

Department of the Army Permit Evaluation  
and Decision Document

Applicant:

Application No: 07V0XL1002259  
File Number: 200008910

Holcim (US) Inc.<sup>1</sup>  
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This document constitutes the U.S. Army Corps of Engineers (USACE) St. Louis District's Environmental Assessment (EA), Statement of Findings and review and compliance determination according to Section 404 of the Clean Water Act (33 U.S.C. 1344), which applies to the discharge of dredged or fill material into waters of the United States, including wetlands, and according to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403), which applies to the performance of work, or the placement of structures, in or affecting navigable waters of the United States.

In the course of the USACE's review of Holcim's permit application, the USACE visited the project site on several occasions, conducted a public workshop, met and consulted with resource agencies such as EPA, FWS, MDNR, and MDC, met with Holcim on several occasions, required Holcim to conduct various additional studies, reviewed all submitted public comments, reviewed all relevant studies and materials submitted by Holcim, and met with certain environmental groups concerned about the project.

Pursuant to 40 CFR 1506.5(b), an applicant may prepare an EA, provided the USACE makes an independent evaluation of the environmental issues and takes responsibility for the scope and content of the supplied EA. The applicant (Holcim) supplied an EA dated 14 March 2003, entitled "Environmental Assessment for the Proposed Holcim (US) Inc. Lee Island Project" (Holcim's EA) as well as various studies either required by the USACE or voluntarily performed by Holcim. Portions of Holcim's EA have been directly incorporated into this USACE EA. Other information in Holcim's EA and studies submitted by Holcim, which has not been directly referenced in this USACE EA, is hereby incorporated by reference. All USACE responses in the attached Response to Comments are also hereby incorporated in this EA by reference.

The USACE independently evaluated Holcim's EA and submitted studies. In addition, the USACE independently evaluated all factors, data and comments concerning the potential impacts of the proposed permit action. In support of the USACE's independent review, a multidisciplinary team of USACE personnel, consisting of members with accredited wildlife, forestry, soil science, fisheries, environmental engineering and law degrees reviewed the contents of this document, with particular emphasis directed at topics respective to areas of each individual's expertise, to further confirm the findings of the USACE's EA.

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<sup>1</sup> \* Holnam Inc. changed its name to Holcim (US) Inc. on December 12, 2001.

I. Proposed Project: The location and description of work are described in the jointly issued USACE and Missouri Department of Natural Resources (MDNR) Water Pollution Control Program public notice P-2259, dated 6 November 2000, and in Holcim's 8 August 2000 Section 404/401 and Section 10 Permit Application Companion Report. A subsequent public notice P-2259a, dated 6 December 2000, provided a 30-day comment period extension and also advertised availability of a Public Workshop. A public workshop was held on 24 January 2001, and was open to all interested parties. At the Public Workshop, the comment period was extended until 5 February 2001. All comments received during the official public notice comment period are considered under this evaluation. Additional comments received after the official public notice comment period, and deemed relevant by the USACE, were also considered under this evaluation (No comments received after 1 May 2003, the end of our review, were considered).

Since issuance of the public notice, several aspects of the project have changed. Several clarifications are required regarding the acreage that would be affected and the project components that were listed in the public notice. The public notice stated that approximately 2,000 acres of the approximately 4,000-acre site would be directly utilized by the project. However, the project would not directly utilize as much of the site as originally indicated. Based upon improved mapping, a more exact figure for the total project area is approximately 3,916 acres. As a result of project modifications (discussed below), the buffer area has been increased from 2,000 acres to approximately 2,200 acres. The buffer area now encompasses more than half of the project site. The area that would be directly utilized by the project is now approximately 1,322 acres, which includes approximately 1,261 acres for the quarry (the quarry also includes the cement plant area), 47 acres for the harbor and associated infrastructure, and 14 acres for the cement plant sedimentation basin. The remaining acreage within the 3,916 acre project area consists of approximately 28 acres of the access road which lie outside the quarry boundary and the approximate 366-acre area between the "ultimate extent of the quarry" and the 100+ years" quarry boundary. As shown on Sheet 8 of 10 in the public notice, the applicant has only applied for a permit to impact jurisdictional waters within the "100+ years boundary" of the proposed quarry. If the applicant were to eventually require limestone reserves in the area between the "100+ years boundary" and the "ultimate extent of the quarry," new authorization would be required from the Corps to impact jurisdictional waters in that area, and from MDNR to quarry the additional acreage. In the meantime, the 366-acre area would remain undisturbed forested land contiguous with the buffer area, and would not be directly utilized under the authority of a permit that would be issued as a result of this review.

In the first three years of the project (initial construction and development), the following impacts would occur: 47 acres for the harbor and associated infrastructure, 14 acres for the cement plant sedimentation basin, and, within the quarry boundary, 227 acres – consisting of approximately 109 acres for the Old Quarry Hollow fill area, 54 acres for the Raddy Hollow fill area, 13 acres for the topsoil storage area, and 51 additional acres for the cement plant. (Note: Approximately 56 acres in the area of the former quarry that will be required for the cement plant were previously impacted during construction of the access road).

Development of the quarry will occur at an average rate of about 12 acres per year. (Note: During the first 10 years of quarry operations, the quarry will advance at an average rate of approximately 18 acres per year. In addition, the first 10 years of quarry operations will involve a 27-acre expansion of the Raddy Hollow fill area in year 4, and a 28-acre expansion of the

Raddy Hollow fill area in year 7). After the first 10 years, quarry advancement will begin to slow down so that after 50 years, the quarry is advancing at an average rate of only approximately 8-10 acres per year.

No more than approximately 200 acres will be actively quarried at one time. After the first 8-10 years of quarry operations, reclamation will begin in accordance with MDNR land reclamation requirements.

In August 2001, the applicant completed construction of the above mentioned access road to provide safe and direct access through the project site to the former quarry and the Mississippi River. As explained in Holcim's EA, the access road has independent utility and was authorized under a separate USACE nationwide permit (NWP). As such, the access road is not considered a component of this project, but its potential environmental impacts have been analyzed during permit review. It should also be noted that the Lee Island cement plant project component originally required direct authorization under Section 404 because it would have involved filling wetlands. However, Holcim modified the cement plant design to avoid wetlands along Isle du Bois Creek. In addition, the USACE has determined that two small isolated wetlands that would have been impacted by the cement plant are not waters of the United States (USACE Jurisdictional Determination, 19 September 2002). Based on these changes, construction of the cement plant alone does not require specific authorization from the USACE. Nevertheless, this EA evaluates the entire project, including the cement plant.

Two major project components - the overburden disposal areas and the two crossings of Isle du Bois Creek - have been modified or eliminated to reduce impacts and are discussed below.

Since the public notice, the project has been modified to reduce environmental impacts in response to comments and agency recommendations. Modifications include withdrawal from the permit application for any work in North and Hickory Hollows (the two hollows north of Isle du Bois Creek in Jefferson County). These hollows would not be used for disposal of overburden/harbor excavation material or any other project activity. This results in complete avoidance of North Hollow (93 acres) including impacts to the North Hollow Calcareous Glade. It also results in complete avoidance of Hickory Hollow (182 acres) including two springs and approximately 0.2 miles of jurisdictional stream. Therefore, the overall impacts to jurisdictional intermittent streams (also variously referred to as tributaries in this document) for the total project are reduced from approximately 3.4 miles to approximately 3.2 miles.

Avoidance of North and Hickory Hollows increases the buffer area to approximately 2,200 acres. All land located in Jefferson County would now be set aside as part of the buffer area. Avoidance of North and Hickory Hollows eliminates sedimentation basins and storm water discharges north of Isle du Bois Creek, but requires addition or enlargement of sedimentation basins for run-off from areas within the quarry. Avoidance of North and Hickory Hollows also requires placement of the overburden and harbor excavation material in two areas within the limits of the quarry: the Raddy Hollow fill area (at the head of Raddy Hollow) and the Old Quarry Hollow fill area (in Hollows D and E). A dam that must be permitted by MDNR would be required in south Old Quarry Hollow to retain harbor excavation material. The Raddy Hollow fill area requires the extension of a small portion of the quarry to the west (by approximately 50 acres), but no regulated resources would be effected by the extension. A topsoil storage area would also be located near the west boundary of the quarry (in Hollow L). The fill areas and

topsoil storage area would be seeded and controlled to protect against erosion. The material in the fill areas would eventually be used in the cement manufacturing process or in reclamation, and the topsoil would be used in mitigation and reclamation.

In addition, several project modifications were made since issuance of the public notice to avoid Isle du Bois Creek wetland impacts: Withdrawal from the permit application of the western and eastern portions of the haul road that would have connected the plant/harbor with North and Hickory Hollows; withdrawal from the permit application of the improvements to two crossings of Isle du Bois Creek that would have been required for the haul road; and relocation of the overall plant footprint and an associated railroad spur further to the south. Based on these changes, Holcim has withdrawn from the permit application approximately 2.6 acres of direct wetland impacts along Isle du Bois Creek that were associated with the railroad spur, the haul road, and the crossings. The net result is an overall reduction of impacts to wetlands on the project site from approximately 16.8 acres to approximately 14.2 acres, and avoidance of all direct impacts to Isle du Bois Creek and its associated riparian and floodplain areas.

On 19 September 2002, the Corps made a formal jurisdictional determination for the wetlands that would be impacted by the project. The jurisdictional determination essentially confirmed the previous wetland delineation for most of the 14.2 acres of wetlands that would be impacted by the project. However, two minor changes were made. Approximately 7.5 acres of emergent wetlands were re-classified as farmed wetland based on a certification by the Natural Resources Conservation Service (NRCS). In addition, two small wetlands in the vicinity of the proposed cement plant - referred to as Wetland K and the Upland Pond in the Companion Report - were determined not to be jurisdictional wetlands based on recent case law. These wetlands are isolated waters above the 500-year floodplain that are not hydrologically connected to other waters of the United States, and therefore do not qualify as jurisdictional wetlands. This change reduces the overall wetland impacts for the project from 14.2 acres to 14 acres. However, the applicant would still provide compensatory mitigation for 14.2 acres of wetlands.

The project also now includes the applicant's proposed mitigation, developed since the public notice. The applicant's mitigation consists of a Wetland and Stream Mitigation Plan, a revised Long Term Land Reclamation Strategy, habitat-based conservation measures (as part of the applicant's Biological Assessment), and proposed storm water controls (as part of the applicant's Water Resources and Hydrology Report).

The Wetland and Stream Mitigation Plan proposes the creation and enhancement of approximately 61 acres of high-quality wetlands on the project site to replace the 14 acres of mostly farmed wetlands that would be impacted by the project. On southern Lee Island below the proposed harbor, the applicant would create 25.5 acres of new wetlands, enhance 12.8 acres of farmed wetlands, and restore the Lee Island slough, to create a contiguous wetland complex with a 3.6 acre vegetated buffer. The applicant would also enhance the Isle du Bois Creek riparian corridor by restoring 22.8 acres of farmed wetlands along Isle du Bois Creek. In addition, the applicant would create intermittent streams in the reclaimed quarry area on a 1:1 basis to mitigate for impacts to jurisdictional streams.

The principal objectives of the revised Long Term Land Reclamation Strategy would be to reconstruct the existing rugged upland topography, at a lower elevation, and replace the jurisdictional intermittent stream systems, to the extent practical, using fluvial geomorphology and state-of-the-art methods and practices. Reclaimed areas would be seeded with native

vegetation species that would re-establish the forest and provide a range of wildlife habitats. Small ponds (one for every 50 acres) would be created to provide additional upland aquatic habitat. A 500-acre lake with vegetated fringes would cover the eastern part of the quarry. Undisturbed areas would be integrated with reclaimed areas to provide the largest contiguous wildlife habitat possible.

The Wetland and Stream Mitigation Plan and the conservation measures would be integrated with the revised Long Term Land Reclamation Strategy to ensure a comprehensive habitat-based approach to site environmental management. The storm water controls would be implemented as provided in the Water Resources and Hydrology Report. The applicant has committed to perform all of this proposed mitigation as part of the project.

At the direction of the USACE and other Federal and state mandated programs, Holcim conducted more than two dozen studies of the project site (see Appendix A of this EA). The purpose of the studies is to better understand the Lee Island project area's ecological and cultural resources, physical characteristics, and potential environmental and human use impacts. The studies, hereby incorporated by reference, were used to develop detailed design alternatives and/or evaluate the environmental impacts of the relevant project components.

The USACE independently reviewed the studies and determined they were based on accurate information, used accepted methodology, and reached valid conclusions. Several of the studies, and other submitted documents, generated facts and information directly related to other federal and state regulated permit programs. Regardless, the USACE considered all information under this review per NEPA requirements. Studies and information beyond the direct jurisdictional authority of the USACE will also be analyzed by the expertise of other Federal and state agencies during the course of their applicable permit review. The USACE considers the submitted studies, even those outside of our expertise or direct permit authority, to contain accurate information. If at any point the USACE determines that the information was inaccurate, the USACE reserves the right to suspend, re-evaluate or revoke any or all portions of a subsequently authorized action, particularly information that weighed in the formulation of the official USACE decision.

## II. Environmental and Public Interest Factors Considered:

A. Purpose and need: Holcim's stated overall project purpose is to construct a 4 Million Ton (MMT (all tonnages are referred to in metric tons)) per year portland cement plant, including a limestone quarry, harbor, and barge fleeting area, at a central location on the Mississippi River. Holcim further identified the purpose and need as utilization of mineral resources in the Lee Island project area, with raw material and product shipment reliant on a strategically located river transportation hub.

The USACE finds that the project is necessary to fulfill continuing demand for cement and replace sources of imported cement. Portland cement is a relatively low-cost, heavy, bulk commodity, which is marketed aggressively in a very competitive industry. Competition within the industry results from both domestic production and imported cement. Portland cement is the world's most widely used building material; an essential binding agent in concrete and also the key binding ingredient for other building materials, such as mortar and stucco. In 1999, 5.8 Million Tons (MMT) of cement produced outside of the United States were imported into New Orleans and transported via the Mississippi River system to Midwest targets, representing a \$1.5

billion lost revenue opportunity for US based cement producers. Holcim proposes activities within the Lee Island project area to fulfill some of the demand currently being met by imports. The proposed Lee Island project would produce approximately 4 MMT of portland cement annually, utilizing primarily onsite raw materials. Approximately 80% of all cement products generated by the Lee Island facility would be shipped by barge transportation. Holcim's project would also reduce the amount of imported cement currently being shipped on the Mississippi River.

The USACE also finds that Holcim's purpose of achieving major navigable river access at a central location below any locks and dams is a legitimate one. As explained and documented in Holcim's EA and Supplemental Alternatives Analyses, in a large area such as the River market, barge shipment is by far the most cost-efficient means of transportation. For example, a single barge tow, typically consisting of 15 barges, can carry the equivalent of 225 rail cars or 780 trucks. Based on industry figures and logistics, rail transportation can cost three to four times more than barge transportation, depending on distance and season, and truck transportation 10 to 12 times more than barging. In addition, barge traffic is safer and has less environmental impact. The USACE is very knowledgeable of the Mississippi River system, the barge transport industry, its role in the regional and national economy, the necessity for bulk commodity producers to have river access to become or remain economically competitive by utilizing low-cost barge transportation, the importance of choosing locations with year-round river transport capability, the continuing demand for stone and cement products throughout the river region, and the problems of finding sites that practicably meet other necessary criteria. In general, only a limited number of sites would appear to offer the combined availability of river access, adequate supplies of quality limestone in near proximity to the river, other accessible transportation alternatives, and low jurisdictional impact potential.

The Lee Island site is adjacent to open flows of the Mississippi River, below lock and dam structures, to allow efficiently wider barge configuration shipments to southern markets. Narrower tows could also seasonally supply northern markets with cement. Lock and dam maintenance and upstream ice conditions often halt river transportation and stifle year-round supply opportunities. A location below locks and dams is necessary to minimize risk of river closure so that Holcim can ship cement and receive fuel and secondary raw materials year-round. Year-round barge transportation capability is especially important to enable Holcim to provide uninterrupted customer service to the lower River market (i.e., New Orleans and other southern cities), which typically has demand for cement year-round. The Lee Island site additionally offers needed on-site rail loading options and quick access to highway transportation. Where barge shipment is not possible or practical, Holcim must have the capability to ship finished product to customers by truck or rail. Truck or rail is also necessary to receive supplies and some secondary raw materials. Typically, truck or rail would be used for transportation of cement over shorter distances or where the destination is not accessible by barge.

The USACE determined that the Lee Island site would directly serve Holcim's purpose of providing a portland cement production site with significant river transport potential to consistently supply needed cement to customers in the River market (The River market, as defined in Holcim's EA, refers to the area served by the Mississippi River system). By comparison, site locations in the upper reaches of the Mississippi River (referring to areas above the southern most lock and dam) are frequently hindered by weather driven river closures and

common lock and dam maintenance/closure requirements. A project site located in the upper reaches of the Mississippi River would face greater challenges to consistently provide cement to River based customers.

The Lee Island site also contains limestone that can be quarried and is well suited to manufacture cement. The limestone at Lee Island consists of nearly pure calcium carbonate with low alkali, hydrocarbon, and magnesium levels. The chemical composition of the limestone has a direct effect on the plant design specifications, and the resulting air/water/solid waste production. The USACE finds it reasonable and typical to expect that some secondary raw materials would be required from off-site sources. Therefore, a basic purpose and need of the project is to obtain a quarry on-site that can produce cement-quality limestone in sufficient quantity for a 100+ year quarry life, with secondary raw materials available on-site, or economically available from nearby off-site locations. The necessary secondary materials can also be economically transported via river barge to the Lee Island site for incorporation into the cement process. River access/availability also allows for shipment of coal material necessary for plant operations. Reliable river bound shipments of these secondary materials would be further diminished by locating the site in the unpredictable upper Mississippi River.

The USACE further finds that Holcim properly evaluated all practicable alternative locations that would support a river-based operation with the least potential impacts to jurisdictional features. Holcim, as any other applicant, is allowed to focus on a specific geographic area to provide desired project purposes and needs. The St. Louis District's familiarity with this reach of the river and surrounding area enables us to confirm that a facility requiring adequate supplies of high quality limestone, practicable distance to a river terminal facility (harbor/fleeting) and year-round river transport potential would focus on a geographic location situated below the southernmost lock and dam structure to approximately Scott City, Missouri (areas south of Scott City, Missouri, lack practicable distances between the river and adequate supplies of quality limestone).

The USACE also considered the fact that Holcim's efforts to avoid and minimize impacts at the Lee Island site would result in direct jurisdictional impacts to less than 1% of the nearly 4,000 acre site. Holcim concluded that other considered alternative areas would have similar, if not greater impacts than the Lee Island site. The USACE required and reviewed the NWI maps used by Holcim to evaluate alternative sites. The USACE concluded that alternative sites considered by Holcim would result in similar, and more likely, greater direct impacts to jurisdictional waters of the United States, including wetlands and navigable waters. The USACE also independently reviewed and found the information stated in Holcim's Supplemental Alternatives Analyses to be accurate and directly related to the findings within this EA. As such, the preferred Lee Island site was clearly demonstrated as the only practicable area to meet Holcim's overall and basic project purposes and needs.

B. Alternatives (33 CFR 320.4(b)(4), 40 CFR 230.10): Throughout the course of this evaluation, the USACE required Holcim to evaluate potential alternatives and to apply practicable avoidance/minimization efforts. In response, Holcim supplied a Supplemental Alternatives Analyses, dated 29 March 2002, which are discussed in part below and further detailed in Appendix B of Holcim's EA.

1. No Action: Denying authorization to complete the requested actions would result in no impacts by Holcim to jurisdictional areas, or to general land and environmental features in the Lee Island project area. This alternative would assume no impacts to the area due to the construction of the quarry, cement plant and harbor facility. However, even if Holcim does not build their proposed cement facility at this site, preservation of the area is not likely to remain a realistic option.

As background, it should be noted that past and adjacent activities have rendered the site in less than pristine condition. While portions of the action area appear undisturbed, the entire property is not a pristine, untouched area. Past landowners have transected various locations of the site with logging/hunting access roads, cleared areas, constructed dwellings, bridge structures and utilized scattered areas to abandon debris and other dilapidated materials.

Land-use history of the project area indicates that previous landowners have conducted frequent logging operations in several forested areas of the property. Since acquiring the property, Holcim has halted or suspended logging rights that had been retained by several past landowners in Wolf Hollow and other areas. Mandatory permit conditions would require Holcim to comply with FWS tree clearing restrictions and maintain the buffer in its undisturbed condition except for beneficial conservation measures. Farming is also a historical use of the site. Farming activities continue to occur in the Lee Island flood plain, including wetland areas. Farming activities also occur directly adjacent to Isle du Bois Creek and the Mississippi River.

The Lee Island project site was also the location of two former limestone quarries: a now-abandoned limestone quarry was located in the area where the proposed cement plant would be constructed. A substantial amount of overburden and tailings from this former quarry was deposited in large piles near the location of the proposed harbor. A component of this previous operation included a loading operation on the Mississippi River in the vicinity of Holcim's proposed north fleeting area. Another abandoned quarry about 3-4 acres in size was operated in a hollow near the eastern boundary of the proposed quarry, just to the west of the railroad tracks.

An active, frequently used main line of the Burlington Northern Santa Fe Railroad traverses the Lee Island site along the base of the Mississippi River bluff line. The Lee Island site is located just south of the AmerenUE Rush Island electric power generating plant and approximately one mile north of the Brickeys Stone quarry operation. While not a dependent project component, the AmerenUE plant could potentially provide a nearby source of electricity for plant operations with minimal associated power line clearing (habitat fragmentation) activities.

As stated, the No Action alternative would likely result in uses for the Lee Island project site other than preservation. Because the site contains excellent quality limestone, it would be a potentially attractive location for a limestone quarry operation. A new quarry operator may also seek a permit for a harbor or barge fleeting operation on the river.

Other potential uses of the project site could include hunting, farming and logging. The Lee Island and Isle du Bois Creek flood plain wetlands would likely continue to be farmed, resulting in a sustained degraded condition to both wetlands and the adjacent creek/riverine setting. New landowners could resume logging in much the same way the previous landowners logged the property.

The project area could also be utilized for residential development such as large estates. Subdivision development of the Lee Island site would likely entail environmental impacts from tree clearing, habitat fragmentation, and increased run-off, and would probably eliminate any prospect of preserving a significant amount of the undisturbed buffer.

The No Action alternative would not fulfill Holcim's project purpose of developing additional low-cost cement production capacity to serve the River market. The No Action alternative would result in continued importing of cement, which creates an economic business risk for Holcim. The No Action alternative would restrict Holcim's ability to remain competitive in the cement industry.

In addition, continued reliance on imports would entail global and regional environmental impacts in the form of greater ship and barge traffic, increased shipping fuel consumption, corresponding air emissions, and the increased potential for accidents. Most current imports involve transoceanic shipments, which would be reduced by a new cement plant located on the Mississippi River system. Further, overseas imports through New Orleans must travel significant distances on the Mississippi River to reach upper Midwest destinations such as Chicago and Minneapolis. A more centrally located plant on the Mississippi River system would shorten overall freight distances, and potentially lessen overall global and regional impacts on fuel usage and air quality.

Further, the No Action alternative would likely result in competitors expanding existing operations or constructing new plants in the river market area to produce low-cost cement to displace imports and meet current and future customer demand. Construction or expansion of plants by other companies would likely produce overall aquatic resource impacts (resulting from harbors, fleeting areas, quarries, roads, etc.) similar to or greater than Holcim's proposed Lee Island project.

The Lee Island site is located near other industrial developments, contains all necessary transportation options and has undergone previous development, at least in certain places on the property. In a realistic sense, the No Action alternative is not likely to result in preservation of land features found in the project area, nor would it reasonably result in total avoidance of jurisdictional land features by other potential future landowners. Therefore, the No Action alternative is not considered a feasible alternative.

2. Other project designs (smaller, larger, different, etc.): Holcim considered building a smaller 2 or 3 MMT capacity cement plant at Lee Island and the alternative sites that were examined. However, a smaller plant would not provide sufficient capacity, and production costs would increase because economies of scale would be lost. Therefore, a smaller plant would not fulfill the project purposes of creating sufficient new low-cost capacity to maintain and expand Holcim's market share in the growing river market while enabling the company to reliably and effectively serve its customers.

As an additional project design consideration, Holcim originally determined that underground mining was not a viable option at the Lee Island site. The following provides a summary of the reasons why underground mining is not possible at the Lee Island project site:

- There is insufficient supportable roof rock available to conduct underground mining. The topographic relief at the site is several hundred feet between the ridge tops and the intervening valley bottoms. An underground mine would be exposed to the surface at each valley. Therefore, a structurally sound underground mine is not possible.
- Approximately 75 to 80 percent of the material from the surface down to the Joachim Dolomite can be utilized for the manufacture of cement. It has been determined that the remaining 20 to 25 percent would be utilized for other purposes such as reclamation. The Joachim Dolomite cannot be used in the cement process because it is high in magnesium. Because the useable minerals at the proposed Lee Island site are near the surface, no rock can be left in place for underground mining.
- Quarrying allows the complete and efficient utilization of mineral resources.
- Safety, productivity, and utilization of natural resources all are optimized with quarrying. Energy consumption would be less with quarrying. Operating with 60 percent material removal efficiency in an underground mine for a plant of Lee Island's size would require nearly double the amount of land currently required for the quarry (Holcim does not own that amount of land, nor are there sufficient mineral reserves under such land).

