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

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Appendices A-H

U.S. Army Corps of Engineers
Jacksonville District
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COVER SHEET

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

Title: *Draft 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 60 days from the date on which the Notice of Availability of this Draft 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 *Draft 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 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 of the *Draft King Road EIS*. The location and time of a public hearing on this document will be announced in the *Federal Register* in May 2012. Comments on this *Draft King Road EIS* will be accepted at the address listed above for a period of 60 days following issuance and will be considered for preparation of the *Final King Road EIS.*

3.3.4. Surface Water Quality

Water quality in the streams is good and, except for dissolved oxygen, meets applicable surface water quality standards. Entrix, fka Biological Research Associates[12], has been conducting monthly surface water quality sampling at 13 monitoring stations on the project site since November 2007. Dry conditions were encountered during most sampling events at most stations and all 13 stations were sampled only twice during the 2008 monitoring year. Measured pH values were fairly consistent, ranging from 6.2 to 7.6. Turbidity was in the range of 0.5 to 5.4 NTU. Conductivity varied from 171 μS to 2685 μS across the project area. The higher conductivities were measured on the mitigation portion of the site in close proximity to Withlacoochee Bay where salt water influences surface water quality. Dissolved oxygen was typically below 5 mg/L. Biological oxygen demand was typically between 2 and 6 mg/L. Chlorophyll-*a* values were near the method detection limits of 1.1 to 2.2 mg/m^3 at most stations and sampling events. Total nitrogen in the stream stations varied from 0.02 to 3.1 mg/L and was primarily in the form of organic nitrogen. Phosphorous was typically between 0.02 and 0.2 mg/L.

Chlorides and sulfates at most stations were typically below 15 mg/L. At the stations along the coast, the concentrations of these two parameters were in the range of 100 mg/L to 500 mg/L reflecting the influence of salt water. Gross alpha particle activity was below 3 pCi/L. Oil and grease was only detected at three of the 13 stations and, at 2 to 3 mg/L, was below the Class III standard of 5 mg/L. Total hardness at most stations was in the range of 100 mg/L to 300 mg/L. Arsenic, cadmium, chromium, copper, lead, nickel and zinc were all below their respective Class III standard. Iron exceeded the Class III standard at only one station with measured values of 2.3 mg/L in August 2008 and 13 mg/L in March 2008. The station with the elevated iron concentration is at the eastern entrance to the mine site.

3.4. Groundwater Monitoring Plan

As part of the field exploration program for the proposed project site, Tarmac America, LLC, will implement a comprehensive groundwater monitoring plan (GWMP) with the objective of measuring groundwater levels and quality both prior to and during mining operations. The objective of the groundwater monitoring program is to document compliance with permit conditions related to water quality and water quantity. Full details of the GWMP are described by Garlanger and Rolo (2010)[13].

The GWMP was prepared following the guidance for ground water monitoring plan design from the Florida Department of Environmental Protection (2008) and Rule 62-520.600, F.A.C.

Figure 21 shows the location of the proposed monitoring well network for the first ten years of mining. Two monitor wells will be provided at each water quality sampling location; one screened from 15 feet to 35 feet below existing grade (S well) and one screened from 50 to 70 feet below existing grade (D well). Monitor Wells MW-15S and MW-15D will serve as the ***Background Wells***. Wells MW-4, MW-6, MW-7, MW-11, MW-12, MW-13 and MW-14 will serve as ***Regional Wells*** (i.e. they are sufficiently far from the withdrawal points to ensure minimum drawdown effects from the mining operations). Wells MW-17S, MW-17D, MW-18S, MW-18D

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[12] Hammond, Daniel G. and Kristan M. N. Robbins (2008). “Surface Water Quality Assessment, Baseline Monitoring, Tarmac King Road Limestone Mine, 2008 Annual Report”, Biological Research Associates, September 2008.

[13] Garlanger, J. and Rolo, R (2010). “Groundwater Monitoring Plan for Proposed King Road Mine”. Ardaman & Associates, January 2010.

MW-19S, MW-19D, MW-20S, MW-20D, MW-21S, MW-21D, MW-22S and MW-22D will serve as ***Intermediate Wells*** (interceptor wells) located within the permitted zone of discharge, and monitor wells MW-2S, MW-2D, MW-7S, MW-7D, MW-16S and 16D will serve as ***Compliance Wells***. MW-8, MW-9 and MW-10 are existing salt water monitors screened below 300 feet. MW-1, MW-2, MW-3, and MW-5 are existing monitor wells used to obtain water levels and water quality during design and permitting of the project.

