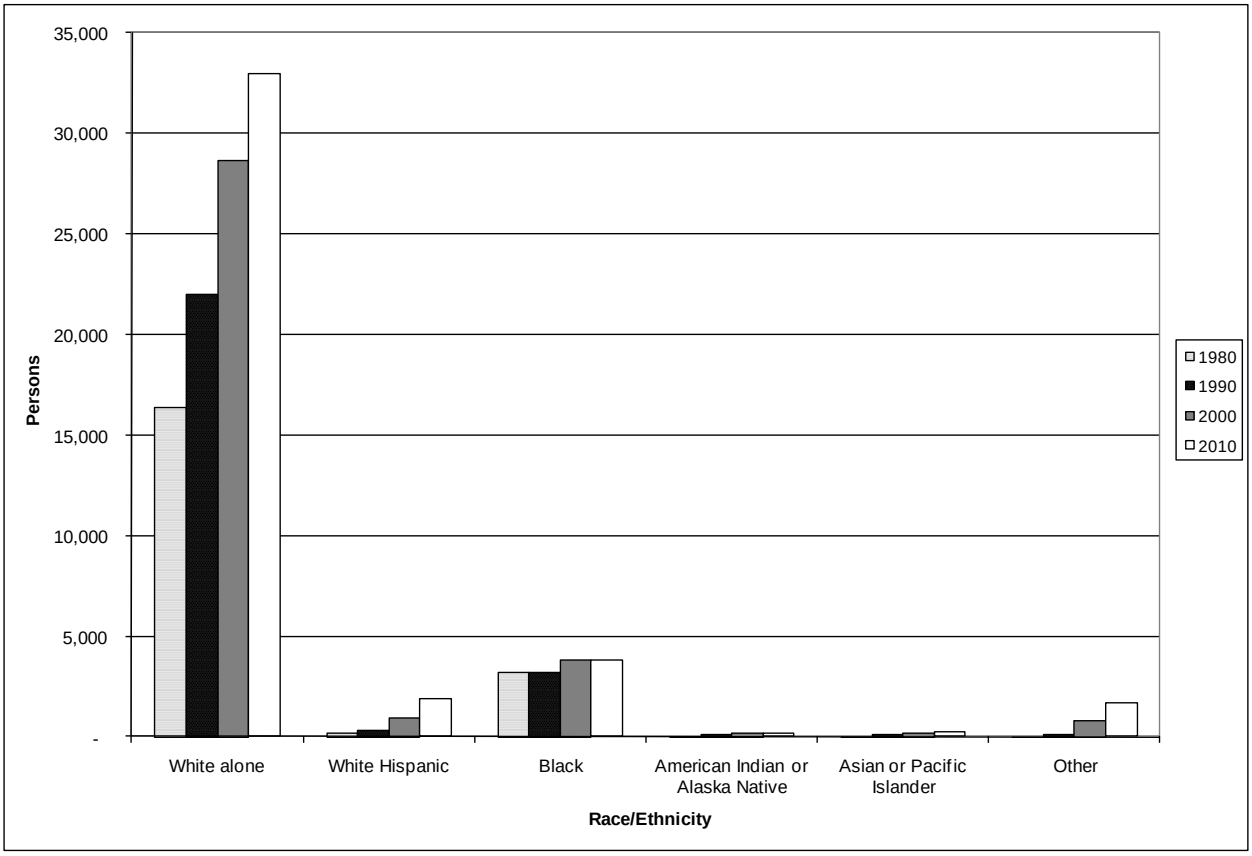


Figure 3–31. Levy County Demographic Profile

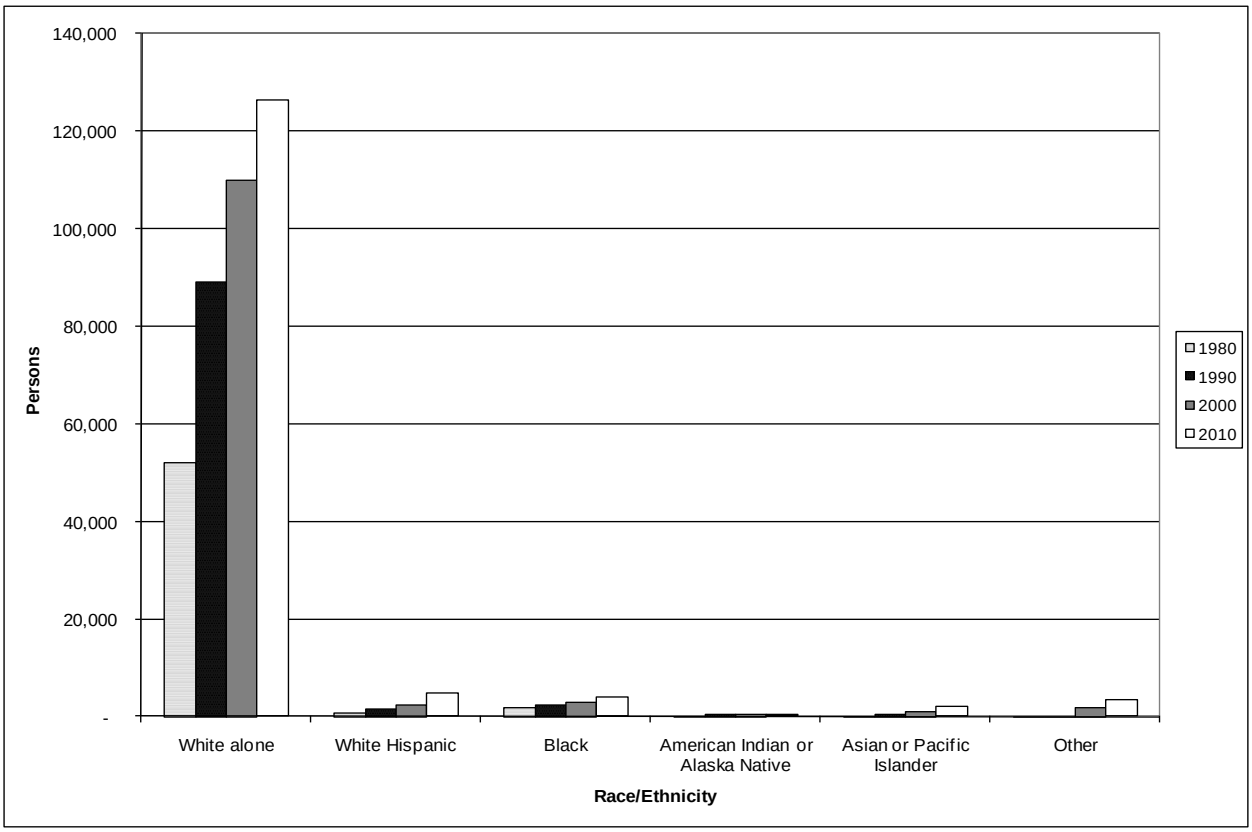
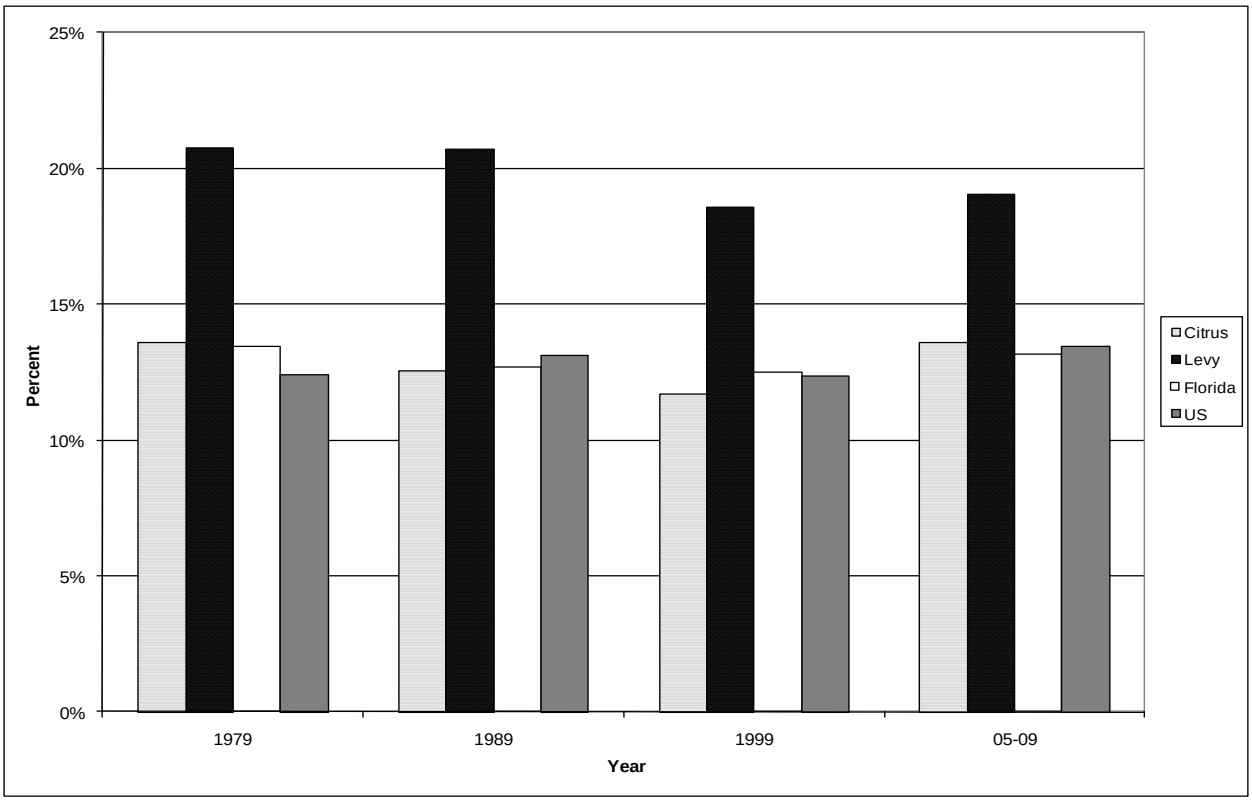


Figure 3–32. Citrus County Demographic Profile

The U.S. Census Bureau reports data at a number of different geographies. A block group is defined as a subdivision of a census tract and is the smallest geographic unit for which the census tabulates sample data. Within the 5-mile zone established around the Tarmac King Road Limestone Mine for this environmental justice analysis were eight census block groups, as established by the 2010 decennial census. Two of these block groups are in Citrus County, and six are in Levy County. Of the eight block groups within the 5-mile zone, none contain a higher minority population than the county or the state. The 5-mile zone surrounding the Tarmac King Road Limestone Mine area is not composed of a larger minority population in general than the county or state averages.

3.15.2 Poverty

The 2010 decennial census does not include estimates based on sample data that have been traditionally included as part of Summary File 3. All sample data have been transitioned to the Census Bureau's American Community Survey Program. The most up-to-date estimates of low-income populations available at the block group level of geography are published as part of the *2005–2009 American Community Survey 5-Year Estimates*. Therefore, the analysis of low-income populations in this EIS relies upon data from the *2005–2009 American Community Survey 5-Year Estimates*. Although the Census Bureau publishes more recent data for levels of geography higher than block groups, low-income data presented here for the county, state, and Nation are also taken from the *2005–2009 American Community Survey 5-Year Estimates* to provide a reasonably comparable analysis. As a percentage of the population, the number of people living at or below the poverty level in Levy County was consistently higher than the national and state levels since 1979 (Census 2009a, 2009b, 2010b, 2011). As shown in Figure 3–33, according to the *2005–2009 American Community Survey 5-Year Estimates*, 19.1 percent of the Levy County population was living at or below the poverty line compared with 13.2 percent of Florida's population and 13.5 percent of the Nation's population. The percentage of the population of Levy County living at or below the poverty level has been relatively steady since the late 1970s. Fewer of Citrus County's population (13.6 percent) are living at or below the poverty level compared with Levy County. Citrus County's poverty levels have been comparable to Florida and the Nation as a whole since the late 1970s.



Source: Census 2009a, 2010b.

Figure 3–33. Percentage of the Population Living Below the Poverty Level

Figure 3–34 shows census block groups in the 5-mile zone surrounding the Tarmac King Road Limestone Mine in terms of their relative poverty levels compared with the state average. Of the five block groups in Levy County that fall within this zone, three had a higher poverty level than the state average. The only block group in Citrus County that falls within the 5-mile zone also had a higher poverty level than the state average. When compared to the county averages, the results of this analysis are identical to those compared with the state. As shown in Figure 3–34, the 5-mile zone surrounding the Tarmac King Road Limestone Mine area is not composed of a larger low-income population in general than the county or state averages.

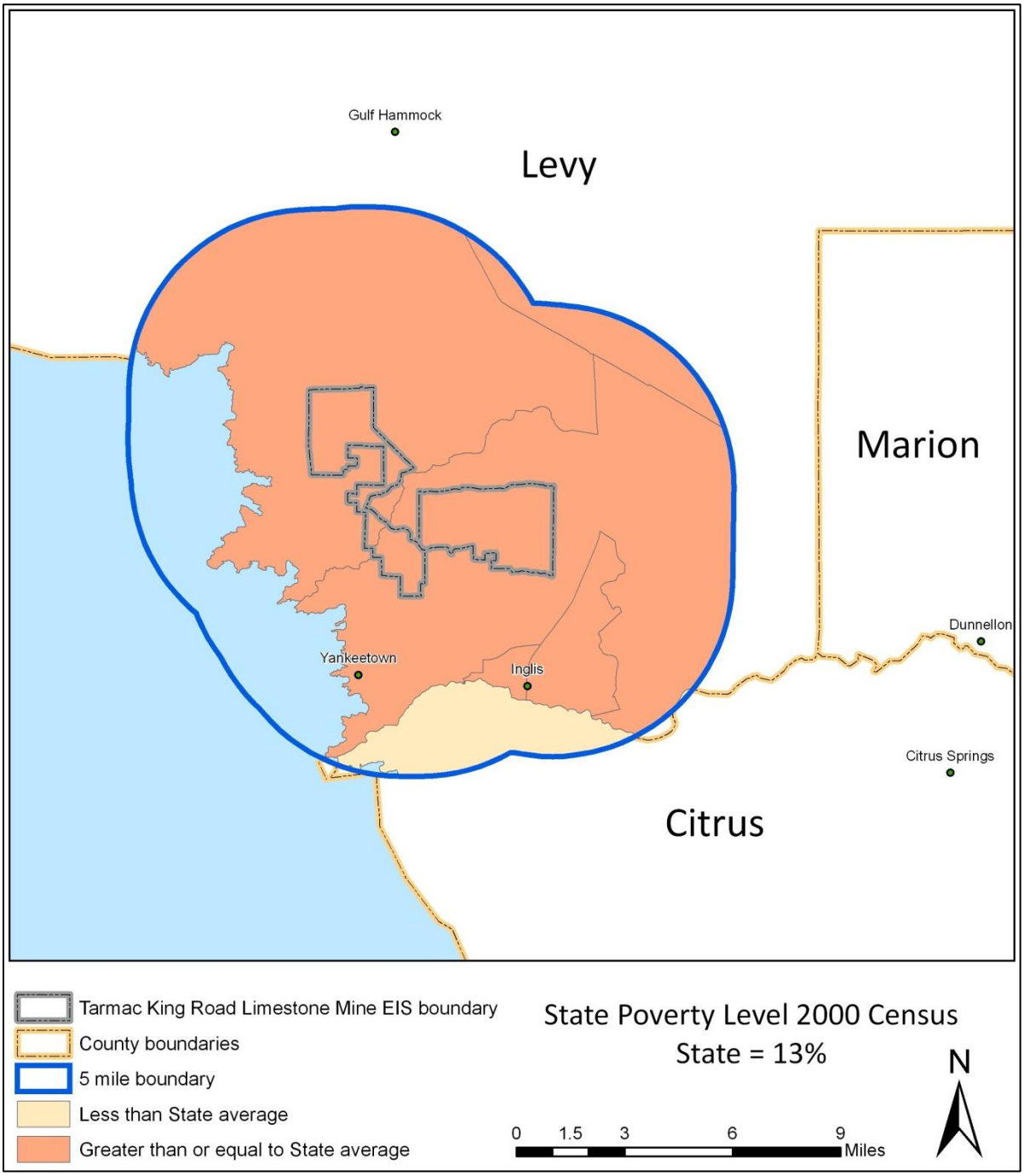


Figure 3–34. Areas Within 5 Miles of the Tarmac King Road Limestone Mine with Higher Percentages of the Population Living Below the Poverty Level Than the State Average

3.16 REFERENCES

AmphibiaWeb, 2012, *Information on amphibian biology and conservation: Pseudobranchus striatus*, accessed through http://amphibiaweb.org/cgi/amphib_query?where-genus=Pseudobranchus&where-species=striatus&account=amphibiaweb on February 13.

AOML (Atlantic Oceanographic & Meteorological Laboratory), 2009, accessed through http://www.aoml.noaa.gov/general/ on March 18.

Ardaman & Associates, 2008a, *Engineering Report in Support of General Water Use Permit, Proposed King Road Mine, Levy County, Florida*, File Number 05-086, June 5.

Ardaman & Associates, 2008b, *Results of Transient Simulation, Pre-Mining and Post-Reclamation Groundwater Systems, Proposed King Road Mine, Levy County, Florida*, File Number 05-086, September 27.

Arthur, J.D., R.A. Lee, and L. Li, 2001, *Lithostratigraphic and Hydrostratigraphic Cross Sections Through Levy-Marion to Pasco Counties, Southwest Florida*, *Open File Report 81*, Florida Department of Natural Resources, Division of Resource Management, Florida Geological Survey, Tallahassee, Florida.

ATSDR (Agency for Toxic Substances and Disease Registry), 2008, *Public Health Assessment for Barker Chemical Company, Inglis, Levy County, Florida*, EPA Facility ID: FL0001275627, Tallahassee, Florida, May 8.

Bailey, R.G, 1995, *Description of the Ecoregions of the United States,* U.S. Forest Service, Washington, D.C., accessed through http://permanent.access.gpo.gov/websites/fsfedus/www.fs.fed.us/institute/ecoregions/ecoreg1_home.html in March 2009.

BEA (Bureau of Economic Analysis), 2011a, Regional Data, GDP & Personal Income, Gross Domestic Product by State, SIC Industrial Classification (1963–1997), accessed through http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1, June 20.

BEA (Bureau of Economic Analysis), 2011b, Regional Data, GDP & Personal Income, Gross Domestic Product by State, NAICS Industrial Classification (1997–1020) accessed through http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1, June 20.

BIPM (Bureau of Invasive Plant Management), 2004, Upland Invasive Exotic Plant Management Program, Florida Department of Environmental Protection.

BRA (Biological Research Associates), 2007, *Mining Impact Assessment Report, King Road Mine*, Deerfield Beach, Florida, October.

BRA (Biological Research Associates), 2008, *Vegetative Cover Evaluation for Reference and Enhancement Areas, Tarmac King Road Limestone Mine, Levy County, FL*, April.

BRA/ENTRIX (Biological Research Associates/ENTRIX, Inc.), 2008a, *Tarmac King Road Limestone Mine, Levy County, Florida, Environmental Narrative,* Riverview, Florida, October.

BRA/ENTRIX (Biological Research Associates/ENTRIX, Inc.), 2008b, *Tarmac King Road Limestone Mine U.S. Army Corps of Engineers Wetland Delineation Review Methodology*, July.

CCS (Center for Climate Strategies), 2008, *Final Florida Greenhouse Gas Inventory and Reference Case Projections 1990–2025*, October.

Census (U.S. Bureau of the Census), 2009a, *Decennial Census Reports 1970–2000*, accessed through http://censtats.census.gov/usa/usa.shtml, March 18.

Census (U.S. Bureau of the Census), 2009b, *2006–2008 American Community Survey 3-Year Estimates*, accessed through http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenuId=datasets_2&_lang=en.

Census (U.S. Bureau of the Census), 2010a, *Population Estimates*, Table 4: Cumulative Estimates of the Components of Resident Population Change for Counties of Florida: April 1, 2000 to July 1, 2009, accessed through http://www.census.gov/popest/counties/CO-EST2009-04.htm, March.

Census (U.S. Bureau of the Census), 2010b, *2005–2009 American Community Survey 5-Year Estimates*, Detailed Tables, Table C17002: Ratio of Income to Poverty in the Last 12 Months (Universe: Population for Whom Poverty Status is Determined), accessed through http://www2.census.gov/acs2005_2009_5yr/summaryfile/, December 14.

Census (U.S. Bureau of the Census), 2011, 2010 Decennial Census, 2010 Demographic Profile Data, Table DP-1, accessed through http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml, August.

CEQ (Council on Environmental Quality), 1997, *Environmental Justice Guidance Under the National Environmental Policy Act*, Executive Office of the President, Washington, D.C., December 10.

Denton, S.R., and M.E. Evans, 2008, *Vegetative Cover Evaluation for Reference and Enhancement Areas*, Biological Research Associates, April 18.

DSLSA, RCLS, and FNAI (Division of State Lands Staff Acquisition and Restoration Council Liaison Staff, and Florida Natural Areas Inventory), 2004, *Gulf Hammock Evaluation Report*, Levy County, Florida, June 4.

Endries, M., T. Gilbert, and R. Kautz, 2009, *The Integrated Wildlife Habitat Ranking System 2009,* Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

ENTRIX (ENTRIX, Inc.), 2009a, "Wetlands Shapefiles," personal communication between M. Evans, ENTRIX, and J.O. Holian, Science Applications International Corporation, Germantown, Maryland, March 6.

ENTRIX (ENTRIX, Inc.), 2009b, *Wildlife Survey Results, Tarmac King Road Limestone Mine, Levy County, Florida*, Revised, Riverview, Florida, July.

ENTRIX (ENTRIX, Inc.), 2010, *Tarmac King Road Limestone Mine Project Biological Assessment*, Riverview, Florida, January.

EPA (U.S. Environmental Protection Agency), 1974, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, EPA-550/9-74-004, Washington, D.C., March.

EPA (U.S. Environmental Protection Agency), 1999, *Guidance Manual for Compliance with the Interim Enhanced Surface Water Treatment Rule: Turbidity Provisions*, EPA-815-R-99-010, Office of Water, April.

EPA (U.S. Environmental Protection Agency), 2006a, *Water: Monitoring & Assessment, 5.2 Dissolved Oxygen and Biochemical Oxygen Demand*, accessed through http://www.epa.gov/volunteer/stream/vms52.html on October 23, 2007.

EPA (U.S. Environmental Protection Agency), 2006b, *National Primary Drinking Water Regulations: Technical Factsheet on Benzene*, accessed through http://www.epa.gov/OGWDW/dwh/t-voc/benzene.html on July 20, 2007.

EPA (U.S. Environmental Protection Agency), 2008a, *National Air Quality Status and Trends Through 2007*, EPA-454/R-08-006, Office of Air Quality Planning and Standards, Air Quality Assessment Division, Research Triangle Park, North Carolina, November.

EPA (U.S. Environmental Protection Agency), 2008b, *Facility Emissions Report-Criteria Air Pollutants*, accessed through http://www.epa.gov/air/data/netemis.html?st~FL~Florida on March 23, 2009.

EPA (U.S. Environmental Protection Agency), 2009a, *Ammonia Aquatic Life Criteria*, accessed through http://www.epa.gov/waterscience/criteria/ammonia/index.html on March 12.

EPA (U.S. Environmental Protection Agency), 2009b, *The Green Book Nonattainment Areas for Criteria Pollutants,* accessed through http://www.epa.gov/oar/oaqps/greenbk/ on March 23.

EPA (U.S. Environmental Protection Agency), 2009c, *Prevention of Significant Deterioration* (*PSD*) *Basic Information*, accessed through http://epa.gov/nsr/psd.html on March 24.

EPA (U.S. Environmental Protection Agency), 2011, *Superfund Information Systems – Superfund Site Information*, accessed through http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm on June 17.

EPA (U.S. Environmental Protection Agency), 2013, *Watershed Quality Assessment Report: Florida, Waccasassa Watershed*, accessed through http://iaspub.epa.gov/tmdl_waters10/attains_watershed.control, June 19.

FDEM (Florida Division of Emergency Management), 2009, *Florida's Storm Surge Zones, Evacuation Routes and Evacuation Zones*, accessed through http://www.floridadisaster.org/PublicMapping/index.htm, January 19.

FDEO (Florida Department of Economic Opportunity), 2013a, Labor Market Statistics, State of Florida Labor Force Summary, State and All Areas, Annual Local Area Unemployment Statistics Annual Averages 1990–2012, accessed through http://www.floridajobs.org/labor-market-information/data-center/statistical-programs/local-area-unemployment-statistics on May 31.

FDEO (Florida Department of Economic Opportunity), 2013b, Labor Market Statistics, Quarterly Census of Employment and Wages, County Employment by Industry, 2012 by Sector, accessed through http://www.floridajobs.org/labor-market-information/data-center/statistical-programs/quarterly-census-of-employment-and-wages on May 31.

FDEP (Florida Department of Environmental Protection), 2005, *Waccasassa Bay Preserve State Park Unit Management Plan*, Division of Recreation and Parks, June 3.

FDEP (Florida Department of Environmental Protection), 2006, *Florida Geology Forum,* Vol. 20, No. 2, Tallahassee, Florida, October.

FDEP (Florida Department of Environmental Protection), 2009a, *Surface Water Quality Classifications-Classes, Uses, Criteria,* accessed through http://www.dep.state.fl.us/water/wqssp/classes.htm on March 9.

FDEP (Florida Department of Environmental Protection), 2009b, *Big Bend Seagrasses Aquatic Preserve Information*, accessed through http://www.dep.state.fl.us/coastal/sites/bigbend/info.htm on March 16.

FDEP (Florida Department of Environmental Protection), 2010a, *MapDirect, GIS Gateway*, accessed through http://ca.dep.state.fl.us/imf/sites/gisgateway/ on February 24.

FDEP (Florida Department of Environmental Protection), 2010b, *Storage Tank/Contaminated Facility Search by Facility Name, Attributes, &/or Location*, accessed through http://appprod.dep.state.fl.us/www_stcm/reports/facility_location_p.asp on February 24.

FDEP (Florida Department of Environmental Protection), 2010c, *Storage Tank/Contaminated Facility Name & Address Search*, accessed through http://appprod.dep.state.fl.us/www_stcm/reports/STCM02.asp on February 24.

FDEP (Florida Department of Environmental Protection), 2012a, "Numeric Nutrient Criteria in the State of Florida: Status and Meaning of November 30, 2012 Action by EPA," December.

FDEP (Florida Department of Environmental Protection), 2012b, *Florida Forever Five Year Plan,* Division of State Lands, Office of Environmental Services, in cooperation with Florida's Acquisition and Restoration Council, April.

FDEP (Florida Department of Environmental Protection), 2013, "Implementation of Florida's Numeric Nutrient Standards: Document Submitted to EPA in Support of the Department of Environmental Protection's Adapted Nutrient Standard for Streams, Spring Vents, Lakes, and Selected Estuaries," March.

FDHR (Florida Division of Historic Resources), 2010, *Data for Archaeological Sites, Field Surveys, and Standing Structure GIS Data Layers*, Tallahassee, Florida, January.

FDOT (Florida Department of Transportation), 1999, *Florida Land Use, Cover and Forms Classification System*, Surveying and Mapping Office Geographic Mapping Section, Third Edition, January.

FDOT (Florida Department of Transportation), 2007, *Strategic Aggregates Study: Sources, Constraints, and Economic Value of Limestone and Sand in Florida*, March 12

FDOT (Florida Department of Transportation), 2008, "Support Information from FDOT," personal communication (email) between B. Blanchard, FDOT, and J. Eichner, Science Applications International Corporation, Germantown, Maryland, November 25.

FDOT (Florida Department of Transportation), 2011a, *Florida Highway Mileage Reports – Public Roads, Summary Since 1990*, accessed through http://www.dot.state.fl.us/planning/statistics/mileage-rpts/public.shtm.

FDOT (Florida Department of Transportation), 2011b, *Florida Highway Mileage Reports – Public Roads, Annual Reports, Public Road Mileage and Miles Traveled, 2009*, accessed through http://www.dot.state.fl.us/planning/statistics/mileage-rpts/public.shtm.

FDOT (Florida Department of Transportation), 2011c, *Florida Highway Mileage Reports – Public Roads, Annual Reports, Public Road Mileage and Miles Traveled, 2010*, accessed through http://www.dot.state.fl.us/planning/statistics/mileage-rpts/public.shtm.

FEMA (Federal Emergency Management Agency), 2009, "Coastal High Hazard Area," accessed through http://www.fema.gov/prevent/floodplain/nfipkeywords/chhas.htm, April 11.

Fetter, C.W., 1988, *Applied Hydrogeology*, Merrill Publishing Company, Columbus, Ohio, 2nd Edition.

FFWCC (Florida Fish and Wildlife Conservation Commission), 2009a, *Florida Land Cover Classification System, Final Report*, State Wildlife Grant, SWGT-13, Center for Spatial Analysis, Fish and Wildlife Research Institute, December 31.

FFWCC (Florida Fish and Wildlife Conservation Commission), 2009b, *Black Bears in Florida,* accessed through http://www.floridaconservation.org/WILDLIFEHABITATS/Bear_index.htm in March.

FFWCC (Florida Fish and Wildlife Conservation Commission), 2009c, Gulf Hammock Wildlife Management Area*,* accessed through http://www.floridaconservation.org/RECREATION/WMA Sites_GulfHammock_index.htm on March 16.

FFWCC (Florida Fish and Wildlife Conservation Commission), 2011, Gulf Hammock Wildlife Management Area, Regulations Summary and Area Map, July 1, 2011–June 30, 2012.

Florida Geological Survey, 1992, *Florida's Ground Water Quality Monitoring Program Background Hydrogeochemistry,* Special Publication No. 34, ISSN 0085–0640, Tallahassee, Florida, October.

Florida Geological Survey, 2010, *Hazards – Earthquakes*, accessed through http://www.dep.state.fl.us/geology/geologictopics/hazards/earthquakes.htm, February 9.

FNAI (Florida Natural Areas Inventory), 2009, *Biodiversity Matrix, Levy County, Unofficial Report for Matrix Units 21102, 21103, 21338-21341, 21575, 21577, 21578, 21813-21815, 21817, 22054-22057, 22297, 22298*, accessed through http://lotmaps.freac.fsu.edu/bio05/index.html, March.

FNAI (Florida Natural Areas Inventory), 2010, *Guide to the Natural Communities of Florida, 2010 Edition*, Tallahassee, Florida.

Fretwell, J.D., 1983, *Ground-water Resources of Coastal Citrus, Hernando, and Southwestern Levy Counties*, *Florida,* U.S. Geological Survey, Water Resources Investigations Report 83-4079, Tallahassee, Florida.

FWS (U.S. Fish and Wildlife Service), 1990, *Gopher Tortoise* (Gopherus polyphemus) *Recovery Plan*, Southeast Region, Atlanta, Georgia, December 26.

FWS (U.S. Fish and Wildlife Service), 1997, *Revised Recovery Plan for the U.S. Breeding Population of the Wood Stork*, Southeast Region, Atlanta, Georgia, January 27.

FWS (U.S. Fish and Wildlife Service), 1999, *Eastern Indigo Snake* Drymarchon corais couperi, in *Multi-species Recovery Plan for South Florida*, South Florida Ecological Field Services, Vero Beach, Florida, accessed through http://www.fws.gov/verobeach/images/pdflibrary/eisn.pdf on February 19, 2009.

FWS (U.S. Fish and Wildlife Service), 2007, *Florida Wood Stork Colonies Core Foraging Areas,* November 2007, accessed through http://www.fws.gov/northflorida/WoodStorks/Documents/110107-WOST-Nest-Colonies-Forag-Areas-w-buffers.pdf, March 2009.

FWS (U.S. Fish and Wildlife Service), 2010, *Wood Storks,* North Florida Field Office, accessed through http://www.fws.gov/northflorida/WoodStorks/wood-storks.htm, November.

FWS (U.S. Fish and Wildlife Service), 2011a, *Levy County, FL Federally Listed Species,* North Florida Field Office, accessed through http://www.fws.gov/northflorida/CountyList/Levy.htm, June.

FWS (U.S. Fish and Wildlife Service), 2011b, personal communication (email) between Mr. Ed Sarfert (USACE) and Mr. Todd Mecklenborg (FWS) dated September 8, 2011.

Geselbracht, L., K. Freeman, E. Kelly, D.R. Gordon, and F.E. Putz, 2011, *Retrospective and Prospective Model Simulations of Sea Level Rise Impacts on Gulf of Mexico Coastal Marshes and Forests in Waccasassa Bay, Florida,* May 10.

GMFMC (Gulf of Mexico Fishery Management Council), 2005, *Addressing Essential Fish Habitat Requirements, Habitat Areas of Particular Concern, and Adverse Effects of Fishing in the following Fishery Management Plans of the Gulf of Mexico: Shrimp Fishery of the Gulf of Mexico, United States Waters; Red Drum Fishery of the Gulf of Mexico; Reef Fish Fishery of the Gulf of Mexico; Coastal Migratory Pelagic Resources* (*Mackerels*) *in the Gulf of Mexico and South Atlantic; Stone Crab Fishery of the Gulf of Mexico; Spiny Lobster in the Gulf of Mexico and South Atlantic; Coral and Coral Reefs of the Gulf of Mexico*, Final Generic Amendment Number 3, Tampa, Florida, March.

Griffith, G.E., J.M. Omernik, and S.M. Pierson, 2002, *Level III and IV Ecoregions of Florida,* U.S. Environmental Protection Agency and ManTech Environmental Technology, Inc., Corvalis, Oregon.

Hammond, D.G., and K.M.N. Robbins, 2008, *Surface Water Quality Assessment, Baseline Monitoring, Tarmac King Road Limestone Mine 2008 Annual Report*, Biological Research Associates/ENTRIX, October.

Kincaid, T.R., 2009, Survey of *Groundwater Discharges in Waccasassa Bay Area Between Dowry Creek and Beetree Slough*, H2H Associates, LLC, Reno, Nevada, February 5.

Klotzbach, P., and W. Gray, 2012, United States Landfall Probability Webpage, accessed through http://www.e-transit.org/hurricane/welcome.html, December.

Lane, E., R.W. Hoenstine, J.W. Yon, and S.M. Spencer, 1988, *Map Series No. 116, Mineral Resources of Levy County, Florida*, Florida Department of Natural Resources, Division of Resource Management, Florida Geological Survey, Tallahassee, Florida.

Lane, E., ed., 1994, *Florida's Geological History and Geological Resources*, Special Publications 35, Florida Geological Survey, Tallahassee, Florida.

Levy County, 2008, *Levy County Comprehensive Plan: Chapter 8, Future Land Use Element*, accessed through http://www.levycounty.org/planning/compplan08.pdf, Planning Department, Bronson, Florida.

Lincks & Associates, Inc., 2010, *Transportation Analysis - Tarmac-Levy County*, Tampa, Florida, June.

Maehr, D.S., T.S. Hoctor, L.J. Quinn, and J.S. Smith, 2001, *Black Bear Habitat Management Guidelines for Florida,* Technical Report No. 17, Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

McDonald, M.G., and A.W. Harbaugh, 1988, *Techniques of Water-Resources Investigations of the United States Geological Survey, Chapter A1: A Modular Three-Dimensional Finite-Difference Ground-Water Flow Model*, Open File Report 83-875, U.S. Geological Survey, Reston, Virginia.

NatureServe, 2012, *Comprehensive Report Species – Pseudobranchus striatus*, accessed through http://www.natureserve.org/explorer/servlet/NatureServe?searchName=Pseudobranchus+striatus on February 13.

NCDC (National Data Climatic Center), 2009, *Climates of the World*, accessed through http://www.ncdc.noaa.gov/oa/documentlibrary/pdf/climatesoftheworld.pdf on March 16.

NCGS (North Carolina Geological Survey), 2007, Crushed Stone Aggregates in North Carolina, accessed through http://www.geology.enr.state.nc.us/NAE%20aggregates%20Internet%20NRC%20with%20USGS%20sheet/Aggregate%20overview%20new.htm, June 6.

NOAA (National Oceanic and Atmospheric Administration), 2005, *NOAA Tides and Currents, Datums for Cedar Key, FL, Station ID: 8727520*, accessible at http://tidesandcurrents.noaa.gov/data_menu.shtml?stn=8727520%20Cedar%20Key,%20FL&type=Datums, with link to National Geodetic Survey data correlating water level heights to NAVD88 and NGVD at http://www.ngs.noaa.gov/newsys-cgi-bin/ngs_opsd.prl?PID=AR1204&EPOCH=1983-2001.

NOAA (National Oceanic and Atmospheric Administration), 2011, *Sea Levels Online*, NOAA Center for Operational Oceanographic Products and Services, searchable map accessible at http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml.

NRC (U.S. Nuclear Regulatory Commission), 2010, *Draft Environmental Impact Statement for Combined Licenses* (*COLs*) *for Levy Nuclear Plant Units 1 and 2*, NUREG-1941, Washington, D.C., August.

Panamerican Consultants, Inc., 2006, *An Archaeological and Historical Survey of the King Road Mine Project Area in Levy County, Florida*, Tampa, Florida, October.

PEF (Progress Energy Florida, Inc.), 2008, *Levy Nuclear Plant Units 1 and 2 Combined License (COL) Application, Part 3, Environmental Report*, accessed through http://www.nrc.gov/reactors/new-reactors/col/levy/documents.html on March 12, 2009.

Plum Creek (Plum Creek Timber Company), 2008, *Quick Facts About Plum Creek in Florida,* Gainesville, Florida, February.

Pollock, D.W., 1989, *Documentation of Computer Programs to Compute and Display Pathlines Using Results from the U.S. Geological Survey Modular Three-Dimensional Finite-Difference Ground-Water Flow Model*, Open-File Report 89-381, U.S. Geological Survey, Reston, Virginia.

Romero, G., Levy County Development Department, 2011, personal communication (email) with S. Dixon, Science Applications International Corporation, Germantown, MD, August 18.

Rupert, F.R., 1988, *Geology and Geomorphology of Levy County, Florida,* Florida Geological Survey, Open File Report-19, Tallahassee, Florida, May.

Ryder, P.D., 1985, *Hydrology of the Floridan Aquifer System in West-Central Florida*, U.S. Geological Survey Professional Paper 1403-F, Washington, D.C.

Sarfert, E.P., USACE Jacksonville Regulatory District, Jacksonville, Florida, 2009, personal communication with J.O. Holian, Science Applications International Corporation, Germantown, Maryland, March 19.

Sarfert, E.P., USACE Jacksonville Regulatory District, Jacksonville, Florida, 2010, personal communication with J.O. Holian, Science Applications International Corporation, Germantown, Maryland, May 4.

Schiffer, D.M., 1998, *Hydrology of Central Florida Lakes—A Primer,* U.S. Geological Survey Circular 1137, Denver, Colorado.

Scott, T.M., 2001, *Text to Accompany the Geologic Map of Florida, Open File Report 80*, Florida Department of Natural Resources, Division of Resource Management, Florida Geological Survey, Tallahassee, Florida.

SERCC (Southeast Regional Climate Center), 2009, *Usher Tower Climate Summary*, accessed through http://www.sercc.com/cgi-bin/sercc/cliMAIN.pl?fl9120 on March 16.

SDHEC (South Carolina Department of Health and Environmental Controls), 2004, *Water Classifications and Standards, Regulation 61-68*, Bureau of Water, Columbia, South Carolina, June 25

STOF (Seminole Tribe of Florida), 2012, personal communication between P.N. Backhouse, Ph.D., STOF Historic Preservation Officer, and E.P. Sarfert, U.S. Army Corps of Engineers, July 16.

SWFWMD (Southwest Florida Water Management District), 2001, *The Hydrology and Water Quality of Select Springs in the Southwest Florida Water Management District*, Tampa, Florida.

SWFWMD (Southwest Florida Water Management District), 2009, *Shapefile Library*, accessed through http://www.swfwmd.state.fl.us/data/gis/layer_library/category/physical_sparse, March.

SWFWMD (Southwest Florida Water Management District), 2010, *Southwest Florida Water Management District-Shapefile Library*, accessed through http://www.swfwmd.state.fl.us/data/gis/layer_library/index.php?search=FLUCCS&submit=Search, September.

Tarmac (Tarmac America, LLC), 2008, King Road Mine, Special Exception Application, February 1.

Tarmac (Tarmac America, LLC), 2009a, Additional Information for Tarmac America - Titan King Road Mine File No. 0244771-002, May 21.

Tarmac (Tarmac America, LLC.), 2009b, Data Call Response.

Tarmac (Tarmac America, LLC), 2010a, Tarmac King Road Mine Site Special Exception Application #3, Levy County, Florida, filed June 13, 2010.

Tarmac (Tarmac America, LLC.), 2010b, Additional Information for Tarmac America – Shapefiles for Alternative Mine Plan Boundaries, December 13.

Tarmac King Road Mine Site Permit Application, 2008, filed on October 25, 2007, and supplemented on February 1, 2008.

Trinity Consultants, 2010, *Greenhouse Gas Emissions Inventory, Tarmac America LLC–King Road Mine*, Orlando, Florida, February.

University of Florida, 2011, *Florida Maps, Florida Maps Collection, University of Florida Digital Collections*, accessed through http://ufdc.ufl.edu/UF00020281/00001, October 10.

USACE (U.S. Army Corps of Engineers), 1987, *Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1,* Department of the Army, Washington, D.C., January.

USACE (U.S. Army Corps of Engineers), 2006, *Biological Assessment, 2002, Lakebelt 10-Year Mining Permits, Miami-Dade County*, Palm Beach Gardens Regulatory Office, Florida, August.

USACE (U.S. Army Corps of Engineers), 2011, *Water Resource Policies and Authorities Incorporating Sea-Level Change Considerations for Civil Works Programs*, EC-1165-2-212, October.

USDA (U.S. Department of Agriculture), 1996, *Soil Survey of Levy County, Florida*, Natural Resources Conservation Service, September.

USDA (U.S. Department of Agriculture), 2010, *Area of Interest Interactive Map*, http://websoilsurvey.nrcs.usda.gov/app/ WebSoilSurvey.aspx.

USGS (U.S. Geological Survey), 2007, *Potentiometric Surface of the Upper Floridan Aquifer, West-Central Florida, May 2006*, Open File Report 2007-1032, Tampa, Florida, May.

USGS (U.S. Geological Survey), 2008, *National Seismic Hazard Maps-2008*, accessed through http://gldims.cr.usgs.gov/nshmp2008/viewer.htm.

Wilsnack, M.M. and S.K. Nair, 1998, "Designing an ARC/INFO Database for a MODFLOW Model: A Case Study in the Limestone Mining Belt of Southern Florida," *Proceedings for MODFLOW'98,* Colorado School of Mines, October 4–8, Vol. II, pp. 649–656.

Florida Administrative Code

FAC Chapter 62-302, "Surface Water Quality Standards."

FAC Chapter 62-340, "Delineation of the Landward Extent of Wetlands and Surface Waters."

FAC Chapter 62-345, "Uniform Mitigation Assessment Method."

FAC Chapter 62-730, "Hazardous Waste."

FAC Rule 62-4.242, "Antidegradation Permitting Requirements; Outstanding Florida Waters; Outstanding National Resource Waters; Equitable Abatement."

FAC Rule 62-204.240, "Ambient Air Quality Standards."

FAC Rule 62-204.340, "Designation of Attainment, Nonattainment, and Maintenance Areas."

FAC Rule 62-302.300, "Findings, Intent, and Antidegradation Policy for Surface Water Quality."

FAC Rule 62-302.530, "Table: Surface Water Quality Criteria."

FAC Rule 62-302.531, "Numeric Interpretations of Narrative Nutrient Criteria."

FAC Rule 62-302.700, "Special Protection, Outstanding Florida Waters, Outstanding National Resource Waters."

Florida Statutes

Title XXIII, "Motor Vehicles." Section 316.293, "State Uniform Traffic Control: Motor Vehicle Noise."

Title XXIII, "Motor Vehicles." Section 316.3045, "State Uniform Traffic Control: Operation of Radios or Other Mechanical Soundmaking Devices or Instruments in Vehicles; Exemptions."

Title XXVIII, "Natural Resources; Conservation, Reclamation, and Use." Section 373.414, "Water Resources: Additional Criteria for Activities in Surface Waters and Wetlands."

Title XXXII, "Regulation of Professions and Occupations." Chapter 487, "Pesticide Regulation and Safety."

Code of Ordinances of Levy County

Chapter 50, "Land Development Code." Section 50-719, "Mining and Excavation of Minerals, Resources, or Natural Resources, and Site Reclamation."

Code of Federal Regulations

40 CFR 50, U.S. Environmental Protection Agency, "National Primary and Secondary Ambient Air Quality Standards."

40 CFR 81.310, U.S. Environmental Protection Agency, "Designation of Areas for Air Quality Planning Purposes: Florida."

40 CFR 261.5, U.S. Environmental Protection Agency, "Identification and Listing of Hazardous Waste: Special Requirements for Hazardous Waste Generated by Conditionally Exempt Small Quantity Generators."

40 CFR 262, U.S. Environmental Protection Agency, "Standards Applicable to Generators of Hazardous Waste."

44 CFR 64.3(a), Emergency Management and Assistance, "Federal Emergency Management Agency, Department of Homeland Security: Communities Eligible for the Sale of Insurance."

Executive Orders

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, February 11, 1994.

Federal Register

52 FR 21059, U.S. Department of the Interior, Fish and Wildlife Service, 1987, "Endangered and Threatened Wildlife and Plants; Reclassification of the American Alligator to Threatened Due to Similarity of Appearance Throughout the Remainder of its Range," June 4.

75 FR 4174, U.S. Environmental Protection Agency, "Water Quality Standards for the State of Florida's Lakes and Flowing Waters."

75 FR 45579, U.S. Environmental Protection Agency, "Water Quality Standards for the State of Florida's Lakes and Flowing Waters: Supplemental Notice of Data Availability and Request for Comment."

75 FR 57426, U.S. Department of the Interior, Fish and Wildlife Service, 2010, "Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition to Reclassify the U.S. Breeding Population of Wood Storks from Endangered to Threatened."

CHAPTER 4
ENVIRONMENTAL IMPACTS

Chapter 4 describes the environmental impacts of the alternatives for development and operation of the Tarmac King Road Limestone Mine. The environmental impacts of the alternatives were generally estimated by comparing facility characteristics and requirements from Chapter 2 with affected environment information from Chapter 3. Environmental impacts are described in terms of the various aspects of the affected environment (described in Chapter 3) that are expected to change over time. Environmental impacts could include direct physical disturbance of resources, consumption of resources, or degradation of resources caused by effluents and emissions. Impacts may be adverse or beneficial.

Section 4.1 provides a brief overview of the planned mining process. The impact analyses presented in Sections 4.2 through 4.16 of this chapter address those areas of the environment where the potential exists for environmental impacts as listed below:

- Hydrology
- Water quality
- Wetlands
- Vegetation
- Wildlife
- Geology and soils
- Land use
- Hazardous and toxic wastes
- Meteorology and air quality
- Aesthetics
- Noise
- Cultural resources
- Recreation
- Socioeconomics
- Environmental justice

The cumulative impacts are presented in Section 4.17. The relationship between short-term use of the environment and enhancement of long-term productivity and irreversible and irretrievable commitments of resources are presented in Sections 4.18 and 4.19, respectively. A summary of the potentially significant environmental effects among alternatives is presented in Chapter 2, Section 2.4.

The level of documentation provided in this environmental impact statement (EIS) for each resource area is consistent with its significance, where significance includes the severity, nature, and extent of environmental impact and the potential for controversy. This approach is consistent with Council on Environmental Quality guidance to focus the presentation in an EIS on the impacts of significance.

4.1 PLANNED KING ROAD MINING PROCESS

The environmental impacts of rock mining described in this chapter are directly related to the land clearing, associated infrastructure development, rock removal and processing, transportation, and delivery of product. An overview of the planned mining process at the Tarmac King Road Mine site is necessary to evaluate potential changes to the affected environment.

MINE CYCLE DESCRIPTION

All rock mining in Florida is considered surface mining, a type of mining in which the overburden soil is removed from the surface, exposing the rock for removal (LHC 2007). In many areas of Florida, including Levy County, the water table is at or near the land surface. In such areas, the rock is mined “wet” as the open pit excavated during mining is filled with water (e.g., a quarry lake). The Tarmac King Road Limestone Mine would be a “wet” mining operation due to the nearness of the water table to the land surface.

The mine cycle is a process of activities necessary to prepare the land (stripping/padding), loosen the rock (blasting), remove the rock (excavating), and prepare the rock for sale (crushing, conveying, and processing). The following provides a summary level description of these activities.

STRIPPING OVERBURDEN

The removal of vegetation and stripping of overburden at the Tarmac King Road Limestone Mine site are necessary to expose the rock surface. The overburden must be removed to prevent co-mingling with the rock resource and degradation of the quality. This initial preparation step would require the removal of soils to a depth of approximately 2 feet. Material removed during this process would be used on site for the construction of berms within and exterior to the active mine area.

Initial areas to be cleared would include the processing plant area, the area for digging of lakes for temporary and permanent water withdrawal, the initial production area, and roads required for access to the mine area. Up to 100 acres of land would be cleared each year for the first 5 years for construction of this initial infrastructure. Once areas are cleared and stripped, crushed rock is hauled back to fill in areas to their original grade in a step called padding. Padding is the process of building a firm, level foundation area for equipment to move along, such as a road, or for plant construction.

After mining production begins, additional stripping of the land would be limited to removal in areas necessary for mining production to continue and areas necessary for future development of the mine. The area of lands stripped would vary annually, but is expected to be 25 to 30 acres or less per year (Tarmac 2010). Material removed during stripping and used for berms would be used for land reclamation once mining has been completed.

DRILLING AND BLASTING

Drilling and blasting are completed to loosen the rock to allow for excavation. The process is begun with the drilling of blast holes up to a depth of approximately 5 feet deeper than the maximum planned mining depth of 120 feet below ground surface. The drill rig would bore a number of holes in a pattern designed for maximum rock fracturing per blast while using the minimum amount of explosive. Holes are filled with bulk explosives (typically ammonium nitrate and a mineral oil emulsion). Ammonium nitrate is a blasting agent and cannot be detonated without an explosive to start the detonation reaction. The reaction is initiated by the blasting caps attached to primers placed at several intervals along the explosive column in the blast hole. Detonation of the explosives throughout the pattern is sequenced to minimize vibration and maximize rock fracturing and movement.

EXCAVATION

Excavation of the fractured rock would be accomplished using a large, mobile dragline excavator. As shallow rock is removed and the water table is intercepted, the mined pit would fill with water, thus creating lakes. The dragline would dig long narrow lakes to a maximum depth of 120 feet. The rock excavated from the quarry lake would be stockpiled close to the dragline in long windrows. The dragline would work for several hours at one location until all of the broken rock is removed and then move along the quarry lake boundary to the next area to be worked. After rock is windrowed, it would remain for several weeks to allow water to drain.

The dragline would move from one area of the active mine area to another to work open pits and excavate new pits in a complex sequence that would be planned once a mining alternative is selected and permitted. The excavation of pits would be designed and sequenced to allow maintenance of the water table very near its original (pre-mining) level. Approximately half of the completed pits would be closed (i.e., re-filled) with waste rock and fine sized material generated at the rock plant, as discussed below.

CRUSHING AND CONVEYING

Rock would be placed in windrows and would be transported to nearby mobile rock crushers by large front-end loaders. The crusher would reduce the rock to a maximum size of 8 inches. Rock leaving the

crusher would fall onto a mobile conveyor belt and be transported to a longer conveyor ending at the primary crushing plant. The conveyor would be almost 3 miles long at the farthest point within the active mine area. Along each quarry lake that is not completely excavated, the loaders would use a portion of the crushed rock to construct a level pad 3 to 5 feet thick. This pad provides a firm, level surface for the drill rig and the dragline to work on (upon return to the pit for blasting and excavating) and keeps this machinery above the water level.

ROCK PROCESSING

Rock conveyed to the primary plant would be split into two streams and fed onto sorting screens. The coarse material would be separated from the fine component by water washing and directed to impact crushers. The material from the crushers would be transferred to the secondary crushing plant via conveyors. Material moved to the secondary plant would be further crushed and the fine component again removed by water washing. All of the processed rock would be washed and sorted.

The fine material washed from the rock prior to and during crushing would be washed into a sump. From the sump, the material would be pumped into a bank of cyclones, which dewater and classify (sort by size) the material. The coarse fraction of fines would be transferred to a surge pile and allowed to drain prior to sale. The water and fine fraction of fines that cannot be utilized would be pumped back into the open pits to be used as fill material. This fine fraction would be directed to the pits using piping to place the material along the edges of the pits to fill them to capacity. The purpose of placing fines at this location is to recreate the natural restriction of water movement from the pits with the intent to balance the water table level.

The crushing and processing of rock at the plants would use water withdrawn from a lake near the processing plant. It is estimated that approximately 95 percent of the water withdrawn for processing material would be returned to the water table via percolation through the ground in the plant area or to the lake.

SHIPPING

Once the material is drained and ready for sale, loading it onto trucks would be completed and it would be transported from the mine site. All trucks would pass through a wheel wash on the road to the weight scale to remove mud from the tires. Each truck would be weighed and ticketed, and dump beds would be covered with a tarp. All trucks would be within Florida Department of Transportation-rated capacities before leaving the mine.

4.2 HYDROLOGY

4.2.1 Surface Water

4.2.1.1 Alternative 1 Potential Surface Water Impacts

Surface Waters. Under the No Action Alternative, there would be no change to the existing configuration of surface waters on the project mine site. Surface waters include intermittent stream channels that occur on the site and seasonally ponded wetlands.

Floodplain. The 100-year floodplain covers approximately the western third of the project mine site, as depicted in Chapter 3, Figure 3–2. Evaluation factors pertaining to floodplains include minimizing the risk of flood loss; minimizing the impact of floods on human health, safety, and welfare; and preserving the natural beneficial value of floodplains (Executive Order 11988:Section 6). Under the No Action Alternative, the floodplain conditions of the site would remain unchanged.

Hurricane Surge. Hurricanes have the potential to flood the project mine site, as depicted in Chapter 3, Figure 3–2, including the potential to inundate the western half of the site during Category I and II hurricanes and the potential to inundate the entire project mine site during Category III through V hurricanes. Under the No Action Alternative, hurricane surge conditions would continue to impact the site to the same extent as current conditions.

Sea-Level Change. As discussed in Chapter 3, Section 3.6.2, potential sea-level changes over the life of proposed mining were evaluated using the methodology outlined in U.S. Army Corps of Engineers (USACE) Circular EC-1165-2-212 (USACE 2011). Under the No Action Alternative, the predicted sea-level changes would continue to occur but would not have any impact on the mine site since no mining would be occurring.

4.2.1.2 Alternative 2 Potential Surface Water Impacts

Surface Waters. A total of 2,757 acres would be mined under Alternative 2, with a small portion of that corresponding to actively mined lakes at any one time. The size of individual lakes would vary between approximately 10 and 388 acres, with an average size of 137 acres. The water management plan for the site includes maintaining as consistent a water level as possible in lakes being actively mined. Unusable mine spoils would be used to backfill as many lakes as possible to restore pre-mining ground surface elevations. Upon completion of mining activities, an estimated total of 1,506 acres of lake would remain on site, most with an approximate depth of 120 feet; one lake would be partially backfilled and therefore shallower. This corresponds to approximately 32 percent of the entire project mining site area that would remain as lakes upon completion of the project. None of the lakes would be contiguous with existing stream channels on the site.

Floodplain. The 100-year floodplain covers approximately the western third of the project mine site, as depicted in Chapter 3, Figure 3–2. Evaluation factors pertaining to floodplains include minimizing the risk of flood loss; minimizing the impact of floods on human health, safety, and welfare; and preserving the natural beneficial value of floodplains (Executive Order 11988:Section 6). Alternative 2 would include mining areas located across the entire east-west extent of the site and would therefore include activities located in the 100-year floodplain. Mining activities would include construction of temporary roads, equipment staging areas, a processing facility, and stockpiles of mined and processed materials. These activities would not have more than localized impacts on the extent of the floodplain on the site. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet National Geodetic Vertical Datum of 1929 (NGVD29). Restoration of disturbed areas following completion of mining may result in some minor increases in elevation on the eastern third of the site. However, none of these increases in elevation would alter the extent of the 100-year floodplain on the site or in the vicinity, with the exception of perimeter berms totaling approximately 500 acres that would remain around the 1,506 acres of non-backfilled lakes that would remain at the end of mining under this alternative. This includes 688 acres of lakes that would remain bermed within the 100-year floodplain.

Hurricane Surge. Hurricanes have the potential to flood the project mine site, as depicted in Chapter 3, Figure 3–3, including the potential to inundate the western half of the site during Category I and II hurricanes and the potential to inundate the entire project mine site during Category III through V hurricanes. The probabilities of at least one hurricane impacting the mine site over the next 50 years range from 14.5 percent for Category I to 1.6 percent for Category III and above (see Table 3–16). Alternative 2 would include mining activities in all hurricane surge zones. Mining activities would include relatively small-scale structures and fill areas that would be moved from place to place as mining progressed. The type and size of structures and fills that would be present on the site would not alter storm flooding conditions. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet NGVD29. It is important to note that this 19-foot height is referenced to this vertical datum, not existing grade; some berms in the eastern portion of the site would rise only a few feet above grade at 19 feet NGVD29. The 19-foot berms (referenced to NGVD29) would be higher than the 100-year return period storm tide (storm surge added to Mean Higher High Water) and at the limits of a surge resulting from a Category III storm. The hurricane surge limits are shown in Figure 3–3 of the EIS. The project is designed to withstand storm surge greater than that which would completely inundate the nearby communities of Yankeetown and Inglis. Miles of heavily wooded land exist between the proposed berms and the Gulf of Mexico; therefore, wave action on the exterior of these berms would be minimal. The berms themselves would be composed mostly of limestone from the mine site, and therefore would be less prone to erosion from wave action. Interior waves would have to break past the 100-foot-wide work area surrounding mine pits to reach the berms. Each lake would be

constructed with a 100-foot-wide work area that is 3 feet above the seasonal high water level (Ardaman & Associates 2012a). Lake elevation would be held below 16 feet. Wave heights on the largest lake in Alternative 7 for a sustained wind speed of 100 miles per hour (mph) (major hurricane) were calculated to be 3.66 feet. (Results for the largest lakes in the other alternatives would be similar.) This would result in a wave crest 1.83 feet above seasonal water levels and a resultant total height of 17.8 feet NGVD29. Extreme rain events could add up to 1 foot to this level but would result in the total water level remaining below the top of the 19-foot NGVD29 bank. In addition, waves would break when the water depth reaches approximately one-half the height of the wave. They would therefore break onto the 100-foot-wide work area before reaching the berm (Ardaman & Associates 2012b). A more detailed discussion on the integrity of the berms is included in Appendix M. Wave height calculations are included in Appendix N. Restoration of disturbed areas following completion of mining would result in no permanent structures or fills that would alter the extent of coastal storm flooding on the site or in the vicinity, with the exception of perimeter berms totaling approximately 500 acres that would remain around the 1,506 acres of non-backfilled lakes that would remain at the end of mining under this alternative.

Under Alternative 2, the temporary and permanent containment berms could be inundated during Category IV and V hurricanes, with implications for equipment safety/stability and water quality (discussed in Section 4.2.1).

Sea-Level Change. As discussed in Chapter 3, Section 3.6.2, potential sea-level changes over the life of proposed mining were evaluated using the methodology outlined in USACE Circular EC-1165-2-212 (USACE 2011). Under Alternative 2, the predicted sea-level rise for the low and intermediate scenarios depicted in Chapter 3, Figures 3–17 through 3–20, would have no immediate impact on the proposed mining. However, using the highest predicted sea-level rise of 5.7 feet results in the extreme southwestern end of the mining site being inundated after approximately 85 years of mining (see Chapter 3, Figures 3–19 and 3–20). At the end of mining (100 years), approximately 96 acres of the 2,757 acres mined would be impacted. In addition, floodplain and hurricane surge impacts would have to be adjusted accordingly to account for this increase in sea level for all scenarios as impacts could occur in earlier mining years. Predicted impacts on the proposed mitigation area for all of the action alternatives (see Alternatives 2–8) from sea-level rise are described in Chapter 3, Section 3.6.2. Mitigation of the potential impacts of sea-level change is addressed in Chapter 5.

Land-Sea Interface. The probability of seawater impacting the lakes, as shown in Chapter 3, Table 3–16, is relatively small over the next 50 years. The impact of seawater introduction into the lakes would only create a temporary increase in pit water salinity. This phenomenon naturally occurs in estuaries and lakes in close proximity to the shoreline during large storm events, such as hurricanes, floods, etc. (Titus *et al.* 2009). Should this occur, the potential temporal effect of this infiltration has been historically shown to be minimal (Steyer *et al.* 2005).