In conclusion, for technical, logistical and cost reasons, underground mining is prohibitive and not considered a viable alternative at the Lee Island site. At the MDNR's 19-21 February 2003 land reclamation hearing, this conclusion was supported by the testimony of the Dean of the School of Mines at the University of Missouri-Rolla.

Based upon comments concerning Wolf Hollow, the USACE required Holcim to evaluate the possibility of entirely avoiding this area. In response, Holcim conducted a study, which involved the development of a computer block model to analyze the quantity of mineable reserves that would be eliminated. Avoidance of Wolf Hollow would also necessitate the avoidance of Longs Hollow, which is adjacent to and south of Wolf Hollow (Longs Hollow could not be reached by the quarry unless Wolf Hollow was quarried first). Figure 3-2 of Holcim's Companion Report identifies the mineable reserves in both Wolf and Longs Hollows, up to the 100+ year quarry boundary.

The computer block model determined that avoidance of Wolf and Longs Hollows would reduce the mineable reserves within the 100+ year quarry boundary from 705 MMT to 553 MMT, a decrease of 152 MMT. A 152 MMT reduction in mineable reserves would reduce the life of the quarry by approximately 25 years, and in turn, reduce total cement plant production by 96 MMT, which translates into lost plant revenue of approximately \$7.4 billion in today's dollars (based on the USGS-reported 2000 average mill cement price of \$77.50).

Also, these figures do not include the additional reserves in Wolf and Longs Hollows between the 100+ year boundary and the ultimate extent of the quarry. There are an additional 196 MMT of mineable reserves in the area between the 100+ year boundary and the ultimate extent of the quarry. This area must remain potentially available to Holcim to justify the significant investment in this project should additional limestone be needed in the long-term.

In addition, avoiding Wolf and Longs Hollows would further reduce the availability of some secondary raw materials (e.g., silica from Burlington Limestone) and require obtaining these materials from off-site. Bringing raw materials from off-site would increase production costs by more than \$1 per ton of clinker (the intermediate product in the cement manufacturing process), which is a substantial increase in cost of production that would not be offset by market pricing.

Other resulting effects would be increased barge, rail or truck traffic and reduced overall energy efficiency.

Based upon this analysis, the USACE concluded that avoidance of Wolf Hollow (and by necessity Longs Hollow) would cause a revenue loss of significant magnitude, result in the loss of approximately ¼ of the anticipated project life and would not render a logistically or economically viable project. The mineral reserves in Wolf Hollow and Longs Hollow are critical to enable Holcim to fulfill the project purposes, and therefore, these areas cannot be avoided. However, Wolf and Longs Hollows would not be impacted by the quarry for decades, and would remain part of the contiguous undisturbed area until quarrying and subsequent reclamation occurred. Particularly, the USACE considered the fact that the majority of lands within Wolf and Longs Hollow contain upland land features that would be mitigated, reclaimed and revegetated. Other project designs have been sufficiently studied by Holcim and warrant no further evaluation. These were discussed in Holcim's 404 application Companion Report and Supplemental Alternatives Analyses.

3. Other sites: In proximity to the Lee Island facility, Holcim considered other alternative locations not owned by the company (For specific details, see Section 2.8 of Holcim's Supplemental Alternatives Analyses). Based on project purposes, Holcim considered various sites on the Mississippi River between St. Louis, Missouri and Scott City, Missouri. A project of this nature requires an available tract of land large enough to accommodate a cement plant, quarry, harbor, and significant buffer. Depending on the thickness of the mineral reserves, a rough estimate of the total land area required would be 1,000 - 2,000 acres, not including a buffer. Contiguous tracts of undeveloped land this size are limited. In addition, the land - preferably owned by one or a few landowners - must be available for purchase. Land owned by many small landowners or competitors was not considered reasonably available. Numerous small parcels owned by numerous different individuals would unduly complicate and frustrate the land acquisition process. Because of the highly competitive nature of the cement industry, existing cement plants owned by other cement manufacturers, existing limestone quarries, and other sites where competitors owned the mineral rights were not considered viable prospective candidates for alternative site locations.

Holcim stated two main reasons the area between St. Louis and Scott City, Missouri, was selected. First, a basic project purpose is to obtain a central strategic location that minimizes risk of river closure, i.e., that is below any locks and dams on the Mississippi or Ohio Rivers. This requirement effectively excludes any alternative sites on the Mississippi River north of St. Louis, or on the Missouri or Illinois Rivers, which both join the Mississippi River above the southernmost lock and dam. Also, the presence of locks and dams on the Ohio River just above its confluence with the Mississippi River effectively excludes any alternative sites on the Ohio River or its tributaries. Essentially, the only location that meets the requirement for a central strategic location below any locks or dams is the central portion of the Mississippi River below St. Louis.

Second, the need for adequate cement-quality limestone reserves excludes sites south of Scott City, Missouri. Over the years, the geology of the Mississippi River has been well explored for various purposes including the mapping of mineral reserves. Holcim stated that United States and state geological survey maps show there are no outcroppings of limestone suitable for the production of cement on the Mississippi River from Scott City, Missouri to the Gulf of Mexico. The USACE agrees that there are no practicable areas located below Scott City, Missouri that

meet the purpose and need of the proposed action, further limiting the required geographic setting of the project area. Alternative sites situated below Scott City, Missouri are not considered practicable due to geologic factors such as the widening of the river valley and sediment deposition.

Thus, the only geographic area warranting consideration for alternative sites is limited to the Mississippi River between St. Louis, Missouri, and Scott City, Missouri. As discussed below, there are several potential sites for a large cement plant in this area. However, for various reasons discussed, these sites are not practicable alternatives.

Holcim's evaluation of other sites on the Missouri side of the Mississippi River provided accurate documentation that other practicable alternative locations did not meet project purposes for one or more of the following reasons: insufficient limestone reserves, insufficient contiguous land area, too many small landowners, land not available for purchase, lack of access to road transportation, no area for a harbor, navigation and safety hazards, and major gas or electric lines. In addition, the USACE applied our expertise and permitting knowledge to conclude that prospective sites within this portion of the Mississippi River, where a harbor and quarry would have otherwise been feasible, would result in similar or greater impacts to jurisdictional waters of the United States than proposed at the Lee Island site.

The USACE has a long-standing familiarity with this geographic area and on-going oversight of other permit evaluations in the project area. As such, our knowledge further supports our concurrence with Holcim's finding that the Illinois side of the Mississippi River from East St. Louis down to a point across from Scott City, Missouri, does not practicably allow alternative sites because the area, in general, does not have limestone outcroppings or cement plant sites within an economic distance of the river. Typically, the bluffs on the Illinois side that contain limestone outcroppings are separated from the river by three to five miles of floodplain (in contrast to the bluffs on the Missouri side, which are frequently very close to the river). Any cement plant built to use the limestone from these bluffs would also have to be located three to five miles from the river. Holcim would not construct a cement plant in the floodplain due to business risk, and location of a cement plant three to five miles from the harbor would make construction of a mechanical conveyance system uneconomical. In addition, acquiring the land or right of way for the conveyance system and a road to access the harbor would be difficult over so great a distance. Moreover, development (harbor, road to harbor, and conveyor system) across this width of floodplain would likely result in wetland impacts similar to or greater than Lee Island. Finally, the Illinois side generally lacks access to an adequate rail and truck transportation infrastructure. There is no interstate or even four-lane highway serving the Illinois side, and although there is a rail line, it does not service the distribution terminals on the Mississippi River system that Holcim uses (instead, the BNSF rail line on the Missouri side of the river services those terminals).

Between St. Louis and Scott City, Missouri, Holcim considered the following specific alternative sites (this information was previously considered proprietary, but later released, and was referenced in footnote number 6 in Section 2.8 of Holcim's Supplemental Alternatives Analyses):

- St. Louis County, Missouri site

- Ste. Genevieve County, Missouri sites
- Chester, Illinois site
- Wittenberg, Missouri sites
- Scott City, Missouri site

### **St. Louis County Site**

This site (River Mile 168.0) is located at an existing active limestone quarry – the Bussen Quarry – in St. Louis County just south of I-270 near the “Jefferson Barracks” area (which is the location of a veteran’s hospital, national cemetery, and state park/historic military installation). Because the Bussen Quarry is located in an urbanized area, there was not sufficient land for a cement plant, harbor, quarry, and buffer. In addition, this site was owned by a company that competes with Holcim for limestone reserves, and therefore was not considered available to Holcim for acquisition.

### **Ste. Genevieve County Sites**

The Lee Island project site (River Mile 139) is located in Ste. Genevieve County. Other sites were considered in Ste. Genevieve County, but none met the project purposes or were available to Holcim.

Holcim considered purchase of a site just south of Lee Island identified as the Menefee tract. This site has been the location of an active limestone aggregate quarry for many years (River Mile 136.0). An aggregate quarry is one that produces rock for direct use rather than as raw material for a manufacturing process. The current operator of the quarry is Brickeys Stone.

The Menefee tract encompasses Morrison, Brickey, and Shell Hollows and is similar in size to Lee Island. Both sites are located in the Brickey’s Hills landscape feature and, therefore, have similar rugged upland topography. The Menefee tract does not have a floodplain, as the limestone bluffs are right along the river.

There are several reasons the Menefee tract was not considered a practicable alternative. First, cement-quality limestone is not accessible by quarry on the Menefee tract. At Lee Island, the Plattin limestone formation contains the quality of limestone necessary for the manufacture of cement at a point sufficiently close to the surface to be quarried. However, on the Menefee tract, the Plattin formation is found only below river level and it is not economically feasible to access it by quarry. The limestone available for quarrying at the Menefee tract is the Burlington formation, which contains excessive silica for cement manufacturing. For this reason alone, the Menefee tract would not provide the necessary on-site primary raw material required by the project.

Second, it would not be possible to construct a harbor at the Menefee tract. Without a harbor, Holcim would be forced to exclusively fleet barges in the river. The USACE knowledge and further review of this particular river location determined exclusive river fleeting would likely create unacceptable navigation problems (obstruction/impedance) and personnel safety hazards. Third, the Menefee tract would likely have similar environmental impacts to Lee Island, especially in the uplands. Finally, Holcim stated the Menefee tract was not available for acquisition.

Apart from the Menefee tract, Holcim considered other potential sites in Ste. Genevieve County. However, the land and/or mineral reserves in other Ste. Genevieve County locations with potentially suitable limestone formations was owned by Tower Rock, Mississippi Lime, Chemical Lime, and other companies which compete with Holcim for limestone. In particular, Mississippi Lime (River Mile 125.5) has been well established in Ste. Genevieve for many years and has tied up mineral rights to the exclusion of any new competitors. Therefore, these locations were not considered available to Holcim for acquisition.

### **Chester, Illinois Site**

One potential site (River Mile 108.7) was identified on the Illinois side of the Mississippi River just north of the town of Chester, Illinois. Although most of the limestone on the Illinois side is located too far from the river for an economically feasible project, Holcim believed this site might have cement-quality limestone closer to the river. Holcim conducted a field inspection and determined the site could not be used because the limestone is not accessible by quarry.

The site is located just north of the Menard State Penitentiary, where limestone bluffs occur above a farmed floodplain. Due to the presence of existing commercial and residential development on the limestone bluffs, a quarry would not be possible without disrupting the lives of those individuals or buying out each property. Furthermore, there would be no place at this site where a cement plant could be located. There are no openings in the bluffs where a plant could be built and due to business risk, Holcim would not site a cement plant in a floodplain.

The Chester site was also disqualified by its distance from the St. Louis home market and lack of access to adequate road and rail transportation. Customers from the St. Louis area would not travel additional distance to Chester for cement when there are Holcim competitors closer by, especially since there is no interstate or even four-lane highway serving the Chester area. Although there is a rail line along the Illinois side of the river, it does not service the distribution terminals on the Mississippi River system that Holcim uses (instead, the BNSF rail line on the Missouri side of the river services those terminals).

Finally, based on submitted maps and observation, the USACE independently determined that construction of a harbor/fleeting area and associated facilities on the floodplain at this site, and operation of a quarry (if one were possible), would likely result in wetland and stream impacts similar to or greater than Lee Island.

### **Wittenberg, Missouri Sites**

Potential sites were identified and evaluated to the north and south of the now-abandoned town of Wittenberg (River Mile 90.3) on the Mississippi River. Wittenberg was founded in the 1830s by immigrant settlers from Germany and, for many years, was the location of a Mississippi River ferry landing. The town lost population over the years and was devastated by the 1993 flood. Now, only a few buildings remain.

#### **Site South of Wittenberg, Missouri**

There is a relatively small area approximately one-half mile south of Wittenberg that was evaluated as a project site. However, several features made this site unusable for Holcim. First, there is an active natural gas pipeline, which crosses the approximate middle of the floodplain from west to east, continuing over the river on a 300-foot high suspension bridge. The pipeline would make construction of a harbor or other activity in the floodplain too dangerous, and there is not sufficient room to work around the pipeline right-of-way. Second, Tower Rock, which is a one-acre 90-foot high rock natural feature in the Mississippi River, is located only approximately 1,500 feet south of the floodplain. Tower Rock creates navigational problems for barges on this

reach of the river. A harbor/fleeting operation would not be feasible at this location from a navigation safety standpoint. Third, there is no cement-quality limestone formation close to the river south of Wittenberg. The nearest formation is the Bailey limestone, approximately 4 miles inland. The Bailey limestone is very cherty, or high in silica. For these reasons, the area south of Wittenberg could not be used as a project site.

#### **Site North of Wittenberg, Missouri**

North of Wittenberg, just above Brazeau Creek, there is an area with a floodplain that was considered as a potential alternative site. However, due to land acquisition, transportation, navigation, and environmental problems, this site could not be used.

First, land for a quarry at this site was not considered reasonably available. The nearest suitable limestone formation for the manufacture of portland cement is the Plattin. However, the Plattin is not exposed on the surface until a point about two to three miles inland from the river (the Plattin does not extend to the base of the bluffs which run along the western side of the Wittenberg floodplain and, therefore, could not be quarried closer to the river). The land underlain by the Plattin formation is generally owned by numerous small landowners, which would make land acquisition difficult and maybe impossible.

Second, this site lacks access to adequate road transportation. The site is a considerable distance from any interstate or divided highway and is served only by a two-lane road.

Third, the USACE reviewed and concurs that a harbor/fleeting area at this point on the river would not be possible from a navigation and personnel safety standpoint. Just above the most likely area for a harbor is a large shoal or submerged island in the river, formed by the deposition of sediment as the river flows around the bend to the north. The shoal would constitute a serious navigation hazard. In addition, the deposition of sediment on the inside bend of the river would tend to silt up the harbor and the navigation lanes, requiring excessive continuous dredging. Further, additional barge operations from a harbor/fleeting area would interfere with navigation along this reach of the river, which is already congested and complicated by the Tower Rock obstruction to the south.

Finally, based on the review of submitted maps and Holcim's field observation, the USACE concurred that construction of a harbor/fleeting area and associated facilities on the floodplain at this site, and operation of a quarry (if the land could be acquired), would result in wetland and stream impacts similar to or greater than at Lee Island. In addition, there is a historic district on the floodplain for the original settlement, including monuments, cemeteries and ruins of churches and other buildings.

#### **Scott City, Missouri Site**

Holcim identified a potential alternative site on the Mississippi River south of Cape Girardeau and north of Scott City, Missouri (approximately River Mile 48.8). The site is in an area of several active quarry operations in the Plattin limestone formation, including a quarry owned by the Tower Rock Co. The existing quarries are located on the river. The area considered for an alternative site is just south of the existing quarries. However, several factors disqualified this site for Holcim's use. First, there was not enough remaining land to meet the purpose and need of a project the size of Lee Island. Second, the land was divided into small parcels so that it was not considered reasonably available for acquisition. Third, the plant/quarry site was impracticably located more than a mile from river access. Fourth, there was a major overland electrical transmission (power) line that crossed the site. Finally, based on submitted maps and

Holcim's field observation, the USACE determined that construction of a harbor/fleeting area and associated facilities on the floodplain at this site, and operation of a quarry (if there had been enough land and if it could have been acquired), would likely result in wetland and stream impacts similar to or greater than Lee Island.

#### **Utilize Holcim's Existing Clarksville, Missouri Site**

Holcim also considered whether its existing Clarksville, Missouri plant - which is the only Holcim plant presently located on the Mississippi River system (a requirement to meet the purpose and need of the proposed action) - could be used to fulfill project purposes. Because the Clarksville plant currently produces 1.3 MMT of cement per year, a 4.0 MMT per year capacity increase would require total production from Clarksville to expand to approximately 5.3 MMT per year.

In order for Clarksville to produce 5.3 MMT per year, Holcim considered several options: Upgrade the existing Clarksville plant to produce 5.3 MMT per year; keep the existing Clarksville plant as is and build a second, 4 MMT plant at the site; Replace the existing Clarksville plant with a new 5.3 MMT per year plant.

If expansion were feasible at the Clarksville plant, it would have the following advantages:

Holcim owns the raw materials (there is an existing quarry at the site); Holcim operates a harbor and barge loading operation (there is an existing harbor off the Mississippi River at the site); the workforce is trained and experienced; and the community, would likely support a new plant.

However, expanding the Clarksville plant was determined not to be possible for the following reasons: First, one of the basic purposes of this project is to provide year-round water transportation, which requires a location that is not subject to river closure. Clarksville is above (upstream of) the southernmost locks and dams on the Mississippi River. These locks and dams are subject to winter closure by weather and/or repairs. For example, Lock and Dam Number 24 (Clarksville) has been closed for three to four months during the past three consecutive years and is scheduled for an additional three to four month shut down at the end of 2003 through the beginning of 2004 to complete continued maintenance and rehabilitation activities.

Second, expansion of the plant to 5.3 MMT per year would require expansion of the harbor. The Clarksville harbor was designed to accommodate the shipping and receiving requirements of the existing 1.3 MMT plant. A 5.3 MMT plant would require more loading and unloading capacity, and consequently more harbor area. Expansion of the Clarksville harbor is not possible due to land acquisition and environmental constraints. Directly to the north of the existing harbor are wetlands owned by the Corps of Engineers and managed as a conservation area. The area directly to the south of the existing harbor also is wetlands and property of the Corps of Engineers. A state highway and the railroad line serving the plant limit the area to the west of the existing harbor. The area to the east of the existing harbor is the Mississippi River.

Third, due to design considerations, the existing Clarksville plant cannot be upgraded to produce the required 5.3 MMT per year. The existing plant was built in 1967 using "wet" process technology, which is not compatible with current (industry standard) "dry" process technology. Therefore, a retrofit of the existing plant to the required capacity is not economically or technically feasible. A new plant using "dry" process technology would have to be constructed at the site.

Fourth, any large new “dry” process plant constructed at Clarksville would have other problems and limitations. The raw material in Clarksville’s existing quarry has high hydrocarbon content. Addressing the manufacturing problems caused by the hydrocarbon content would require significant additional investment and increase operating costs, complicate operation of the kiln system, and create additional NOx emissions because of the need to incinerate the excess hydrocarbon emissions with additional fuel combustion.

Some of the raw material in Clarksville’s existing quarry has high alkali content. High alkali raw material would complicate the manufacturing process and create a solid waste. Currently, generally accepted specifications and buyer requirements in the U.S. for portland cement require low alkali portland cement. The proposed plant must have the capability of producing low alkali portland cement. Low alkali portland cement could not be produced in a “dry” process plant at Clarksville without either using an alkali bypass system or obtaining low alkali raw materials from another off-site location. An alkali bypass system would increase fuel usage, combustion emissions (NOx), and electrical energy consumption. An alkali bypass system would also generate cement kiln dust, a solid waste product. If low alkali raw materials were obtained from another location on the River, it would significantly increase costs (and make transportation riskier due to the locks and dams that may separate the plant from the off-site source). In addition to the basic cost of bringing the raw material to Clarksville, there would also be substantial “stripping” costs incurred at Clarksville. “Stripping” costs are the costs that would be associated with mining and then disposing of the existing high alkali raw materials in the Clarksville quarry that overlay the useable limestone.

Fifth, for operational and managerial reasons, a large cement plant would have to use a single-line kiln design, but such a design has not been proven technically feasible for a 5.3 MMT per year plant. At present, 4 MMT per year is at the limit of the feasible size for existing single-line kiln design technology. Therefore, attempting to use such a design for a 5.3 MMT per year plant would be an unacceptable business risk.

Finally, concentrating all of Holcim’s River market capacity in one location would result in increased business risk. Historically, having only the Clarksville plant on the Mississippi River system has negatively impacted Holcim’s ability to consistently supply markets. Cement plants can encounter operational problems, sometimes unexpectedly. By operating two cement plants on the Mississippi River, Holcim would be better able to manage any equipment downtime and minimize the impact to customers. For all of these reasons, Holcim provided sufficient evidence that the Clarksville site could not be used to fulfill the project purposes and needs, particularly when compared to the Lee Island site.

### **Expand Other Holcim Plants**

Holcim considered whether the project purposes could be met by increasing capacity and production at one or more of their existing U.S. plants. Holcim has cement plants in the United States at the locations shown on Figure 2-4 of Holcim’s Supplemental Alternatives Analyses. Based on their geographic location in or near the River market geographic area, the following plants were considered for expansion: Mason City, Iowa; Artesia, Mississippi; Dundee, Michigan; and Theodore, Alabama.

The USACE does not consider the Mason City, Iowa plant as a potential expansion candidate because of its landlocked status and limited limestone reserves. The only modes of transportation available from central Iowa are truck and rail. Both modes of moving cement from plant-to-market are significantly more expensive than river-borne transport. Furthermore, Mason City's limestone reserves do not meet the 100+ year quarry life requirement for this project.

Similarly, the Artesia, Mississippi plant is not a potential expansion candidate. Like Mason City, it does not have the required access to the Mississippi River system, and has inadequate limestone reserves. While a navigable channel exists in the general vicinity of the Artesia Plant (within 10 miles), there is no way to economically access that waterway. The double handling costs that would be required to transport product to the navigable channel would make this option uneconomical. In addition, Artesia's limestone reserves do not meet the 100+ year quarry life requirement for this project.

Holcim's information regarding the Dundee, Michigan plant, located near the Detroit metropolitan area, sufficiently supports the fact that it is not a candidate for expansion. The Dundee plant is in some ways similar to the Artesia plant. The plant is near, but not actually on a navigable waterway. While Lake Erie and the Detroit River are in the general vicinity (within 15 miles), there is no economic way to access those waterways for shipping to the Mississippi River System markets. Also, Holcim's studies determined that Dundee's limestone reserves do not meet the 100+ year quarry life requirement for this project. In addition, the raw material in Dundee's existing quarry has high hydrocarbon content. With a "dry" process plant, the hydrocarbon content would require significant additional investment and increase operating costs, complicate operation of the kiln system, and create additional NOx emissions from the need to incinerate the excess hydrocarbon emissions with additional fuel combustion. The alkali content of Dundee's raw materials is also too high for production of low alkali cement.

The Theodore, Alabama plant is located on a deep-water harbor in Mobile Bay. It is possible to ship cement from the Theodore Plant via barge to the Mississippi River system. However, Theodore is not a strategic location, and the cost of supplying Theodore product to all the cities in the River market, including the northern cities, would be significantly higher than is economically feasible. The Theodore plant already incurs high transportation costs because it receives its raw material via barge from its off-site Florida quarry. Additionally, Theodore's limestone reserves do not meet the 100+ year quarry life requirement for this project. In conclusion, for the reasons stated above, Holcim provided sufficient and factual information to support the USACE determination that expanding other Holcim plants in or near the River market is not a viable or practicable alternative.

Based upon the above alternatives review, the USACE determined that only the Lee Island site met all of Holcim's project purposes and needs, including availability for purchase. As discussed, Holcim's competitors already own many of the viable sites along the river between St. Louis and Scott City, Missouri. The concentrated presence of other competitive cement plants/quarries in this portion of the Mississippi River further demonstrates the quality and quantity of limestone reserves and reliance of plant locations on this desirable stretch of river. The few potential sites that are not owned by competitors were reasonably disqualified by Holcim for one or more of the reasons previously discussed, including lack of size, lack of access to an adequate transportation infrastructure, navigation and safety hazards, lack of availability for acquisition, and/or environmental concerns. In particular, the USACE independent review of appropriate maps and field observations determined that alternative sites, where quarry and

harbor/fleeting areas were possible, would result in wetland and/or stream impacts similar to and likely greater than the proposed Lee Island site. In summary, the USACE knowledge and expertise in this region independently confirms that the proposed Lee Island site is the only alternative area to practicably meet the purposes and needs of this geographically required project. The USACE determined Holcim's alternative site evaluation was sufficient to warrant no further consideration of additional alternative sites.