The following parameters will be monitored quarterly (or annually in the case of Gross Alpha Radium^{226}, and Uranium) in the background well, the intermediate wells and the compliance wells once mining operations start.

Field Parameters	Laboratory Parameters
pH	TDS
Conductivity	Sulfate
Temperature	Chloride
Turbidity	Total Nitrogen
Water level	Arsenic
	Gross Alpha
	Radium^{226} (*)
	Uranium

(*) To be measured if Gross Alpha exceeds 15 pCi/l.

The chloride monitors will be sampled and tested annually for the field parameters, TDS, sodium and chloride. Other chemical analyses may be performed if required by FDEP or the Water Management District.

Tarmac also proposes to install staff gauges in the active mine pit, tailings disposal area and in the plant pond and to install piezometers/staff gauges in preserved wetlands located within 500 feet of the active mine cut and tailings disposal area.

4. ANALYSIS

4.1. Proposed Mine Plan

The proposed mine plan was developed to generate approximately 3 million tons of saleable construction grade aggregate each year. The quality of the Avon Park limestone is such that approximately 5.2 million tons of the formation must be mined and processed each year to generate 3 million tons of aggregate.

Figure 22 is an illustration of the currently proposed mine plan for the first ten years of the mine life. The first production mine pit will be located just east of the proposed plant site. This area, totaling 50 acres, would be completely reclaimed by the end of the 10-yr period. After the area east of the plant site is mined, the dragline will cross the northernmost stream channel and walk approximately one mile to the west to begin mining the western end of the northern mine parcel. Mining will proceed from west to east for approximately 2.5 years after which the dragline will walk approximately 2 miles to the east to begin mining from east to west at the eastern end of the northern mine parcel. The cross-hatched areas in Figure 22 are the mine pits that will be backfilled and/or reclaimed by the end of the ten-year mining period.

The area that will be disturbed during the first ten years of the project is estimated at 590 acres (this includes mine pits, the 238-acre plant site and other operation-related disturbed areas). At an assumed average mining rate of 24 acres per year, the area that could be mined during the first ten years is 240 acres (including the Plant Pond). A portion of the site development pit and approximately 95 acres of mine pits will be backfilled and partially or fully reclaimed during the initial ten years of mining. At the end of the first ten-year mining period, the area of open water is expected to be 145 acres, which includes 15 acres of shallow ponded water on the current tailings pond, 30 acres of ponded water in the two plant ponds, and 100 acres of deep water in the last mining area.

Although the dragline has the capability of mining to a depth of 120 feet, the mine plan for the first ten years of the mine life assumed an average mine depth of 100 feet. Using an *in situ* dry density for the rock of 1.375 tons/yd^3 and a design mining rate of 5.2 million tons per year, the number of acres mined each year will be a little less than 25 acres. Using an average dry density of 1.2 tons/yd^3, the 2.2 million tons of tailings are sufficient to backfill approximately one-half of the mined pits. Tailings consist of rock fragments and fines not meeting specifications.

The rock will be excavated using a large, electric-powered walking dragline. The mine pit will not be de-watered before, during or after mining. The rock will be removed, cast into large windrows (stockpiles) and allowed to drain before processing. Drainage water will be directed back to the mine pit or allowed to seep back into the aquifer.

After the excavated rock has drained for several weeks, it will be removed from the stockpile, crushed, and then conveyed to the plant for further processing. Processing consists of additional crushing, washing and screening to meet the required specifications. Water for washing the aggregate and transporting the tailings will be pumped from the plant pond, which will also be used to receive return flow from the mine pit being filled. The recirculation flow will be approximately 9,000 gpm (13 MGD). The average water content of the aggregate being trucked from the site is expected to be about 6 percent.

After the excavated rock has drained for several months, it will be removed from the stockpile, crushed, and then conveyed to the plant for further processing. Processing consists of additional crushing, washing and screening to meet FDOT specifications.

Some of the rock removed from the initial 14-acre site development pit will be used to construct roads and berms and to provide fill for the plant site. Berms up to 4 or 5 feet high will be constructed adjacent to all of the undisturbed areas using the overburden stripped from the areas to be mined. A layer of limerock fill approximately 2 to 3 feet thick will be placed over the areas to be mined. This will provide a working pad for the dragline.

The net volume of the aggregate removed from the mine pit, using a specific gravity for dolomitic limestone aggregate of 2.75, is about 800 acre-ft per year. This volume of excavated rock will be replaced by groundwater pumped into the active mine pit from the plant pond or directly seeping into the active pit from the surrounding Floridan aquifer. The quantity of water that must be pumped or allowed to seep into the mine pit to replace the net volume excavated is 720,000 gpd. Note that this water is not consumed or used by the mining process; it is the annual change in storage within the aquifer resulting from extracting the aggregate.