4.2.1.3 Alternative 3 Potential Surface Water Impacts

Surface Waters. A total of 1,884 acres would be mined under Alternative 3, with a small portion of that corresponding to actively mined lakes at any one time. The size of individual lakes would vary between approximately 10 and 164 acres, with an average size of 63 acres. The water management plan for the site includes maintaining as consistent a water level as possible in lakes being actively mined. Unusable mine spoils would be used to backfill as many lakes as possible to restore pre-mining ground surface elevations. Upon completion of mining activities, an estimated total of 958 acres of lake would remain on site, most with an approximate depth of 120 feet; one lake would be partially backfilled and therefore shallower. This corresponds to approximately 20 percent of the entire project mining site area that would remain as lakes upon completion of the project. None of the lakes would be contiguous with existing stream channels on the site.

Floodplain. The 100-year floodplain covers approximately the western third of the project mine site, as depicted in Chapter 3, Figure 3–2. Evaluation factors pertaining to floodplains include minimizing the risk of flood loss; minimizing the impact of floods on human health, safety, and welfare; and preserving the natural beneficial value of floodplains (Executive Order 11988:Section 6). Alternative 3 would not include mining activities in the western third of the site and therefore would not include impacts located in the 100-year floodplain.

Hurricane Surge. Hurricanes have the potential to flood the project mine site, as depicted in Chapter 3, Figure 3–3, including the potential to inundate the western half of the site during Category I and II hurricanes and the potential to inundate the entire project mine site during Category III through V hurricanes. The probabilities of at least one hurricane impacting the mine site over the next 50 years range from 14.5 percent for Category I to 1.6 percent for Category III and above (see Table 3–16). Alternative 3 includes mining activities in areas potentially inundated by Category II hurricanes in the central portion of the site and in areas potentially inundated by Category III through V hurricanes in the eastern half of the site. Mining activities would include relatively small-scale structures and fill areas that would be moved from place to place as mining progressed. The type and size of structures and fills that would be present on the site would not alter storm flooding conditions. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet NGVD29. The 19-foot berms (referenced to NGVD29) would be higher than the 100-year return period storm tide (storm surge added to Mean Higher High Water) and at the limits of a surge resulting from a Category III storm. The hurricane surge limits are shown in Figure 3–3 of the EIS. The project is designed to withstand storm surge greater than that which would completely inundate the nearby communities of Yankeetown and Inglis. Miles of heavily wooded land exist between the proposed berms and the Gulf of Mexico; therefore, wave action on the exterior of these berms would be minimal. The berms themselves would be composed mostly of limestone from the mine site, and therefore would be less prone to erosion from wave action. Interior waves would have to break past the 100-foot-wide work area surrounding mine pits to reach the berms. Each lake would be constructed with a 100-foot-wide work area that is 3 feet above the seasonal high water level (Ardaman & Associates 2012a). Lake elevation would be held below 16 feet. Wave heights on the largest lake in Alternative 7 for a sustained wind speed of 100 mph (major hurricane) were calculated to be 3.66 feet. (Results for the largest lakes in the other alternatives would be similar.) This would result in a wave crest 1.83 feet above seasonal water levels and a resultant total height of 17.8 feet NGVD29. Extreme rain events could add up to 1 foot to this level but would result in the total water level remaining below the top of the 19-foot NGVD29 bank. In addition, waves would break when the water depth reaches approximately one-half the height of the wave. They would therefore break onto the 100-foot-wide work area before reaching the berm (Ardaman & Associates 2012b). A more detailed discussion on the integrity of the berms is included in Appendix M. Wave height calculations are included in Appendix N. Restoration of disturbed areas following completion of mining would result in no permanent structures or fills that would alter the extent of coastal storm flooding on the site or in the vicinity, with the exception of perimeter berms totaling approximately 300 acres that would remain around the 958 acres of non-backfilled lakes remaining at the end of mining under this alternative.

Under Alternative 3, the temporary and permanent containment berms could be inundated during Category IV and V hurricanes, with implications for equipment safety/stability and water quality (discussed in Section 4.3.1).

Sea-Level Change. As discussed in Chapter 3, Section 3.6.2, potential sea-level changes over the life of proposed mining were evaluated using the methodology outlined in USACE Circular EC-1165-2-212 (USACE 2011). Under Alternative 3, the predicted sea-level rise for the low, intermediate, and high scenarios depicted in Chapter 3, Figures 3–17 through 3–20, would have no immediate impact on the proposed mining. However, sea-level rises between 0.2 and 3.7 feet over the approximately 70 years of mining (see Chapter 3, Figures 3–17 through 3–19) are possible. Should they occur, floodplain and hurricane surge impacts would have to be adjusted accordingly to account for this increase in sea level for all scenarios as impacts could occur in earlier mining years. Mitigation of the potential impacts of sea-level change is addressed in Chapter 5.

Land-Sea Interface. The probability of seawater impacting the lakes, as shown in Chapter 3, Table 3–16, is relatively small over the next 50 years. The impact of seawater introduction into the lakes would only create a temporary increase in pit water salinity. This phenomenon naturally occurs in estuaries and lakes in close proximity to the shoreline during large storm events, such as hurricanes, floods, etc. (Titus *et al.* 2009). Should this occur, the potential temporal effect of this infiltration has been historically shown to be minimal (Steyer *et al.* 2005).

4.2.1.4 Alternative 4 Potential Surface Water Impacts

Surface Waters. A total of 1,671 acres would be mined under Alternative 4, with a small portion of that corresponding to actively mined lakes at any one time. The size of individual lakes would vary between approximately 10 and 181 acres, with an average size of 64 acres. The water management plan for the site includes maintaining as consistent a water level as possible in lakes being actively mined. Unusable mine spoils would be used to backfill as many lakes as possible to restore pre-mining ground surface elevations. Upon completion of mining activities, an estimated total of 1,029 acres of lake would remain on site, most with an approximate depth of 120 feet; one lake would be partially backfilled and therefore shallower. This corresponds to approximately 22 percent of the entire project mining site area that would remain as lakes upon completion of the project. None of the lakes would be contiguous with existing stream channels on the site.

Floodplain. The 100-year floodplain covers approximately the western third of the project mine site, as depicted in Chapter 3, Figure 3–2. Evaluation factors pertaining to floodplains include minimizing the risk of flood loss; minimizing the impact of floods on human health, safety, and welfare; and preserving the natural beneficial value of floodplains (Executive Order 11988:Section 6). Alternative 4 would not include mining activities in the western third of the site and therefore would not include impacts located in the 100-year floodplain.

Hurricane Surge. Hurricanes have the potential to flood the project mine site, as depicted in Chapter 3, Figure 3–3, including potential to inundate the western half of the site during Category I and II hurricanes, and the potential to inundate the entire project mine site during Category III through V hurricanes. The probabilities of at least one hurricane impacting the mine site over the next 50 years range from 14.5 percent for Category I to 1.6 percent for Category III and above (see Table 3–16). Alternative 4 would include mining activities in areas potentially inundated by Category II hurricanes in the central portion of the site and in areas potentially inundated by Category III through V hurricanes in the eastern half of the site. Mining activities would include relatively small-scale structures and fill areas that would be moved from place to place as mining progressed. The type and size of structures and fills that would be present on the site would not alter storm flooding conditions. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet NGVD29. The 19-foot berms (referenced to NGVD29) would be higher than the 100-year return period storm tide (storm surge added to Mean Higher High Water) and at the limits of a surge resulting from a Category III storm. The hurricane surge limits are shown in Figure 3–3 of the EIS. The project is designed to withstand storm surge greater than that which would completely inundate the nearby communities of Yankeetown and Inglis. Miles of heavily wooded land exist between the proposed berms and the Gulf of Mexico; therefore, wave action on the exterior of these berms would be minimal. The berms themselves would be composed mostly of limestone from the mine site, and therefore would be less prone to erosion from wave action. Interior waves would have to break past the 100-foot-wide work area surrounding mine pits to reach the berms. Each lake would be constructed with a 100-foot-wide work area that is 3 feet above the seasonal high water level (Ardaman & Associates 2012a). Lake elevation would be held below 16 feet. Wave heights on the largest lake in Alternative 7 for a sustained wind speed of 100 mph (major hurricane) were calculated to be 3.66 feet. (Results for the largest lakes in the other alternatives would be similar.) This would result in a wave crest 1.83 feet above seasonal water levels and a resultant total height of 17.8 feet NGVD29. Extreme rain events could add up to 1 foot to this level but would result in the total water level remaining below the top of the 19-foot NGVD29 bank. In addition, waves would break when the water depth reaches approximately one-half the height of the wave. They would therefore break onto the 100-foot-wide work area before reaching the berm (Ardaman & Associates 2012b). A more detailed discussion on the integrity of the berms is included in Appendix M. Wave height calculations are included in Appendix N. Restoration of disturbed areas following completion of mining would result in no permanent structures or fills that would alter the extent of coastal storm flooding on the site or in the vicinity, with the exception of perimeter berms totaling approximately 300 acres that would remain around the 1,029 acres of non-backfilled lakes remaining at the end of mining under this alternative.

Under Alternative 4, the temporary and permanent containment berms could be inundated during Category IV and V hurricanes, with implications for equipment safety/stability and water quality (discussed in Section 4.3.1).

Sea-Level Change. As discussed in Chapter 3, Section 3.6.2, potential sea-level changes over the life of proposed mining were evaluated using the methodology outlined in USACE Circular EC-1165-2-212 (USACE 2011). Under Alternative 4, the predicted sea-level rise for the low, intermediate, and high scenarios depicted in Chapter 3, Figures 3–17 through 3–20, would have no immediate impact on the proposed mining. However, sea-level rises between 0.2 and 3.0 feet over the approximately 60 years of mining (see Chapter 3, Figures 3–17 through 3–19) are possible. Should they occur, floodplain and hurricane surge impacts would have to be adjusted accordingly to account for this increase in sea level for all scenarios as impacts could occur in earlier mining years. Mitigation of the potential impacts of sea-level change is addressed in Chapter 5.

Land-Sea Interface. The probability of seawater impacting the lakes, as shown in Chapter 3, Table 3–16, is relatively small over the next 50 years. The impact of seawater introduction into the lakes would only create a temporary increase in pit water salinity. This phenomenon naturally occurs in estuaries and lakes in close proximity to the shoreline during large storm events, such as hurricanes, floods, etc. (Titus *et al.* 2009). The impact of seawater introduction into the lakes would only create a temporary increase in pit water salinity. This phenomenon naturally occurs in estuaries and lakes in close proximity to the shoreline during large storm events, such as hurricanes, floods, etc. Should this occur, the potential temporal effect of this infiltration has been historically shown to be minimal (Steyer *et al.* 2005).

4.2.1.5 Alternative 5 Potential Surface Water Impacts

Surface Waters. A total of 2,293 acres would be mined under Alternative 5, with a small portion of that corresponding to actively mined lakes at any one time. The size of individual lakes would vary between approximately 10 and 388 acres, with an average size of 100 acres. The water management plan for the site includes maintaining as consistent a water level as possible in lakes being actively mined. Unusable mine spoils would be used to backfill as many lakes as possible to restore pre-mining ground surface elevations. Upon completion of mining activities, an estimated total of 1,210 acres of lake would remain on site, most with an approximate depth of 120 feet; one lake would be partially backfilled and therefore shallower. This corresponds to approximately 25 percent of the entire project mining site area that would remain as lakes upon completion of the project. None of the lakes would be contiguous with existing stream channels on the site.

Floodplain. The 100-year floodplain covers approximately the western third of the project mine site, as depicted in Chapter 3, Figure 3–2. Evaluation factors pertaining to floodplains include minimizing the risk of flood loss; minimizing the impact of floods on human health, safety, and welfare; and preserving the natural beneficial value of floodplains (Executive Order 11988:Section 6). Alternative 5 would include mining areas across the entire east-west extent of the site and would therefore include mining activities located in the 100-year floodplain. Mining activities would include construction of temporary roads, equipment staging areas, a processing facility, and stockpiles of mined and processed materials. These activities would not have more than localized impacts on the extent of the floodplain on the site. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet NGVD29. Restoration of disturbed areas following completion of mining may result in some minor increases in elevation on the eastern third of the site. However, none of these increases in elevation would alter the extent of the 100-year floodplain on the site or in the vicinity, with the exception of perimeter berms totaling approximately 400 acres that would remain around the 1,210 acres of non-backfilled lakes remaining at the end of mining under this alternative. This includes 693 acres of lakes that would remain bermed within the 100-year floodplain.

Hurricane Surge. Hurricanes have the potential to flood the project mine site, as depicted in Chapter 3, Figure 3–3, including potential to inundate the western half of the site during Category I and II hurricanes and the potential to inundate the entire project mine site during Category III through V hurricanes. The probabilities of at least one hurricane impacting the mine site over the next 50 years range from 14.5 percent for Category I to 1.6 percent for Category III and above (see Table 3–16). Alternative 5

would include mining activities in all hurricane surge zones. Mining activities would include relatively small-scale structures and fill areas that would be moved from place to place as mining progressed. The type and size of structures and fills that would be present on the site would not alter storm flooding conditions. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet NGVD29. The 19-foot berms (referenced to NGVD29) would be higher than the 100-year return period storm tide (storm surge added to Mean Higher High Water) and at the limits of a surge resulting from a Category III storm. The hurricane surge limits are shown in Figure 3–3 of the EIS. The project is designed to withstand storm surge greater than that which would completely inundate the nearby communities of Yankeetown and Inglis. Miles of heavily wooded land exist between the proposed berms and the Gulf of Mexico; therefore, wave action on the exterior of these berms would be minimal. The berms themselves would be composed mostly of limestone from the mine site, and therefore would be less prone to erosion from wave action. Interior waves would have to break past the 100-foot-wide work area surrounding mine pits to reach the berms. Each lake would be constructed with a 100-foot-wide work area that is 3 feet above the seasonal high water level (Ardaman & Associates 2012a). Lake elevation would be held below 16 feet. Wave heights on the largest lake in Alternative 7 for a sustained wind speed of 100 mph (major hurricane) were calculated to be 3.66 feet. (Results for the largest lakes in the other alternatives would be similar.) This would result in a wave crest 1.83 feet above seasonal water levels and a resultant total height of 17.8 feet NGVD29. Extreme rain events could add up to 1 foot to this level but would result in the total water level remaining below the top of the 19-foot NGVD29 bank. In addition, waves would break when the water depth reaches approximately one-half the height of the wave. They would therefore break onto the 100-foot-wide work area before reaching the berm (Ardaman & Associates 2012b). A more detailed discussion on the integrity of the berms is included in Appendix M. Wave height calculations are included in Appendix N. Restoration of disturbed areas following completion of mining would result in no permanent structures or fills that would alter the extent of coastal storm flooding on the site or in the vicinity, with the exception of perimeter berms totaling approximately 400 acres that would remain around the 1,210 acres of non-backfilled lakes remaining at the end of mining under this alternative.

Under Alternative 5, the temporary and permanent containment berms could be inundated during Category IV and V hurricanes, with implications for equipment safety/stability and water quality (discussed in Section 4.3.1).

Sea-Level Change. As discussed in Chapter 3, Section 3.6.2, potential sea-level changes over the life of proposed mining were evaluated using the methodology outlined in USACE Circular EC-1165-2-212 (USACE 2011). Under Alternative 5, the predicted sea-level rise for the low, intermediate, and high scenarios depicted in Chapter 3, Figures 3–17 through 3–20, would have no immediate impact on the proposed mining. However, sea-level rises between 0.2 and 3.7 feet over the approximately 82 years of mining (see Chapter 3, Figures 3–17 through 3–19) are possible. Note that although the mining extends to the far western site boundary, similar to Alternative 2, mining would be completed about the time the highest scenario sea level would encroach on the mined area (see Chapter 3, Figure 3–19). However, floodplain and hurricane surge impacts would have to be adjusted accordingly to account for this increase in sea level for all scenarios as impacts could occur in earlier mining years. Mitigation of the potential impacts of sea-level change is addressed in Chapter 5.

Land-Sea Interface. The probability of seawater impacting the lakes, as shown in Chapter 3, Table 3–16, is relatively small over the next 50 years. The impact of seawater introduction into the lakes would only create a temporary increase in pit water salinity. This phenomenon naturally occurs in estuaries and lakes in close proximity to the shoreline during large storm events, such as hurricanes, floods, etc. (Titus *et al.* 2009). Should this occur, the potential temporal effect of this infiltration has been historically shown to be minimal (Steyer *et al.* 2005).

4.2.1.6 Alternative 6 Potential Surface Water Impacts

Surface Waters. A total of 1,048 acres would be mined under Alternative 6, with a small portion of that corresponding to actively mined lakes at any one time. The size of individual lakes would vary between approximately 10 and 479 acres, with an average size of 118 acres. The water management plan for the site includes maintaining as consistent a water level as possible in lakes being actively mined. Unusable

mine spoils would be used to backfill as many lakes as possible to restore pre-mining ground surface elevations. Upon completion of mining activities, an estimated total of 713 acres of lake would remain on site, most with an approximate depth of 120 feet; one lake would be partially backfilled and therefore shallower. This corresponds to approximately 15 percent of the entire project mining site area that would remain as lakes upon completion of the project. None of the lakes would be contiguous with existing stream channels on the site.

Floodplain. The 100-year floodplain covers approximately the western third of the project mine site, as depicted in Chapter 3, Figure 3–2. Evaluation factors pertaining to floodplains include minimizing the risk of flood loss; minimizing the impact of floods on human health, safety, and welfare; and preserving the natural beneficial value of floodplains (Executive Order 11988:Section 6). Alternative 6 would include mining areas in roughly the western third of the site; therefore, mining activities would be located entirely in the 100-year floodplain. Mining activities would include construction of temporary roads, equipment staging areas, a processing facility, and stockpiles of mined and processed materials. These activities would not have more than localized impacts on the extent of the floodplain on the site. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet NGVD29. Restoration of disturbed areas following completion of mining may result in some minor increases in elevation on the eastern third of the site. However, none of these increases in elevation would alter the extent of the 100-year floodplain on the site or in the vicinity, with the exception of perimeter berms totaling approximately 250 acres that would remain around the 713 acres of non-backfilled lakes remaining at the end of mining under this alternative. This includes 635 acres that would remain bermed within the 100-year floodplain.

Hurricane Surge. Hurricanes have the potential to flood the project mine site, as depicted in Chapter 3, Figure 3–3, including the potential to inundate the western half of the site during Category I and II hurricanes and the potential to inundate the entire project mine site during Category III through V hurricanes. The probabilities of at least one hurricane impacting the mine site over the next 50 years range from 14.5 percent for Category I to 1.6 percent for Category III and above (see Table 3–16). Alternative 6 would include mining activities in all hurricane surge zones. Mining activities would include relatively small-scale structures and fill areas that would be moved from place to place as mining progressed. The type and size of structures and fills that would be present on the site would not alter storm flooding conditions. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet NGVD29. The 19-foot berms (referenced to NGVD29) would be higher than the 100-year return period storm tide (storm surge added to Mean Higher High Water) and at the limits of a surge resulting from a Category III storm. The hurricane surge limits are shown in Figure 3–3 of the EIS. The project is designed to withstand storm surge greater than that which would completely inundate the nearby communities of Yankeetown and Inglis. Miles of heavily wooded land exist between the proposed berms and the Gulf of Mexico; therefore, wave action on the exterior of these berms would be minimal. The berms themselves would be composed mostly of limestone from the mine site, and therefore would be less prone to erosion from wave action. Interior waves would have to break past the 100-foot-wide work area surrounding mine pits to reach the berms. Each lake would be constructed with a 100-foot-wide work area that is 3 feet above the seasonal high water level (Ardaman & Associates 2012a). Lake elevation would be held below 16 feet. Wave heights on the largest lake in Alternative 7 for a sustained wind speed of 100 mph (major hurricane) were calculated to be 3.66 feet. (Results for the largest lakes in the other alternatives would be similar.) This would result in a wave crest 1.83 feet above seasonal water levels and a resultant total height of 17.8 feet NGVD29. Extreme rain events could add up to 1 foot to this level but would result in the total water level remaining below the top of the 19-foot NGVD29 bank. In addition, waves would break when the water depth reaches approximately one-half the height of the wave. They would therefore break onto the 100-foot-wide work area before reaching the berm (Ardaman & Associates 2012b). A more detailed discussion on the integrity of the berms is included in Appendix M. Wave height calculations are included in Appendix N. Restoration of disturbed areas following completion of mining would result in no permanent structures or fills that would alter the extent of coastal storm flooding on the site or in the vicinity, with the exception of perimeter berms totaling approximately 250 acres that would remain around the 713 acres of non-backfilled lakes remaining at the end of mining under this alternative.

Under Alternative 6, the temporary and permanent containment berms could be inundated during Category IV and V hurricanes, with implications for equipment safety/stability and water quality (discussed in Section 4.3.1).

Sea-Level Change. As discussed in Chapter 3, Section 3.6.2, potential sea-level changes over the life of proposed mining were evaluated using the methodology outlined in USACE Circular EC-1165-2-212 (USACE 2011). Under Alternative 6, the predicted sea-level rise for the low, intermediate, and high scenarios depicted in Chapter 3, Figures 3–17 through 3–20, would have no immediate impact on the proposed mining. However, sea-level rises between 0.2 and 2.1 feet over the approximately 45 years of mining (see Chapter 3, Figures 3–17 and 3–18) are possible. Note that although the mining extends to the far western site boundary, similar to Alternative 2, mining would be complete approximately 40 years before the highest scenario sea level would encroach on the mined area (see Chapter 3, Figure 3–19). However, floodplain and hurricane surge impacts would have to be adjusted accordingly to account for this increase in sea level for all scenarios as impacts could occur in earlier mining years. Mitigation of the potential impacts of sea-level change is addressed in Chapter 5.

Land-Sea Interface. The probability of seawater impacting the lakes, as shown in Chapter 3, Table 3–16, is relatively small over the next 50 years. The impact of seawater introduction into the lakes would only create a temporary increase in pit water salinity. This phenomenon naturally occurs in estuaries and lakes in close proximity to the shoreline during large storm events, such as hurricanes, floods, etc. (Titus *et al.* 2009). Should this occur, the potential temporal effect of this infiltration has been historically shown to be minimal (Steyer *et al.* 2005).

4.2.1.7 Alternative 7 Potential Surface Water Impacts

Surface Waters. A total of 898 acres would be mined under Alternative 7, with a small portion of that corresponding to actively mined lakes at any one time. The size of individual lakes would vary between approximately 10 and 181 acres, with an average size of 69 acres. The water management plan for the site includes maintaining as consistent a water level as possible in lakes being actively mined. Unusable mine spoils would be used to backfill as many lakes as possible to restore pre-mining ground surface elevations. Upon completion of mining activities, an estimated total of 511 acres of lake would remain on site, most with an approximate depth of 120 feet; one lake would be partially backfilled and therefore shallower. This corresponds to approximately 11 percent of the entire project mining site area that would remain as lakes upon completion of the project. None of the lakes would be contiguous with existing stream channels on the site.

Floodplain. The 100-year floodplain covers approximately the western third of the project mine site, as depicted in Chapter 3, Figure 3–2. Evaluation factors pertaining to floodplains include minimizing the risk of flood loss; minimizing the impact of floods on human health, safety, and welfare; and preserving the natural beneficial value of floodplains (Executive Order 11988:Section 6). Alternative 7 would include mining areas located generally in the eastern half of the site and therefore would not include mining activities located in the 100-year floodplain.

Hurricane Surge. Hurricanes have the potential to flood the project mine site, as depicted in Chapter 3, Figure 3–3, including the potential to inundate the western half of the site during Category I and II hurricanes and the potential to inundate the entire project mine site during Category III through V hurricanes. The probabilities of at least one hurricane impacting the mine site over the next 50 years range from 14.5 percent for Category I to 1.6 percent for Category III and above (see Table 3–16). Alternative 7 would only include mining activities in portions of the site that could be flooded during Category III through V hurricanes (i.e., the eastern half of the site). Mining activities would include relatively small-scale structures and fill areas that would be moved from place to place as mining progressed. The type and size of structures and fills that would be present on the site would not alter storm flooding conditions. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet NGVD29. The 19-foot berms (referenced to NGVD29) would be higher than the 100-year return period storm tide (storm surge added to Mean Higher High Water) and at the limits of a surge resulting from a Category III storm. The hurricane surge limits are shown in Figure 3–3 of the EIS. The project is designed to withstand storm surge greater than that which

would completely inundate the nearby communities of Yankeetown and Inglis. Miles of heavily wooded land exist between the proposed berms and the Gulf of Mexico; therefore, wave action on the exterior of these berms would be minimal. The berms themselves would be composed mostly of limestone from the mine site, and therefore would be less prone to erosion from wave action. Interior waves would have to break past the 100-foot-wide work area surrounding mine pits to reach the berms. Each lake would be constructed with a 100-foot-wide work area that is 3 feet above the seasonal high water level (Ardaman & Associates 2012a). Lake elevation would be held below 16 feet. Wave heights on the largest lake in Alternative 7 for a sustained wind speed of 100 mph (major hurricane) were calculated to be 3.66 feet. (Results for the largest lakes in the other alternatives would be similar.) This would result in a wave crest 1.83 feet above seasonal water levels and a resultant total height of 17.8 feet NGVD29. Extreme rain events could add up to 1 foot to this level but would result in the total water level remaining below the top of the 19-foot NGVD29 bank. In addition, waves would break when the water depth reaches approximately one-half the height of the wave. They would therefore break onto the 100-foot-wide work area before reaching the berm (Ardaman & Associates 2012b). A more detailed discussion on the integrity of the berms is included in Appendix M. Wave height calculations are included in Appendix N. Restoration of disturbed areas following completion of mining would result in no permanent structures or fills that would alter the extent of coastal storm flooding on the site or in the vicinity, with the exception of perimeter berms totaling approximately 200 acres that would remain around the 511 acres of non-backfilled lakes remaining at the end of mining under this alternative.

Under Alternative 7, the temporary and permanent containment berms could be inundated during Category IV and V hurricanes, with implications for equipment safety/stability and water quality (discussed in Section 4.3.1).

Sea-Level Change. As discussed in Chapter 3, Section 3.6.2, potential sea-level changes over the life of proposed mining were evaluated using the methodology outlined in USACE Circular EC-1165-2-212 (USACE 2011). Under Alternative 7, the predicted sea-level rise for the low, intermediate, and high scenarios depicted in Chapter 3, Figures 3–17 through 3–20, would have no immediate impact on the proposed mining. However, sea-level rises between 0.2 and 2.1 feet over the approximately 33 years of mining (see Chapter 3, Figures 3–17 and 3–18) are possible. Should they occur, floodplain and hurricane surge impacts would have to be adjusted accordingly to account for this increase in sea level for all scenarios as impacts could occur in earlier mining years. Mitigation of the potential impacts of sea-level change is addressed in Chapter 5.

Land-Sea Interface. The probability of seawater impacting the lakes, as shown in Chapter 3, Table 3–16, is relatively small over the next 50 years. The impact of seawater introduction into the lakes would only create a temporary increase in pit water salinity. This phenomenon naturally occurs in estuaries and lakes in close proximity to the shoreline during large storm events, such as hurricanes, floods, etc. (Titus *et al.* 2009). Should this occur, the potential temporal effect of this infiltration has been historically shown to be minimal (Steyer *et al.* 2005).

4.2.1.8 Alternative 8 Potential Surface Water Impacts

Surface Waters. A total of 1,896 acres would be mined under Alternative 8, with a small portion of that corresponding to actively mined lakes at any one time. The size of individual lakes would vary between approximately 10 and 309 acres, with an average size of 86 acres. The water management plan for the site includes maintaining as consistent a water level as possible in lakes being actively mined. Unusable mine spoils would be used to backfill as many lakes as possible to restore pre-mining ground surface elevations. Upon completion of mining activities, an estimated total of 981 acres of lake would remain on site, most with an approximate depth of 120 feet; one lake would be partially backfilled and therefore shallower. This corresponds to approximately 21 percent of the entire project mining site area that would remain as lakes upon completion of the project. None of the lakes would be contiguous with existing stream channels on the site.

Floodplain. The 100-year floodplain covers approximately the western third of the project mine site, as depicted in Chapter 3, Figure 3–2. Evaluation factors pertaining to floodplains include minimizing the risk of flood loss; minimizing the impact of floods on human health, safety, and welfare; and preserving the natural beneficial value of floodplains (Executive Order 11988:Section 6). Alternative 8 would include

mining areas that would encroach into the 100-year floodplain (all or portions of the three westernmost lakes). Mining activities would include construction of temporary roads, equipment staging areas, a processing facility, and stockpiles of mined and processed materials. These activities would not have more than localized impacts on the extent of the floodplain on the site. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet NGVD29. Restoration of disturbed areas following completion of mining may result in some minor increases in elevation on the eastern third of the site. However, none of these increases in elevation would alter the extent of the 100-year floodplain on the site or in the vicinity, with the exception of perimeter berms totaling approximately 400 acres that would remain around the 981 acres of non-backfilled lakes remaining at the end of mining under this alternative. This includes 309 acres that would remain bermed within the 100-year floodplain.

Hurricane Surge. Hurricanes have the potential to flood the project mine site, as depicted in Chapter 3, Figure 3–3, including the potential to inundate the western half of the site during Category I and II hurricanes and the potential to inundate the entire project mine site during Category III through V hurricanes. The probabilities of at least one hurricane impacting the mine site over the next 50 years range from 14.5 percent for Category I to 1.6 percent for Category III and above (see Table 3–16). Alternative 8 would include mining activities in all hurricane surge zones. Mining activities would include relatively small-scale structures and fill areas that would be moved from place to place as mining progressed. The type and size of structures and fills that would be present on the site would not alter storm flooding conditions. Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Category III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet NGVD29. The 19-foot berms (referenced to NGVD29) would be higher than the 100-year return period storm tide (storm surge added to Mean Higher High Water) and at the limits of a surge resulting from a Category III storm. The hurricane surge limits are shown in Figure 3–3 of the EIS. The project is designed to withstand storm surge greater than that which would completely inundate the nearby communities of Yankeetown and Inglis. Miles of heavily wooded land exist between the proposed berms and the Gulf of Mexico; therefore, wave action on the exterior of these berms would be minimal. The berms themselves would be composed mostly of limestone from the mine site, and therefore would be less prone to erosion from wave action. Interior waves would have to break past the 100-foot-wide work area surrounding mine pits to reach the berms. Each lake would be constructed with a 100-foot-wide work area that is 3 feet above the seasonal high water level (Ardaman & Associates 2012a). Lake elevation would be held below 16 feet. Wave heights on the largest lake in Alternative 7 for a sustained wind speed of 100 mph (major hurricane) were calculated to be 3.66 feet. (Results for the largest lakes in the other alternatives would be similar.) This would result in a wave crest 1.83 feet above seasonal water levels and a resultant total height of 17.8 feet (NGVD29). Extreme rain events could add up to 1 foot to this level but would result in the total water level remaining below the top of the 19-foot NGVD29 bank. In addition, waves would break when the water depth reaches approximately one-half the height of the wave. They would therefore break onto the 100-foot-wide work area before reaching the berm (Ardaman & Associates 2012b). A more detailed discussion on the integrity of the berms is included in Appendix M. Wave height calculations are included in Appendix N. Restoration of disturbed areas following completion of mining would result in no permanent structures or fills that would alter the extent of coastal storm flooding on the site or in the vicinity, with the exception of perimeter berms totaling approximately 400 acres that would remain around the 981 acres of non-backfilled lakes remaining at the end of mining under this alternative.

Under Alternative 8, the temporary and permanent containment berms could be inundated during Category IV and V hurricanes, with implications for equipment safety/stability and water quality (discussed in Section 4.3.1).

Sea-Level Change. As discussed in Chapter 3, Section 3.6.2, potential sea-level changes over the life of proposed mining were evaluated using the methodology outlined in USACE Circular EC-1165-2-212 (USACE 2011). Under Alternative 8, the predicted sea-level rise for the low, intermediate, and high scenarios depicted in Chapter 3, Figures 3–17 through 3–20, would have no immediate impact on the proposed mining. However, sea-level rises between 0.2 and 3.7 feet over the approximately 68 years of mining (see Chapter 3, Figures 3–17 through 3–19) are possible. Should this occur, floodplain and hurricane surge impacts would have to be adjusted accordingly to account for this increase in sea level

for all scenarios as impacts could occur in earlier mining years. Mitigation of the potential impacts of sea-level change is addressed in Chapter 5.

Land-Sea Interface. The probability of seawater impacting the lakes, as shown in Chapter 3, Table 3–16, is relatively small over the next 50 years. The impact of seawater introduction into the lakes would only create a temporary increase in pit water salinity. This phenomenon naturally occurs in estuaries and lakes in close proximity to the shoreline during large storm events, such as hurricanes, floods, etc. (Titus *et al.* 2009). Should this occur, the potential temporal effect of this infiltration has been historically shown to be minimal (Steyer *et al.* 2005).

4.2.2 Groundwater and Seepage

The potential hydrologic impacts due to rock mining in the Tarmac King Road Limestone Mine site under the different mining alternatives were evaluated using a numerical model developed by Science Applications International Corporation (see Appendix D) during this EIS process. Four of the selected onsite action alternatives were modeled for their anticipated impacts on groundwater without mitigation. The alternatives selected included the alternative with the largest project footprint, the alternative with the second-smallest project footprint, and two of the alternatives falling in size between those “bookends.” These four alternatives were initially modeled to determine if results would be similar enough between them to allow for interpolation of results for the remaining three alternatives. This is discussed below in Section 4.2.2.4. All of the anticipated impacts presented are based on completion of the full permitted mine-out of the particular alternative. The anticipated impacts on groundwater from the remaining alternatives were derived based on the modeling results of the modeled alternatives. Chapter 3, Section 3.2, of this EIS includes a brief discussion of the groundwater seepage analysis being conducted to evaluate the potential effects of the quarries (created due to limestone mining) on the local, as well as regional, groundwater system for the existing site conditions. Appendix D provides a more detailed discussion of the Tarmac King Road Limestone Mine site groundwater flow model, the results of this seepage analysis, and specific modeling to address areas of uncertainty related to modeling.

The impacts on the groundwater system were quantitatively evaluated based on comparisons with baseline groundwater flow model results presented in Chapter 3, Section 3.2. As part of the analysis, groundwater seepage through identified sections of the model domain was estimated. The selection of these transects, as shown in Figure 4–1, was based on locations that would provide information for analyses necessary to evaluate the impacts in terms of seepage from the areas to the north, south, and west of the mine site boundary, along the boundaries of mining footprints. Therefore, transects were placed north-south, as well as east-west, in the model domain. In addition, transects were evaluated that estimate regional seepage impact. A description of these transects is included in Chapter 3, Section 3.1.3.2. Groundwater seepage estimates through these transects were developed for four of the proposed seven action alternatives. Three different seepage values were developed: (1) yearly daily average from the period of simulation, (2) a selected dry period daily average, and (3) a selected wet period daily average.

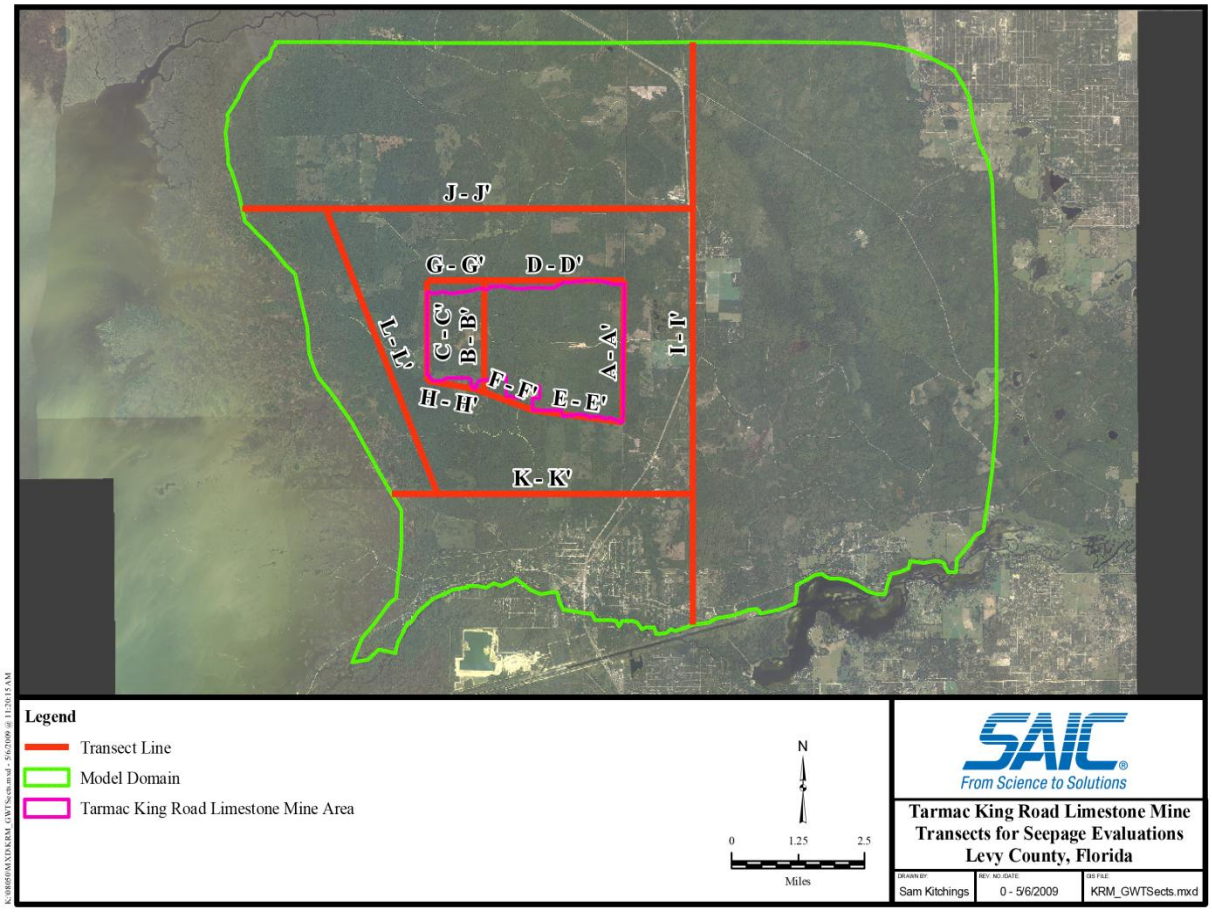


Figure 4–1. Hydrogeologic Sections for Seepage Analysis

The results of the groundwater seepage analysis for the four selected alternatives are shown in Tables 4–1, 4–2, and 4–3 for the average condition, dry period, and wet period, respectively. Note that the No Action Alternative is the baseline scenario without any mining. This section also analyzes hydrologic impacts outside of the mining site potentially caused by the different alternatives. However, because the locations of other potential wet mining operations and the volumes that might be mined are unknown at this time, these impacts could not be quantified in this EIS.

Seepage rates across various transects are expected to increase as a result of increased mining activities. The largest increases would be associated with Alternative 2 because this alternative involves the largest amount of proposed mining. In general, the magnitude of seepage changes when comparing the alternatives with baseline results is largest under dry conditions and smallest under wet conditions, with the seepage rates under average conditions representing a reasonable average between the dry and wet scenarios.

Table 4–1. Predicted 5-Year Average Seepage Rates[a] from Different Sections for Multiple Scenarios, Calendar Years 2004–2008

Transects for Evaluating Seepage[b]	Seepage Flow Direction	Baseline (MGD)	Alternative 2 MGD	Alternative 2 Difference from Baseline (MGD)	Alternative 2 Percent Change from Baseline	Alternative 3 MGD	Alternative 3 Difference from Baseline (MGD)	Alternative 3 Percent Change from Baseline
Mine-Out Areas Within Mine Site Boundary								
(G-G'+ D-D')	North to South	23.36	27.65	4.29	18.4	23.98	0.62	2.7
(E-E'+F-F'+ H-H')	North to South	9.93	11.46	1.53	15.4	10.11	0.18	1.8
A-A'	East to West	7.42	7.19	–0.23	–3.1	7.03	–0.39	–5.3
B-B'	East to West	16.56	17.46	0.90	5.4	16.47	–0.09	–0.5
C-C'	East to West	24.43	28.32	3.88	15.9	24.26	–0.17	–0.7
Regional Areas Outside Mine Site Boundary								
I-I'	East to West	131.16	131.18	0.02	0.0	131.12	–0.04	0.0
J-J'	North to South	93.96	95.76	1.80	1.9	94.19	0.23	0.2
K-K'	North to South	3.31	4.06	0.75	22.5	3.66	0.35	10.5
L-L'	East to West	89.36	92.05	2.68	3.0	88.97	–0.39	–0.4

Transects for Evaluating Seepage[b]	Seepage Flow Direction	Baseline (MGD)	Alternative 7 MGD	Alternative 7 Difference from Baseline (MGD)	Alternative 7 Percent Change from Baseline	Alternative 8 MGD	Alternative 8 Difference from Baseline (MGD)	Alternative 8 Percent Change from Baseline
Mine-Out Areas Within Mine Site Boundary								
(G-G'+ D-D')	North to South	23.36	23.66	0.30	1.3	25.99	2.63	11.3
(E-E'+ F-F'+ H-H')	North to South	9.94	10.15	0.21	2.1	11.53	1.59	16.0
A-A'	East to West	7.42	7.08	–0.34	–4.6	7.17	–0.25	–3.4
B-B'	East to West	16.56	16.04	–0.52	–3.2	17.44	0.87	5.3
C-C'	East to West	24.43	24.12	–0.32	–1.3	25.86	1.42	5.8
Regional Areas Outside Mine Site Boundary								
I-I'	East to West	131.16	131.14	–0.02	0.0	131.10	–0.06	0.0
J-J'	North to South	93.96	94.02	0.06	0.1	95.02	1.06	1.1
K-K'	North to South	3.31	3.62	0.31	9.3	4.00	0.69	20.7
L-L'	East to West	89.36	88.98	–0.38	–0.4	90.58	1.21	1.4

[a] Seepage rates for 5-year average represent the predicted average of 2004 through 2008 (i.e., the period of simulation excluding the initial period of calendar year 2003).

[b] See Figure 4–1 and Chapter 3, Section 3.1.3.2, for the location and description of the transects.

Key: MGD=million gallons per day.

Table 4–2. Predicted Dry Period Average Seepage Rates[a] from Different Sections for Multiple Scenarios, Calendar Year 2007

Transects for Evaluating Seepage[b]	Seepage Flow Direction	Baseline (MGD)	Alternative 2 MGD	Alternative 2 Difference from Baseline (MGD)	Alternative 2 Percent Change from Baseline	Alternative 3 MGD	Alternative 3 Difference from Baseline (MGD)	Alternative 3 Percent Change from Baseline
Mine-Out Areas Within Mine Site Boundary								
(G-G'+ D-D')	North to South	23.27	27.2	3.93	16.9	23.69	0.42	1.8
(E-E'+ F-F'+ H-H')	North to South	9.46	11.16	1.70	18.0	9.68	0.22	2.3
A-A'	East to West	7.04	6.8	–0.24	–3.4	6.66	–0.38	–5.4
B-B'	East to West	15.81	16.97	1.16	7.3	15.91	0.10	0.6
C-C'	East to West	23.4	27.93	4.53	19.4	23.38	–0.02	–0.1
Regional Areas Outside Mine Site Boundary								
I-I'	East to West	131.01	130.95	–0.06	0.0	130.92	–0.09	–0.1
J-J'	North to South	93.81	95.39	1.58	1.7	93.9	0.09	0.1
K-K'	North to South	2.04	2.93	0.89	43.6	2.5	0.46	22.5
L-L'	East to West	86.31	89.3	2.99	3.5	86.15	–0.16	–0.2

Transects for Evaluating Seepage[b]	Seepage Flow Direction	Baseline (MGD)	Alternative 7 MGD	Alternative 7 Difference from Baseline (MGD)	Alternative 7 Percent Change from Baseline	Alternative 8 MGD	Alternative 8 Difference from Baseline (MGD)	Alternative 8 Percent Change from Baseline
Mine-Out Areas Within Mine Site Boundary								
(G-G'+ D-D')	North to South	23.27	23.44	0.17	0.7	25.82	2.55	11.0
(E-E'+ F-F'+ H-H')	North to South	9.46	9.71	0.25	2.6	11.04	1.58	16.7
A-A'	East to West	7.04	6.72	–0.32	–4.5	6.8	–0.24	–3.4
B-B'	East to West	15.81	15.41	–0.40	–2.5	16.72	0.91	5.8
C-C'	East to West	23.4	23.19	–0.21	–0.9	24.82	1.42	6.1
Regional Areas Outside Mine Site Boundary								
I-I'	East to West	131.01	130.95	–0.06	0.0	130.95	–0.06	0.0
J-J'	North to South	93.81	93.78	–0.03	0.0	94.86	1.05	1.1
K-K'	North to South	2.04	2.39	0.35	17.2	2.75	0.71	34.8
L-L'	East to West	86.31	86.08	–0.23	–0.3	87.53	1.22	1.4

[a] Seepage rates for dry period represent the predicted average of January through December 2007.
[b] See Figure 4–1 and Chapter 3, Section 3.1.3.2, for the location and description of the transects.
Key: MGD=million gallons per day.

Table 4–3. Predicted Wet Period Average Seepage Rates[a] from Different Sections for Multiple Scenarios, Calendar Year 2004

Transects for Evaluating Seepage[b]	Seepage Flow Direction	Baseline (MGD)	Alternative 2 MGD	Alternative 2 Difference from Baseline (MGD)	Alternative 2 Percent Change from Baseline	Alternative 3 MGD	Alternative 3 Difference from Baseline (MGD)	Alternative 3 Percent Change from Baseline
Mine-Out Areas Within Mine Site Boundary								
(G-G'+ D-D')	North to South	23.44	27.84	4.40	18.8	24.11	0.67	2.9
(E-E'+ F-F'+ H-H')	North to South	10.88	12.32	1.44	13.2	10.99	0.11	1.0
A-A'	East to West	8.31	8	–0.31	–3.7	7.8	–0.51	–6.1
B-B'	East to West	17.95	18.53	0.58	3.2	17.76	–0.19	–1.1
C-C'	East to West	26.11	30.16	4.05	15.5	25.85	–0.26	–1.0
Regional Areas Outside Mine Site Boundary								
I-I'	East to West	132.08	131.82	–0.26	–0.2	131.76	–0.32	–0.2
J-J'	North to South	93.99	95.81	1.82	1.9	94.26	0.27	0.3
K-K'	North to South	5.5	6.14	0.64	11.6	5.78	0.28	5.1
L-L'	East to West	94	96.79	2.79	3.0	93.4	–0.60	–0.6

Transects for Evaluating Seepage[b]	Seepage Flow Direction	Baseline (MGD)	Alternative 7 MGD	Alternative 7 Difference from Baseline (MGD)	Alternative 7 Percent Change from Baseline	Alternative 8 MGD	Alternative 8 Difference from Baseline (MGD)	Alternative 8 Percent Change from Baseline
Mine-Out Areas Within Mine Site Boundary								
(G-G'+ D-D')	North to South	23.44	23.76	0.32	1.4	26.01	2.57	11.0
(E-E'+ F-F'+ H-H')	North to South	10.88	11.1	0.22	2.0	12.57	1.69	15.5
A-A'	East to West	8.31	7.86	–0.45	–5.4	7.98	–0.33	–4.0
B-B'	East to West	17.95	17.31	–0.64	–3.6	18.77	0.82	4.6
C-C'	East to West	26.11	25.71	–0.40	–1.5	27.71	1.60	6.1
Regional Areas Outside Mine Site Boundary								
I-I'	East to West	132.08	131.76	–0.32	–0.2	131.7	–0.38	–0.3
J-J'	North to South	93.99	94.07	0.08	0.1	94.97	0.98	1.0
K-K'	North to South	5.5	5.8	0.30	5.5	6.18	0.68	12.4
L-L'	East to West	94	93.45	–0.55	–0.6	95.33	1.33	1.4

[a] Seepage rates for wet period represent the predicted average of January through December 2004.
[b] See Figure 4–1 and Chapter 3, Section 3.1.3.2, for the location and description of the transects.
Key: MGD=million gallons per day.

An analysis of the impact on groundwater flow in the mining area was also completed by DHI Group using the MODFLOW [modular three-dimensional finite-difference groundwater flow model] model as constructed by Ardaman & Associates. The version of the model evaluated was that supplied with the General Use Permit Application for the Proposed King Road Mine (Tarmac 2008a). As stated in the DHI Group Technical Memorandum, Subject Line: Summary of MODFLOW model setup improvement and results (DHI 2011), the model was modified to re-examine the (future) impact of mining operations. DHI developed a steady state model and a transient model for its evaluation. The differences between the Ardaman & Associates model and the DHI model include the following:

(1) Refining the values used as specified head boundary conditions for Layer 1 and removing the specified head boundary conditions for deeper layers

(2) Substituting the no-flow boundary condition assumed in the east boundary with a specified head boundary condition

(3) Including existing pumping wells in the model domain area

(4) Including drain boundary condition cells as in previous transient pre-mining models

(5) Including other calibration targets (i.e., observation well stations)

A summary of the results of the DHI model in predicting post-mining changes to groundwater flow include the following:

- The predicted water table level increases slightly toward the east from the mining property and decreases in all other directions. The decrease in the water table levels may imply a shorter hydroperiod in wetlands, and therefore, a negative impact on the existing wetland ecosystems.

- The depth to water increase of around 0.3 feet occurs toward the northwestern part of the mining property area where the depth to water table is mostly above 3 feet. However, the extent of an area north of the mining property with depth to water table lower than 1 foot is reduced at post-mining conditions.

- The post-mining recharge inflow and drain outflow decreases in the mining property with respect to the pre-mining conditions. This causes an increase of the groundwater inflow to the property. The contribution to the surface water flow from the mining property is predicted to be lower by 3.8 cubic feet per second at post-mining conditions, mainly due to the increase in the evapotranspiration losses from open water bodies by 3.9 cubic feet per second.

- The groundwater discharge at the coastal boundary decreases from 33.4 cubic feet per second (pre-mining conditions) to 30.7 cubic feet per second (post-mining conditions).

- The particle path tracking shows no visible difference between the pre- and post-mining conditions. In both cases, the analysis indicates that the groundwater being pumped in wells inside the model domain is not coming from the mining property.

As indicated in the DHI report, DHI's MODFLOW steady state modeling has limitations, which can be summarized as follows: (1) the surface water processes are not simulated, (2) the steady state simulations do not capture daily and seasonal variations, and (3) the model parameterization is simplistic due to the lack of data. Note that the modeling results from the DHI model were not used in forecasting impacts on hydroperiod as the model used in this EIS does. In addition, the DHI evaluation is not specific to the post-mining land configurations of each alternative; therefore, a direct comparison of results is difficult. The modeling completed for this EIS was performed by Science Applications International Corporation with a version of the MODFLOW model that is not identical to that provided by Ardaman & Associates with the General Use Permit Application for the Proposed King Road Mine (Tarmac 2008a).

4.2.2.1 Alternative 1 Potential Groundwater and Seepage Impacts

Under the No Action Alternative, there would be no mining-related activities. Therefore, there would be no impact on the groundwater system under this alternative. Simulations using the numerical groundwater model were performed to develop the baseline seepage values through the selected transect for comparison with multiple action alternatives.

4.2.2.2 Alternative 2 Potential Groundwater and Seepage Impacts

Under Alternative 2, about 1,506 acres of a total mining area of about 2,757 acres would be converted from various land cover types to lakes. Groundwater flow model simulations were performed to predict the effects on the hydrologic system caused by implementation of Alternative 2. The Alternative 2 results for seepage under average conditions, representing hydrologic conditions for the period of simulations, compared with the no-mining scenario (No Action Alternative or baseline) model results, shown in Table 4–1, are summarized below.

- Seepage to the west along the eastern border of the mine site area through Transect A-A′ is expected to slightly decrease by 0.23 million gallons per day (MGD), or –3.1 percent, compared with existing (baseline) conditions. Seepage along the northern boundary of the mine site area would be a combination of water seeping through Transects D-D′ and G-G′, which is expected to increase by 4.3 MGD, or 18.4 percent, compared with baseline conditions.

- Seepage along the southern boundary through the Transects E-E′, F-F′, and H-H′ out of the mine site area is expected to increase by 1.5 MGD, or 15.4 percent, compared with baseline conditions.

- Seepage to the west through the north-south Transect B-B′ that passes through the western portion of the mine site area is expected to increase by 0.9 MGD, or 5.4 percent, compared with baseline conditions.

- Seepage to the west through the north-south Transect C-C′ that passes through the western border of the mine site area is expected to increase by 3.9 MGD, or 15.9 percent, compared with baseline conditions.

- To evaluate regional impacts, seepage through Transects I-I′, J-J′, and K-K′, located more than a mile away from the mining site boundaries, was estimated. Seepage through Transect I-I′ (east of the mine site area, covering a distance of approximately 9.5 miles) is expected to increase slightly (less than 1 percent) compared with baseline conditions. Seepage through Transect J-J′ (north of the mine site area, covering a distance of approximately 5.5 miles) is expected to increase by 1.8 MGD, or 1.9 percent, compared with baseline conditions. Seepage through Transect K-K′ (south of the mine site area) is expected to increase by 0.8 MGD, or 22.5 percent, compared with baseline conditions.

- To evaluate the impact on saltwater intrusion, seepage through Transect L-L′, located near the western model boundary (i.e., near the coastline) was estimated. Seepage through this transect is expected to increase by 2.7 MGD, or 3.0 percent, compared with baseline conditions, indicating no negative impact on saltwater intrusion.

Figures 4–2 and 4–3 show outputs from the groundwater flow model that represent plots of potentiometric surface for model Layer 2 for the dry and wet periods, respectively, after implementation of Alternative 2. As can be seen from these figures, water levels are decreasing from east to west and southwest. When the wet and dry periods are compared, it appears that the water levels are higher for the wet period than the dry period. However, these figures appear to be almost identical to the figures for the baseline (see Chapter 3 and Appendix D). Therefore, it may be concluded that the overall potentiometric surface would not be adversely impacted by implementation of Alternative 2.

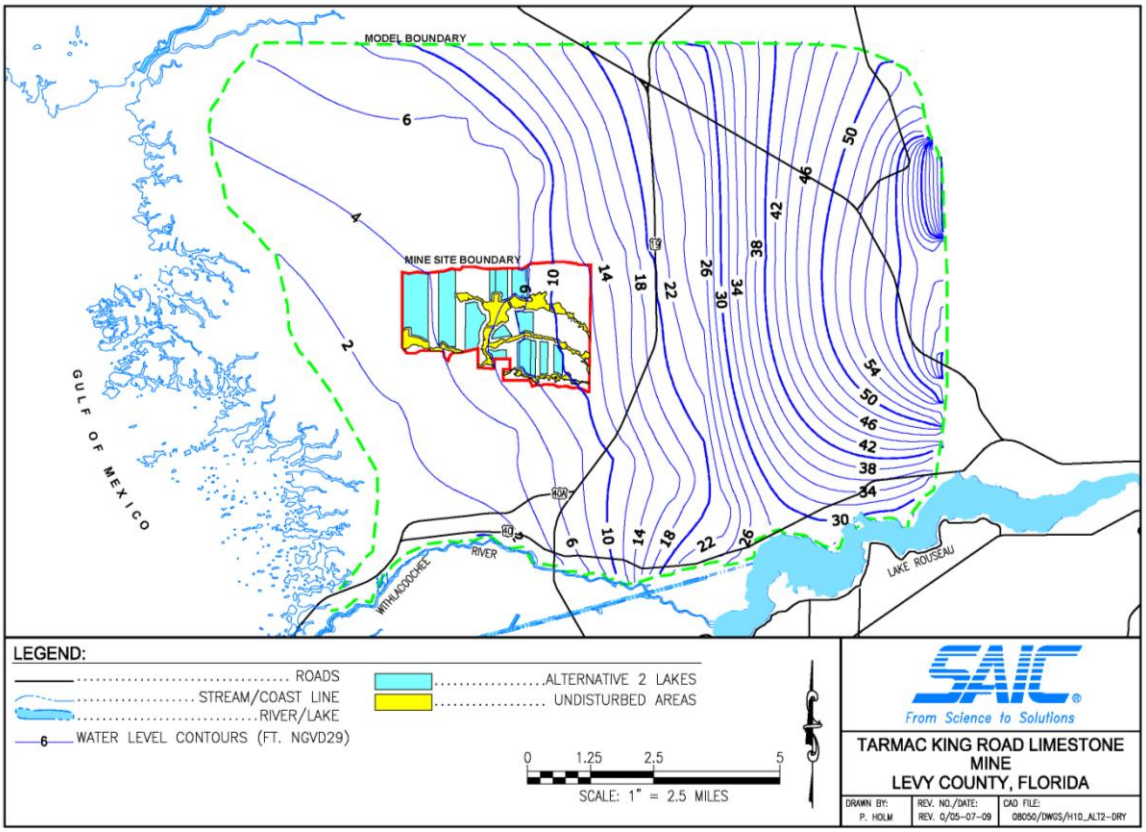


Figure 4–2. Alternative 2 Water Level Contours During Dry Season

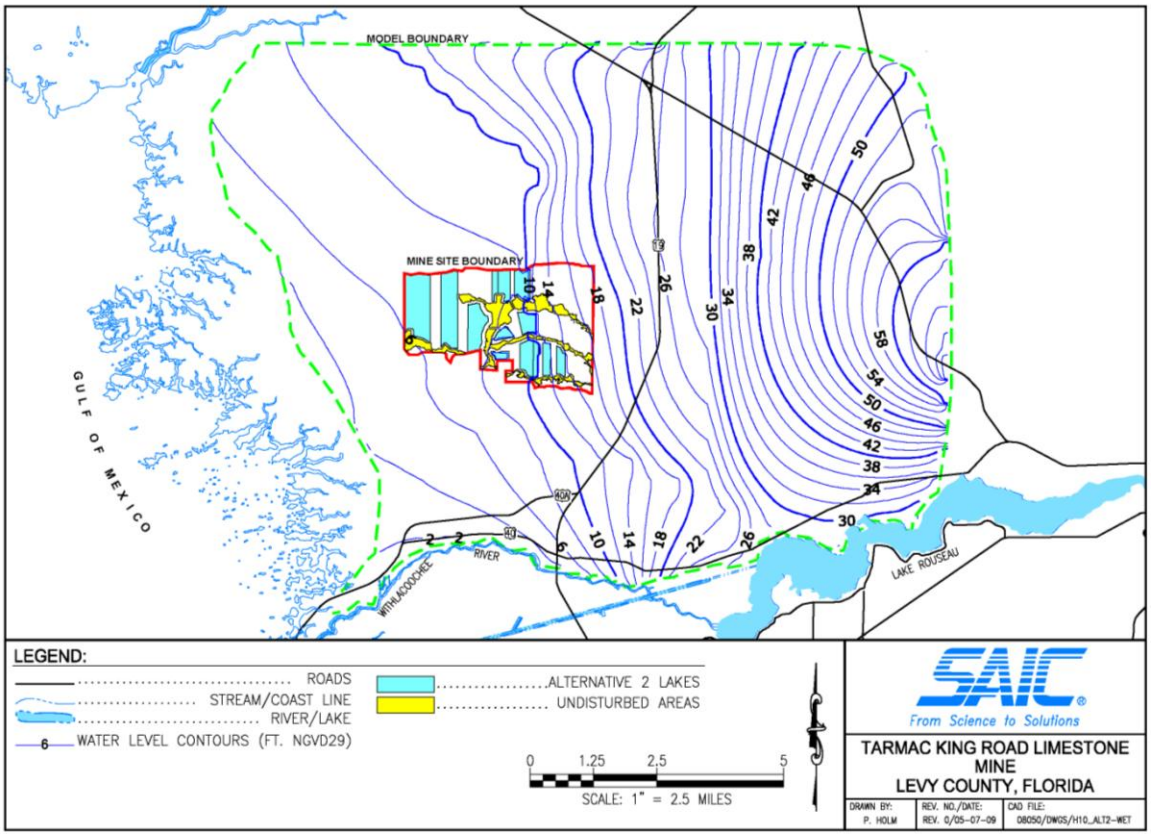


Figure 4–3. Alternative 2 Water Level Contours During Wet Period

Figures 4–4 and 4–5 are examples of head (water level elevation) versus time plots, showing head versus time for the baseline and Alternative 2 for Monitoring Well 01 (MW-1) and MW-5, respectively, for calendar year 2006, representing average hydrologic conditions. MW-1 is located in the northern boundary of the mine site area and MW-5 is located within the mine site area more toward the eastern portion of the mining area. Figure 4–4 shows that water levels in the wells located in the northern boundary of the mine site area are expected to slightly decrease (by approximately 0.3 feet on average) under Alternative 2 compared with the baseline. However, Figure 4–5 shows that water levels within the eastern portion of the mining area are expected to slightly increase (by approximately 0.2 feet on average) under Alternative 2 compared with the baseline. Therefore, it may be concluded that implementation of Alternative 2 would decrease the groundwater levels near the northern boundary of the mine site area, whereas it would slightly increase the groundwater levels within the eastern portion of the mining area. Under this alternative, the overall seepage increase into the mine site and the average groundwater drawdown in wetlands adjacent to the mine site would be minimal.