C. Physical/chemical characteristics and anticipated changes (check applicable blocks and provide concise description of impacts): For the purposes of evaluating direct and indirect impacts and designing mitigation measures to compensate for those impacts, the discussion of physical/chemical characteristics and anticipated changes include analyses with the following actions/features in mind: In-River Fleeting, Harbor, Limestone Quarry, Associated Fill and Storage Areas.

(x) substrate: Fleeting would occur within two separate areas along the right descending bank, with a total of 83 barges divided in two areas situated just above and below the mouth of the proposed inland harbor. Based upon depth soundings in the proposed fleeting areas, Holcim states no dredging activities would be required to initiate fleeting. However, unpredictable river stages and changing river/substrate conditions are likely to occur over the anticipated 100+ year project life. Therefore, it is necessary to preliminarily address the factors that may result from potential in-river dredging needs. According to our review of the 1998 USACE Hydrographic Survey Maps, the most likely candidate area for future dredging is located in the area of the proposed upper fleet. Historical data shows a reoccurring bar to periodically form near the right descending bank of the Mississippi River at approximate Upper Mississippi River (UMR) Mile 138.9 to 139.1. The formation of this bar is most likely influenced by bed load carried into the Mississippi River from Isle du Bois Creek and periodic Mississippi River flood events. The confluence of Isle du Bois Creek and the Mississippi River is located just upstream, along the right descending bank, at approximate UMR mile 139.4. It is unlikely that the maintained dikes along the left (Illinois) descending bank are directly influencing this periodic formation. In general, the deeper flow channel of the Mississippi River is found along the right descending bank in this river reach. As such, the bar's formation frequently changes due to Isle du Bois Creek's introduced deposition pattern and the Mississippi River's natural tendency to erode the formation away during periodic high flow events. Pallid sturgeon in the area could potentially utilize this isolated bar formation as a temporary habitat feature, but are more likely to be found along the opposite bankline where dikes and sand bars offer greater microhabitat, eddies and sand bars (known fisheries surveying efforts conducted by local universities and state resource agencies, have not found the pallid sturgeon present within the project limit's right descending bank). Historical data shows the candidate dredging formation to nearly disappear after high water events. Unknown dredging requirements to remove this formation would likely result in minimal impact to the river or aquatic life as the Mississippi River is already keeping this formation in a constant state of change. However, Holcim would be required to apply for a Department of the Army permit if dredging is determined necessary. Conducting fleeting activities in this area is not anticipated to affect the river's impact on the bar.

Holcim also requests authorization to construct an inland harbor facility. Construction of the harbor would require the excavation of earth materials using a combination of excavation and dredging methods. Material excavated above the subsurface water table would invoke impacts to approximately 13.9 acres of wetland's substrate. These substrate impacts would occur when land-based earth moving equipment begins initial excavation of the harbor area. Excavated

wetland substrate materials would be relocated to the north branch of Old Quarry Hollow. It is anticipated and preferred that excavation of the harbor take place during the late fall and winter months, as this time period corresponds to low river levels, which would maximize the dry excavation of the harbor. Approximately 12.1 acres of the 13.9 acres of the existing wetland substrate currently experiences impacts on a reoccurring basis during routine agricultural tillage practices. The remaining 1.8 acres of jurisdictional wetland substrate, which would be directly impacted/removed by the proposed harbor excavation activities, exist as low quality successional wooded wetlands in an adjacent agricultural drainage ditch. Regardless, the diminished substrate characteristics of the frequently disturbed wetlands still provide limited environmental benefits. The substrate of these jurisdictional wetlands would be converted following harbor excavation to function as open water aquatic substrates. While the excavation activities would convert the functions of the existing wetland substrate, compensatory mitigation for unavoidable impacts is further discussed under the wetland evaluation of this EA.

Harbor excavation below the water table would be accomplished primarily by use of hydraulic dredging equipment. While dredging activities occur, the barrier between the Mississippi River and the harbor excavation area would remain intact to hinder turbidity. Dredged material, having an anticipated composition of approximately 80 percent water and 20 percent solid material, would be pumped (via pipeline) in a slurry form to the south branch of Old Quarry Hollow where it would be deposited behind a dam that would be permitted and constructed according to MDNR Dam Safety Program specifications. Sediment and erosion control measures including sedimentation basins would be in place prior to dry-material deposition in the north branch of Old Quarry Hollow and prior to dam construction on the south branch of Old Quarry Hollow. Once the slurry is deposited in the south branch of Old Quarry Hollow, the solids would settle out and the clear (decant) water would be gravity-fed back to the harbor excavation area. This system is a closed loop system, and the activity would continue until the design limits for the quarry harbor footprint have been established within the confines of the earthen protective barrier strip. The indirect/secondary effects associated with this action involve the construction of the earthen dam on the substrate found in non-jurisdictional headwater drainage ways supplying Old Quarry Hollow. The effect would be the loss of nutrients and sporadic flows supplied by this non-jurisdictional headwater. Periodic headwater flows generated during harbor creation activities would intermix with the dredged slurry materials. The amount of flows generated by the non-jurisdictional headwaters would be minor and subsequently intermix with waters in the closed-loop harbor excavation process. Prior to the harbor barrier's removal, a sediment curtain would be put in place and the recycle line would be disengaged, causing dredged slurry to flow in only one direction, to the dam impoundment. The excavation by dredging of the earthen barrier strip would finalize the harbor excavation.

Excavation of the harbor would also be accomplished to minimize the possibility of direct nutrient or sediment impacts to adjacent wetlands and their substrate. A vegetated buffer area would be established between the harbor construction and southern Lee Island wetland mitigation area prior to or concurrent with excavation. Any storm water that comes into contact with exposed harbor excavation areas would drain toward the excavation. In addition, Best Management Practices including the use of erosion and sedimentation controls would be put in place to avoid potential indirect impacts to the Mississippi River and adjacent wetland substrate due to sedimentation. A minor area of the Mississippi River's substrate would not be impacted until the last remaining barrier blocking the harbor's connection is removed. Substrate along the

riverward barrier has been limited by past placement of large stone for erosion control. Once the river barrier is excavated, additional substrate would be created by the hydrological connection of the Mississippi River's flows supplying the created inland harbor.

A minimal amount of substrate disturbance could also potentially occur during excessive low water periods when the churning actions of towboat propellers move in and out of the fleeting and inland harbor area. This situation is not likely to occur as the deeper portion of the Mississippi River's channel is located adjacent to the project area.

Holcim recognizes the probable need for future maintenance dredging of 10,000 to 65,000 cubic yards, per year, of accumulated sediments from the proposed harbor entrance and harbor bottom (substrate) to maintain sufficient clearance for barges and operations. All maintenance dredging activities would be accomplished with hydraulic dredging equipment to minimize the amount of sediment stirring. The dredged material would be pumped to an approved upland non-jurisdictional disposal location (or other future environmentally preferable location). It is anticipated that the decanted water would be recycled back to the dredging operation in a closed loop process. If decanted water needs to be discharged, it would be regulated under appropriate permits and would meet state and federal standards. The sediment/solids (clay-silt-sand) generated in this process would be placed in the designated upland non-jurisdictional disposal areas. Dredged material would not be placed in the Mississippi River or Isle du Bois Creek. Use of hydraulic dredging would control the release of sediments such that any release of dredged sediments would be minimal and would not result in any significant degradation of water quality. Holcim is aware that any future maintenance dredging would require notification and permit review from the USACE and MDNR. Under current regulations, periodic maintenance dredging within existing basins is authorized under Department of the Army Nationwide Permit Number 35. The applicability of this particular nationwide permit would require evaluation by the USACE and MDNR each time dredging of the harbor is requested. If a Department of the Army permit is issued, it would be conditioned to require notification of any required maintenance dredging activities.

Several fill and storage areas would be established within the quarry limits to contain fill material resulting from construction of the harbor and cement plant, and operation of the quarry. A fill containment area at the Old Quarry Hollow would be constructed to accommodate material excavated during construction of the harbor. No fill material would be placed within jurisdictional land features of Old Quarry Hollow. The associated dam and subsequent fill materials would be located upstream of this area's jurisdictional limits. A 106-acre fill area, primarily in non-jurisdictional areas, in Raddy Hollow would also be developed to accommodate overburden and unusable rock generated during construction of the cement plant and operation of the quarry. A small portion of the overall fill material would be placed on approximately 300 linear feet of Raddy Hollow's intermittent stream and associated substrate. This same section of impacted substrate is also included within the proposed quarry limits. As such, initial impacts caused by placement of fill material would deduct future quarry impacts at this location. Sedimentation basins and BMP's, such as seeding, would be incorporated into the design of the storage areas and each of the fill areas. The basins would capture storm water runoff from upstream exposed material areas and also from any upstream-undisturbed areas that may drain over the exposed material. The basins would be designed to manage runoff from a 100-year 24-hour storm event.

Substrates found within the 3.2 miles of jurisdictional tributaries are primarily composed of loose stone and bedrock material. Phased quarry blasting and excavation would remove each of the tributary's substrate for use in cement production. The impacted tributaries would be returned at an approximate 1:1 mitigation ratio following land reclamation and associated tributary mitigation activities. Phased mitigation activities should sequentially return temporarily lost substrate values. Overburden (unusable stone and other earthen materials) generated by phased quarry operations would be stockpiled for later use in reclamation and stream mitigation activities. Land reclamation would begin after approximately 8 to 10 years of quarry operations. Objectives of Holcim's Long Term Land Reclamation Strategy would be to reconstruct the existing rugged upland topography, at a lower elevation, and replace the jurisdictional intermittent stream systems, to the extent practical, using fluvial geomorphology and state-of-the-art methods and practices. Reclaimed areas would be seeded and planted with native vegetation species that would re-establish the forest and provide a range of wildlife habitats. Small ponds would be created to provide additional upland aquatic habitat. Holcim has proposed to construct one pond for every 50 acres of reclaimed area. A lake with vegetated fringes would cover approximately the eastern one-third of the quarry. Impacted substrate areas found in jurisdictional and non-jurisdictional intermittent streams should be mitigated by these phased reclamation actions, as well as specific stream mitigation actions.

(x) currents, circulation or drainage patterns: The Mississippi River is constantly undergoing a natural process of maintaining a deep water channel within the project area's right descending bank. This natural occurrence has been further promoted by the installation of several dikes along the left (Illinois) descending bank. Dike structures were installed in this typically shallow water area where depleted flows prompt suspended sediment loads to settle out, and in effect, cause a deflection for quicker moving currents to continue flows on the opposite bankline. The proposed fleeting and localized towboat activities would occur in relatively deeper water where the presence of the vessels is not anticipated to impede flows or water conveyance. In addition, no alterations to these evaluated factors are expected to result by the excavation of the inland harbor area. Water levels in the harbor should immediately correspond to Mississippi River elevation changes.

While no direct impacts to the Mississippi River's currents, circulation and drainage patterns are expected, Holcim's general usage of the river would be mitigated by a proposal to reconnect drainage patterns of the relict Lee Island slough with the Mississippi River. The mouth and scattered portions of this slough have silted in. Consequently, flow and drainage patterns typically occur only during and immediately following periodic Mississippi River high water events and heavy/localized precipitation. Holcim's proposed excavation of the silt deposits would re-introduce natural currents and create additional aquatic habitat.

Required blasting and excavations would disrupt drainage patterns within the quarry area's 3.2 miles of jurisdictional tributaries. General flows through the tributaries are seasonal, most exhibiting characteristics of an ephemeral tributary, rather than intermittent. As such, flows may not even be present during drier periods. Initial blasting of each newly quarried area would cause flows to travel down the declining draws through the blasted rock material. As blasting and excavation of varying formations continue in the same quarry area, the elevations would continue to decrease in a stair step pattern. Any flows present would trickle from one level to the next until reaching the downstream attenuation basins.

As previously mentioned, the quarry's generated blasting activities would break the tributary's bedrock and stone material into smaller pieces where flows would reroute until reaching a centrally located sedimentation basin at the base of Raddy Hollow. Jurisdictional tributaries currently flowing outside of the Raddy Hollow drainage area would have their flows temporarily collected in other attenuation basins until they are pumped to the Raddy Hollow sedimentation basin. For further clarification, Section 3.1.1 of Holcim's EA described quarry actions as follows, "Quarrying activities would occur on two faces (west and east faces) to obtain the correct mixture for cement manufacture. The west quarry initially would be approximately 1,000 feet in width, starting at the western valley wall of Raddy Hollow, and the face would advance to the southwest. The east quarry face (approximately 800 feet in length) would start on the eastern valley wall of Raddy Hollow and progress to the east, toward the bluffs along the Mississippi River. The east quarry would proceed along the bluffs to a point near Old Quarry Hollow (Hollows D and E). At approximately 30 to 40 years, the east quarry would then turn to the northwest in order to connect with the south flank of the west quarry. A sedimentation basin would also be constructed at the base of Raddy Hollow to collect, detain, and treat all storm water from the quarry."

The collected flows would periodically remain in the sedimentation basin until particulate materials fall from suspension. The sedimentation basin would be subject to a storm water discharge (National Pollutant Discharge Elimination System (NPDES)) permit and designed with Best Management Practices (BMPs). Basins would be large enough to manage discharges up to a 100-year, 24-hour event. The basins would effectively moderate peak runoff and detain/remove sediment. These basins would also include a sediment sump, vegetated fringes, and other features to improve water quality prior to its release to Isle du Bois Creek.

Referencing Holcim's EA, Section 5.1.1.2, a range of analyses was conducted to determine the potential impact on hydrology and water quality within the site's varying watersheds. Modeling tools used to perform the analysis of impacts to surface water quantity (i.e., storm water runoff) and quality included: Hydrologic Engineering Center (HEC)-2 – used to estimate one-dimensional Mississippi River water surface elevations and frequencies; Hydrologic Engineering Center-River Analysis System (HEC-RAS) – used to estimate flood and normal Mississippi River and Isle du Bois Creek levels, erosion and sediment transport potential, and evaluate the backwater influence of the Mississippi River on Isle du Bois Creek; Hydrologic Engineering Center-Hydrologic Modeling System (HEC-HMS) – used to estimate storm water runoff volumes and flow rates for Isle du Bois Creek and select sub-watersheds; and Hydrologic Simulation Program-Fortran (HSPF) – used to model annual surface water runoff volume and nutrient and sediment production from the proposed quarry and cement plant sub-watersheds. This analysis included an evaluation of the extensive information available concerning the site's soils, topography, geology, hydrology, land cover types, and surface water modeling and has been presented in detail in the Water Resources and Hydrology Report (STS et al., 2002).

Surface water resources would be impacted at different times over the course of the life of the quarry, with some areas being impacted within the first 10 years and other areas not being impacted for several or many decades. After the first 8 to 10 years, some of these resources would begin to undergo reclamation, while the advancing quarry is impacting other areas. The total direct impact and the approximate sequence of impacts to jurisdictional intermittent streams are presented in the table below (taken from Holcim's EA, Table 5-2). In total, approximately 3.2 miles of jurisdictional intermittent streams and 13 springs/seeps would be impacted within the "100+ years" quarry boundary.

Table 5-2. Approximate Quarry Impacts to Jurisdictional Intermittent Streams

Year	Impacts to Intermittent Streams by Time Interval (feet)	Cumulative Impacts to Intermittent Streams for Time Intervals (feet)
0-5†	5,100	5,100
5-10	960	6,060
10-20	1,110	7,170
20-30	580	7,750
30-40	1,030	8,780
40-50	0	8,780
50-60	290	9,070
60-70	700	9,770
70-80	1,010	10,780
80-90	1,530	12,310
90-100	2,390	14,700
100+	2,270	16,970 (3.2 miles)

† Includes approximately 300 feet of intermittent stream that would be impacted by overburden storage.

The analysis of direct impacts of the project was presented in detail in the Water Resources and Hydrology Report (STS et al., 2002). This analysis focused on the changes in the volumes and flow rates of annual surface water and storm water runoff (due to the effects of land clearing and site development), and resultant changes to the following water quality indicator parameters: total sediment, total phosphorus, and total nitrogen. Detailed analyses of impacts including water quality and storm water modeling were completed for the Raddy Hollow and cement plant sub-watersheds.

The Raddy Hollow and cement plant sub-watersheds were modeled in a conservative fashion in order to provide a “worst case” assessment of potential impacts. For example, all existing vegetated and forested surfaces within these sub-watersheds that would experience disturbance during the first 10 years of development were assumed to be completely cleared of vegetation. This assumption (“bare earth scenario”) exaggerates the estimated impacts, and provides a conservative method of evaluating the relative influence of development activities on the water quality and hydrology of Isle du Bois Creek.

As presented in the Water Resources and Hydrology Report (STS et al., 2002), at Year 10, the maximum impact scenario, the project would have impacted only 2.9 percent (approximately 425 acres) of the total 14,859-acre watershed of the Isle du Bois Creek.

Because of the mitigating effects of the sedimentation basins, the assessment of indirect impacts focuses on the water quantity and quality of receiving waters, as discussed below.

Tables 5-3 and 5-4 summarize the water quality and hydrology impacts at Year 10 (after sedimentation basin control) to Isle du Bois Creek resulting from the cement plant, limestone quarry, associated fill and storage areas, and access road.

As shown in Table 5-3, the potential indirect impacts to Isle du Bois Creek from the proposed condition at Year 10 (including sedimentation basin controls) are an estimated 7.0 percent increase in annual surface water runoff volume but a 3.7 percent decrease in annual sediment in

runoff. Despite the development within the watershed, nutrient loading to Isle du Bois Creek is expected to be comparable to existing levels with increases of 0.5 percent or less of total nitrogen and phosphorus when compared to baseline conditions.

Table 5-3. Summary of Potential Indirect Impacts to Annual Surface Water Runoff and Water Quality of Isle du Bois Creek (IDBC)<sup>1</sup>

Runoff Parameter	Impacts to Isle du Bois Creek		
	IDBC Existing Condition	Proposed Change	Change (%)
Annual Surface Water Runoff Volume (acre-feet)	14,725	+1,023 <sup>2</sup>	+7.0
Annual Sediment (tons)	5,750	-215 <sup>3</sup>	-3.7
Annual Total Nitrogen (pounds) <sup>4</sup>	22,500	+101 <sup>5</sup>	+0.5
Annual Total Phosphorus (pounds) <sup>4</sup>	9,200	+16 <sup>6</sup>	+0.2

<sup>1</sup> Raddy Hollow fill area, topsoil storage area, and access road data inferred from Raddy Hollow analysis.

<sup>2</sup> Total of cement plant (+34 acre-feet), Raddy Hollow cement plant and quarry (+499 acre-feet), Raddy Hollow Fill Area (+280 acre-feet), topsoil storage area (+35 acre-feet), and access road (+178 acre-feet).

<sup>3</sup> Total of cement plant (-53 tons), Raddy Hollow cement plant and quarry (-107 tons), Raddy Hollow Fill Area (-60 tons), topsoil storage area (-10 tons), and access road (+15 tons).

<sup>4</sup> Assumes zero BMP effectiveness.

<sup>5</sup> Total of cement plant (-32 lbs.), Raddy Hollow cement plant and quarry (+63 lbs.), Raddy Hollow Fill Area (+40 lbs.), topsoil storage area (+5 lbs.), and access road (+25 lbs.).

<sup>6</sup> Total of cement plant (-3 lbs.), Raddy Hollow cement plant and quarry (+8 lbs.), Raddy Hollow Fill Area (+5 lbs.), topsoil storage area (+1 lbs.), and access road (+5 lbs.).

Source: STS et al., 2002.

Table 5-4. Summary of Potential Indirect Impacts on Storm water Hydrology of Isle du Bois Creek (IDBC)<sup>1</sup>

Storm Event Runoff Parameter (100-Year)	Impacts to Isle du Bois Creek		
	IDBC Existing Condition	Proposed Change	Change (%)
Peak Flow Rate (cfs)	17,929	-2,193 <sup>2</sup>	-12.2
Volume (acre-feet)	4,477	+64 <sup>3</sup>	+1.4

<sup>1</sup> Raddy Hollow fill area, topsoil storage area, and access road data inferred from Raddy Hollow analysis.

<sup>2</sup> Total of cement plant (-599 cfs), Raddy Hollow cement plant and quarry (-938 cfs), Raddy Hollow Fill Area (-660 cfs), topsoil storage area (-80 cfs), and access road (+84 cfs).

<sup>3</sup> Total of cement plant (+7 acre-feet), Raddy Hollow cement plant and quarry (+29 acre-feet), Raddy Hollow Fill Area (+16 acre-feet), topsoil storage area (+2 acre-feet), and access road (+10 acre-feet).

Source: STS et al., 2002.

As shown in Table 5-4, the peak 100-year storm runoff volume would increase by approximately 1.4 percent, but peak storm flow rates for this event would be reduced by an estimated 12.2 percent when compared to the existing baseline Isle du Bois Creek condition.

Based on the results summarized in Tables 5-3 and 5-4, the combined changes in storm water, sediment, and nutrients in runoff during individual storm events, and on an annual basis as well, are insignificant compared to baseline conditions. Additionally, the development within the Isle du Bois Creek watershed would have no significant impact to Isle du Bois Creek water quality and hydrology because it would effect a relatively small percentage of the watershed of Isle du Bois Creek, and the hydrology and water quality of the lower section of the Isle du Bois Creek is significantly influenced by backwater flooding from the Mississippi River.

Flow disruptions in the intermittent tributaries would temporarily occur during each phase of quarry operations. However, Holcim would initiate phased compensatory reclamation/stream mitigation activities after the first 8 to 10 years of initial quarry operations. This mitigative action would ultimately restore intermittent flow patterns within the 3.2 miles of recreated stream channels. If a Department of the Army permit is issued, it would be conditioned to require compensatory mitigation to replace intermittent stream flows and reconnection of the Lee Island slough, similar to the MDNR Water Pollution Control Program issued water quality certification with conditions. Holcim's required mitigation would return drainage patterns that mimic those occurring in a lower gradient stream channel, to the extent practical.

(x) suspended particulate; turbidity: Proposed project actions occurring in or associated with the Mississippi River are not expected to have a significant effect on suspended particulate materials or turbidity. The river already carries a heavy load of suspended materials but the deeper channel and faster current found in the project area hinders suspended particulate material from settling. The majority of suspended particulates held in the rivers current should continue to flow past the project area until they reach a slack water area where deposition is more probable. Future maintenance dredging of the inland harbor would temporarily increase suspended particulates and turbidity in the immediate vicinity of the inland harbor, but would be

negligible shortly after brief dredging actions are complete. Future inland harbor dredging materials would be disposed in an approved upland non-jurisdictional disposal location (or other environmentally preferable location).

Quarry blasting and excavation actions within the jurisdictional tributaries would create particulate material and increase turbidity levels - when flows are present. The majority of particulate material and turbidity from the active quarry should be captured within the crevices of downstream blasted stone material. Intermittent flows associated with the tributaries are typically low energy trickles. As such, the majority of captured materials should remain settled within the blasted rock material until they are removed from the quarry area and delivered to the stone crushing station. Increased turbidity and particulate material levels could still potentially occur with localized/heavy rains. Additional measures (i.e.: the installation of attenuation basins, BMP's or siltation fencing) to protect downstream water bodies should receive thorough review and be the subject of mandated conditions under the appropriate lead agencies scope of authority. These agencies and permits include the MDNR Land Reclamation Program's Land Disturbance Permit and the MDNR Water Pollution Control Program's Section 401 Water Quality Certification. As part of mitigation, Holcim intends to construct a strategically located sedimentation basin in Raddy Hollow to capture flows generated during phased quarry operations. If a Department of the Army permit is issued, it would be conditioned to require Holcim to obtain all necessary state and Federal permits prior to commencement of project related activities in jurisdictional areas. As an added measure, the permit would require the applicant to install all necessary siltation/turbidity control devices to capture sediment and particulate materials before they enter and possibly degrade receiving waterways. As the previous section shows, the planned Raddy Hollow and cement plant sedimentation basins would ensure particulates do not cause significant indirect impacts to Isle du Bois Creek, or in turn, the Mississippi River.

Proposed wetland mitigation activities within the Isle du Bois Creek corridor would return a contiguous riparian corridor in areas that have more recently been under agricultural production. Agricultural activities have been conducted near or directly adjacent to the high bank of Isle du Bois Creek, resulting in increased runoff, siltation and turbidity. Reforestation of this portion of the channel should greatly reduce the amount of chemicals and particulate materials entering the watershed for additional purification. In addition, the establishment of the root system of trees and other vegetation would better serve to bind the soil and roots of the bankline for an overall reduction of stream bank erosion and sedimentation.

(x) water quality (temperatures, salinity patterns and other parameters): Water quality issues were partially discussed in the *currents, circulation or drainage patterns* review section above and are further addressed here.