As described earlier and illustrated in Figures 15 and 16, the water table (potentiometric surface) slopes from east to west across the site with a gradient of about 4 feet per mile. Because the water level in a mine pit is horizontal, the water table will be lowered on the east side and raised on the west side of each mine pit. The magnitude of this raising and lowering of the water table at the east and west end of the mine pit depends on the actual slope of the water table at each pit and the width of the opening. The mining and reclamation plan was designed to minimize changes in the water table during mining and reclamation. Tarmac will maintain the difference in water level between adjoining mine cuts to a maximum of 12 inches, i.e., the water level will be allowed to drop by no more than 6 inches on the east end of the mine cut and rise by no more than 6 inches on the west side of the mine cut. This will keep the average water level in the mine cut at or very near the natural pre-mining water level.

4.2. Water Balance

4.2.1. Pre-mining and During-mining

As discussed in the hydrology section, the average surface water and ground water outflow from the site on a long-term basis can be calculated from the hydrology mass balance equation:

Runoff + Groundwater Outflow = Rainfall - Evapotranspiration.

Figure 23 is the flow diagram for the proposed King Road Mine. The water budget for the proposed mine under annual average conditions is provided in Table 8. All of the quantities are based on 24 hours per day and 365 days per year.

Figures 24 and 25 are diagrams illustrating the water balance for the King Road Mine catchment area for the pre-mining and during-mining condition. In the pre-mining condition, rainfall on the catchment area is balanced by evapotranspiration from the pre-mining landform, groundwater outflow to the surrounding Floridan aquifer, and runoff to streams. In the during-mining condition, rainfall on the catchment area must be supplemented with water seeping into the catchment area from the surrounding Floridan aquifer to balance the evaporation from the mine pits and plant pond, evaporation from paved/roofed areas and the plant area/stockpiles, evapotranspiration from reclaimed areas and other vegetated surfaces, groundwater outflow to the Floridan aquifer, water leaving the site as product moisture, and the change in storage created by the removal of aggregate from the site. Note that during mining, runoff from the catchment area is collected and directed to the mine pit or plant pond.

The Floridan aquifer withdrawal is the amount of water required to balance the budget and is equal to the difference between the sum of the users and the sum of rainfall and recycled water (i.e. 0.34 mgd). Please note that an earlier mining plan produced a more conservative estimate of Floridan aquifer withdrawal of 0.38 mgd, which is the value used for the steady-state groundwater impact analyses described later in this report. Recycle water is the water used to transport the mine tailings to the tailings disposal area. It was calculated from the total tailings generated in an average production year and assumed solids content in the slurry of 10 percent. The total tailings volume generated during an average year is the difference between the amount of rock mined and the amount of product sold.

To prevent any deterioration in surface water quality and to comply with permit conditions, all of the active areas of the mine site will be surrounded by an engineered berm designed to prevent surface water discharge during all storm events up to and including the 25-year storm, i.e. average annual runoff from the catchment area is zero. The stormwater captured behind the perimeter berms will be used as makeup water in the plant recirculation system. The average annual quantity of surface water runoff captured and used as makeup in the mine recirculation system is estimated at 0.48 million gallons per day (mgd). The reduction in surface water discharge to Withlacoochee Bay from the mine site is minimal compared to the average annual discharge from Lake Rousseau to the Withlacoochee River and Withlacoochee Bay, which is reported by the US Geological Survey to be in excess of 650 million gallons per day.

Change in Storage is the water that is needed to fill the void left by excavating the rock and removing a portion of it from the site. The amount of rock that is excavated from the quarry each year is 5.2 million tons. Product sales will remove 3.0 million tons of rock from the site. The volume of water needed to fill the void left by removing 5.2 million tons of rock from the quarry is calculated by dividing the mass of rock removed by the dry density of the solid portion of the rock (the water in the void space does not leave the site). The solid rock, which is primarily dolomite, is estimated to have a specific gravity of 2.75 and a solids density of 172 lbs/ft^3 (2.75*62.4 lbs/ft^3). The volume of solid rock removed is 1,390 acre-ft per year. The volume of tailings, which is also estimated to have a specific gravity of 2.75, is calculated by dividing the mass of tailings returned to a previously-mined quarry (the tailings disposal area) by the dry density of the tailings grains, i.e., 172 lbs/ft^3 and is equal to 587 acre-ft per year. The difference between these two volumes is the net change in storage, i.e. 803 acre-ft per year, or 720,000 gpd.