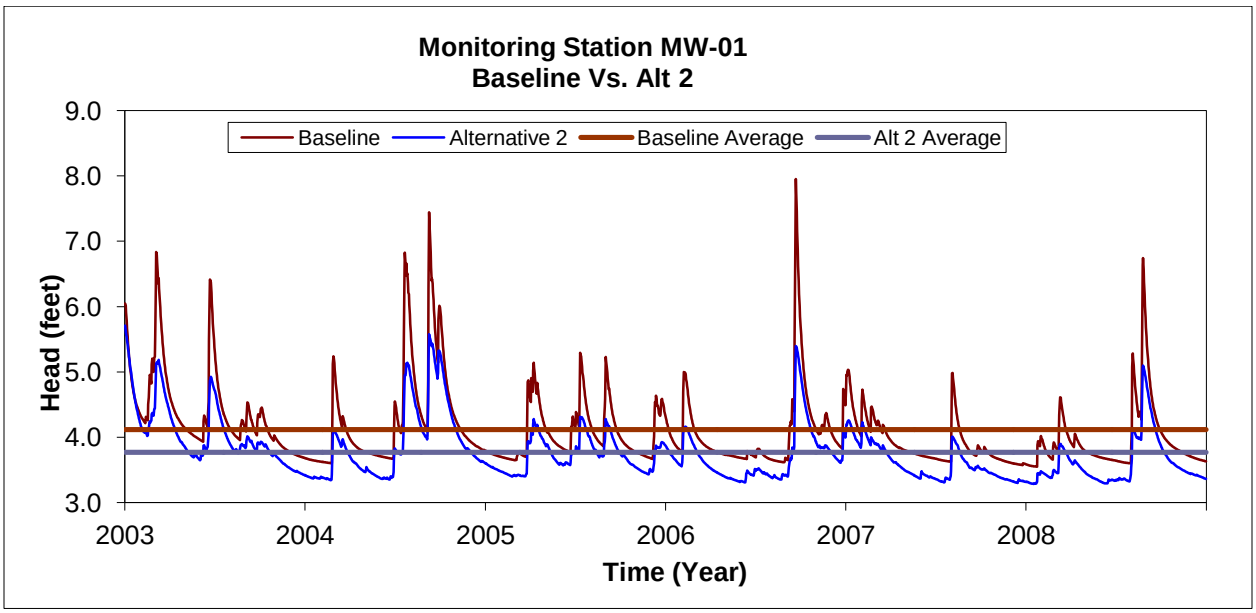


Figure 4–4. Alternative 2 Water Level Elevations Versus Time Compared with the Baseline at Monitoring Well 1

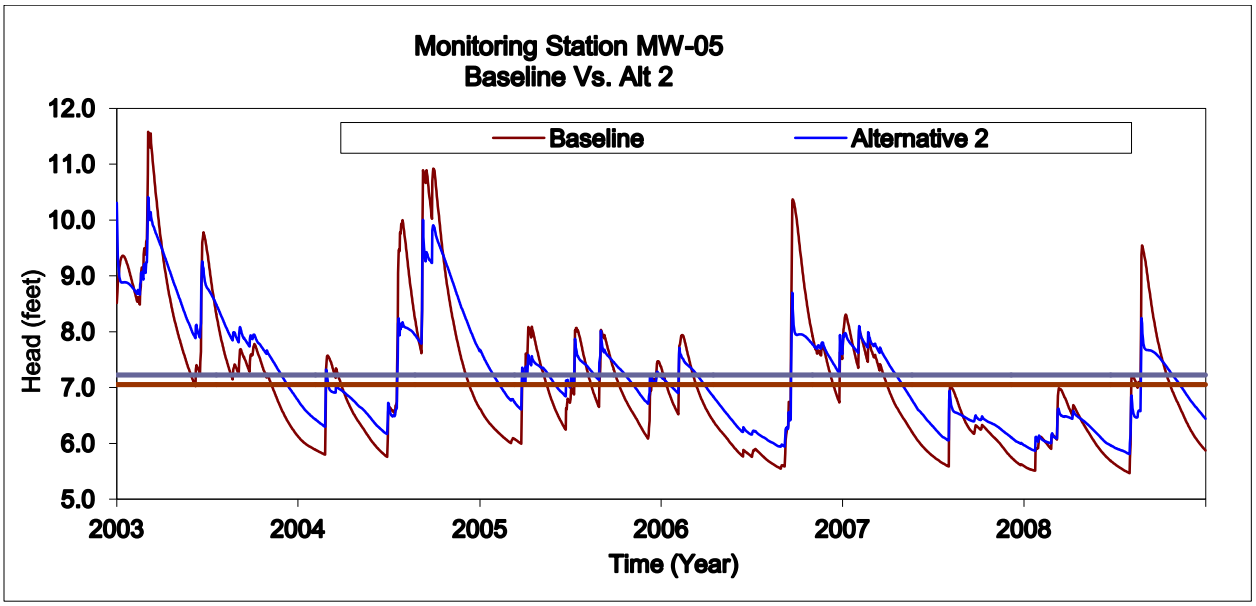


Figure 4–5. Alternative 2 Water Level Elevations Versus Time Compared with the Baseline at Monitoring Well 5

4.2.2.3 Alternative 3 Potential Groundwater and Seepage Impacts

Under Alternative 3, about 958 acres of a total mining area of about 1,884 acres would be converted from various land cover types to lakes. The Alternative 3 results for seepage under average conditions, shown in Table 4–1, are summarized below.

- Seepage to the west along the eastern border of the mine site area through Transect A-A′ is expected to decrease by 0.4 MGD, or 5.3 percent, compared with existing (baseline) conditions. Seepage along the northern boundary of the mine site area is a combination of water seeping through Transects D-D′ and G-G′, which is expected to increase by 0.6 MGD, or 2.7 percent, compared with baseline conditions.

- Seepage along the southern boundary through Transects E-E′, F-F′, and H-H′ out of the mine site area is expected to slightly increase (by 0.2 MGD, or 1.8 percent) compared with baseline conditions.

- Seepage to the west through the north-south Transect B-B′, which passes through the western portion of the mine site area with lakes on either side, is only expected to change minimally compared with baseline conditions.

- Seepage to the west through the north-south Transect C-C′, which passes through the western border of the mine site area, is expected to slightly decrease (by 0.2 MGD, or 0.7 percent) compared with baseline conditions.

- Seepage through Transects I-I′ and J-J′ is only expected to change minimally compared with baseline conditions; however, there would be a slight increase in seepage (approximately 0.4 MGD, or 10.5 percent) through Transect K-K′ (located south of the mine site area).

- Seepage through Transect L-L′ is only expected to change minimally compared with baseline conditions, indicating no adverse impact on saltwater intrusion.

Potentiometric surface plots for model Layer 2 for the wet and dry periods, respectively, after implementation of Alternative 3, are included in Appendix D. These plots show that the potentiometric surface for model Layer 2 under Alternative 3 is similar to that under Alternative 2.

Water levels in the wells located within the mining site would only slightly decrease or increase depending on their locations under Alternative 3 compared with the baseline, thereby causing a minimal seepage increase. Therefore, it may be concluded that implementation of Alternative 3 would only slightly decrease (by less than 0.3 feet on average) the groundwater elevations within the mine site, thereby slightly increasing seepage (by less than 0.5 MGD) into the mine site area, without causing more than minimal average groundwater drawdown in wetlands adjacent to the mine site.

4.2.2.4 Alternatives 4–6 Potential Groundwater and Seepage Impacts

Potential seepage under Alternative 3 is minimal, and because the mining footprint under Alternatives 4 and 5 is similar to that under Alternative 3 and the mining footprint under Alternative 6 is significantly smaller than that under Alternative 3, no further simulations were performed for Alternative 4, 5, or 6. Seepage increases compared with the baseline under Alternatives 4 and 5 are expected to be similar to those under Alternative 3. Seepage impacts under Alternative 6 would be lower than those under Alternative 3 but slightly higher than those under Alternative 7.

4.2.2.5 Alternative 7 Potential Groundwater and Seepage Impacts

Under Alternative 7, about 511 acres of a total mining area of about 898 acres would be converted from various land cover types to lakes. The Alternative 7 results for seepage under average conditions, shown in Table 4–1, indicate that seepage increases or decreases through all the transects in the mine-out areas and regional areas outside the mine site boundary are insignificant (i.e., less than or equal to 0.52 MGD) compared with baseline conditions.

Potentiometric surface plots for model Layer 2 for the wet and dry periods, respectively, after implementation of Alternative 7, are included in Appendix D. These plots show the potentiometric surface for model Layer 2 for Alternative 7 to be similar to those shown for the baseline in Chapter 3, Section 3.6.

Water levels in the wells located within the mining site would minimally decrease under Alternative 7 compared with the baseline. Therefore, it may be concluded that implementation of Alternative 7 would not change the groundwater elevations within the mine site. Therefore, there would be no change in seepage into the mine site area compared with the baseline, and this alternative would not cause discernible groundwater drawdown in wetlands adjacent to the mine site.

4.2.2.6 Alternative 8 Potential Groundwater and Seepage Impacts

Under Alternative 8, about 981 acres of a total mining area of about 1,896 acres would be converted from various land cover types to lakes. The lakes created and the area mined would be nearly identical to those under Alternative 3, with only slight differences in the locations within the mining parcel. Alternative 8 includes mining approximately 400 acres just to the west of Transect B-B′ and removing approximately 400 acres from mining immediately north of Transects E-E′ and F-F′. The Alternative 8 results for seepage under average conditions, shown in Table 4–1, are summarized below.

- Seepage to the west along the eastern border of the mine site area through Transect A-A′ is expected to decrease by 0.3 MGD, or –3.4 percent, compared with existing (baseline) conditions. Seepage along the northern boundary of the mine site area is a combination of water seeping through Transects D-D′ and G-G′, which is expected to increase by 2.6 MGD, or 11.3 percent, compared with baseline conditions.

- Seepage along the southern boundary through Transects E-E′, F-F′, and H-H′ out of the mine site area is expected to slightly increase (1.6 MGD, or 16.0 percent) compared with baseline conditions.

- Seepage to the west through the north-south Transect B-B′ that passes through the western portion of the mine site area is expected to increase by 0.9 MGD, or 5.3 percent, compared with baseline conditions.

- Seepage to the west through the north-south Transect C-C′ that passes through the western border of the mine site area is expected to increase by 1.4 MGD, or 5.8 percent, compared with baseline conditions.

- Seepage through Transects I-I′ and J-J′ is only expected to change minimally compared with baseline conditions; however, there would be a slight increase in seepage (approximately 0.7 MGD, or 20.7 percent) through Transect K-K′ (located south of the mine site area).

- Seepage through Transect L-L′ is expected to increase by 1.2 MGD, or 1.4 percent, compared with baseline conditions, indicating no negative impact on saltwater intrusion.

Potentiometric surface plots for model Layer 2 for the wet and dry periods, respectively, after implementation of Alternative 8, would be similar to those shown for Alternative 2.

Water levels in the wells located within the mining site would only slightly decrease or increase depending on their locations under Alternative 8 compared with the baseline, causing only minimal seepage increase. Therefore, it may be concluded that implementation of Alternative 8 would be similar to Alternative 3, only slightly decreasing groundwater elevations within the mine site, thereby slightly increasing seepage into the mine site area. This alternative would not cause discernible groundwater drawdown in wetlands adjacent to the mine site. If one of the action alternatives is selected and approved by the USACE, any accompanying permit would require groundwater level monitoring and reporting to demonstrate that the groundwater impacts being realized are consistent with the impacts estimated in this EIS.

4.3 WATER QUALITY (SURFACE WATER AND GROUNDWATER)

4.3.1 Surface Water Quality

Under the No Action Alternative, intermittent logging activities and recreational use of the site for hunting would continue, and there would be no change to current surface water quality conditions.

Surface water quality impacts of Alternatives 2 through 8 are discussed in the following paragraphs, which present both impacts on the project mine site and on adjacent streams and the Gulf of Mexico.

As summarized in Chapter 3, Section 3.2.2, water-quality monitoring data indicate that surface water quality at the project mine site is good, with the exception of dissolved oxygen (DO) and ammonia. Other water quality parameters for which data are available indicate good water quality at the project mine site, including low levels of turbidity, benzene, and metals (with the exception of iron), which likely reflects regional background conditions.

Temperature. Changes to surface water temperatures from mining activities consist of likely increased temperatures in the created mine lakes. The presence of large, permanent open water bodies with no shading from sunlight would establish conditions where surface water temperatures would increase with respect to current site conditions. The magnitude of temperature increases expected in the lakes compared with existing surface waters on the site has not been estimated or modeled. However, elevated surface water temperatures would have implications for DO in lake waters, algae productivity (see chlorophyll *a* below), and suitability of the lakes for wildlife.

pH. Background data on pH indicate surface waters at the project mine site are within state water quality standards. Activities that could alter pH from lake mining include direct inputs from acid rain and primary productivity (e.g., by algae, see chlorophyll *a* discussion below); respiration and decomposition lower pH as well (Washington Department of Ecology 1991). The pH level of water determines the solubility and bioavailability of nutrients and metals and therefore has ecological implications. Lakes tend to have ample buffering capacity that prevents major changes in pH; this is particularly true in a limestone environment such as the project site. Increased temperature and increased primary productivity that is expected in the mined lakes could potentially alter the range of pH from existing conditions. Estimates or predictions of the possible magnitude of changes in pH in the lakes have not been determined for the project.

Turbidity and Total Suspended Solids. Turbidity data for surface waters on the site indicate existing levels would be considered low. Regional references suggest that forestry activities have served as one of the primary sources of turbidity and total suspended solids to the region's rivers (Levy County 2008). Potential sources of sediment from mining activities that would increase turbidity and total suspended solids include site clearing and grading; construction of containment berms; stockpiled materials (e.g., rock, rock dust, topsoil); construction vehicles (e.g., tires and dust); wind and water transport from pavement, and all disturbed and unstabilized land surfaces (e.g., unpaved roads and construction staging areas). Standard best management practices that would be used to prevent adverse impacts from erosion and sedimentation include the following:

- Establishing and maintaining adequate sedimentation and erosion control devices (e.g., silt fences) at all disturbance areas, including site clearing and grubbing, site grading, and construction of retention pond, stormwater features, buildings, roads, sidewalks, parking, and landscaping areas.

- Setting up perimeter berms around each lake mining site to prevent the potential for offsite transport of soil or rock; berms would be stabilized with appropriate seeding and mulch.

- Setting up perimeter berms around the central rock processing facility, offices, storage area, and water control ponds, including a dry swale to collect the first half inch of runoff from these developed areas to prevent introduction of particulates (and contaminants) in runoff to the water processing ponds.

- Using a preliminary sedimentation pond prior to discharge to the main water processing pond, which would be used to maintain adequate water levels in active mining lakes throughout the site.
- Storing waste, including all trash and construction debris, in closed dumpsters with offsite disposal.
- Stabilizing the construction entrance to reduce sediment tracking and cleaning main access roads daily to remove mud, dust, and/or rock.
- Using covered trucks for all offsite transport of materials.
- Stabilizing disturbed areas and stockpiles using appropriate seed mix and mulch when construction activities are complete or the areas are going to be left inactive for 14 days or more.

Stream crossings for access roads would be the most critical locations for implementation of sound sedimentation and erosion controls to prevent direct runoff into streams. Additionally, stormwater collected from all active work areas is proposed to be diverted to sedimentation basins. The basins would be periodically cleaned out to ensure they function adequately to remove particulates and debris prior to diversion to the central water management lake at the rock processing site. Keeping mining waters isolated from non-mining surface waters on the site would reduce the potential for offsite increases in turbidity.

Conductivity, Salinity, Chloride, and Sulfate. These constituents are all associated with marine waters; surface water data from the project mine site and mitigation area indicate that these constituents increase in concentration for surface waters closest to the Gulf of Mexico. There are two potential sources of increases of these parameters from proposed mining activities: (1) exposure of the mined lakes to increased levels of these constituents in groundwater at depth (see Section 4.3.2) and (2) inundation from stormwater, which could affect the western portion of the site in the Gulf Coast's 100-year floodplain, as described in Section 4.2.1, and storm surge from hurricanes, which could affect the entire site.

Temporary berms around active mining areas and permanent containment berms to be constructed around all lakes to remain on site would prevent flooding during conditions corresponding to a 100-year flood event and/or Category III hurricane storm surge. Coastal flooding would have the potential to inundate active mining areas and completed lakes during occurrence of Category IV and V hurricanes.

Introduction of chloride and sulfate to the lakes caused by coastal flooding would not be different than coastal flooding of natural lakes that occurs throughout the southeastern United States and Gulf Coast. Because surface waters are not used for drinking water, there would be no human health implications from this impact.

Dissolved Oxygen and Biological Oxygen Demand. Surface waters at the site currently do not meet the Florida Department of Environmental Protection (FDEP) surface water quality standard for DO, and there is no clear indication of spatial or seasonal trends. Low DO and elevated ammonia in the surface waters at the site reflect regional conditions that are evident in water quality data available for rivers in the area (e.g., low DO in Little Waccasassa River and Waccasassa River) and the Gulf of Mexico (low DO and elevated ammonia), as described in Chapter 3, Section 3.2.2.

In natural rivers, streams, ponds, and lakes, alterations to circulation and flushing can exacerbate DO problems (Murphy 2007). The existing surface waters at the project mine site are intermittent stream channels and small borrow ponds. Impacts from mining would be limited to temporary, culverted road crossings over streams to provide access to different portions of the site. No mining would occur within or immediately adjacent to any existing stream channels. The size and elevation of culverts at all temporary stream crossings would be designed to prevent alterations in the existing stream flow patterns. Therefore, the proposed mining activities would not alter circulation and flushing conditions on the project site that have an influence on water quality parameters such as DO downstream.

Other activities that could exacerbate low DO conditions include increased discharges of organic matter and nutrients (Murphy 2007). As described in Chapter 3, Section 3.2.2.1, inputs of organic matter increase biological oxygen demand and contribute to low DO. Vegetation and soils would be removed prior to mining and would be processed separately from the mined rock materials. Material with an organic component (e.g., vegetation and topsoil to be cleared from work areas) would be disposed of and/or handled in a manner that would prevent disposal or discharge in surface waters on the site. The proposed mining activities would include use of mined lakes to supply water for processing the mined material, with post-processing water discharged into a single treatment lake before pumping the treated water back into the mined lakes. This recycling of process water on site should not introduce organic material or nutrients into the lakes because the processing would be conducted only on rock material.

Changes in temperature can affect the ability of surface waters to absorb DO. The existing vegetation along the stream channels through the site would be maintained under all alternatives, which should maintain the existing temperature regime in those surface waters. The mined lakes would be between 10 and 479 acres in size and would be surrounded by cleared land; this would expose substantial areas of surface waters to unshaded conditions that would increase the water temperature. Recycling lake water through conduits, rock processing, and the process-water treatment lake also tends to increase water temperatures. Based on these factors, it is likely the lakes would experience low DO concentrations. The lakes would not be connected to stream channels in any way and would therefore not have any offsite impacts on surface water quality.

Chlorophyll *a*. Potential sources of chlorophyll *a* from mining activities would be primary productivity in the surface waters of mined lakes. The presence of large, permanent open water bodies with no shading from sunlight would establish conditions where surface water primary productivity would increase with respect to the current site conditions. Phytoplankton productivity in the lakes would be limited by the availability of nitrogen; plankton would be grazed by aquatic organisms or would settle to the bottom of the lakes. This would provide a source of organic matter to the lake bottoms that could exacerbate low DO conditions. The magnitude of primary productivity expected to occur in surface waters of the lakes and the implications for DO in lake waters have not been estimated or predicted with modeling. However, any contribution would tend to worsen the regional low DO conditions.

Nutrients and Ammonia. Surface waters at the site currently do not meet the FDEP surface water quality standard for ammonia, and there is no clear indication of spatial or seasonal trends. As with DO, this is indicative of a regional condition that is evident in water quality data available for the Gulf of Mexico (low DO and elevated ammonia). As described in Chapter 3, Section 3.2.2.1, possible sources of ammonia to the mined lakes could include sewage treatment plants, manufacturing processes, agricultural runoff from fertilized fields and livestock, and residential cleaning products and septic systems. Stormwater and waste controls to be implemented during mining activities would help prevent introduction of ammonia into the lakes and stream channels that cross the site. Upon completion of mining, the land areas around the lakes to remain on site would be restored to pre-mining conditions. Land uses that could constitute potential sources of ammonia to surface waters on the site could occur, as the landowner has not specified a definite land use after the end of the land lease to the mining company.

Sources of nitrogen and phosphorus nutrients to surface waters on the site would be limited to clearing and stockpiling organic matter (vegetation and organic soils). Stockpiling, storage, and disposal of vegetation and organic soils would be accomplished in a way that controls any runoff and prevents its introduction to surface waters on the site, including existing stream channels and mined lakes. Other potential sources of nutrients would not occur on site or would be contained on site in an appropriate manner to prevent release (e.g., septic wastes). Fertilizers may be used to ensure successful stabilization of seeded areas; the minimum amount of fertilizer required would be mixed into the topsoil in planting areas to limit runoff in stormwater.

Other Constituents. As described in Chapter 3, Section 3.2.2.1, surface water quality data collected on the project mine site indicate no current water quality impacts associated with oil and grease, benzene, gross alpha, or metals. Potential sources of contaminants to surface waters from the proposed mining activities would include constituents associated with stormwater runoff from fuel storage areas, vehicles, construction equipment, and road surfaces. These could include heavy metals, oil and grease, and

petroleum products such as PAHs [polycyclic aromatic hydrocarbons]. Contributions of these constituents to surface waters on the site would be prevented with implementation of best management practices (e.g., those listed under "Turbidity and Total Suspended Solids" above) and appropriate stormwater management methods throughout every phase of the project, from land-clearing to final site restoration. A contained storage location has been identified in the central processing area of the site where all fuels and associated waste materials, paint, roofing supplies, cleaning agents and supplies, and similar materials would be stored. Storage and handling procedures for these materials, which are potential surface water contaminants, would be clearly identified to prevent any spills or releases.

Benzene in surface waters is of potential concern because it is a byproduct produced during blasting when diesel fuels are used as a blasting agent. As described in Chapter 3, Section 3.2.2.1, background data on surface water quality on the site indicate no concerns with benzene in surface waters on the site. There are environmentally benign blasting agents, such as mineral oil, that can be used and are already being used for blasting at other mining sites in Florida. The applicant has indicated that mineral oil would be used as a blasting agent for all mining associated with each alternative. Therefore, adverse impacts on surface water quality from blasting should not occur.

In addition to the general discussion of surface water quality impacts applicable to Alternatives 2 through 8 provided in the previous section, specific concerns pertaining to each alternative are described in this section.

Microbial Pathogens. Microbial pathogens that have the potential to affect human health are introduced to surface waters through human waste, agricultural herds (e.g., cattle yards, grazing lands), wildlife, and birds. Human waste would be handled on site in accordance with state and county requirements (e.g., *Levy County Code* for sewage waste in coastal areas, Chapter 74, Article 1, Section 74-1) and would not be a potential source of contaminants to surface waters. Agricultural land uses do not occur in close proximity to the site and would therefore not be a potential source of contaminants to surface waters. Birds and mammals would be potential sources of surface water contaminants from wildlife.

Potential surface water impacts from wildlife during construction would be relatively limited; the perimeter berms around each lake mining area would discourage access by terrestrial wildlife and therefore would limit potential for wildlife-associated contaminants to enter the lakes in surface runoff. Contamination by birds would be possible but is expected to be limited based on mining disturbance and lack of optimal habitat that would be attractive to birds in the mined lakes during mining operations.

Upon completion of mining, potential surface water impacts from wildlife could occur because wildlife might use the open water areas that would remain on site (acreages and percentages of the total site provided in Section 4.2.1.2). Restoration of the lake perimeter would reintroduce potential for wildlife use along the lake shore and thus, the potential for contaminant runoff into the lakes. Bird use would increase upon completion of mining activities, particularly if the lakes become inhabited by prey fish for species such as osprey or herons. However, this is expected to be minimal, as the lakes would not be configured specifically to allow development of a vegetated littoral zone. The edge of the lake would be designed to eliminate an abrupt drop-off to deep water, and would be sloped at a 3:1 angle out to about 7 feet of water depth. Emergent aquatic vegetation would not be planted, but is likely to naturally recruit here where water depths allow. This relatively narrow area of shallow, vegetated habitat would decrease the attractiveness of the lakes for wading birds.

Historical Surface Water Quality Data from Existing Mined Lakes. Water quality in mined lakes has been monitored through a comprehensive program for the current mining in the Lake Belt region of south Florida, with monitoring initiated in 2002 and specific monthly, quarterly, and annual monitoring required by permits for 2010 to the present. The permit monitoring encompasses surface water in mined lakes analyzed for total PAHs, volatile organic compounds (VOCs), metals, nutrients, and pathogens. As of initiation of the 2010 monitoring program, lake samples have been collected and analyzed from three water depths (generally 5, 20, and 40 feet). The only constituent that has shown any relationship with depth in the lakes is DO, which is higher near the surface of the lakes.

Results of sampling of surface waters in the lakes and monitoring wells from 2010 through September 2011 indicated that total PAHs were below the method detection limit in 694 out of 709 samples, and three samples that were initially reported greater than the laboratory practical quantitation limit were resampled and found to be below the method detection limit (MacVicar Consulting, Inc. 2012a). The annual monitoring summary prepared in July 2012 (MacVicar Consulting, Inc. 2012b) indicated that 125 microbiological samples collected in the preceding year did not indicate presence of *Cryptosporidium* or *Giardia* and that a single detection of fecal strep was resampled and found to be below the laboratory method minimum detection limit (MDL). A total of 597 chemical samples in the same timeframe indicated VOCs and PAHs were not detected in any lake or well samples (MacVicar Consulting, Inc. 2012b).

These results indicate that water quality in the Lake Belt mined lakes does not exceed applicable water quality criteria and does not indicate negative effects related to mining activities. The mining process proposed by Tarmac for the King Road mine is very similar to the process currently in use in the Lake Belt region. Thus, the impacts would be expected to be similar.

Monthly and quarterly surface water quality monitoring required by FDEP Permit No. 0244771-002 will be performed to ensure that water quality does not deteriorate below acceptable levels.

4.3.1.1 Alternative 1 Potential Surface Water Quality Impacts

The No Action Alternative would not alter existing surface water quality conditions on the project mine site.

4.3.1.2 Alternative 2 Potential Surface Water Quality Impacts

Alternative 2 would generally impact the entire site, with the exception of the stream corridors and buffer areas around the site perimeter, and would result in the largest percentage of the site being converted to lakes upon completion of all mining activities (32 percent). Therefore, Alternative 2 would have the greatest potential impacts on surface water quality on the site, including potential for construction impacts and permanent impacts from lakes upon completion of all mining activities. Mining impacts would affect all project mine site boundaries and could therefore result in offsite impacts on all receiving watersheds. Under Alternative 2, the potential for surface water quality impacts would be minimized through (1) implementation of the construction controls described in the water quality parameter sections above and (2) restoration of all disturbed areas upon completion of mining.

4.3.1.3 Alternative 3 Potential Surface Water Quality Impacts

Alternative 3 would eliminate mining impacts in the western third of the site and would therefore reduce potential surface water quality impacts on streams and offsite lands closest to the tidal resources to the west. This would also reduce the potential for saltwater contamination during some coastal flooding events. For the remainder of the site, the potential for surface water quality impacts would be the same as described for Alternative 2 and would be minimized through (1) implementation of the construction controls described in the water quality parameter sections above and (2) restoration of all disturbed areas upon completion of mining.

4.3.1.4 Alternative 4 Potential Surface Water Quality Impacts

Potential impacts on surface water quality under Alternative 4 would be similar to those under Alternative 3, with the exception of a reduced mining area in the northeast corner of the site. This would decrease the potential for surface water quality impacts on the natural springs northeast of the project mine site and tributaries to Spring Run. For the remainder of the site, the potential for surface water quality impacts would be the same as described for Alternatives 2 and 3 and would be minimized through (1) implementation of the construction controls described in the water quality parameter sections above and (2) restoration of all disturbed areas upon completion of mining.

4.3.1.5 Alternative 5 Potential Surface Water Quality Impacts

Alternative 5 would impact most of the project mine site, including the western portion located in the 100-year floodplain, but would avoid mining activities in the south-central and southeastern portions of the site. This alternative would reduce mining activities in the vicinity of two substantial stream corridor boundaries on the site and would therefore reduce the potential for surface water quality impacts on the streams. Unlike Alternative 3, Alternative 5 would have mining activities located adjacent to the westernmost stream corridor, which is located closest to the tidal resource areas west of the site. Under Alternative 5, the potential for surface water quality impacts would be minimized through (1) implementation of the construction controls described in the water quality parameter sections above and (2) restoration of all disturbed areas upon completion of mining.

4.3.1.6 Alternative 6 Potential Surface Water Quality Impacts

Alternative 6 would impact the western third of the site and would leave the eastern two-thirds of the site undisturbed. Therefore, this alternative would have less potential overall for adverse impacts on surface water quality because the magnitude of the mining activities and resulting lakes would be less. However, impacts would be located adjacent to the offsite resources that are closest to tidal resources to the west. Under Alternative 6, the potential for surface water quality impacts would be minimized through (1) implementation of the construction controls described in the water quality parameter sections above and (2) restoration of all disturbed areas upon completion of mining.

4.3.1.7 Alternative 7 Potential Surface Water Quality Impacts

Alternative 7 would impact the smallest portion of the site and would result in the smallest percentage of permanent lake area (11 percent) of Alternatives 2 through 8. Mining activities would not occur adjacent to the western side of the site, closest to tidal resources to the west. The northeastern corner of the site would be undisturbed and would reduce the potential for adverse impacts on the springs located northeast of the site and tributaries to Spring Run. Based on this, Alternative 7 would have the lowest potential for impacts on surface water quality of Alternatives 2 through 8. Under Alternative 7, the potential for surface water quality impacts would be minimized through (1) implementation of the construction controls described in the water quality parameter sections above and (2) restoration of all disturbed areas upon completion of mining.

4.3.1.8 Alternative 8 Potential Surface Water Quality Impacts

Alternative 8 would impact most of the project mine site, excluding only the far western portion located in the 100-year floodplain, and would avoid mining activities in the south-central and southeastern portions of the site. This alternative would reduce mining activities in the vicinity of two substantial stream corridor boundaries on the site and would therefore reduce the potential for surface water quality impacts on the streams. Unlike Alternative 3, Alternative 8 would have mining activities located adjacent to the westernmost stream corridor, which is located closest to the tidal resource areas to the west of the site. Under Alternative 8, the potential for surface water quality impacts would be minimized through (1) implementation of the construction controls described in the water quality parameter sections above and (2) restoration of all disturbed areas upon completion of mining.

4.3.2 Groundwater Quality

4.3.2.1 Alternative 1 Potential Groundwater Quality Impacts

Under the No Action Alternative, no mining would occur at the Tarmac King Road Limestone Mine site. As a result, no additional impacts on groundwater quality would occur.

4.3.2.2 Alternatives 2–8 Potential Groundwater Quality Impacts

The impact of mining on groundwater is a concern under the action alternatives, as planned mining operations would intercept and alter groundwater flow. The assessment of impact on groundwater quality must consider changes as a result of drilling and blasting the rock, removing the rock, and refilling

excavated quarries with fill material. These alterations may increase fine sediment concentrations, create conditions that alter the natural geochemistry of the aquifer, and increase the potential effects of accidental spillages and subsequent introduction of contaminants into groundwater. It is possible these processes would impact groundwater quality in the vicinity of the mine site and further downgradient as impacted waters migrate away from the site. The impact on groundwater quality can be assessed by examining potential changes to groundwater turbidity, groundwater geochemistry, and the potential for saltwater intrusion. The following sections provide a discussion of potential impacts on the quality of groundwater. Note that these impacts are independent of the alternative implemented but can be minimized or mitigated with proper planning and execution.

Turbidity. Groundwater quality would be affected through increased fine sediment concentrations in quarry lakes and the potential transport of suspended matter in groundwater. As described previously, fine rock, silt, and clay from the crushing, washing, and screening operations would be pumped from the production area to the quarry lakes. Refilling the pits would result in an intermixed coarse and upward fining sequence of sediment. The upward fining is a result of the slower deposition rate of finer particles versus the faster settling of larger rock particles. In addition to direct input of fine sediment to a quarry lake, the settling of airborne rock dust onto lake waters would contribute additional particles to the water column when a pit is active (e.g., blasting is ongoing) or near an active roadway. Each of these fine particle contributions would decrease upon filling of the quarry lake and cessation of operations in the vicinity of a quarry lake.

Prior to and during refilling of the quarry lakes, suspended particles in the water column would be available for entrainment in groundwater flow and subsequent movement through the quarry walls via the rock pore system. The volume of transported particles would be dependent upon particle size and concentration, groundwater velocity, pore size distribution, and gradient. Deposition of the fine particles in the pore network adjacent to a quarry lake may result in the plugging and reduction of the volume of rock pores available for groundwater flow. In the event fine particles entrained in groundwater flow from a quarry lake are not filtered in the rock matrix of the aquifer, an increase in groundwater turbidity would occur. Quarry lakes that are active, are being refilled, or are filled and disturbed (e.g., due to nearby blasting) would likely be the prime sources of turbid waters. With the refilling of a quarry lake to capacity and reduction of the water depth (e.g., thickness from water surface to top of sediment), the potential for resuspension of particles would be reduced.

As the blasting, excavation, and refilling of the pits would be an ongoing process under each alternative, potential impacts on turbidity may be short-lived, gradual, and difficult to isolate. The impact of mining on groundwater turbidity is difficult to predict per alternative, yet it is expected that the greatest potential for increased particulates entrained in the water column (e.g., increased turbidity) would occur when quarry lakes are actively being mined, blasting of quarry mines is ongoing, and sediment is being returned to fill a quarry lake.

An indicator of the impact of mining operations on groundwater turbidity can be assessed by routine measurements of turbidity in monitoring wells, Big Spring and Little Spring. Measurements should be compared with pre-mining baseline values collected to compensate for natural seasonal changes in turbidity.

Geochemical Impacts. Changes in the geochemistry of groundwater in the mine site area would occur due to the breaking of the rock matrix and an acceleration of the dissolution of native minerals into the quarry waters. The mineralogy of rocks to be mined at the Tarmac King Road Limestone Mine site (limestones and dolomites) is dominated by calcium carbonate ($CaCO_3$) for limestone and calcium magnesium carbonate ($CaMg(CO_3)_2$) for dolomite. Trace elements associated with these rocks include silica, iron, aluminum, potassium, sodium, magnesium, sulfur, and titanium. The major dissolved constituents in the groundwater, determined by sampling the mine site wells, are calcium, magnesium, and bicarbonate, all of which are common elements in waters moving through limestone/dolomite aquifers. It is possible that a net increase in these constituents would occur due to rock destruction; however, many geochemical and mechanical factors would control their concentration in groundwater.

Potential for Sulfate Concentration Increase. Minor minerals associated with limestone and dolomite include pyrite and evaporites. Pyrite (iron sulfide [FeS_2]) is common in marine sediments and is widespread in Florida rocks (SWFWMD 2001). Evaporites are typically associated with carbonate rocks, with two of the more common being gypsum ($CaSO_4$ $2H_2O$) and anhydrite ($CaSO_4$). As discussed in Chapter 3, the Tarmac King Road Limestone Mine would penetrate the shallow sediments of the surficial aquifer, the underlying Ocala Limestone, and the deeper Avon Park Formation. Evaporites are not present in the Ocala Limestone nor are they expected in the shallow clastic interval near the surface of the mine site. The Avon Park Formation contains a low percentage of evaporites, occurring as nodules or secondary infilling of pre-existing pore spaces in the rock. Pyrite has been identified in the Avon Park Formation occurring within pore spaces of the rock, between rock grains, and as small distinct masses (Arthur, Dabous, and Fischler 2005). Data from mine site exploratory cores indicate an average sulfur content (reported as sulfur trioxide [SO_3]) in the rock of 0.20 percent (Tarmac 2008b). The exploratory rock cores were collected between the ground surface and a maximum depth of 40 feet below ground surface, with an average SO_3 increase from 0.14 to 0.27 over this interval. It is unknown if SO_3 increases, decreases, or remains constant in percentage to the total planned excavation depth of 120 feet below ground surface.

A study of the chemical composition of groundwater of the Upper Floridan Aquifer within the Southwest Florida Water Management District indicates that sulfur is naturally occurring in groundwater and may be sourced from gypsum (Sacks 1996). Sampling of shallow and deep wells for the Southwest Florida Water Management District study in Marion, Sumter, and Citrus Counties indicated a wide range of sulfate concentrations in groundwater (0.2 to 1,400 milligrams per liter[1]). The study results indicate that sulfate was found to increase between shallow and deep groundwater sampled wells (i.e., the deeper groundwater had higher sulfate concentrations than the shallow water). Shallow wells were assumed to be completed within the Ocala Limestone with deeper wells assumed to be placed in the Avon Park Formation (Sacks 1996).

The sampling and analysis of groundwater from monitoring wells in the Tarmac King Road Limestone Mine site area and wells placed further from the site indicate a similar sulfate concentration increase with depth (see Chapter 3, Table 3–5). A sample of water flowing out of Little King Spring collected during the same timeframe had a sulfate concentration of 11 parts per million. In contrast, concentrations of sulfate in three water samples collected from the waters of the mine site test pit were 86 to 99 parts per million. The samples were collected at three different depths (1.5 feet, 25 feet, and 50 feet) below the water surface. The difference in sulfate concentrations between well samples and pit samples may be indicative of changes associated with breaking rock and exposing pyrite, gypsum, and/or anhydrite minerals for dissolution.

The release of sulfur and a potential increase in groundwater concentrations during mining are possible when pyrite and/or evaporites are exposed during the excavation of the mine pits. A prediction of potential mine quarry lake water sulfate concentrations can be modeled, assuming variations in several parameters controlling sulfate inputs. Table 4–4 provides the modeled input assumptions and the resultant prediction of concentrations of sulfate in mine quarry lake waters for four scenarios (A–D). Figure 4–6 presents a graph of modeled sulfate concentrations in mine water versus the percentage of dissolved sulfate from rock tailings for the four scenarios in Table 4–4. As shown, the sulfate concentrations in quarry lake(s) are modeled to increase with assumed higher input from groundwater entering a lake and assumed percentage that dissolves from mined rock.

[1] Milligrams per liter is equivalent to parts per million; for example, a sulfate concentration of 10 milligrams per liter can be thought of as 10 parts of sulfate per 1 million parts of water.

Table 4–4. Projection of Modeled Sulfate Concentrations in Quarry Lakes

Modeled Variables[a, b]	Modeled Scenarios			
	A	B	C	D
Average sulfate concentration in groundwater (percent)	0.01	0.03	0.04	0.09
Sulfate in tailings that dissolves into quarry lake (percent)	10	50	67	90
High sulfate groundwater that enters quarry lake at a concentration of 1,300 ppm (percent)	10	25	33	67
Derived concentration of sulfate in quarry lake (ppm)	174	776	1,034	1,100

[a] Model inputs and calculations provided by Ardaman & Associates (2009), average sulfate concentration from mine site core analyses.
[b] Mining and production rate constant, average sulfate concentration in mine site rock assumed to be 0.20 percent, average sulfate in pore water assumed to be 0.002 percent.
Key: ppm=parts per million.

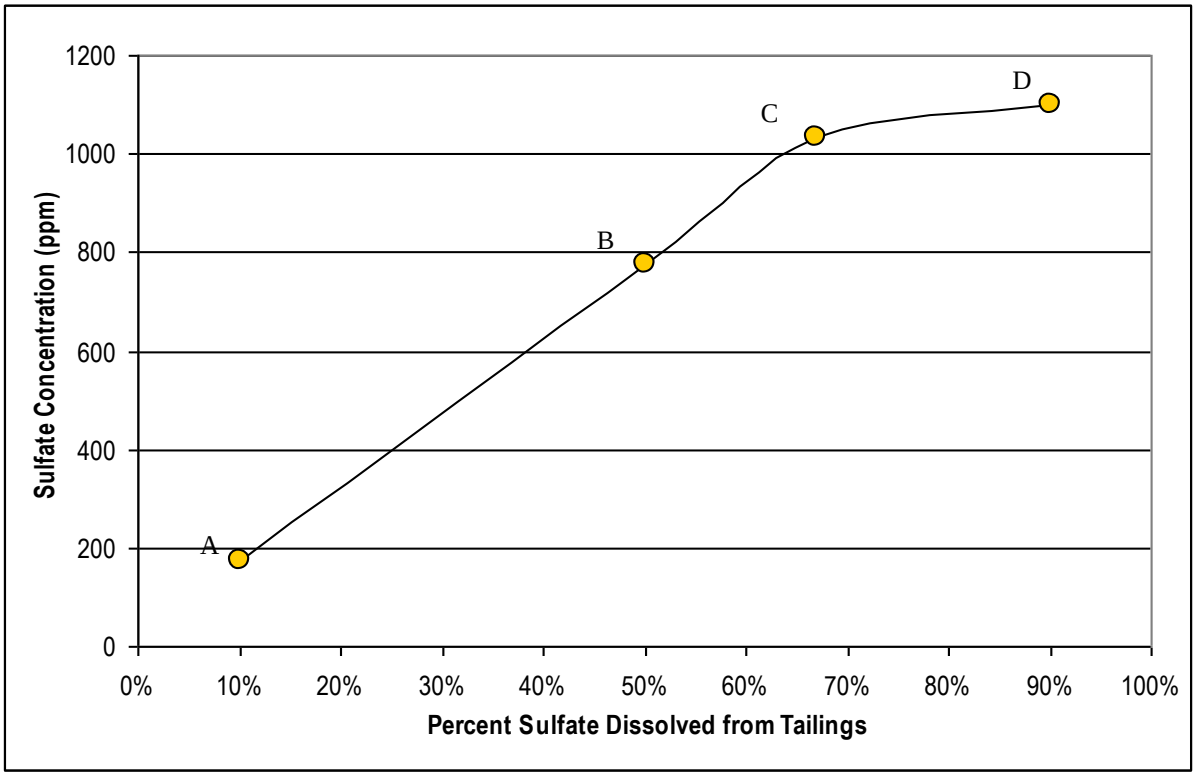


Figure 4–6. Modeled Sulfate Concentration Increase with Increased Dissolution from Tailings

Ultimately, many unknown factors, such as the geochemistry of mine waters (e.g., oxidation potential, pH, mineral saturation concentrations), the actual percentage of sulfate in rock tailings available for release, and offsetting chemical reactions, would determine sulfate concentrations in mine site groundwater. The impact of mining on groundwater geochemistry is difficult to predict per alternative, yet it is expected that the greatest potential for increased sulfate concentration would occur with the increase in the volume of rock mined. Thus, the greatest potential for impact would occur under Alternative 2; impacts are expected to be less under the remaining alternatives.

Routine monitoring of sulfate concentrations in quarry lake waters and area monitoring wells off site (via sampling) during mining would yield information to determine if there is a net increase in concentration above pre-mining concentrations. The FDEP Industrial Wastewater Facility Permit issued to the applicant in 2010 requires quarterly monitoring of groundwater at depths of 35 and 70 feet, with a compliance limit of 250 milligrams per liter for total sulfate. The permit also requires quarterly grab sampling of the discharge from the tailings pond prior to discharge to the mine pit for total sulfate, as well as pH, total phosphorus, and nitrite plus nitrate.

Potential for Perchlorate Presence. The blasting gel to be used at the Tarmac King Road Limestone Mine site would be a mixture of ammonium nitrate and mineral oil. This mixture is typically 94 percent ammonium nitrate suspended in 6 percent mineral oil and is pumped down drilled blast holes laid out in a pattern to facilitate rock breakage when detonated. Recent correlations have been found with the presence of the compound perchlorate in groundwater and nearby blasting operations (MDEP 2006). Perchlorate has been recognized as a groundwater contaminant of concern by the U.S. Environmental Protection Agency (EPA), the state of Florida, and other states; this contaminant has many different potential sources, including explosives for rock blasting (ITRC 2009). Some commercial blasting agents can contain sodium perchlorate, ammonium perchlorate, and/or potassium perchlorate as a sensitizing agent. The blasting gel used by Tarmac America, LLC (Tarmac) during the test pit blasting contains no perchlorates (Hansaker 2009), and Tarmac advises it intends to use the same gel during any production mining. As such, generation of perchlorate during mining should not be of concern relative to the quality of groundwater.

Potential for Volatile Organic Compounds and Other Synthetic Organics. Mining operations involve the use of equipment fueled by gasoline or diesel and/or lubricated with grease(s) and cleaned with solvents. The accidental introduction of these chemicals (a broad category of VOCs) into groundwater is possible as a result of accidental spillage or poor contaminant management practices. It is expected that the potential for introduction of VOCs into the groundwater system increases with an increase of equipment-in-use (e.g., more refueling of trucks, bulldozers); an increase in the area of open lakes, which allow direct input to the groundwater system; and longevity of operations. The potential for substantial direct introductions of fuel remains minimal, however, because equipment associated with mining could not be refueled over water, with the possible exception of small boats. In addition, regulations require prompt reporting and cleanup of spills. However, the risk under each onsite action alternative would be nearly identical, only varying by the number of years of mining. Because the introduction of VOCs is assumed to be an accidental event, quantification of the potential impact is difficult to predict on an alternative basis.

Routine monitoring in quarry lake waters and area monitoring wells (via sampling) during mining would yield information to determine if there is a detection of VOCs in groundwater related to a release within the mine site.

Potential for Impacts Related to Post-Project Land Use. Future land use after completion of mining has not been determined. The land would revert back to the current timber company owner after the lease to the mining company ended. The landowner has advised the USACE it expects that silvicultural practices would recommence on the site, but that planning for definitive land use that far in the future is difficult. The potential for more direct inputs into the aquifer and resultant impacts on groundwater quality would be present with mine quarry lakes that would remain after mining was completed. While many types of development and land uses currently require protections such as stormwater management and treatment, many do not. It is difficult to predict what land use might occur, or what regulations might be in place post-project. To address these uncertainties, special conditions to a permit, if issued, could limit the potential for impacts on groundwater from post-project land use.

Potential for Salinity Increase due to Seawater Intrusion. The intrusion of seawater landward is a natural phenomenon, and it is typical for a transition, or interface, between freshwater and saltwater to be present at depth in the nearshore regions of a coastline, such as to the west of the Tarmac King Road Limestone Mine site. Above the transition zone, the rock pore space is occupied by freshwater, whereas below the zone, pore space is filled with saltwater. The transition zone is a brackish mixture of both freshwater and saltwater. The seasonal variations in rainfall, the effect of the tides, and the amount of natural discharge from the land affect the depth and location of the interface. Because of the proximity of the Tarmac King Road Limestone Mine to the coast and the potential change in groundwater flow volume due to mining, the depth and location of the interface between freshwater and saltwater could be affected under the action alternatives.

Saltwater is denser than freshwater and thus would underflow a freshwater interval in the nearshore region of a coastline. Under static conditions, if the freshwater has a specific gravity of 1.00 gram per cubic centimeter and the saltwater has a specific gravity of 1.025 grams per cubic centimeter, the interface between the heavier saltwater and the overlying freshwater in the area is pushed 40 feet below

sea level for every foot that the water table stands above sea level. This means that if the height of the water table above sea level is known, it is possible to calculate the depth to which freshwater is present. Additionally, this relationship indicates that if the freshwater level is lowered by 1 foot, a corresponding rise of 40 feet would occur in the interface depth. The extent of saltwater intrusion, as reflected by salinity concentrations, is most affected by recharge, groundwater pumpage (volume and duration), sea-level change, and salinity of the Gulf of Mexico waters (Shoemaker 2004).

This EIS assesses alterations to the interface location and depth due to recharge loss, groundwater pumpage, and potential lowering of the potentiometric surface. As with many potential changes to groundwater due to mining construction and operations at the Tarmac King Road Limestone Mine, impacts on the freshwater-saltwater interface location and depth must be evaluated with knowledge of pre-mining conditions and accounting for natural changes not related to mining (e.g., predictions of a rise in sea level during the next 100 years) that could result in a shift in the interface location.

The distinct chemical properties of freshwater, brackish water, and saltwater allow classification of which interval a well sample has been collected from. Table 4–5 provides a simple classification of water type based on dissolved solids, chloride concentration, and fluid-specific conductance. Chloride is the main constituent of seawater and its concentration in water samples is the most commonly used indicator of saltwater occurrence. Chloride is a charged ionic species, thus making water more conductive as its concentration increases. Specific conductance has been shown to be strongly correlated to chloride concentrations and can be measured in a water sample. Specific conductance of groundwater also can be used to identify saltwater transition because it is a direct measure of total dissolved solids and salinity. According to the U.S. Geological Survey, no standard practice exists for defining the transition zone. However, the U.S. Geological Survey typically characterizes the transition zone as having total dissolved solid concentrations ranging from about 1,000 to 35,000 milligrams per liter and chloride concentrations ranging from about 250 to 19,000 milligrams per liter.

Table 4–5. Classification of Freshwater, Brackish Water, and Saltwater

Category[a]	Dissolved Solids (mg/L)	Chloride Concentration (mg/L)	Fluid-Specific Conductance (µS/cm)
Freshwater	0–1,500	0–500	0–1,500
Brackish water	1,000–10,000	500–5,000	1,500–15,000
Saltwater	10,000–100,000	5,000–50,000	15,000–150,000

[a] Mahon 1989.

Key: µS/cm=micro-Siemens per centimeter; mg/L=milligrams per liter.

The Ghyben-Herzberg method is a simplified equation for predicting depth to the saltwater interface assuming an elevation of the water table is known. Using this method and a measured water table elevation of 3.5 feet, the predicted depth along the western boundary of the Tarmac King Road Limestone Mine site is 140 feet to the interface. Tarmac drilled MW-7 and MW-8 on the western boundary of the mine site in an effort to determine the actual depth to the freshwater-saltwater interface (see Chapter 3, Figure 3–5, for well locations). MW-7 was drilled to a depth of 150 feet, and nearby MW-8 was drilled to 380 feet. Sampling of groundwater at selected intervals was performed with analysis for chloride content. The chloride concentration from the deepest sample collected within MW-8 was determined by field analysis to be less than 100 parts per million (Tarmac 2008b), indicating freshwater was encountered to this depth at this well location.

Significant water quality changes would not be expected to occur in the immediate vicinity of active mining due to the fact that potable groundwater is extracted from the deep groundwater zone. Potable groundwater extends to a depth greater than 400 feet over most of the mine lease area. As indicated in Section 3.2.1, the chloride concentration in the site groundwater at a depth of 370 feet is only 50 milligrams per liter, and monitoring wells screened between 278 and 306 feet below ground surface had chloride concentrations between 11 and 32 milligrams per liter (i.e., much below the maximum contaminant level of 250 milligrams per liter) (Tarmac 2010). Therefore, it is expected that the saltwater interface at the mining site is likely much below the depth of 400 feet. As a result, groundwater extraction above this depth would not be expected to cause any saltwater intrusion or significant water quality changes.

An evaluation of the potential for a significant change in the depth to saltwater (e.g., a rise in the interface depth) was completed by Tarmac using site-specific information and predicted changes in groundwater flow, as related to pumpage and change to recharge volume. These predictions included estimation of loss of recharge from site surface water and loss of groundwater contributions due to increased evaporation as quarry lakes are created and changes to the water level due to pumpage of groundwater for operations. Table 4–6 provides a listing of parameters for pre-mining conditions and estimated post-mining change. The Tarmac analysis indicates a net change of approximately 10 feet in the depth to the freshwater-saltwater interface.

Table 4–6. Parameter Description and Results for Water Level Change and Impact on Freshwater-Saltwater Interface Depth

Parameter	Pre-mining Condition[a]	Predicted Post-mining Condition[a, b]
Median monthly groundwater level	0	Decrease of less than 3 inches
Average annual groundwater outflow from site	Approximately 5.1 inches per year	Decrease to approximately 4.6 inches per year
Average annual surface water runoff	Approximately 10.9 inches per year	Decrease to approximately 8.9 inches per year
Predicted change in saltwater interface	0	Upward movement of approximately 10 feet

[a] Values from Tarmac 2009.
[b] As predicted along western boundary of mine site with a mining configuration approximating Alternative 2.

The projected upward movement of the freshwater-saltwater interface of approximately 10 feet would likely not result in a significant change to groundwater quality. Measurements of chloride concentration in well samples indicate that the depth to the freshwater-saltwater transition zone is well beyond that predicted by the Ghyben-Herzberg method. An additional evaluation of the changes to the seepage volume (of groundwater) was performed using the Tarmac King Road Limestone Mine site groundwater flow model. Results of the modeling for average meteorological conditions indicate a potential 16.0 percent increase in seepage volume (4.0 MGD) from baseline conditions along the western edge of the mine site under Alternative 2. The predicted increase in seepage would not create conditions favorable to the movement of the freshwater-saltwater interface depth or location.

The predicted change in water levels due to mining is likely to result in only very minimal upward movement of the interface depth; however, routine monitoring of chlorides and specific conductance in mine site wells should be performed to assess the accuracy of this prediction.

Historical Groundwater Quality Data from Current Mining Activities. Groundwater quality has been monitored through a comprehensive program for the current mining in the Lake Belt region of south Florida, with monitoring initiated in 2002 and specific monthly, quarterly, and annual monitoring required by permits for 2010 to the present. The permit monitoring encompasses groundwater in monitoring well clusters at three depths, as well as pre- and post-blasting monitoring. Results indicate that for all water quality constituents of concern for drinking water, samples indicated concentrations below the laboratory method MDL or below the applicable groundwater or drinking water standards.

Deep well annual monitoring requirements in 2011 indicated that arsenic, cadmium, and total phosphorus were below the laboratory method MDL in all samples (20 out of 20), nitrate and nitrite and radium-228 were below laboratory method MDL in 18 out of 20 samples, and gross alpha, radium-226, total dissolved solids, chloride, sulfate, and pH were all below the applicable groundwater standards (MacVicar Consulting, Inc. 2012a).

These results indicate groundwater quality does not exceed applicable water quality criteria and does not indicate negative effects related to mining activities. The mining process proposed by Tarmac for the King Road mine is very similar to the process currently in use in the Lake Belt region. Thus, the impacts from the proposed mining processes would be expected to be similar.

4.4 WETLANDS

This section describes the potential impacts of implementing the alternatives on the wetlands in the Tarmac King Road Limestone Mine area. Section 4.4.1 describes and quantifies the various types of impacts on wetlands, including potential direct and indirect impacts on wetlands adjacent to and outside the Tarmac King Road Limestone Mine area. Section 4.4.2 briefly discusses and compares potential adverse impacts of each alternative.

4.4.1 Wetland Impacts

If implemented, all alternatives except No Action would result in some degree of adverse impacts on wetlands. Adverse impacts related to mining activities are direct or indirect.

DIRECT IMPACTS

Direct adverse impacts include permanent conversion of wetlands to nonwetlands by excavating or filling wetlands during mining operations. Mining activities under Alternatives 2–8 would directly affect substantial acreages of wetlands. These wetlands could be excavated during mining and/or filled with overburden from mine excavation. The direct impacts on the various wetland types found within the Tarmac King Road Limestone Mine region would vary depending on the alternative implemented. Table 4–7 presents the acreage of each wetland type that would potentially be directly impacted under each alternative.

Table 4–7. Acres of Jurisdictional Wetland Cover Types Directly Impacted by Tarmac King Road Limestone Mine Under Each Alternative

Cover Type (FLUCCS Description [Code])	Total Wetland Area (acres)	Wetland Area Directly Impacted by Alternative (acres)							
		1	2	3	4	5	6	7	8
Borrow pits (530)	11.0	0	10.8	1.6	1.6	9.1	9.1	0.0	3.5
Deepwater ponds (616a)	150.7	0	134.3	106.3	101.5	110.0	38.5	64.9	100.1
Sloughs and intermittent flow-ways (616b)	154.3	0	15.7	12.1	12.1	13.6	4.1	8.2	13.0
Mixed wetland hardwoods (617)	158.5	0	115.7	96.9	86.8	72.3	24.8	38.0	68.7
Cypress (621)	1.2	0	1.2	1.2	1.2	0.0	0.0	0.0	0.0
Pine-mesic-oak (628)	213.3	0	135.1	69.8	69.8	117.9	108.2	9.3	98.7
Hydric coniferous plantation > 8 years (6291)	1,121.3	0	1,024.7	781.3	753.7	931.7	430.6	447.5	852.3
Hydric coniferous plantation < 8 years (6292)	495.8	0	439.6	206.1	206.1	384.7	250.6	133.1	219.1
Wetland forested mixed (630)	284.1	0	191.5	125.9	71.2	191.4	115.2	19.3	161.4
Wetlands Total	**2,590.2**	**0**	**2,068.5**	**1,401.2**	**1,304.0**	**1,830.7**	**981.1**	**720.3**	**1,516.8**
Rank		**8**	**1**	**4**	**5**	**2**	**6**	**7**	**3**

Note: These acreages exclude the No Mine Area, as well as unclassified FLUCCS codes.
Key: <=less than; >=greater than; FLUCCS=Florida Land Use, Cover and Forms Classification System.

INDIRECT IMPACTS

Indirect adverse impacts could result from changes in environmental conditions following mining or other associated activities in locations not directly impacted by mining. Environmental changes, such as large increases or decreases in hydrology, may potentially diminish or impair wetland functions or quality, including alteration of wetland plant community composition and relative abundance. Groundwater

modeling was conducted only for Alternatives 2, 3, 7, and 8 to represent the potential maximum, intermediate, and least effect on wetlands (see Table 4–7). Groundwater modeling indicates that mining activities would result in less than a ±0.3-foot change in the average water level beyond the proposed mine areas. Changes of this magnitude in average local water tables are expected to have negligible to minimal effects on nearby wetlands. Thus, impacts on hydrology in the mine areas should not result in any indirect effects on wetlands in the No Mine Area within the Tarmac King Road Limestone Mine boundary or on wetlands outside of and adjacent to the Tarmac King Road Limestone Mine area.

4.4.2 Wetland Assessment (UMAM) Evaluation

Table 4–8 presents summaries of Uniform Mitigation Assessment Method (UMAM) scores for the impact areas of the Tarmac King Road Limestone Mine site. In general, a negative functional loss value represents a permanent loss of wetland functions in wetlands directly disturbed by mining and associated activities and in wetlands immediately adjacent to mining activities indirectly impacted by losses in landscape support. A positive functional gain value represents wetlands preserved in No Mine Areas. The loss of functional units follows the same ranking described in Chapter 3, Section 3.3.2. Alternative 2 would result in the greatest impacts on wetland functions, and the No Action Alternative would not impact any wetland functions. Mitigation is being proposed to offset some or all of the functional unit losses and is discussed in Chapter 5.

Table 4–8. UMAM Score Summary for Wetlands Within Tarmac King Road Limestone Mine Area by Alternative

Alternative	Functional Losses (Mine Areas)	Functional Gains (No Mine Area)	Total
1	0	0	0
2	–1,194.9	9.2	–1,185.6
3	–803.0	5.6	–797.4
4	–777.9	5.6	–772.3
5	–1,061.6	3.2	–1,058.4
6	–578.2	0.0	–578.2
7	–428.9	1.1	–427.8
8	–878.4	9.3	–869.1

Key: UMAM=Uniform Mitigation Assessment Method.
Source: Sarfert 2010.

4.4.2.1 Alternative 1 Potential Wetland Impacts

Under the No Action Alternative, no wetlands would be impacted. The wetland communities found within the Tarmac King Road Limestone Mine area would continue to exist in their present condition and form and in general would be influenced by natural and existing anthropogenic forces. The No Action Alternative ranks eighth out of the eight alternatives in terms of acres of wetlands directly impacted.