The USACE determined that the proposed action's effect on Mississippi River water quality would be minimal as no direct discharge of fill materials is anticipated. A possible secondary effect to riverine water quality relates to the fleeting area's potential reduction in water temperatures. The barges may slightly decrease temperatures caused by their shading effect. However, the barges are not expected to remain in a constant position for extended periods. During the excavation of the inland harbor, *de minimis* fallback may result as the bankline is breached to connect the river with the excavated harbor. The *de minimis* fall back may temporarily alter water quality in terms of turbidity. These effects would rapidly diminish as river currents mix their sediment loads with the disturbed waters. The Mississippi River

would supply water to the inland harbor after excavation activities are complete. Waters within the excavated harbor should maintain similar chemical composition as found in the supplying river water. During operations, there is the possibility that harbor activities may also result in incidental releases of oil and grease due to towboat operations and minor emissions associated with barge loading/off-loading actions. However, given the high frequency of towboat operation on the Mississippi River, the minor amount of these potential releases, and spill prevention and reporting requirements, this potential impact is not considered to be significant. A minimal amount of substrate disturbance could also potentially occur during excessive low water periods when the churning actions of towboat propellers move in and out of the fleeting and inland harbor area. Any such substrate disturbance is not expected to result in a significant change in water quality as the Mississippi River is a highly turbid environment with frequent towboat activity. Substrate disturbance is not likely to occur during normal river stage, as the channel of the Mississippi River is deeper along the length of Lee Island (right descending bank). Permanent harbor perimeter erosion control measures would include riprap construction on harbor slopes and the establishment of vegetated buffer areas. These features would be in place prior to initiating the river connection. After excavation of the harbor, small portions of the remaining land surface located adjacent to the harbor would drain to the harbor instead of the existing wetlands. All disturbed areas would be managed with BMPs to offset potential water quality impacts. For example, strips of deep-rooted vegetation would be established adjacent to the stone riprap slopes of the harbor perimeter. Drainage swales would be grass-lined, and access roads would be constructed primarily of gravel.

Excavation of the harbor would also be accomplished to minimize the possibility of direct nutrient or sediment impacts to adjacent wetlands. A vegetated buffer area would be established between the harbor construction and southern Lee Island wetland mitigation area prior to or concurrent with excavation. Any storm water that comes into contact with exposed harbor excavation areas would drain toward the excavation. In addition, BMPs including the use of erosion and sedimentation controls would be put in place to avoid potential indirect impacts to the Mississippi River and adjacent wetlands due to sedimentation.

Water quality in the intermittent tributaries would experience temporary impacts after each phase of quarry preparation is complete. Preparation involves the removal of vegetation and topsoil in advance of opening a new quarry face for blasting and excavation. As a result, the tributaries' riparian corridor would be removed, causing subsequent exposure of the waterways. Short term water temperature increases would increase during warmer months due to the loss of provided shading habitat. Major alterations caused by temperature increases should not be extreme due to the minimal flows generated by the intermittent nature of the site's streams. Water quality, in terms of nutrient and chemical composition, would experience alterations caused by the loss of mineral and detrital input. In addition, the quarry's associated blasting activities would temporarily expose chemical variants found in exposed rock formations. Periodic rain and upstream (headwater) flows passing through the blasted rock would likely undergo changes induced by natural chemical bonding properties. The minimal flows typically generated in the intermittent streams are unlikely to cause substantial water quality alterations. The phased quarry units would only remain open for limited durations, after which time reclamation and mitigation activities would return rugged terrain with intermixed tributaries and a revegetated landscape. Time would be required for each reclaimed area and tributary to reach a physical, chemical, biological and geological balance. The functions of the previous landscape and watershed, while not identical to the previous condition, should gradually return with each reclamation and stream mitigation phase.

The total area of the site that would be disturbed by Year 10 of Holcim's development/operation (the maximum impact scenario) is estimated to account for 581 acres of the Mississippi River's watershed, which the USACE determined an insignificant portion of the total watershed area of the Mississippi River. Potential impacts to the Isle du Bois Creek watershed could theoretically have a localized effect on the Mississippi River. However, the USACE determined that the project would not adversely impact the water quality or hydrology of Isle du Bois Creek, due to the USACE's requirement that Holcim apply avoidance and minimization measures, which resulted in no direct project actions or impacts in Isle du Bois Creek. The USACE also considered the fact that the installation of attenuation/sedimentation basins, the requirement of BMP's and other applicable MDNR stormwater control permits, would result in no adverse water quality or hydrology impacts to Isle du Bois or the Mississippi River. Additionally, because the Mississippi River is a large turbid river, any minor addition of suspended solids as a result of the project would not represent a significant impact on water quality.

The project would also result in the creation of an approximate 500-acre lake as part of reclamation process (See additional discussion in Section 3.1.1 of Holcim's EA). The water source for the lake would consist of precipitation run-off and some groundwater. Post-reclamation run-off entering the lake would result from drainage over the undisturbed buffer area and over reclaimed, stabilized, and revegetated land. Given proper land reclamation construction and management, this run-off is expected to meet state water quality standards, as confirmed by the MDNR Water Quality Certification. No development, including that associated with the cement plant, would drain into the lake. The lake should provide varying aquatic habitats, a potential vegetated fringe and support localized water quality management.

Based on hydrogeological testing results performed by Holcim, the bedrock (Plattin Limestone) in the area of the proposed quarry and the bluffs was determined to be hard and dense, with few permeable features. Additionally, the rock underlying the quarry excavation area (i.e., the Joachim Dolomite) has generally low permeability and does not transmit groundwater rapidly. Any groundwater that is slowly contributed to the lake would be equal in quality to the naturally occurring water in the Plattin Limestone. The water is considered to be fit for human consumption and therefore of good quality. Because the water in the lake from run-off and groundwater would be of good quality, lake water should not cause any degradation of groundwater quality.

Potential impacts to surface waters would also be mitigated as part of Holcim's Wetland and Stream Mitigation Plan, which provides for the replacement of 3.2 miles of jurisdictional intermittent streams on a 1:1 basis. The Wetland and Stream Mitigation Plan would be integrated into the Long Term Land Reclamation Strategy and would be implemented over the 100+ year life of the quarry.

Additional mitigation for impacts to surface water resources would include enhancement of the Isle du Bois Creek riparian corridor, as described in the Wetland and Stream Mitigation Plan. The restoration of farmed wetlands within the Isle du Bois Creek floodplain by re-establishing bottomland forest would have the added benefit of creating an expanded and continuous swath of bottomland riparian habitat along Isle du Bois Creek.

The creation of a lake and a variety of upland ponds would further compensate for impacts to surface water resources. The lake would provide ecological and wildlife opportunities by providing additional habitat for a variety of upland, bottomland, wetland, aquatic, and migratory

species. The lake would be designed in such a way as to contain shallow shoreline areas that would become submergent and emergent wetland areas. Because lake water quality is expected to meet Missouri water quality standards, any discharge of excess lake water would not adversely impact Isle du Bois Creek.

Finally, it should also be recognized that reclaimed land surfaces would be contoured, stabilized, and vegetated to reduce erosion from site runoff. Consequently, actual runoff characteristics are expected to be less than suggested by the maximum impact scenario that was used to model potential impacts.

The MDNR Water Pollution Control Program, the lead agency tasked to review a proposed action's effect on water quality, issued a Section 401 Water Quality Certification with conditions on 13 November 2002. The MDNR's water quality certification further supports the USACE's determination that the overall project, with properly executed mitigation and land reclamation activities, should not have significant impacts to the area's water quality. In reaching this conclusion, the USACE also reviewed the information that was provided from the administrative record for Holcim's water quality certification, which included the transcript of MDNR's 24 June 2002 public hearing and the various written comments submitted to MDNR during June-July 2002, as well as information provided from MDNR's 14-16 November 2001 hearing on the appeal of Holcim's original water quality certification.

(x) flood control/flood plain functions: The Mississippi River and Isle du Bois Creek are the primary hydrological sources triggering periodic flooding in the project area. The lower lying lands adjacent to the waterways provide over bank flood storage capacity. Over bank flooding events provide a natural method for waterways to capture minerals and nutrients from surrounding land and vegetation. Naturally vegetated floodway/plain areas provide the highest habitat and water recharge benefit. Floodway/plain areas on Holcim's property are primarily farmed and offer minimal vegetative habitat or recharge benefits. However, Holcim's property provides important floodway or flood plain values on lower lying lands along Lee Island, Isle du Bois Creek and near the mouths of Raddy, Old Quarry and Von Behren's Hollow.

Holcim evaluated all available Flood Insurance Rate Maps (FIRMs), Flood Boundary Floodway Maps (FBFMs), and Flood Hazard Boundary Maps (FHBMs) from the Federal Emergency Management Agency (FEMA) for the project area. Holcim utilized information from FIRMs, FBFMs, and FHBMs in conjunction with hydrologic modeling to quantify flood plain and floodway occurrence (STS et al., 2002). This analysis indicates that approximately 363 acres of Zone A (100-year) flood plain occur at the project site on the Mississippi River flood plain (Lee Island) and the Isle du Bois Creek flood plain. The 100-year flood elevation at the confluence of the Mississippi River and Isle du Bois Creek is 406 feet msl. Relatively small extensions of flood plain areas are also mapped within the lower extents of several hollows (Raddy Hollow, Old Quarry Hollow, Von Behren's Hollow).

Holcim would rely on direct usage of the Mississippi River to support the two proposed barge fleeting areas and for a hydrological source to support inland harbor functions. The river would be utilized to transport raw materials to the plant and cement products to river-based customers. Based on the knowledge the USACE has gained serving as the lead agency in reviewing other river related activities, we have determined that the construction and location of associated mooring cells would result in an insignificant displacement of the river's flood storage capacity. Development activities encroaching on the site's flood plain include loading/unloading

infrastructure on Lee Island, the cement plant sedimentation basin, fill activities associated with the rail spur and grading along the lowest reaches of Raddy, Old Quarry and Von Behren's Hollows. Hydrological data prepared and submitted under an officially certified Professional Engineer (PE) document depicts that these flood plain encroachments would impact approximately 85 acre-feet of flood storage capacity. However, the excavation of the inland harbor would create 342 acre-feet of flood storage capacity, resulting in a storage capacity gain. All other project features would be constructed above the 100-year base flood plain elevation.

In accordance with Executive Order (EO) 11988 (Flood plain Management) and 33 CFR 320.4(1), development in a flood plain should only be authorized when there are no practicable alternatives outside the flood plain. However, there are no practicable alternatives outside the flood plain for the proposed harbor, as the harbor is a necessary project component and is by its very nature, a feature that must be located in a flood plain area (see discussion of alternatives, Section 3.0 of Holcim's EA). Similarly, there are no practicable alternatives outside the flood plain for the cement plant sedimentation basin. The basin must be located well below the elevation of the cement plant area in order to collect runoff.

As demonstrated in Holcim's Flood Plain Development Permit Application submitted to Ste. Genevieve County on 12 November 2002, with subsequent addendum, the project meets the applicable flood ordinance criteria, including no significant impact to the base flood elevation or the 100-year floodway elevation of either Isle du Bois Creek or the Mississippi River. On 28 April 2003 Ste. Genevieve County issued Holcim's Flood Plain Development permit for the project.

EO 11988 also requires that federal agencies attempt to restore and preserve the natural and beneficial values of flood plains. In general, natural river flood plains are important resources with numerous natural and beneficial values. Important flood plain functions include the dissipation of floods, erosion control, sediment and nutrient retention, water quality enhancement, and fish and wildlife habitat. Natural flood plain ecosystems are areas that provide fish and wildlife species with a variety of resting, feeding, and nesting habitats.

Most of the site flood plain, including the portion of the Lee Island flood plain that would be taken by the proposed harbor, consists of active farm fields with limited functional values (e.g., wildlife habitat, erosion control/sediment retention). Of the approximately 47 acres of flood plain that would be taken, approximately 11 acres exist as tailings piles and 31 acres are areas that have been farmed for many years. In addition, Holcim's mitigation (see Sections 6.1 and 6.6 of Holcim's EA) would help compensate for any loss of flood plain value. The proposed southern Lee Island wetland mitigation area, for example, would improve the pollutant filtering function of the flood plain, reduce erosion, and provide enhanced habitat for fish, birds, and other wildlife.

The proposed project actions are not expected to have an adverse effect on local flood control or flood plain functions.

(x) storm, wave and erosion buffers: Riparian corridors, which naturally occur and create storm, wave and erosion buffers along waterways, were primarily removed from Lee Island and Isle du Bois Creek's floodway/plain (within the project boundary) decades ago to support logging, agriculture and past quarry operations. Large rip rap exists along the majority of the Mississippi River's bankline following along the river boundary of the project area. The

inland harbor's construction would require excavation of the river's bankline. This area would be protected by the placement of rock to buffer the area from potential scouring. Holcim proposes to replant trees to return the natural riparian corridor on the southern portion of Lee Island, an adjoining remnant channel and along previously disturbed sections of Isle du Bois Creek. Wetlands would also be created and restored in areas along the Mississippi River and Isle du Bois Creek. These mitigative actions would return the natural storm, wave and erosion buffers that historically occurred in the project area. The inland harbor would be protected with riprap and a vegetative buffer to negate potential impacts.

Excavation of quarry materials would ultimately impact 3.2 miles of jurisdictional streams, thus temporarily altering the site's intermittent storm flows and natural erosion patterns. The on-site tributaries are primarily narrow, low flow capacity waterways that typically carry water only during and shortly after precipitation events. The nominal amount of flow carried by the jurisdictional tributaries would likely percolate through voids created by phased quarry actions and ultimately reach the created attenuation basins before entering natural receiving water bodies. Impacts to the tributaries would occur sequentially in phased quarry operations. The previously quarried area would be reclaimed immediately following phased quarry operation by recreating rugged topography at a lesser gradient with new channel creation. The impacted tributaries would be recreated on-site at a 1:1 mitigative replacement ratio over the phased 100-year life of the project to return any temporarily lost storm and erosion buffers.

Excavating approximately 14 acres of jurisdictional wetlands to construct the inland harbor would alter storm, wave and erosion buffers. However, the wetlands in question have experienced extreme alteration by previous clearing and continued farming/ditching activities. After historic clearing took place to create open farmlands, the site's storm, wave and erosion buffering capabilities were dramatically diminished. The current proposal is to create the inland harbor and convert the remaining Lee Island flood plain, including farmed wetlands, back to its natural riparian wetland function of enhancing storm, wave and erosion buffering. Conversion of agricultural lands into an inland harbor with stabilized banks should reduce storm, wave and erosion problems.

On-site quarry, topsoil and harbor excavation storage/fill areas would be equipped with attenuation and sedimentation basins to capture generated flows with acceptable release rates. The basins should supplement existing storm, wave and erosion buffers.

(x) erosion and accretion patterns: The Mississippi River's bankline adjacent to the proposed fleeting areas has an existing protective rock blanket to deter erosion induced by concentrated near shore passage of barges and tow boats. Future rip rap replacement may be a necessary maintenance measure to prevent erosion. The additional barge traffic and concentrated fleeting is unlikely to alter accretion patterns. Swifter river currents are typically found near and adjacent to the deeper river channel; a natural force that typically hinders excessive accretion patterns. A reoccurring bar accretion periodically exists beneath the proposed upper fleeting area. The size and presence of this bar alters with changing flow patterns induced by weather and river stages. While not anticipated, extreme low water conditions may necessitate future dredging activities within the fleeting area, including the reduction of the accreted bar's dimensions. Future Department of the Army permits would be required to evaluate the removal of any accreted formations. Coordination amongst all appropriate agencies would occur, should maintenance dredging in the fleeting areas be required.

A protective rip rap blanket would be installed along the bankline of the excavated inland harbor to prevent erosion. A vegetative border would also be established where possible to further create erosion barriers. River borne sediments would fall out of suspension after entering the slack water area of the inland harbor. This continual pattern would eventually form impassible accretions. The specific amounts, frequency and duration of any required maintenance dredging within the excavated inland harbor is unknown at this time. Holcim realizes the likelihood of maintenance dredging within their harbor and plans to dispose of periodically dredged materials in an approved upland non-jurisdictional disposal site. Dredged materials would be dewatered for later use in the cement and/or reclamation process.

Charges would be set off in the uplands and beneath jurisdictional tributaries to blast rock material for later excavation and quarry operations. Periodic flows generated in the quarry area would be directed to detention areas designed to capture fugitive particles that could otherwise accelerate accretion patterns. Alteration to existing accretion patterns within each phased quarry location is not expected to cause adverse impacts (phased quarry operations would result in “pit-like” excavation areas where intermittent flows and accreted materials would be contained). Flow alterations are not expected to result in uncontrollable or significant increases in sediment, erosion or accretion in the intermittent tributaries or in Isle du Bois Creek.

Holcim’s Water Resources and Hydrology Report accurately demonstrated that the project would not cause significant increases in sediment to Isle du Bois Creek or the Mississippi River. The Missouri Department of Natural Resources is the ultimate permitting authority to review and grant land/stormwater disturbance permits. The review and issuance of the MDNR’s permits would ensure all appropriate measures (BMP’s) be installed to protect against project induced runoff and erosion. If a Department of the Army permit is issued, it would be conditioned to require erosion monitoring within the inland harbor, along Holcim's Mississippi River frontage and areas 200 linear feet upstream of all disturbed jurisdictional tributaries. The applicant would be responsible for any corrective measures deemed necessary.

(x) aquifer recharge and base flow: The fleeting and inland harbor operations would rely on base flows generated by the Mississippi River. Changing flow heights in the Mississippi River and Isle du Bois Creek have an effect on the surrounding area’s ground water table, which subsequently can cause alterations in the aquifer recharge rate beneath the site’s floodway and flood plain areas. Activities associated with the initiation of fleeting operations and the excavation of the harbor should not alter the river’s base flow or hinder recharge functions.

The majority of the remaining project area exhibits rugged upland topography. A very thin layer of soil covers the underlying layers of rock to be removed by the proposed quarry operations. Long duration saturation periods and percolation are severely limited by the physical composition of subsurface land features. Long duration flows within the site’s waterways are restricted by the presence of transecting bluff lines and correspondingly minimize surface area drainage. As a result, most of the tributaries in the proposed quarry area produce ephemeral to intermittent base flows. Blasting activities associated with phased quarry operations would impact and alter the tributaries’ periodic base flows. The tributaries’ base flow would ultimately reach a centrally located sedimentation basin in Raddy Hollow prior to their release in Isle du Bois Creek. Sequential reclamation activities, including on-site stream recreation actions, would occur after each quarry phase to negate long-term impacts to base flow and aquifer recharge.

As depicted in Holcim's EA (Section 5.1.2), the geology, hydrogeology, and soils of the site were extensively studied to evaluate the on-site mineral resources, the potential need for quarry dewatering, groundwater supply for the facility, and geotechnical engineering applications.

The bedrock formations at the site consist predominantly of limestone interbedded with thin (8- to 26-foot) shale beds (see Holcim's EA, Appendix B, Figure 3-1). The formations at the site that would be impacted by the proposed development (surface downward) consist of the following:

- Burlington Limestone (average thickness of 127 feet);
- Fern Glen Limestone (average thickness of 27 feet);
- Maquoketa Shale (average thickness of 26 feet);
- Kimmswick Limestone (average thickness of 40 feet);
- Decorah Shales (average thickness of 8 feet);
- Platin Limestone (average thickness of 210 feet); and
- Bloomsdale Limestone (average thickness of 16 feet).

The Platin Limestone is the principal quarrying unit at the site. The above formations are underlain by the Joachim Dolomite (approximately 200 feet thick), which in turn is underlain by the St. Peter Sandstone. The Joachim Dolomite would not be quarried, and would form the bottom of the quarry. The Joachim Dolomite is a regional barrier (i.e., aquitard) to groundwater movement and separates the quarrying units from the underlying St. Peter Sandstone, which is a useable aquifer.

### **Groundwater Resources**

The St. Peter Sandstone is considered part of the Ozark Aquifer system. Neither water yields nor the quarry would impact water quality within the St. Peter Sandstone and deeper formations because the Joachim Dolomite separates these formations from the quarry. The overlying formations to be quarried are not considered significant aquifers. The use of these formations by local well users and potential impacts due to the project development are presented in Section 7.1 of Holcim's EA. This analysis determined that there would not be significant effects on water supply wells of nearby property owners.

The bedrock formations to be quarried contain groundwater in the bedding planes, joints, solution conduits, and pores, which flow towards Isle du Bois Creek and/or eventually the Mississippi River. Based upon site-specific testing, the formations to be quarried have generally low permeability and do not transmit groundwater in large quantities. The information provided in Holcim's studies appears to accurately depict future groundwater patterns. The USACE determined that at most, when considering the overall watershed and other areas supplying groundwater flows to Isle du Bois Creek and the Mississippi River, the proposed Lee Island action would render an insignificant alteration to the receiving water bodies.

Holcim's comprehensive survey of the site resulted in the identification of several small springs and solution voids. The typical groundwater discharges observed at the springs/seeps ranged from 1 to 10 gallons per minute (gpm). Some of the larger springs/seeps were observed to have wet weather flows in the 50 to 100 gpm range. Typical dimensions of the solution voids were in the order of 1 to 3 feet in diameter and 5 to 10 feet in length. Two solution voids along the river bluffs had diameters in the 4- to 6-foot range and a length of 20 to 30 feet.

Given the nature of these karst features (springs/seeps and solution voids), the on-site aquifers are considered to have “immature” karst development. This condition indicates that the site bedrock has not developed large, integrated cave/spring systems that are more typical of karst areas of the Ozarks. In mature karst systems most of the surface water flows directly into the bedrock via sinkholes or losing streams.

In general, immature karst systems, similar to that of the project site, are characterized by upland surface water flow that is largely conveyed via ephemeral and intermittent stream systems, rather than the underlying bedrock. Subsurface water flow, however, may contribute locally to some of the larger on-site intermittent stream systems (e.g., Von Behren’s Hollow, North Hollow) as surface water appears to enter the alluvial deposits (silt, sand, gravel) and/or shallow bedrock and subsequently re-emerge downstream via gaining stream sections or small springs. Given these conditions, the potential project related impacts to groundwater quality and/or quantity are not expected to be as significant as such impacts would be in a mature karst system.

Minor variations in groundwater flow may occur on the project site but only in the immediate vicinity of the quarry, and the effect would be localized due to the relative impermeability of the rock formations. With regard to regional groundwater flow or gradient, the quarry is not anticipated to result in significant impacts due to the following conditions:

- The matrix of material to be quarried has generally low permeability and does not transmit groundwater in large quantities.
- Much of the material to be quarried is above the Mississippi River and Isle du Bois Creek floodplain groundwater tables.

Only when the quarry advances to the elevation below Isle du Bois Creek and the Mississippi River could local impacts to groundwater flow direction and gradient occur. Such effects would last only as long as the water table is depressed during active excavation within the quarry.

Groundwater quality would not be significantly affected as a result of the quarrying process. The quarrying process involves the extraction of earth material, which is not an activity that creates pollutants or pathways that could affect groundwater quality. In the unlikely event of a spill (e.g., accidental release of pollutants from a vehicle), any material would be cleaned up promptly in accordance with an approved spill response plan. In addition, the Joachim Dolomite formation underlies the base of the proposed quarry. The Joachim Dolomite formation is an aquitard that would provide further protection from any potential impact to groundwater quantity or quality.

### **Alluvial Aquifer Resources**

The Mississippi River flood plain area (approximately 170 acres) of the site has been studied for both harbor design and potential groundwater resource purposes. These studies included numerous soil borings, monitoring wells, geotechnical and geochemical sampling, and the monitoring of groundwater and river elevations. The flood plain unconsolidated materials consist predominantly of silts, sands, and gravel. These materials are overlain by clay loam and sandy loam soils. The unconsolidated silt, sand, and gravel comprise an alluvial aquifer that ranges from approximately 50 feet thick near the bluffs to approximately 100 feet thick near the Mississippi River. Monitoring of river and groundwater elevations shows that the alluvial aquifer responds relatively quickly (within days) to changes in Mississippi River elevations. This is due to the ability of the aquifer to transmit large volumes of groundwater quickly (i.e., high permeability).

The harbor construction would remove some unconsolidated materials from the shallow portion of the alluvial aquifer. Approximately 47 acres of the 170-acre flood plain would be impacted by the proposed harbor, which would consist of about 26 acres of open water and 21 acres of proposed development. This would result in some localized changes in aquifer properties (groundwater flow patterns, storage, etc.) but these changes are not expected to be significant due to the high permeability of the alluvial aquifer, which would still be able to respond to changes in Mississippi River elevations. In addition, the remaining area of the Mississippi River flood plain would still be bordered by the Mississippi River, with no structures blocking the interaction of the Mississippi River and the alluvial aquifer. Therefore, the harbor construction would not cause significant impacts to the alluvial aquifer groundwater resources and subsequent impacts to groundwater-supplied wetlands.

Additionally, for projects involving the discharge of dredged material:

(x) mixing zone, in light of the depth of water at the disposal site; current velocity, direction and variability at the disposal site; degree of turbulence; water column stratification; discharge vessel speed and direction; rate of discharge; dredged material characteristics; number of discharges per unit of time; and any other relevant factors effecting rates and patterns of mixing: Authorization for dredging activities is not required for initial project construction. However, future maintenance dredging activities within the inland harbor would require permit authorization. Holcim stated that an approved upland non-jurisdictional disposal site or future environmentally preferable location would be utilized to contain any future generated dredge materials. No specific method of dredging has been discussed due to the unknown dredge quantities, durations and frequencies. It is likely that either a clamshell bucket or hydraulic dredging unit would be utilized. Either of these dredging methods would only produce minimal discharges that are considered *de minimis*. Under current regulations, activities resulting in *de minimis* fallback do not invoke Section 401 or Section 404 of the Clean Water Act. However, the activity would still require authorization under Section 10 of the Rivers and Harbors Act. Under current regulations, nationwide permit number 35 (Maintenance Dredging of Existing Basins) could be used to authorize future harbor dredging activities.