As shown on the flow diagram, ground water withdrawals will be from the mine and the plant pond. The relative volumes from each of these withdrawal points depend on how much plant flow is diverted to the mine pit. For the conditions shown, most of the ground water withdrawal is from the mine pit. If more water is pumped to the mine pit (or in the case of the first 5 years, less water is pumped back to the plant pond, more of the withdrawal will be from the plant pond. On the flow diagram, net rainfall (rainfall - ET) is proportioned by area.

During a meeting on May 28, 2008, SWFWMD staff indicated that although changes in natural ET resulting from project development (and the water used to replace the volume of aggregate leaving the site) would be included in the evaluation of impacts resulting from the project, the ET changes would not be included in the water use permit. Therefore, Tarmac requested a general water use permit to consume 120,000 gpd from the Floridan aquifer. There is no source of lower water quality available for use as makeup in the mine recirculation system.

4.2.2. Post-reclamation

At the end of the 110-year mine life, approximately one-half of the mine pits will have been reclaimed as uplands and one-half will remain as lakes. A daily water balance analysis of the watershed performed prior to mining and after reclamation was used to demonstrate to FDEP and the Water Management District that groundwater outflow from the mine site would not be significantly altered as a result of the proposed mining/reclamation and that the only impact from the expected 10-in/yr increase in evaporation resulting from the change in land use from planted pine to lakes would be a decrease in surface runoff from the Mine site to Withlacoochee Bay of 1.0 million gallons per day. When compared to the average annual discharge from Lake Rousseau to Withlacoochee Bay of 650 million gallons per day, the 1.0-mgd change in surface water runoff resulting from the increased evaporation is minimal. Groundwater levels are not predicted to change significantly as a result of the increased evaporation.

In conclusion, neither surface water nor groundwater resources at and in the vicinity of the site will be adversely impacted by development of the King Road Mine.

4.3. Salt Water Intrusion

Decreased groundwater outflow from the site has the potential to increase salt water intrusion. Under steady-state conditions, salt water inflow is balanced by fresh water outflow. Figure 26 is a conceptual cross section of the salt water\fresh water boundary. If neither the freshwater nor the salt water is flowing, the depth to the salt water\fresh water interface could simply be computed from the density of the two fluids. Under no flow conditions, the thickness of fresh

Table 8

Annual Water Budget for King Road Mine

Average Rainfall Year

Annual Rainfall	54	in/yr
Natural ET	38	in/yr
Lake Evaporation	48	in/yr
Stockpile ET	40	in/yr
Paved Area ET	10	in/yr
Other Disturbed Area ET	34	in/yr
Average Mining Rate	25	ac/yr
Average Mining Depth	100	ft
Rock Production	3	mty
Product Moisture Content	6	Percent
Catchment Area	590	acres
Open Mine Areas	145	acres
Reclaimed Areas	30	acres
Other Areas	393	acres
Paved & Roofed Areas	5.0	acres
Stockpile Areas	17	acres
Unit Weight of Rock	2,750	lbs/yd^3
Specific Gravity of Aggregate	2.75	
Groundwater Outflow	5	in/yr

AVERAGE ANNUAL WATER BUDGET UNDER NATURAL CONDITIONS

SOURCES	ACRE-FT	MGD	USERS	ACRE-FT	MGD
Rainfall	2,655	2.37	ET	1,868	1.67
			Groundwater Recharge	246	0.22
			Contribution to Streamflow	541	0.48
			Change in Storage	0	0.00
TOTAL	2,655	2.37		2,655	2.37

ANNUAL WATER BUDGET WITH MINING

SOURCES	ACRE-FT	MGD	USERS	ACRE-FT	MGD
Rainfall	2,655	2.37	ET	1,849	1.65
Floridan Aquifer	375	0.34	Change in Storage*	803	0.72
Recycle Water	14,563	13.00	Tailings water return	14,563	13.00
			Product Moisture	132	0.12
			Groundwater Recharge	246	0.22
			Contribution to Streamflow	0	0.00
TOTAL	17,593	15.71		17,593	15.71

Uses	MGD	Gal/ton	Source	MGD	Gal/ton
Change in ET	-0.02	-2	Captured GW Recharge	0.00	0
Product	0.12	14	Floridan Aquifer	0.34	41
Change in Storage	0.72	87	Captured SW	0.48	59
Total	0.82	100		0.82	100

* Change in Storage = Volume of Rock (Aggregate) Removed from Site

** Visher & Hughes (1975)