4.4.2.2 Alternative 2 Potential Wetland Impacts

Alternative 2 would result in the greatest amount of direct and indirect impacts on wetlands among the eight alternatives. Under Alternative 2, 2,068.5 acres of wetlands, or approximately 53 percent of the total area that would be mined and disturbed under the alternative, would be directly impacted. Alternative 2 would result in the greatest percentage decrease of wetlands over all the mining alternatives, affecting nearly 80 percent of the 2,590.2 acres of wetland cover types in the entire mining parcel. Nearly 91 percent of the hydric coniferous plantation cover types would be mined. Impacts on other wetland cover types include the loss of two-thirds of the wetland forested mixed, pine-mesic-oak, and mixed wetland hardwoods. Without mitigation, Alternative 2 would result in a functional loss of approximately 1,185.6 units.

4.4.2.3 Alternative 3 Potential Wetland Impacts

Alternative 3 would directly impact 1,401.2 acres of wetlands, or about 48 percent of the total area that would be mined and disturbed under the alternative. Alternative 3 would disturb about 54 percent of the 2,590.2 acres of wetland cover types in the entire mining parcel and is the fourth highest among the eight alternatives. As under Alternative 2, impacts on the following cover types would be greatest: coniferous plantations, wetland forested mixed, pine-mesic-oak, and mixed wetland hardwoods. Impacts on wetland cover types would be lower than under Alternative 2 because a relatively large proportion of wetlands on the west side of the Tarmac King Road Limestone Mine parcel is excluded from mining under Alternative 3. Without mitigation, Alternative 3 would result in a functional loss of approximately 797.4 units.

4.4.2.4 Alternative 4 Potential Wetland Impacts

Under Alternative 4, 1,304.0 wetland acres, or about 47 percent of the total area that would be mined and disturbed under the alternative, would be directly impacted. Approximately 50 percent of the 2,590.2 acres of wetland cover types in the entire mining parcel would be affected under Alternative 4. This alternative ranks fifth highest in terms of wetland acreage directly impacted. Without mitigation, Alternative 4 would result in a functional loss of 772.3 units.

4.4.2.5 Alternative 5 Potential Wetland Impacts

Alternative 5 would impact 1,830.7 wetland acres, or about 57 percent of the total area that would be mined and disturbed under the alternative. Under Alternative 5, almost 71 percent of the 2,590.2 acres of wetland cover types in the entire mining parcel would be disturbed, making Alternative 5 second only to Alternative 2 in the amount of wetlands impacted. The amount of wetlands impacted is similar to that impacted under Alternative 2 because this alternative includes a large portion of the wetlands on the west side of the Tarmac King Road Limestone Mine parcel. Without mitigation, Alternative 5 would result in a functional loss of 1,058.4 units.

4.4.2.6 Alternative 6 Potential Wetland Impacts

Alternative 6 would impact 981.1 wetland acres, or about 68 percent of the total area that would be mined and disturbed under the alternative. This percentage is high for this alternative because the actual mining parcel is one of the smallest but includes a large portion of the wetlands on the west side of the Tarmac King Road Limestone Mine parcel. Under Alternative 6, almost 38 percent of the 2,590.2 acres of wetland cover types in the entire mining parcel would be disturbed, making Alternative 6 sixth highest in the amount of wetlands impacted. Without mitigation, Alternative 6 would result in a functional loss of approximately 578.2 units.

4.4.2.7 Alternative 7 Potential Wetland Impacts

Alternative 7 would impact 720.3 wetland acres, or about 47 percent of the total area that would be mined and disturbed under the alternative. Only 28 percent of 2,590.2 acres of wetland cover types in the entire mining parcel would be disturbed under Alternative 7. This alternative ranks seventh out of the eight alternatives in terms of wetland acreage impacted. Without mitigation, Alternative 7 would result in a functional loss of 427.8 units.

4.4.2.8 Alternative 8 Potential Wetland Impacts

Alternative 8 would impact 1,516.8 wetland acres, or about 55 percent of the total area that would be mined and disturbed under the alternative. Under Alternative 8, about 59 percent of the 2,590.2 acres of wetland cover types in the entire mining parcel would be disturbed, making Alternative 8 third highest behind Alternatives 2 and 5 in the amount of wetlands impacted. Alternative 8 is very similar to Alternative 5, but the amount of wetlands that would be impacted is lower because a section of mining in a wetland area on the extreme western portion of the mine parcel has been eliminated. Without mitigation, Alternative 8 would result in a functional loss of 869.1 units.

4.4.3 Conclusions

All of the alternatives considered in this EIS, except No Action, would have some degree of adverse impact on wetland cover types within the Tarmac King Road Limestone Mine area, the primary impact being destruction of wetlands by mining activities. Among the eight alternatives considered in this EIS, the acreage of potential direct impacts on wetland cover types ranges from 2,068.5 acres under Alternative 2 to 720.3 acres in Alternative 7 (see Table 4–7). In addition, without mitigation, Alternatives 2 through 8 would result in UMAM functional losses of 427.8 to 1,185.6 units. Groundwater modeling suggests that no indirect impacts on water levels are expected in wetlands in the No Mine Area within the Tarmac King Road Limestone Mine or in wetlands outside the mine boundary.

4.5 VEGETATION

This section describes the potential impacts on vegetation in the Tarmac King Road Limestone Mine area of implementing the alternatives. Sections 4.5.1 through 4.5.8 describe and quantify the various types of impacts on vegetation, including direct and indirect impacts, and Section 4.5.9 discusses potential adverse impacts.

TYPES OF IMPACTS

If implemented, all alternatives except No Action would result in some degree of adverse impacts on vegetation. Adverse impacts related to mining activities can be placed into two categories: direct and indirect. Direct adverse impacts include removal or clearing of vegetation either by machinery or other means, while indirect adverse impacts include water table alteration and introduction of invasive species.

Following completion of mining activities, reclamation would be conducted in accordance with the State of Florida's Limestone Reclamation Requirements, as described in Chapter 62C-36 of the *Florida Administrative Code*. Specific reclamation efforts could include replanting native vegetation in uplands where feasible; some portions of littoral zones will likely revegetate over time on their own. Additionally, the pits created during the mining process could also be replanted with native vegetation after backfilling and grading has taken place, although a return to pine plantation and timbering is more likely to occur.

Some of the activities associated with mining under the action alternatives could potentially result in the introduction or spread of invasive species. Of primary concern is the exposure of bare soil associated with the removal of native vegetation. Best management practices should be adopted and practiced to limit the spread of species that are known to exist within the Tarmac King Road Limestone Mine area, such as the air potato *(Dioscorea bulbifera)*, the Japanese honeysuckle *(Lonicera japonica)* (ENTRIX 2011), and cogon grass *(Imperata cylindrica)*.

The impact on the various cover types, and thus habitat types, found within the Tarmac King Road Limestone Mine region would vary depending on the alternative implemented. Table 4–9 describes the acreage of each cover type that would potentially be impacted under each alternative. The cover types presented in Table 4–9 have been grouped into upland and wetland habitat types to facilitate comparison among and between habitat types.

Chapter 3, Table 3–13, lists the rare and endangered plant species that occur within the Tarmac King Road Limestone Mine area and their associated habitats. Clearing native vegetation in the habitats where listed species are known or expected to occur constitutes the primary threat to the six listed species. Regardless of which alternative is chosen, steps should be taken to identify and avoid impacts on all listed species occurring in the areas that would be affected by mining activities.

4.5.1 Alternative 1 Potential Vegetation Impacts

Under the No Action Alternative, no additional acres of vegetation would be impacted. The vegetative community found within the Tarmac King Road Limestone Mine area would continue to exist in its present form and in general would be shaped by existing anthropogenic and natural forces. Harvesting timber from the pine plantations would continue to occur at approximately 25-year intervals.

Table 4–9. Acres of Cover Types Potentially Impacted by Each Alternative

Cover Type (FLUCCS – Description [Code])	Total Area (acres)	Area Impacted by Alternative (acres)							
		1	2	3	4	5	6	7	8
Uplands									
Temperate hardwood (425)	117.9	0	44.2	35.2	26.9	38.4	18.8	4.5	33.8
Live oak (427)	45.5	0	45.3	45.3	45.3	0.0	0.0	0.0	0.0
Coniferous plantation (441)	987.7	0	925.0	768.0	743.0	848.4	305.1	502.6	792.4
Forest regeneration (443)	996.2	0	803.9	674.5	671.0	457.2	140.9	313.0	419.3
Uplands Total	**2,147.3**	**0**	**1,818.4**	**1,523.0**	**1,486.2**	**1,344.0**	**464.8**	**820.1**	**1,245.5**
Wetlands									
Borrow pits (530)	11.0	0	10.8	1.6	1.6	9.1	9.1	0.0	3.5
Deepwater ponds (616a)	150.7	0	134.3	106.3	101.5	110.0	38.5	64.9	100.1
Sloughs and intermittent flow-ways (616b)	154.3	0	15.7	12.1	12.1	13.6	4.1	8.2	13.0
Mixed wetland hardwoods (617)	158.5	0	115.7	96.9	86.8	72.3	24.8	38.0	68.7
Cypress (621)	1.2	0	1.2	1.2	1.2	0.0	0.0	0.0	0.0
Pine-mesic-oak (628)	213.3	0	135.1	69.8	69.8	117.9	108.2	9.3	98.7
Hydric coniferous plantation > 8 years (6291)	1,121.3	0	1,024.7	781.3	753.7	931.7	430.6	447.5	852.3
Hydric coniferous plantation < 8 years (6292)	495.8	0	439.6	206.1	206.1	384.7	250.6	133.1	219.1
Wetland forested mixed (630)	284.1	0	191.5	125.9	71.2	191.4	115.2	19.3	161.4
Wetlands Total	**2,590.2**	**0**	**2,068.5**	**1,401.2**	**1,304.0**	**1,830.7**	**981.1**	**720.3**	**1,516.8**
Other									
Roads (740)	13	0	11.8	8.8	8.8	10.4	5.8	4.6	9.5
Roads Total	**13**	**0**	**11.8**	**8.8**	**8.8**	**10.4**	**5.8**	**4.6**	**9.5**
Totals	**4,750**	**0**	**3,898.8**	**2,933.0**	**2,799.0**	**3,185.1**	**1,451.7**	**1,545.0**	**2,771.8**

Note: These acreages exclude the No Mine Area, as well as unclassified FLUCCS codes.
Key: FLUCCS=Florida Land Use, Cover and Forms Classification System.

4.5.2 Alternative 2 Potential Vegetation Impacts

Alternative 2 would result in the greatest amount of impacts on vegetation among the eight alternatives. Impacts would occur both on upland and wetland cover types. Approximately 3,898.8 acres, or around 82 percent of the entire mine area, would be impacted under Alternative 2. Alternative 2 would result in the greatest percentage decrease of every cover type among all of the action alternatives. Over 87 percent of the upland cover types—live oak, forest regeneration, and coniferous plantation—would be lost, along with 37 percent of the temperate hardwood cover type. Over 90 percent of the hydric coniferous plantation cover types would be lost. Impacts on other wetland cover types include the loss of over half of the wetland forested mixed, pine-mesic-oak, and mixed wetland hardwoods cover types.

Despite the fact that 250 more acres of wetland cover types would be impacted than upland cover types, upland cover types would be equally affected under Alternative 2: almost 85 percent of the total area of upland cover types would be impacted compared with 80 percent of the area of wetland cover types within the mine parcel. Of the eight alternatives, the mining and ground-disturbing activities associated with Alternative 2 would result in the highest amount of disturbed soil, thus providing the largest area for invasive species colonization.

4.5.3 Alternative 3 Potential Vegetation Impacts

Alternative 3 would impact 2,933.0 acres, or about 62 percent of the mine area, the third highest among the eight alternatives. As under Alternative 2, both upland and wetland habitats would be impacted. In contrast to Alternative 2, the area of upland cover types impacted compared with the area of wetland cover types impacted would be more equal. However, impacts on wetland cover types would be disproportionately lower than under Alternative 2 because the area on the west side of the Tarmac King Road Limestone Mine parcel, which is excluded from mining under Alternative 3, contains a relatively large proportion of wetlands compared with the entire mine parcel.

4.5.4 Alternative 4 Potential Vegetation Impacts

Under Alternative 4, 2,799.0 acres, or about 59 percent of the mine area, would be impacted. Alternative 4 ranks as the fourth highest alternative in terms of vegetation acreage impacted. The area of upland and wetland cover types impacted in this case would be similar to Alternative 3. With even more wetland-rich area excluded from mining under Alternative 4, the impact on wetland cover types would be substantially lower than all other alternatives, except Alternatives 6 and 7.

4.5.5 Alternative 5 Potential Vegetation Impacts

Alternative 5 would impact 3,185.1 acres, or about 67 percent of the total mine area, making Alternative 5 second only to Alternative 2 in the amount of vegetation impacted. Both uplands and wetlands would be impacted, and in this case the acreage of wetland cover types impacted would be nearly 500 acres higher than the area of upland cover types impacted. The impacts on wetland cover types are substantially higher under Alternative 5 than under Alternative 3. This is because the area in the southeast corner that is excluded from mining under Alternative 5 contains a relatively smaller proportion of wetlands compared with both the entire mine parcel and the area on the western side of the parcel, which is excluded under Alternative 3.

4.5.6 Alternative 6 Potential Vegetation Impacts

Alternative 6 ranks as seventh out of eight in terms of the amount of vegetation impacted among the eight alternatives. Approximately 1,451.7 acres, or 31 percent of the mine area, would be impacted; only the No Action Alternative would impact fewer acres. Under Alternative 6, there would be a substantially greater impact on wetland cover types than upland cover types, in terms of both acreage and as a proportion of the total of each type within the mine parcel (38 percent of the wetlands versus 22 percent of the uplands).

4.5.7 Alternative 7 Potential Vegetation Impacts

Alternative 7 would impact 1,545.0 acres, or about 33 percent of the mine area. It ranks third lowest out of the eight alternatives in terms of vegetation acreage impacted. The acreage of upland and wetland cover types impacted would be almost equal, but the percentage of total area of wetland cover types in the mine parcel impacted under Alternative 7 (28 percent) would be less than the percentage of total area of upland cover types impacted (38 percent).

4.5.8 Alternative 8 Potential Vegetation Impacts

Alternative 8 would impact 2,771.8 acres, or about 58 percent of the total mine area. Both uplands and wetlands would be impacted, and in this case 270 more acres of wetlands than uplands would be impacted. The impacts on wetland cover types would be substantially higher under Alternative 8 than

under Alternatives 3 and 4. This is because the area in the southeast corner that is excluded from mining under Alternative 8 contains a relatively smaller proportion of wetlands compared with both the entire mine parcel and the area on the western side of the parcel, which is excluded under Alternative 3.

4.5.9 Conclusions

All of the alternatives considered in this EIS, except No Action, would have some degree of adverse impact on existing vegetation within the Tarmac King Road Limestone Mine area, the primary impact being removal of vegetation. Among the eight alternatives considered in this EIS, the acreage of potentially impacted vegetation cover types ranges from 3,898.8 acres under Alternative 2 to 1,451.7 acres under Alternative 6. Table 4–10 ranks the alternatives from greatest to least in terms of vegetation acreage impacted. During mining activities, measures should be taken to manage invasive species such as the air potato, cogon grass, and Japanese climbing fern. Preventing the introduction or spread of these species can be accomplished by identifying and adopting best management practices.

Table 4–10. Alternatives Ranked in Order of Decreasing Acres of Vegetation Impacted

Alternative	1	2	3	4	5	6	7	8
Total area impacted	8	1	3	4	2	7	6	5
Total area uplands impacted	8	1	2	3	4	7	6	5
Total area wetlands impacted	8	1	4	5	2	6	7	3

4.6 WILDLIFE

This section evaluates the potential impacts of implementing the alternatives on the wildlife of the Tarmac King Road Limestone Mine area. Impacts on wetlands and vegetation are evaluated as distinct resources in Sections 4.4 and 4.5, respectively. The evaluation for wildlife focuses on the general impacts of the alternatives on indigenous wildlife, federally and state-listed threatened and endangered (T&E) species, and state-listed species of special concern. Impacts of specific alternatives are addressed in Section 4.6.3. Cumulative effects on wildlife are addressed in Section 4.17.

Indigenous Wildlife

Implementation of mining alternatives is unlikely to have any direct beneficial effects on the native wildlife species that occur in the Tarmac King Road Limestone Mine (see Chapter 3, Table 3–14). The alternatives are more likely to negatively impact one or more species within the mine site through effects on air quality, noise, food abundance, habitat alterations, and permanent loss and fragmentation of habitat. Substantial or immediate recolonization of areas that were disturbed but not mined is unlikely given the degree to which the ground surface would be altered by these activities. Potential beneficial impacts are likely to accrue on nearby lands as a result of planned mitigation activities, and a small number of wildlife species may experience limited benefits from the construction of mining lakes. Mitigation is discussed further in Chapter 5.

Air quality impacts from the mining alternatives are not expected to cause significant impacts on wildlife. Elevated levels of airborne particulate matter are likely to occur periodically in the project area due to suspended particulate matter (dust) generated from mining activities, emissions from mining machinery, and diesel exhaust from project pumps (see Section 4.10). Impacts on air quality as a result of mining are predominantly short-term occurrences that most wildlife species can avoid or endure.

Noise during activities conducted under the mining alternatives is not expected to cause a significant adverse impact on wildlife. Noise impacts would likely increase over current noise conditions in the Tarmac King Road Limestone Mine (see Section 4.12), but noise impacts associated with mining would not extend beyond the immediate project area. Noise created by machinery and operations would potentially disturb wildlife during mining throughout the duration of the permit period. However, noise impacts on mobile wildlife species would be minimal due to their ability to migrate to surrounding areas during mining operations.

The predominant and long-term negative impacts of the mining alternatives on wildlife would occur through permanent loss and alteration of the habitats and the ecological services those habitats provide. Although the Tarmac King Road Limestone Mine area is already highly modified from its natural condition by anthropogenic activities (e.g., tree farming), species of indigenous wildlife use it for nesting and foraging habitat and, to some extent, as a corridor as they move across north-central Florida. Effects of the mining alternatives include transforming wetlands and other forested habitats to open lakes or pits refilled to become uplands. Construction of berms for storm protection and sound abatement could potentially reduce or eliminate the use of the area by large land animals (e.g., Florida black bears [*Ursus americanus floridanus*]), as they move across the Tarmac King Road Limestone Mine area. Berms would not absolutely obstruct the movements of large mammals and would not adversely affect the movement of birds or animals that can move via waterways. Through clearing, excavation, and filling, mining alternatives would fragment the larger patches of forested habitat in the King Road mine area to various degrees, resulting in a patchwork of mined areas (bermed lakes, filled quarries) and areas disturbed but not mined, dissected by a network of flow-ways and other unmined higher-quality wetlands (No Mine Areas).

The loss of habitat, particularly wetlands, in the Tarmac King Road Limestone Mine area as a result of mining (see Section 4.4) could result in less or lower-quality foraging habitat for birds and other wildlife. For most wildlife species that occur in the Tarmac King Road Limestone Mine area, similar foraging habitat is available in the surrounding area, and the mining footprint under all alternatives is a small fraction of the available foraging and nesting habitat in the greater region. For wildlife in general, mining alternatives are unlikely to have a significant adverse impact, such as local population extirpation.

The Gulf Coast and downstream estuaries of the Withlacoochee River, including emergent wetlands, are located approximately 3 miles from the proposed mine site. These areas are designated Essential Fish Habitat (EFH) for species including coastal migratory pelagics, stone crab, red drum, shrimp, and reef-fish fisheries. An analysis of the effects, including potential cumulative effects, of the proposed action on EFH, managed fish species, and major prey species was performed. After additional coordination with the National Marine Fisheries Service, the USACE determined that the proposed limestone mine project would not have a substantial adverse impact on EFH or federally managed fisheries in the Gulf of Mexico. The potential for adverse effects on EFH, managed fish species, and major prey species would be minimal through stormwater management (buffers, berms, and erosion controls, etc.) to control sedimentation or other pollutants from leaving the project site. The predicted reduction in the volume of surface runoff and groundwater discharge to the Withlacoochee River and Gulf of Mexico would be so minimal as to not adversely impact EFH. In addition, the substantial distance between the proposed mine site and surface waters would further reduce the potential for any adverse impact on EFH or the managed fish or prey species from the proposed project.

The potential impacts of mining alternatives on federally and state-listed T&E species and state-listed species of special concern are similar, but vary in magnitude with the amount and characteristics of the wetlands lost to mining. Impacts on these species are evaluated below.

4.6.1 Threatened and Endangered Species

Beneficial and negative impacts on federally and state-listed T&E species are possible from implementation of the mining alternatives. Some minimal benefits may accrue from the creation of new habitats (upland berms) or expansion of locally uncommon habitat (lakes) for species that are limited by the current amount of those habitat types in the Tarmac King Road Limestone Mine area. The primary potential negative effect on T&E species is the loss or degradation and fragmentation of natural habitat. Although federally and state-listed T&E species are neither abundant nor dependent on habitats exclusively found in the Tarmac King Road Limestone Mine area, these negative impacts on habitat would outweigh the potential benefits.

The wood stork *(Mycteria americana)*, a federally listed endangered species, has been observed in the Tarmac King Road Limestone Mine area (ENTRIX 2009). These observed birds were possibly from two roost sites in the proposed mitigation area because wood storks generally forage within a 12-mile radius of the roosting site. Wetland loss under the mining alternatives would further reduce the value of the Tarmac King Road Limestone Mine area for wood storks, but is unlikely to result in adverse impacts on

local wood stork populations. While the wood stork was observed roosting on the proposed mitigation parcel, no wood storks were observed roosting or foraging within the relatively minor amount of suitable foraging habitat on the mine site. Further, no nesting was observed within the project area. The loss of fish currently found on the mine site is unlikely to result in reduced wood stork breeding success (Gawlick 2002) because the nearest wood stork nesting colonies are located approximately 25 miles from the Tarmac King Road Limestone Mine area, outside the 13-mile-radius core foraging "buffer" area for nesting colonies (FWS 2007). Hydrological changes resulting from the mining alternatives are also unlikely to directly impact the nearest wood stork nesting colonies. Because roosting sites with 20 to 25 birds are considered "moderately important" in the *Revised Recovery Plan for the U.S. Breeding Population of the Wood Stork, Southeast Region* (FWS 1997), impacts of mining alternatives on prey abundance for wood storks roosting in the mitigation area would not likely adversely affect, or promote, recovery of wood storks in Florida. However, some of the proposed habitat improvements in the mitigation area could provide additional roosting or nesting habitat. A minimal increase in the area of suitable foraging habitat and the production of fish prey is also possible in the mine lakes, although the lakes would not be configured specifically to allow development of a vegetated littoral zone. Emergent aquatic vegetation would not be planted there, but is likely to naturally recruit in areas where water depths allow. This relatively narrow area of shallow, vegetated habitat would only provide a small amount of additional forage area for wood storks or other wading birds. The U.S. Fish and Wildlife Service (FWS) concurred with the USACE determination that the applicant's preferred alternative (Alternative 2) may affect, but is not likely to adversely affect, the wood stork (FWS 2011a).

The Florida panther *(Puma concolor coryi)* is a federally listed endangered species that is found primarily in the southern half of Florida. As discussed in Chapter 3, Section 3.5.2, there have been unconfirmed sightings in the area reported by nearby residents over the last few years. While transient male panthers could occur in the area, FWS does not believe a breeding population is present, and has concluded that the proposed project is not likely to adversely affect the Florida panther (FWS 2011b).

The eastern indigo snake *(Drymarchon corais couperi)*, a federally listed threatened species, is widely distributed throughout Florida, and several have been observed on or near the mine site. However, they species occurs primarily in sandhill habitats, which are not present in the Tarmac King Road Limestone Mine area. Construction of storm surge berms around permanent lakes under mining alternatives could result in a minimal amount of additional suitable habitat for the indigo snake because it prefers upland habitats (FWS 1999). Berms may offer suitable habitat and substrate for the gopher tortoise *(Gopherus polyphemus)*, a state species of concern, which could increase the number of nesting sites for the indigo snake. The indigo snake prefers gopher tortoise burrows as shelter from winter cold and desiccating conditions (FWS 1999). FWS issued its biological opinion of the potential impacts of the proposed Tarmac King Road Limestone Mine on the eastern indigo snake (FWS 2011a). After reviewing the current status of the eastern indigo snake, the environmental baseline of the action area, the effects of the proposed action, and cumulative effects, FWS determined that the project, as proposed, is not likely to jeopardize the continued existence of the eastern indigo snake. Limited mortality of eastern indigo snakes and their nests resulting from habitat loss would occur from the construction, operations, and maintenance of the proposed action. However, the loss of this habitat is not expected to appreciably affect the overall survival and recovery of this species. The entire biological opinion is provided as Appendix E of this EIS.

Suitable habitat for most other protected species listed by FWS as likely occurring in Levy County is not found within the proposed mine and mitigation parcels of the Tarmac King Road Limestone Mine project area. These species include the Florida scrub jay (*Aphelocoma coeruluscens*), red-cockaded woodpecker (*Picoides borealis*), West Indian manatee (*Trichechus manatus*), and Gulf sturgeon (*Acipenser oxyrinchus desotoi*), as well as several species of sea turtle. Due to this lack of suitable habitats, these species are not anticipated to occur within the mine or mitigation areas. In addition, the distances from the project site to their suitable habitats and the best management practices proposed (buffers, berms, erosion controls, etc.) make the proposed activities unlikely to adversely impact these species, either directly or indirectly.

All mining alternatives would likely reduce the value of the Tarmac King Road Limestone Mine area for the Florida black bear (*Ursus americanus floridanus*), a state-listed threatened species. The best bear habitat in Florida is a thoroughly interspersed mosaic of flatwoods, swamps, scrub-oak, ridges, bayheads,

and hammock habitats (Maehr *et al.* 2001). While the Gulf Hammock region has been transformed by human activities, elements of the original habitat mosaic persist, including in the Tarmac King Road Limestone Mine area. The mining alternatives would likely further degrade the overall value of this area for bears by reducing the amount of forested and hammock habitats.

It is difficult to assess the potential negative impact of mining alternatives on the likelihood that black bears would use the Tarmac King Road Limestone Mine area as they move along the coast between larger, better-defined population centers, such as the Big Bend area and the Greater Chassahowitzka Ecosystem. Corridors between prime bear habitat are important for the survival of the population (Maehr *et al.* 2001). The area between the Gulf Coast and U.S. Route 19, which contains the proposed Tarmac King Road Limestone Mine and mitigation areas, while suitable for bear movement, funnels the animals toward Inglis, where interactions with humans are more likely. To enter the Goethe State Forest to the east from the Tarmac King Road Limestone Mine area, bears must cross U.S. Route 19, a four-lane divided highway. The impact of mining alternatives on bears could be either to increase or decrease the probability that they would cross the highway closer to Inglis where there is likely to be more traffic. In general, the reduced wildness of the Tarmac King Road Limestone Mine site would not contribute positively toward the management goal for the Florida black bear, i.e., promoting or restoring connectivity among prime bear habitat in Florida.

The gopher tortoise and short tail snake *(Stilosoma extenuatum)*, state-listed threatened species that potentially occur in the Tarmac King Road Limestone Mine area, are unlikely to be adversely impacted by the mining alternatives. Suitable habitat for the gopher tortoise and species commonly associated with tortoise burrows, including the short tail snake, is rare or does not occur in the Tarmac King Road Limestone Mine area. Construction of permanent storm surge berms around lakes under the mining alternatives could result in a minimal amount of additional suitable habitat for the gopher tortoise and associated species, depending on how revegetation of berms and disturbed areas progresses.

4.6.2 State Species of Special Concern

The State of Florida species of special concern that occur or are likely to occur in the Tarmac King Road Limestone Mine area are the snowy egret, tricolor heron, little blue heron, white ibis, limpkin, roseate spoonbill, and osprey (see Chapter 3, Table 3–14). The impacts of mining alternatives on these wading birds are similar to those discussed for the wood stork.

The destruction of suitable nesting and foraging habitat as a result of mining potentially would reduce the net amount of roosting and nesting area and of prey biomass available to wading birds. In general, wading birds are not likely to be significantly impacted by mining activities because of the minimal suitable nesting and foraging habitat currently existing on the mine site and the continuing availability of wetlands in the nearby mitigation area and greater surroundings.

Mining alternatives could have beneficial and negative effects on state species of special concern. Like other wetland wildlife, some wading birds, including wood storks, potentially benefit from transformation of relatively low-value habitat to lakes, if those lakes have a suitable littoral zone. Littoral shelves in lakes provide an open, shallow area for foraging. Water depth (shelf depth) is a critical determinate for selecting foraging habitat for wading birds. Wading bird characteristics, such as length of legs or bill, influence the depth of water where the bird forages (Gawlik 2002). Although the precise value to wading birds of the lakes created under the mining alternatives is difficult to predict, it is possible that mining lakes could increase the amount of suitable foraging habitat for wading birds in the Tarmac King Road Limestone Mine area. However, this relatively narrow area of shallow, potentially vegetated habitat would only provide a small amount of additional forage area. Lakes created under mining alternatives could increase the suitable foraging habitat for the osprey, which prefers to hunt for fish over open water, assuming those lakes are eventually colonized by fish.

4.6.3 Wildlife Impacts

This EIS evaluates each mining alternative's impacts on wildlife. Mining alternatives may have negative impacts on wildlife and wading birds as a result of habitat loss and fragmentation, particularly wetland habitats. Minimal fish habitat exists within the proposed impact areas on the King Road Limestone Mine

site, with the exception of small borrow ponds. Therefore, reductions in fish biomass resulting from conversion of Tarmac King Road Limestone Mine borrow ponds and wetland habitats to lakes would be minimal. These specific biomass changes are not calculated in this EIS because the degree of change is expected to be minimal. After the initial reduction, an increase in fish biomass is expected over time through replacement of small borrow ponds with larger lakes. In addition, wood storks or other species that could be highly dependent on this specific fish habitat do not nest in the vicinity of the mine and do not use the mine area for foraging during the nesting season. Table 4–9 shows the amount of different habitat/cover types under each of the mining alternatives. Mitigation is discussed in Chapter 5.

4.6.3.1 Alternative 1 Potential Wildlife Impacts

Under the No Action Alternative, wildlife and birds would have continued access to 2,590.2 acres of wetlands, primarily hydric coniferous plantation (69 percent older than 8 years), wetland forested mixed, coastal maritime hammock, and pine-mesic-oak (see Chapter 3, Section 3.3). Wetland habitat types represent 55 percent of the total 4,750-acre mine parcel. Approximately 305 acres are deepwater ponds, sloughs, and intermittent flow-ways. No lakes or berms would be constructed under this alternative, so there would be no adverse impact on the use of the Tarmac King Road Limestone Mine area as a corridor by large animals, (e.g., Florida black bears). Hunting would continue under this alternative. Under each of the following mining alternatives, hunting would be maintained except for the mined area and a published buffer zone.

4.6.3.2 Alternative 2 Potential Wildlife Impacts

Under Alternative 2, 2,068.5 acres of wetlands and 1,818.4 acres of uplands would be impacted by mining activities. The impacted area represents 82 percent of the total 4,750-acre mine parcel, a significant reduction in the current terrestrial upland and wetland habitat in the Tarmac King Road Limestone Mine site. Mining activities under Alternative 2 would leave more than 1,142 acres of disturbed terrestrial habitat, 1,251 acres of backfilled lakes, approximately 1,506 acres of open lakes, and many hundreds of linear feet of berm, all permanent or long-term changes to wildlife habitat. The large number and total length of berms would be likely to disrupt movement of large ground-dwelling animals across the site. Approximately 852 acres of high-quality wetlands designated as the No Mine Area would remain as wildlife habitat.

4.6.3.3 Alternative 3 Potential Wildlife Impacts

Under Alternative 3, 1,401.2 acres of wetlands and 1,523 acres of uplands would be impacted by mining activities. The impacted area represents 62 percent of the total 4,750-acre mine parcel. Mining activities under Alternative 3 would leave 1,049 acres of disturbed terrestrial habitat, 926 acres of backfilled lakes, approximately 958 acres of open lakes, and many hundreds of linear feet of berm. The large number and total length of berms would seriously disrupt movement of large ground-dwelling animals across the site. Approximately 466 acres of high-quality wetlands designated as the No Mine Area would remain as wildlife habitat.

4.6.3.4 Alternative 4 Potential Wildlife Impacts

Under Alternative 4, 1,304.0 acres of wetlands and 1,486.2 acres of uplands would be impacted by mining. The impacted area represents 59 percent of the total 4,750-acre mine parcel. Mining activities under Alternative 4 would leave 1,128 acres of disturbed terrestrial habitat, 642 acres of backfilled lakes, approximately 1,029 acres of open lakes, and many hundreds of linear feet of berm. The number and total length of berms would potentially disrupt movement of large ground-dwelling animals across the site. Approximately 532 acres of high-quality wetlands designated as the No Mine Area would remain as wildlife habitat.

4.6.3.5 Alternative 5 Potential Wildlife Impacts

Under Alternative 5, about 1,830.7 acres of wetlands and 1,344 acres of uplands would be impacted by mining. The impacted area represents 67 percent of the total 4,750-acre mine parcel. Mining activities under Alternative 5 would leave 892 acres of disturbed terrestrial habitat, 1,083 acres of backfilled lakes,

approximately 1,210 acres of open lakes, and many hundreds of linear feet of berm. The large number and total length of berms would disrupt movement of large ground-dwelling animals across the site. Approximately 348 acres of high-quality wetlands designated as the No Mine Area would remain as wildlife habitat.

4.6.3.6 Alternative 6 Potential Wildlife Impacts

Under Alternative 6, about 981.1 acres of wetlands and 464.8 acres of uplands would be impacted by mining. The impacted area represents only 30 percent of the total 4,750-acre mine parcel. Mining activities under Alternative 6 would leave 404 acres of disturbed terrestrial habitat, 465 acres of backfilled lakes, approximately 713 acres of open lakes, and many hundreds of linear feet of berm. The smaller number and total length of berms would not disrupt wildlife movement across the site to the same extent as Alternatives 2–5. There would be no dedicated No Mine Area on site under this alternative

4.6.3.7 Alternative 7 Potential Wildlife Impacts

Under Alternative 7, 720.3 acres of wetlands and 820.1 acres of uplands would be impacted by mining. The impacted area represents only 32 percent of the total 4,750-acre mine parcel. Mining activities under Alternative 7 would leave 853 acres of disturbed terrestrial habitat, 387 acres of backfilled lakes, approximately 511 acres of open lakes, and many hundreds of linear feet of berm. The smaller number and total length of berms would not disrupt wildlife movement across the site to the same extent as Alternatives 2–5. Approximately 206 acres of high-quality wetlands designated as the No Mine Area would remain as wildlife habitat.

4.6.3.8 Alternative 8 Potential Wildlife Impacts

Under Alternative 8, 1,516.8 acres of wetlands and 1,245.5 acres of uplands would be impacted by mining. The impacted area represents 59 percent of the total 4,750-acre mine parcel. Mining activities under Alternative 5 would leave 876 acres of disturbed terrestrial habitat, 915 acres of backfilled lakes, approximately 981 acres of open lakes, and many hundreds of linear feet of berm. The large number and total length of berms would disrupt movement of large ground-dwelling animals across the site. Approximately 485 acres of high-quality wetlands designated as the No Mine Area would remain as wildlife habitat.

4.6.4 Conclusions

With the possible exception of the Florida black bear, the alternatives are unlikely to have a significant adverse or positive impact on wildlife. Direct adverse impacts of mining operations would be mostly short term and avoidable by most wildlife species, although some animals would be lost during construction and operations. T&E species and state-listed species of special concern other than those listed above are unlikely to occur in the Tarmac King Road Limestone Mine area and thus would not be impacted by short-term, direct, adverse impacts or long-term habitat alterations. The largest impact on wildlife from all of the mining alternatives (without factoring in future habitat enhancement on the mitigation parcel) would be the permanent reduction of available habitat. However, the mine parcel contains only a small fraction of similar habitat available in the immediate vicinity, and no wildlife species have been identified that are dependent on habitats exclusively found on the site. In addition, this reduction in habitat would occur incrementally over decades, allowing for more gradual displacement of animals to surrounding existing habitat. There is no evidence that wood storks roosting in the mitigation area are breeding, so a further reduction in the suitability of the Tarmac King Road Limestone Mine site for foraging is unlikely to have a significant impact on wood stork populations. This alteration would have similar minimal impact on other wading birds. Habitat modifications could minimally increase the suitability of the mine area for species that prefer more upland conditions, such as the gopher tortoise, eastern indigo snake, and short tail snake. However, habitat modifications would also include a reduction in cover and would likely have substantially greater impact on the availability of prey. As a result of the construction of mining lakes, some potentially suitable foraging habitat for osprey and other aquatic predators, e.g., alligators, would be added under Alternatives 2 through 8.

4.7 TOPOGRAPHY, GEOLOGY, AND SOILS

The impacts of rock mining on the site topography, geology, and soils are directly related to the actions completed during land clearing and the rock removal processes. An overview of the planned mining process is presented in Section 4.1.

4.7.1 Alternative 1 Potential Impacts on Topography, Geology, and Soils

Under the No Action Alternative, no mining would occur at the Tarmac King Road Limestone Mine site. As a result, no additional impacts on topography, geology, or soils would occur outside of those associated with the continued harvesting of timber.

4.7.2 Alternatives 2–8 Potential Impacts on Topography and Soils

Rock mining preparation and excavation would result in the replacement of land area (wetland or upland) with open surface areas. Portions of the open surface areas would exist either as pits refilled with fine material or as water-filled pits (e.g., lakes). Rock removal would lower the existing ground surface elevations, at least initially, as soil cover is removed and subsurface rock is exposed and excavated. Changes to topography within the active mine area would be the result of berm construction, haul road building, clearing for conveyor pathways, and quarry lake excavation.

Land alteration acreage due to disturbance and mining at the end of each alternative is provided in Table 4–11 and depicted in Chapter 2, Figures 2–5 to 2–11 (alternatives maps). Impacts on topography by mining and associated land disturbance would be greatest under Alternative 2, least under Alternative 6, and intermediate under the remaining alternatives.

Table 4–11. Mined and Disturbed Area at the End of Each Alternative (acres)

Alternative	Mined Acres	Area Disturbed But Not Mined	Undisturbed No Mine Area	Total Acres
2	2,757	1,142	852	4,751
3	1,884	1,049	466	3,399
4	1,671	1,128	532	3,331
5	2,293	892	348	3,533
6	1,048	404	0	1,452
7	898	853	206	1,957
8	1,896	876	485	3,257

Source: Tarmac 2010.

This section does not analyze impacts in terms of topography and soils outside of the Tarmac King Road Limestone Mine site potentially caused by the different alternatives. To the extent that any alternative selected would prevent or reduce the amount of mining planned at the Tarmac King Road Limestone Mine site, it is expected that the reduction in mining there may result in some increase in mining at other locations. This increase in mining elsewhere would occur at the conclusion of any permitted mining at the King Road Limestone Mine site. This potential increase could result in impacts on topography, geology, and soils at other locations that cannot be reasonably quantified for this EIS because the locations where mining would increase are unknown at this time; thus, these impacts are beyond the scope of this EIS.

4.7.3 Alternatives 2–8 Potential Impacts on Geology

Impacts on subsurface rock in the Tarmac King Road Limestone Mine area would increase incrementally with each alternative as larger volumes of the limestone rock are removed by mining. The blasting and excavation process would alter the subsurface geology in the following ways:

- Fracture and weaken the rock matrix within and exterior to the mine quarry lake
- Create loose rock (fine to coarse in size) in the bottom of the quarry lake
- Disrupt flow paths within the rock matrix, with net increase in rock matrix connectivity within the vicinity of the active pit

- Increase dissolved and particulate matter entrained in groundwater in the area of the quarry lake
- Decrease aquifer thickness with the volume of rock removed replaced with water
- Create pits of filled rock of different rock properties (grain size, rock matrix strength, flow paths) than surrounding non-mined areas

The approximate volumes of rock to be excavated under Alternatives 2 through 8 are shown in Table 4–12. The area and location of future lake footprints were provided by Tarmac and were used to estimate acres of lake footprint per alternative. The calculation method assumes a maximum excavation depth of 120 feet below ground surface. Quarry walls were assumed to slope 70 degrees, but actual slope would vary during mining. Figure 4–7 is a schematic representation of removed rock and remaining rock using these approximations. It is recognized that the actual configurations of lake sizes and quarry profiles would vary from this conceptualization. In this method, the volumes of rock removed under each alternative are not reduced by estimated pore space; thus, the volumes presented in Table 4–12 reflect the total volumes of the created void under each alternative.

Table 4–12. Volume of Rock Removed at the End of Each Alternative

Alternative	Volume of Rock Removed (millions of cubic yards)[a]	Lakes Created (acres)
2	397.2	1,506
3	271.8	958
4	241.2	1,029
5	330.6	1,210
6	151.8	713
7	130.5	511
8	273.5	981

[a] Total volume of area excavated, including pore space.

As indicated in Table 4–12, under Alternative 2, both the maximum volume of rock would be removed, 397.2 million cubic yards, and the maximum area of lakes would be created, 1,506 acres, among the action alternatives. Under Alternative 8, 273.5 million cubic yards of rock would be removed and 981 acres of lakes would be created.

Drilling and rock blasting would be used to weaken the rock structure to aid in rock removal via excavation. During a blast, the broken rock is moved laterally by the explosive force into the quarry lake, enlarging the working face of the mine. Explosive energy not used in breaking or moving the rock materials moves outward as ground vibration. The blasting process would create a fracture network in the vicinity of each blast, resulting in weakening of the rock matrix, disruption of the pore network, and a net reduction of rock strength in the vicinity of the quarry lake.

The explosive force of blasting, combined with excavation, may create localized collapse areas in the vicinity of the active mine quarry lake. In karst areas, such as the Tarmac King Road Limestone Mine site, the natural dissolution of rock in the subsurface can leave behind a soil arch or bedrock void that supports the overlying rock and/or soil interval. In the event the explosive energy dissipating from a blast is sufficient to weaken a soil arch, a collapse could occur, creating a sinkhole or depression. As the thickness to bedrock in the Tarmac King Road Limestone Mine site appears to be relatively thin, the depth of collapse would likely be minimal.

Literature reviews indicate blasting operations can induce fracturing in the rock matrix surrounding the area blasted and/or excavated (Keldall *et al.* 1984; Milanovic 1985; Pugliese 1972). These actions may increase the hydraulic conductivities (K_v and K_h) of the rock matrix. Studies indicate the linear or vertical extents of these fractures are not expected to be of any significant lengths (Pusch 1989). A potential impact of higher rock matrix conductivity surrounding the quarry pits would be increased groundwater flow, although it would be limited to within the extended area (i.e., surrounding the quarry pit area with induced fractures from blasting operations) of the mining pits. Therefore, the overall impacts would be minimal. Previously, it has been observed from the backfill material *K*-sensitivity analysis (see Appendix D, Table D–17) that increasing the backfill material hydraulic conductivity by a couple of orders of magnitude did not change the head differences from the baseline by any significant amount, thus justifying the above conclusion.

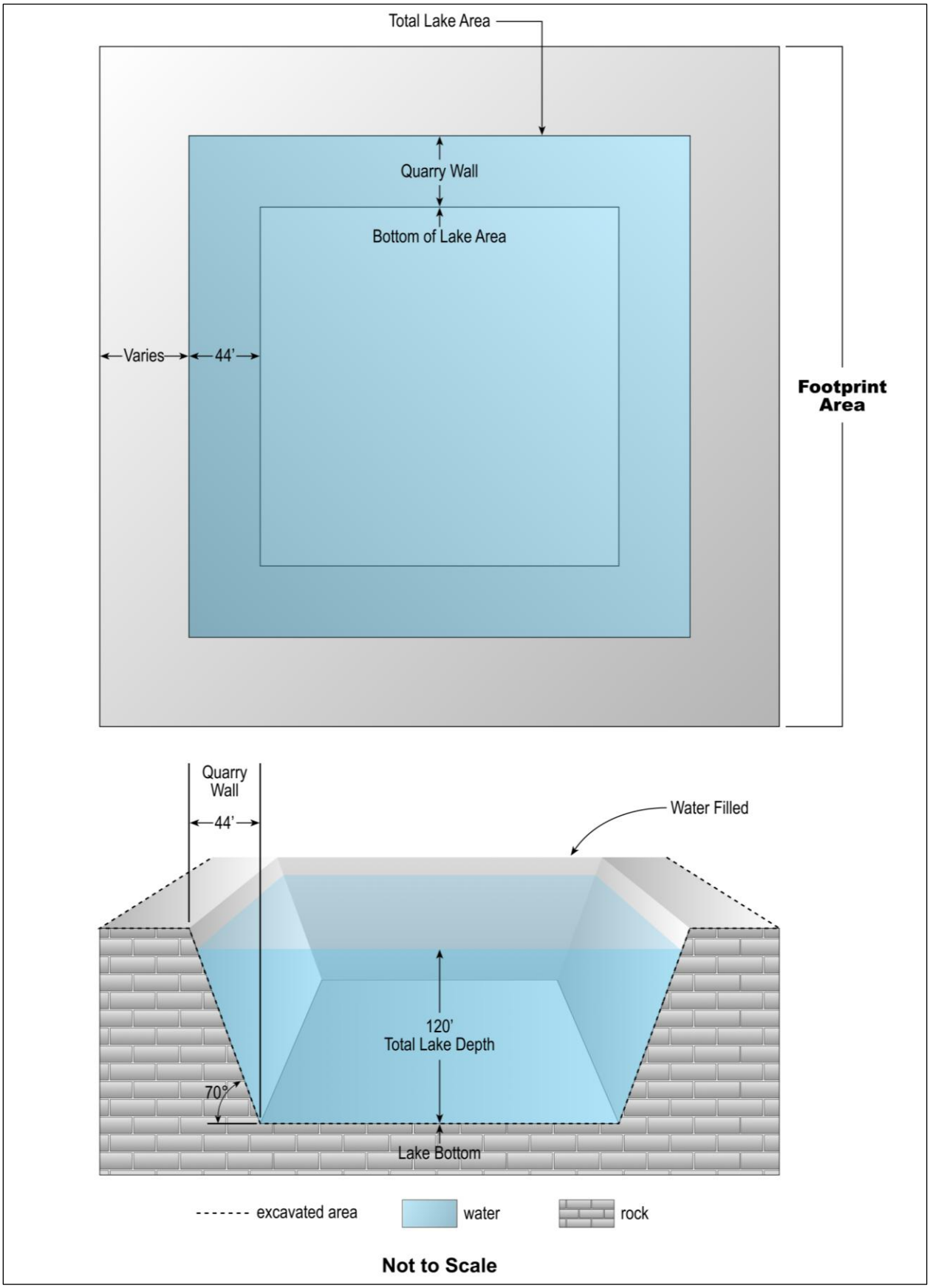


Figure 4–7. Conceptual Lake Configuration Used for Rock Removal Volume Estimates

4.7.4 Seismicity

An evaluation of blast effects was completed by Tarmac during 2006 at the Tarmac King Road Limestone Mine site using 10 seismographs to record vibration measurements during test detonations. Four blasts were completed during March and April 2006 with each blast using 30 to 55 drill holes loaded with explosives. The purpose of this testing was to assess potential damages created by ground vibrations and air pressure levels to surface structures; the test did not evaluate impacts on subsurface geology. A report of the findings was provided to the Levy County Planning Commission in the Special Exception Application (Tarmac 2008b, 2010).

Immediate and residual impacts on site geology from blasting are expected to increase as the mining footprint increases. Variation in the magnitude of impact would depend upon strength and number of detonations, the rigidity of the rock and its ability to fracture, and the radius of impact surrounding each pit.

4.7.4.1 Alternative 1 Potential Impacts on Seismicity

Under the No Action Alternative, no mining would occur at the Tarmac King Road Limestone Mine site. As a result, no impacts on seismicity would occur.

4.7.4.2 Alternatives 2–8 Potential Impacts on Seismicity

Actual blast data taken during the 2006 testing were used to develop a mathematical model for predicting offsite impacts of quarry blasting on the closest residences to the Tarmac King Road Limestone Mine site.

Vibration projections are necessary to assess ground vibration at offsite locations and structures and evaluate community awareness of the blasting operations. To develop these ground vibration projections, statistical evaluation is necessary. Regression analysis was completed to determine the relationship between vibration reduction and distance. The data necessary for these relationships were obtained using multiple seismographs located at specific distances, discussed further below. The vibration levels, distance, and explosives charge weight per delay were combined to make the projection formulas and evaluation (Tarmac 2010:Vol. II, Appendix 5).

GeoSonics, Inc., used 10 blasting seismographs to obtain vibration measurements during the blast test. A series of instruments were laid out extending from immediately adjacent to the blast site to the east of the blast site in an approximate straight line. The instruments were coupled to the ground and were installed at preset distances to obtain the required data. In addition to the instruments installed to the east, specific seismographs were installed to the southwest, near the Deerhaven Campsites. The remaining instruments were set up at individual points south of the blast site to evaluate levels at farther distances and ensure that ground vibration levels were not perceptible, nor capable of creating annoyance (Tarmac 2010:Vol. II, Appendix 5). The complete blasting study is included in Appendix L.

A regression evaluation was made for each blast, as well as all of the levels combined. These data were used to predict ground vibration at locations not measured with seismographs, i.e., the offsite residences. Table 4–13 presents the predicted ground level vibration and percent of the state standard for drywall structures for the closest residences to the Tarmac King Road Limestone Mine site. For the first 40 years of mining under all of the action alternatives, the vibration levels were well below Florida's most restrictive limits for drywall homes, 0.75 inches per second. The closest residences would feel vibration levels of approximately 25 percent of the standard.

Table 4–13. Predicted Quarry Blast Impacts on Nearest Offsite Residences

Location	Distance (feet) Mining Area	Projected Ground Vibration Level (inches per second)	Percent of State Limit for Drywall (0.75 inches per second)	Alternatives	Comment
Residence along SE 72nd Court South of King Road	2,815	0.185	25	2, 3, 4, 5, 7, 8	Occurs in first 5 years of mining
Residence along SE 72nd Court North of King Road	2,843	0.182	24	2, 3, 4, 5, 7, 8	Occurs in years 5–10 of mining
Residence / Youth Ranch Structure with Pool	3,368	0.144	19	2, 3, 4, 5, 7, 8	Closest public facility to mining (occurs in years 5–10 of mining)
Deerhaven Campsites/Residence along Butler Road	815	1.034	138	2, 3, 4, 5, 6, 8	Closest residence to mining (occurs beyond mining year 40)
Deerhaven Campsites/Residence along Butler Road	815	0.88[a]	117	2, 3, 4, 5, 6, 8	Closest residence to mining (occurs beyond mining year 40)

[a] Effect of reducing blast hole diameter from 4.5 inches to 4.0 inches.
Source: Tarmac 2010:Vol. II, Appendix 5.

For areas within the southwest section of the Tarmac King Road Limestone Mine site, the residences and campsites are within 815 feet of the proposed mining. These are the closest residences to the entire Tarmac King Road Limestone Mine site, but would not be impacted by mining until 40 years or more after the project would commence. As originally proposed, vibration levels approximately 815 feet from the potential blasting to the closest structure existing in 2010 would be 1.034 inches per second for the maximum charge weight per delay, which exceeds the Florida State limit for drywall. Tarmac has proposed modifications to the blasting pattern used and would adjust for the proximity of structures located in the area now occupied by the Deerhaven Campsites. Using the simplest method of reducing the blast hole diameter from 4.5 inches to 4.0 inches, a reduction in pounds per delay could be achieved. Using 408.6 pounds per delay, a level of 0.88 inches per second is predicted. This level would still represent an exceedance, at 117 percent of the current drywall limit of 0.75 inches per second, as defined by Florida statute (Tarmac 2010:Vol. II, Appendix 5).

4.8 LAND USE

As discussed in Chapter 3, Section 3.7, the Tarmac King Road Limestone Mine project area consists of approximately 4,750 acres in the proposed mine area and 4,526 acres in the proposed mitigation area; the major land use is silvicultural (forestry) practices. The current zoning of the Tarmac King Road Limestone Mine is forestry/rural residential. The proposed limerock mine falls under the category of major mining and must receive a special exception approval and excavation and fill permits to be in compliance with current local land use codes and regulations. Tarmac has applied for and received a Special Exception from the Levy County Planning Commission for the Tarmac King Road Limestone Mine as a major mining facility and re-zoning as a mining operation has been approved by the county. The mining facility would mainly consist of roads and supporting infrastructure, mining areas, aggregate processing and truck-loading facilities, lakes, berms, and vegetative buffers (Tarmac 2008b). The mine and mitigation areas are located in the Gulf Hammock Wildlife Management Area (WMA) and, according the Gulf Hammock evaluation report of 2004 (DSLSA, RCLS, and FNAI 2004), this area is under consideration for preservation under the Florida Forever project. Implementing any of the alternatives would result in the mining area acreages no longer being available for preservation under the Florida Forever project. However, for all of the alternatives, forestry practices would be discontinued on the 4,526-acre mitigation area, and the applicant proposes that this area would be turned over to the state for

preservation. Forestry practices would also permanently cease within the specific No Mine Area associated with each alternative. Mitigation is discussed in detail in Chapter 5.

4.8.1 Alternative 1 Potential Land Use Impacts

Under the No Action Alternative, silviculture (forestry) is likely to remain the primary land use of the Tarmac King Road Limestone Mine project and mitigation areas, although these areas could eventually be preserved by the state as part of the Florida Forever project, if funding for that program is restored.

In Florida, aggregates are mined and produced primarily from limestone deposits defined by geological conditions that are limited in location and quality. If mining operations at the Tarmac King Road Limestone Mine do not meet the need for aggregates, it is assumed that this need will still exist and that other land within or outside the state will be impacted to obtain the necessary aggregate.

4.8.2 Alternative 2 Potential Land Use Impacts

The total area mined under Alternative 2 is expected to be as high as 2,757 acres. The total area disturbed for roadways and other supporting infrastructure under Alternative 2 is expected to be 1,142 acres, with undisturbed flow-ways and other environmentally sensitive areas totaling 852 acres. The total area of lakes at completion of mining under Alternative 2 is expected to be 1,506 acres.

Under Alternative 2, as well as under the following six action alternatives, land use would slowly shift over the life of the mine from silviculture to mining and conservation areas (the dedicated No Mine Areas). This transition would not be immediate as only 25–30 acres per year would be converted after the first 5 years. No Mine Areas would be excluded from silvicultural operations upon commencement of the project; however, timbering activities could continue in the remaining areas of the site until their conversion to mining. The mine site would include a vegetated perimeter buffer at least 100 feet wide that would function to shield mining activities from view and reduce noise to adjoining properties. Manmade berms would also surround the mine lakes during mining and would remain around open lakes post-project. These berms would serve to further shield mining from view and reduce noise and other adverse impacts on adjacent properties. These actions would combine to allow only minimal potential for impacts under Alternatives 2 through 8 on surrounding land uses.

4.8.3 Alternative 3 Potential Land Use Impacts

Alternative 3 is similar to Alternative 2, except the total area mined is expected to be 1,884 acres. The total area disturbed for roadways and other supporting infrastructure under Alternative 3 is expected to be 1,049 acres, with undisturbed flow-ways and other environmentally sensitive areas totaling 466 acres. The total area of lakes at completion of mining under Alternative 3 is expected to be 958 acres.

4.8.4 Alternative 4 Potential Land Use Impacts

Alternative 4 is similar to Alternative 3, except the total area mined is expected to be 1,671 acres. The total area disturbed for roadways and other supporting infrastructure is expected to be 1,128 acres, with undisturbed flow-ways and other environmentally sensitive areas totaling 532 acres. The total area of lakes at completion of mining under Alternative 4 is expected to be 1,029 acres.

4.8.5 Alternative 5 Potential Land Use Impacts

The total area mined under Alternative 5 is expected to be 2,293 acres. The total area disturbed for roadways and other supporting infrastructure is expected to be 892 acres, with undisturbed flow-ways and other environmentally sensitive areas totaling 348 acres. The total area of lakes at completion of mining under Alternative 5 is expected to be 1,210 acres.

4.8.6 Alternative 6 Potential Land Use Impacts

The total area mined under Alternative 6 is expected to be 1,048 acres. The total area disturbed for roadways and other supporting infrastructure is expected to be 404 acres, with no undisturbed flow-ways

or other environmentally sensitive areas. The total area of lakes at completion of mining under Alternative 6 is expected to be 713 acres.

4.8.7 Alternative 7 Potential Land Use Impacts

Alternative 7 is similar to Alternative 4, except the total area mined is expected to be 898 acres. The total area disturbed for roadways and other supporting infrastructure is expected to be 853 acres, with undisturbed flow-ways and other environmentally sensitive areas totaling 206 acres. The total area of lakes at completion of mining under Alternative 7 is expected to be 511 acres.

4.8.8 Alternative 8 Potential Land Use Impacts

Alternative 8 is similar to Alternative 5, except the total area mined is expected to be 1,896 acres. The total area disturbed for roadways and other supporting infrastructure is expected to be 876 acres, with undisturbed flow-ways and other environmentally sensitive areas totaling 485 acres. The total area of lakes at completion of mining under Alternative 8 is expected to be 981 acres.

4.9 HAZARDOUS AND TOXIC WASTES

The following discussion summarizes the extent to which hazardous materials and toxic wastes would be generated under each alternative. This section does not address hazardous materials and toxic waste impacts outside the Tarmac King Road Limestone Mine and mitigation areas caused by the various alternatives. To the extent that any alternative selected would prevent or reduce the amount of mining planned at the Tarmac King Road Limestone Mine, it is expected that the reduction in mining there would result in some increase in mining at other locations. This increase in mining elsewhere would occur at the conclusion of any permitted mining at the King Road Limestone Mine site. This could result in hazardous and toxic waste impacts at other locations that cannot be reasonably quantified for this EIS because the locations where mining would increase are unknown at this time; thus, these impacts are beyond the scope of this EIS.

4.9.1 Alternative 1 Potential Impacts on Hazardous and Toxic Wastes

Mining operations would not occur under the No Action Alternative, and hazardous materials and toxic wastes would be generated only to the extent of impacts resulting from ongoing forestry activities and power line right-of-way maintenance, such as herbicide and pesticide use.

4.9.2 Alternative 2 Potential Impacts on Hazardous and Toxic Wastes

Hazardous materials and toxic wastes related to mining operations would be stored in a covered hazardous materials storage area surrounded by a 2-foot-high wall. Fuel oil would be stored in a 5,000- or 10,000-gallon aboveground storage tank within a walled containment area within the hazardous materials storage area. The potential for leaks can be more easily monitored, contained, and mitigated if leaks occur from aboveground storage tanks. Quantities of petroleum, diesel fuel, lubricants, and oils would be replenished as needed, depending on the rate of mining. All aboveground storage tanks that support mining operations would be removed when mining operations cease at the completion of Alternative 2.

Solid and liquid wastes would be generated from maintenance of mining equipment and from employees through the end of Alternative 2 at the estimated rates given in Table 4–14. These wastes would be managed at permitted facilities in accordance with Federal, state, and local regulations. When mining operations cease at the end of Alternative 2, all solid and liquid wastes remaining on site would be removed, treated, and disposed of according to Federal, state, and local regulations. Blasting materials would be brought on site daily, as needed, and used until Alternative 2 is completed, or until mining operations cease. Blasting materials, including ammonium nitrate, mineral oil, blasting caps, and blasting agents, would not be stored on site.

Table 4–14. Alternatives 2–8 Annual Generation Rate of Solid and Liquid Wastes

Waste Type	Annual Generation Rate	Units
Solid		
General refuse[a]	20,900	Pounds
Liquid		
Waste oil	5,135	Gallons
Wastewater[b]	104,000	Gallons
Antifreeze	572	Gallons

[a] Estimated based on 35 employees and 4.6 pounds per person per day, 0.5 day, 260 days per year (Titan America 2009).
[b] Based on 400 gallons per day potable water withdrawal for sanitary use, 260 days per year (Tarmac 2008c).
Note: Other wastes may include rags and absorbents, oil-contaminated solids, contaminated soil, empty drums, oil filters, solvents and petroleum distillates, and grease. These wastes have not been quantified.

Herbicides would continue to be used to control weeds and other plants in the adjacent Progress Energy Florida transmission line right-of-way and possibly to control weeds and invasive plant species at the mine facilities and along mine roadways.