D. Biological characteristics and anticipated changes (check applicable blocks and provide concise description of impacts):

(x) special aquatic sites (wetlands, mudflats, coral reefs, pool and riffle areas, vegetated shallows, sanctuaries and refuges, as defined in 40 CFR 230.40-45): No mudflats, coral reefs, vegetated shallows or sanctuaries and refuges are located on or directly adjacent to the project area. Further discussion regarding pool and riffle areas and wetlands is provided below.

Pool and riffle areas:

40 CFR 230.45 states, “Steep gradient sections of streams are sometimes characterized by riffle and pool complexes. Such stream sections are recognizable by their hydraulic characteristics. The rapid movement of water over a coarse substrate in riffles results in a rough flow, a turbulent surface, and high dissolved oxygen levels in the water. Pools are deeper areas associated with riffles. Pools are characterized by a slower stream velocity, a steaming flow, a smooth surface, and a finer substrate.”

The Isle du Bois Creek watershed may contain areas that could be designated as pool and riffle complexes, but there are no pool and riffle complexes in Isle du Bois Creek that would be directly or adversely affected by project development.

Pool and riffle complexes are not found in the proposed quarry site. The waterways in the proposed quarry site are narrow, steep drainage sources (headwater tributaries) that transition from indistinguishable broken rocky substrates to areas which gradually possess defined bed and bank characteristics created by erosive forces of past and continuing precipitation events. The site's jurisdictional intermittent streams possess steeper gradients than areas that are typically associated with true pool and riffle complex areas. During and immediately after storm events, the site's intermittent streams may provide the stated riffle functions, but do not possess pooling areas with the associated deeper water and fine substrate areas. The sporadic wet weather flow patterns found in the proposed quarry area's 3.2 miles of intermittent streams are not characteristic of a true stream that supports prolonged flows with scattered pooling areas. The closest links to pool and riffle complex areas in the proposed quarry site are located in a few intermittent streams containing a series of "stair step" channel drops and intermittent flows over smooth bedrock. The lack of flow volume, frequency and duration significantly limits a intermittent stream from supporting a true pool and riffle complex. In any event, Holcim proposes to recreate waterways after each phase of quarrying to mimic, to the extent practical, a lesser gradient stream.

Wetlands:

Holcim submitted its Section 404/401/10 permit application to the USACE, with a Companion Report (ESE, 2000a) and Preliminary Jurisdictional Wetland Determination Report (ESE, 2000b) on 8 August 2000. The Companion Report and the Preliminary Jurisdictional Wetland Determination Report included a summary of the ecological resources found on-site, including wetlands and streams. These reports identified wetland and stream impacts and mitigation opportunities. The public notice (P-2259) included a description of impacts to wetlands and surface water resources, as well as potential areas for wetland mitigation.

On 18 September 2002, the Natural Resources Conservation Service (NRCS) issued a written Wetland Determination that essentially concurred with the findings of the Preliminary Jurisdictional Wetland Determination Report for wetlands on agricultural lands except that two wetlands previously classified as emergent (palustrine emergent (PEM)) were reclassified as farmed wetlands (FW). On 19 September 2002, the USACE issued its approved Jurisdictional Determination affirming the Preliminary Jurisdictional Wetland Determination Report and the minor reclassification of farmed wetlands by NRCS, except that Wetland K and the Upland Pond – two small isolated wetlands totaling 0.2 acres - were determined to be non-jurisdictional wetlands under a recent Supreme Court decision (*Solid Waste Agency of Northern Cook County (SWANCC) v. U.S. Army Corps of Engineers*, 121 S. Ct. 675, 9 January 2001). The USACE's approved Jurisdictional Determination reduced the overall project wetland impacts from approximately 14.2 acres to approximately 14 acres. Despite the NRCS and USACE changes to the project site wetland delineation, Holcim is not proposing any revisions to the mitigation ratios, acreage, or types of wetland mitigation originally set forth in the Wetland and Stream Mitigation Plan.

A total of approximately 141 acres of jurisdictional wetlands have been identified within the project site (see Table 6-1 in Holcim's EA). Approximately 47 acres of wetlands were mapped on Lee Island. For the Lee Island wetlands, the dominant (seasonal) hydrology source is the

Mississippi River, but ponding of direct precipitation and alluvial groundwater discharge are also contributing hydrology sources. Due to soil disturbance from farming and periodic flooding, vegetation of farmed wetlands is dominated by “weedy” plant species such as cocklebur (*Xanthium strumarium*), fog fruit (*Phyla lanceolata*), and swamp smartweed (*Polygonum coccineum*). Additional species identified from emergent wetlands on Lee Island included river bulrush (*Scirpus fluviatilis*), upright burhead (*Echinodorus berteroi*), and asters (*Aster* spp.). Willows (*Salix* spp.), sycamore (*Platanus occidentalis*), cottonwood (*Populus deltoides*), and buttonbush (*Cephalanthus occidentalis*) were found to be characteristic of scrub shrub and forested wetlands located on the western portion of Lee Island.

The majority of the wetlands on the project site are associated with the Isle du Bois Creek flood plain (approximately 94 acres). Wetlands identified included emergent, scrub-shrub, and forested wetlands located in broad depressions or low flood plain (relict scar) areas. Some of the Isle du Bois Creek wetlands have a hydrology that is seasonally dominated by the Mississippi River. However, other surface water and groundwater sources also contribute to the hydrology of these wetlands. Dominant trees within these wetlands include green ash (*Fraxinus pennsylvanica*), swamp privet (*Forestiera acuminata*), silver maple (*Acer saccharinum*), sycamore, and slippery elm (*Ulmus rubra*). Characteristic non-woody plants observed includes smartweed (*Polygonum* spp.), giant ragweed (*Ambrosia trifida*), stinging nettle (*Urtica dioica*), beggars-tick (*Bidens frondosa*), and fog fruit.

Limited wetlands occur within the uplands. The total jurisdictional wetland area within the uplands is restricted to approximately 0.1 acre at Old Quarry Hollow.

Flood plain wetlands provide functional value through flood attenuation and storage, groundwater discharge/recharge, seasonal/temporary fish and wildlife values (forage/cover/spawning), and sediment retention and nutrient removal. However, such functions as fish and wildlife habitat, and sediment retention and nutrient removal, are reduced for those wetlands on Lee Island and the flood plain of Isle du Bois Creek that have been converted to agricultural use.

The proposed excavation of the inland harbor and placement of fill material to support landside harbor facilities would impact approximately 13.9 acres of jurisdictional wetlands. The NRCS designated approximately 12.1 acres of agricultural lands within the Lee Island harbor construction area as farmed wetlands. An additional 1.8 acres of successional growth, found in an agricultural drainage ditch, was classified by the NRCS as a wooded wetland. The farmed wetlands are located within Lee Island’s undulating, swale-like terrain. These swales were likely created by past over bank scouring effects induced by the Mississippi River and/or deposition of river borne materials into remnant flow channels of the Mississippi River. The elevation of the terrain supporting the wetlands is high enough to support the production of current commodity crops on a fairly routine basis. As such, the designated farmed wetlands are extremely disturbed and exhibit minimal wetland characteristics. The farmed wetlands are routinely disturbed by agricultural tillage practices and chemical applications. The designated wooded wetlands are situated in the farm field’s associated drainage ditch. The ditch was likely excavated to reduce prolonged saturation and standing waters on the adjacent farm fields. The wooded wetland is converting into what many would consider a later successional or early wooded wetland phase. The tree species, density and size are somewhat homogenous. In comparison to other wooded wetlands, this site is considered a very low quality area.

Per Holcim's EA, potential indirect impacts to the harbor wetlands were also assessed in detail in the Water Resources and Hydrology Report. Potential mechanisms of indirect impact included the alteration of wetland hydrology (via surface water runoff and groundwater discharge) and changes in water quality due to characteristics of site runoff and storm water flow from the site. Analyses of changes in surface water runoff characteristics (quantity and quality) were conducted by extensive modeling that considered the effectiveness of the storm water sedimentation basins that would be constructed on site. The modeling determined that no significant change in either the water quality or hydrology of wetlands adjacent to developed areas would occur.

The analysis also evaluated the potential for changes in groundwater discharge patterns and the extent to which groundwater discharge supports wetland hydrology. Holcim's extensive studies of the site have demonstrated that groundwater conductivity within the associated geologic formations matrix is low. This fact coupled with the fact that the hydrology of most of the site wetlands is seasonally driven by surface water flooding of the Mississippi River, indicates that there would be no significant indirect impact on the hydrology of the harbor wetlands.

One jurisdictional wetland at Old Quarry Hollow, totaling approximately 0.1 acre, would be affected by the storage of material that would be excavated from the Mississippi River flood plain to construct the harbor. These impacts would be fully mitigated.

### **Wetland Mitigation**

The USACE requires compensatory mitigation to offset unavoidable impacts to jurisdictional wetlands. Holcim has proposed greater than customary mitigation ratios on southern Lee Island and within the Isle du Bois Creek flood plain. The mitigation actions entail wetland restoration, creation, preservation and enhancement.

As presented in the Wetland and Stream Mitigation Plan, sufficient acreage south of the proposed harbor on Lee Island exists to create new wetlands to compensate for the wetlands that would be impacted by the project. As detailed in Table 6-3 of Holcim's EA, the total area of southern Lee Island (south of the proposed harbor and east of the railroad tracks) is approximately 71.8 acres, not including a narrow strip of the Mississippi River bank. On southern Lee Island, Holcim is proposing to create approximately 25.5 acres of new wetlands from non-jurisdictional cultivated fields and enhance approximately 12.8 acres of farmed wetlands. In addition, Holcim would create an approximate 3.6-acre vegetated buffer below the harbor. Approximately 2.0 acres of existing farmed wetland would remain on southern Lee Island and may be used for additional wetland restoration. In addition to these commitments, approximately 13.2 acres of forested wetlands on Lee Island would be preserved and together with the restored and created wetlands would form a contiguous high-quality wetland mitigation complex.

In addition, there are a number of areas along the flood plain of Isle du Bois Creek that are available and would be used for wetland restoration. Mitigative commitments along Isle du Bois Creek include the restoration of 22.8 acres of farmed wetlands to scrub shrub wetlands (ultimately transitioning to forested wetlands), and the preservation of 11.1 acres of emergent wetlands, 7.6 acres of scrub shrub wetlands, and 52.9 acres of forested wetlands.

Wetland mitigation would entail enhancing currently degraded wetlands (e.g., farmed wetlands), restoring previously impacted wetlands, and creating new wetlands from non-wetland areas on Lee Island. The creation and restoration of wetlands would effectively result in an increase of jurisdictional wetlands within the project area. Because such wetlands would be closely associated with the Mississippi River and Isle du Bois Creek, they would have a highly reliable wetland hydrology. In addition, these wetlands would be designed and constructed in such a manner that they would incorporate a heterogeneous mosaic of plant communities and microhabitats (emergent and scrub-shrub communities, open water, vernal pools, shallow channels, etc.) that would ensure a high level of performance for such functions as sediment and nutrient retention and removal, flood storage, water quality enhancement, wildlife habitat, and support for fish feeding and reproduction. A 3.6-acre vegetated buffer area between the southern Lee Island wetland mitigation site and the proposed harbor would also be established. The wetland creation and restoration activities would be initiated after all necessary permits are issued and prior to or concurrent with the filling of any wetlands. In summary, Holcim has proposed to create 25.5 acres of wetlands (southern Lee Island) and restore 35.6 acres (12.8 acres on southern Lee Island, 22.8 acres within the floodplain of Isle du Bois Creek). This totals a commitment to create, restore and enhance approximately 61 acres of wetlands in compensation for impacts to approximately 14 acres, and equates to a combined mitigation ratio of approximately 4.3:1. Considering the extent and quality of the proposed mitigation, no significant adverse impacts to wetlands would occur.

The USACE would conditionally require measures to ensure Holcim's mitigation succeeds. Other mitigation actions required by the St. Louis District are on average succeeding or are under corrective review. If for some reason Holcim's mitigation is not fully effective, the USACE retains the authority to require Holcim to develop alternative mitigation or withdraw the permit. MDNR would have similar authority under its water quality certification, and is imposing conditions requiring off-site mitigation if on-site mitigation is not successful. The MDNR conditions, which will become requirements of any Department of the Army permit, are additional safeguards to ensure adequate mitigation.

Mitigated wetlands would also be the subject of an approved monitoring program designed to evaluate performance (i.e., success), potential problems (e.g., invasive species), and prescribe appropriate corrective and maintenance measures, if necessary. The loss of the highly disturbed/low quality wetlands is far outweighed by the proposed mitigation activities. A condition of the permit would require a Declaration of Covenants and Restrictions to protect all wetland mitigation areas in perpetuity.

It should be clarified that designated special aquatic sites under this review are not necessarily considered Aquatic Resources of National Importance (ARNI). The USEPA and FWS provided written opinions that Holcim's proposed activities may potentially impact ARNI's. The USACE disagrees with the notion that ARNI's are present within the proposed action area. Degraded farmed wetlands and intermittent tributaries, similar to those found on Holcim's property, are common throughout the area and have never before been designated as an ARNI under similar permit reviews. The project area's other surrounding land features are non-jurisdictional uplands that have been adequately reviewed for indirect and secondary impacts. Jurisdictional/aquatic features considered under this permit review supply significantly less in terms of aquatic functions and values than the majority of jurisdictional/aquatic habitats considered under other Department of the Army permit evaluations. Proposed impacts to other jurisdictional/aquatic

areas possessing significantly higher functions and values have routinely been approved with conditions after undergoing similar coordination with the USEPA and FWS and with no designation of ARNI's.

(x) habitat for fish and other aquatic organisms: The site contains considerably dissimilar aquatic habitats ranging from low gradient watersheds (unnamed tributaries) to higher energy watersheds (Isle du Bois Creek and the Mississippi River).

Holcim proposes utilization of the Mississippi River for fleeting and its provided hydrological source for inland harbor operations. Proposed fleeting activities would occur along the right descending bank of the Mississippi River between River Miles 132.3 and 133.2. The Mississippi River's currents are directed towards the right descending bank as a result of past dike construction upstream and along the opposite bankline. The dike structures direct higher velocity currents to maintain the deeper navigation channel near the fleeting area. Existing rip rap along the right descending bank of the Mississippi River was likely installed to deter erosion and to protect aquatic habitats. Deep waters and swifter current can somewhat limit aquatic species presence compared to the more diverse habitats frequently associated with shallower water. Smaller aquatic species and prey often occupy backwater habitats and other channel break areas as compared to high-energy flow areas to help them maintain their position and save energy. Based upon our review of USACE hydrograph surveys, a reoccurring sediment bar was determined to periodically take shape beneath the proposed upper fleet. Sediment drift and accretion patterns commonly create bars, as well as periodically relocate materials. The presence of submerged sediment bars is common in the Mississippi River. Sediment deposits of this nature can provide slight current deflection and resulting habitat areas utilized by most aquatic life. Any potential future maintenance dredging within the fleeting area altering potential habitat of the federally endangered pallid sturgeon would require a subsequent Department of the Army permit review and coordination with the FWS. No proposals or requests for alteration of aquatic habitat in the fleeting area, besides the minor installation of mooring structures, were requested. The concentrated movement of barges traveling through the fleeting areas and inland harbor areas would likely discourage aquatic life from inhabiting the area. Fish have an additional sensory perception organ known as a lateral line. This sensory organ detects vibrations traveling through the water. Towboat operations, barge-to-barge contact and other associated riverine activities emit unnatural vibrations that allow fish and other aquatic species to avoid areas of concentrated disturbances. Fleeting operations are not expected to alter the physical aquatic habitat.

Aquatic species may periodically enter the fleeting and inland harbor areas, but no direct harm is expected. If harm to aquatic life were linked to vessel activities, mortality would be significantly evident in other similar settings, such as existing harbors and marinas. Periodic maintenance dredging needs are likely associated with the inland harbor area. Sediment carried by the Mississippi River is apt to fall out of suspension when encountering slack water areas such as the inland harbor. Maintenance dredging requests from these types of facilities are common. Existing parameters of Department of the Army nationwide permit number 35 would likely authorize future performance of maintenance dredging and associated upland disposal. The dredging activities would cause temporary disturbance and alteration of the inland harbor's created habitat. As previously mentioned, the presence of fish and other aquatic life would likely be low in these areas due to concentrated traffic and disruption. The proposed Mississippi River activities should not have a direct negative effect on aquatic habitats.

Periodic over bank flooding events cause inundation of lower lying flood plain areas along the Mississippi River. These events are exemplified on Lee Island and lands adjacent to Isle du Bois Creek. Over bank flooding durations are, on average, short natured in the project area. The late Dr. Robert Sheehan, Professor of Fisheries at Southern Illinois University at Carbondale, Illinois, provided testimony at the Missouri Department of Natural Resources Section 401 Water Quality Certification hearing which in general stated that flooding events in the Lee Island area may benefit aquatic species by offering flooded habitat for feeding and spawning opportunities. The USACE finds no conclusive evidence that the site would potentially be utilized as a spawning area by the pallid sturgeon, since the area's flood plain lacks the necessary spawning substrate. While over bank flooding may provide temporary benefits to aquatic species, the benefits are not as great as claimed by the commenters for the specific project area. The majority of lands within the site's flood prone areas have been cleared for agricultural production. As such, they lack natural vegetation which otherwise would provide temporary aquatic habitat and higher mineral/nutrient recharge rates. Flooding is most likely to occur in the spring when tillage, planting, fertilizer and pesticide/herbicide applications are conducted on Lee Island farm fields and those bordering Isle du Bois Creek. While it is difficult to quantify the exact effects these materials are causing, they are more likely detrimental than beneficial. With regard to Lee Island being a potential spawning habitat during flood events, the short flooding durations and higher elevations of the on-site agricultural fields would not support, on average, efficient inundation periods to support gestation periods of most fish and other riverine life. If aquatic life hatched over the flooded lands, their chance for survival would be further limited by entrapment in pockets of water separated by retreating over bank flows. The majority of wetland mitigation would be conducted on existing agricultural lands in the Mississippi and Isle du Bois Creek flood plain to return mineral, nutrient and vegetative habitat for future over bank flood events. The conversion of these disturbed areas back to their original habitats would greatly enhance water quality and habitat for aquatic species during flood events, as well as halt the application of fertilizers, pesticides and herbicides. This mitigation would outweigh the present aquatic habitat value of the Lee Island floodplain as aquatic habitat during flood events.

The Lee Island slough, a remnant channel along the southern part of Lee Island provides temporary aquatic habitat to fish and other organisms while inundated. Inundation is induced by periodic high river flows and/or above average rain periods. Fish and other aquatic life enter the slough from the Mississippi River, but are often trapped by the combination of falling river levels and silted in return passages. The slough is most heavily silted in near its southern confluence (mouth) with the main river channel. The slough typically dries up during low river stages and low precipitation months. Holcim proposes no development of this slough, but has offered to remove areas of heavy siltation. This action would return an open hydrologic connection with the Mississippi River and allow greater usage of available aquatic habitats with less chance of species entrapment. The narrow riparian corridor along the slough would also be supplemented with tree plantings in the adjacent farm field.

Isle du Bois Creek has a large watershed and offers great habitat diversity. Direct impacts to Isle du Bois Creek were originally proposed, but later withdrawn by Holcim as part of additional avoidance and minimization efforts. A low water crossing exists upstream of Isle du Bois Creek's juncture with the Mississippi River. The structure was historically installed for access to cabin sites and for past logging activities. The structure, measuring approximately six to seven feet in height, artificially pools flows. This pooling effect has enhanced and created additional wetlands/aquatic habitats in the immediate upstream vicinity. While this may be viewed as a benefit to some, the crossing structure has formed an unnatural blockage to fish and other aquatic

species reliant on upstream feeding and spawning opportunities. Periodic high waters generated by the Mississippi River allows backwater flooding to overtop the structure for passage to Isle du Bois Creek's upstream habitat. Holcim originally proposed abandonment of the existing low water crossing and the construction of a new bridge for access to dispose generated overburden materials into Hickory and North Hollows. Avoidance and minimization efforts prompted Holcim to preserve the integrity of Hickory and North Hollow, thus removing the necessity for reliable access over Isle du Bois Creek. The existing crossing structure is in imminent danger of structural failure. Holcim offered to either repair or remove the existing low water crossing in a manner that would satisfy the needs of the area's aquatic resources. This action is unrelated and may be addressed in the future. Regardless of the structures fate, no project related actions are proposed within Isle du Bois Creek or its associated aquatic habitat.

Within the proposed quarry area, non-jurisdictional headwaters form near the upper reaches of the site's steep terrain. Local precipitation is the primary hydrological source generating flows in the headwaters and unnamed tributaries. Jurisdictional features (channels/ordinary high water marks) become evident below the upper headwater reaches as flows concentrate with declining channel gradients. The rugged terrain provides an established riparian corridor along the unnamed tributaries drainage paths. The thin layer of topsoil and rocky substrate somewhat limits plant diversity and growth rates. However, leaf litter and other decaying woody debris provide detrital material to supplement nutrients within the unnamed tributaries. No federally listed endangered or threatened aquatic species were found within the unnamed tributaries' aquatic zones. The phased quarry operations would sequentially remove the tributaries' existing habitat and present species. Upon completion of each phase, Holcim would return to the previously quarried area for land reclamation activities. In brief summary, the quarried area would be reclaimed to return similar rugged terrain, with created tributaries, at lower elevations. The reclaimed terrain would be reforested with similar species to promote a riparian corridor along the re-created tributaries. The existing tributaries' habitat has undergone successional changes to support varying species over time. Similarly, the reclaimed areas and re-created tributaries would undergo geophysical and biological changes to gradually support aquatic species diversity and greater populations.

Portions of the re-created tributaries' headwaters (found in the undisturbed buffer area) may provide a source of existing species for repopulating the created channels. A tributary can be created to mimic the appearance of other similar waterways, but the same species and populations would not return immediately. The physical, chemical, biological and geological condition of the re-created tributaries would undergo changes for decades to follow. The species and populations would also change with these altering conditions. In conclusion, the phased quarry operations would remove existing aquatic habitat, but the proposed stream mitigation and reclamation activities would sequentially replace the lost tributary features for an overall no net loss of lineal stream channel. Like any mitigative effort, time and close management of the mitigated channels would be required to ensure successful replacement of the aquatic habitats. Also, stream mitigation occurring before quarry operations begin, e.g., opening the Lee Island slough, enhancing the Isle du Bois Creek riparian corridor, re-opening relict stream channels, and, as part of reclamation, the creation of upland ponds, would enhance aquatic habitat, providing additional stream mitigation. Finally, the tributaries do not support sufficient flows, fisheries or unique/uncommon habitat to justify their classification as an ARNI.

(x) wildlife habitat (breeding, cover, food, travel, general): Holcim owns slightly less than 4,000 acres of contiguous lands within Jefferson and primarily Ste. Genevieve Counties, Missouri. Of this acreage, Holcim proposes to maintain approximately 2,200 acres as a buffer zone around the proposed active quarry, harbor and cement plant operations. The buffer area also includes a portion of the outer Mississippi River bluff face adjacent to Lee Island. No direct physical modifications to wildlife habitat are proposed in the buffer area.

The proposed action's primary direct impacts/alteration to existing wildlife habitat would occur in the proposed quarry area. No more than 200 acres would be actively quarried at any one time, with ongoing reclamation after the first 8-10 years. Quarry operations would be conducted in the site's rugged upland terrain with intermingled drainage ways. The majority of the quarry site contains non-jurisdictional upland features. Much of this upland wooded terrain has undergone past logging activities, which likely changed the original vegetation and substrate of the area. A very thin layer of soil covers the remaining underlying layers of stone formations. While disturbances have occurred in the area, the contiguous nature of the area represents an important area for resident and migrating wildlife species.

At the onset of project discussions, Holcim realized the importance of categorizing on-site resources, including all forms of wildlife and their habitat. As such, Holcim engaged experienced consultants to conduct a thorough review. The results are found in the previous list of studies and surveys and further summarized in Holcim's EA, Section 6.5. The following is provided from these references:

Birds:

The World Bird Sanctuary (WBS) has extensively studied the avian (bird) usage of the project site. As a result of WBS surveys over multiple seasons, a total of 158 bird species were observed on-site. Common species observed to occur on the site included blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), American goldfinch (*Carduelis tristis*), barn swallow (*Hirundo rustica*), tufted titmouse (*Baeolophus bicolor*), Carolina chickadee (*Poecile carolinensis*), downy woodpecker (*Picoides pubescens*), northern flicker (*Colaptes auratus*), eastern wood pewee (*Contopus virens*), and red-eyed vireo (*Vireo olivaceus*).

Many species of neotropical migrant songbirds (defined as spending the majority of the year in the tropic zones of North and South America) have been recorded at the site during the WBS bird surveys. These species use a variety of habitats throughout the site. Neotropical migratory species observed to occur on the site include Eastern wood pewee, wood thrush (*Hylocichla mustelina*), red-eyed vireo, Kentucky warbler (*Oporornis formosus*), common yellowthroat (*Geothlypis trichas*), and ovenbird (*Seiurus aurocapillus*). However, the cerulean warbler (*Dendroica cerulea*), a species of interest to some parties who commented on the Public Notice, was not found at the site. Many of the neotropical migrant songbirds have shown significant, long-range declines in population across their North American breeding areas, presumably due to habitat loss, increased predation and nest parasitism. The brown-headed cowbird (*Molothrus ater*) is recognized to be the cause of nest parasitism among neotropical migrants. The brown-headed cowbird was observed throughout the site and is likely parasitizing nests of neotropical migrants within the site. According to the WBS, the presence of the brown-headed cowbird indicates that some degree of habitat fragmentation has already occurred on the project site, likely due to previous disturbances such as farming and logging.

A local heron rookery located on the Illinois side of the Mississippi River at Beagles Island is known to support nesting great blue herons (*Ardea herodias*). WBS determined that direct impacts to the Beagles Island rookery itself would not occur, as all project development would take place on the Missouri side of the Mississippi River. However, construction of the harbor facility would result in the direct loss of wetlands that have been observed to be used by great blue herons for foraging. Consequently, the project would result in some short-term reduction in foraging habitat for this and other water-dependent species. Such potential impacts, however, are expected to be short-lived and would be compensated for by the restoration and creation of wetlands on southern Lee Island and within the Isle du Bois Creek flood plain that would provide valuable foraging and nesting habitat for a wide variety of water-dependent bird species.

Potential impacts to birds as a result of the project are associated with the alteration and loss of habitats as presented in Table 6-5 of Holcim's EA. For the most part, direct mortality to birds as a result of project construction is expected to be low as birds are highly mobile. Land conversion alone could be expected to reduce the overall carrying capacity of the site due to the accompanying alteration of associated habitats. However, as is presented in Table 6-5, the primary impact to natural cover types (and hence, bird habitat) is to forest types that are well represented on and adjacent to the site. Approximately 73 species of birds may utilize habitats within the proposed quarry for nesting. No or minimal impacts would occur to uncommon habitats (e.g., glades, sandstone forest, etc.). Consequently, localized displacement of species that may be dependent on such unusual habitats is not expected to occur. Additionally, conversion of natural habitats of the site would occur over a long period of time and would be mitigated for by the development of reclaimed areas that, over time, would be restored to a variety of cover types. Conservation measures would also be implemented over the life of the project to manage the extensive buffer area lands to enhance their suitability and value to a variety of wildlife species. WBS indicated that several areas of the site were particularly well used by neotropical migratory birds. Those areas included the bluffs along the Mississippi River, Wolf Hollow, Hickory and North Hollows, and Isle du Bois Creek flood plain areas. With the exception of Wolf Hollow, each of these areas would be preserved in the buffer and would be available for future, long-term use by birds. Additionally, while Wolf Hollow would be impacted, it would not be impacted for many years. Consequently, the maintenance of these extensive forested areas within the buffer coupled with the long term, slow progression of the quarry would provide for continued support of neotropical migrants. Furthermore, in consideration of the planned mitigation and conservation measures (e.g., restoration and enhancement of glades, a tall grass prairie in the southwestern corner of the buffer area, riparian corridors, and wetlands), bird diversity for the site as a whole may be expected to increase as these measures would improve existing habitat quality and develop new habitats that may be utilized by resident and migratory birds. Such measures would be particularly beneficial to such species as Henslow's sparrow and northern harrier that were observed to utilize the field in Morrison Hollow proposed for prairie restoration.

Potential indirect impacts to birds may be associated with noise (i.e., blasting) and fugitive dust emissions as a result of quarry operation. Potential effects from these activities include periodic startling of birds (and other fauna), avoidance of areas in close proximity to the quarry face (i.e., the area in which blasting occurs), and avoidance of areas subject to fugitive dust emissions. These impacts however, are not significant as they are expected to be rather localized in nature and would be mitigated by factors of distance and topography (due to natural attenuation of dust and noise energy—see Sections 7.9 and 7.10), would be further mitigated by active dust control

measures (see Section 7.9 of Holcim's EA). The USACE concludes that Holcim's proposed mitigative measures and protective buffers should provide adequate habitat for the existing avian species utilizing the site to avoid significant impacts.

#### Amphibians and Reptiles:

Due to property size and differences of natural community types, the project site offers a variety of habitats suitable for amphibian and reptile species. Thirty-one amphibian and reptile species have been identified at the site. Representative groups included frogs, salamanders, turtles, snakes, and lizards. No federally listed amphibian or reptile species have been observed at the project site. The northern crawfish frog (*Rana areolata*), a Missouri amphibian species of conservation concern, was heard at the site during field sampling in 2001, but no individuals were observed or heard during field surveys conducted in the spring of 2002. This species breeds in temporary pools in the Mississippi River flood plain such as those located in the vicinity of the proposed harbor.

Potential impacts to amphibians and reptiles on the project site include direct mortality during construction and facility operation, and reduced population due to the effects of habitat alteration. Holcim's proposed wetland and stream mitigation, conservation measures, and land reclamation efforts would serve to offset some of the impacts to amphibian and reptile species on-site by enhancing or providing additional habitat. Frogs, toads, aquatic and semi-aquatic turtles, and some snake species would benefit from the creation and restoration of wetlands and streams.

The Department of the Army permit would impose a condition requiring Holcim to evaluate the feasibility of relocating selected species from impacted areas to suitable habitats in un-impacted areas, as discussed in the Amphibian and Reptile Relocation Study (Harding ESE, 2002e). Species considered to be potential relocation candidates are those from specialized niche habitats (e.g., springs/seeps and wetlands) and include the *Eurycea* spp. (long-tailed, dark-sided, and cave salamanders), the *Plethodon* spp. (slimy and southern red-backed) salamanders, and northern crawfish frog. Because there is some documented evidence of success relocating *Eurycea* and *Rana* species, the literature suggests that a relocation effort for the candidate crawfish frog and *Eurycea/Plethodon* salamander species could be initiated at the site on an experimental basis. Feasibility of such a relocation effort, however, has not yet been fully assessed and would be dependent on such factors as the availability of suitable habitats, timing, and individual species' life history characteristics.

#### Other Wildlife:

Other wildlife known or expected to occur on the site include, but are not limited to, such species as white-tailed deer (*Odocoileus virginianus*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), skunk (*Mephitis mephitis*), mink (*Mustela vison*), eastern cottontail rabbit (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), shrews (masked, short-tailed), bats, various rodents, and other species. Potential impacts to such wildlife include displacement due to habitat conversion and loss, and direct mortality during construction and operation (particularly for smaller, less mobile species). Such impacts however, are expected to occur incrementally across the site as habitat conversion would occur over the life of the project. Reclamation of the site would also proceed incrementally and would

provide habitat that would be suitable to a variety of wildlife species. As these habitats develop, they would be recolonized by dispersal of wildlife from resident populations in the buffer (see Figure 3-1 of Holcim's EA).

The upland wildlife habitat in the quarry area does not possess the physical characteristics to be considered a direct jurisdictional land feature regulated by the Clean Water Act. However, as a secondary and indirect effect of the quarry's operation, we have taken into consideration the proposed impacts to these non-jurisdictional upland land features. The Clean Water Act sets provisions for ensuring lost jurisdictional resources (i.e., wetlands, streams) are returned. Mitigation for non-jurisdictional upland features is not a requirement under the Clean Water Act. However, Holcim voluntarily agreed to return the non-jurisdictional upland habitats through reclamation/replanting activities. Impacts to wildlife habitat/usage would be temporary during phased quarry operations until phased reclamation activities return lost wildlife features. The buffer zone and areas not disturbed by future phased quarry operations would provide nearby resources of similar wildlife habitat.

By comparison, many other actions reviewed by the USACE involve total site development. These actions, such as subdivision or commercial developments, have little to no chance for returning pre-project features, including wildlife habitat. However, Holcim's proposal would involve the sequential return of wildlife habitat following each phase of quarry operations. Ongoing land reclamation would begin after the first 8-10 years of initial quarry operations. Overburden, dredged materials and stored topsoil would be returned to each quarried area for recreating similar rugged terrain. The previous site assessment studies would be utilized as a reference tool in promoting plant species to return the area's previous vegetation. By the time the phased quarry operations reach year 100, the first quarried area should have approximately 90 years of growth, with each following reclaimed area, except for the lake, exhibiting approximately 10 years of decreasing age, until meeting the last quarry face. Approximately 3.2 miles of lower gradient tributaries would also be recreated within the draws of reclaimed lands to support wildlife that depend on the existing habitat conditions. Holcim's actions, unlike almost all other developers, would provide compensatory mitigation for non-jurisdictional upland habitat to return and support wildlife needs. For a full assessment of mitigation and conservation measures, see Section 6.6 of Holcim's EA.

(x) endangered or threatened species: The potential presence of federally listed threatened and endangered species was identified in the USACE public notice P-2259, dated 6 November 2000. In summary, the USACE and the FWS entered Section 7 Consultation proceedings under the Endangered Species Act to evaluate the potential effects of the project actions on the following species and their habitat: Indiana bat, gray bat, bald eagle, pallid sturgeon, peregrine falcon and the Hine's emerald dragonfly. As part of informal consultation, and at FWS' request, Holcim prepared a Biological Assessment (BA), dated 10 January 2002. The USACE evaluated the BA and concluded in a 19 March 2002, letter to the FWS that Holcim's proposed actions were not likely to adversely effect the listed species or their critical habitats. The FWS provided a response letter dated 8 May 2002, concurring with the USACE's "not likely to adversely effect" determination on the gray bat, bald eagle and Hine's emerald dragonfly, with further clarification that the peregrine falcon was no longer a federally listed threatened species under the Endangered Species Act. The FWS did not agree with the USACE "not likely to adversely effect" position for the Indiana bat and stated that it could not concur with this position regarding the pallid sturgeon without further clarification and future dredging information. The USACE provided further information regarding the pallid sturgeon and

potential future dredging operations in a letter to the FWS dated 27 June 2002. In summary, the USACE pointed out that future maintenance dredging actions within the fleeting area would require a separate Department of the Army permit evaluation. The USACE also provided further information related to recent permit reviews for developments in the vicinity of the project site, which did not trigger FWS concern for potential pallid sturgeon or Indiana bat impacts (Brickeys Stone Quarry operations and AmerenUE power plant expansion actions). With this information, the USACE again determined the project would “not be likely to adversely effect” position on the pallid sturgeon and Indiana bat. The USACE included caveat statement requesting formal consultation proceedings if the FWS disagreed regarding the Indiana bat. In telephone conversations and a 29 July 2002, letter, the FWS concurred that the proposed harbor is not likely to adversely affect the pallid sturgeon, and stated that the FWS would comment in the future regarding in-river maintenance dredging if required. The FWS also stated that it could not concur regarding the Indiana bat and initiated formal consultation, pursuant to Section 7 of the Endangered Species Act, for further review of the project’s potential action on the Indiana bat. Ultimately, the FWS provided a Final Biological Opinion on 24 April 2003, concluding the action would not jeopardize the continued existence of the Indiana bat or its critical habitat, authorizing the incidental take of Indiana bat habitat in acres per year, and requiring reasonable and prudent measures including implementation of the conservation measures proposed by Holcim in its BA. The Department of the Army permit would include the terms and conditions, including conservation measures, required by FWS as part of the Biological Opinion. For a more thorough description of the numerous efforts, studies, and actions associated with the endangered and threatened species analyses, see the referenced materials and summary provided in Holcim’s EA, Section 6.2.

(x) biological availability of possible contaminants in dredged or fill material, considering hydrograph in relation to known anticipated sources of contaminants; results of previous testing of material from the vicinity of the project; known significant sources of persistent pesticides from land runoff or designated (Section 311 of the CWA) hazardous substances; other public records of significant introduction of contaminants from industries, municipalities or other sources: Holcim’s fleeting proposal would not require the placement of fill material or dredging within the Mississippi River. As previously stated, if future harbor or in-river dredging were warranted, a Department of the Army permit would be required. In addition, no dredging or placement of fill materials is required in Isle du Bois Creek.

The creation of the inland harbor would involve excavation activities that may result in discharge of earthen materials into the jurisdictional areas. No contaminants are known to occur within the proposed harbor excavation areas. Whether a regulated discharge occurs may depend on the type of equipment utilized. Use of equipment such as a bulldozer in a jurisdictional area requires a Section 404 permit due to the bladed equipments tendency to push materials in sufficient amounts to cause a discharge. However, use of equipment such as a track hoe (scooping) or belly scraper may contain excavated materials in an attached hopper for later discharge in a non-jurisdictional location. The use of mechanized equipment capable of scooping materials with only incidental fall back may be considered non-jurisdictional operations.

Earth moving equipment would initially remove the upper layers of the inland harbor’s footprint. Portions of the excavation would occur within the approximate 13.9 acres of jurisdictional, mostly farmed, wetlands on Lee Island. Excavated materials would be placed in the Old Quarry Hollow upland disposal area as earlier discussed. Hydraulic dredging equipment may be

necessary to remove the remaining earthen materials found beneath the initial “in the dry” excavation area. Based on hydrogeological investigation by Holcim, no existing surface or sub-surface contaminants are known to occur in the site’s jurisdictional areas.

E. Human use characteristics and impacts (check applicable blocks and provide concise description of impacts):

(x) existing and potential water supplies; water conservation: Water supplies within the project area’s designated floodway and flood plain are primarily generated by the Mississippi River’s (and to some extent Isle du Bois Creek’s) contributions to the local aquifer, over bank flood events, back water flood retention, local precipitation and intermittent stream flows. Intermittent stream flows are supplied by localized precipitation and some groundwater from springs and seeps.

Actions associated with fleeting and constructing the inland harbor is unlikely to alter existing/potential water supplies and water conservation patterns. Ground waters from the Mississippi River should continue to pass through porous layers of the river’s bank line and the excavated inland harbor walls. Likewise, blasting and subsequent quarry operations would not significantly impact existing and potential water supplies. Phased quarry reclamation activities should return rugged topography with intermittent streams to support similar water supply and water conservation patterns. The quarry operations would gradually decrease site elevations until the last desired rock formations are removed. Periodic accumulations of natural surface flows may temporarily collect in the lower quarry elevations found below adjacent surface elevations. The quarry area’s collected flows would be transferred to the centrally located Raddy Hollow sedimentation basin, where subsequently settled out flows would reach Isle du Bois Creek. The remaining captured ground water and surface flows would remain in the quarry’s created lake, located in the eastern portion of the quarry area.

In addition, Holcim’s EA (see Section 7.1), determined that the project would not adversely affect the water wells of local residents in both Missouri and Illinois. Extensive hydrogeologic investigation of the project site was performed in an effort to document site conditions and assess potential hydrogeologic impacts. A detailed evaluation of potential impacts to the water quality or water quantity in local residents’ wells is provided in the Water Resources and Hydrology Report. The project components with the potential to impact these resources are the proposed quarry and the proposed production well. The production well is planned to be located near the cement plant to supply its water needs.

### **Missouri Water Wells**

In brief, Holcim identified wells at local residences in the vicinity of Morrison Hollow, within the upper alluvial valley of Isle du Bois Creek, and along Highway 61. In most cases these wells are located more than a mile from the nearest edge of the proposed quarry and even further from the cement plant area. Therefore, distance alone provides some level of protection to the residential wells from the proposed quarry and production well. Holcim’s studies have also shown that the area’s stratigraphy (underlying rock formations) dips at a 2 percent rate from west to east (toward the Mississippi River). Consequently, almost all the residential wells are located in a position that is hydraulically up gradient from the proposed quarry and production well. Several local resident wells are side gradient (on a parallel path with groundwater flowing

toward the plant or quarry), but none are down gradient. Additionally, the source (recharge) areas of the aquifer(s) supplying water to these residential wells lie in an area that is up gradient (west) of the project site.

Low permeability of the Joachim Dolomite (see Holcim's EA, Section 5.1.2) is a factor that also prevents the quarry from impacting local well production. The floor of the quarry would be the Joachim Dolomite formation, but the local resident wells, which are at depths ranging from 100 to 330 feet, mostly use water from lower formations, such as the Roubidoux, Cotter, and St. Peter Sandstone formations. Because the Joachim Dolomite is an aquitard (i.e., a barrier to water movement), it would prevent the flow of water between the quarry excavation, which would be in the higher Plattin Limestone, and the local resident well formations. Consequently, the quarry would not draw down or otherwise impact the aquifers, which supply the local resident wells.

These conclusions are further supported by the testimony of an expert hydrogeologist at the MDNR land reclamation permit hearing.

The stratigraphy of the site as discussed above, coupled with production well construction techniques, would also protect local wells from impact by the project. In contrast to the target zones of local wells, the target zone for the production well is 1,100 to 1,800 feet below grade, with the majority of water being produced from units 1,600 to 1,800 feet below grade (e.g., Gasconade, Eminence and Potosi formations). Construction of the production well would include a grouted casing to a great depth (Cotter formation) that would prevent groundwater from directly entering the well from shallower formations. Low permeability bedrock units, including beds within the Cotter formation and the Jefferson City Dolomite, separate the local residential wells from the proposed production well target formations. In addition, the proposed production well would not produce significant quantities of water from the formations used by the residential wells. Therefore, the proposed production well is not anticipated to impact the water yields or water quality to the residential wells.

Before the proposed production well is developed, however, further testing would be conducted to determine whether there would be any significant impacts to local residential wells. Potential significant impacts to the water supply of these wells would be mitigated by appropriate measures or would result in the use of an alternative water supply.

### **Illinois Water Wells**

On the Illinois side, there are several wells potentially within a mile of the project site, but none deeper than 70 feet. At that depth, all of the Illinois wells would be completed in the Mississippi River alluvial aquifer. Because they are in the alluvial aquifer on the opposite side of the river, they are not connected to aquifers on the Missouri side and are therefore, not potentially impacted by the project.

### **Summary**

In summary, the proposed quarry and the water production well are not anticipated to significantly alter the availability and quality of water from nearby wells for several reasons:

1. Source areas supplying groundwater to Missouri residential wells are up gradient from the wells and the project site (consequently, no interruption of groundwater flow supplying these wells would occur);

2. Most Missouri residential wells are located up gradient of the project site. Consequently, water supplying these wells would not be interrupted by activities associated with the project.
3. A few Missouri residential wells are located side gradient to the project site. However, water flowing to and past side gradient wells is on a path parallel to the path of water flowing to and past the proposed plant and quarry, and would therefore not be significantly effected by the project.
4. Quarrying activities would be limited to the strata above the Joachim Dolomite formation. The Joachim Dolomite acts as an aquitard that would prevent the transmission of water between the quarry and local resident well formations.
5. Water supply for the cement plant would be derived from formations significantly below and hydraulically separated by confining units from formations which are used for residential supply;
6. Design of the Holcim production well (including a sealed casing to great depth) would prevent the direct capture of water from shallower aquifers.
7. Resident wells in Illinois are developed in the shallow alluvial aquifer and are therefore not connected to the aquifers on the Missouri side of the river; and
8. Residential water supply wells are located a considerable distance from the quarry and plant site.

Holcim's studies have determined water supplies and water conservation would not be affected by the project. The Department of the Army permit would also include a condition stating that if the permitted actions are determined by the USACE to be the cause of an adverse effect on any adjacent landowner's water supply corrective measures shall be taken by the permittee. Modifications to subsequent site operations may be evaluated by the USACE accordingly.

(x) recreational or commercial fisheries: The Mississippi River offers a variety of aquatic niches (backwater habitats, underwater structures/islands, and feeder tributaries) that are occupied by numerous species of fish. This provides a broader range of angling opportunities for all levels of recreational and commercial fishermen. Recreational and commercial fishermen mutually utilize the benefits of the river with existing navigation/shipping industries. Anglers have ample room to avoid conflicts with barge traffic and large towboat operations already common in the Mississippi River. The proposed fleeting operations are similar to existing traffic and river usage conditions. These activities should not alter potential fishing success. In addition, the fleeting areas would be located in and near the deeper channel of the Mississippi River. Most recreational and commercial fishing opportunities focus on shallower habitats, particularly near dike structures, chutes, bars, and other changing structure areas that are not readily available in the direct project area. Floating vessels in the fleeting area and concentrated towboat operations should have little to no effect on the presence and attraction to fishing opportunities.

A public access at the Harry S. Truman Memorial Park is managed by the Missouri Department of Conservation and is located immediately upstream of the AmerenUE Rush Island plant. The access consists of a boat ramp and does not have restroom or picnic facilities. Consequently, use of the access and the river in the vicinity of the project site is limited to local residents who fish along the bank (upstream of AmerenUE's plant) and occasional boat fishermen who fish various locations on the Mississippi River. Little information is available documenting the extent to

which commercial fishermen locally use the Mississippi River. However, typical commercially important fish harvested within the reach include blue, channel and flathead catfish, smallmouth and bigmouth buffalo, and silver and common carp as described in Section 6.3 of Holcim's EA.

After heavy or prolonged precipitation, larger tributaries, such as Isle du Bois Creek, can create increased oxygen levels, currents and food sources that attract and congregate fish for higher feeding opportunities. In conjunction, varying substrate changes induced by the tributary's dropped bed load also offers altered habitat. An existing low water crossing structure is situated upstream of the mouth of Isle du Bois Creek and the Mississippi River. The structure limits small craft passage throughout the majority of the year. Flooding conditions may allow recreational anglers temporary boat access to upstream portions of Isle du Bois Creek. Without high flow access over the low water crossing, anglers cannot utilize Isle du Bois Creek unless they trespass on lands owned by Holcim. It is not Holcim's intent to hinder individuals from enjoying and utilizing natural resources in the surrounding areas. However, Holcim would prohibit unauthorized site access by land or water for obvious safety reasons associated with quarry and plant operations. Regardless, Isle du Bois Creek would continue to provide breeding, feeding, nutrient recharge and habitat areas supporting the general Mississippi River fisheries.

No recreational or commercial fishing opportunities are available in the quarry area's intermittent tributaries because there are no fish in those systems. Secondary effects of the phased quarry operations may temporarily limit lost mineral, nutrients and detrital input supporting the ultimate receiving water bodies and fisheries. However, as Holcim's Water Resources and Hydrology Report demonstrates, such impacts would not be significant.

(x) other water related recreation: In addition to fishing, the Mississippi River provides recreation such as boating, water-skiing, and bird watching. These activities can be compatible with the fleet operations and should not be significantly affected, especially considering the existing fleet operations on the river in the vicinity of the project site. Also, there is a substantial volume of vessels/river traffic currently passing the project area. The remaining waterways within the project area, especially the intermittent streams, are situated in less accessible locations that generally cannot be accessed without trespassing. Existing and future water related recreational opportunities should not be adversely affected by initiation of project activities.

(x) aesthetics of the aquatic ecosystem: Visual resources consist of the combined effects of the natural and constructed features that give a particular environment its aesthetic qualities. Such features form the overall impression that a viewer receives of an area, or its landscape character. It is important to determine whom the receptors are and where the key observation points (critical viewpoints) are located. Visual effects generally are determined by the receptor, the person experiencing a view; that person may experience a positive or negative effect.

The most visible factors associated with the proposal are the barge fleet operations, associated inland harbor and portions of the cement processing plant (storage silos). Individuals traveling by boat are most likely to see these features as the remaining operations would be hidden by the surrounding buffer and remaining Mississippi River bluff. The cement plant would only be visible as the site is approached from the north, and the bluffs would conceal the entire quarry. It should be recognized however, that the current view is not that of a pristine environment and does not have any unique features that are not found elsewhere along the Mississippi River.

Rather, the view is one that has been subjected to agricultural activities, as well as past quarrying activities and has been impacted by the deposition of large tailings piles along the Mississippi River that are not consistent with natural riverine aesthetics. In addition, AmerenUE's Rush Island Plant is located immediately upstream of the project site and is an industrial site characterized by visible features such as smoke stacks, coal piles, barge fleeting areas, and a barge unloading facility. Brickeys Stone Quarry operates just south of the proposed project area and affords a direct view of barge and quarry operations. Generally, Holcim's aesthetic impacts are minor and similar to visible navigation features already encountered by individuals traveling the Mississippi River.

Holcim proposes to maintain an approximate 2,200-acre buffer area that would provide important aesthetic benefits. Individual landowners around the area would generally not be able to see the physical features associated with the project. In addition, the development of wetlands on the southern part of Lee Island, in conjunction with the wetland mitigation effort, would afford an enhancement of the aesthetics of the area. Secondly, a visible increase in truck and rail traffic may be generated during shipping operations. Holcim's aesthetic impacts are minor and similar to visible navigation features already encountered by individuals traveling the Mississippi River. In light of this information, the USACE considered the degree of contrast between visual resources both before and after the proposed action to be insignificant.