Hazardous and toxic wastes stored on site would be protected in advance of land falling tropical storms and hurricanes to minimize the potential for accidental spills and contamination. Procedures have been developed by the applicant detailing the protection measures to be taken within 2 hours of the issuance of a hurricane warning to protect equipment and for the proper storage and security of hazardous materials. This includes capping and securing all gas bottles, positioning standby generators for areas required to pump flood-prone areas to minimize contamination from runoff, and securing all storage drums or relocating them inside secure warehouses. Tank farm fill spouts would be wrapped to prevent water infiltration, and used oil drums would be shipped off site or tanks emptied if sufficient lead time exists. In addition, all aboveground storage tanks used at the King Road mine site would be double walled for protection against airborne projectiles (Titan America 2013).

4.9.3 Alternatives 3–8 Potential Impacts on Hazardous and Toxic Wastes

The impacts associated with the management of hazardous materials and toxic wastes would be the same as those identified in Section 4.9.2 for Alternative 2.

4.10 AIR QUALITY

The Tarmac King Road Limestone Mine site located in Levy County, Florida, is currently in an attainment area for all regulated criteria air pollutants. The air construction permit issued to the Tarmac King Road Limestone Mine by the FDEP is for limestone mining and its processing facility. The processing facility is permitted as a natural minor air pollution source. Prevention of Significant Deterioration (PSD) permitting is required for facilities located in attainment areas. The facility is potentially subject to PSD permitting requirements and not subject to New Source Review (Trinity Consultants 2008). The Tarmac Kind Road Limestone Mine processing facility would be a minor source for the purpose of PSD permitting requirements as potential criteria pollutant emissions are below the threshold of 250 tons per year. The particulate matter emissions from the defined processing operations are less than the major source threshold (100 tons per year) for the Title V permitting program. Fugitive emissions from the stockpiles and vehicle traffic are not included in the total emissions comparison for permitting purposes because they are excluded from the definition of a major source. Process particulate matter emissions are the only emissions considered in determining that Tarmac is a minor air pollution source for permitting purposes.

Emissions expected to occur during processing, loadout, and offsite hauling are considered in this section. Tarmac King Road Limestone Mine air emissions would consist of three grouped emission units: primary processing, secondary processing, and loadout operations. The estimated emissions of the Tarmac King Road Limestone Mine alternatives are analyzed in terms of their potential impacts on air

quality within the counties of the primary market. Section 4.15, "Socioeconomics," discusses the primary and secondary markets of the Tarmac King Road Limestone Mine.

The mining process involves underwater dredging using an electric-powered walking dragline. Air emissions from mining operations are assumed to be negligible because the mining operations would occur under water and because no trucks are required to transfer the limerock to the processing facility (Trinity Consultants 2008). The dredge would transport rock materials directly on the conveyance system. The material would be deposited onto a conveyance system that would transfer the limerock to the processing facility. The material would then be conveyed to the processing facility to produce construction aggregate materials. The electric dragline would excavate 25–30 acres of the site annually, producing approximately 3 million tons of limestone after processing. Blasting is not expected to produce any long-term air quality impacts. The explosion of the blasting gel would convert essentially all of the ammonium nitrate and mineral oil to relatively small quantities of nitrogen gas, carbon dioxide, and water vapor (Tarmac 2008b).

The limestone processing facility includes primary crushing operations, secondary processing operations, and loadout operations. Emission points of primary crushing and secondary processing operations include crushers, conveyors, surge bins, triple-deck screens, hydro-cyclone separators, and reclaim bins. Emission points of finishing operations include conveyors, four-deck screens, surge piles, surge bins, triple-deck screens, dewatering screens, splitters, and bins. Emission points of loadout operations include conveyors, stockpiles, triple-deck screens, and loadout bin conveyors. All power for the processing equipment would be provided via electricity, and there would be no emergency generators on site (Trinity Consultants 2008). Tarmac King Road Limestone Mine processing operations involve fugitive emissions, but no stack emissions.

The main activities of the Tarmac King Road Limestone Mine site that would generate significant emissions include primary and secondary processing operations, loadout operations, fugitive dust emissions, and truck traffic. The particulate matter emissions would be reduced by the inherent moisture content of the limestone material and water spray at key transfer points and operations at the facility. Table 4–15 details the facility-wide and processing emissions resulting from particulate matter and fugitive emissions.

Table 4–15. Potential Particulate Matter Emissions (tons per year)

Pollutant	Facility-Wide Potential Emissions	Primary Operations Potential Emissions	Secondary Operations Potential Emissions	Loadout Potential Emissions
PM	70.4	39.7	19.41	11.37
PM_{10}	26.8	16.0	6.97	3.80
$PM_{2.5}$	26.8	16.0	6.97	3.80
PM with fugitives	268	7.67	5.47	3.80
PM_{10} (with fugitives)	78.9	(a)	(a)	(a)
$PM_{2.5}$ (with fugitives)	46.0	(a)	(a)	(a)

[a] Included in total PM with fugitive emissions.

Key: PM=particulate matter; PM_n=particulate matter with an aerodynamic diameter less than or equal to *n* micrometers.

Fugitive particulate matter emissions from unpaved roads are also quantified for the Tarmac King Road Limestone Mine processing facility. Fugitive dust emissions from unpaved roads occur from trucks transporting limestone from the facility and front-end loaders transferring limestone from the stockpiles to the trucks. Fugitive particulate matter emissions from paved roads are also quantified for the mine processing facility. Fugitive dust emissions from paved roads occur from trucks transporting limestone from the facility. Water would be applied to unpaved roads, and open stockpiles and stockpile height would be limited to mitigate wind entrainment of particulate matter from unpaved roads and stockpiles.

Greenhouse gas (GHG) emissions are described in Chapter 3, Section 3.9.2. There are currently no Federal, state, or local (Levy County) regulations limiting GHG by any industry. However, rules under consideration by the EPA would exempt sources that emit GHG below an annual threshold of 25,000 metric tons of carbon dioxide equivalence (CO_2e) (Trinity Consultants 2010).

4.10.1 Alternative 1 Potential Air Quality Impacts

Under the No Action Alternative, no mining would be permitted at the Tarmac King Road Limestone Mine site. Air emissions in the region of influence (ROI) are expected to remain similar to those described in Chapter 3, Section 3.9. Without mining operations at the proposed mine site, it is assumed that construction materials would be brought into the local area from mines within the state, outside the state, or outside the country via Florida's ports. It is expected that the extraction operations, combined with the additional travel distance required by obtaining aggregates from mines outside the state via rail, ship, and truck, would result in a greater increase in emissions than expected to result from operations at the Tarmac King Road Limestone Mine under the action alternatives.

GHG emissions would occur under the No Action Alternative due to the continued timber harvesting activities. As shown in Chapter 3, Table 3–20, estimated annual GHG emissions would be approximately 6,221 metric tons of CO_2e. Additional indirect GHG emissions would be realized due to the need to obtain limestone from other sources outside of the Tarmac King Road Limestone Mine site. Due to the amount of fuel consumed in shipping limestone, the GHG emissions would rise substantially the farther the source is from the King Road market area. Trinity Consultants (2010) estimated that there would be additional annual emissions of 13,000–63,000 metric tons of CO_2e if limestone was obtained from other Florida resource areas; 145,000–222,000 metric tons if obtained from U.S. sources outside Florida; 76,000 metric tons if obtained from Mexico; and 210,000 metric tons if obtained from Canada.

4.10.2 Alternatives 2–8 Potential Air Quality Impacts

Under Alternatives 2–8, it is estimated that 25 to 30 acres of land would be excavated and mined annually. Annual air pollutant emissions from Alternatives 2 through 8 are estimated for crushing, screening, conveying product, fugitive emissions, stockpile fugitives, and unpaved and paved road fugitives. Additionally, offsite truck hauling is estimated based on 1,000 truckloads and 60 employee trips per day at a maximum 70-mile radius. Table 4–16 details the offsite truck emissions from hauling aggregate.

Table 4–16. Estimated Annual Emissions from Offsite Hauling, Including Employee Vehicles

Pollutant	Tarmac King Road Limestone Mine Offsite Truck Hauling (tons per year)
Carbon monoxide	228
Nitrogen oxides	32.0
Sulfur dioxide[a]	0.20
PM_{10}	1.0
Volatile organic compounds[b]	21.1
$PM_{2.5}$	0.06

[a] Based on a sulfur content of 0.05 percent in diesel fuel. Regulations on fuels and fuel additives, beginning in June 2007, limit sulfur in diesel fuel for locomotives to 0.05 percent. Beginning in June 2012, sulfur in diesel fuel for locomotives is limited to 0.0015 percent (40 CFR 80.510).

[b] Calculated as total organic compounds.

Note: Emission factor of Tarmac King Road Limestone Mine offsite truck hauling based on all vehicle types using Mobile 6.2 vehicle model.

Key: PM_n=particulate matter with an aerodynamic diameter less than or equal to *n* micrometers.

Under Alternatives 2–8, criteria pollutant emissions from offsite hauling are estimated to increase by 1 percent for volatile organic components, nitrogen oxides, particulate matter (PM) with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$), and particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}) for the combined highway vehicle emissions of Levy, Citrus, and Marion Counties. A less than 1 percent increase of criteria pollutants is expected for sulfur dioxide and carbon monoxide highway vehicle emissions. $PM_{2.5}$ facility-wide emissions would

result in a 3 percent increase in all Levy County emissions. PM_{10} facility-wide emission would result in less than a 2 percent increase in Levy County emissions, including point, nonpoint, and mobile emissions.

GHG emissions were calculated (Trinity Consultants 2010) for proposed operations of the Tarmac King Road Limestone Mine based on an annual throughput of approximately 3,000,000 metric tons of limestone. Since the emissions are annualized, they apply to Alternatives 2–8 equally. The emissions were calculated using the following:

- Bulldozers, scrapers, trucks, and other gas-powered vehicles on site
- Trucks required to transport limestone from the mine to the market
- Personal vehicles used by Tarmac employees commuting to work
- Electricity purchased to operate draglines, processing equipment, and offices
- Fugitive emissions from air conditioning equipment

Direct annual GHG emissions from mining operations were calculated to be 14,790 metric tons CO_2e. Total annual GHG emissions, including indirect emissions from the reduction of timber harvesting in the mining area, would be 20,167 metric tons CO_2e (Trinity Consultants 2010). These emissions are less than 0.06 percent of Florida's annual GHG emissions.

There are currently no Federal, state, or local (Levy County) regulations limiting GHG emissions by any industry. However, rules under consideration by the EPA would exempt sources that emit GHGs below an annual threshold of 25,000 metric tons of CO_2e (Trinity Consultants 2010). There is no discernible impact anticipated from a change in GHG emissions by implementing any of the proposed alternatives. As noted above, projected annual GHG emissions would be the same under each alternative; the period of emissions would be longer for alternatives with larger footprints such as Alternative 2, and shorter for those with smaller footprints like Alternative 6. Performing a life-cycle analysis of GHG emissions for the aggregate produced would not be appropriate for this EIS, as it is outside the scope of the project impacts being assessed.

The potential health impact of diesel exhaust due to the increase in trucks on county roads was evaluated. The *Health Assessment Document for Diesel Engine Exhaust* (EPA/600/8-90/057F), published in May 2002, is a comprehensive study using data from the 1960s through the early 1990s to conclude that there is a causal relationship between diesel exhaust and cancer risk in humans. As stated in the document, the majority of the study was based on older diesel-burning engines, and that the increased risk was found to be small and could be affected by other factors. In June 2006, the "2007 Highway Rule" promulgated by the EPA took effect, requiring a 97 percent reduction in the sulfur content of highway diesel fuel from 500 to 15 parts per million by 2009. The EPA states that this is the greatest reduction in harmful emissions of soot, or particulate matter, ever achieved from cars or trucks. As a result, the potential health impacts of diesel exhaust have been drastically reduced and are considered minimal for any of the action alternatives.

4.11 AESTHETICS

Mining operations affect views where land is cleared of vegetation, large piles of excavated soil and aggregate are created, temporary and permanent haul roads are created, processing plant equipment and facilities are established, and truck traffic volume is generated. The current aesthetics of the Tarmac King Road Limestone Mine, as detailed in Chapter 3, Section 3.10, include mainly forested lands and pine plantations, with rural residential dwellings located south and east of the project site. The current site includes only unpaved roads. The activities of the King Road mine would change the way the current land of the proposed mine site is viewed. Traffic increases are also expected throughout the project site and along U.S. Route 19/98, the main arterial road, east of the project site. The lakes and berms that would be created would not be visible from the main arterial highway. After mining is complete, the land would be restored to a more natural state, although angular manmade lakes would occur throughout the project site. The following details potential aesthetics impacts of the No Action and action alternatives.

4.11.1 Alternative 1 Potential Aesthetics Impacts

Under the No Action Alternative, the Tarmac King Road Limestone Mine site would exist as a forested area used for timbering operations. The project site and mitigation area include intermittent streams, natural wetland and upland forests, mature pine plantation, young pine plantation, and disturbed areas. There are several manmade borrow ponds on the western third of the mine site as a result of road construction for timbering activities. Currently there are no lakes or rivers on the proposed mine site. The need for aggregate in the Florida construction industry would still need to be met by in-state and/or out-of-state sources if No Action is the alternative chosen; in such case, the aesthetic quality of another area would experience aesthetic changes similar to those described below under the action alternatives for the Tarmac King Road Limestone Mine.

4.11.2 Alternative 2 Potential Aesthetics Impacts

Under Alternative 2, 11 lakes totaling approximately 1,506 acres would be created throughout the project site. Additionally, Alternative 2 involves a temporary lake in the northeastern sector of the project site totaling 163 acres. The manmade lakes would be angular and would not look like naturally occurring lakes.

Under Alternative 2, as well as under the following six action alternatives, the mine site would include a vegetated perimeter buffer at least 100 feet wide that would function to shield mining activities from view. Manmade berms would surround the mine lakes during mining and would remain around open lakes post-project. These berms would serve to further shield mining from view and would extend no higher than 19 feet above sea level (Tarmac 2009). The dragline tower (305-foot boom) extends a maximum of 160 feet vertically. The overland conveyor systems and stockpiles would be less than 70 feet tall. During mining near site boundaries, some of these structures and the dragline tower would be visible from nearby areas just outside the project site.

Construction trucks and dust would be visible as the trucks move on and off the property from U.S. Route 19/98. During peak operation, maximum truck traffic is expected for 10 hours a day, averaging about 50 trucks per hour.

4.11.3 Alternative 3 Potential Aesthetics Impacts

Alternative 3 would be similar to Alternative 2, except 10 lakes totaling 958 acres would be created. Additionally, the area west of Butler Road would not be mined. A continuous, forested appearance would remain in this area, which would naturally blend with the vegetated areas to the west and with state-owned park/reserve lands. The other impacts discussed under Alternative 2 would also apply to Alternative 3 mining operations.

4.11.4 Alternative 4 Potential Aesthetics Impacts

Alternative 4 would be similar to Alternative 3, except 11 lakes totaling 1,029 acres would be created. Additionally, a 100-acre area in the northeast corner of the project site and a 150-acre area just north of the southern boundary would not be mined and would remain as forested land. An additional No Mine Area would also occur in the north-central sector of the project site. The other impacts discussed under Alternative 2 would also apply to Alternative 4 mining operations.

4.11.5 Alternative 5 Potential Aesthetics Impacts

Under Alternative 5, seven permanent lakes totaling 1,210 acres and one temporary 162.8-acre lake would be created. Additionally, the southeast corner of the project site would remain undisturbed to increase mining distance from local communities and state-owned park/reserve lands. The other impacts discussed under Alternative 2 would also apply to Alternative 5 mining operations.

4.11.6 Alternative 6 Potential Aesthetics Impacts

Under Alternative 6, three lakes totaling 713 acres would be created, all in the western third of the site. Additionally, the eastern half of the project site would remain undisturbed. The other impacts discussed under Alternative 2 would also apply to Alternative 6 mining operations.

4.11.7 Alternative 7 Potential Aesthetics Impacts

Alternative 7 would be similar to Alternative 4, except five lakes totaling 511 acres would be created. Additionally, the western half, the southeast corner, and a small area in the northeast corner of the project site would remain undisturbed. The other impacts discussed under Alternative 2 would also apply to Alternative 7 mining operations.

4.11.8 Alternative 8 Potential Aesthetics Impacts

Alternative 8 would be similar to Alternative 5, except seven lakes totaling 981 acres would be created. Additionally, the southeast corner of the project site would remain undisturbed to increase mining distance from local communities. The far western edge of the site has also been eliminated from this alternative to reduce the overall impact on wetlands. The other impacts discussed under Alternative 2 would also apply to Alternative 8 mining operations.

4.12 NOISE

Noise impacts associated with rock mining activities would result from blasting and operating excavators, loaders, trucks, crushing and sorting equipment, and conveying equipment. Potential impacts of specific alternatives are discussed below.

This section does not analyze noise impacts outside of the Tarmac King Road Limestone Mine area potentially caused by the different alternatives. To the extent that any alternative selected would prevent or reduce the amount of mining planned at the Tarmac King Road Limestone Mine, it is expected that the reduction in mining there would result in some increase in mining at other locations. This increase in mining elsewhere would occur at the conclusion of any permitted mining at the King Road Limestone Mine site. This could result in noise impacts at other locations that cannot be reasonably quantified for this EIS because the locations where mining would increase are unknown at this time; thus, these impacts are beyond the scope of this EIS.

4.12.1 Alternative 1 Potential Noise Impacts

Under the No Action Alternative, there would be no noise impacts from mining or mitigation activities. Noise from forestry and hunting activities would likely continue at these sites. Forestry activities are expected to produce similar noise levels to those produced previously when areas were harvested or prepped for replanting. Noise sources would include heavy equipment and trucks used to move logs. Noise levels at nearby residences would vary with the location of the logging operation.

4.12.2 Alternative 2 Potential Noise Impacts

Under Alternative 2, mining at the Tarmac King Road Limestone Mine would result in noise and vibration from quarry operations, trucking aggregate products from the mine site, and employee vehicles and other traffic. There would be some temporary noise impacts from earth-moving activity at the perimeter of the mine site when the earth berm is constructed. There would also be some temporary noise impacts from wetland mitigation activities at the mitigation site. Noise from continuing forestry and hunting activities in areas not yet mined would also continue as described under Alternative 1.

Quarry operation noise sources include equipment operations, such as draglines, loaders, conveyors, crushers, trucks, and employee vehicles. Vibration would result primarily from blasting. As the location of actively mined areas moves within the mine site, the noise sources would also move. Therefore, the noise and vibration affecting residential areas and other sensitive receptors would change as mining proceeds. The potential for disturbance of wildlife is discussed in Section 4.6, “Wildlife.”

During site clearing, berm construction, and mining operations, the receptors nearest to the site boundary have the greatest potential for noise impacts. The distances to nearest residences from various parts of the Tarmac King Road Limestone Mine site are presented in Chapter 3, Section 3.11. Under Alternative 2, quarry operations are estimated to be nearest to residences to the east of the mine site during the first 10 years of mining and nearest to residences to the south along Butler Road beyond the fortieth year of mining. During construction of the lake berm, when scrapers and bulldozers may be used, the daytime noise level at the residences south of the site along Butler Road about 700 feet from the equipment would be about 61 decibels A-weighted (dBA) (equivalent sound level over 8 hours). The daytime noise level at the residence south of King Road near SE 72nd Court, about 2,700 feet from the equipment, would be about 45 dBA. This equipment would be operated only during daytime hours. The noise level at the residences along Butler Road south of the mine site is not expected to reach a level that would interfere with normal activities, although it would exceed background sound levels. The noise level at the residence south of King Road from berm construction would be barely audible above background sound levels. At this residence, noise from truck traffic on King Road is expected to be audible. At this residence, the noise level during mining operations from traffic along King Road is estimated to be about 59 dBA during the peak hour; the noise level during mining operations from traffic along U.S. Route 19, including traffic generated by mining operations, is also estimated to be about 59 dBA during the peak hour. The combined noise level at this residence is estimated to be 62 dBA during the peak daytime hour.

Noise levels at the residences described above and other residences near the Tarmac King Road Limestone Mine are expected to be below the county noise level limit of 65 dBA (maximum level) for daytime hours at rural residential properties (Levy County 2009), except for the residences near the southern site boundary along Butler Road (Grimail Crawford, Inc. 2008). These closest residences are about 815 feet to the southwest from potential mining areas. Although mining operations are exempt from this noise limit, Tarmac has indicated it intends to control noise levels to meet this limit (Grove 2010:8). Tarmac concludes that sound levels could potentially exceed 65 dBA at these homes as a result of dragline, crusher, and screening operations at the mining area. Operating one equipment item near the site boundary would result in a maximum noise level of about 63 dBA at the nearest residence to the south along Butler Road; operating two items would result in a maximum noise level of 66 dBA if they were operated at their maximum level simultaneously at the same location. The report also indicates that Tarmac has committed to address this by providing a minimum 100-foot-wide vegetated buffer in this area to mitigate sound levels and to build berms to a minimum elevation of 19 feet above sea level around all mining areas before excavation begins. This would help minimize any sound emanating from the mining areas (Grove 2010:11). The complete noise study is included in Appendix K.

Ground vibration from blasting at the Tarmac King Road Limestone Mine was analyzed for nearby residential properties around the mine and compared with the Florida limits on vibration for precluding building damage. This analysis is presented in Section 4.7.4.

4.12.3 Alternatives 3–8 Potential Noise Impacts

Under Alternatives 3 through 8, the noise and vibration impacts would be similar to those under Alternative 2, except that there would be some variability in the location of the quarry operation. For example, under Alternative 6, quarry operations would not occur near the residences to the east, but truck noise along King Road would continue. Under Alternative 7, quarry operation would not occur near the residences to the south along Butler Road. In addition, these impacts under Alternatives 3–8 would occur for varying shorter periods of time, as completion of the project would occur earlier than it would under Alternative 2.

4.13 CULTURAL RESOURCES

Historical and archaeological sites are defined as those identified in the Florida Master Site File. Table 4–17 lists the historical and archaeological sites that could potentially be impacted by the action alternatives at the Tarmac King Road Limestone Mine and mitigation area. These include some sites that may be eligible for listing in the National Register of Historic Places (NRHP), as well as sites that have not yet been evaluated by the State Historic Preservation Officer (SHPO). These sites are all located within the wetland mitigation area.

Table 4–17. Recorded Archaeological Sites Potentially Impacted

Site Number	Name	Type	Impacted by Alternatives
LV00532	Turtle Creek North	Prehistoric midden(s)	2–8[c]
LV00110	Beetree Slough Mound	Prehistoric burial(s)[a]	2–8[c]
LV00468	Crackerville	Habitation (prehistoric)[b]	2–8[c]

[a] Contains human remains.
[b] Ineligible for listing in the National Register of Historic Places.
[c] Located within the mitigation site.
Source: FDHR 2009.

Under any of the alternatives, known archaeological sites would be clearly identified to construction personnel prior to land-disturbing activities to ensure that these areas are avoided. If unknown historical or archaeological artifacts were discovered, soil disturbance activities would be immediately halted and the Florida Division of Historical Resources would be notified. A permittee may be exempt from these restrictions if (1) appropriate documentation is obtained from the Florida Division of Historical Resources indicating that permitted activities would not affect any sites eligible for listing in the NRHP or (2) required mitigation procedures are followed, including submission of a Phase II archaeological survey to the USACE following approval of the survey design, submission and approval of a mitigation plan, and receipt of a "Certificate to Dig" from the SHPO.

This section does not analyze impacts on cultural resources outside of the Tarmac King Road Limestone Mine site potentially caused by the different alternatives. To the extent that any alternative selected would prevent or reduce the amount of mining planned at the Tarmac King Road Limestone Mine, it is reasonably foreseeable that the reduction in mining there would result in some increase in mining at other locations. This increase in mining elsewhere would occur at the conclusion of any permitted mining at the King Road Limestone Mine site. This could result in impacts on cultural resources at other locations that cannot be reasonably quantified for this EIS because the locations where mining would increase are unknown at this time; thus, these impacts are beyond the scope of this EIS.

Potential sites that may be impacted by each alternative are described below. Sites were listed as potentially being impacted by the alternatives if they were located within the mine site or the mitigation site.

4.13.1 Alternative 1 Potential Cultural Resource Impacts

The No Action Alternative would result in no further impacts on cultural resources within the proposed Tarmac King Road Limestone Mine and mitigation areas.

4.13.2 Alternative 2 Potential Cultural Resource Impacts

Alternative 2 would potentially impact the three archaeological sites listed in Table 4–17 as a result of wetland mitigation activities. None of these sites have been evaluated by the Florida SHPO. One site may contain human remains (FDHR 2009). As discussed above, these sites would be protected to the maximum extent possible. The *Cultural Resource Management Plan for the Tarmac Mine Mitigation Area* (Florida History 2008) proposes management measures to ensure that the cultural resources within the mitigation area are not disturbed. The SHPO approved the preliminary plan in 2008 (FSHPO 2008). Upon SHPO's and USACE's request, Tarmac provided an updated schedule and plan of work in 2012 for its management measures for known and unknown resources (Cardno Entrix 2012).

According to Panamerican's report, "the King Road Mine is recognized as having a low to moderate probability for prehistoric cultural material and archaeological sites" (Panamerican Consultants 2006). However, in the event that any unexpected discoveries were made during any permitted operations, the USACE and the state archaeologist would be notified and Tarmac would cooperate fully with Federal and state requirements regarding the protection of cultural and historic resources.

4.13.3 Alternatives 3–8 Potential Cultural Resource Impacts

Alternatives 3 through 8 would have impacts similar to those under Alternative 2, and mitigation measures would be implemented as discussed in Section 4.13.2 and Chapter 5.

4.14 RECREATION

The recreational opportunities afforded by the Tarmac King Road Limestone Mine and mitigation areas are currently limited to hunting, as discussed in Chapter 3, Section 3.13. The mine is located in the Gulf Hammock WMA and, according the Gulf Hammock evaluation report of 2004 (DSLSA, RCLS, and FNAI 2004), this area is under consideration for preservation under the Florida Forever project. One of the goals of the Gulf Hammock Florida Forever proposal is to increase natural-resource-based public recreation and possibly include passive recreation such as picnicking, hiking trails, and nature appreciation and education. Under the Florida Forever project, primitive camping and nature appreciation trails may be considered. A small part of the Gulf Hammock WMA, less than 3 percent, or 716 acres, could be considered as prioritized trail opportunities (DSLSA, RCLS, and FNAI 2004).

4.14.1 Alternative 1 Potential Recreation Impacts

Under the No Action Alternative, hunting would likely continue in the proposed mine and mitigation areas, although these areas may be preserved by the state as part of the Florida Forever project. If this alternative is implemented, it is possible that impacts on recreation in other areas of the state and/or out of state could occur during mining of aggregate from these areas.

4.14.2 Alternatives 2–8 Potential Recreation Impacts

Under Alternatives 2–8, hunting would be permitted within the mine site, but would not be permitted in active mine operations areas, including a surrounding prescribed buffer zone. The approved hunting areas and no hunting areas would be published annually by the landowner in the Gulf Hammock WMA brochure. The limited loss of hunting area in the Tarmac King Road Limestone Mine could shift hunting activities to other portions of the Gulf Hammock WMA or Goethe State Forest, increasing the number of visitors and hunting permits requested in those areas during hunting season. In addition, the mine area would no longer be available for preservation under the Florida Forever project.

Under Alternatives 2–8, the 4,526-acre mitigation area could be turned over to the state. Although no plans currently exist for recreation activities that might be allowed on the mitigation area other than hunting and fishing, it is conceivable that some trails would be constructed across the area for hiking, biking, and/or horseback riding. This area could conceivably be preserved by the state as part of the Florida Forever project or the Waccasassa Bay Preserve State Park.

The proposed mining operations under Alternatives 2–8 would not adversely affect the recreational enjoyment of Federal or county parks by the public as there are no Federal or county parks adjacent to the proposed mining site (Tarmac 2008b). The Waccasassa Bay Preserve State Park abuts the mitigation area to the west. This park provides wildlife viewing by canoe and other activities as discussed in Chapter 3, Section 3.13. Preservation of the mitigation area would add a buffer of land to the east side of the Waccasassa Bay Preserve State Park.

The manmade lakes remaining when mining is complete are not expected to provide recreational opportunities such as fishing, canoeing, or boating. Lakes created by quarry operations would not be specifically designed for public access, although it is certainly feasible that modifications could be undertaken post-project to allow this. Hunting could resume on the site, post-project. Because future land use is uncertain after project completion, and the lease on the mine parcel would revert use back to the current owner, all potential impacts on recreation are not known at this time.

The potential impacts on ecotourism in the region from the development of the King Road mine were evaluated. The primary objective of ecotourism is to provide an ecologically and economically sustainable model where people can visit pristine and relatively undisturbed natural areas while attempting to minimize the impacts from tourism on the natural environment. Activities associated with

ecotourism such as hiking, camping and boating are generally low impact in nature and can help provide funding for ecological conservation. There are a variety of ecotourism opportunities in Levy County including the Lower Suwannee National Wildlife Refuge, the Devil's Hammock WMA, and the Cedar Keys National Wildlife Refuge, in addition to several state parks. The proposed King Road mine would have no impact on the ecotourism for any of these areas. The proposed King Road mine would be developed in and around the Gulf Hammock WMA. This is a privately owned area of approximately 24,625 acres; the public are only allowed access during hunting season with a valid hunting license and a permit from the Florida Fish and Wildlife Conservation Commission (TWF 2013). Mining operations are considered a compatible land use in this area, and would be separated from other land uses using appropriate buffers as required under the Levy County Comprehensive Plan (Levy County 2013). There are no opportunities for ecotourism-related activities in the Gulf Hammock WMA. Therefore, development of the King Road mine would not have any adverse impacts on ecotourism.

4.15 SOCIOECONOMICS

The socioeconomic impacts presented in this section focus on the potential for the creation of new employment opportunities in the ROI, the earnings that would be generated from employment opportunities, and the resulting economic output generated by mining-related activities. To provide an estimate of impacts that can be directly compared with gross domestic product (GDP), an estimate of the value added to the local economy in terms of final goods and services is also presented. Value-added estimates take into account the portion of output that is directly attributed to activity in the local area and the portion of that activity that should be attributed to upstream sources. For example, the economic impact of gas purchased in the ROI should not be estimated based on the total revenue generated from the sale of the gas by a local retailer. Rather, it should be estimated based on the total revenue minus the costs that the retailer had to pay to a wholesaler where the gas was supplied. The retailer's cost should not be included as part of the impact in the ROI because that value should be attributed to the wholesaler. This method is consistent with how GDP is calculated and is done to eliminate double counting, as GDP only includes output by end use, and not intermediate goods and services.

It is assumed in this analysis that a regional mine developed at the King Road site would service a market area encompassing a 70-mile radius (approximately 100 miles driving) and could potentially service points as far away as Polk City, Lake Butler, Clearwater, Ocoee, Kathleen, and North Tampa. Primary markets that could be serviced would likely include Gainesville, Ocala, Leesburg, and the nearby Levy Nuclear Plant (LNP) potentially being developed east of U.S. Route 19, which is expected to result in a large, but relatively short-term, demand for aggregates.

4.15.1 Alternative 1 Potential Socioeconomic Impacts

Under the No Action Alternative, no mining would be permitted at the King Road site. If this alternative is implemented, the socioeconomic conditions of the ROI are expected to remain similar to those described in Chapter 3. In the absence of a localized source of construction material that would be provided by developing a regional mine, construction materials would be brought into the area from other domestic sources such as mines within the state, mines outside the state, or foreign sources that are brought into Florida's ports. Materials coming from within the state could be transported using a combination of rail and truck, while materials coming from outside the state would only be economically feasible if brought in by rail or integrated barge-tug units, then transported by truck. Ports that could potentially service the market area include the Port of Tampa, Port Manatee, Port Canaveral, and the Port of Jacksonville.

4.15.2 Alternative 2 Potential Socioeconomic Impacts

Socioeconomic impacts under Alternative 2 would be divided into two distinct phases: the construction phase and the operations phase. During the construction phase, a portion of the proposed mine site would be cleared and the infrastructure necessary to support mining operations would be put in place. No marketable construction materials would be produced during this phase. The operations phase would include the extraction and processing of materials for sale and transportation to the points of use. Impacts specific to each phase are discussed in detail in the following sections.

4.15.2.1 Construction Phase

Under Alternative 2, construction activities associated with mine site development are expected by the applicant to begin in 2013 and extend through 2014. During this time, Tarmac estimates that 60 people would be directly employed each year during construction (kingroadmine.com). The direct employment is expected to result in additional indirect employment opportunities. The indirect employment has been estimated by the USACE using multipliers developed by the Bureau of Economic Analysis specifically for the ROI (BEA 2011). The ROI direct effect employment multiplier for the construction industry of 1.4072 indicates that 60 direct jobs would result in 24 indirect jobs throughout the region. Therefore, a total of 84 jobs would be created in the ROI during the construction phase of Alternative 2.

The average Florida construction worker earned approximately $37,000 in wages in 2011 (BLS 2012a). Wages for the same occupations vary throughout the state; however, wages are not compiled by the Bureau of Labor Statistics (BLS) for every region. The closest region to the King Road site with BLS wage data is Ocala. The average wage for construction workers in the Ocala area was approximately $34,200 in 2011. Total compensation is defined as the sum of wages and benefits. Using BLS data that state average benefits amount to approximately 30 percent of total compensation, it is estimated that the total compensation of a construction worker in Ocala was $48,900 in 2011 (BLS 2012b, 2012c). The total compensation for workers that would be directly employed during the construction phase is estimated to be approximately 2.9 million dollars annually. The wages of those people indirectly employed were estimated using the average annual wages for all occupations in Ocala—approximately $36,500 in 2011. Total compensation for indirect workers in the ROI is estimated to be approximately 1.3 million dollars annually. The total compensation of direct and indirect workers is estimated to be approximately 4.2 million dollars annually.

Approximately 21 million dollars of economic output are estimated to be generated during the construction phase of the project (BEA 2011). The indirect economic output resulting from construction spending in the ROI could reach approximately 9 million dollars, for a total potential economic impact of approximately 30 million dollars of output. The value added to the local economy from direct construction activity in terms of final goods and services that are directly comparable to GDP is estimated to be approximately 16 million dollars.

4.15.2.2 Operations Phase

Under Alternative 2, production and sales of construction-grade materials from the Tarmac King Road Limestone Mine are expected by the applicant to begin at some point in 2014. It is estimated that 25 to 30 acres would be mined each year to produce approximately 3 million tons of crushed rock. At this rate of production, it is estimated that mining under this alternative would come to an end between 2106 and 2124.

During the operations phase, Tarmac estimates 35 people would be directly employed by its mining operations annually. Indirect employment opportunities resulting from the direct employment were estimated using the direct effect employment multiplier for the ROI stone mining and quarrying industry of 1.6846 (BEA 2011). It is estimated that 35 direct jobs would create an additional 24 indirect jobs. Therefore, a total of 59 jobs would be created in the ROI during the operations phase of Alternative 2.

The average wage of mining personnel was estimated using a weighted average of reported wages for mining-related occupations in all of Florida, as regional data for areas such as Ocala did not include many of the occupational categories for mining personnel (BLS 2012a). The occupations used in the calculation include “excavating and loading machine and dragline operators,” “continuous mining machine operators,” “rock splitters, quarry,” and “helpers, extraction workers.” In 2011, the average annual wage of those directly employed by mining operations was approximately $34,600. Average wages plus benefits of mining personnel were estimated to be approximately $49,400, assuming that benefits amount to approximately 30 percent of total compensation (BLS 2012b, 2012c). The total compensation of workers directly employed by mining operations is estimated to be approximately 1.7 million dollars annually. The total compensation of workers indirectly employed is estimated to be approximately 1.3 million dollars using the same methodology described above under the construction phase.

Therefore, direct and indirect workers would earn a total of approximately 3.0 million dollars annually in the ROI during the operations phase of Alternative 2.

The annual direct economic output generated from mining activities is estimated to be approximately 35.8 million dollars. This estimate is derived using the average cost per ton of limestone sold or used in Florida in 2011, $11.92 (USGS 2012), and assumes annual sales of 3 million tons of crushed rock. This cost represents the "free on board" value and does not include the cost of transportation to the consumer. The indirect economic output resulting from mining operations could reach up to 11.3 million dollars, for a total potential economic impact of approximately 47 million dollars of output annually. The value added to the local economy from direct economic output in terms of final goods and services that are directly comparable to GDP is estimated to be approximately 24.8 million dollars annually.

Mining operations would also result in increased revenue to Levy County from property taxes, sales taxes, and fees generated from licenses and permits. The discretionary sales surtax in Levy County is 1 percent (FDOR 2010); therefore, sales of crushed rock at the quarry are expected to generate approximately $358,000 of revenue for the county annually. The taxes generated from indirect output are estimated to generate another $113,000 in revenue, resulting in a total impact of approximately $470,000 in revenue that otherwise would not have been generated. Additional revenue to the county would be generated through personal property taxes and license and permit fees.

4.15.2.2.1 Transportation

All of the material produced at the Tarmac King Road Limestone Mine would be transported from the quarry to the point of use by trucks capable of hauling 20 tons per trip. Typically this is done by independent operators who do not work for the mining company. Assuming the mine would operate 300 days out of the year, production is estimated to be 10,000 tons daily. To transport this material would take an estimated 500 trips a day. Assuming that each independent operator is capable of making 2 round trips each day, up to 250 independent operators would be needed. Indirect employment opportunities resulting from employing independent operators were estimated using the direct effect employment multiplier for the ROI truck transportation industry of 1.4874 (BEA 2011). It is estimated that 250 independent operators transporting materials would generate approximately 122 indirect jobs. Therefore, a total of 372 transportation jobs would be created in the ROI during the operations phase of Alternative 2.

Average earnings for independent operators were estimated using the average annual wage for Ocala area heavy and tractor-trailer truck drivers of $34,500 in 2011 (BLS 2012b). The total earnings of 250 independent operators are estimated to be approximately 8.6 million dollars. The earnings of 122 indirect workers are estimated to be 6.4 million dollars using the same methodology described above under the construction phase. Therefore, the total earnings impact of direct and indirect workers is estimated to be approximately 15 million dollars annually.

The annual direct economic output generated from the delivery of construction materials is estimated to be 22 million dollars. This estimate assumes the average distance materials would be hauled is 50 miles and the cost per ton-mile is 15 cents (CDOC 2006). The indirect economic output resulting from hauling crushed rock could reach up to 7.2 million dollars, for a total potential economic impact of approximately 29.74 million dollars of output annually. The value added to the local economy from direct economic output in terms of final goods and services that are directly comparable to GDP is estimated to be approximately 15 million dollars annually.

There is potential for adverse impacts on local traffic conditions resulting from truck transport and employee commutes. The estimated 500 round trips a day discussed above would increase traffic volumes on local roads by 1,000 heavy vehicles daily. Additionally, 35 direct employees could potentially increase the volume of traffic by up to 70 passenger vehicles a day. An analysis of the impacts on local transportation resulting from mining operations was performed as part of the permit application. The results of this analysis indicate that the levels of service of roads to and from the mine are expected to remain above level of service standards (Grimail Crawford, Inc. 2007).

Lincks & Associates (2010) completed traffic studies for six key points along main roads in the vicinity of the mine site. Existing traffic volumes are discussed in Chapter 3, Section 3.14.5. Peak hourly morning and afternoon traffic volumes are presented in Table 3–28, and indicated that the six main roads studied are all well below capacity. Future traffic growth volumes were based on the historical trend and were estimated to be approximately 3 percent per year (Lincks & Associates 2010). Under the No Action Alternative, this traffic growth would not exceed the estimated peak-hour capacity of any of the roads studied until 2045.

Under Alternatives 2–8, traffic was estimated for years 2014 and 2020. Traffic associated with the operation of the Tarmac King Road Limestone Mine, as well as the estimated 1,000 truck trips per day, was added into the traffic volumes. Estimated traffic from the construction and operation of LNP was also included in the traffic volumes. Estimates were made for traffic distribution on the six major roads around the mine site based on the field data collected. Note that no truck traffic was assumed to travel on County Road 40 between U.S. Route 19 and County Road 336 because County Road 40 currently has a weight restriction of 10,000 pounds (Lincks & Associates 2010). This portion of road was included in the June 2010 Lincks & Associates Inc. *Transportation Analysis: Tarmac – Levy County* to capture the potential for "non-truck project trips" that might be added to that road as a result of the project. These trips could include mine employees or vendors. Table 4–18 lists the peak morning and evening traffic volumes for 2014 and 2020 based on the existing volume, 3 percent annual growth, and the estimated contribution of the Tarmac King Road Limestone Mine and LNP. All of the roads surrounding the mine site are well within capacity through the 2020 projections on this table. Using those same growth projections, traffic would begin to exceed peak-hour capacities of local roads 1 to 2 years earlier under Alternatives 2–8 than under the No Action Alternative. Since traffic from the proposed LNP is also considered in these estimates, the year that peak-hour capacities would be exceeded would be further in the future if the LNP is not constructed. The complete traffic study is included in Appendix J.

Traffic impacts on surrounding communities such as Dunnellon were analyzed in detail. Tarmac's June 2010 Lincks & Associates Inc. *Transportation Analysis: Tarmac – Levy County* projects approximately 16 percent of its truck traffic would move east on County Road 336 and on to County Road 40. This would equate to approximately 16 trucks during the morning peak hour and 7 trucks during the evening peak hour. These numbers are approximately 1.2 percent of the roads' capacity in the morning peak hour, and 0.5 percent in the evening peak hour, Mondays through Saturdays; trucks would not run on Sundays. County Road 40 runs through the Dunnellon Boomtown Historic District. There is currently no restriction on trucks of this size using this road. The size and weight of trucks and their loads, as well as safety requirements that apply to the operation of commercial vehicles on the state's public highways, are regulated by the Florida Department of Transportation. In consideration of the roads' designed weight and traffic capacities, this minor increase in traffic is not expected to have a significant impact on air quality, school zones, property values, or overall quality of life in Dunnellon. In compliance with Section 106 of the National Historic Preservation Act, the USACE determined that the Dunnellon Boomtown Historic District is outside the project's area of potential effect. In addition, the *Marion County 2035 Long-Range Transportation Plan* proposes a bypass to be constructed connecting County Road 40 to U.S. Route 441, which would allow through traffic to avoid the downtown area of Dunnellon.

Table 4–18. Years 2014 and 2020 Peak Hours Traffic Analysis

Roadway	From	To	Period	Peak-Hour Capacity	2014 Traffic				2020 Traffic			
					Background	LNP	King Road Mine	Total	Background	LNP	King Road Mine	Total
King Road	U.S. 19	Project	AM	1,390	0	0	118	118	0	0	118	118
			PM	1,390	7	0	64	71	8	0	64	72
U.S. 19	C.R. 326	S.R. 121	AM	2,390	237	335	5	577	274	168	5	447
			PM	2,390	353	266	3	622	408	137	3	548
U.S. 19	S.R. 121	King Road	AM	2,390	343	395	56	794	396	198	56	650
			PM	2,390	499	313	29	841	577	161	29	767
U.S. 19	King Road	C.R. 40	AM	2,390	343	922	62	1,327	396	462	62	920
			PM	2,390	499	732	35	1,266	577	374	35	986
U.S. 19	C.R. 40	Citrus	AM	2,390	618	658	61	1,337	714	330	61	1,105
			PM	2,390	940	524	33	1,497	1,087	266	33	1,386
C.R. 40 E	U.S. 19	Marion	AM	1,390	268	132	1	401	310	66	1	377
			PM	1,390	384	104	2	490	444	54	2	500
S.R. 121	U.S. 19	C.R. 337	AM	1,390	140	40	33	213	162	20	33	215
			PM	1,390	170	31	17	218	197	16	17	230
C.R. 336	S.R. 121	Marion	AM	1,390	52	20	18	90	60	10	18	88
			PM	1,390	56	16	9	81	65	8	9	82

Key: C.R.=county road; LNP=Levy Nuclear Plant; S.R.=state route; U.S.=U.S. route.
Source: Lincks & Associates 2010:Tables 5 and 6.

Based on the traffic study and the volume of truck traffic turning onto and off of U.S. Route 19 at King Road, Lincks & Associates (2010) recommended that left and right turning lanes in excess of 400 feet be established along U.S. Route 19. Tarmac would apply for approval of these lanes from the Florida Department of Transportation and would be responsible for financing their installation.

4.15.2.2.2 Total Economic Impact of Operations and Transportation

Table 4–19 displays the total combined impacts of mining operations and transporting crushed rock from the quarry to the customer. Implementation of this alternative would have an additional positive impact on the low-income populations identified in the ROI through creation of relatively well-paying jobs from construction and operation of a mine. As indicated in the table, total employment under Alternative 2 could be as high as 431 jobs annually. These jobs are expected to pay approximately 18 million dollars annually in wages and benefits to employees living in the ROI and could generate approximately 76.8 million dollars in economic output. The direct economic activity would be expected to increase the GDP of the ROI by approximately 40 million dollars annually.

Table 4–19. Annual Economic Impacts of Mining Operations and Truck Transportation

Operations Phase (2011 dollars)				
	Employment	**Earnings**	**Output**	**Value Added**
Mine Operations	59	$2,983,044	$47,063,736	$24,770,952
Independent Operators	372	$14,982,414	$29,706,750	$15,025,500
Total	431	$17,965,458	$76,770,486	$39,796,452

4.15.3 Alternatives 3–8 Potential Socioeconomic Impacts

The potential socioeconomic impacts under Alternatives 3 through 8 would be the same as those identified above under Alternative 2. All of these alternatives would be implemented in the same manner and rate of production as described above. The major difference between the alternatives from a socioeconomic standpoint would be the duration of the project. Table 4–20 displays estimates of the years in which mining operations are expected to end under each alternative, assuming a start date of 2014 and a mining rate of 25 acres per year (low) and 30 acres per year (high). The earliest year mining is expected to end is 2044 under Alternative 7.

Table 4–20. Estimates of the End of Mining Operations for Each Alternative

Alternative	2	3	4	5	6	7	8
High Final Year	2124	2089	2081	2106	2056	2050	2090
Low Final Year	2106	2077	2070	2090	2049	2044	2077

4.16 ENVIRONMENTAL JUSTICE

As discussed in Chapter 3, Section 3.15, the area surrounding the potential mine site does not consist of higher-than-normal concentrations of minority populations when compared with both the state and county averages. However, the surrounding area does contain higher-than-average concentrations of low-income populations when compared with the state.

This section addresses the potential environmental justice impacts of implementing the alternatives discussed in this EIS. No adverse impacts on the local population are expected to occur as a result of implementing any of the alternatives discussed in this EIS. Therefore, none of the alternatives is expected to result in a disproportionately adverse impact on minority or low-income populations.

4.16.1 Alternative 1 Potential Environmental Justice Impacts

Under the No Action Alternative, there would be no mining-related activities. Conditions in the ROI would remain unchanged from those described in Chapter 3, Section 3.15. Therefore, there would be no disproportionately high and adverse impacts on minority or low-income populations.

4.16.2 Alternative 2 Potential Environmental Justice Impacts

Under Alternative 2, the maximum amount of proposed acreage would be mined. Minority and low-income populations are subsets of the local total population; however, the analysis presented in the various resources areas throughout this chapter identified no adverse impacts on the total population in the ROI. Therefore, no disproportionately high and adverse impacts on minority or low-income populations are expected.

4.16.3 Alternatives 3–8 Potential Environmental Justice Impacts

Impacts under Alternatives 3 through 8 would be similar to those described above under Alternative 2, although for shorter durations corresponding with the smaller mine footprint size of each alternative. Minority and low-income populations are subsets of the local total population; however, the analysis presented in the various resources areas throughout this chapter identified no adverse impacts on the total population in the ROI.

4.17 CUMULATIVE IMPACTS

Council on Environmental Quality regulations (40 CFR 1500–1508) define cumulative impacts as effects on the environment that result from implementing the proposed action or any of the alternatives when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions (40 CFR 1508.7). Thus, the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource irrespective of the proponent (EPA 1999).

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative impacts can also result from spatial (geographic) and/or temporal (time) crowding of environmental perturbations (i.e., concurrent human activities and the resulting impacts on the environment are additive if there is insufficient time for the environment to recover).

The sections below describe impacts from the proposed action (see Section 4.17.1), impacts from past actions (see Section 4.17.2), impacts from reasonably foreseeable future actions (see Section 4.17.3), and finally results of the cumulative impacts analysis (see Section 4.17.4). Watersheds are commonly used as boundaries for evaluating cumulative impacts on wetlands and water quality, but are less functional when used to assess impacts on other factors, including socioeconomics, air quality, land use, wildlife, noise, or environmental justice. Using the Hydrologic Unit Code (HUC) and cataloging system utilized by EPA and the U.S. Geological Survey, the proposed project site lies just within the southern edge of the Waccasassa Watershed (HUC 03110101). Most of this watershed lies “upstream” of the project site, extending more than 45 miles away. Actions occurring that far away would be unlikely to produce cumulative impacts. However, many nearby actions have the potential to produce cumulative impacts, but are within the adjacent Withlacoochee Watershed (HUC 03100208). Using other geographic or political boundaries such as rivers or county lines would also exclude nearby actions that should clearly be considered in this analysis. In order to consider the full range of impacts evaluated within this EIS, reviewing actions within a set distance of the proposed site is more appropriate. Therefore, cumulative impacts have been evaluated for actions potentially impacting resources within 10 miles of the Tarmac King Road Limestone Mine and mitigation areas. This distance was selected as it encompasses all of the adjacent Withlacoochee Watershed’s section along the river of the same name, a large part of the Gulf Hammock, and the nearby major roads that would be most impacted by mine traffic. Activities outside this area are unlikely to interact with proposed activities at the mine and mitigation areas to produce cumulative impacts. Possible exceptions to this are socioeconomics, environmental justice, recreation, and cultural resources; therefore, those factors are evaluated using a larger scope, as described below.

4.17.1 Impacts That Would Occur as a Result of the Proposed Action

Sections 4.2 through 4.16 present the impacts that would occur as a result of the proposed action. These impacts have been discussed in detail for Alternatives 1 through 8. The geographic boundaries of the impacts vary by the area being evaluated and are described in the individual sections. For example, the socioeconomic impacts could have an effect throughout the state, depending on the alternative being evaluated.

4.17.2 Impacts That Have Occurred as a Result of Past Actions

As discussed in Chapter 3, the Gulf Hammock area has been affected by moderate to very intensive past silviculture activities (pine plantations) and by some residential, road, and utility development. As shown in Table 3–12, approximately 21,300 acres (34 percent) of the Gulf Hammock region are actively cultivated in pine plantations. The environmental impacts of these activities include a loss of wetlands in the Gulf Hammock and a reduction in the quality and functions of remaining wetlands; destruction and fragmentation of other high-quality habitat; soil disturbance and compaction; introduction of exotic and invasive species; and loss of habitat for other plant and animal species. These impacts are reflected in the current conditions in the region, as described in Chapter 3, "Affected Environment."

The Florida Gas Transmission Company constructed a natural gas pipeline loop through Levy and Citrus Counties as part of an expansion of its existing pipeline system. This loop comprises about 46.1 miles of 36-inch-diameter pipeline running north-south through Levy and Citrus Counties. The majority of the pipeline route was planned to be constructed parallel to existing Florida Gas Transmission Company pipelines with an offset typically of 25 feet from the nearest existing pipeline. Construction involved some disturbance of wetland areas (FERC 2009). Wetlands in gas pipeline corridors generally are restored to original wetland grades to retain their hydric characteristics, although permanent conversion from forested to herbaceous habitats is typical. The previously existing natural gas pipeline is located approximately 1.5 miles east of the proposed Tarmac King Road Limestone Mine boundary, with the pipeline passing as close as 1 mile from the southeast corner of the proposed mine.

The Citrus Mining and Timber (Cemex) and HCR Mining Inc. (Holcim), mines are located approximately 4.2 and 5.8 miles, respectively, south of the Tarmac King Road Limestone Mine site. The Cemex mine contains over 700 acres of disturbed land associated with mining activities, with the majority of this disturbance occurring prior to 1994. The Holcim mine contains over 1,100 acres of disturbed land associated with mining activities, most of this existing as excavated quarries. Approximately two-thirds of this land disturbance has occurred since 1995.

4.17.3 Potential Impacts of Reasonably Foreseeable Future Actions

As noted throughout this chapter, the creation of additional mines, or increased mining at existing mines in other areas, is expected if the No Action Alternative is selected, or at the end of mining under any of the action alternatives. Because the potential locations of increased or new mining operations and the volumes that might be mined are unknown at this time, these impacts could not be quantified in this EIS. However, there are a number of reasonably foreseeable future actions that could result in additional environmental impacts in the area surrounding the proposed Tarmac King Road Limestone Mine. These include the proposed LNP Units 1 and 2, Inglis Hydropower Project, EPA "Superfund" and state-funded cleanup sites, transmission lines, and road projects. The following paragraphs describe the potential impacts of these activities.

4.17.3.1 Levy Nuclear Plant Units 1 and 2

Florida Power Corporation, doing business as Progress Energy Florida, Inc.,[2] proposes to build and operate two Westinghouse Electric Company, LLC, AP1000 nuclear reactors at a site in Levy County. The AP1000 design has a thermal power rating of 3,415 megawatts thermal, with a design gross-

[2] Progress Energy merged with Duke Energy in July 2012, and Duke Energy began phasing out the Progress Energy brand in April 2013. This final EIS continues to refer to Progress Energy, as referred to throughout the *Final Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2*.

electrical output of approximately 1,200 megawatts electric (NRC 2012). The numbers used for cumulative impacts as a result of the construction and operation of LNP are based on those provided in the *Final Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2* (NRC 2012).

The LNP site is approximately 3,105 acres in size, with the primary location for the two reactors and associated support buildings comprising approximately 627 acres near the center of the site. The nearest boundary of the proposed site is approximately 2 miles east of the proposed Tarmac King Road Limestone Mine (NRC 2012).

The AP1000 units would use a recirculating cooling water system, and waste heat would be dissipated by a series of mechanical draft cooling towers, which would draw makeup cooling water from the Cross Florida Barge Canal (CFBC). This canal extends west about 7.4 miles from the Inglis Lock at Lake Rousseau to the Gulf of Mexico. The intake structure would be located approximately 6.9 miles from the Gulf of Mexico on the berm that forms the north side of the canal and within 0.5 miles of the Inglis Lock. When the intake is operational, it is anticipated that the makeup water to the cooling towers would be seawater drawn from shallow, nearshore gulf waters. Freshwater sources would not be used for cooling tower makeup. Cooling tower blowdown, including residual waste heat, would be transported in two pipelines (one for each unit). The blowdown lines would run south to the CFBC and then west along the northern edge of the bypass canal. They would then cross the bypass canal just north of the Crystal River Energy Complex (CREC), run south, and discharge into the CREC discharge canal and ultimately into the Gulf of Mexico (PEF 2008).

LNP would require a new transmission system to incorporate the additional power into the Florida electrical grid system. Four new 500-kilovolt (kV) transmission lines and two new substations would connect LNP to the Florida electrical grid system. Two of the four lines would connect to the proposed Citrus Substation, one would connect to the proposed Central Florida South Substation, and the last one would connect to the CREC 500-kV switchyard. Approximately 82 miles of transmission line corridors would be needed to make these connections. The transmission line corridors would use the utility's existing high-voltage transmission line corridors and other existing linear corridors and major roads to the maximum extent possible. Additional 230-kV transmission lines from the new substations would be constructed to distribute power. In total, about 180 miles of new transmission line corridors would be needed to connect the LNP site to the electrical grid system. Of that, approximately 98 miles would be new or widened corridors of approximately 1,000 to 2,640 feet wide to allow for maximum flexibility when determining the right-of-way. A total of approximately 98 miles of new or widened corridors would be needed to connect to the first substations to incorporate the power generated by LNP into the electrical grid system (NRC 2012).

4.17.3.2 Inglis Hydropower Project

Inglis Hydropower proposes to install an electrical generation facility on 1.7 acres at the existing Inglis Bypass Spillway, which carries the flow of the Withlacoochee River in Inglis, Florida. The Inglis Hydropower Project would be 4 miles south-southeast of the proposed Tarmac King Road Limestone Mine. The proposed project facilities and components include a new powerhouse, intake structure, penstock, intake and discharge channels, and turbines and a re-conductored existing transmission line. Total plant output would be 2.0 megawatts. The estimated annual energy production would be 12,300 megawatt-hours, enough to supply energy for up to 2,000 homes (Inglis Hydropower 2008).

The existing Inglis Dam, the Bypass Channel, and the Bypass Spillway are part of the Marjorie Harris Carr Cross Florida Greenway. The Bypass Channel carries water from Lake Rousseau, which was formed by the construction of Inglis Dam in 1909 by Florida Power Corporation for the generation of hydroelectric power. The original hydroelectric project was dismantled in the 1960s during construction of the CFBC (Inglis Hydropower 2008).

4.17.3.3 EPA "Superfund" Cleanup Sites

The EPA National Priorities List (also known as Superfund sites) was reviewed to determine whether these sites could contribute to cumulative impacts at the proposed Tarmac King Road Limestone Mine (EPA 2009a, 2009b, 2009c, 2009d). One National Priorities List site is located within 10 miles of the proposed mine. The Barker Chemical site in Inglis, Florida, is approximately 3.3 miles south of the proposed mine. The Florida Department of Health has determined that the Barker Chemical site is no longer a public health hazard (ATSDR 2008; EPA 2009b, 2009d).

The State of Florida also actively pursues cleanup of contaminated sites through the state-funded Superfund Program (FDEP 2009a, 2009b). There are no state-funded Superfund sites within 10 miles of the proposed mine.

4.17.3.4 Transmission Lines

Information on transmission line projects was collected to determine whether major projects are planned for the region around the proposed Tarmac King Road Limestone Mine. Progress Energy Florida is considering adding about 200 miles of 230-kV and 500-kV transmission lines across nine counties in Florida to maintain reliability and to move energy efficiently to customers throughout the state (PEF 2009a). Portions of the transmission lines in Levy and Citrus Counties would be within 10 miles of the proposed mine.

New rights-of-way would be needed for 9 miles of new 500-kV transmission lines between the proposed LNP and the area near the proposed Citrus Substation. The transmission line would be as close as 2.5 miles east of the Tarmac King Road Limestone Mine. Rights-of-way may be up to 705 feet wide to accommodate four 500-kV lines. Progress Energy may need to purchase up to 5 homes in this area, depending on the selected route. Typical heights of the 500-kV transmission structures would range from 120 to 175 feet above ground. One of the 500-kV lines would continue on to the CREC in existing rights-of-way. Two of the 500-kV lines would connect into the proposed new substation. One of the 500-kV lines would turn and go east into Marion and Sumter Counties (PEF 2009b).

In addition, a 230-kV transmission line is planned to be constructed between the CREC and the Brooksville West Substation in Hernando County, a distance of about 41 miles. The transmission line would be as close as 10 miles south of the Tarmac King Road Limestone Mine. This transmission line would be constructed in the existing rights-of-way through most of Citrus and Hernando Counties. The existing 115-kV line would be rebuilt to accommodate the new 230-kV line. The existing wood poles and lattice structures would be removed and replaced with single steel structures. Typically, heights of the new 230-kV transmission structures would range from 90 to 150 feet above ground (PEF 2009b).

4.17.3.5 Water Pipelines

The makeup water intake and blowdown pipelines are proposed to connect to LNP Units 1 and 2. The makeup water pipeline corridor would disturb a total of 68.0 acres between LNP and the CFBC. The proposed blowdown pipeline corridor would disturb a total of 115.6 acres between LNP and the CREC (PEF 2008). These water pipelines would be as close as 2.5 miles east of the Tarmac King Road Limestone Mine.

4.17.3.6 Road Projects

Information on road projects was collected to determine if major projects could impact the region around the proposed Tarmac King Road Limestone Mine. A number of road projects are ongoing or planned, and are relatively minor maintenance, upgrade, and resurfacing projects (FDOT 2009a, 2009b, 2009c).

4.17.3.7 Port Citrus

The Port Authority in Citrus County is proposing establishment of a commercial port on the CFBC. Port Citrus is in the early stages of planning, with feasibility studies to begin after Port Citrus' selected its contractor in 2012 to perform them. According to information on the Port Authority's website, portcitrus.com, no dredging or impacts on wetlands or sea grass beds would occur; therefore, cumulative impacts on those resources are not expected. Since the scope or even the feasibility of the project has not been determined, impacts on other resources or factors such as land use cannot be estimated at this time.

4.17.3.8 Other Potential Nearby Projects

The USACE is aware of two other potential sources of cumulative impacts that could begin in the vicinity over the next several years. Approximately 35,700 acres of land has been recently purchased in Taylor County by affiliated companies for a cattle operation. Media reports indicate that these companies may use part of the land for cattle operations, with a portion remaining in silviculture. The cattle would be entirely grass-fed, which could result in ground or surface water withdrawals higher than for typical cattle operations in order to irrigate additional pasture grasses. No designs or requests for land use changes have been submitted for approval at the county or state level, so quantifying potential impacts is not possible at this time. However, these parcels are approximately 15 miles or greater from the Tarmac King Road Limestone Mine site, and therefore would be unlikely to contribute to cumulative impacts in the EIS project area.