(x) parks, national and historic monuments, national seashores, wild and scenic rivers, wilderness areas, research sites, etc.: The action would cause no direct impacts to any of these designated areas. Holcim's primary land disturbance operations would be contained within the site's interior quarry area. The nearest designated resource is Harry S. Truman Memorial Park, a small unimproved park located immediately north of the AmerenUE Rush Island facility. This site is unimproved (i.e., lacking any picnic areas, restroom facilities, paved parking, etc.) but does have a boat ramp that is used for river access. Other parklands located in the vicinity of the project area include the Magnolia Hollow Conservation Area, which is located approximately 6 miles south of the site, and the Harlow Island Division of the Middle Mississippi National Wildlife Refuge located approximately 2.5 miles north of the site at Mississippi RM 141 to 145. This portion of the refuge is currently undeveloped and consists of 1,224 acres on the Missouri side of the Mississippi River. The Felix Valle House historic site is located about 13 miles from the site, and Hawn State Park is located about 17 miles from the site. Project development would not directly impact any of these areas. Navigation and shipping actions to support Holcim's operations should not result in a direct impact to any designated areas outside of the activity site, as they are no different than the navigation/shipping actions already occurring on the Mississippi River. Secondary effects could be related to the project's slight increase in river transport passing through off-site river reaches which have officially designated features (i.e. parks, monuments...). Again, the methods proposed are no different than other navigational operations already occurring near other officially designated features.

(x) navigation, traffic, transportation patterns (Each of these factors have been combined due to their interrelated ties in evaluating this proposal): Members of the United States Coast Guard (USCG) and the River Industry Action Committee (RIAC) attended an on-site pre-application meeting to view the proposed activity site and provide comments regarding the anticipated project action. In summary, based on recommendations by RIAC and requirements by the USACE, Holcim placed barrels in the Mississippi River to mark the outer extent of the proposed fleeting locations. River captains moving barge tows through the area then provided comments based on the proposed fleeting locations, which ultimately led to the

current barge fleeting configurations, as stated and shown in USACE public notice P-2259. The proposed fleeting and subsequent barge transport operations are not expected to impede or hinder navigation at the site or outside the direct project area.

In addition, the USACE knowledge of the river system and its transportation needs/patterns, allowed us to determine that the proposed project is not expected to result in significantly increased barge traffic that would strain the Mississippi River navigation system. Any increase that could be attributable to Holcim, which the USACE would expect to be negligible, would be a small percentage of the existing barge traffic already on the Mississippi River. To ship cement, Holcim uses common carrier barge lines. In doing so, Holcim relies on the common carrier “backhaul” transportation system, where costs are reduced by the carrier’s ability to schedule return shipments for other companies, so that the barge is used both ways. Barge tows moving on the river consist of loaded and empty barges moving north and south. Barges which bring salt and fertilizer up from New Orleans to northern cities could be used by Holcim on the return trip to ship cement to the southern Mississippi River market. Conversely, empty barges moving up-river to pick up grain for export could be used by Holcim to transport cement to northern markets. This practice should substantially minimize any net increase of barge traffic from the proposed plant, especially considering that Holcim is already shipping imported cement on the Mississippi River that would be replaced by the project’s production.

The RIAC also provided specific recommendations relating to matters such as the width of the north and south barge fleeting areas, and operational safety requirements such as lighting. Holcim followed the RIAC fleeting configuration recommendations in the design of the fleeting areas. Holcim would also follow the RIAC’s operational recommendations, except the recommendation to avoid tows larger than 25 barges, because this is not within Holcim’s control. The common carrier barge lines determine the size of the tows based on river conditions and the markets to which they are providing shipments.

In addition to the RIAC's review, the USCG also evaluated the proposal and stated that no impedance or hazards to navigation should result from authorization of the project. Others navigating this reach of the river should have the ability to safely pass the proposed fleeting operation if they follow safe boating procedures. To ensure navigation is not impeded by the introduction of fleeting activities at the Holcim site, the permit would be conditioned to specifically limit maximum barge configurations (widths and lengths).

In addition to the proposed action’s verified need to be centrally located on geographic portions of the Mississippi River, below lock and dam structures, the plant would also require access to a railroad line and an interstate or divided highway. Where barge shipment is not possible or practical, Holcim must have the capability to ship the finished product to customers by truck or rail. Truck or rail is also necessary to receive supplies and some secondary raw materials. Typically, truck or rail would be used for transportation over shorter distances.

Highway 61, a two-lane north-south arterial roadway, provides access to the project site, which is parallel to Interstate Highway 55 (I-55) in Ste. Genevieve County. Approximately one half mile north of the entrance to the facility is the Route TT intersection (see Figure 3-1 in Holcim’s EA). Route TT extends westerly from Highway 61 and crosses I-55. Currently, no access to Route TT is provided at I-55. From the project site, access to I-55 is obtained either at the Highway 61 interchange in southern Jefferson County or at the Route OO/DD interchange in northern Ste. Genevieve County.

Traffic volumes along Highway 61 are relatively low. Published data from the Missouri Department of Transportation (MoDOT) indicates that the year 2000 average daily traffic (ADT) volume on Highway 61 was 1,192 vehicles per day (vpd). By comparison, the volume on I-55 was 15,045 vpd. Given a standard assumption that the design hour volume (DHV) is 10 percent of the daily volume in a rural area, approximately 119 vehicles per hour (vph) are present on Highway 61 in the peak hour. Assuming the volume consists of 8 percent trucks (or 10 trucks), the level of service (LOS) on Highway 61 is a level A (good, free-flow traffic conditions). Level of service is a ranking system ranging from A (highest quality) to F (lowest quality—breakdown in traffic in both directions) as described in the Highway Capacity Manual (Federal Highway Administration (FHWA), 1998).

In order to assess potential impacts of the project on the traffic and roadway conditions of the local road system, the projected truck traffic from the Holcim cement plant was added to the existing traffic volume on Highway 61. This additional volume was used to compute the forecasted LOS on Highway 61 and to determine the effects of the Holcim plant on the traffic on Highway 61. Table 7-1, shown below, indicates traffic volumes that can be expected on Highway 61 if the Holcim plant becomes operational.

If authorized, the Holcim plant is expected to generate a peak hourly volume of 108 passenger cars and 41 trucks. This volume is expected in the morning. The projected traffic from the Holcim plant raises the DHV on Highway 61 to 268 vph consisting of 19 percent trucks (51 trucks).

Table 7-1. Breakdown of Traffic Generated by the Project

Type of Traffic	Typical Daily Volume	Peak Hourly Volume
Cement Shipping (Inbound)	132 trucks* (empty)	13 trucks
Cement Shipping (Outbound)	132 trucks* (loaded)	13 trucks
Raw Materials (Inbound)	72 trucks (loaded)	7 trucks
Raw Materials (Outbound)	72 trucks (empty)	7 trucks
Employee Traffic†	308 <sup>2</sup>	108 passenger cars <sup>2</sup>
Miscellaneous Deliveries	4 trucks	1 truck
<b>Total</b>		<b>108 passenger cars/41 trucks</b>

\*Bulk cement trucks – during peak shipping seasons, May through August.

†Employee Traffic      140 first shift employees  
                                  40 second shift employees  
                                  20 third shift employees  
                                  Use first shift as a “worst-case” volume.  
                                  Assumes 1.3 passengers per vehicle.  
                                  “Cars” include cars and light duty trucks (pickups)

Assuming that the total 268 vehicles enter and exit the plant entirely in one direction (a conservative assumption), the LOS on Highway 61 would be a level C, which is an acceptable level for a rural setting (Highway Capacity Manual, FHWA, 1998). Consequently, no significant

impact on the nearby roadway would occur. The actual LOS on Highway 61 is likely to be better than a level C, because it is likely that some of the employee traffic would originate from south of the plant.

The USACE’ knowledge in assessing riverine functions, navigation and traffic patterns further supported our review and conclusion that the related data provided in Holcim’s EA and Supplemental Alternatives Analyses represents pertinent and factual information. In conclusion, the proposed project would not adversely affect traffic, transportation and navigation patterns.

(x) energy consumption or generation: In general, energy consumption utilized at the Lee Island project would primarily result from equipment operations to remove/haul quarry resources, crush raw materials, manufacture the product, and ship to requested locations. Fossil fuels and their derivatives would be utilized as the primary energy source during site operations. Operation of the cement plant is expected to utilize the fuel as indicated in Table 7-2 of Holcim’s EA (also shown below). Gasoline, diesel fuel, and electricity would also be required to support construction and operation of other elements of the project (quarry, harbor, material transport, etc.). Adequate supplies of gasoline, diesel fuel, and electrical energy are readily available to construct the facility and operate it at its expected capacity. The proposed plant would consume significantly less energy per ton of cement than existing older plants.

Table 7-2. Anticipated Energy Usage by the Cement Plant

Energy Type/Source	Quantity
Electricity	100 Megawatts
Coal	500,000-600,000 tons per year
Waste Tires	up to 5,000,000 tires per year

Note: Start-up fuels (e.g., natural gas, liquid petroleum gas (LPG), fuel oil) would also be required for kiln operation.

Additional fuel consumption would also result from the transportation of portland cement to markets within the region. However, shipping by barge has been studied and proven to be more energy efficient than other forms of transport (truck and rail), and correspondingly consumes less energy - See Table 7-3, as shown below and in Holcim’s EA.

Table 7-3. Shipment of Lee Island Annual Production\*

Transportation Mode	Comparable Fuel Usage
Truck	40.5 million gallons
Rail	12 million gallons
Barge	4.7 million gallons

\* Assumed 500 miles in distance.

(x) safety: The project would be operated to protect the health and welfare of local residents, as well as individuals working at the site. The cement plant, harbor and quarry would comply with all appropriate Mine Safety and Health Administration (MSHA) and USCG (river operations) regulatory requirements to ensure proper worker safety and health. Safety for workers would in turn ensure protection of local residents. Blasting in the proposed quarry would occur only twice a day – once during the lunch hour period (approximately 11:30 AM – 12:00 PM), and once during afternoon shift change (approximately 4:00 PM). During each of

these times, the actual blast would last no more than approximately five seconds. The USACE evaluated the testimony of Mr. Larry Coen, Staff Director of the MDNR Land Reclamation Commission, provided during the 19-21 February 2003 MDNR Land Reclamation hearing. Mr. Coen stated Holcim's evidence satisfactorily addressed the relevant health, safety or livelihood issues, including those for which he had originally believed information was lacking. Mr. Coen testified that he did not believe the quarry would impair any neighbors' health, safety or livelihood, and again recommended that Holcim's permit be granted. The Dean of the School of Mines at the University of Missouri-Rolla also testified as an expert witness at the hearing, stating the quarry would not adversely affect the health, safety or livelihood of any neighbors.

Based on information from the land reclamation hearing, the USACE also concludes there should be no safety concern from the transportation of explosives to the quarry. Holcim would use contractors who follow U.S. DOT regulations for the transportation of hazardous material. Among the precautions are armored vehicles and separation of ignition sources (caps) from the explosives. Holcim has not had any accidents involving transportation of their explosives at other plants. The adjacent Brickeys quarry operation has been receiving explosives by truck for years without incident along the same routes that Holcim would use. Holcim did not have any explosives safety incidents during its construction of the access road. All blasting would comply with Bureau of Alcohol, Tobacco and Firearms (ATF) safety regulations.

Fleeting can be compatible with commercial navigation safety interests as long as the maximum conditioned configuration is not exceeded. Boaters on the Mississippi River must contend with barge tows and other large craft already utilizing the same stretch of river. There is a potential for accidents with any type of operation, just as there is with the many forms of transportation. Boaters who use common sense and do not challenge potentially dangerous portage situations could be assured a safe boating experience. As long as restrictions on fleeting operations are adhered to and other boaters observe safe passage distances near the fleeting area, navigational safety concerns should remain minimal. From a safety perspective, barge transportation is preferable. According to the USDOT, the accident rate for large trucks was one accident per 16 million ton-miles. Rail transport's accident rate was one per 257 million ton-miles, while the accident rate for barges was only one per 600 million ton-miles (USDOT, Environmental Advantages of Barge Transportation, 1994). The project is not expected to create unacceptable safety issues.

(x) air quality: During initial development (e.g., construction of the harbor and fleeting areas, construction of the cement plant, establishment of fill areas and haul roads in the quarry, and preparation of the quarry) air emissions would consist of dust and engine exhaust from equipment and vehicles. Air emissions from these initial development activities would be temporary.

During both initial development and operation of the project, Holcim would control dust by watering dry areas, or using other methods as necessary, to comply with MDNR air regulations limiting the emission of fugitive dust. For example, during operation of the quarry, haul roads would be watered or dust suppressant would be applied as needed to ensure fugitive dust is properly controlled. Also, dust settles out of the air rapidly, further minimizing the potential for adverse dust impacts.

Using standard air dispersion modeling methods, Holcim studied the potential impacts of particulate matter (dust and engine exhaust) from the project on the surrounding area. Two worst-case scenarios were modeled: (1) the initial temporary project development activities (as described above); and (2) year 10 of quarry operations (e.g., drilling and blasting, loading and unloading, hauling, and crushing) combined with other project air emissions. For each scenario, the modeling determined the concentrations of PM<sub>10</sub> (coarse particulate matter) and PM<sub>2.5</sub> (fine particulate matter) in the ambient air outside the project site boundary, including appropriate background levels.

The modeling demonstrated that under each scenario, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations would be below the applicable USEPA National Ambient Air Quality Standards (NAAQS). The NAAQS are standards that have been developed to protect human health (including the most sensitive part of the population). The PM<sub>10</sub> NAAQS have been in effect for a number of years; the PM<sub>2.5</sub> NAAQS have been promulgated, but have not yet been implemented. The modeling results show that no significant impact would occur to human health from project particulate matter emissions, either in the area immediately surrounding the project site or in the St. Louis metropolitan area. Moreover, project particulate matter emissions would be primarily composed of limestone dust, which is not toxic.

In addition, Holcim cannot begin construction of the project without an air permit from the MDNR Air Pollution Control Program. Holcim cannot obtain an MDNR air permit without demonstrating that the project's air emissions would comply with all applicable federal and state air quality and control standards. Those standards, which include the NAAQS, have been developed to protect human health (including the most sensitive part of the population) and the environment.

The USACE has evaluated information made available from the ongoing MDNR air permitting process, and concludes there appears to be reliable scientific data showing that the air quality impacts from the Holcim project would not be significant. The USACE further notes that the project will not be permitted to go forward if MDNR concludes that the air quality impacts are unacceptable.

As part of the air permitting process, Holcim has conducted air dispersion modeling for both criteria pollutants (e.g., PM<sub>10</sub>, sulfur dioxide, oxides of nitrogen, and carbon monoxide) and hazardous air pollutants (HAP) (including mercury) using MDNR-approved procedures. The modeling demonstrated that project criteria pollutant impacts would be below the applicable NAAQS, indicating no significant impact would occur to human health from project air emissions. The modeling also demonstrated that project criteria pollutant and HAP emission impacts, including impacts of atmospheric deposition to plants, soils, or animal life in the vicinity of the project, would be below USEPA and MDNR-defined impact thresholds, indicating no significant impact would occur to the environment from project air emissions.

In addition to the HAP modeling results, evidence from a MDNR water quality certification hearing showed that mercury air emissions are considered a global problem, the vast majority of elemental mercury is not readily deposited and is transported globally, mercury problems in water do not have a direct correlation with the facilities neighboring those waters, and there is not a current mercury toxicity problem in the Mississippi River. After the hearing, Holcim engaged AER, Inc. to study the potential effects of atmospheric deposition of mercury emissions from the Holcim cement plant on fish in the Mississippi River. AER demonstrated that at most,

the project may cause a 0.39 ppb increase in the existing 131 ppb value for mercury in Mississippi River fish located in the vicinity of the project. This potential increase is considered very small compared to the 300-ppb threshold used by the State of Missouri for health-based fish advisories, and in practice would probably not even be measurable. Based on the AER report, section 7.9 of Holcim's EA, and the other evidence about mercury submitted to the USACE, the project's mercury air emissions would not have a significant impact on Mississippi River fish or human health.

As another part of the air permitting process, computer modeling conducted by a Holcim consultant (Environ International Corp., 2001) and separately by a USEPA/MDNR consultant (Alpine Geophysics, 2001) has shown that project air emissions would have an insignificant impact on local and regional ozone air quality.

Recently, the MDNR concluded that the emissions controls proposed by Holcim in its air permit application are the Best Available Control Technology (BACT), a requirement under the air-permitting program. The USACE has received and reviewed Holcim's application for the MDNR air permit, the addenda to the application, the modeling reports, and the BACT determination.

The Corps of Engineers has taken the above construction and operational air quality issues into consideration. In addition, the proposed permit action has been analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. It has been determined that the activities proposed under this permit would not exceed *de minimis* levels of construction-related emissions of a criteria pollutant or its precursors and are exempted by 40 CFR Part 93.153. Any later operational emissions are generally not within the Corps continuing program responsibility and generally cannot be practicably controlled by the USACE. For these reasons a conformity determination is not required for this permit. Operational (post-project) air quality issues are under thorough evaluation by the MDNR Air Pollution Control Program. The MDNR accepted the task to oversee and mandate a permit program, pursuant to Clean Air Act regulations, under the oversight granted by the U.S. EPA. As such, the MDNR serves as the lead agency to oversee the applicable federal air permitting regulations in the state of Missouri. All project induced air emissions/air quality issues would be thoroughly considered in the MDNR's permit analyses. In terms of fugitive dust, the MDNR also has existing regulations in place to limit the emission of fugitive particulate matter or "dust" from the plant site. If a Department of the Army permit were authorized, it would not alter future air emission levels imposed by the lead air regulating agency. The USACE will not attempt duplicate detailed analysis of areas that are not reasonably under direct authority of the Clean Water Act. Air quality standards would be further assured by conditioning the potential Department of the Army permit to state that all project related activities within the site's jurisdictional waters of the United States are prohibited until all other federal and state authorizations are obtained.

(x) noise and vibrations: Noise is unwelcome or unwanted sound that usually is caused by human activity and added to the baseline acoustic setting. It is defined further as sound that disrupts normal activities or that diminishes the quality of the environment. Community response to noise generally is based not on a single event, but on a series of events over the day. The standard measurement unit of noise is the decibel (dB), generally weighed to the A-scale (dBA), which corresponds to the range of human hearing.

Holcim's design of the cement plant would incorporate state-of-the-art technology to reduce noise, and must meet regulatory limits established by the Mine Safety and Health Administration (MSHA) for ambient noise both inside and outside. As demonstrated at the MDNR Land Reclamation hearing, noise, vibration, and airblast impacts from blasting or other operations in the quarry would be limited by several factors, including landscape features, distance, and blasting controls. The natural landscape, including the bluffs along the Mississippi River, the surrounding hills, and a ridge between the quarry and Isle du Bois Creek, would keep the quarry relatively isolated and provide good containment of sound from the quarry. The buffer area, which would surround the quarry on all sides, would prevent any development encroaching on the quarry. As explained in Section 7.17 of Holcim's EA and at the land reclamation hearing, the buffer area would maintain substantial distance – typically at least 1 mile – between the quarry and local residents. In addition, blasting would occur only during daylight hours, typically once in the morning (approximately 11:30 a.m. to 12:00 p.m. and once in the afternoon (approximately at 4:00 p.m.). After considering the evidence from the land reclamation hearing, the USACE determined that the site's distance from surrounding landowners, the buffer, the natural attenuation of noise and vibration energy by the intervening rock formations, and the rugged terrain will prevent quarry operations, as well as other project activities, from having a significant noise or vibration impact on local residents. In addition, all blasting would be required to comply with the applicable ATF and MSHA regulations, and with guidelines developed by the Office of Surface Mining Reclamation and Enforcement (Department of Interior).

The USACE further recognizes that Holcim's experience in the cement industry makes the company very competent in using a variety of standard blasting practices to help ensure that ground vibrations do not adversely impact neighboring homes or other structures.

These conclusions are confirmed by the construction of the existing access road. During the access road's construction, no complaints or concerns were received from adjoining neighbors while Holcim conducted blasting in the 64-acre quarry area (approved by a USACE NWP 14 and a MDNR land reclamation permit). As shown at the land reclamation hearing, Holcim has also conducted on-site testing of experimental blasting using seismographic equipment. This testing determined that blasting can be properly controlled at the site and there are no unusual geologic features that would adversely affect the use of standard blasting controls. The study also concluded that there would be no damage to aboveground or underground structures beyond 1,000 feet. During the night, quarry operations would be limited to drilling, loading, hauling, and crushing operations, which generate minimal noise. Quarry operations would also be subject to regulatory limits established by MSHA for ambient noise.

Fleeting, truck and rail operations would cause some increased noise while supporting plant and transportation operations. However, the approximate 2,200-acre wooded buffer surrounding the outer perimeter of the quarry area should greatly abate noise, thus minimizing any effect on adjoining properties. Many species of wildlife, found within areas where noise would be introduced, would adapt to noise or have the ability to relocate to surrounding lands, including the undisturbed buffer and future reclamation areas. The effects of the project, including noise, on endangered species, including the Indiana bat, were considered under Section 7 of the Endangered Species Act with the FWS. These factors, as well as other project-induced actions, were addressed in the BA and Final BO. FWS determined that the proposed actions, including

introduced noise levels, would not jeopardize the Indiana bat or adversely affect the other endangered species that were considered, provided Holcim's conservation measures are implemented.

(x) historic properties (Section 301(5) National Historic Preservation Act): Cultural resources are prehistoric or historical sites, structures, districts, artifacts, or other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources are divided into archaeological resources (prehistoric and historical), historical buildings and structures, and traditional resources (for example, American Indian artifacts or burial grounds).

The primary federal laws that pertain to the treatment of cultural resources during the NEPA process are the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act. Section 106 of the NHPA requires that federal agencies consult with the state historic preservation officer (SHPO) before taking any actions that have the potential to affect cultural resources.

An archaeological consultant analyzed the potential presence of sites eligible for listing under the National Historic Preservation Act. The work included a "Phase I" cultural resource survey at the project site, which identified a number of prehistoric, historic and modern architectural sites. In coordination with the responsible government agency, the Missouri SHPO, only five of the prehistoric sites were determined potentially eligible for inclusion on the NRHP. Of those five sites, only one – a prehistoric Native American field camp – would actually be impacted by the project. This site is referred to as "23SG1."

Subsequently, the consultant performed a "Phase II" investigation of Site 23SG1. This work resulted in a 2 January 2002, Memorandum of Agreement (MOA), under section 106 of the National Historic Preservation Act, between the USACE, the SHPO, and Holcim. The MOA primarily addresses the recovery of significant information from Site 23SG1. However, as a precaution, the MOA also provides that Holcim would protect any historic sites potentially eligible for inclusion on the NRHP, should they be determined in the future to be affected by the project.

The MOA provides for the handling of Site 23SG1 by means of a "Phase III" "data recovery" operation. Data recovery operations would be conducted in accordance with a plan attached to the MOA. The operations would be carried out by trained archaeologists, who would conduct a field investigation and excavation, in accordance with standard Department of the Interior procedures to collect all significant cultural artifacts and deposits. All recovered material would be returned to a laboratory where it would be washed, sorted, and cataloged. As appropriate, some of the material would be tested or analyzed using specialized techniques such as radiocarbon dating. A report would be provided within 12 months to the SHPO following Phase III data recovery. All recovered material and records would be permanently curated at the Division of American Archaeology, University of Missouri, Columbia, or approved alternate location.

Efforts were made during the development of the MOA to coordinate with Native American groups that may have an interest in the various prehistoric sites at the project site. However, no Native American tribes were identified with religious or cultural interests or concerns that would be affected at the project site.

Pursuant to the MOA, cultural resources at the project site would be handled properly under the requirements of the National Historic Preservation Act and state regulations. The Phase III data recovery operation at Site 23SG1 would ensure that there would be no significant impacts related to cultural resources because the artifacts from this location would be collected, removed, and preserved.

(x) land use classification: The project would occur on lands owned by Holcim, within Ste. Genevieve County, Missouri. A minor portion of the action area lies within Jefferson County, Missouri, where no direct actions are proposed. The site is primarily composed of rugged upland terrain where the buffer zone and quarry operations are intended. A smaller portion of the project area contains flood plain and floodway areas along Isle du Bois Creek and the Mississippi River. Agricultural lands are scattered along Isle du Bois Creek and on the Lee Island area adjacent to the Mississippi River. Portions of Lee Island would be utilized for the construction of the inland harbor, while remaining farmed areas on the southern portion of Lee Island and along Isle du Bois Creek would become part of the proposed wetland mitigation area.

Official land use designations (zoning) do not exist in Ste. Genevieve County at this time. As such, the proposed activities would not alter county designations. The proposed use of the site is consistent with some past land uses, as a part of the project site had been used as a quarry. Some undeveloped portions of the site would be converted from open space to industrial uses. As a result of reclamation activities, quarried areas would ultimately revert back to open space with more natural habitats and characteristics. The buffer area, approximately 2,200 acres, would be maintained as open space and would sustain its present land use designation. The reclamation activities would return similar land features and add a lake. Mitigation activities would return the majority of the site's agricultural lands to their historic land use as a riparian corridor and/or wetland functions. The proposed fleeting area on the Mississippi River is and would remain open water, and would not require a change in use.