In addition, a proposed sand mine approximately 2 miles east of the Tarmac King Road Limestone Mine site is in the pre-application phase with Levy County. The project as proposed to the county involves a parcel approximately 380 acres in size, 241 acres of which would be disturbed through mining activities. While the early design indicates wetlands are present on the parcel, the project would avoid those areas and provide for 100-foot-wide wetland buffers. Groundwater withdrawal is not proposed, and lake evaporation would not be a factor, as excavation would be limited to 2 feet above the seasonal high water table. However, transportation would be impacted, as trucking sand material could add up to 250 daily truck trips to local roads.

4.17.4 Results of the Cumulative Impact Analyses

As defined above, cumulative impacts on the environment result from adding the proposed action (i.e., the Tarmac King Road Limestone Mine) to other past, present, and reasonably foreseeable future actions. The following future actions are not expected to add to cumulative impacts:

- *Inglis Hydropower Project.* Because the Inglis Hydropower Project would disturb only 1.7 acres, is approximately 3.3 miles south of the proposed mine, would result in little pollutant emissions, and is in a different surface water drainage basin, cumulative impacts are not expected.

- *EPA Superfund and State-Funded Cleanup Sites.* Because substantial cleanup actions have occurred at the Barker Chemical site, the Florida Department of Health has determined that the site is no longer a public health hazard, the site is approximately 3.3 miles south of the proposed mine, and the site is in a different surface water drainage basin, cumulative impacts are not expected.

- *Natural Gas Pipelines.* Because the Florida Gas Transmission Company natural gas pipeline loop through Levy and Citrus Counties parallels the existing pipeline, results in little pollutant emissions or loss of wetland acreage and function, and is approximately 1.5 miles east of the proposed mine, cumulative impacts are not expected.

- *Road Projects*. These types of road projects can be expected to have temporary impacts through increased air emissions and noise. However, these temporary impacts would also be minimal. Because no major road projects have been identified, cumulative impacts are not expected.

Cumulative impacts are evaluated for LNP Units 1 and 2 and associated utility (i.e., transmission lines and water pipelines) and transportation infrastructure (i.e., access roads and railroads). Potential cumulative impacts are described for the resource areas listed in this chapter.

4.17.4.1 Hydrology

As described in Section 4.2, construction and operation of the Tarmac King Road Limestone Mine would result in no withdrawals from existing surface water bodies. LNP operations would result in an anticipated withdrawal rate of 122 million gallons per day of cooling water from the CFBC. Withdrawal of brackish water ultimately sourced from the Gulf of Mexico would not impact surface water levels or availability (NRC 2012). Therefore, there would be no cumulative impact from surface water withdrawals.

Because stormwater would be contained within the mined areas of the Tarmac King Road Limestone Mine, surface water runoff flowing downstream toward the Waccasassa Bay Preserve State Park would decrease by approximately 1.6 cubic feet per second from the current annual average stream flow of 10 cubic feet per second (Tarmac 2009). Drainage from the LNP site would occur in three different subbasins of the Waccasassa and Withlacoochee River basins. The upper part of the LNP site lies in the Spring Run subbasin of the Waccasassa River basin. Runoff from this area travels through overland pathways until it reaches Spring Run. Flow from Spring Run Creek travels directly to the Gulf of Mexico. Flow from the middle of the LNP site, including the locations of the two proposed reactor units, drains into the Direct Runoff to Gulf subbasin that flows west to the Gulf of Mexico south of the proposed mine. Three stormwater retention ponds would be constructed to contain surface water flows from the operations areas of the LNP site. These ponds would not flow into any other surface water bodies. The third subbasin, named Withlacoochee, drains a small area located at the southern end of the site. Runoff from this subbasin flows directly to the Withlacoochee River off site (PEF 2008). These separate subbasins would each experience only minimal changes, shortly before discharging into the Gulf of Mexico. The combined impact of these small quantity changes on a receiving water the size of the Gulf of Mexico gulf would be minimal. Therefore, substantial cumulative impacts from changes to surface water runoff are not expected.

As described in Section 4.2, under the largest mining alternative (Alternative 2), construction and operation of the Tarmac King Road Limestone Mine would result in the withdrawal of approximately 136,800 gallons per day from groundwater. Withdrawal of groundwater is expected to produce no more than a 0.3-inch drop in nearby well levels. If pursued and approved, the sand mine 2 miles east of the Tarmac King Road Limestone Mine site would be limited to shallow “dry” mining of sand only, with no impacts on groundwater hydrology. LNP operations would result in an anticipated average withdrawal rate of 1.58 million gallons per day, with a peak rate of 5.8 million gallons per day, from groundwater. After 1 year of pumping, withdrawals of groundwater are expected to result in surficial aquifer drawdowns of no more than 1.5 feet in areas where wetlands are present (NRC 2012). Similar drops in water levels would be expected in nearby wells. Because of the anticipated small reduction in the water table elevation and the distance (approximately 3.5 miles) between the supply wells for the Tarmac King Road Limestone Mine and LNP, no appreciable cumulative impacts are expected.

4.17.4.2 Water Quality

As described in Section 4.3, under the largest mining alternative, construction and operation of the Tarmac King Road Limestone Mine would result in minimal impacts on surface water and groundwater quality. Some increase in downgradient groundwater sulfate concentrations is expected, although no exceedance of applicable standards is expected. Construction and operation of LNP would result in no discharges of wastewater to groundwater; only water contained in the three stormwater management ponds would infiltrate to groundwater. LNP cooling water would be conveyed to the Gulf of Mexico via the discharge canal of the CREC approximately 15 miles south of the proposed mine (PEF 2008). Therefore, cumulative impacts on surface water and groundwater quality would be minimal.

4.17.4.3 Wetlands

As described in Section 4.4, under the largest mining alternative, up to 2,068.5 acres of wetlands would be impacted at the Tarmac King Road Limestone Mine. Approximately 450 acres of wetlands on the LNP site would be affected by project development, of which approximately 392 acres would be permanently affected and 58 acres would be temporarily affected. Offsite, another 138 acres of wetlands would be affected, of which approximately 130 acres would be permanently affected (NRC 2012). Although a total of 2,657 acres of wetlands would be impacted, wetland regulations require the functional losses associated with these wetland impacts to be compensated for by preserving, enhancing, rehabilitating, establishing, or re-establishing other wetlands. This mitigation activity must be concurrent with, or be done prior to, the impacts occurring. Therefore, cumulative impacts on wetlands would be minimized.

4.17.4.4 Vegetation

As described in Section 4.5, under the largest mining alternative, construction and operation of the Tarmac King Road Limestone Mine would disturb approximately 2,068.5 acres of wetlands and 1,818.4 acres of upland forest land. After the mining is completed (approximately 100 years), reclamation of these areas would produce 1,506 acres of lakes and 2,393 acres of forest land.

Construction of LNP Units 1 and 2 would disturb approximately 777 acres on site and 1,233 acres off site associated with new transmission lines and other offsite facilities. This includes approximately 450 acres of wetlands on site and 138 acres of wetlands off site. These areas would be committed to industrial land uses for the 8-year construction and 60-year operations periods (NRC 2012). After decommissioning, some portion of this area could be returned to previous land uses.

Adverse cumulative impacts on vegetation are not expected, as removal of this portion of vegetated area represents only a small portion of the approximately 57,600 acres of vegetation in the project area (see Chapter 3, Table 3–12). As noted in Section 4.17.4.3, functions of wetlands to be impacted must be replaced through mitigation. This mitigation typically occurs in close proximity, and within the same watershed, further reducing the cumulative impacts on vegetation.

4.17.4.5 Wildlife

As described in Section 4.6, construction and operation of the largest mining alternative would result in the loss of less mobile animal species during site clearing and mining over the 3,898 acres of disturbed habitat. More mobile species would likely relocate to adjacent habitats. A similar situation would occur at the LNP site during disturbance of 777 acres of habitat (NRC 2012).

Some cumulative impacts of wildlife and habitat loss are likely, although some species may return to these areas after construction is completed. In addition, some species may relocate to other wetlands that would be enhanced, protected from exempt activities, or restored as a result of wetlands mitigation.

As described in Section 4.6, construction and operation of the Tarmac King Road Limestone Mine is unlikely to adversely impact EFH for the Gulf of Mexico, coastal migratory pelagics, stone crab, red drum, shrimp, and reef-fish fisheries because the coast and estuaries of the Withlacoochee River are at least 3 miles from the proposed mine site. The onsite stormwater controls proposed would further reduce the potential for impacts on EFH. Similarly, based on the project design, the minimal short-term impacts associated with the dredging and intake installation and the mitigation measures planned for the LNP, the U.S. Nuclear Regulatory Commission/USACE review team concluded that construction and operation of the LNP would result in a minimal adverse effect on EFH (NRC 2012). Therefore, cumulative adverse impacts are not expected.

As described in Section 4.6, construction and operation of the largest mining alternative could result in impacts on T&E species, including the eastern indigo snake and Florida black bear. Implementation of FWS terms and conditions, conservation recommendations, and reasonable and prudent measures from its biological opinion and development of an overall plan for wildlife management would reduce any impacts on these and other species. In consideration of these factors and the substantial amount of

similar habitat that would remain in the project area, cumulative impacts on wildlife are expected to be minimal.

4.17.4.6 Topography, Geology, and Soils

As described in Section 4.7, construction and operation of the largest mining alternative would result in the removal of large quantities of salable limestone along with non-salable geologic materials. If approved, the sand mine 2 miles east of the Tarmac King Road Limestone Mine site would also remove mineral material; however, this would be limited to shallow "dry" mining of sand only. Construction of LNP would not require substantial removal of geologic materials; therefore, only minimal cumulative impacts would result.

Construction and operation of the Tarmac King Road Limestone Mine would disturb approximately 3,898 acres of soils under the largest mining alternative. Construction of the sand mine 2 miles east of the Tarmac King Road Limestone Mine site would disturb approximately 241 acres of soils. Construction of LNP Units 1 and 2 would disturb approximately 2,010 acres (777 onsite acres and 1,233 offsite acres) of soils (NRC 2012). Therefore, a total of 5,908 acres of soils would be disturbed. None of these soils are Prime Farmland Soils or soils of special significance.

4.17.4.7 Land Use

Construction and operation of the Tarmac King Road Limestone Mine would disturb approximately 3,898 acres under the largest mining alternative. This includes 2,068.5 acres of wetlands and 1,818.4 acres of upland forest land. Construction of LNP Units 1 and 2 would disturb approximately 2,795 acres (777 onsite acres, 228 offsite acres and 1,790 acres for transmission line corridors) (NRC 2012).

4.17.4.8 Hazardous and Toxic Wastes

Construction and operation of the Tarmac King Road Limestone Mine are expected to generate small quantities of hazardous materials and toxic wastes primarily related to truck and other machinery maintenance. The other actions listed here would also be expected to create only small amounts of hazardous materials and toxic wastes. These wastes would be managed as required by Federal and state regulations and therefore are not expected to substantially contribute to cumulative impacts when combined with other producers, including the potential output of nuclear waste material from the LNP.

4.17.4.9 Air Quality

Except for particulate matter, construction and operation of the Tarmac King Road Limestone Mine are expected to generate small quantities of air pollutants. Particulate matter emissions from construction and operation of the proposed mine and construction and operation of LNP could result in some cumulative impacts. The impacts of cumulative particulate emissions would be reduced by the distance between the source areas and the control measures that would be implemented such that air quality standards would not be exceeded.

Construction and operation of LNP could potentially result in additional cumulative GHG emissions. The Tarmac King Road Limestone Mine would contribute 20,167 metric tons of CO_2e annually. During the anticipated 7-year construction of LNP, approximately 53,000 metric tons of CO_2e would be released annually. During the 40-year operation of LNP following construction, 9,000 metric tons of CO_2e are estimated to be released annually (NRC 2012). The combined impact of increased GHG emissions from both the proposed mine and LNP is less than 0.05 percent of the total GHG annual emissions in the United States and is considered small.

4.17.4.10 Aesthetics

As described in Section 4.11, construction and operation of the Tarmac King Road Limestone Mine under the largest mining alternative would result in some impacts on the area viewshed. These would be largely confined to offsite views of the 305-foot dragline boom and occasional dust from onsite activities,

views of some conveyor equipment and the 19-foot-high berms surrounding the mining areas, and views of increased truck traffic.

The physical structures of LNP would not be visible from public areas at ground level, and only the cooling tower plumes would potentially be visible (during limited meteorological conditions) from a limited number of offsite locations. The length of the visible plumes would depend on the temperature and humidity of the atmosphere. Generally, colder and more humid weather is more conducive to longer plumes. The results of plume modeling indicate that for all hours of the day, including daylight hours, visible plumes from the LNP cooling towers would remain primarily on site and within 328 feet of the towers. Visible plumes are predicted to extend beyond 328 feet from the cooling towers for only a small percentage of the year. Plumes greater than 3,280 feet (that is, the approximate distance to the nearest site boundary) are predicted to occur less than approximately 2 percent of the time (1 percent during daylight hours). The plume height during daylight hours is predicted to rise up to 656 feet above ground less than 1 percent of the time (0.5 percent during daylight hours). Based on the predictions of the plume analysis, the cooling tower plumes are expected to be visible outside the LNP property very infrequently throughout the year and only at a few locations (NRC 2012). The new 90- to 175-foot-tall transmission line towers and areas cleared for utility and transportation access may also be visible from some areas.

Because of the distances between the Tarmac King Road Limestone Mine and LNP, only minor cumulative aesthetic impacts are expected.

4.17.4.11 Noise

As described in Section 4.12, construction and operation of the Tarmac King Road Limestone Mine under the largest mining alternative would result in noise from operation of mining and processing equipment, blasting, and trucks entering and leaving the site. Blasting would only occur twice a week during weekdays between 8:00 a.m. and 5:00 p.m. From the nearest offsite areas, blasting noise would be similar to the sound of thunder. This noise would attenuate quickly with distance away from the mine site.

The noise analysis performed for LNP indicated that noise from the main plant equipment may be perceptible at the nearest offsite locations (that is, near the west property boundary of the project site); however, the areas where these perceptible noise levels would exist are not presently developed, and there are no sensitive noise receptors (residences) in those areas. The nearest existing residences are located approximately 1.6 miles to the northwest and 1.7 miles to the west-southwest of the center of the project site. At these locations, noise impacts attributable to plant operation were predicted to be in the range of 25 to 28 dBA at the three nearest residences. These noise levels would only be perceptible under limited ambient conditions, such as calm winds with very low background ambient noise levels. During the quietest periods of the day, the increase in noise levels (above the existing ambient background) at the nearest residences is predicted to be no greater than 1 dBA. The presence of extensive vegetation in the site area should result in further reductions in noise levels that were not accounted for in the noise modeling. The noise analysis also predicted that offsite noise levels would not exceed the noise limitations established by the Levy County Noise Ordinance (that is, 65 dBA for daytime hours, 55 dBA for nighttime hours in rural and residential areas) at any location (PEF 2008).

The impacts of blasting on the nearest residences to the Tarmac King Road Limestone Mine would be small and below the Florida state limit for drywall houses for the first 40 years of mining operations. Potential exceedances would occur after that time. The cumulative impact of the 7-year LNP construction period 2 miles to the east would not be expected to result in additional vibration impacts because of the strict control of blasting and other shock-producing activities (NRC 2012).

4.17.4.12 Cultural Resources

As described in Section 4.13, cultural resources surveys found no appreciable cultural resources within the proposed Tarmac King Road Limestone Mine area. Three sites potentially eligible for listing in the NRHP were found in the mitigation area. These sites would be avoided during mitigation activities.

Cultural resource investigations conducted in 2007 and 2008 determined that the areas to be disturbed on the LNP site and offsite facilities (heavy haul roads, makeup and blowdown pipelines, transmission

corridors) did not include any resources that were listed in or eligible for listing in the NRHP. One exception was the proposed LNP-to-central Florida substation transmission corridor where one NRHP-eligible site and two sites having confirmed or potential human remains were found. In 2011, during a desktop cultural resources investigation of the transmission line corridors, one additional potentially NRHP-eligible site was identified along the LNP-to-central Florida substation corridor and five potentially NRHP-eligible sites were identified along the PHP corridor (Kathleen substation in Polk County to the Griffin substation in Hillsborough County, terminating at the Lake Tarpon substation in Pinellas County). In addition, sites containing confirmed or potential human remains were identified in two other transmission line corridors and in the accessory parcels. Progress Energy Florida, Inc., will avoid these sites to the maximum extent practicable during corridor selection and structure placement. Once transmission rights-of-way within the affected corridors have been finalized, Progress Energy Florida, Inc., has agreed to complete comprehensive Phase I surveys prior to construction activities, and to work in consultation with the SHPO to mitigate potential impacts on sensitive cultural resources (NRC 2012). Therefore, no cumulative impacts on cultural resources are expected.

4.17.4.13 Recreation

As described in Section 4.14, construction and operation of the Tarmac King Road Limestone Mine under the largest mining alternative would result in reduced hunting on various segments of the 4,750-acre Tarmac King Road Limestone Mine site. Hunting would still be allowed except for in the currently active mining areas plus a published buffer zone. During enhancement and management activities, temporary cessation is also likely on the 4,526-acre mitigation area. The land the LNP site would occupy has historically been used for hunting on a limited basis. When the property was purchased for the LNP site, hunting was terminated on 3,105 acres (PEF 2008). Therefore, gradually over time, up to 7,855 acres would be removed from hunting, combining with additional temporary closures to result in a moderate cumulative impact. This assessment considered an area extending 25 miles from the mine site to capture areas with higher population such as Crystal River. This was done in recognition of the fact that hunters must often travel longer distances to access the region's designated hunting areas. However, the remainder of the Gulf Hammock WMA and portions of the Goethe State Forest would still be available for hunting, and post-project, hunting could again be allowed in some areas.

Under the action alternatives, the mitigation area could be turned over to the state. Although no plans currently exist for recreation activities other than hunting and fishing that might be allowed on the mitigation area, it is conceivable that trails could be constructed across the area for hiking, biking, and/or horseback riding.

4.17.4.14 Socioeconomics

As described in Section 4.15, construction and operation of the Tarmac King Road Limestone Mine are expected to employ approximately 60 and 35 persons, respectively. This small number of employees is not expected to add appreciably to the impacts of the peak construction (3,440 persons) and operations (1,573 persons) workforces expected to be employed at LNP (NRC 2012). Therefore, cumulative socioeconomic impacts are expected to be moderate, based on the average income levels of Levy and its surrounding counties.

Traffic was estimated for years 2014 and 2020 for six major roads in the vicinity based on the peak year cumulative impacts of the Tarmac King Road Limestone Mine and LNP. In addition, traffic was increased 3 percent per year to account for the historical growth rate of traffic in the region. All of the roads surrounding the proposed mine are well within capacity through 2020, even with the potential addition of 250 truck trips from the sand mine 2 miles east of the Tarmac King Road Limestone Mine site. Therefore, cumulative impacts are not expected to be adverse through exceeding road capacities.

4.17.4.15 Environmental Justice

As described in Section 4.16, there would be no environmental justice impacts from construction and operation of the Tarmac King Road Limestone Mine. Based on that analysis, impacts from other actions in combination with construction and operation of the mine would not contribute to cumulative environmental justice impacts in Levy or its surrounding counties.

4.18 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF THE LONG-TERM PRODUCTIVITY

Pursuant to National Environmental Policy Act regulations (40 CFR 1502.16), an EIS must consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. The limestone mining alternatives have been crafted to consider the short-term uses of the environment, as well as maintaining and enhancing its long-term productivity. Mining limestone rock would have quantifiable impacts on the environment; however, plans have been developed to avoid or minimize some of the potential impacts and to compensate for impacts wherever possible. Substantial areas of wetlands would be lost as a result of implementing any of the proposed action alternatives; to compensate for this, nearby wetlands would be enhanced or restored to offset the proposed loss of wetland function. The proposed mitigation would contribute to the long-term preservation of a portion of the Gulf Hammock through restoring natural plant communities to an area currently dominated by pine plantations, placing conservation easements over wetlands to protect them from exempt activities such as silviculture, and restoring habitat characteristics to enhance the wetlands' entire range of functions. See Section 4.4 for a discussion of wetland acres and functional units lost as a result of each alternative and Chapter 5 for the proposed mitigation actions that would be taken.

Implementation of any of the alternatives, other than the No Action Alternative, would result in employment, expenditures, and tax revenues being generated, which, in turn, would directly benefit the local, regional, and state economies over the short term. Local governments investing project-generated tax revenues into infrastructure and other required services could facilitate long-term economic productivity. Investing those revenues into land acquisition for conservation purposes could also assist in reducing cumulative impacts from future development projects. See Section 4.15 for a discussion of the socioeconomic aspects of the mine.

4.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The phrase "irreversible commitment of resources" describes the loss of future options. This primarily applies to the effects of using nonrenewable resources (e.g., energy and minerals). It also refers to the loss of production, harvest, or use of natural resources such as pine plantations and limestone rock. In general, the commitment of capital, land, energy, labor, and materials during implementation of the alternatives would be irreversible or irretrievable.

The conversion of approximately 1,506 acres of land to deep lakes under the largest proposed mining alternative (Alternative 2) would have an irreversible conversion impact on the environmental resources of the region. Once lost, these environmental resources would be irretrievable. The limestone rock resources removed as a result of the mining would also be irretrievable. The conversion of up to 2,068.5 acres of wetlands to uplands and lakes is an irretrievable loss of wetlands measured spatially as acres lost. Section 4.4 of this EIS also presents an assessment of the functional value of wetlands that would be lost under each of the alternatives, and Chapter 5 discusses functional value replacement through a series of proposed mitigation actions.

The end product of the limestone (i.e., concrete and asphalt products) could be recycled as aggregate, which would reduce the demand for mined limestone. In recent years, there has been an increase in the amount of materials being recycled and used for other purposes within the state of Florida. Uses of recycled building materials include construction of roads, highways, and foundations and stabilization of marginal soils. Based on the rate of concrete recycling in Florida, and the limitations of recycled concrete for some applications, it could not replace the output of limestone from the Tarmac King Road Limestone Mine.

After completion of mining activities, areas filled with overburden and waste rock and areas disturbed for site infrastructure (e.g., haul roads, parking and storage areas, conveyor belts, and processing plant) could be easily restored for other uses through planting vegetation. Therefore, these areas would not be irreversibly lost to other uses.

4.20 REFERENCES

Ardaman & Associates, 2009, personal communication (email) to B. Murray, Science Applications International Corporation, "Sulfate Levels in Mine Pits," Excel worksheet, May.

Ardaman & Associates, 2012a, personal communication (letter) to C. Burns, Tarmac America, LLC, "Response to Comments on the Draft EIS, Levy County Mine, Tarmac America, LLC, Levy County, Florida," September 10.

Ardaman & Associates, 2012b, personal communication (letter) to C. Burns, Tarmac America, LLC, "Response to Comments on the Draft EIS, Levy County Mine, Tarmac America, LLC, Levy County, Florida," November 26.

Arthur, J.D., A. Dabous, and C. Fischler, 2005, *The Behavior of Arsenic and Other Metals in Bench-Scale Leaching Studies that Simulates ASR Conditions*, Florida Geological Survey, presentation to Aquifer Storage and Recovery Forum V, Tampa, Florida.

ATSDR (Agency for Toxic Substances and Disease Registry), 2008, *Public Health Assessment for Barker Chemical Company, Inglis, Levy County, Florida*, May 8.

BEA (Bureau of Economic Analysis), 2011, Regional Input Output Multiplier System, RIMS II Multipliers (2008/2008), Table 2.5 Total Multipliers for Output, Earnings, Employment, and Value Added by Industry Aggregation, King Road Mine ROI (Type II).

BLS (Bureau of Labor Statistics), 2012a, *May 2011 Metropolitan and NonMetropolitan Area Occupational Employment and Wage Estimates – Ocala, FL*, accessed through http://bls.gov/oes/current/oes_fl.htm, April 10.

BLS (Bureau of Labor Statistics), 2012b, *May 2011 Metropolitan and Nonmetropolitan Area Occupation Employment and Wage Estimates for Ocala, FL*, accessed through http://www.bls.gov/oes/current/oes_36100.htm, April 10.

BLS (Bureau of Labor Statistics), 2012c, *Employer Costs for Employee Compensation, All Occupations, All Civilian – December 2011*, accessed through http://www.bls.gov/news.release/pdf/ecec.pdf, March 14.

Cardno Entrix, 2012, personal communication (letter) to E. Sarfert, U.S. Army Corps of Engineers, Jacksonville District, "Archaeological Survey Schedule for the Tarmac King Road Limestone Mine Levy County, Florida," November 30.

CDOC (California Department of Conservation), 2006, *Aggregate Availability in California, Map Sheet 52*, California Geological Survey, Sacramento, California.

DHI, 2011, Technical Memorandum to Town of Yankeetown, May 3.

DSLSA, RCLS, and FNAI (Division of State Lands Staff Acquisition and Restoration Council Liaison Staff, and Florida Natural Areas Inventory), 2004, *Gulf Hammock Evaluation Report*, Levy County, Florida, June 4.

ENTRIX (ENTRIX, Inc.), 2009, *Wildlife Survey Results Tarmac King Road Limestone Mine Levy County, Florida*, revised, July.

ENTRIX (ENTRIX, Inc.), 2011, *Tarmac King Road Limestone Mine Compensatory Mitigation Plan Levy County, Florida*, October 7.

EPA (U.S. Environmental Protection Agency), 1999, *Consideration of Cumulative Impacts in EPA Review of NEPA Documents*, EPA 315-R-99-002, Office of Federal Activities, Washington, D.C., May.

EPA (U.S. Environmental Protection Agency), 2002, *Health Assessment Document for Diesel Engine Exhaust*, Office of Research and Development, National Center for Environmental Assessment, Washington, D.C., EPA/600/8-90/057F, May.

EPA (U.S. Environmental Protection Agency), 2009a, *Superfund Site Information Search Results, Citrus, Florida*, accessed through http://cfpub.epa.gov/supercpad/cursites/srchrslt.cfm?start=1&CFID=2808141&CFTOKEN on April 30.

EPA (U.S. Environmental Protection Agency), 2009b, *Superfund Site Information Search Results, Levy, Florida*, accessed through http://cfpub.epa.gov/supercpad/cursites/srchrslt.cfm?start=1&CFID=2921484&CFTOKEN on April 30.

EPA (U.S. Environmental Protection Agency), 2009c, *Superfund Site Information Search Results, Marion, Florida*, accessed through http://cfpub.epa.gov/supercpad/cursites/srchrslt.cfm?start=1&CFID=2808141&CFTOKEN on April 30.

EPA (U.S. Environmental Protection Agency), 2009d, *Site Profile, Barker Chemical, Inglis, FL – EPA Region IV*, accessed through http://www.epaosc.net/site_profile/asp?site_id=1469 on April 30.

FDEP (Florida Department of Environmental Protection), 2009a, *Quick Look Summary of Florida National Priority List Sites*, accessed through http://www.dep.state.fl.us/waste/categories/wc/pages/ npl_1199.htm, April 14.

FDEP (Florida Department of Environmental Protection), 2009b, *State Funded Sites*, accessed through http://www.dep.state.fl.us/waste/categories/wc/pages/stat_1199.htm, April 3.

FDHR (Florida Division of Historic Resources), 2009, *Data for Archaeological Sites, Field Surveys, and Standing Structure GIS Data Layers*, Tallahassee, Florida, March.

FDOR (Florida Department of Revenue), 2010, Form DR-15DSS, Discretionary Sales Surtax Information, accessed through http://dor.myflorida.com/dor/forms/index.html#discretionary, November 2.

FDOT (Florida Department of Transportation), 2009a, *District Seven Construction – Citrus County*, accessed through http://www.dot.state.fl.us/publicinformationoffice/construc/district7pio/citrus.shtm, March 17.

FDOT (Florida Department of Transportation), 2009b, *District Five Construction – Marion County*, accessed through http://www.dot.state.fl.us/publicinformationoffice/construc/district5pio/marion.shtm, April 21.

FDOT (Florida Department of Transportation), 2009c, *North Florida Roads – Projects – Levy County*, accessed through http://www.northfloridaroads.com/projects/searchdetails.asp?County=Levy on April 30.

FERC (Federal Energy Regulatory Commission), 2009, Federal Energy Regulatory Commission, Final environmental Impact Statement on Florida Gas Transmission Company, LLC's Phase VIII Expansion Project, September.

Florida History (Florida History, LLC), 2008, *Cultural Resource Management Plan for the Tarmac Mine Mitigation Area*, June (Appendix K to the Environmental Resource Permit).

FSHPO (Florida State Historic Preservation Officer), 2008, letter approving the cultural resource management plan for the Tarmac Mine mitigation area, August 20 (Appendix L to the Environmental Resource Permit).

FWS (U.S. Fish and Wildlife Service), 1997, *Revised Recovery Plan for the U.S. Breeding Population of the Wood Stork, Southeast Region*, Atlanta, Georgia, January.

FWS (U.S. Fish and Wildlife Service), 1999, *Eastern Indigo Snake* Drymarchon corais couperi, in Multi-species Recovery Plan for South Florida, South Florida Ecological Field Services, Vero Beach, Florida, accessed through http://www.fws.gov/verobeach/images/pdflibrary/eisn.pdf, March 2009.

FWS (U.S. Fish and Wildlife Service), 2007, *Florida Wood Stork Colonies Core Foraging Areas,* November 2007, accessed through http://www.fws.gov/northflorida/WoodStorks/Documents/110107-WOST-Nest-Colonies-Forag-Areas-w-buffers.pdf, March 2009.

FWS (U.S. Fish and Wildlife Service), 2011a, *Biological Opinion*, FWS Log No. 41910-2010-F-0168, Jacksonville, Florida, March 9.

FWS (U.S. Fish and Wildlife Service), 2011b, personal communication (email) with E. Sarfert, U.S. Army Corps of Engineers, October 12.

Gawlik, D.E., 2002, "The Effect of Prey Availability on the Numerical Response of Wading Birds," *Ecological Monographs* 72(3): 329-346.

Grimail Crawford, Inc., 2007, *Tarmac Lime-Rock Mine Traffic Concurrence Study*, Tampa, Florida, November.

Grimail Crawford, Inc., 2008, *Tarmac Lime-Rock Mine Supplemental Traffic Report*, Tampa, Florida, January.

Grove (Grove Scientific and Engineering Company), 2010, *Tarmac King Road Mine, Levy County, Florida, Potential Sound Impact Study*, Orlando, Florida, March.

Hansaker D., Dyno Nobel, 2009, personal communication regarding perchlorate generation during blasting using Dyno Nobel Titan® 1000 G unsensitized gassable bulk emulsion matrix.

Inglis Hydropower, 2008, Draft License Application Inglis Bypass Channel Spillway, Inglis Hydropower Project, No. 12783, Inglis, Florida, Dover Florida, December 29.

ITRC (Interstate Technology & Regulatory Council), 2009, Perchlorate Documents web page, http://www.itrcweb.org/.

Keldall, P.C., *et al.,* 1984, "Evaluation Excavation-Induced Changes in Rock Permeability," *International Journal of Rock Mechanics, Mineral Sciences, and Geomechanics*, Vol. 26, No. 1, pp 79–83.

Levy County, 2008, *Levy County Comprehensive Plan*, Levy County Planning Department, accessed through http://www.levycounty.org/comprehensiveplan.aspx on April 28, 2009.

Levy County, 2009, *Levy County Code of Ordinances*, *Article VIII, Miscellaneous Provisions, Division 2 – Noise*, accessed through http://www.municode.com, March 16.

Levy County, 2013, *Levy County Comprehensive Plan*, accessed through http://www.levycounty.org/comprehensiveplan.aspx.

LHC (Lampl Herbert Consultants), 2007*, Strategic Aggregates Study: Sources, Constraints, and Economic Value of Limestone and Sand in Florida*, Tallahassee, Florida, March.

Lincks & Associates, Inc., 2010, *Transportation Analysis: Tarmac – Levy County*, Tampa, Florida, June.

MacVicar Consulting, Inc., 2012a, Minor Modification Request for Permit No. 175244, Cemex Construction Materials Florida, LLC, FEC Quarry, Miami-Dade County, submitted to the Florida Department of Environmental Protection, dated February 13.

MacVicar Consulting, Inc., 2012b, 2011–2012 Water Quality Monitoring Results Summary, Lake Belt Permits, Miami-Dade County, submitted to the Florida Department of Environmental Protection, August 17.

Maehr, D.S., T.S. Hoctor, L.J. Quinn, and J.S. Smith, 2001, *Black Bear Management Guidelines for Florida*, Technical Report No. 17, Florida Fish and Wildlife Conservation Commission, Tallahassee, Florida.

Mahon, G.L., 1989, *Potential for Saltwater into the Upper Floridan Aquifer, Hernando and Manatee Counties, Florida*, USGS Water-Resources Investigation Report 88-4171, prepared in cooperation with the Southwest Florida Water Management District, Tallahassee, Florida.

MDEP (Massachusetts Department of Environmental Protection), 2006, *The Occurrence and Sources of Perchlorate in Boston, Massachusetts*, accessed through http://www.mass.gov/dep/.

Milanovic, P., 1985, *Hydrogeological and Engineering Geological Problems of Hydrotechnical Construction in Karst*, Karst Water Resources (Proceedings of the Ankara-Antalya Symposium, July 1985), IAHS Publication No. 161.

Murphy, S., 2007, General Information on Dissolved Oxygen, accessed through http://bcn.boulder.co.us/basin/data/BACT/info/DO.html, City of Boulder and USGS, Boulder Area Sustainability Information Network (BASIN), Water Quality Monitoring, last updated April 23.

NRC (U.S. Nuclear Regulatory Commission), 2012, *Final Environmental Impact Statement for Combined Licenses (COLs) for Levy Nuclear Plant Units 1 and 2*, NUREG-1941, Vol. 1, April.

Panamerican Consultants (Panamerican Consultants Inc.), 2006, *An Archaeological and Historical Survey of the King Road Mine Project Area in Levy County, Florida*, Tampa, Florida, October.

PEF (Progress Energy Florida, Inc.), 2008, Levy Nuclear Plant Units 1 and 2 COL Application Part 3, Environmental Report, Rev. 0.

PEF (Progress Energy Florida, Inc.), 2009a, *Project Overview*, accessed through http://www.progress-energy.com/aboutenergy/transmission/florida/energyplanning/projectoverview.asp on April 30.

PEF (Progress Energy Florida, Inc.), 2009b, *Proposed Transmission Routes from Levy Plant to Brookville West Substation in Hernando County*, accessed through http://www.progress-energy.com/ aboutenergy/transmission/florida/energyplanning/BrooksvilleWest.pdf on April 30.

Pugliese, J.M., 1972, *Designing Blast Patterns Using Empirical Formulas: A Comparison of Calculated Patterns with Plans Used in Quarrying Limestone and Dolomite, with Geologic Considerations*, Information Circular 8550, U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement, Pittsburgh, Pennsylvania.

Pusch, R.,1989, “Alteration of Hydraulic Conductivity of Rock by Tunnel Excavation,” *International Journal of Rock Mechanics, Mineral Sciences, and Geomechanics*, Vol. 26, No. 1, pp 79–83.

Sacks, L., 1996, *Geochemical and Isotopic Composition of Groundwater with Emphasis on Sources of Sulfate in the Upper Floridan Aquifer in Parts of Marion, Sumter, and Citrus Counties, Florida,* U.S. Geological Survey Water-Resources Investigations Report 95-4251, prepared in cooperation with the Southwest Florida Water Management District, Tallahassee, Florida.

Sarfert, E.P., U.S. Army Corps of Engineers, Jacksonville Regulatory District, Jacksonville, Florida, 2010, personal communication with J.O. Holian, Science Applications International Corporation, Germantown, Maryland, May 4.

Shoemaker, B., 2004, “Important Observations and Parameters for a Salt Water Intrusion Model,” *Ground Water*, Vol. 42, No. 6, pp. 829-840.

Steyer, G.D., B.C. Perez, S. Piazza, and G. Suir, 2005, “Potential Consequences of Saltwater Intrusion Associated with Hurricanes Katrina and Rita,” in *Science and the Storms: The USGS Response to the Hurricanes of 2005*, accessed through http://pubs.usgs.gov/circ/1306/pdf/c1306_ch6_c.pdf.

SWFWMD (Southwest Florida Water Management District), 2001, *The Hydrology and Water Quality of Select Springs in the Southwest Florida Water Management District*, Tampa, Florida.

Tarmac (Tarmac America, LLC), 2008a, Summary of MODFLOW Model Setup Improvement and Results, DHI Group Technical Memorandum.

Tarmac (Tarmac America, LLC), 2008b, Tarmac King Road Mine Site Special Exception Application, Levy County, Florida, filed October 25, 2007, and supplemented February 1.

Tarmac (Tarmac America, LLC), 2008c, General Water Use Application.

Tarmac (Tarmac America, LLC), 2009, Request for Additional Information, Tarmac America – Titan King Road Mine, File No. 0244771-002, Levy County, April 29.

Tarmac (Tarmac America, LLC), 2010, Tarmac King Road Mine Site Special Exception Application #3, Levy County, Florida, filed June 13.

Titan America, 2009, personal communication (email) from C. Burns, to E. Sarfert, U.S. Army Corps of Engineers, "Waste Fluid Generation at Petra," April 22.

Titan America, 2013, personal communication (email) from C. Burns, to E. Sarfert, U.S. Army Corps of Engineers, "Hurricane Plan," May 22.

Titus, J.G., *et al.*, 2009, *Coastal Sensitivity to Sea Level Rise: A Focus on the Mid-Atlantic Region*, U.S. Climate Change Science Program, Synthesis and Assessment.

Trinity Consultants, 2008, Air Construction Permit Application-Non-Title V Source Tarmac America, LLC., August.

Trinity Consultants, 2010, *Greenhouse Gas Emissions Inventory-Tarmac America LLC–King Road Mine*, Orlando, Florida, February.

TWF (Tidewater-Florida), 2013, Gulf Hammock Wildlife Management Area, accessed through http://tidewater-florida.com/wildlife-management/gulf-hammock-wma.htm.

USACE (U.S. Army Corps of Engineers), 2011, Water Resource Policies and Authorities Incorporating Sea-Level Change considerations in Civil Works Programs, EC-1165-2-212, October.

USGS (U.S. Geological Survey), 2012, Mineral Industry Surveys, Crushed Stone and Sand and Gravel in the First Quarter 2011, accessed through http://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/, March.

Washington Department of Ecology, 1991, *A Citizen's Guide to Understanding and Monitoring Lakes and Streams*, Chapter 2, "Lakes," accessed through http://www.ecy.wa.gov/programs/wq/plants/management/joysmanual/ph.html on May 14, 2009.

Code of Federal Regulations

40 CFR 80.510, U.S. Environmental Protection Agency, "Regulation of Fuels and Additives: What Are the Standards and Marker Requirements for NRLM Diesel Fuel and ECA Marine Fuel?"

40 CFR 1500–1508, Council on Environmental Quality, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act.

40 CFR 1502.16, Council on Environmental Quality, "Environmental Impact Statement: Environmental Consequences."

40 CFR 1508.7, Council on Environmental Quality, "Terminology and Index: Cumulative Impact."

Executive Orders

Executive Order 11988, *Floodplain Management*, May 24, 1977.

Florida Administrative Code

FAC Chapter 62C-36, “Limestone Reclamation Requirements.”

CHAPTER 5
MITIGATION

5.1 TARMAC MITIGATION SITE

As part of the Tarmac King Road Limestone Mine project, the applicant, Tarmac America, LLC (Tarmac), is proposing to establish a nearby mitigation area to be known as the Tarmac Mitigation Site (TMS), located in the Gulf Hammock Wildlife Management Area in Levy County, Florida.

The proposed TMS would consist of approximately 4,526 acres (subject to a final survey) that are currently owned by Plum Creek Timber Company. Tarmac may or may not purchase all or part of the TMS acreage, but would assume management and financial responsibility to ensure that proposed mitigation activities are fully implemented and the site is preserved in perpetuity. Both wetlands and uplands on that parcel have been altered and degraded through silvicultural activities, and there is substantial opportunity to restore and enhance hydric hammocks, swamp forests, and the embedded upland "islands" that support these wetlands. The proposed mitigation plan is intended to restore degraded areas, particularly through the rehabilitation of hydric hammocks that have been converted to pine plantation, and to enhance adjacent lands, including publicly owned offsite areas (Waccasassa Bay State Preserve) through providing buffer and additional landscape support to those areas.

Tarmac has developed a detailed mitigation plan (see Appendix G) outlining the activities proposed to attain these objectives of restoration and enhancement of natural ecosystems. Projected functional lift calculated using the Uniform Mitigation Assessment Method (UMAM) would be obtained through habitat restoration and enhancement. A conservation easement would be recorded upon establishment of the TMS and this, combined with mitigation actions, financial assurances, and long-term adaptive management, would ensure that the functions of the TMS are preserved in perpetuity in accordance with Title 33 of the *Code of Federal Regulations* Part 332 – *Compensatory Mitigation for Losses of Aquatic Resources*. The Florida Department of Environmental Protection (FDEP) is proposed as the Grantee of this conservation easement. The U.S. Army Corps of Engineers (USACE), as a third-party beneficiary, would have the right to enforce the terms and conditions of the site protection instrument and would have to approve any modification, amendment, release, or revocation of the conservation easement. Additionally, the USACE would have to review and approve as necessary any additional structures or activities on the property that require approval by the Grantee.

An additional area encompassing approximately 851 acres of "No Mine Area" within the proposed mine parcel would also be placed under a conservation easement with FDEP as the Grantee. As with the proposed conservation easement on the TMS, the USACE, as a third-party beneficiary, would have the right to enforce the terms and conditions of the site protection instrument and would have to approve any modification, amendment, release, or revocation of the conservation easement. Additionally, the USACE would have to review and approve as necessary any additional structures or activities on the property that require approval by the Grantee. This conservation easement would allow sustainable thinning and selective harvesting of pine trees and would prohibit removal or destruction of native trees, shrubs, and other vegetation. This easement would permanently preserve the seasonally flooded flow-ways across the proposed mine parcel (±141 acres), along with a buffer of hydric and mesic hammock, thus maintaining hydrologic connectivity and over 7.5 miles of wildlife corridors from east of the mine parcel through the TMS and out to Waccasassa Bay.

5.1.1 Vegetative Cover/Wetland Cover Types

The TMS is part of the Gulf Hammock that stretches from the Withlacoochee River northward along the coast to north of State Route 24. The Gulf Hammock was the largest example of hydric hammock in Florida prior to the early 1900s. Since that time, much of the TMS has been altered, primarily by timbering and conversion to pine plantation. Historic references also note that the scale of variation is very fine—upland and wetland conditions may occur within the same forest type due to minor variations in surface elevation – microtopography – or the subsurface limestone. Distance from the coast, especially when combined with elevation, is also critical as low hammocks along the coast and low drainage ways leading to the coast are subject to saltwater inundation during major storm events, and vegetation incapable of handling occasional saline conditions is eliminated from those areas. A detailed vegetative cover evaluation is included in Attachment B of Appendix G.

Table 5–1 includes the acreages of various cover types in the TMS. The cover types are based on the Florida Land Use, Cover and Forms Classification (FLUCCS) terminology, but Florida Natural Areas Inventory (FNAI) and Natural Resources Conservation Service (NRCS) terminology are used in combination with FLUCCS terminology to clearly distinguish between the major types of existing and historic vegetation and to provide a basis from which to develop an effective mitigation plan. Table 5–2 includes the acreages of the various cover types in the No Mine Area.

Table 5–1. Acreage of FLUCCS Cover Types in the Tarmac Mitigation Site

FLUCCS Code	FLUCCS Cover Type	Mitigation Area (acres)
Upland		
441	Coniferous plantation	171.5
443	Forest regeneration	33.2
425	Temperate hardwood	104.1
434	Hardwood conifer mixed	22.3
Wetland		
6292	Hydric coniferous plantation <8 years	1,314.6
630	Wetland forested mixed	1,601.2
6291	Hydric coniferous plantation >8 years	345.0
633	Coastal maritime hammock	382.9
628	Pine-mesic-oak	20.7
616a	Deepwater ponds	101.4
617	Mixed wetland hardwoods	124.7
615	Streams and lake swamps	22.5
642	Saltwater marsh	36.5
6301	Wetland forested mixed – cleared	43.1
651	Tidal flats	71.3
530	Borrow pits	11.2
641	Freshwater marsh	13.1
621	Cypress	20.5
Other		
740	Roads/disturbed land	86.7
Total		**4,526**

Key: FLUCCS=Florida Land Use, Cover and Forms Classification.
Source: Tarmac 2009.

Table 5–2. Acreage of FLUCCS Cover Types in the No Mine Area

FLUCCS Code	FLUCCS Cover Type	Mitigation Area (acres)
Upland		
441	Coniferous plantation	62.7
443	Forest regeneration	192.3
425	Temperate hardwood	73.8
434	Live oak	0.1
Wetland		
6292	Hydric coniferous plantation <8 years	56.2
630	Wetland forested mixed	92.7
6291	Hydric coniferous plantation >8 years	96.5
628	Pine-mesic-oak	78.3
616a	Deepwater ponds	16.4
616b	Sloughs and intermittent flow-ways	138.6
617	Mixed wetland hardwoods	42.7
530	Borrow pits	0.2
Other		
740	Roads	1.3
Total		**851.7**

Key: FLUCCS=Florida Land Use, Cover and Forms Classification.
Source: Tarmac 2009.

5.1.2 Wildlife

Wildlife biologists from ENTRIX, Inc., visited the site regularly from 2005 through 2008, and any wildlife observed by their staff during this period was recorded. The results of these visits and resultant surveys are discussed in detail in Chapter 3, Section 3.5.

The federally listed threatened and endangered species observed in the immediate project area are the wood stork (*Mycteria Americana*) and eastern indigo snake (*Drymarchon corais couperi*). Several wood storks and three eastern indigo snakes were observed in the immediate area (ENTRIX 2009). No Florida panthers (*Puma concolor coryi*) were reported on the proposed Tarmac King Road Limestone Mine site or the TMS, although there have been unconfirmed sightings in the area reported by nearby residents over the last few years.

The Florida black bear (*Ursus americanus floridanus*) and gopher tortoise (*Gopherus polyphemus*) are the only state-listed threatened animal species that likely occurs in the mine area (FNAI 2009), although neither was actually observed. The mine area is characterized by the Florida Fish and Wildlife Conservation Commission (FFWCC) as “secondary range” for the black bear, meaning the area is important to maintaining movement of bears between areas considered “primary range,” where there is a core population and evidence of reproduction (FFWCC 2009). One active gopher tortoise burrow was observed on the far eastern border of the mine area (ENTRIX 2009).

The state species of special concern found or likely to be found in the mine area include the snowy egret (*Egretta thula*), tricolor heron (*Egretta tricolor*), little blue heron (*Egretta cairulea*), white ibis (*Eudocimus albus*), reddish egret (*Egretta rufescens*), limpkin (*Aramus guarauna*), roseate spoonbill (*Ajaia ajaja*), and osprey (*Pandion haliaetus*) (FNAI 2009). A detailed accounting of sampling methodology and results is provided in the *Tarmac King Road Limestone Mine Wildlife Survey Results* (ENTRIX 2009).

5.1.3 Listed Plant Species

Only state-listed rare plant species have been observed on the TMS. These include corkwood (*Leitneria cordifolia*), which occurs in moderately deep ponds, mostly near the coast; brown-eyed susan (*Rudbeckia triloba*), which is abundant in recently clear areas with clayey soils; pinewoods dainties (*Phyllanthus liebmannianus* subsp. *platylepis*); and anglepod (*Matelea gonocarpus*), which was seen in several areas of older pine plantation and natural hammock. No federally listed plants were observed on the site, and none are currently listed by the U.S. Fish and Wildlife Service (FWS) as known to occur in Levy County.

5.2 MITIGATION PROPOSED BY TARMAC

The objective of the Tarmac mitigation plan is to compensate for projected impacts on wetlands in the Waccasassa River basin (see Appendix G, Figure 3–1) that would result from the proposed construction of the Tarmac King Road Limestone Mine project. A majority of the projected impacts of this limestone mine would be in hydric pine plantation and other wetlands that have been disturbed by silviculture and silviculture-related activities such as ditching, road building, and maintenance. The current landowner has advised the USACE that all forested wetlands on the proposed mine parcel and the TMS that are too wet for successful cultivation of pine trees are still scheduled to be clear-cut if the mining project were not to occur. The majority of these areas are dominated by hardwood species.

Prior to commencement of any construction activities if a permit were issued, Tarmac would retain a Qualified Mitigation Supervisor (QMS) (a person or persons) to oversee all aspects of TMS implementation, management, monitoring, and corrective actions until final success criteria are met. The QMS would have the duty to ensure that the mitigation work and reporting are conducted in accordance with the permit. Tarmac proposes that it would not commence work on the TMS until approval of the selected QMS is received from the state permitting agencies. Tarmac also proposes that the QMS would review the permit conditions that pertain to environmental enhancements to ascertain whether, in their professional opinion, any criteria need to be modified to ensure ecological success. Tarmac would then submit modification requests for the agencies’ consideration. The USACE may consider modification requests, but is under no obligation to approve them.

The ecological restoration/enhancement described here and in Appendix G is designed to restore the pre-pine plantation/historical communities to the project site. Specifically, it would entail the restoration of the total mosaic of natural plant communities on the site. Tarmac's proposed ecological goals for restoration are threefold.

1. Recreate the landscape mosaic as it appears in 1963 aerial photographs (see Appendix G, Figure 2–1). Timbering activities have disturbed this area since the 1800s; however, the 1963 photographs provide a target landscape that existed immediately preceding conversion of the area to more intensive silviculture land use.

2. Re-establish the species composition and structure of the 1963 plant communities. The communities would resemble reference communities in the coastal Big Bend region of Florida on similar soils and at similar elevations above sea level with respect to life form distribution, vertical stratification, overall special abundance, and patterns of dominance.

3. To the extent practicable and without impacting offsite property owners, rehabilitate natural surface water runoff patterns by filling ditches and erosion areas, eliminating some raised roads, installing equalizer culverts under certain roads, and creating hardened low water crossings in other roads proposed to remain.

Tarmac notes that achieving the primary goal of restoring the existing plant communities to the historic natural conditions in the Gulf Hammock is based on its review of the best available information from the literature and a quantitative study of reference wetlands and uplands in the vicinity of the project area.

5.2.1 Mitigation Activities

The planned mitigation and rehabilitation efforts involve restoring the TMS and No Mine Area to the pre-pine plantation/historical communities. Specifically, efforts entail the restoration/enhancement of approximately 1,821.6 acres of wetlands and 456.2 acres of uplands to the historical Gulf Hammock community type described in Appendix G, Section 3. To obtain success, the rehabilitated communities would resemble reference communities with respect to life form distribution, vertical stratification, overall plant size, species abundance, and patterns of dominance. The rehabilitation would focus on three levels of diversity: (1) landscape mosaic, (2) plant community structure, and (3) plant species composition. These restored habitats would be preserved in perpetuity, as described in Section 5.1. In addition, all remaining wetlands (2,841.4 acres) and uplands (184.39 acres) that are relatively intact on the two sites would also be preserved. These remaining higher-quality areas have been subjected to less severe, and/or less recent silvicultural activities, and the potential benefit of restoration and enhancement activities is more limited.

Tarmac's proposed mitigation activities include the following:

1. Implement monitoring in accordance with the procedures provided in Attachment C of Appendix G (Monitoring Plan).

2. Cease any further silvicultural activities not directly related to restoration (Note: the proposed conservation easement for the No Mine Area allows thinning of pine trees only and prohibits the removal or destruction of other native trees, shrubs, or other native vegetation. Thus, the No Mine Area is proposed to succeed to native hammock).

3. Thin planted pine to no more than 5 percent of total tree stems for slash pine or 10 percent for loblolly pine.

4. As determined by quantitative and qualitative monitoring results (see Attachment C of Appendix G), plant the species listed in Attachment D of Appendix G (see Table D–1) to supplement the vegetation in areas with less than 300 tree stems per acre or less than 200 shrub stems per acre to meet these minimum requirements. Supplemental planting also would occur if less than 80 percent of the species in the target community type (see Table D–1) are detected, with a focus on those species that are most underrepresented by monitoring. These focal

species would be planted in loose groupings of 10–12 individual plants to ensure that all planted obligate outcrossing species (i.e., species that must cross-pollinate rather than self-pollinate) would be pollinated. The goal of this latter effort is to inoculate the community type with a broad spectrum of representative species that could successfully reproduce and colonize the remainder of the plant community in the future.

5. Control exotic and nuisance species in accordance with the procedures listed in Attachment E, Exotic and Nuisance Species Control Plan. In addition, remove any native opportunistic species, particularly vines such as *Vitis* spp., *Smilax* spp., *Rubus argutus*, and *Mykania scandens*, which occur in densities such that they impede the survival of the mitigation target community species.

6. Regrade any bedded areas to match the ground elevation of any surrounding hammock restoration areas where bedding has not occurred.

7. If warranted, use localized burning to remove piles of logging debris. As hammocks are believed to burn only rarely, fire would not be used on the site as a whole.

Proposed success criteria for the TMS are provided in Attachment F of Appendix G.

Credits

Mitigation credits would be produced within five different post-reclamation target community types: (1) upland preservation – mesic hammock and coastal mesic hammock; (2) wetland preservation – hydric hammock, coastal maritime hammock, and all other native wetland communities; (3) mesic hammock restoration; (4) coastal mesic hammock restoration; and (5) hydric hammock restoration. UMAM was used by the USACE to recalculate the Relative Functional Gain (RFG) and total number of credits (functional units) Tarmac originally proposed could be generated for each mitigation type (see Figures 5–1 and 5–2 in Appendix G). While preservation or restoration of uplands cannot directly generate wetland functional gain, those activities can act to provide more effective buffers to protect and/or enhance aquatic functions in adjacent wetlands. These aquatic functions include providing the landscape support that many wildlife species that utilize both wetlands and uplands rely upon. Based on the USACE evaluation of the current site conditions and proposed mitigation activities, it is anticipated that the plan, if fully successful, would yield 897.2 USACE UMAM credits to be released according to the following schedule:

Year 1 – Credit from Wetland Preservation Areas and Hydrologic Enhancement Plan 413.6

Year 15 – Achieve Success on Hydric Hammock Restored from Hydric Coniferous Plantation >8 years 102.3

Year 30 – Achieve Success on Hydric Hammock Restored from Hydric Coniferous Plantation <8 years and Cleared Mixed Hardwood Forest 381.3

5.2.2 Exotic and Nuisance Species

The TMS includes both relatively natural and altered plant communities. Alterations to native plant communities, including establishing conifer plantations and harvesting both conifers and hardwoods throughout the TMS, have allowed for some encroachment of nuisance and/or exotic species in limited areas. Six general areas have been mapped as including three species of concern. Three species observed on site—air potato (*Dioscorea bulbifera*), Japanese honeysuckle (*Lonicera japonica*), and cogongrass (*Imperata cylindrical*)—are identified as Category 1 invasive exotics according to the Florida Exotic Pest Plant Council's 2009 List of Invasive Plant Species. Cattail (*Typha* spp.) is found in borrow pits on the TMS, and although a native to Florida, can become a nuisance species where land alterations have occurred. Restoration of native habitats would include the control and eradication of these four targeted species, as well as any others identified on the 2009 List of Invasive Plant Species, should they be identified during future restoration and monitoring activities. Additionally, any nuisance species would be removed, particularly vines such as *Vitis* spp., *Smilax* spp., *Rubus* spp., and *Mykania scandens*. These species can occur in high densities such that they could impede the survival of the mitigation target community species.

All areas containing exotic and nuisance species would be mapped in Year 1 and chemically treated to control and eventually eradicate these species from the TMS. Specific methodologies for control of exotic and nuisance species are included in Attachment E of Appendix G.

5.2.3 Monitoring

Monitoring of mitigation efforts is proposed to document the effectiveness of the restoration/enhancement activities, to identify and recommend any needed remedial actions, and to measure the progression of the restored/enhanced areas toward meeting the success criteria established for each plant community type as part of the mitigation plan.

Both qualitative and quantitative monitoring are proposed to occur annually in the late summer/fall for each plant community to be restored or enhanced. Qualitative monitoring provides for documentation of general conditions and management recommendations across a large area. Quantitative monitoring provides reproducible sampling of species composition and diversity to track progress of restoration over time. Vegetative conditions at the quantitatively monitored transects and at representative locations would be documented with photographs. Photographs provide a visual means to track progression over time and to document unique features/circumstances that may not otherwise be captured.

Quantitative monitoring would occur in September and October in alternate years; qualitative monitoring would occur annually. Reporting of quantitative, qualitative, and photographic monitoring events would be summarized and submitted annually, no later than December 31 of each year. Monitoring data would be summarized in a tabular-style report for ease of review and comparisons from year to year.

Specific details regarding the proposed monitoring and reporting are included in Attachment C of Appendix G.

5.2.4 Success Criteria

The overall goals of Tarmac's mitigation effort are to eliminate artificial drainage, extend hydroperiods, preserve and maintain existing intact wetlands and uplands, enhance harvested wetland and upland forests with supplemental planting, and convert planted pine communities to the appropriate native hammock community type.

Mitigation is proposed by Tarmac to be deemed successful when all of the following criteria, in addition to the community descriptions in Appendix G, Attachment B, have been met for a period of at least 1 full year without intervention in the form of eradication of undesirable vegetation, pine harvesting, or replanting of desirable vegetation.

a. Entire Site.

    1. Plants are reproducing naturally, either by normal, healthy vegetative spread (in ways that would be normal for each species) or through seedling establishment, growth, and survival.
    2. All wetland target communities proposed for enhancement meet wetland delineation criteria.
    3. Category I and II invasive exotic plant species (pursuant to the most current list established by the Florida Exotic Pest Plant Council at www.fleppc.org) coverage does not exceed 5 percent per acre.
    4. Vegetation in each target community is dominated by species indicative of the target/historic community assemblage, as described in Attachment B of Appendix G.

b. Overall Hydrology.

    1. All low water crossing installations, culvert replacements, and ditch fill areas (see Attachment G of Appendix G) have been completed to the satisfaction of FDEP and the USACE, are stabilized showing no signs of erosion, and have operated as designed without repair for a period of 2 years.

2. There is no evidence of wash outs, erosion, or other indications of unnatural channelized water flow.
3. Each wetland polygon associated with crossing enhancements (see Attachment G of Appendix G) demonstrates appropriate hydric soils per Chapter 62-340 of the *Florida Administrative Code*.

c. Upland and Wetland Enhancement Areas.

1. All areas proposed for enhancement have at least 300 tree stems per acre and 200 shrub stems per acre that are considered representative of the target community type.
2. At least 80 percent of the tree and shrubs species known from the target community types are present in the enhanced and restored communities. These representative species must be capable of successful reproduction and colonizing the remainder of the plant community type.

d. UMAM Assessment.

1. Using monitoring data and reports, and in conjunction with Tarmac, the USACE would inspect the site and conduct a UMAM analysis to ensure that all communities in the enhancement areas have reached, or are expected to reach and maintain, the "with mitigation" scores in Figure 5–2 of Appendix G or community descriptions in Attachment B of Appendix G under the permitted management requirements.

5.2.5 Financial Assurance

Tarmac proposes to manage the TMS and No Mine Areas according to its proposed mitigation plan. Tarmac proposes to provide sufficient financial assurance instruments, formatted to follow Federal guidelines. Once all mitigation activities required by any permit(s) for this project have been completed and released, Tarmac proposes to have title of the TMS transferred to the State of Florida, Board of Trustees of the Internal Improvement Fund. The No Mine Area would remain in the ownership of the current landowner or a subsequent purchaser; conservation easements on those areas would remain in place in perpetuity. A detailed implementation schedule and cost estimate are provided in Attachment L of Appendix G.

5.3 HYDROLOGY

5.3.1 Surface Water Mitigation

The potential impacts on surface water quality for all alternatives are discussed in Chapter 4, Section 4.3.1. With the implementation of standard best management practices, as well as the monthly and quarterly surface water quality monitoring required by FDEP Permit No. 0244771-002, the impacts on surface water quality either on or off site were determined in this environmental impact statement to be minimal. Lakes constructed through mining would also have no surface water connection to other surface waters. The onsite streams that do drain to surface waters such as Waccasassa Bay would be avoided with the exception of a few road crossings. These onsite streams would also be surrounded by uplands and wetlands preserved in perpetual conservation easements as buffers, further reducing the potential for impacts on surface waters, sea grasses, or manatees. Therefore, no surface water mitigation would be required.

5.3.2 Seepage Mitigation

A detailed analysis of seepage impacts under all of the alternatives is provided in Chapter 4, Section 4.2.2; the details and results of the groundwater flow modeling are provided in Appendix D. The worst-case scenario, which corresponds to full mine-out under Alternative 2, would result in a slight decrease in groundwater levels near the northern boundary of the mine site area and a slight increase in groundwater levels within and outside of the eastern portion of the mining area. The other areas around the proposed mine site boundary would experience no discernible alteration. The overall seepage increase into the mine site area would be minimal, and average groundwater drawdown in wetlands

adjacent to the mine site would also be minimal (an average drop of 0.3 feet or less during average, dry, or wet precipitation years). As a result, no additional mitigation for seepage impacts would be required.

5.4 SEA ENCROACHMENT MITIGATION

5.4.1 Storm Surge

Active mining areas would be protected from coastal flooding by construction of a perimeter berm with a top elevation corresponding to the Class III hurricane storm surge elevation and the 100-year storm surge elevation, 19 feet National Geodetic Vertical Datum (NGVD). Restoration of disturbed areas following completion of mining would result in no permanent structures or fills that would alter the extent of coastal storm flooding on the site or in the vicinity, with the exception of perimeter berms that would remain around all non-backfilled lakes. That maximum total area to remain, including lakes, berm footprint, and area between the berms and shoreline, is approximately 2,001 acres.

While inundation from Category III and lower tropical disturbances would be potentially mitigated by the berms, the potential for inundation of the temporary and permanent containment berms during Category IV and V hurricanes would exist under all mining alternatives. The probability of seawater impacting the mine or mitigation sites as a result of storm surge is relatively small (approximately 3 percent) over the next 50 years, as shown in Chapter 3, Table 3–16. The probability increases to approximately 6 percent for a 100-year occurrence. The impact of seawater introduction into these sites would only create a temporary increase in surface and lake water salinity. This phenomenon naturally occurs in estuaries and lakes in close proximity to the shoreline during large storm events, such as hurricanes, floods, etc. Should this occur, the potential temporal effect of this infiltration has been historically shown to be minimal; thus, no additional mitigation would be required.

5.4.2 Sea-Level Rise

The potential sea-level rise over the potential 100-year mining period is discussed in Chapter 3, Section 3.6.2. The highest predicted sea-level rise over the life of the proposed mining is 5.7 feet. Active mining areas would be protected from sea-level rise by construction of a perimeter berm with a top elevation of 19 feet NGVD. Restoration of disturbed areas following completion of mining would result in no permanent structures or fills that would alter the extent of sea-level rise on the site or in the vicinity, with the exception of perimeter berms that would remain around all non-backfilled lakes. That maximum total area to remain, including lakes, berm footprint, and area between the berms and shoreline, is approximately 2,001 acres.

The predicted sea-level rise would begin to encroach on the western part of the mitigation site in 25 to 50 years for the worst-case scenario. For the medium-case scenario, encroachment would not begin until sometime after 50 years but before 75 years. The predicted sea-level rise is an event influenced by factors unrelated to the proposed mining. In addition, the methodology for calculating the potential sea-level rise is still in debate within the scientific community and published results vary widely. However, depending on the alternative selected and the length of any mining permit, if issued, areas within the mitigation parcel that are expected to become inundated during the period evaluated for a permit would either be assessed for removal from the mitigation plan, have reduced mitigative value if included, or be otherwise addressed through special permit provisions imposed by the USACE.

5.5 WETLANDS MITIGATION NEEDED AS A RESULT OF PROPOSED MINING

UMAM scores for the impact areas of the Tarmac King Road Limestone Mine site are discussed in Chapter 4, Section 4.4.2, and presented in Table 4–8. The total functional losses under the mining alternatives (2 through 8) range from 428 units under Alternative 7 to 1,186 units under Alternative 2 (Sarfert 2010).

Tarmac has proposed to implement a series of wetland restoration measures on the TMS and No Mine Area within the proposed mine parcel that could result in long-term functional gains to offset the functional losses of wetlands associated with the proposed mining. The USACE has reviewed this mitigation plan and determined that the proposed activities on the TMS could result in functional gains of approximately

888 units, and the proposed activities within the No Mine Area could result in 9.2 additional units of functional gains (Sarfert 2010). Table 5–3 presents the proposed functional losses and gains from mining and mitigation by alternative. The loss/gain of functional units follows the same ranking described in Chapter 3, Section 3.3.2. The wetland restoration measures in the mitigation plan could result in net functional gains after offsetting impacts associated with Alternatives 3, 4, 6, 7, and 8. The proposed mitigation would not be sufficient to offset the impacts on wetlands from mining under Alternatives 2 and 5. Additional mitigation would be needed from other methods to balance the functional losses proposed from those two mining alternatives.

Table 5–3. UMAM Score Summary for Wetlands Within King Road Mine Area by Alternative with Mitigation

Alternative	Functional Losses Total	Functional Gains (Mitigation Area)	Total Functional Gains/Losses
1	0	0	0
2	–1,185.6	897.2	–288.4
3	–797.4	897.2	99.8
4	–772.3	897.2	124.9
5	–1,058.4	897.2	–161.2
6	–578.2	897.2	319.0
7	–427.8	897.2	469.4
8	–869.1	897.2	28.1

Key: UMAM=Uniform Mitigation Assessment Method.
Source: Sarfert 2010.

5.6 MITIGATION OF IMPACTS ON THREATENED AND ENDANGERED SPECIES

Beneficial and negative impacts on federally and state-listed threatened and endangered (T&E) species are possible from implementation of the mining alternatives. The largest potential negative effect on T&E species is the loss or degradation and/or fragmentation of natural habitat, particularly wetlands. Potential benefits may accrue from the proposed restoration activities associated with the mitigation plan, including the cessation of silviculture within those areas. Because few listed T&E species are found on the project site or are dependent on habitats exclusively found in the Tarmac King Road Limestone Mine area, activities conducted under the mining alternatives would have only a minimal effect on T&E species, except as described for the species below.

5.6.1 Wood Stork

The wood stork, a federally listed endangered species, has been observed in the Tarmac King Road Limestone Mine area (ENTRIX 2009). These birds were likely from two roost sites in the TMS because wood storks generally forage within a 12-mile radius of the roosting site. Wetland loss under the mining alternatives would reduce the already minimal value of the mine area for wood storks, but is unlikely to result in adverse impacts on local wood stork populations.

The FWS completed a biological opinion (see Appendix E) on the potential impacts of the proposed Tarmac King Road Limestone Mine site on the wood stork and concurred with the USACE's determination that the proposed action is not likely to adversely affect the endangered wood stork. This determination was made based on the relatively minor amount of suitable wood stork foraging habitat that would be impacted and the fact that the impacts would not be located within the core foraging area of any active wood stork rookery (FWS 2011). As a result, no further mitigation would be required.

5.6.2 Eastern Indigo Snake

The eastern indigo snake, a federally listed threatened species, is widely distributed throughout Florida, and several have been observed on or near the mine site. However, they occur more frequently in sandhill habitats, which are not present in the Tarmac King Road Limestone Mine area. Construction of storm surge berms around permanent lakes under the mining alternatives could result in a very small

addition of suitable habitat for the indigo snake because it prefers upland habitats (FWS 1999). Berms may also offer a very small amount of suitable habitat and substrate for the gopher tortoise, a state-listed species of special concern, which could increase the number of nesting sites for the indigo snake. The indigo snake prefers gopher tortoise burrows as shelter from winter cold and desiccating conditions (FWS 1999).

The FWS completed a biological opinion on the potential impacts of the proposed Tarmac King Road Limestone Mine site on the eastern indigo snake (FWS 2011). The full biological opinion is included as Appendix E of this environmental impact statement. The FWS concurred with the USACE's determination that the proposed mine project is not likely to jeopardize the continued existence of the eastern indigo snake. The FWS concluded that the loss of habitat would not affect the overall survival and that the species may indeed live within the suitable habitat remaining within the site. The TMS was cited as a permanently protected and occupied eastern indigo snake habitat.

In an effort to minimize the impact on the eastern indigo snake to the maximum extent possible, if a permit is issued, the FWS would require the USACE to include permit conditions requiring Tarmac's full compliance with the Incidental Take Statement included in Appendix E. These conditions are briefly summarized as follows:

- Tarmac must implement the FWS/USACE Standard Protection Measures for the Eastern Indigo Snake (revised 2004).
- Tarmac must complete pre-clearing surveys for each mining unit or sub-parcel to document potential refugia for eastern indigo snakes.
- Tarmac must provide at least one qualified observer during ground-clearing activities to visually evaluate areas immediately prior to and following those activities to record any eastern indigo snake activity.
- Tarmac must post all roads under its control with a speed limit of 25 miles per hour.
- Tarmac must immediately notify the FWS, the FFWCC, and the USACE if a dead or injured eastern indigo snake is encountered.
- Tarmac must reinitiate FWS consultation and re-evaluate reasonable and prudent measures if the take of more than three eastern indigo snakes over a rolling 5-year period occurs or if productivity of two eastern indigo snake nests is lost over the same period.
- Tarmac must provide an annual report summarizing the status of implementation and operation of the project, including detailed information on all eastern indigo snake activity, to the USACE and FWS.

5.7 SEISMICITY

Seismicity results are presented in Chapter 4, Section 4.7.4. Offsite impacts from proposed blasting were determined to be minimal for the majority of the alternatives. However, for areas located within the southwest section of the Tarmac King Road Limestone Mine site, the residences and campsites are within 815 feet of the proposed mining. These are the closest residences to the Tarmac King Road Mine site boundary, but would not be impacted by mining until 40 years or more after the project would commence. As originally proposed, vibration levels approximately 815 feet from the potential blasting to the closest structure existing in 2010 would be 1.034 inches per second for the maximum charge weight per delay, which exceeds the Florida State limit for drywall. Tarmac has proposed mitigation that includes modifications to the blasting pattern used and would adjust for the proximity of structures located in the area now occupied by the Deerhaven Campsites. Due to the length of time involved until this area would be reached for mining as proposed, multiple options for explosives patterns and products could be considered. Using the simplest method of reducing the blast hole diameter from 4.5 inches to 4.0 inches, a reduction in pounds per delay would be achieved. Using 408.6 pounds per delay, a level of 0.88 inches per second is predicted. This level represents 117 percent of the current drywall limit of 0.75 inches per second, as defined by Florida statute (Tarmac 2010:Vol. II, Appendix 5). Because this method would still exceed the level of the Florida State limit for drywall, further mitigation would be needed.

5.8 AIR QUALITY

The main activities of the Tarmac King Road Limestone Mine site that would generate significant emissions include primary and secondary processing operations, load-out operations, fugitive dust emissions, and truck traffic. These emissions are quantified in Chapter 4, Section 4.10. As a mitigation measure, these particulate matter emissions would be reduced by using water sprays at key transfer points and operations at the facility as necessary.

Fugitive particulate matter (dust) emissions from unpaved roads would occur from trucks transporting limestone from the facility and front-end loaders transferring limestone from the stockpiles to the trucks. Fugitive dust emissions from paved roads occur from trucks transporting limestone from the facility. As a mitigation measure, water would be applied to unpaved roads and open stockpiles as necessary to reduce fugitive emissions. Mine road speed limits would also be posted at 25 miles per hour or less to further reduce fugitive dust. In addition, stockpile height would be limited to a 70-foot maximum to mitigate wind entrainment of particulates from stockpiles.

5.9 NOISE

A detailed noise analysis is presented in Chapter 4, Section 4.12. Offsite impacts due to noise were determined to be minimal for the majority of the alternatives. However, a recent study conducted for Tarmac indicates that the closest residences to potential mining areas are to the southwest about 815 feet from the potential mining areas. It concluded that there is the potential for sound levels to exceed 65 decibels A-weighted (dBA) at these residences as a result of dragline, crusher, and screening operations at the mining area. The report also indicates that Tarmac has committed to providing a 100-foot-wide vegetated buffer in this area to mitigate sound levels and to build berms to a minimum elevation of 19 feet above sea level around all mining areas before excavation would begin. This would further minimize any sound emanating from the mining areas (Grove 2010:11), likely resulting in levels below the Levy County noise level limit of 65 dBA for daytime hours at rural residential properties.

5.10 CULTURAL RESOURCES

Restoration activities on the TMS associated with Alternatives 2 through 8 could potentially impact three archaeological sites. These sites would be protected to the maximum extent possible. The Cultural Resource Management Plan for the Tarmac Mine Mitigation Area (Florida History 2008) proposes management measures to ensure that the cultural resources within the TMS are not disturbed. The Florida State Historic Preservation Officer has approved this plan (FSHPO 2008).

Panamerican Consultants evaluated the Tarmac King Road Limestone Mine site in 2006 and classified the site as having a low to moderate probability for prehistoric cultural material and archaeological sites

(Panamerican Consultants 2006). However, in the event that any unexpected discoveries are made during any permitted operations under any of the alternatives, the state archaeologist would be notified and Tarmac would be required to cooperate fully with Federal and state requirements regarding the protection of cultural and historic resources.

5.11 RECREATION

Impacts on recreation would occur because of restrictions and land cover changes that would result from mining activities and conservation easement requirements. Tarmac has proposed that recreation on the TMS would be limited to the following activities: hiking, hunting, fishing, horseback riding on remaining monitoring roads only, bird and wildlife observation, non-professional beekeeping, sustainable seed collection for restoration, and educational field trips or research. All educational field trips would be guided by the QMS, Tarmac, or the FFWCC.

Tarmac's intent is to allow the TMS to remain a vital part of the Gulf Hammock Wildlife Management Area and to allow hunting and similar recreational activities to continue to be managed by the FFWCC. Accordingly, Tarmac would submit a hunting and recreational activity lease agreement to the state for review and approval. Such a lease would be consistent with the conservation easement. If at any time the QMS determines that any hunting or recreational activity would restrict ecological management or progress toward the mitigation success criteria discussed in Section 5.2.4, such activities would be discontinued and a plan for correction of the problem prepared.

Hunting would also be permitted on the proposed mine site, but not in active mining areas. Tarmac would construct "No Hunting" buffer zones. These zones would be published annually in the Gulf Hammock Wildlife Management Area Brochure.

5.12 TRANSPORTATION

A detailed traffic analysis is presented in Chapter 4, Section 4.15.2.2.1. Based on the existing traffic volume, 3 percent annual growth, and the estimated contribution of the proposed Tarmac King Road Limestone Mine and Levy Nuclear Plant, all of the roads surrounding the proposed mine site are well within capacity through year 2020. However, based on the traffic study and the volume of truck traffic turning onto and off of U.S. Route 19 at King Road, Lincks and Associates (2010) recommended that left and right turning lanes in excess of 400 feet be established along U.S. Route 19 to mitigate impacts on through traffic.

Specific Condition 16 of Levy County's order approving Tarmac's special exception application for the mine project states that Tarmac is obligated to "construct, or cause to be constructed" improvements to the intersection of U.S. Route 19 and King Road, which include the referenced turning lanes, "in accordance with plans approved by FDOT [Florida Department of Transportation]." Accordingly, Tarmac is the responsible entity for financing their construction, in accordance with plans approved by FDOT. FDOT has not expressed support or opposition to new turning lanes. A request for authorization for the turning lanes has not yet been received by FDOT.

5.13 REFERENCES

ENTRIX (ENTRIX, Inc.), 2009, *Wildlife Survey Results Tarmac King Road Limestone Mine Levy County, Florida*, revised, July.

FFWCC (Florida Fish and Wildlife Conservation Commission), 2009, *Black Bears in Florida,* accessed through http://www.floridaconservation.org/WILDLIFEHABITATS/Bear_index.htm in March.

Florida History, LLC, 2008, *Cultural Resource Management Plan for the Tarmac Mine Mitigation Area*, June (Appendix K to the Environmental Resource Permit).

FNAI (Florida Natural Areas Inventory), 2009, *Biodiversity Matrix, Levy County, Unofficial Report for Matrix Units 21102, 21103, 21338-21341, 21575, 21577, 21578, 21813-21815, 21817, 22054-22057, 22297, 22298*, accessed through http://lotmaps.freac.fsu.edu/bio05/index.html, March.

FSHPO (Florida State Historic Preservation Officer), 2008, letter approving the cultural resource management plan for the Tarmac Mine mitigation area, August 20 (Appendix L to the Environmental Resource Permit).

FWS (U.S. Fish and Wildlife Service), 1999, *Eastern Indigo Snake Drymarchon corais couperi*, in Multi-species Recovery Plan for South Florida, South Florida Ecological Field Services, Vero Beach, Florida, accessed through http://www.fws.gov/verobeach/images/pdflibrary/eisn.pdf, March 2009.

FWS (U.S. Fish and Wildlife Service), 2011, *Biological Opinion*, FWS Log No. 41910-2010-F-0168, Jacksonville, Florida, March 9.

Grove (Grove Scientific and Engineering Company), 2010, *Tarmac King Road Mine, Levy County, Florida, Potential Sound Impact Study*, Orlando, Florida, March.

Lincks & Associates, Inc., 2010, *Transportation Analysis – Tarmac-Levy County*, Tampa, Florida, June.

Panamerican Consultants (Panamerican Consultants, Inc.), 2006, *An Archaeological and Historical Survey of the King Road Mine Project Area in Levy County, Florida*, Tampa, Florida, October.

Sarfert, E.P., USACE Jacksonville Regulatory District, Jacksonville, Florida, 2010, personal communication with J.O. Holian, Science Applications International Corporation, Germantown, Maryland, May 4.

Tarmac, 2009, Request for Additional Information, Tarmac America – Titan King Road Mine, File No. 0244771-002, Levy County, April 29.

Tarmac, 2010, *Tarmac King Road Mine Site Special Exception Application #3*, Levy County, Florida, filed June 13, 2010.

Code of Federal Regulations

33 CFR 332, Corps of Engineers, Department of the Army, “Compensatory Mitigation for Losses of Aquatic Resources.”

Florida Administrative Code

FAC Chapter 62-340, “Delineation of the Landward Extent of Wetlands and Surface Waters.”

CHAPTER 6
COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

This chapter provides a description of the major Federal regulations and Executive orders that may currently or in the future apply to the various alternatives analyzed in this *Tarmac King Road Limestone Mine Environmental Impact Statement (King Road EIS).*

6.1 NATIONAL ENVIRONMENTAL POLICY ACT OF 1969

The National Environmental Policy Act (NEPA) of 1969 (42 United States Code [U.S.C.] 4321 et seq.) establishes a national policy requiring that Federal agencies consider the environmental impacts of major Federal actions significantly affecting the quality of the human environment before making decisions and taking actions to implement those decisions. Implementation of NEPA requirements in accordance with Council on Environmental Quality (CEQ) regulations (Title 40 of the *Code of Federal Regulations* [CFR] Sections 1500 through 1508 [40 CFR 1500–1508]) can result in a Categorical Exclusion, an environmental assessment, a Finding of No Significant Impact, or an environmental impact statement (EIS). This EIS has been prepared in accordance with NEPA requirements, CEQ regulations (40 CFR 1500 et seq.), and U.S. Army Corps of Engineers (USACE) provisions for implementing the procedural requirements of NEPA (33 CFR 230; USACE Engineering Regulation ER 200-2-2).

6.2 ENDANGERED SPECIES ACT OF 1973

The Endangered Species Act of 1973 (7 U.S.C. 136; 16 U.S.C. 460 et seq.) is intended to prevent the further decline of endangered and threatened species and to restore these species and their habitats. Section 7 of the act requires Federal agencies having reason to believe that a prospective action may affect an endangered or threatened species or its habitat to consult with the U.S. Fish and Wildlife Service (FWS) of the U.S. Department of the Interior and/or the National Marine Fisheries Service of the U.S. Department of Commerce to ensure that the action does not jeopardize the species or destroy its habitat. If, despite reasonable and prudent measures to avoid or minimize such impacts, the species or its habitat would be jeopardized by the action, a review process is specified to determine whether the action may proceed as an incidental taking (50 CFR 17).

A wildlife survey of the mine and mitigation area was published by Biological Research Associates in September 2008 and revised in July 2009. Consultation with the FWS was initiated on January 14, 2010, and the FWS released its biological opinion on May 9, 2011 (see Appendix D of this EIS). The biological opinion concurs with the USACE determinations that the proposed action may affect the federally threatened eastern indigo snake, and may affect, but is not likely to adversely affect, the federally endangered wood stork.

6.3 NATIONAL HISTORIC PRESERVATION ACT OF 1966

The National Historic Preservation Act of 1966 (16 U.S.C. 470 et seq.) provides that sites with significant national historic value be placed on the National Register of Historic Places, maintained by the Secretary of the Interior. The major provisions of the act for USACE consideration are Sections 106 and 110. Both sections aim to ensure that historic properties are appropriately considered in planning Federal initiatives and actions. Section 106 is a specific, issue-related mandate to which Federal agencies must adhere. It is a reactive mechanism driven by a Federal action. Section 110, in contrast, sets out broad Federal agency responsibilities with respect to historic properties. It is a proactive mechanism with emphasis on ongoing management of historic preservation sites and activities at Federal facilities. No permits or certifications are required under the act.

Section 106 requires the head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking to ensure compliance with the provisions of the act. It compels Federal agencies to “take into account” the effect of their projects on historical and archaeological resources and to give the Advisory Council on Historic Preservation the opportunity to comment on such effects. Section 106 mandates consultation during Federal actions if the undertaking has the potential to affect a historic property. This consultation normally involves State or Tribal Historic Preservation Officers, or both, and may include other organizations and individuals such as local governments and

Native American tribes. If an adverse effect is found, the consultation often ends with the execution of a memorandum of agreement that states how the adverse effect will be resolved.

The results of a systematic archaeological survey performed by Panamerican Consultants, Inc. (PCI), for the mine area were published in October 2006; survey results and management plans for the proposed mitigation areas were published by Florida History, LLC (FHL), in June 2008. The purpose of the surveys was to locate and assess the significance of historic properties and determine if activities proposed for a permit would adversely affect these properties. The surveys were sent to the State Historic Preservation Officer (SHPO) for evaluation and, in a letter dated February 2, 2009, the SHPO indicated concurrence with the PCI survey's conclusion that the proposed action is not likely to disturb historical cultural resources within the proposed mining area. In a letter dated August 20, 2008, the SHPO provided recommendations on FHL's management plans for the proposed mitigation area. After additional consultation between SHPO and USACE in 2012, Tarmac America, LLC, provided a requested updated schedule and plan of work for its management measures for known and unknown resources. Additional direct coordination occurred between the USACE and Seminole Tribe of Florida (STOF) in 2012 concurrent with the USACE Section 404 Public Notice for this project. The archaeological and historical survey was reviewed by the Tribal Historic Preservation Office of the STOF during this consultation. The STOF advised the USACE on July 16, 2012, that the archaeological surveying done for the site was satisfactory. No other Native American tribes responded to the USACE Section 404 Public Notice or the draft EIS.

If it is determined that significant historic properties will be adversely affected by the project, a plan will be developed, in consultation with the SHPO, to avoid, minimize, or mitigate effects on historic properties. Actions under the plan shall be completed prior to initiation of ground-disturbing activities. All work will be conducted in compliance with the National Historic Preservation Act of 1966, as amended (Public Law 89-655), and the Archeological and Historic Preservation Act, as amended (Public Law 93-291). See Chapter 4, Section 4.13, for analyses of cultural resources impacts.

6.4 CLEAN WATER ACT OF 1972

The Clean Water Act (33 U.S.C. 1251 et seq.), which amended the Federal Water Pollution Control Act, was enacted to "restore and maintain the chemical, physical, and biological integrity of the Nation's water." The Clean Water Act prohibits the "discharge of toxic pollutants in toxic amounts" to navigable waters of the United States. Section 313 of the Clean Water Act requires all branches of the Federal Government engaged in any activity that might result in a discharge of runoff of pollutants to surface waters to comply with Federal, state, interstate, and local requirements.

Section 404 of the Clean Water Act gives the USACE permitting authority over activities that discharge dredge or fill materials into waters of the United States, including wetlands. The mining proposed in the Tarmac King Road Limestone Mine area under the various alternatives evaluated in this EIS would require a Section 404(b)(1) evaluation and subsequent permitting before any mining plan could be implemented.

The Clean Water Act also provides guidelines and limitations for effluent discharges from point-source discharges and establishes the National Pollutant Discharge Elimination System (NPDES) permit program. The NPDES program is administered by the U.S. Environmental Protection Agency (EPA), pursuant to regulations in 40 CFR 122 et seq., and authority may be delegated to states. Sections 401 through 405 of the Water Quality Act of 1987 added Section 402(p) to the Clean Water Act, requiring that EPA establish regulations for permits for stormwater discharges associated with industrial activities, including construction activities that could disturb 5 or more acres. Stormwater provisions of the NPDES program are set forth at 40 CFR 122.26. Before ground-disturbing activities would commence, USACE would consult with the EPA to determine whether an NPDES permit would be required.

6.5 CLEAN AIR ACT OF 1972

The Clean Air Act (42 U.S.C. 7401 et seq.) is intended to "protect and enhance the quality of the Nation's air resources so as to promote the public health and welfare and the productive capacity of its population." Section 118 of the Clean Air Act (42 U.S.C. 7418) requires that each Federal agency with

jurisdiction over any property or facility engaged in any activity that might result in the discharge of air pollutants comply with "all Federal, state, interstate, and local requirements" with regard to the control and abatement of air pollution.

Section 109 of the Clean Air Act (42 U.S.C. 7409 et seq.) directs EPA to set National Ambient Air Quality Standards (NAAQS) for criteria pollutants. EPA has identified and set NAAQS under 40 CFR 50 for the following criteria pollutants: particulate matter, sulfur dioxide, carbon monoxide, ozone, nitrogen dioxide, and lead. Section 111 of the Clean Air Act (42 U.S.C. 7411) requires establishment of national standards of performance for new or modified stationary sources of atmospheric pollutants. Section 160 of the Clean Air Act (42 U.S.C. 7470 et seq.) requires that specific emission increases be evaluated prior to permit approval to prevent significant deterioration of air quality. Section 112 of the Clean Air Act (42 U.S.C. 7412) requires specific standards for releases of hazardous air pollutants (including radionuclides).

The mining and processing of limestone proposed in the Tarmac King Road Limestone Mine area require air permits under a state permitting program. The state regulations are implemented to control emissions of air pollutants such that the requirements of the Clean Air Act (including NAAQS and emission limits) are met. An analysis of the potential impacts of the proposed alternatives in terms of their impact on air quality was completed for this EIS in Chapter 4, Section 4.10. Currently, limestone mining and processing are permitted under state permitting programs, which would implement the requirements under the Clean Air Act. The necessary permit has been obtained from the Florida Department of Environmental Protection (FDEP 2008).

6.6 COASTAL ZONE MANAGEMENT ACT OF 1972

The intent of the Federal Coastal Zone Management Act (CZMA) (16 U.S.C. 1456) is to encourage coastal states to manage and balance competing uses of coastal areas that result in impacts on coastal resources. The CZMA gives states the primary role in managing coastal resources provided they develop a federally approved coastal zone management plan (CZMP). Florida has a federally approved CZMP that was approved by the National Oceanic and Atmospheric Administration in 1981 and is codified at Chapter 380, Part II, of the *Florida Statutes*. The coastal zone is defined as the 35 coastal counties and adjoining waters to the limits of the territorial sea. Levy County in its entirety, and thus the entire project site and mitigation area, is contained within the designated coastal zone.

The Florida CZMP is based on a network of state agencies and water management districts implementing 24 state statutes that protect the natural, cultural, and economic resources of the coastal zone. Primary oversight is provided by the Florida Department of Environmental Protection. The 24 statutes pertain to a wide range of topics that could be affected by development activities in the coastal zone, including beach and shore preservation; comprehensive regional plans; emergency management; state lands, parks and preserves; transportation; recreation; biological resources; and public health. Evaluation of the substantive issues pertaining to these statutes is addressed in the applicable sections of the EIS.

Section 307 of the Federal CZMA contains the Federal consistency requirements. A Federal agency considering actions (including issuance of Federal permits) that may impact the land, water uses, or natural resources of the coastal zone must be consistent, to the maximum extent practicable, with the policies of the state's federally approved Coastal Zone Management Program. In Florida, Federal consistency review is integrated into other review processes conducted by the state through the Florida State Clearinghouse. On November 1, 2010, in accordance with Part IV of Chapter 373 of the *Florida Statutes* and Title 62 of the *Florida Administrative Code*, the Florida Department of Environmental Protection issued an Environmental Resources Permit (Permit Authorization Number 0244771-002), indicating that the proposed action as described in Chapter 2 of this *King Road EIS* was in compliance with requirements set forth in the Florida Coastal Zone Management Program and thus satisfies CZMA requirements.

6.7 FARMLAND PROTECTION POLICY ACT OF 1981

The Farmland Protection Policy Act of 1981 (7 U.S.C. 4201), passed in 1981, attempts to minimize the effects that federally funded programs could have on the conversion of farmland to non-agricultural uses. The act specifically targets the urban sprawl resulting from the conversion, and the associated waste of resources and energy.

According to 7 CFR 658.2(c)(1)(i) of the Farmland Protection Policy Act, Federal permitting, licensing, or rate approval programs for activities on private or non-Federal lands are not governed by this act. Therefore, mining activities occurring within the Tarmac King Road Limestone Mine area are not subject to this act.

6.8 NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT OF 1990

The Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq.) establishes a means for Native Americans to request the return or repatriation of human remains and other cultural items presently held by Federal agencies or federally assisted museums or institutions. The act also contains provisions regarding the intentional excavation and removal of, inadvertent discovery of, and illegal trafficking in Native American human remains and cultural items. Major actions under this law include (a) establishing a review committee with monitoring and policymaking responsibilities; (b) developing regulations for repatriation, including procedures for identifying lineal descent or cultural affiliation needed for claims; (c) providing oversight of museum programs designed to meet the inventory requirements and deadlines of this law; and (d) developing procedures to handle unexpected discoveries of graves or grave goods during activities on Federal or tribal lands. All Federal agencies that manage land or are responsible for archaeological collections obtained from their lands or generated by their activities must comply with this act. USACE managers of ground-disturbing activities on Federal and tribal lands are to be aware of the statutory provisions treating inadvertent discoveries of Native American remains and cultural objects. Regulations implementing the act are found at 43 CFR 10.

As described previously, the results of a systematic archaeological survey performed by PCI for the mine area were published in October 2006. The purpose of the survey was to locate and assess the significance of cultural properties and determine if activities proposed under the permit would adversely affect these properties. Consultation with the STOF, Miccosukee Tribe of Indians of Florida, Muscogee (Creek) Nation, Mississippi Band of Choctaw Indians, Poarch Band of Creek Indians, AH-TAH-THI-KI Museum, Seminole Nation of Oklahoma, and Miccosukee (Creek) Nations of Oklahoma was initiated on July 23, 2008 by the applicant. On August 14, 2008, a response was received from the Miccosukee Tribe indicating no direct knowledge of sites within the Tarmac King Road Limestone Mine area. Additional direct coordination occurred between the USACE and STOF in 2012 concurrent with the USACE Section 404 Public Notice for this project. The archaeological and historical survey was reviewed by the Tribal Historic Preservation Office of the STOF during this consultation. The STOF advised the USACE on July 16, 2012, that the archaeological surveying done for the site was satisfactory. No other Native American tribes responded to the USACE Section 404 Public Notice or the draft EIS.

6.9 SOLID WASTE DISPOSAL ACT OF 1965

The Solid Waste Disposal Act of 1965, as amended by the Resource Conservation and Recovery Act of 1976 and the Hazardous and Solid Waste Amendments of 1984 (42 U.S.C. 6901 et seq.), as amended, governs the transportation, treatment, storage, and disposal of hazardous waste and nonhazardous waste (that is, municipal solid waste). Under the Resource Conservation and Recovery Act of 1976, which amended the Solid Waste Disposal Act of 1965, EPA defines and identifies hazardous waste; establishes standards for its transportation, treatment, storage, and disposal; and requires permits for persons engaged in hazardous waste activities. Regulations imposed on a generator or on a treatment, storage, or disposal facility vary according to the type and quantity of hazardous waste generated, treated, stored, or disposed of, and the methods of treatment, storage, and disposal. The State of Florida has adopted by reference portions of the Federal regulations into its *Florida Administrative Code* Rule 62-730. An analysis of issues related to the generation and disposal of wastes associated with mining in the Tarmac King Road Limestone Mine region is included in Chapter 4, Section 4.9, of this EIS.

The Resource Conservation and Recovery Act has been determined not to be applicable, as there are no items regulated under the act being managed by this project.

6.10 EXECUTIVE ORDER 11990, *FLOODPLAIN MANAGEMENT*

Executive Order 11988, *Floodplain Management* (May 24, 1977), requires Federal agencies to establish procedures to ensure that the potential effects of flood hazards and floodplain management are considered for any action undertaken in a floodplain and that floodplain impacts be avoided to the extent practicable. Before any ground-disturbing activities would commence, consultation would occur with the proper regulatory agencies, including the Federal Emergency Management Agency, Southwest Florida Water Management District, and Florida Department of Environmental Protection to assess the potential for floodplain impacts and any necessary mitigation efforts.

6.11 EXECUTIVE ORDER 11990, *PROTECTION OF WETLANDS*

Executive Order 11990, *Protection of Wetlands* (May 24, 1977), requires Federal agencies to avoid any short- or long-term adverse impacts on wetlands wherever there is a practicable alternative. Each agency must also provide an opportunity for early public review of any plans or proposals for new construction in wetlands.

Chapter 4, Section 4.4, of this EIS discusses the expected impacts of the different alternatives on wetlands. Mitigation sites have been identified for consideration in this EIS to achieve complete mitigation should alternatives that require additional mitigation be implemented. The proposed mitigation plan is described in Chapter 5 of this EIS. Also see Section 6.4 on Section 404 permitting under the Clean Water Act.

6.12 EXECUTIVE ORDER 12898, *FEDERAL ACTIONS TO ADDRESS ENVIRONMENTAL JUSTICE IN MINORITY POPULATIONS AND LOW-INCOME POPULATIONS*

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994), requires each Federal agency to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. Executive Order 12898 requires the Federal Government to review the effects of its programs and actions on minorities and low-income communities.

An environmental justice analysis was completed on the proposed alternatives and is included in Chapter 4, Section 4.16, of this EIS.

6.13 EXECUTIVE ORDER 13112, *INVASIVE SPECIES*

Executive Order 13112, *Invasive Species* (February 3, 1999), requires Federal agencies to prevent the introduction of invasive species; to provide for their control; and to minimize their economic, ecological, and human health impacts. The considered alternatives take all feasible and prudent measures to minimize the introduction and spread of invasive species.

6.14 ACTS AND EXECUTIVE ORDERS THAT ARE NOT APPLICABLE TO THIS *KING ROAD EIS*

Wild and Scenic River Act of 1968 (16 U.S.C. 1271). This act is not applicable because there are no rivers designated under this act in the study area.

Estuary Protection Act of 1968 (16 U.S.C. 1221). This act is not applicable because there are no estuaries that would be affected by this project.

Marine Mammal Protection Act of 1972 (16 U.S.C. 1361). This act is not applicable because no marine mammals occur in the mine area and no impact is expected to occur.

Federal Water Project Recreation Act of 1965, as amended (16 U.S.C. 460). This act is not applicable because no Federal recreation funds would be expended by this project.

Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801 et seq.). This act is not applicable because the waters within the project boundaries do not fall under its jurisdiction. An analysis of potential impacts to offsite Essential Fish Habitat (EFH) was performed to ensure adverse impacts to EFH would not occur offsite.

Resource Conservation and Recovery Act of 1976 (42 U.S.C. 321 et seq.) This act has been determined not to be applicable, as there are no items regulated under the act either being disposed of or affected by this project.

Toxic Substances Control Act of 1976 (15 U.S.C. 2601 et seq.). It has been determined that this act is not applicable to this project, as there are no items regulated under the act either being disposed of or affected by this project.

Submerged Land Act of 1953 (43 U.S.C. 1301 et seq.). This act is not applicable because the land that would be affected by this project is not under jurisdiction of this act.

Anadromous Fish Conservation Act (16 U.S.C. 757). This act is not applicable because no anadromous species occur in waters that would be affected by this project.

Executive Order 13089, *Coral Reef Protection*. This order is not applicable to this project because no species, habitats, or other natural resources associated with coral reefs would be affected.

Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*. This order is not applicable to this project because the actions being considered in this EIS are not expected to have significant effects on the environment outside the geographical boundaries of the United States or its territories.

CHAPTER 7
CONSULTATIONS

Certain laws require agencies to consult and coordinate with other governmental entities, including other Federal agencies, state and local agencies, and federally recognized Native American governments. The following sections describe consultations and other interactions that took place during the preparation of this environmental impact statement (EIS). Consultation letters associated with this EIS are included at the end of this chapter.

7.1 ECOLOGICAL RESOURCES

Ecological resource consultations generally pertain to the potential for activities to disturb sensitive species or habitats. At the U.S. Army Corps of Engineers' (USACE's) request, Tarmac America, LLC, submitted additional information regarding its wildlife survey methods at the Tarmac King Road Limestone Mine and mitigation sites for the Florida Fish and Wildlife Conservation Commission's (FWC's) review (Mr. Timothy King, FWC-Department of Environmental Protection Liaison) in 2008. USACE also submitted a biological assessment with a letter requesting initiation of formal consultation to the U.S. Fish and Wildlife Service (FWS) on January 14, 2010. FWS's response to this consultation request was received on March 9, 2011 (see Appendix E). Each of these letters is included at the end of this chapter.

7.2 CULTURAL RESOURCES

Cultural resource consultations relate to the potential for disruption of important cultural and historical resources and archaeological sites. Panamerican Consultants, Inc., prepared an archaeological and historical survey of the Tarmac King Road Limestone Mine site, which the Florida Department of State, Division of Historical Resources, State Historic Preservation Office (SHPO), found to be complete and sufficient in 2009. Florida History, LLC, provided survey results and management plans for the proposed mitigation areas for which the SHPO provided recommendations in 2008. After additional consultation between SHPO and USACE in 2012, Tarmac provided a requested updated schedule and plan of work for its management measures for known and unknown resources (see SHPO, USACE, and Cardno Entrix letters included in this chapter).

7.3 TRIBAL CONSULTATIONS

Native American consultations are concerned with the potential for impacts on any rights and interests, including disturbance of Native American ancestral sites, sacred sites, and traditional and religious practices, or natural resources of importance to Native Americans. Consultation with the Seminole Tribe of Florida (STOF), Miccosukee Tribe of Indians of Florida, Muscogee (Creek) Nation, Mississippi Band of Choctaw Indians, Poarch Band of Creek Indians, AH-TAH-THI-KI Museum, Seminole Nation of Oklahoma, and Muscogee (Creek) Nation of Oklahoma was initiated on July 23, 2008, by the applicant. On August 14, 2008, a response was received from the Miccosukee Tribe indicating no direct knowledge of sites within the Tarmac King Road Limestone Mine area. Additional direct coordination occurred between the USACE and STOF in 2012 concurrent with the USACE Section 404 Public Notice for this project. The archaeological and historical survey was reviewed by the Tribal Historic Preservation Office of the STOF during this consultation. The STOF advised the USACE on July 16, 2012, that the archaeological surveying done for the site was satisfactory. No other Native American tribes responded to the USACE Section 404 Public Notice or the draft EIS. These letters are included in this chapter.

Ecological Resources Consultations

From: Florida Fish and Wildlife Conservation Commission (Mr. Timothy King)
To: U.S. Army Corps of Engineers (Mr. Edward Sarfert)

From: King, Timothy [mailto:timothy.king@MyFWC.com]
Sent: Wednesday, April 09, 2008 3:32 PM
To: Sarfert, Edward P SAJ
Subject: RE: Tarmac King Road Limestone Mine EIS

Ed,
I talked with Shannon Gonzalez (BRA) on the phone about this. Based on our discussion, I don't anticipate wildlife survey methodology issues at this time. Thanks for staying in touch.
Tim

-----Original Message-----
From: Sarfert, Edward P SAJ [mailto:Edward.P.Sarfert@usace.army.mil]
Sent: Tuesday, April 08, 2008 6:32 PM
To: King, Timothy
Cc: Rousso, Stephanie
Subject: RE: Tarmac King Road Limestone Mine EIS

Tim: As an update, our contractor is checking on status of the transcripts, they'd not received by this afternoon.

No formal response yet from BRA, although they acknowledged receipt of The message I sent them and advised the project's primary wildlife biologist Is on paternity leave.

Talk to you soon -
Ed

Please assist us in better serving you! Please complete the customer Survey by clicking on the following link: http://regulatory.usacesurvey.com/

-----Original Message-----
From: Sarfert, Edward P SAJ
Sent: Tuesday, April 01, 2008 9:52 AM
To: 'King, Timothy'
Cc: Rousso, Stephanie
Subject: RE: Tarmac King Road Limestone Mine EIS

Tim:

Thanks for the info, I'll forward the recommendations in your message to BRA with copy to FWS and you both.

We also talked yesterday about availability of meeting comments transcripts...these will be back from the court reporter ~10 days from date of the last meeting, so available approximately the week of 7 April.
I've made a note to send to you when I receive, but if you wouldn't mind contacting me again if you haven't heard from me by middle of that week.

thanks again -

Ed

Please assist us in better serving you! Please complete the customer Survey by clicking on the following link: http://regulatory.usacesurvey.com/

-----Original Message-----
From: King, Timothy [mailto:timothy.king@MyFWC.com]
Sent: Tuesday, April 01, 2008 8:41 AM
To: Sarfert, Edward P SAJ
Cc: Rousso, Stephanie
Subject: Tarmac King Road Limestone Mine EIS

Ed,

1

I asked Stephanie Rousso, a biologist in our section, for some reference wildlife survey methodologies that should be applied to this project.
She's the lead in an ongoing effort to produce a computer-based, interactive "manual" that will provide step-by-step guidelines for addressing fish and wildlife issues with development projects statewide. She suggests that until the manual is completed in the next couple of months, our recommendation is to have the consultants follow protocols available through the FWC-FWRI and USFWS-Vero Beach websites. Her specific recommendations follow:

FWC- FWRI publications website:
http://research.myfwc.com/features/view_article.asp?id=25446

USFWS- go to the Vero Beach website:

Wood 2001 Florida's Fragile Wildlife. UF press. This book contains a lot of survey methods for multiple species produced under OES by Don Wood.

BRA should have all they need- they are well established or can at least Cut and paste a methodology from a similar recent project. If you want me To look over their proposed methodology, get an electronic copy from them.
Also ask them for a potentially occurring species list and have them identify CWCS, FNAI, or FWC habitat classifications not FLUCFCS. FLUCFCS is too specific and often many habitats are missed during surveys because of that reason. CWCS includes a list of all conservation need species, threats to the habitat, and mgmt guidelines. That is what we are pushing in the manual.

If you have any questions about these recommendations feel free to give me a call. My contact information follows.

Tim

Tim King, Statewide Reclaimed Habitat Specialist

Habitat Conservation Scientific Services Section

Division of Habitat and Species Conservation

Florida Fish and Wildlife Conservation Commission

3829 Tenoroc Mine Road

Lakeland, Florida 33805-8547

Office: (863)499-2421 ext. 105

Fax: (863)499-2692

Email: timothy.king@myfwc.com

2

Ecological Resources Consultations *(continued)*

From: U.S. Army Corps of Engineers (Mr. Edward Sarfert)
To: Florida Fish and Wildlife Conservation Commission (Mr. Timothy King)

[With attachment from Biological Research Associates, April 14, 2008, "Wildlife Survey Methodology for the Tarmac King Road Mine EIS"]

From: McLane Evans [mailto:mevans@biologicalresearch.com]
Sent: Monday, April 14, 2008 12:34 PM
To: Sarfert, Edward P SAJ
Cc: Rousso, Stephanie; King, Timothy; Erin Gawera@fws.gov; Jake Varn; Holian, James O.; Shannon Gonzalez; Townsend Al; Burns Cindy
Subject: RE: King Road Mine Wildlife Surveys

Ed,

The attached letter is provided in response to your wildlife survey protocol questions. Thank you for the opportunity to respond. Please don't hesitate to contact me if you need anything else.

Sincerely,
McLane Evans, PMP
Senior Ecologist
Biological Research Associates
A Division of ENTRIX, Inc.

3905 Crescent Park Drive
Riverview, FL 33578-3625
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mevans@biologicalresearch.com
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-----Original Message-----
From: Sarfert, Edward P SAJ [mailto:Edward.P.Sarfert@usace.army.mil]
Sent: Thursday, April 03, 2008 9:44 AM
To: McLane Evans
Cc: Rousso, Stephanie; King, Timothy; Erin Gawera@fws.gov; Jake Varn; Holian, James O.; Shannon Gonzalez
Subject: King Road Mine Wildlife Surveys

McLane: Can you advise if the methods for wildlife surveys described by FWC below are being used on this project? If not, can you provide differences in the current methodologies from those described, and why BRA feels those might be appropriate over what's recommended below?

The earlier that information and the other items below can be provided for review by FWC/FWS, will assist the resource agencies in their scoping comments.

Thanks -
Ed

850-439-9533

Please assist us in better serving you! Please complete the customer survey by clicking on the following link:
http://regulatory.usacesurvey.com/
-----Original Message-----
From: King, Timothy [mailto:timothy.king@MyFWC.com]
Sent: Tuesday, April 01, 2008 8:41 AM

1

To: Sarfert, Edward P SAJ
Cc: Rousso, Stephanie
Subject: Tarmac King Road Limestone Mine EIS

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I asked Stephanie Rousso, a biologist in our section, for some reference wildlife survey methodologies that should be applied to this project.
She's the lead in an ongoing effort to produce a computer-based, interactive "manual" that will provide step-by-step guidelines for addressing fish and wildlife issues with development projects statewide.
She suggests that until the manual is completed in the next couple of months, our recommendation is to have the consultants follow protocols available through the FWC-FWRI and USFWS-Vero Beach websites. Her specific recommendations follow:

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If you have any questions about these recommendations feel free to give me a call. My contact information follows.

Tim

Tim King, Statewide Reclaimed Habitat Specialist

Habitat Conservation Scientific Services Section

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Office: (863)499-2421 ext. 105

Fax: (863)499-2692

Email: timothy.king@myfwc.com

2

Biological Research Associates
Environmental and Natural Resource Management Consultants A Division of ENTRIX, Inc.

14 April 2008

Edward P. Sarfert
US Army Corps of Engineers
41 North Jefferson Street
Suite 111
Pensacola, FL 32502-5794

Re: Wildlife Survey Methodology for the Tarmac King Road Mine EIS

Dear Ed,

Biological Research Associates (BRA) reviewed the proposed wildlife survey methodology for the Tarmac King Road Mine EIS as compared to the specific recommendations forwarded, through you, by representatives of the Florida Fish and Wildlife Conservation Commission (FFWCC). Our comparison indicated that the proposed survey methodology met or exceeded the level and type of effort suggested in the general references and recommendations provided.

For instance, the FFWCC suggested you ask for a "potentially occurring species list". As part of the proposed methodology, BRA searched scientific literature to determine current and historic species distributions of all vertebrates known from the region. Based on this information, we developed an annotated list of vertebrates that included information on listing status (FNAI, FFWC, and USFWS), distribution, seasonality and proposed sampling methods. In addition, FFWCC suggested we identify CWCS, FNAI or FFWCC habitat classifications instead of FLUCFCS. Our final report will include a map that identifies CWCS, FNAI or FFWCC habitat classification as well as FLUCFCS.

In addition to those specific recommendations, we found that the level of detail, survey man-hours, length of transects, and total length of the study exceeded requirements set forth in State or Federal regulatory processes. For instance, the FFWCC Wildlife Methodology Guidelines (1988), which are currently used in approval of Developments of Regional Impact (DRI), require meandering pedestrian transects of at least 1500 feet for every 100 acres, within suitable habitat. Our survey included meandering pedestrian transects of over 165 miles representing nearly 9,000 feet for every 100 acres within the entire limits of the project. These transects were conducted in uplands and wetlands and were supplemented by small mammal trapping, aquatic trapping, fish sampling, an amphibian breeding survey, non-breeding frog surveys, specific bird surveys and a helicopter survey. Specific searches were also conducted for habitat appropriate to support listed species such as red-cockaded woodpecker (*Picoides borealis*), Florida scrub jay (*Aphelocoma coerulescens*), and southeastern American kestrel

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Mr. Ed Sarfert
US Army Corps of Engineers
14 April 2008
Page 2 of 2

(*Falco sparverius paulus*). All observed species (listed or non-listed) and related information (time, date, weather and transect information, etc.) was recorded and analyzed using an interactive Geographic Information Systems (GIS)/Microsoft Access database.

We are confident that the methods used were appropriate and sufficient to detect the species using the site. We look forward to your review of the final report. Please contact us if you have any further specific questions.

Sincerely,

BIOLOGICAL RESEARCH ASSOCIATES

Shannon M. Gonzalez
Senior Project Scientist

McLane E. Evans
Senior Ecologist

SMG/jm

G:\7856\001\B09 EIS\ed_sarfert_wildlife_response_letter.doc

Ecological Resources Consultations *(continued)*

From: U.S. Army Corps of Engineers (Mr. Edward Sarfert)
To: Florida Fish and Wildlife Conservation Commission (Mr. Timothy King)

From: Sarfert, Edward P SAJ [mailto:Edward.P.Sarfert@usace.army.mil]
Sent: Monday, April 21, 2008 10:09 AM
To: Rousso, Stephanie; King, Timothy; Erin Gawera@fws.gov
Subject: RE: King Road Mine Wildlife Surveys

All: Please advise if you have any questions/comments on this...thanks

Ed

Please assist us in better serving you! Please complete the customer survey by clicking on the following link: http://regulatory.usacesurvey.com/
-----Original Message-----
From: McLane Evans [mailto:mevans@biologicalresearch.com]
Sent: Monday, April 14, 2008 12:34 PM
To: Sarfert, Edward P SAJ
Cc: Rousso, Stephanie; King, Timothy; Erin Gawera@fws.gov; Jake Varn; Holian, James O.; Shannon Gonzalez; Townsend Al; Burns Cindy
Subject: RE: King Road Mine Wildlife Surveys

Ed,

The attached letter is provided in response to your wildlife survey protocol questions. Thank you for the opportunity to respond. Please don't hesitate to contact me if you need anything else.

Sincerely,
McLane Evans, PMP
Senior Ecologist
Biological Research Associates
A Division of ENTRIX, Inc.

3905 Crescent Park Drive
Riverview, FL 33578-3625
v. (813) 664-4500
f. (813) 664-0440
c. (813) 625-2204
mevans@biologicalresearch.com
The information contained in this e-mail transmission is intended specifically for the individual or entity to which it is addressed and is privileged and confidential. If you are not the intended recipient, nor the employee or agent responsible for delivering it to the intended recipient, you are hereby notified that any dissemination, copying or storing of this transmission (including any attachments) is strictly prohibited. If you have received this e-mail in error, please notify the sender promptly by return e-mail. We thank you for your compliance with this request.

-----Original Message-----
From: Sarfert, Edward P SAJ [mailto:Edward.P.Sarfert@usace.army.mil]
Sent: Thursday, April 03, 2008 9:44 AM
To: McLane Evans
Cc: Rousso, Stephanie; King, Timothy; Erin Gawera@fws.gov; Jake Varn; Holian, James O.; Shannon Gonzalez
Subject: King Road Mine Wildlife Surveys

McLane: Can you advise if the methods for wildlife surveys described by FWC below are being used on this project? If not, can you provide differences in the current methodologies from those described, and why BRA feels those might be appropriate over what's recommended below?

The earlier that information and the other items below can be provided for review by FWC/FWS, will assist the resource agencies in their scoping comments.

Thanks -
Ed

850-439-9533

1

Please assist us in better serving you! Please complete the customer survey by clicking on the following link:
http://regulatory.usacesurvey.com/
-----Original Message-----
From: King, Timothy [mailto:timothy.king@MyFWC.com]
Sent: Tuesday, April 01, 2008 8:41 AM
To: Sarfert, Edward P SAJ
Cc: Rousso, Stephanie
Subject: Tarmac King Road Limestone Mine EIS

Ed,

I asked Stephanie Rousso, a biologist in our section, for some reference wildlife survey methodologies that should be applied to this project.
She's the lead in an ongoing effort to produce a computer-based, interactive "manual" that will provide step-by-step guidelines for addressing fish and wildlife issues with development projects statewide.
She suggests that until the manual is completed in the next couple of months, our recommendation is to have the consultants follow protocols available through the FWC-FWRI and USFWS-Vero Beach websites. Her specific recommendations follow:

FWC- FWRI publications website:
http://research.myfwc.com/features/view_article.asp?id=25446

USFWS- go to the Vero Beach website:

Wood 2001 Florida's Fragile Wildlife. UF press. This book contains a lot of survey methods for multiple species produced under OES by Don Wood.

Also ask them for a potentially occurring species list and have them identify CWCS, FNAI, or FWC habitat classifications not FLUCFCS.
FLUCFCS is too specific and often many habitats are missed during surveys because of that reason. CWCS includes a list of all conservation need species, threats to the habitat, and mgmt guidelines.

If you have any questions about these recommendations feel free to give me a call. My contact information follows.

Tim

Tim King, Statewide Reclaimed Habitat Specialist

Habitat Conservation Scientific Services Section

Division of Habitat and Species Conservation

Florida Fish and Wildlife Conservation Commission

3829 Tenoroc Mine Road

Lakeland, Florida 33805-8547

Office: (863)499-2421 ext. 105

Fax: (863)499-2692

Email: timothy.king@myfwc.com

2

Ecological Resources Consultations *(continued)*

From: U.S. Army Corps of Engineers (Mr. Clif Payne)
To: U.S. Fish and Wildlife Service (Mr. Dave Hankla)

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
PENSACOLA REGULATORY OFFICE
41 NORTH JEFFERSON STREET, SUITE 111
PENSACOLA, FLORIDA 32502

REPLY TO
ATTENTION OF

Regulatory Division
Pensacola Permits Section
SAJ-2007-05537-IP-EPS

January 14, 2010

Mr. Dave Hankla
U.S. Fish and Wildlife Service
7915 Baymeadows Way, Suite 200
Jacksonville, Florida 32256-7517

Dear Mr. Hankla:

This letter refers to a request by Tarmac America LLC for authorization to construct a limestone mine. The project is located approximately two miles north of C.R. 40 and approximately one mile west of U.S. 19 in Levy County. The site encompasses all or portions of Sections 2, 3, 6-11, 14-23, 29, and 30 of Township 16 South, Range 16 East; Section 31, Township 15 South, Range 16 East; Sections 1-3, 11-13, and 24 of Township 16 South, Range 15 East and Sections 25-27, and 34-36 of Township 15 South, Range 15 East. The U.S. Army Corps of Engineers (Corps) has completed an evaluation of the impacts the work may have on the threatened eastern indigo snake (*Drymarchon couperi*) and endangered wood stork (*Mycteria americana*). The Corps hereby requests initiation of formal consultation pursuant to Section 7 of the Endangered Species Act. In accordance with guidance provided in the Endangered Species Consultation Handbook, the Corps requests that you initiate consultation upon receipt of this request or provide a response within 30 days of receipt of this request stating what information is necessary to meet the requirements of 50 CFR §402.14(c). Upon your initiation of formal consultation, please provide this office with an expected completion date so that we may inform the applicant of the associated timeframes. The following information is provided in accordance with 50 CFR §402.14(c):

Description of the activity: The applicant proposes construction of the project to be known as the Tarmac King Road Limestone Mine. The ±9,277-acre project area includes a ±4,762-acre Mine Parcel and a ±4,515-acre Mitigation Parcel. The applicant would lease proposed mining areas from the timber company that owns the land; proposed mitigation areas would be purchased. Of the 2,590 acres of wetlands within the Mine Parcel, 2,056 acres are proposed for impact and 534 acres would be avoided. The project would result in the excavation of approximately 5,200,000 tons of limestone per year for the life of mine – approximately 100 years as proposed. Of the 5,200,000 tons of limestone excavated, 3,000,000 tons would be available for sale and 2,200,000 tons would be returned to certain pits. This refilling would occur to reclaim excavated areas and convert them to uplands. Other pits would remain as unfilled lakes. Post-project, the applicant's lease would end, and the timber company would resume control of that portion of the property associated with mining. The applicant proposes

to excavate approximately 681,977,941,333 cubic yards of fill from approximately 2,056 acres of wetlands within the project.

If it is determined that issuance of a permit is appropriate, the applicant proposes to preserve and enhance approximately 4,636 acres of wetland habitats as compensatory mitigation for the proposed 2,056 acres of wetland impacts. Enhancement on the ±4,515-acre Mitigation Parcel would occur through the elimination of silvicultural practices, allowing restoration of hydric pine plantations to historic Gulf Hammock hardwood forested wetlands through removal of pine to no more than 100 stems per acre, and management of exotic and invasive plant species. Within the Mitigation Parcel, non-forested communities such as tidal marshes and forested areas not requiring active rehabilitation would be preserved. To ensure perpetual protection, the applicant proposes the entire ±4,515-acre Mitigation Parcel (4,108 acres of wetlands, 331 of uplands, 76 acres of roads) be deeded to the State of Florida. The public/private status of some of the roads is unclear, and it's possible some would need to remain in place for the public. In addition, 528 acres of wetlands and 144 acres of uplands within the Mine Parcel would be preserved by conservation easement.

a. Area affected: The total area for the Tarmac King Road Limestone Mine project area consists of approximately 9,277 acres. The site has been managed as a silviculture operation of varying intensity for at least the past five decades. Typical land management practices used on site include clear-cutting, and in rare instances, bedding and furrowing. Pine plantations and hardwood forests are included in the harvest rotations. In addition, selective high-grading of cypress and cedar has occurred. The area affected was considered to be these 9,277 acres plus an 8, 444 foot buffer around the entire project creating a 40,337.3 acre action area.

Approximately 6,699 acres of the total project area (mine parcel and mitigation parcel) is comprised of wetlands. These areas include approximately 3,280 acres of hydric pine plantation. Hydric pine "plantation" at this site is not of the intensive monoculture variety found at many silviculture sites, and in many areas pines comprise only 50% or less of the canopy and subcanopy species. Of the total 2,056 acres of wetland proposed for impact, ±1,460 acres (71%) are this hydric pine plantation. Additional jurisdictional community types proposed for impact include ±190 acres of wetland forested mixed, ±134 acres of pine-mesic oak, ±1 acre of cypress, ±115 acres of mixed wetland hardwood, ±13 acres of sloughs and intermittent flow-ways, ±134 acres of deep water ponds and ±11 acres of borrow pits.

Other wetland community types present on site include streams and lake swamps (bottomland), wetland forested mixed-cleared, coastal maritime hammock, freshwater marsh, saltwater marsh and tidal flats. Upland communities within the project area are: temperate hardwood, live oak, hardwood conifer mixed, and upland pine plantation.

b. Listed species affected: Wood stork (*Mycteria americana*) and eastern indigo snake (*Drymarchon couperi*).

c. Analysis: Based upon review of the joint U.S. Army Corps of Engineers/U.S. Fish & Wildlife *Effect Determination Key for the Wood Stork in Central and Peninsula Florida* (2008), and required information submitted by the applicant to complete coordination in accordance with 50 CFR 402.14(c) (namely, the enclosed wildlife survey report and biological assessment documents), the Corps has determined that this project may affect but is not likely to adversely affect the endangered wood stork (*Mycteria americana*). While the wood stork was observed roosting on the applicant's proposed mitigation parcel, no wood storks were observed roosting or foraging within the proposed mine parcel. Further, no nesting was observed within the

project area. The closest colony is approximately 24 miles away, well outside the 15-mile Core Foraging Area. Given this information and if a proposed wetlands mitigation plan were approved, the Corps requests the U.S. Fish and Wildlife Service's (the Service's) concurrence that the project may affect, but is not likely to adversely affect, the wood stork.

As noted within the enclosed wildlife survey report and biological assessment, three threatened eastern indigo snakes (*Drymarchon couperi*) were observed within the action area of the proposed project. One eastern indigo snake was observed on the proposed mine parcel, one on the proposed mitigation parcel, and one just off the project site but between the parcels. All were crossing or immediately adjacent to roads. Although there is potential for mortality, injury or harassment of eastern indigo snakes from construction and operation activities within the action area, the applicant is proposing to implement all reasonable measures to protect the indigo snake from proposed mining operations. These measures include preserving and enhancing habitat on the mitigation parcel, and implementing the Service's *Standard Protection Measures for the Eastern Indigo Snake* (USFWS 2004). Because of the proposed acreage of the project, and nature of the proposed construction (*i.e.*, vegetation removal, debris piling and burning, blasting, mining, reclamation, and truck traffic to and from U.S. 19), the Corps has determined that this project may adversely affect the threatened eastern indigo snake.

d. Relevant reports. Enclosed are the following documents specific to this consultation: Biological Assessment (Entrix, Inc. dated January 2010) and Wildlife Survey (Entrix, Inc. dated Revised July 2009). Electronic versions of these documents are also provided as requested by the Service.

If you have any questions regarding this letter, please contact Ed Sarfert at the letterhead address, by telephone at 850-439-9533, or by email at edward.p.sarfert@usace.army.mil.

Sincerely,

Clif Payne
Section Chief
Pensacola Permits Section

Enclosure(s)

Biological Assessment (Entrix, Inc. dated January 2010)
Wildlife Survey (Entrix, Inc. dated Revised July 2009)
Project Drawings (16 pages)

Copies Furnished:

Al Townsend, Tarmac America LLC (w/o enclosures)
McLane Evans, Entrix (w/o enclosures)
Jim Holian, SAIC (w/enclosures)

Cultural Resources Consultations

From: Cardno Entrix (Ms. Victoria "Tori" A. Fera and Mr. McLane E. Evans)
To: U.S. Army Corps of Engineers (Mr. Ed Sarfert)

Cardno ENTRIX
Shaping the Future

November 30, 2012

Received
DEC 04 2012
Jacksonville District
(Pensacola) USACE

Cardno ENTRIX

3905 Crescent Park Drive
Riverview, FL 33578
USA

Phone 813 664 4500
Toll-free 800 368 7511
Fax 813 664 0440
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www.cardnoentrix.com

Mr. Ed Sarfert
Jacksonville District Corps of Engineers
Pensacola Regulatory Office
41 North Jefferson Street, Suite 111
Pensacola, Florida 32502

Regulatory Division
North Permits Branch
SAJ-2007-05537-EPS

Re: Archaeological Survey Schedule for the Tarmac King Road Limestone Mine Levy County, Florida

Dear Mr. Sarfert:

This letter is in response to your request for a detailed schedule and plan of work for the cultural resource assessment survey of the proposed mitigation area. The *Cultural Resource Management Plan for the Tarmac Mine Mitigation Area* (Florida History, LLC, June 2008), divided the mitigation parcel into high, medium and low probability areas. High probability areas include areas surrounding previously recorded archaeological sites, areas immediately adjacent to historic roads, and mounded areas or areas of high(er) elevation. Medium probability areas include areas on upland rises near fresh water sources. Low probability areas include less topographically desirable areas, such as the side slopes of wetlands.

As reflected in the attached map entitled, *Alternative 7 Mitigation Parcel Archaeological Resource Survey Areas*, all high probability areas are located outside the proposed Alternative 7 mitigation parcel boundary. Medium probability areas will be surveyed according to the protocol described in the *Cultural Resource Management Plan for the Tarmac Mitigation Area* and the Division of Historical Resources (DHR) letter dated August 20, 2008 approving the plan. All surveys will be completed and a results report will be submitted to the DHR no less than sixty (60) days prior to commencing any ground disturbing activities on the mitigation parcel. For your convenience, the DHR approved survey protocols are listed below.

Proposed in the *Cultural Resource Management Plan for the Tarmac Mitigation Area*:

- In medium probability areas, shovel tests should be excavated within the project area. These shovel tests will conform to the state's guidelines and

Cardno ENTRIX
Shaping the Future

measure 50-x-50cm in diameter and extend to a depth of 1 meter below surface unless hydric soils or obstructions are met. All excavated soils will be screened through ¼-inch hardware mesh. An archaeologist will be present during the environmental and engineering testing both to monitor the work and to survey the area for the likelihood of identifying cultural resources at this location.

- Monitoring will be conducted in accordance with Occupational Safety and Health Administration (OSHA) regulations, with a hard hat and safety vest worn by the archaeological monitor at all times. A sketch map will be produced for the entire property, showing the locations of testing. Notes and digital color photographs will be taken during monitoring. All exposed ground will be inspected, and the backfill from excavated trenches for improved drainage will be inspected for artifacts. The archaeological field notes and copies of the project maps will be kept on file at the offices of Florida History, LLC.

Required by DHR letter dated August 20, 2008:

- Medium probability areas are proposed to be monitored by heavy equipment operators after receiving appropriate training.
- The DHR requests that subsurface testing be conducted on approximately 10% of the medium probability areas. Should this testing encounter no sites or no significant sites, then monitoring would be all that would be required for the remainder of the medium probability areas.
- Lastly, DHR requires a final archaeological report which meets Chapter 1A-46, FAC, standards.

Sincerely,

Victoria "Tori" A. Fera
Ecologist

McLane E. Evans
Senior Project Scientist

VAF/nnc

Enclosure: Alternative 7 Mitigation Parcel Archaeological Resource Survey Areas

cc: Cindy Burns\Tarmac America, LLC: with enclosure
Paul Jones\Cardno ENTRIX: with enclosure

Cultural Resources Consultations *(continued)*

From: U.S. Department of the Army, Jacksonville Corps of Engineers (Mr. Osvaldo Gollazo)
To: Tarmac America, LLC (Ms. Cindy Burns)

DEPARTMENT OF THE ARMY
JACKSONVILLE DISTRICT CORPS OF ENGINEERS
PENSACOLA REGULATORY OFFICE
41 North Jefferson Street, Suite 301
PENSACOLA, FLORIDA 32502

REPLY TO
ATTENTION OF

Regulatory Division
North Permits Branch
SAJ-2007-05537-EPS

September 5, 2012

Tarmac America, LLC
c/o Cindy Burns, Project Engineer
455 Fairway Drive
Deerfield Beach, FL 33441

Dear Ms. Burns:

Reference is made to the Department of the Army permit application submitted by Tarmac America, LLC (Tarmac) to the U.S. Army Corps of Engineers (Corps) on September 17, 2007 for the proposed construction of the Tarmac King Road Limestone Mine. The project is proposed in wetlands adjacent to the Gulf of Mexico and within the Waccasassa Watershed. The site is located in southwestern Levy County, approximately 1.25 miles west of U.S. Route 19 and 5 miles north of the town of Inglis, Florida, and encompasses all or a portion of Sections 2, 3, 6-11, 14-23, 29, and 30 of Township 16S, Range 16E; Section 31, Township 15S, Range 16E; Sections 1-3, 11-13, and 24 of Township 16S, Range 15E and Sections 25-27, and 34-36 of Township 15S, Range 15E of Levy County, Florida.

The Corps issued a Notice of Availability for the Draft Environmental Impact Statement (DEIS) on May 11, 2012, and a Section 404 public notice for this project on May 25, 2012. In response, the Florida State Historic Preservation Officer (SHPO) provided comments on the proposed project dated July 26, 2012 (enclosed). Their letter outlined the SHPO's requests for an additional cultural resource assessment survey (CRAS) of the proposed mitigation area. The Corps has reviewed these comments and the SHPO's earlier requests from its August 20, 2008 letter (enclosed), and has coordinated with the SHPO directly regarding its concerns, and the nature of the mitigation activities as proposed. The actions required of Tarmac are as follows:

1. Provide a detailed schedule and plan of work to the Corps and the SHPO for approval prior to beginning the following actions.

2. As noted in the August 20, 2008 letter, perform additional testing at each of the listed archaeological resource sites to determine the exact site extent and location within the mitigation tract, and then develop a mitigation plan to avoid impacts to each of these sites. In addition, the restoration tract will be zoned into areas of high, medium, and low probability areas. High probability areas will either be tested or avoided altogether. Medium probability areas, which would include upland rises near freshwater sources, are proposed to be monitored by

heavy equipment operators after receiving appropriate training. Subsurface testing shall be conducted on approximately 10% of the medium probability areas. Should this testing encounter no sites or no significant sites, then monitoring by a professional archaeologist would be all that would be required for the remainder of the medium probability areas. Judgmental testing is required for the low probability areas.

3. Prepare a final CRAS report which meets Chapter 1A-46, FAC, standards, and submit the aforementioned mitigation plan and CRAS to the Corps and SHPO for review and comment.

Questions regarding the application and this letter should be directed to the Corps project manager, Ed Sarfert, at the letterhead address, by electronic mail at edward.p.sarfert@usace.army.mil, or by telephone at 850-439-9533.

Sincerely,

Osvaldo Collazo
Chief, North Permits Branch

Copy furnished:
Florida State Historic Preservation Officer
Jeff Harris, Tarmac
Frank Mathews, HG&S
Jim Holian, SAIC
David Pugh, CESAJ-SP

Enclosures

Cultural Resources Consultations *(continued)*

From: Florida Department of State, Division of Historical Resources (Mr. Frederick P. Gaske)
To: Florida History, LLC (Mr. Paul L. Jones)

FLORIDA DEPARTMENT OF STATE
Kurt S. Browning
Secretary of State
DIVISION OF HISTORICAL RESOURCES

August 20, 2008

Mr. Paul L. Jones
Florida History, LLC
12157 West Linebaugh Avenue
Suite 167
Tampa, Florida 33626

Re: Cultural Resource Management Plan for the Tarmac Mine Mitigation Area
Levy County, Florida: Preliminary Plan (Florida History, LLC, June 2008)
DHR Project File No. 2008-5276B

Dear Mr. Jones:

Our office received and reviewed the above referenced project in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended and *36 CFR Part 800: Protection of Historic Properties*, and with this agency's responsibilities under Section 267.061, *Florida Statutes*. The State Historic Preservation Officer is to advise Federal and State agencies as they identify historic properties (listed or eligible for listing, in the *National Register of Historic Places*), assess effects upon them, and consider alternatives to avoid or minimize adverse effects.

We reviewed the proposed mitigation plan for 4,581 acres in Levy County. This project is mitigation for proposed mining activities, and project mitigation measures will consist of the removal of existing roads, replanting with native vegetation, etc. There are three recorded archaeological resources within this large parcel, including one site with human remains, and these sites extend onto Florida Park Service property. While these sites may be potentially significant resources, according to the information in the Florida Master Site File, there has been no significance determination made by this office for any of these three resources.

The management plan proposes additional testing at each archaeological resource to determine the exact site extent and location within the mitigation tract, and then develop a plan to avoid impacts to each of these three sites. In addition, the restoration tract will be zoned into areas of high, medium, and low probability areas. High probability areas will either be tested or avoided altogether. Medium probability areas, which would include upland rises near freshwater sources, are proposed to be monitored by heavy equipment operators after receiving appropriate training.

500 S. Bronough Street • Tallahassee, FL 32399-0250 • http://www.flheritage.com

☐ Director's Office (850) 245-6300 • FAX: 245-6436
☐ Archaeological Research (850) 245-6444 • FAX: 245-6452
✓ Historic Preservation (850) 245-6333 • FAX: 245-6437

Mr. Paul Jones
August 14, 2008
Page 2

This agency requests that subsurface testing be conducted on approximately 10% of the medium probability areas. Should this testing encounter no sites or no significant sites, then monitoring would be all that would be required for the remainder of the medium probability areas. No testing or monitoring is proposed for the low probability areas. As most of the soils within the restoration area are moderately or poorly drained, sites would not be expected in these areas. Nevertheless, the management plan has included detailed provisions to deal with unexpected discoveries.

Lastly, this agency will require a final archaeological report which meets Chapter 1A-46, FAC, standards.

If you have any questions concerning our comments, please do not hesitate to contact Susan Harp at (850) 245-6333. Thank you for your interest in protecting Florida's historic resources.

Sincerely,

Frederick P. Gaske, Director, and
State Historic Preservation Officer

Cultural Resources Consultations *(continued)*

From: Florida Department of State, Division of Historical Resources (Ms. Laura A. Kammerer)
To: U.S. Army Corps of Engineers (Mr. Ed Sarfert)

RD-N1

RECEIVED
JACKSONVILLE DISTRICT
USACE

FLORIDA DEPARTMENT *of* STATE

RICK SCOTT
Governor

KEN DETZNER
Secretary of State

Mr. Ed Sarfert
Pensacola Regulatory Office
Jacksonville USACE
41 North Jefferson Street, Suite 111
Pensacola, Florida 32502-5794

July 26, 2012

Re: DHR Project File No. 2012-02505/ Received by DHR: June 4, 2012
Applicant: Tarmac America, LLC
Application No.: SAJ-2007-05537-IP-EPS
Project: Tarmac King Road Limetone Mine
County: Levy

Dear Mr. Andrews,

Our office received and reviewed the above referenced project application in accordance with Section 106 of the National Historic Preservation Act of 1966 (Public Law 89-665), as amended in 1992; 36 C.F.R., Part 800: Protection of Historic Properties for assessment of possible adverse impact to cultural resources (any prehistoric or historic district, site, building, structure, or object) listed, or eligible for listing, in the National Register of Historic Places.

Our review of the Florida Master Site File indicates that proposed mitigation areas have not been subjected to a systematic professional archaeological or historical investigation. Furthermore, multiple archaeological sites are recorded within the proposed project area. See enclosed map. For these reasons, this office requests that a professional perform a cultural resource reconnaissance survey of the proposed mitigation area, including judgmental subsurface testing be performed, in order to assess the probability of the presence of historic properties.

The purpose of this survey will be to locate and assess any cultural resources that may be present. The resultant survey report must conform to the specification set forth in Chapter 1A-46, *Florida Administrative Code,* and be forwarded to this agency in order to complete the reviewing process for this proposed project and its impacts. The results of the analysis will determine if significant cultural resources would be disturbed by this development. In addition, if significant remains are located, the data described in the report and the consultant's conclusions will assist this office in determining measures that must be taken to avoid, minimize, or mitigate adverse impacts to archaeological sites and historical properties listed, or eligible for listing in the NRHP, or otherwise significant.

VIVA FLORIDA 500

DIVISION OF HISTORICAL RESOURCES
R. A. Gray Building ▪ 500 South Bronough Street ▪ Tallahassee, Florida 32399-0250
Telephone: 850.245.6300 ▪ Facsimile: 850.245.6436 ▪ www.flheritage.com
Commemorating 500 years of Florida history www.fla500.com

VIVA FLORIDA 500

July 26, 2012
Page 2

Because this letter and its contents are a matter of public record, cultural resource consultants who have knowledge of our survey request may contact an applicant or the project agent. This should in no way be interpreted as an endorsement by this agency. The Division of Historical Resources does not maintain a list of professional consultants who are qualified to work in the State of Florida and/or who meet *The Secretary of the Interior's Historic Preservation Professional Standards* [Volume 62, Number 119, page 33707 (June 20, 1997)], ("Professional Qualifications"), or as amended in the future. However, the American Cultural Resources Association (ACRA) maintains a listing of professional consultants (http://www.acra-crm.org/southeast.html). In addition, the Register of Professional Archaeologists (RPA) maintains a membership directory for locating professional archaeologists as well as other professional preservation consultants (http://www.rpanet.org/about.htm). Many qualified historic preservation professionals are not members of these organizations, and omission from the directories does not imply that someone does not meet the Secretary's Standards or that the resultant work would not be acceptable. Conversely, inclusion on the lists is no guarantee that a product will automatically be acceptable.

For any questions concerning our comments, please contact Michael Hart, Historic Sites Specialist, by electronic mail at Michael.Hart@dos.myflorida.com, or by phone at 850.245.6333. We appreciate your continued interest in protecting Florida's historic properties.

Sincerely,

Laura A. Kammerer

Laura A. Kammerer
Deputy State Historic Preservation Officer
For Review and Compliance

Pc: Cindy Burns/ Tarmac America, LLC
Enclosure

Cultural Resources Consultations *(continued)*

From: Florida Department of State, Division of Historical Resources (Mr. Frederick P. Gaske)
To: Biological Research Associates (Mr. Michael Reyes)

FLORIDA DEPARTMENT OF STATE
Kurt S. Browning
Secretary of State
DIVISION OF HISTORICAL RESOURCES

February 2, 2009

Mr. Michael Reyes
Biological Research Associates
3905 Crescent Park Drive
Riverview, Florida 33578

Re: *An Archaeological and Historical Survey of the Kings Road Mine Project Area in Levy County, Florida* (Panamerican Consultants, Inc., October 2006)
DHR Project File No. 2009-0125

In accordance with this agency's responsibilities under Sections 267.061 and 373, *Florida Statutes*, and Chapter 1A-46, *Florida Administrative Code*, we reviewed the referenced survey report, and find it to be complete and sufficient.

In 2006, Panamerican Consultants, Inc. (PCI) conducted a cultural resource assessment survey on 4,572 acres proposed for mining in Levy County. This property, owned by Plum Creek Timber Company, is within the Gulf Hammock Wildlife Management Area (GHWMA). The report erroneously references the GHWMA as protected as a park, but managed by the Florida Fish and Wildlife Conservation Commission (FFWCC). The FFWCC does not manage the property as a park, but administers this property for wildlife management. Furthermore, as it is in private, not state ownership, there is no measure of protection.

PCI conducted a review of the property, including pertinent environmental data, to determine the appropriate field methodology. A surface inspection was conducted in addition to PCI excavating 494 shovel tests, with only one chert flake recovered. Based on the results of the fieldwork, PCI recommended that no historic sites or properties will be affected by the proposed mining activities. From the results presented in the report, this agency concurs with PCI's recommendation. We do wish to note, though, PCI indicated that there were no available local informants. Nevertheless, as mentioned in the report, as this area was managed by the FFWCC since 1948, we question why FFWCC field staff were unable to provide any pertinent field information.

RECEIVED
FEB 05 2009
BIOLOGICAL RESEARCH ASSOCIATES

500 S. Bronough Street • Tallahassee, FL 32399-0250 • http://www.flheritage.com

❒ Director's Office (850) 245-6300 • FAX: 245-6436
❒ Archaeological Research (850) 245-6444 • FAX: 245-6452
✓ Historic Preservation (850) 245-6333 • FAX: 245-6437

Mr. Reyes
February 2, 2009
Page 2

If you have any questions concerning our comments, please do not hesitate to contact Susan Harp at (850) 245-6333. Thank you for your interest in protecting Florida's historic resources.

Sincerely,

Frederick P. Gaske, Director

Tribal Consultations

From: Tribal Historic Preservation Office (Mr. Paul N. Backhouse, Ph.D.)
To: U.S. Army Corps of Engineers (Mr. Ed Sarfert)

From: Paul Backhouse
To: Sarfert, Edward P SAJ
Cc: Anne Mullins; Elliott York; Alison Swing; Pugh, David W SAJ
Subject: RE: #010057-SAJ-2007-05537-Tarmac King Road Limestone Mine (Response from Applicant) (UNCLASSIFIED)
Date: Monday, July 16, 2012 12:01:21 PM

Ed,

Many thanks for sending this along and getting back to us so promptly. The answers provided help to clear up the questions that we had regarding the report. I think the main issue in this instance was in the communication of the results rather than the results themselves. With so many reports to review clarity in the presentation of the methodological decision making process always helps to avoid any miscommunications or understanding that may arise, as it did in this instance. With this in mind our review team respectfully suggests that such information as outlined below be included in future reports.

We thank you for your time and effort in following up and providing the additional information and look forward to working with you on future projects.

Best, Paul

Paul N. Backhouse, Ph.D.
Acting Tribal Historic Preservation Officer,
Tribal Historic Preservation Office,
30290 Josie Billie Hwy, PMB 1004
Clewiston, FL 33440

paulbackhouse@semtribe.com
tel. (863) 983-6549 (ext. 12244)
tel. (863) 228-3793 (mob)
fax (863) 902-1117

www.STOFTHPO.com

From: Sarfert, Edward P SAJ [mailto:Edward.P.Sarfert@usace.army.mil]
Sent: Monday, July 16, 2012 12:44 PM
To: Paul Backhouse
Cc: Anne Mullins; Elliott York; Alison Swing; Pugh, David W SAJ
Subject: FW: #010057-SAJ-2007-05537-Tarmac King Road Limestone Mine (Response from Applicant) (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Hello, Dr. Backhouse: I'm forwarding the applicant's information provided in response to the Seminole Tribe of Florida, Tribal Historic Preservation Office's letter of 6/27/12.

Please advise if their response clarifies that their survey methods were appropriate, and/or

if any additional information is needed.

Thanks –
Ed

US Army Corps of Engineers
Pensacola Regulatory Office

850-439-9533

From: McLane Evans [mailto:mclane.evans@cardno.com]
Sent: Monday, July 16, 2012 10:18 AM
To: Sarfert, Edward P SAJ
Cc: Burns Cindy; Harris Jeff; Paul L. Jones
Subject: TKRLM - Response to Seminole Tribe's questions

Ed,

Please find the responses to the Seminole Tribe's questions regarding the Tarmac King Road Limestone Mine Draft Environmental Impact Statement discussed during last Friday's call below. Although I'm forwarding you this information, the author is Paul L. Jones, Senior Archaeologist at Cardno ENTRIX. As always, if you have any questions, please feel free to contact me.

Re: Seminole Tribe of Florida – THPO Response #010057-SAJ-2007-05537-
Tarmac King Road Limestone Mine

The following is a response to the Seminole Tribe of Florida (STOF) - Request for Additional Information (RAI) dated June 27, 2012 from Paul Backhouse, Acting Tribal Historic Preservation Officer (THPO) to Ed Sarfert, US Army Corps of Engineers (USACE). The request for information references the report titled "Archaeological and Historic Survey of the Kings Road Mining Project in Levy County Florida." This report was prepared by Panamerican Consultants, Inc. (PCI) for Tarmac/Titan America, LLC (Tarmac) in October 2006, as a due diligence report, with the expectation the Florida SHPO would request a survey of the property. The report was reviewed by the SHPO on February 2, 2009 under Sections 267.061 and 373, *Florida Statutes*, and the report was determined to be both complete and sufficient to meet the requirements of Chapter 1A-46, *Florida Administrative Code*.

1. **Overall survey coverage-**

There were no testing areas intentionally omitted, but much of this area is/was extremely wet and many parts of the parcel were inundated. The testing was judgmental, based on the decision of the archaeologist in the field. While state requirements call for 10% testing in low probability areas, this survey far exceeds that requirement. There were more tests in the eastern portion because it was a somewhat drier sandy, well-drained, soil while the west was extremely wet, with standing water on much of the parcel.

Archaeological site location and density in the Gulf Hammock is almost entirely dependent on two factors; the proximity to the Gulf of Mexico, and the proximity to bays, flowing streams, or rivers. A review of archaeological site location data in the area of the parcel will show these attributes are the key determinates to archaeological site location. Archaeological sites are not found within the low, wet areas that lack flowing water, such as the planned mine area.

2. Ground Disturbing activities-

This area has been regularly clear cut since the mid-1800s. Beginning in the 1860s the need for cedar led to clear cutting of most of the accessible old growth cedar in this area, and the replanting of pine in the areas dry enough to support silvaculture. These pines were harvested every 25-35 years, and the process is extremely destructive to any shallow archaeological sites, the type typically found in the Gulf Hammock. Had there been any archaeological sites present, the harvesting activities, coupled with the shallow soils would have damaged the integrity of any archaeological sites. This would not preclude testing, but would affect potential eligibility.

3. On the question of archaeological site bounding by a single negative shovel test in each cardinal direction:

Please see *Florida Statutes*, Chapter 1A-46, (Module 3, Section 2.4.2.5 - Site Bounding); "In the case of single artifact occurrences, a single artifact in a non-disturbed context, at least four additional subsurface tests are excavated in the cardinal directions at 10m intervals from the original productive test. If no other cultural materials are recovered, the single artifact is described as an

archaeological occurrence." This was the methodology used in this instance for the archaeological occurrence.

Sincerely,

McLane E. Evans, P.M.P.
SENIOR PROJECT SCIENTIST
CARDNO ENTRIX

Cardno ENTRIX
Shaping the Future

Phone (+1) 813-664-4500 Fax (+1) 813-664-0440 Direct (+1) 813-367-0987 Mobile (+1) 813-625-2204
Address 3905 Crescent Park Drive, Riverview, FL 33578 USA
Email mclane.evans@cardno.com Web www.cardno.com - www.cardnoentrix.com

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Classification: UNCLASSIFIED
Caveats: NONE

Tribal Consultations *(continued)*

From: Seminole Tribe of Florida (Mr. Paul N. Backhouse, Ph.D.)
To: U.S. Army Corps of Engineers (Mr. Ed Sarfert)

SEMINOLE TRIBE OF FLORIDA
TRIBAL HISTORIC PRESERVATION OFFICE

TRIBAL HISTORIC
PRESERVATION OFFICE

SEMINOLE TRIBE OF FLORIDA
AH-TAH-THI-KI MUSEUM

30290 JOSIE BILLIE HWY
PMB 1004
CLEWISTON, FL 33440

PHONE: (863) 983-6549
FAX: (863) 902-1117

TRIBAL OFFICERS

CHAIRMAN
JAMES E. BILLIE

VICE CHAIRMAN
TONY SANCHEZ, JR.

SECRETARY
PRISCILLA D. SAYEN

TREASURER
MICHAEL D. TIGER

June 27, 2012

Ed Sarfert
US Army Corps of Engineers
Regulatory Office
41 North Jefferson St., Suite 111
Pensacola, FL 32502-5794

RE: THPO Response: #010057-SAJ-2007-05537-Tarmac King Road Limestone Mine

Mr. Sarfert:

Thank you for the opportunity to review the above reference public notice provided to our office and entered on May 29, 2012. Per our research we obtained a copy of the report completed for the project entitled *"Archaeological and Historic Survey of the Kings Road Mining Project in Levy County Florida"* prepared October 2006. A records search within the THPO correspondence files appears to indicate that the Office was not consulted prior to May 2012 indicating that the project has been inactive since 2006.

The Seminole Tribe of Florida Tribal Historic Preservation Office has reviewed the project referenced above and has some concerns regarding the comprehensiveness of the archaeological survey. Based on the overall survey coverage it appears that large portions of the project area were excluded from survey. The accompanying map does not appear to indicate as to whether these areas were inundated or otherwise inaccessible. Unfortunately the report is somewhat limited in its presentation of the local environment and in this regard the addition of a soils map would have been extremely helpful. Additionally, shovel-test placement is uneven with the eastern portion of the project area sampled more intensely (based on differences in soil type?). Further clarification on the coverage of the survey would certainly be useful in reviewing the potential success of this judgmental strategy. Examination of the FMSF indicates the landscape surrounding the project area has a high density of cultural resources (Florida History LLC, 2008), making the paucity of material recovered within the project boundaries somewhat surprising.

Methodologically it appears, based on the overall project plan, that the single flint flake find was only bound by single negative shovel-tests in each of the cardinal directions. This may not be the case but it is extremely difficult to discern from the available mapping information.

We appreciate the opportunity to provide comments on this report and look forward to receiving further correspondence on this matter.

Please do not hesitate to call (863-228-3793) or email (paulbackhouse@semtribe.com) if you have any questions with regard to this project.

Sincerely,

Paul Backhouse, Ph.D., RPA
Acting Tribal Historic Preservation Office, Seminole Tribe of Florida

CC: Natalie Garret, Tribal Liaison
David Pugh, Archaeologist
Eric P. Summa, Chief Environmental Branch
James Charles, Attorney, LLW, PA

Ref: Florida History LLC., 2008. Cultural Resource Management Plan for the Tarmac Mine Mitigation Area Levy County, Florida. Preliminary Plan.

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Seminole Tribe of Florida (Mr. Mitchell Cypress, Chairman)

FLORIDA HISTORY, LLC

HISTORY ⊞ ARCHAEOLOGY ⊞ ARCHITECTURAL HISTORY ⊞ 106/110 COMPLIANCE

July 23, 2008

Mr. Mitchell Cypress
Chairman
Seminole Tribe of Florida
6300 Stirling Road
Hollywood, FL 33024

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Chairman Cypress:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

- A 4,581-acre mitigation parcel adjacent to and within the Waccasassa Bay Preserve State Park.

At the suggestion of the USACE and in compliance with 36 CFR 800.4(a)(iii and iv) and 800.2(a)(4), Tarmac America, LLC is consulting with your tribe in order to notify you of this project and to get your opinion of the potential effects on sacred areas, archaeological sites, burial grounds or other areas of special sensitivity to you or members of your organization. In addition, archaeological testing is planned in consultation with the Florida SHPO in moderate and high probability areas so that archaeological sites can be accurately mapped and avoided.

Please provide your comments to Tarmac America, LLC as soon as possible so that we may take them into account. Responses may be faxed to Paul L. Jones at (813) 891-6369, or mailed to the address below.

Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

Phone (813) 891-6340 FAX (813) 891-6369
12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Miccosukee Tribe of Indians of Florida (Chairman Billy Cypress)

FLORIDA HISTORY, LLC

HISTORY ARCHAEOLOGY ARCHITECTURAL HISTORY 106/110 COMPLIANCE

July 23, 2008

Chairman Billy Cypress
Miccosukee Tribe of Indians of Florida
Tamiami Station
P.O. Box 440021
Miami, FL 33144

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Chairman Cypress:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

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Please provide your comments to Tarmac America, LLC as soon as possible so that we may take them into account. Responses may be faxed to Paul L. Jones at (813) 891-6369, or mailed to the address below.

Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

Phone (813) 891-6340 FAX (813) 891-6369
12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Miccosukee Tribe of Indians of Florida (Mr. Steve Terry)

FLORIDA HISTORY, LLC

HISTORY ▪ ARCHAEOLOGY ▪ ARCHITECTURAL HISTORY ▪ 106/110 COMPLIANCE

July 23, 2008

Mr. Steve Terry
Section 106 and NAGPRA Representative
Miccosukee Tribe of Indians of Florida
Tamiami Station
P.O. Box 440021
Miami, FL 33144

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Mr. Terry:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

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Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

Phone (813) 891-6340 FAX (813) 891-6369
12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Muscogee (Creek) Nation (Chief A.D. Ellis)

FLORIDA HISTORY, LLC

HISTORY ARCHAEOLOGY ARCHITECTURAL HISTORY 106/110 COMPLIANCE

July 23, 2008

Chief A.D. Ellis
Principal Chief
Muscogee (Creek) Nation
Office of the Administration
P.O. Box 580
Okmulgee, OK 74447

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Chief Ellis:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

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Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

Phone (813) 891-6340 FAX (813) 891-6369
12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Mississippi Band of Choctaw Indians (Mr. Beasley Denson, Chairman)

FLORIDA HISTORY, LLC

HISTORY ⊞ ARCHAEOLOGY ⊞ ARCHITECTURAL HISTORY ⊞ 106/110 COMPLIANCE

July 23, 2008

Mr. Beasley Denson
Chairman
Mississippi Band of Choctaw Indians
101 Industrial Road
Choctaw, MS 39350

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Chairman Denson:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

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Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

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12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Mississippi Band of Choctaw Indians (Mr. Kenneth H. Carleton, Tribal Historic Preservation Officer)

FLORIDA HISTORY, LLC

HISTORY ⊞ ARCHAEOLOGY ⊞ ARCHITECTURAL HISTORY ⊞ 106/110 COMPLIANCE

July 23, 2008

Mr. Kenneth H. Carleton
Tribal Historic Preservation Officer
Mississippi Band of Choctaw Indians
P.O. Box 6257
101 Industrial Road
Choctaw, MS 39350

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Mr. Carlton:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

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Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

Phone (813) 891-6340 FAX (813) 891-6369
12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Poarch Band of Creek Indians (Mr. Buford Rolin, Chairman)

FLORIDA HISTORY, LLC

HISTORY ⊞ ARCHAEOLOGY ⊞ ARCHITECTURAL HISTORY ⊞ 106/110 COMPLIANCE

July 23, 2008

Mr. Buford Rolin
Chairman
Poarch Band of Creek Indians
5811 Jack Springs Road
Atmore, AL 36502

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Chairman Rolin:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

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Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

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12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Poarch Band of Creek Indians (Mr. Robert Thrower, Acting Tribal Historic Preservation Officer)

FLORIDA HISTORY, LLC

HISTORY ARCHAEOLOGY ARCHITECTURAL HISTORY 106/110 COMPLIANCE

July 23, 2008

Mr. Robert Thrower
Acting Tribal Historic Preservation Officer
Poarch Band of Creek Indians
5811 Jack Springs Road
Atmore, AL 36502

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Mr. Thrower:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

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Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

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info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: AH-TAH-THI-KI Museum (Mr. W.S. Steele, Tribal Historic Preservation Officer)

FLORIDA HISTORY, LLC

HISTORY ⊞ ARCHAEOLOGY ⊞ ARCHITECTURAL HISTORY ⊞ 106/110 COMPLIANCE

July 23, 2008

Mr. W.S. Steele
Tribal Historic Preservation Officer
AH-TAH-THI-KI Museum
HC-61, Box 21-A
Clewiston, FL 33440

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Mr. Steele:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

- A 4,581-acre mitigation parcel adjacent to and within the Waccasassa Bay Preserve State Park.

At the suggestion of the USACE and in compliance with 36 CFR 800.4(a)(iii and iv) and 800.2(a)(4), Tarmac America, LLC is consulting with your tribe in order to notify you of this project and to get your opinion of the potential effects on sacred areas, archaeological sites, burial grounds or other areas of special sensitivity to you or members of your organization. In addition, archaeological testing is planned in consultation with the Florida SHPO in moderate and high probability areas so that archaeological sites can be accurately mapped and avoided.

Please provide your comments to Tarmac America, LLC as soon as possible so that we may take them into account. Responses may be faxed to Paul L. Jones at (813) 891-6369, or mailed to the address below.

Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

Phone (813) 891-6340 FAX (813) 891-6369
12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Seminole Nation of Oklahoma (Mr. Enoch Kelly Haney, Principal Chief)

FLORIDA HISTORY, LLC

HISTORY ARCHAEOLOGY ARCHITECTURAL HISTORY 106/110 COMPLIANCE

July 23, 2008

Mr. Enoch Kelly Haney
Principal Chief
Seminole Nation of Oklahoma
P.O. Box 1498
Wewoka, OK 74884

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Chief Haney:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

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Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

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12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Seminole Nation of Oklahoma (Mr. Pare Bowlegs, Tribal Historic Preservation Officer)

FLORIDA HISTORY, LLC

HISTORY ⊞ ARCHAEOLOGY ⊞ ARCHITECTURAL HISTORY ⊞ 106/110 COMPLIANCE

July 23, 2008

Mr. Pare Bowlegs
Tribal Historic Preservation Officer
Seminole Nation of Oklahoma
P.O. Box 1498
Wewoka, OK 74884

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Mr. Bowlegs:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

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Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

Phone (813) 891-6340 FAX (813) 891-6369
12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Florida History, LLC (Mr. Paul L. Jones)
To: Muscogee (Creek) Nation of Oklahoma (Mrs. Joyce A. Bear)

FLORIDA HISTORY, LLC

HISTORY ⊞ ARCHAEOLOGY ⊞ ARCHITECTURAL HISTORY ⊞ 106/110 COMPLIANCE

July 23, 2008

Mrs. Joyce A. Bear
Muscogee (Creek) Nation of Oklahoma
P.O. Box 580
Highway 75 and Loop 56
Okmulgee, OK 74447

Re: Cultural Resource Management Plan for
The Tarmac Mine Mitigation Area

Dear Mrs. Bear:

On behalf of Tarmac America, LLC, Florida History, LLC is seeking comments on the project described below. Tarmac America, LLC is an international company and the proposed Tarmac King Road Limestone Mine project is regulated by the USACE Pensacola Regulatory Office. Because of increased demand for aggregate, Tarmac America, LLC has proposed expanding its mining capacity with a project called the Tarmac King Road Limestone Mine Project. The project involves construction of a long-term mining project in Levy County, Florida. Adjacent to the mining area a 4,581-acre mitigation area is proposed adjacent to and within the Waccasassa Bay Preserve State Park. As part of the mitigation for the proposed mine, this mitigation area will be returned to its natural state, removing roads and replanting natural vegetation. This mitigation was requested and will be permitted by the USACE Pensacola Regulatory Office. Comments are requested for only the following proposed ground disturbing activities in Levy County as shown on the map in the enclosed management plan:

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At the suggestion of the USACE and in compliance with 36 CFR 800.4(a)(iii and iv) and 800.2(a)(4), Tarmac America, LLC is consulting with your tribe in order to notify you of this project and to get your opinion of the potential effects on sacred areas, archaeological sites, burial grounds or other areas of special sensitivity to you or members of your organization. In addition, archaeological testing is planned in consultation with the Florida SHPO in moderate and high probability areas so that archaeological sites can be accurately mapped and avoided.

Please provide your comments to Tarmac America, LLC as soon as possible so that we may take them into account. Responses may be faxed to Paul L. Jones at (813) 891-6369, or mailed to the address below.

Sincerely,

Paul L. Jones, RPA
Senior Archaeologist,
Florida History, LLC

Cc: McLane Evans, BRA

Phone (813) 891-6340 FAX (813) 891-6369
12157 West Linebaugh Avenue #167, Tampa, Florida 33626
info@floridahistoryllc.com www.floridahistoryllc.com

Tribal Consultations *(continued)*

From: Miccosukee Tribe of Indians of Florida (Mr. Steve Terry)
To: Florida History, LLC (Mr. Paul L. Jones)

From: Steve Terry

Sender:

To: pjones@floridahistoryllc.com

Sent: Aug 14, 2008 9:42 AM

Subject: Tamarac Mine Mitigation Area

Dr. Jones,

The Miccosukee Tribe received your letter and Cultural Resource Management Plan for the Tamarac Mine Mitigation Area in Levy County, Florida. The Tribe has no direct knowledge of any sites located in this area. However, we are pleased with your model and plan to do archaeological testing in the area. Our concern is and remains protection/preservation of any sites that you may find. If you encounter human remains during your testing, we request that you note the location and immediately reinter them. Please contact us if you do find human remains.

We are interested in the management plan for this mitigation area, specifically as concerns archaeological sites. Please pass this on to the Tamarac Mine owners and others who will be in charge of the mitigation area. Thank you for consulting with the Miccosukee Tribe. Please contact me if you require additional information.

Steve Terry

NAGPRA & Section 106 Representative
Miccosukee Tribe
P.O. Box 440021
Miami, FL 33144-0021
(305) 223-8380, Ext. 2243
(305) 223-8380, Ext. 2243
Stevet@miccosukeetribe.com

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CHAPTER 8
PUBLIC INVOLVEMENT PROGRAM

A Notice of Intent (NOI) was published in the February 19, 2008, *Federal Register* (73 FR 9103) announcing the U.S. Army Corps of Engineers' (USACE's) intention to prepare a draft environmental impact statement (EIS) on rock mining in wetlands in Levy County, Florida. The NOI for this draft EIS (see Appendix A), the *Draft Tarmac King Road Limestone Mine Environmental Impact Statement (King Road EIS)*, also announced the dates and locations for two scoping meetings and initiated the scoping period, which concluded on April 26, 2008. An advertisement announcing the scoping meetings was published on March 20, 2008, in the *Gainesville Sun*. The first scoping meeting was held on March 26, 2008, at the Inglis Community Center in Inglis, Florida. The second scoping meeting was held on March 27, 2008, at the Tommy Usher Community Center in Chiefland, Florida. In addition, a website was established at www.kingroadeis.com that allowed the public to submit scoping comments during the scoping period and to request information related to the EIS. Chapter 1, Section 1.7.1, of this EIS includes a summary of the scoping comments.

A Notice of Availability (NOA) for the *Draft Tarmac King Road Limestone Mine Environmental Impact Statement* was issued in the *Federal Register* (77 FR 29617) (see Appendix A) on May 18, 2012. National Environmental Policy Act regulations mandate a minimum 45-day public comment period after the NOA of a draft EIS to provide an opportunity for the public and other stakeholders to comment on the EIS analysis and results. In this case, the USACE allowed for a public comment period of 60 days. The public comment period began on May 11, 2012, and ended on July 11, 2012.

The NOA also announced the date and time of the public hearing to be held in Inglis, Florida, on May 31, 2012. Advertisements announcing the public hearing were published in the *Tampa Bay Times*, *Gainesville Sun*, *Chiefland Citizen*, *Citrus County Chronicle*, *The Newscaster*, and *Levy County Journal*. Approximately 80 people attended the hearing where the USACE made a presentation on the draft EIS and accepted both written and oral comments. A court reporter was present to record the public comments. In addition, the public was encouraged to submit comments via U.S. mail, email, or the *King Road EIS* website. There were 225 comments received from the public and Federal and state agencies during the public comment period. Comments submitted after the public comment period but received by the USACE prior to its final drafting of this EIS were also included for evaluation and response. Chapter 1, Section 1.7.2, of this final EIS includes a summary of the public comments on the draft EIS. Comment responses and individual comment letters are included in Appendix I.

CHAPTER 9
LIST OF PREPARERS

U.S. Army Corps of Engineers

Sarfert, Edward, Senior Project Manager
B.S., Environmental Resource Management and Planning, with a Minor in Geography, University of West Florida
Experience: 16 years

Science Applications International Corporation

Burns, Tom, *Wildlife/Threatened & Endangered Species/Vegetation Lead*
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M.S., Marine Biology, University of Miami
B.S., Biology, University of Notre Dame
Experience: 23 years

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B.S., Geology, Ohio University
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A.S., Applied Science, Weather Technology
Experience: 15 years

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M.S., Forestry, University of Tennessee
B.S., Natural Resources, University of the South
Experience: 33 years

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M.S., Environmental Engineering Sciences, University of Florida
B.S., Zoology, Clemson University
Experience: 29 years

Holian, James, Project Manager, *Meteorology, Cumulative Impacts Lead*
M.S., Meteorology, Pennsylvania State University
B.S., Meteorology, Pennsylvania State University
Experience: 29 years

Khan, Alauddin, *Groundwater Modeling Lead*
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M.S., Chemical Engineering, University of Oklahoma
B.S., Chemical Engineering, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh
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M.S., Geology, University of Alabama
B.S., Geology, University of South Alabama
Experience: 30 years

Rhone, Jacquelyn, *Document Production Lead*
A.S., Radiological Health Technology, Central Florida Community College
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B.A., Political Economics/Public Administration, Bloomsburg University
Experience: 7 years

Smith, Alison, *Public Outreach Support*, *Editor*
B.A., English Language and Literature, University of Maryland, College Park
Experience: 5 years

Smith, Charlotte*, Public Outreach Support*
Bachelor in Biblical Studies, Freedom Bible College and Seminary
Masters in Ministry, Freedom Bible College and Seminary
Experience: 38 years

Stillman, Monica, *Surface Waters and Water Quality*
M.S., Oceanography, University of New Hampshire
B.S., Geology, Boston College
Professional Wetlands Scientist Certification from Society of Wetlands Scientists 2006–2010
Experience: 21 years

Werth, Robert, *Air Quality, Noise, and Cultural Resources*
B.A., Physics, Gordon College
Experience: 36 years

CHAPTER 10
DISTRIBUTION LIST

United States Congress

U.S. Senate
Bill Nelson
Marco Rubio

U.S. House of Representatives
District 3 – Ted S. Yoho
District 11 – Richard Nugent

Federal Agencies

National Oceanic and Atmospheric Administration Fisheries Service
Mark Sramek, Southeast Regional Office

U.S. Environmental Protection Agency
William L. Cox
Paul Gagliano
Eric Hughes

U.S. Fish and Wildlife Service
Todd Mecklenborg
Heath Rauschenberger

U.S. Nuclear Regulatory Commission
Mallecia Sutton

State Government

Florida Governor
Rick Scott

Florida Senators
(Alachua, Citrus, Dixie, Gilchrist, Hernando, Levy, Marion, and Sumter Counties)
Rob Bradley
Charles S. Dean, Sr.
Alan Hays
Dorothy Hukill
Wilton Simpson

State Government (continued)

Florida Representatives
(Alachua, Citrus, Dixie, Gilchrist, Hernando, Levy, Marion, and Sumter Counties)
Dennis Baxley
H. Marlene O'Toole
Keith Perry
Elizabeth Porter
Robert Schenck
Jimmie T. Smith
Charlie Stone

Florida Department of Agriculture and Consumer Services
Adam H. Putnam, Commissioner

Florida Department of Economic Opportunity
Hunting F. Deutsch, Executive Director

Florida Department of Environmental Protection
Herschel Vinyard, Secretary

Aquatic Preserve
Melissa Charbonneau, Manager

Bureau of Mining
John Coates

Division of Recreation and Parks
Rick Owen, District Water Coordinator

Florida Department of State
Timothy Parsons
Compliance Review, State Historic Preservation Office

Florida Department of Transportation
Ananth Prasad, Secretary

Florida Fish and Wildlife Conservation Commission
Nick Wiley, Executive Director
Timothy King

Southwest Florida Water Management District

Suwannee River Water Management District

Local Government

Mayors
Glenda Kirkland – Inglis, Florida
Larry Feldhusen (Acting) – Yankeetown, Florida

County Officials
Levy County Board of County Commissioners
Fred Moody, County Coordinator
Levy County Clerk of Court
Danny Shipp
Levy County Attorney
Anne Bast Brown
Levy County Planning Director
Shenley Neeley
Levy County Building Official
Rob Corbitt
Levy County Department of Roads and Bridges
Bruce Greenly, Administrative Superintendent

Town Clerks
Sally McCranie – Inglis, Florida
Laura Coyle – Yankeetown, Florida

Organizations and Companies

Hopping, Green and Sams (Alliance Center, Tallahassee)
Frank Matthews

Tarmac America, LLC
John Crawford
Jeff Harris

Libraries

A.F. Knotts Public Library – Yankeetown, Florida
Bronson Public Library – Bronson, Florida
Cedar Key Public Library – Cedar Key, Florida
Luther Callaway Public Library – Chiefland, Florida
Williston Public Library – Williston, Florida

Individuals

Sydney Bacchus
Greg Beauchamp
Betty Berger
Cara Campbell
Emily Casey
Beth Foley
Dan Hilliard

Individuals (continued)

David Hoyt
Scott McCaleb
Beverly Miller
Jack Schofield
Joyce Tarnow

CHAPTER 11
GLOSSARY

Accuracy: The closeness of a measured value to the true value.

Alkalinity: The alkaline nature of a substance (water) derived by measuring its ability to accept hydrogen ions.

Anthropogenic: Resulting from human influence.

Aquifer: An underground, water-bearing layer of porous rock, sand, or gravel.

Aquifer storage and recovery: The injection of fresh water into a confined aquifer during times when supply exceeds demand (wet season), and recovering it during times when there is a supply deficit (dry season).

Barrier: Any feature that restricts movement from one place to another.

Base aggregate: Limerock aggregate materials that generally range from three to one-half inch in diameter that are primarily used to construct a consolidated, stable base beneath concrete and asphalt pavement.

Benthic: Pertaining to the bottom or sediment habitats of a body of water.

Biodiversity: Biodiversity is the total variety of life and its processes. Biodiversity exists at three different levels: the total variety represented by all species of plants and animals; the variety of different genes within each species; and the variety of different habitats and ecosystems in which these species exist.

Biological Opinion: Document stating the opinion of the Fish and Wildlife Service or the National Marine Fisheries Service on whether or not a Federal action is likely to jeopardize the continued existence of listed species, or result in the destruction or adverse modification of critical habitat.

Biomass: The amount of living material in a particular sample, population, or area, usually measured as dry mass.

Biota: The plants and animals of an area.

Borrow pit: An area where material is excavated to use as fill elsewhere.

Buffer: Buffers are multi-use transition areas designed and managed to protect core reserves and critical corridors from the destructive impacts of human activities. They are designed with consideration for the specific ecological features to be protected and the specific activities that threaten them. These lands may be owned and managed through a wide variety of public and/or private programs.

Coarse aggregate: Naturally occurring materials such as gravel, materials derived from the crushing of parent material such as natural rock, slag, and expanded clays and shale, and other approved inert materials with similar characteristics (FDOT 2010:814).

Compliance monitoring: In a water quality management program, compliance is associated with meeting permit conditions based on ambient standards. Ongoing monitoring provides periodic water quality data, which are used to assess compliance.

Conductance: The ability of an aqueous solution to carry an electric current. Conductance is used as a measure of total dissolved solids in water.

Coniferous: Of or relating to trees or shrubs bearing cones and evergreen needle-like or scale-like leaves. Pine and cypress are examples of coniferous trees.

Conservation: The use of all methods and procedures that are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [the] act are no

longer necessary. Such methods and procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transportation, and in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regular taking.

Consultation: A defined process where the USACE formally or informally coordinates with another agency. One example of formal consultation determines whether a proposed Federal action is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat; begins with a Federal agency's written request and submittal of a complete initiation package; and concludes with the issuance of a biological opinion and incidental take statement.

Corridor: Ecological corridors are landscape linkages designed to permit large-scale and long-term ecological processes to continue operating within fragmented ecosystems. They may be designed to facilitate movements of animals (for seasonal migration, breeding, foraging, or other purposes), plant propagules (via seed dispersal, movement of pollen or pollinators, or other mechanisms), and/or essential abiotic resources, such as water or nutrients. Long-term genetic implications are usually a fundamental consideration in corridor planning. Appropriate design and management of a corridor depends upon the ecological purposes it is intended to serve. Primary corridors are the essential uninterrupted connections that integrate the landscape at the regional level. In most landscape situations, such corridors will be miles wide and structured so that a central spine managed like a core reserve is sheltered by strips of primary buffer within broader areas of secondary buffer. Primary corridors should generally be oriented along riparian systems or wildlife movement routes.

Cover type: A classification of land by its dominant feature, whether natural or man-altered, such as a body of water, plant species, or land use (e.g., lakes, dense melaleuca, or agriculture).

Create: The creation of natural community analogs on massively disturbed land where it is impossible or unfeasible to restore an historic natural community. Historic natural communities are used as general models, and only species that are within their historic ranges are used to construct these natural community analogs.

Critical habitat: The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of Section 4 of the Endangered Species Act, on which are found those physical or biological features essential to the conservation of the species and which may require special management considerations or protection; and specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of Section 4 of the Endangered Species Act, upon a determination by the U.S. Fish and Wildlife Service or the National Marine Fisheries Service that such areas are essential for the conservation of the species.

Decibel (dB): A unit for expressing the relative intensity of sounds on a logarithmic scale where zero is below human perception and 130 is above the threshold of pain to human. For traffic and industrial noise measurements, the A weighted decibel, a frequency-weighted noise unit, is widely used.

Desiccating: Of or pertaining to drying thoroughly.

Discharge (or flow): The rate of water movement past a reference point, measured as volume per unit time (usually expressed as cubic feet or cubic meters per second or gallons per minute).

Dispersal: The movement of organisms away from a location, such as their point of origin.

Drawdown: A lowering of the water level in a reservoir or other body of water.

Drought: A long period of abnormally low rainfall, especially one that adversely affects growing or living conditions.

Easement: An interest in the land of another that provides the easement holder specified rights without actual ownership.

Ecosystem: Biological communities together with their environment, functioning as a unit.

Endangered Species Act: The Endangered Species Act of 1973, as amended, Title 16 *United States Code* (U.S.C.) Section 1531 et seq.

Environment: The complex of climatic, soil, and biotic factors acting upon organisms.

Epifauna: Animals that live on the surface of a substrate such as rocks, pilings, marine vegetation, or the lake floor itself.

Equivalent sound level: The equivalent, steady sound level that, if continuous during a specific time period, would contain the same total energy as the actual time-varying sound. Leq (1-h) and Leq (24-h) are the 1-hour and 24-hour equivalent sound levels, respectively.

Eutrophication: The process of nutrient enrichment in a water body. Eutrophication often results from nitrogen and phosphorous inputs from human activities such as sewage disposal and runoff from uplands. Such input stimulates algal blooms and bacteria growth, which contribute to depletion of oxygen in the water, anoxic conditions, and eventually leads to fish kills.

Evapotranspiration: The process by which water is released to the atmosphere by evaporation from a water surface or movement from a plant surface (more specifically known as transpiration).

Exotic species: Any introduced plant, animal, or protist species that is not native to the area and may be considered a nuisance.

Fauna: All animal life associated with a given habitat.

Federally listed threatened and endangered species: Species of wildlife which have been determined by the Fish and Wildlife Service to be endangered or threatened under the Endangered Species Act, as amended.

Fine aggregate: Natural silica sand, screenings (by product of rock crushing), local materials, or other approved inert materials with similar characteristics (FDOT 2010:819).

Flora: All plant life associated with a given habitat.

Florida land use, cover, and forms classification system (FLUCCS): This land use, vegetation cover and land for classification system developed by the Florida Department of Transportation is arranged in hierarchical levels with four different levels of categorization, each level containing land information of increasing specificity. Four digit codes are used to describe the various classifications.

Florida Statutes: The Florida Statutes are a permanent collection of state laws organized by subject area into a code made up of titles, chapters, parts, and sections. The Florida Statutes are updated annually by laws that create, amend, or repeal statutory material.

Foraging: The act of searching for and obtaining food.

Fugitive emissions: (1) Emissions that do not pass through a stack, vent, chimney, or similar opening where they could be captured by a control device. (2) Any repair pollutant emitted to the atmosphere other than from a stack. Source of fugitive emissions include pumps; valves; flanges; seals; areas sources such as ponds, lagoons, landfills, and piles of stored material (e.g., coal); and road construction areas or other areas where earthwork occurs.

Geographic information systems (GIS): A computerized system of organizing and analyzing any spatial array of data and information.

Greenway: A greenway is a corridor that serves both ecological and recreational functions. It can include terrestrial and/or properly buffered aquatic systems. A well-designed regional greenway system links non-motorized community transportation and recreation trails through secondary corridors to long-distance routes embedded in the buffers of primary ecological corridors and cores.

Habitat: Area or type of environment that a plant or animal normally lives in or is found in.

Hammock: A habitat often characterized by thick stands of shade-tolerant hardwoods and few pines. Understory vegetation may be quite sparse. Hammocks occur on rolling terrain. The soils vary from somewhat poorly to well drained, are high in nutrients, and contain more organic material and litter than drier sites.

Hydric: A description of habitat or soil that formed under conditions of frequent saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper soil profile.

Hydrology: The scientific study of the properties, distribution, and effects of water on the earth's surface, in the soil and underlying rocks, and in the atmosphere.

Hydroperiod: Duration and frequency of inundation in a wetland area.

Indigenous: Originating or occurring naturally in a place; native; not invasive.

Infauna: Aquatic animals that live on the substrate of a body of water.

Inflow: The act or process of flowing in or into.

Infrastructure: The fundamental facilities and systems serving a county, city, or area, in this case as related mainly to transportation. Bridges, roads, and railways, all examples of transportation related infrastructure.

Intrusion: The invasion of a body of fresh water by a body of salt water, due to its greater density. It can occur either in surface water or groundwater bodies. The term is applied to the flooding of freshwater marshes by sea water, the upward migration of sea water into rivers and navigation channels, and the movement of sea water into freshwater aquifers along coastal regions.

Invasive species: A species that is not native to the ecosystem.

Karst: A landscape shaped by the dissolution of a layer or layers of soluble bedrock, usually carbonate rock such as limestone or dolomite.

Landscape: An areal entity that is a composite of all the characteristics that distinguish a certain area on the earth's surface from other areas.

Levee: Small rise or embankment used to keep water in certain areas.

Listed species: Any species of fish, wildlife, or plant that has been determined to be endangered or threatened under Section 4 of the Endangered Species Act.

Littoral: The region of well-lit water close to shore. Home to most of the aquatic plant life (both rooted and floating) in a pond or lake because the high amount of sunlight reaching it allows for significant photosynthetic activity.

Littoral shelf: Of, pertaining, or existing on a shore, in this case along the shores of the lakes being created in the mined area.

Littoral zone: The shore zone from the high water mark to a depth where light is barely sufficient for rooted aquatic plants to grow.

Loading (or mass loading): The amount of material carried into a specified area, expressed as mass per unit of time. One example is phosphorus loading, measured in metric tons per year.

Management: Any intentional or planned activity that has an effect on an existing natural community that has been degraded in some way. Management that attempts to restore natural community functions, structures and/or composition is termed restorative management. Restorative management includes both in-kind restoration and not-in-kind restoration.

Marl: A clay, sand, limestone mixture of varying proportions that is soft and crumbly and usually contains shell fragments.

Marsh: An area of soft, wet, low-lying land, characterized by grassy vegetation and often forming a transition zone between water and land.

Median: The middle value in a set of ordered data. The median is often used to express the typical (average) value of a group of water quality data because the median is less influenced than the arithmetic average by outlying values routinely seen in such data.

Mesic: A type of habitat with a moderate or well-balanced supply of moisture. Compared to a dry habitat, a mesic habitat is moister.

Migration: Broad-scale movement of water or organisms (for example, groundwater migration, pathogen migration).

Mitigation: Compensation required for the alteration of natural resources or habitat pivotal to the survival or well-being of listed species.

Model: A conceptual or mathematical simulation of reality (for examples, biological) for purposes of describing, analyzing, or understanding nature.

Muck: Dark, organic soil derived from well-decomposed plant biomass.

Native plant: In its broadest definition, plants that were indigenous to the landscape before European settlers arrived on the North American continent. If the definition were applied to just Florida, plants indigenous to Florida before the arrival of European settlers. This definition may be extended even further to say that native plants are those plants that occur naturally and are not present due to ANY type of human activity, including American Indian Activities before the arrival of European settlers.

Noise: Any sound that is undesirable because it interferes with speech and hearing, is intense enough to damage hearing, or is otherwise annoying or undesirable.

Nutrients: Organic or inorganic compounds essential for the survival of an organism. In aquatic environments, nitrogen and phosphorus are important nutrients that affect the growth rate of plants.

Outflow: The act or process of flowing out of.

Overburden: The rock or soil overlying the limestone to be extracted from the mine.

Parameter: A variable or constant representing a characteristic of interest. For example, conductance is a water quality parameter. Use of this term is highly subjective and varies greatly across disciplines.

Parts per billion (ppb): A unit of measure, equivalent to micrograms per liter (1 ppb = 1 µg/L).

pH: A measure of the concentration of hydrogen ions in a solution.

Plan: A predetermined course of action.

Population: A group of plants or animals in the same taxon below the subspecific level, in common spatial arrangement that interbreed when mature.

Potentiometric: a surface that represents the level to which water will rise in tightly cased wells; the water table is a particular potentiometric surface for an unconfined aquifer.

Quality control: Steps taken to ensure that quality standards are met.

Reclamation: The act of restoring land to a habitable or cultivatable condition.

Recovery: Improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set in Section 4(a)(1) of Endangered Species Act; the process by which species' ecosystems are restored so they can support self-sustaining and self-regulating populations of the listed species as persistent members of native biotic communities.

Reserve: Nature preserve, national park, refuge, natural reserve, or other conservation land. A tract of land set aside to preserve it in its natural condition.

Reservoir: A man-made or natural water body used for water storage.

Restoration: Management actions to return a vegetative community or ecosystem to its original, natural condition.

Risk assessment: A tool to estimate the probability of extinction (or persistence) for a particular species.

Roosting: The act of settling or congregating for rest or sleep.

Seepage: The movement of fluids particles though porous media.

Slough: A depression associated with swamps and marshlands as part of a bayou, inlet or backwater; it contains areas of slightly deeper water and a slow current.

Species: Any subspecies of fish or wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife which interbreeds when mature.

Species abundance: In ecology, the relative distribution of the number of individuals of each species in a community.

Species of concern: The Florida Fish and Wildlife Conservation Commission maintains the State list of animals designated as endangered, threatened, or species of special concern, in accordance with Rules 68A-27.003, 68A-27.004, and 68A-27.005, respectively, of the Florida Administrative Code.

Species richness: The number of species occurring in a particular area for a specified sampling period.

Structure: Man-made pump stations, reservoirs, channel improvements canals, levees, and diversion channels.

Uniform Mitigation Assessment Method (UMAM): A method for assessing the functional value of wetlands. This approach is consistent with USACE permit applications and mitigation determinations within Florida

Upland: A non-wetland area, or of, or relating to, an area with elevation higher than a wetland or water level.

Variety: A rank in the hierarchy of botanical classification; the principal category between species and form; an ambiguous term often used for any variant group within a species.

Vegetation type: A plant community with distinguishable characteristics.

Watershed: A region or area bounded peripherally by a water divide and draining ultimately to a particular watercourse or body of water.

Wetland: An area that is inundated or saturated frequently enough by surface water or groundwater to allow growth by vegetation adapted for life under those soil conditions (for example, swamps, bogs, and marshes).

Xeric: Of, pertaining to, or adapted to a dry environment.

Zoning: Land-use zoning; the demarcation of a planning area by ordinance into zones and the establishment of regulations to govern their use.

CHAPTER 12
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U.S. Army Corps of Engineers
Jacksonville District
August 2013