(x) economics: At the USACE's request, Holcim prepared a thorough alternatives analysis, including an evaluation of economics. The USACE has independently reviewed the actions associated economic factors and furthermore concluded that the economics information contained in Holcim's Supplemental Alternatives Analyses is an accurate and justified representation.

Cement plants are major facilities requiring significant capital investment. For example, construction of the proposed Lee Island project would cost approximately \$600 million, take 3 years, and require approximately 3 million work-hours. Many years of production and sales are required to recoup the investment in a new cement plant. Because of the significant investment required and the competition within the industry, economic feasibility is a crucial factor in the selection of plant size and location. While the construction figure represents a major investment by Holcim, it also represents a future economic boost to the Midwest and the area's employment opportunities.

Two of the most important factors in determining the economic viability of a project are: (1) unit cost of production - i.e., the ability to produce low-cost cement, and (2) the cost of transportation - i.e., the cost associated with delivering cement to the customers. These factors were previously discussed under the evaluation of navigation/traffic/transportation patterns.

As previously stated, the project was determined to create approximately 200 long-term, good-paying jobs and an annual payroll of approximately \$10 million to Ste. Genevieve County. A study entitled “The Economic Impact of the Lee Island Cement Plant in Ste. Genevieve County” was also conducted at Holcim’s request by the Center for Economic and Business Research in the Donald L. Harrison School of Business at Southeast Missouri State University (See Appendix A of Holcim’s EA). This study determined that the project would:

- During the peak year in the construction phase, create 431 direct construction-related jobs and another 281 indirect jobs for residents of Ste. Genevieve and Jefferson counties;
- During the peak year in the construction phase, create 848 direct construction-related jobs and another 938 indirect jobs on a statewide basis.
- After construction, increase annual employment in the state by 536 new jobs as a result of project operations and additional spending created by the project and its employees;
- After construction, increase annual personal income in Jefferson and Ste. Genevieve counties by \$24 million and in the state by \$32 million;

In addition, Holcim would be responsible for payments to the Ste. Genevieve County R-II School District totaling more than \$35 million over 20 years, and payments to Ste. Genevieve County of more than \$12 million over 20 years. As a result of those payments, Holcim would be one of the largest contributors to the county’s overall revenue base. If the project were to become operational, the state would receive an additional \$1.37 million in retail sales and personal income tax revenue. In summary, the USACE determined that the project would have a beneficial impact to the regional and state economies.

(x) prime and unique farmland (7 CFR Part 658): Candidate prime and unique farmland occurs in agricultural fields on Lee Island and along Isle du Bois Creek. Some of the factors associated with categorizing prime or unique farmland are soil type, physical location and outside factors affecting the land (i.e. tiling, ditching, levees). Three prime farmland soil types, Auxvasse, Beaucoup and Carr, occur on Holcim property, as shown on the Natural Resource Conservation Service's (formerly Soil Conservation Service) county soil survey maps. Soils in the Auxvasse series must be drained to meet prime farmland status. Auxvasse soils are mapped in past quarry operation areas that lack the presence of manmade drainage features. Therefore, this area was discounted as a candidate prime and unique farmland. Soils within the Beaucoup series must be drained and have flood protection to receive consideration as a prime farmland. Previous drainage features are evident, but the lack of flood protection discounted this area as candidate prime farmland. Unprotected farmland on Lee Island contains soils in the Carr series. Since levee protection is not required for Carr soils, the project would directly impact 5.2 acres of prime farmland during the construction of the inland harbor. The loss of this acreage is considered minute compared to the vast acreage of lands remaining in agricultural production along the Mississippi River's flood plain. Tree plantings associated with mitigation would also occur on Lee Island farmland. The planting activities would not alter the presence of potential prime farmland soils.

(x) food and fiber production: Past landowners elected to clear cut portions of the site's natural woody vegetation to create agricultural production areas. While these actions introduced

food and fiber production, present day grain yields have created surplus reserves, which ultimately lower demand. If the proposed action were authorized, the Lee Island project would remove approximately 22 acres of land from active crop production. This loss would not hinder food and fiber supply or production, in light of agricultural surpluses and continuing advances in bioengineering and hybridization. Other previous landowners logged the site's trees for what may be considered fiber production. Holcim would continue this process by sequentially removing a total of approximately 1,120 acres of forestland to access the rock resource below. Holcim, unlike other quarry operations, would take the extra step to reforest the majority of the reclamation areas. The phased process of removing and subsequently replanting trees should have minimal effects on the areas potential fiber production. Aquatic life harvested for food (i.e. fish) from the Mississippi River should not be altered as the result of the proposed fleeting and harbor activities or the inland quarry operations.

(x) mineral needs: The primary action associated with this project is to quarry on-site mineral resources for use in manufacturing cement products. Other off-site mineral reserves would be required for facility operation. Raw materials that would be required from off-site sources include sand, clay, gypsum, iron ore/slag, flyash, and bottom ash. Such minerals also include the necessary coal and petroleum that would be needed to supply the facility with the required energy sources needed for operation.

Holcim's quarry plan is dependent on characterization of the site's mineral reserves. Models were developed and studied by Holcim to determine the location and amount of minerals needed to manufacture cement. From these studies it was determined that approximately 75-80 percent of the minerals within the deposit areas on the project site can be used in the cement manufacturing process. This process also defined the proposed quarrying sequence, which focused on creating the greatest mineral resource extraction over the smallest possible surface area.

The overlying rocky soils (overburden) averages about 22 feet, but many areas have exposed bedrock. The underlying Joachim Dolomite cannot be used due to high magnesium content. The Joachim Dolomite is a regional barrier to groundwater movement and separates the quarrying units from the underlying St. Peter Sandstone, which is a useable aquifer.

Holcim's provided information and studies show the site's geologic strata to exhibit a 3-degree slope to the east. Consequently, site reserves are thickest in the areas closest to the Mississippi River, towards the east end of the proposed quarry, and thin out as the quarry proceeds west. This geologic feature therefore limits the area available for a quarry on the project site. At the point where the Joachim Dolomite outcrops on the project site (the location of the dolomite glades), all lithologic layers needed to manufacture cement are gone due to erosion over time.

A geologic column showing the bedrock formations at the site can be viewed in Figure 3-1 of Holcim's Companion Report. The pertinent bedrock formations at the Lee Island site consist predominantly of limestone interbedded with thin (10 to 20 feet) shale beds. These formations are underlain by the Joachim Dolomite (approximately 200 feet). The bedrock formations that can be utilized in the manufacturing of cement are the Bloomsdale Limestone (average 16 feet), the Plattin Limestone (average 210 feet), the Maquoketa Shale (average 26 feet), the Fern Glen Formation (average 27 feet), and the lower 67 feet (average) of the 127-foot thick (average) Burlington Limestone. The Plattin Limestone is the principal quarrying unit at the site. These pure, high calcium, low alkali, low magnesium mineral deposits have the necessary chemical

composition for manufacturing cement. In addition, the lower Burlington limestone has a high silica content that is needed for cement.

The on-site formations that cannot be utilized in Holcim's manufacturing of cement are the Decorah Shales (average 8 feet), the Kimmswick Limestone (average 40 feet) and the upper (average 60 feet) of the Burlington Limestone. The Decorah Shales is considered unusable in the process because of high alkali content. The upper 60 feet (average) of the Burlington stratum cannot be used due to excessively high silica content, while the Kimmswick Limestone cannot be used because of its high organic content that would increase volatile organic compound (VOC) emissions from the plant. These formations would be used for quarry reclamation purposes.

The cement manufacturing process requires additional minerals either not found or in adequate quantity on the existing site. The following off-site materials must be obtained as additives in formulating the intended cement product: sand, clay, gypsum, iron ore/slag, flyash and bottom ash. Fly ash and bottom ash are typically by-products of burning coal materials. The adjacent AmerenUE facility currently places these materials in a slurry and landfill type setting. Holcim could potentially utilize these materials and circumvent the damage and loss of lands from AmerenUE's by-products disposal. Fly ash and bottom ash generated at other coal burning facilities (often located in the River system, with existing off-loading facilities) could be shipped to the proposed Lee Island site. General operations of the plant would also require the consumption of coal and petroleum products to supply energy in manufacturing cement. Rail or barge transportation would likely be utilized to supply these unavailable mineral resources. The proposed action would convert the existing mineral resources into a highly demanded cement product.

(x) consideration of private property: Land adjacent to Holcim's property exhibits light development, mainly occupied by larger tract single-family dwellings and additional forested areas intermixed with open grazing and farmland. Holcim purposely set aside approximately 2,200 acres surrounding the quarry area to serve as a noise, light, dust and visibility abatement feature in consideration of surrounding properties. Portions of the existing Mississippi River bluff, adjacent to Lee Island, would be set aside to buffer the quarry and cement plant's potential effect on Illinois landowners. Illinois properties, situated along the opposite left descending bank of the Mississippi River, are primarily lower lying lands in agricultural production. Flooding potential on nearby Illinois properties inhibit residential development for several miles from project activities. Portions of Lee Island not utilized for the construction of the inland harbor would be reforested to provide wetland mitigation and to further enhance buffering. Similarly, existing agricultural fields along Isle du Bois Creek would be revegetated to supplement mitigation and add buffering capabilities. All but two tributaries in the project area contain their flows within Holcim's property. Drainage from Long's Hollow and Wolf Hollow, which is ephemeral to seasonally intermittent, originates in the southwestern portion of the property and continues in an easterly direction before leaving Holcim's property. From there, a short distance of these flows pass through private lands primarily utilized by a hunting club. Flow alteration to these drainages should have minimal impact on the adjacent property. AmerenUE (a large electric utility) operates on lands situated just northwest of Holcim's boundary, and has constructed on its property a coal-fired electric generating station, outside coal storage, a large fly ash disposal pond adjacent to Isle du Bois Creek, and a barge fleeting area on the right descending bank of the Mississippi River. Brickeys Quarry has an

existing limestone quarry operation to the southeast. Both AmerenUE and Brickeys Stone operate without a large, dedicated buffer area like Holcim's proposal.

On 19-21 February 2003, the MDNR held a land reclamation hearing to address potential impacts of the quarry on adjoining landowners. Information from that hearing including the transcript was provided and reviewed by the USACE. The evidence at the hearing, including testimony of the MDNR Land Reclamation Commission Staff Director, showed that activities in the quarry such as blasting, loading and hauling, crushing, and reclamation will not cause adverse effects to any neighbor from dust, noise, blasting, vibrations or other means because of the distance between the quarry and neighbors, the substantial buffer area, the hilly and wooded topography that will surround the quarry, and other factors such as Holcim's expertise in quarry operations.

Distance, topography, and the buffer area would also help control potential dust, noise, and other impacts from other components of the project such as the cement plant. The buffer area would maintain considerable distance, typically one mile or greater, between homes of local residents and project activities. To the west, the nearest resident is approximately 1.5 miles from the cement plant and approximately 2/3 mile from the closest point in the quarry. To the northwest, the nearest resident is about 1.8 miles from the cement plant and the closest point in the quarry. To the south, the home of the nearest resident is approximately 1 mile from the closest point in the quarry and farther from the cement plant.

If a Department of the Army permit is issued, it would be conditioned to require the establishment of an undisturbed 2,200 acre buffer zone around the project and to limit duration/timing of specific project activities. This condition should provide an adequate buffer distance between the project area and the nearest adjoining properties to minimize potential property effects.

Due largely to the protective effect of the buffer, the project would not cause decreased property values in the local area. Holcim conducted a study that demonstrated properly operated quarries with buffer areas do not have an adverse effect on local property values. The study also showed that Holcim's Clarksville quarry and cement plant did not have an adverse effect on local property values. In addition, the cement plant, quarry, and harbor would not be visible to local residents, and as explained in Holcim's EA, Section 7.10, there would be no significant impacts from blasting or other noise. Further, as explained in Section 7.1 of Holcim's EA, there would be no adverse impact to the water wells of local residents, and as explained in Section 7.9, there would be no adverse dust impacts. For these reasons, the project would not cause any significant impact to private property.

(x) environmental justice: Executive Order 12898 requires that federal agencies identify and evaluate potential disproportionately high and adverse environmental effects on minority and low-income populations. The residential population within the vicinity of the project is located in a rural setting and is not characterized as being composed of either low income or minority groups. Therefore, no disproportionate adverse impact to such groups would occur as a result of the project.

( ) other: none.

F. Summary of indirect, secondary and cumulative impacts or effects: Direct impacts are those localized and immediate in their effect (e.g., physical removal/loss of jurisdictional waters of the United States); indirect impacts are those that may effect those same resources, but would be evident somewhat later in time or somewhat removed in distance from the primary areas of operation, and are still reasonably foreseeable (e.g., changes in groundwater flow or water sources to waters of the United States). Secondary impacts/development, a term that typically refers to those impacts that result from the off-site growth-induced effects of a project, are those impacts associated with resulting residential and commercial development, and the construction of needed infrastructure (roadways, utilities, etc.). However, potential secondary development must be reasonably foreseeable to warrant analysis under NEPA. Cumulative impacts are those that may result from the incremental impact of the project when added to known or potential impacts from other past, present, and reasonably foreseeable future actions.

Every application must be considered on its own merits and its impacts on the environment must be assessed in light of historical permitting activity along with anticipated future activities in the area. Although a particular project may constitute a minor impact in itself, the cumulative effect of a large number of such projects could cause a significant impairment of water resources and interfere with the productivity and water quality of existing aquatic ecosystems.

**Indirect Impacts:** Potential indirect impacts from the project have been addressed in many of the previous sections of this document. For example, potential indirect impacts were analyzed to the:

- Water quality and hydrology of Isle du Bois Creek;
- Water quality and hydrology of the Mississippi River (including potential indirect impacts due to barge fleeting, harbor construction and operation, and maintenance dredging);
- Groundwater;
- Wetlands and aquatic resources of the project area;
- Local residents (potable groundwater supply, dust, noise and blasting impacts);
- Capacity and condition of adjacent roadways, and
- Socioeconomic factors such as employment, income and tax base;

As pointed out throughout this document, Holcim followed the required sequencing process (avoidance, minimization and mitigation), which resulted in no significant impacts to earlier assessed factors. Holcim has also taken additional measures to avoid, minimize and mitigate for features that typically are not under the direct jurisdiction of the USACE (uplands). Compensation for upland impacts, such as Holcim's proposal to revegetated/reforest the reclamation areas in phases following each quarry progression would help to stabilize soils in the re-created rugged upland terrain, supply shade for recreated streams and maintain detrital input. These actions would offset potential indirect water quality effects on nearby waterways (Isle du Bois Creek and the Mississippi River). Holcim would also voluntarily set aside an approximately 2,200 acre buffer area around the proposed quarry limit to avoid potential indirect impacts that could otherwise be caused by the quarry's associated noise, vibration, light and dust. Holcim would also install sedimentation basins and apply BMP's in key project locations to manage intermittent flows (hydrology) and water quality before they indirectly impact receiving waterways and local groundwater. Holcim would also take additional precautions by storing secondary materials, such as coal, in contained storage areas. This measure would abate potential indirect coal dust and tainted storm water impacts from entering nearby aquatic

resources. The USACE determined that Holcim's proposed operations would result in no significant indirect impacts because of the additional efforts undertaken to avoid, minimize, and mitigate for potential project impacts.

Similarly, the creation and restoration of wetlands on Lee Island and along Isle du Bois Creek would compensate for the loss of wetland functions, preventing indirect effects to the aquatic ecosystem that otherwise may occur. Indirect effects resulting from the creation and restoration of wetlands along Isle du Bois Creek and on the southern half of Lee Island are expected to be positive, as such wetlands would:

- Increase soil stabilization and reduce erosion;
- Halt the need for future pesticide/herbicide applications as well as halt the need for applying high concentrations of nitrogen and other fertilizers;
- Produce natural wetland filtering functions;
- Increase beneficial detrital, mineral and nutrient input;
- Contain wetland plant communities with greater diversity/quality and therefore, improve wildlife habitat;
- Provide expanded and improved wetland foraging areas for such wildlife as the great blue heron and the Indiana bat; and
- Increase the function and value of the site as a foraging and nursery area for fish and other aquatic life.

**Secondary Impacts:** No extensive secondary development as a result of the project is anticipated, although the project is expected to generate favorable economic growth in the Ste. Genevieve County and Jefferson County area (the two-county region). For example, the project would bring approximately 200 long-term jobs and an annual payroll of approximately \$10 million to Ste. Genevieve County (Southeast Missouri State University, 2001).

Most of the workers at the plant would reside within a variety of communities within the two-county region (which includes Festus/Crystal City, Bloomsdale, and Ste. Genevieve, Missouri), but some may commute from the St. Louis area and Illinois. Potential secondary residential development resulting from the project is expected to be limited, as most workers would likely commute from their current residence, or rent/buy an existing apartment or home. Some limited new construction may occur, but such development would likely take place within existing residential areas or occur on a very sporadic basis in rural areas. The USACE does not consider secondary impacts due to such limited, sporadic development as a factor causing significant land use changes or potentially causing adverse impacts to waters of the United States.

Similarly, extensive new commercial support development is not expected in the immediate area surrounding the project site. Once constructed, the cement plant should be the type of operation to function without heavy reliance on other commercial support. The concentrated presence of other similar quarry/plants in the Ste. Genevieve area has likely already created the presence of commercial supporting businesses, including equipment/repair facilities. The most likely scenario for commercial support may include a gas station, convenience store or restaurant at the nearest I-55 interchange. At present, the nearest interchange to the north (7 miles) is at Highway 61, which is served by a single gas station. The nearest interchange to the south (3 miles) is the OO-DD Highway interchange, which has no services.

As previously discussed in the traffic and transportation section above, the project is expected to increase local traffic. This traffic would only occur on Highway 61, a two-lane main road that runs roughly parallel to I-55. MoDOT has proposed a new I-55 interchange at Route TT that would be constructed relatively near the project site. If this interchange is built as proposed, increases in local traffic on TT may create a demand for a gas station, convenience store or a restaurant at the I-55/TT interchange. Such a development may consist of minimal building structures, fuel pumps, and associated parking, and would likely occur on a relatively small parcel of land (e.g., likely less than 2 acres). The USACE considers impacts from such limited secondary commercial development as insignificant. The new interchange at Route TT would substantially reduce traffic on Highway 61, thereby improving its level of service.

### **Cumulative Impacts:**

A cumulative impact analysis must consider the potential impact on the environment that may result from the incremental impact of the project when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The methodology for performing such analyses is set forth in “Considering Cumulative Effects Under the NEPA” (Council on Environmental Quality (CEQ), 1997) and includes the following:

1. Identification of the area in which effects of the project may be felt;
2. Assessment of the impacts that are expected in that area from the project;
3. Identification of other actions (past, present, and reasonably foreseeable) that have had or are expected to have impacts in the same area;
4. Assessment of the impacts or expected impacts from these other actions, and
5. Assessment of the overall impact that can be expected if the individual impacts are allowed to accumulate.

Holcim provided a cumulative impact assessment within the context of three geographic areas. The geographic areas for analysis were selected based on the environmental effects that may occur to each of the primary resources under consideration. Primary resource categories and their associated geographic areas are as follows.

1. **Water-related Effects:** The area in which water-related effects of the project may be evident was determined to include the project site, the watershed of Isle du Bois Creek, and the Mississippi River from Crystal City in southern Jefferson County to the southern boundary of Ste. Genevieve County. Selection of a portion of the Mississippi River upstream of the project site was designed to allow for consideration of actions occurring in upstream areas and their potential for cumulative impacts on downstream areas.
2. **Upland-related Effects:** The area in which upland-related effects of the project may be evident is the area from Festus-Crystal City in southern Jefferson County to the southern boundary of Ste. Genevieve County. This area was selected in order to consider potential cumulative impacts on birds and wildlife from forest fragmentation south of the St. Louis metropolitan area.
3. **Air Quality-related Effects:** The area in which air quality-related effects may be evident is the St. Louis ozone nonattainment area and the Ste. Genevieve County PSD airshed.

### **Water-Related Effects**

#### **Background and Area of Analysis**

A proper analysis of potential cumulative impacts to wetlands and other aquatic resources must consider that both direct and indirect water-related effects of the project would be mitigated by Holcim, as described in more detail throughout this document. The analysis must also consider the context within which the project is located, which is the Mississippi River and the watershed of Isle du Bois Creek. The reach of the Mississippi River between Crystal City and the southern

boundary of Ste. Genevieve County is a relatively undeveloped area characterized by limestone bluffs close to the river along the Missouri side and a wider bottomland flood plain on the Illinois side. Historically, there has been a significant loss of wetlands and extensive closure of side channels within this reach due to the construction of an extensive levee system coupled with drainage of agricultural lands. This area, together with the watershed of Isle du Bois Creek provides a sufficiently large enough context within which the potential water-related cumulative effects of the project may be analyzed.

Over the past approximate 100-years, the Middle Mississippi River's (MMR) wetlands and aquatic resources have been significantly altered as a result of the construction of projects aimed at improving navigation (wing dams, bendway weirs, deflective structures, etc.) coupled with the expansion of agriculture within the flood plain (resulting in drainage and land clearing). However, in recent years, the wetland resource within this segment of the MMR has stabilized and has even demonstrated willow and cottonwood stand regeneration within flood plain areas (U.S. Geological Survey (USGS), 1999). As a result of the extensive levee system, wetlands within the MMR are largely confined to the area within the levee system and along the main channel of the river. It is this resource that is most vulnerable to cumulative impacts from the project when considered in combination with other regional actions. Consequently, the evaluation of cumulative impacts to water resources focused on this geographic area.

### **Analysis of Cumulative Effects**

Figure 8-2, of Holcim's EA, presents a compilation of the National Wetland Inventory (NWI) wetlands (including the main stem Mississippi River) within this area from Crystal City to the southern boundary of Ste. Genevieve County. In total, wetlands and open water account for 49 percent (25,287 acres) of the geographic area. Outside of the main channel, the dominant wetland resource consists of forested wetlands (9,835 acres) and emergent wetlands (2,137 acres). Scrub shrub wetlands account for a lesser amount of the resource (965 acres). By contrast, the project would impact approximately 14 (mostly farmed) acres of wetlands, which represents only approximately 0.03 percent of the geographic area and 0.1 percent of the wetlands within the geographic area. In addition, the project would create, enhance or restore approximately 61 acres of wetlands to compensate for the 14 acres of mostly farmed/degraded wetlands impacted by the project.

There are several active mineral or industrial operations on the Missouri side of the Mississippi River that operate within the geographic area of consideration:

- Weber limestone aggregate quarry fleeting area (approximately 3 miles below Crystal City);
- River Cement plant, quarry, and fleeting area (approximately 6 miles north of Lee Island);
- AmerenUE's Rush Island power plant (immediately north of Lee Island);
- Brickeys Stone limestone aggregate quarry (approximately 1 mile south of Lee Island);
- Tower Rock/Chemical Lime aggregate quarry, lime plant, and fleeting area (just north of the town of Ste. Genevieve); and
- Mississippi Lime's barge load-out facility (0.25-mile north of the ferry port in Ste. Genevieve).

Each of these facilities is an existing permitted (or grandfathered) operation that forms the long-established baseline land use within the area.

Figure 8-2 and Table 8-1 of Holcim's EA identifies recent, past, present, and reasonably foreseeable future actions within this geographic area that can be assessed to determine cumulative effects on the wetland and aquatic resources. This information, developed from USACE Public Notices, indicates that within recent years (i.e., since 1998), seven projects have been proposed that entail some in-stream work within the Mississippi River (fleeting, dredging). Several other proposed or foreseeable actions on this reach of the Mississippi River were at one time proposed in writing and conversation with other potential applicants. These actions, however, have been withdrawn or otherwise cannot be considered. The proposal to construct the Kimmswick Casino has been dropped (this project is outside the area of this analysis). Continental Cement is no longer pursuing the construction of a cement plant north of Ste. Genevieve, but instead may expand their Hannibal, Missouri plant, which is outside the area of this analysis. River Cement has not submitted a permit application for potential plant expansion, and therefore, impacts associated with its action are uncertain. In addition, Chemical Lime recently contacted the USACE to discuss potential permit requirements associated with fleeting actions near their existing river terminal. Actions regarding Chemical Lime's recent inquiry are unknown as no application or discussion of potential fleeting locations/configuration has been provided. There are no other reasonably foreseeable future projects in this geographic area.

The potential water-related impacts of the projects listed in Figure 8-2 and Table 8-1 that could warrant analysis would include wetland and stream impacts, stormwater run-off, barge fleeting impacts, and dredging impacts. Each of these issues is discussed below.

### **Wetland and Stream Impacts**

Very few of these projects have had or would have an effect on wetlands. In fact, AmerenUE's recent approval for a loop track at its Rush Island plant is the only individual permit action in recent years that has impacted wetlands within this geographic area. As with Holcim's project, these potential impacts would be mitigated (AmerenUE will perform compensatory wetland mitigation in the Fall of 2003) by creating higher quality and increased acreage of wetlands than which existed. As is summarized in Table 8-1 of Holcim's EA, the cumulative impact to wetlands is approximately 19.75 acres. Mitigation for these projects (once complete) would result in the creation, enhancement and/or restoration of 73.6 acres of wetlands.

As was the case with wetlands, few projects were identified that resulted in stream impacts. The 1998 application by Brickeys Stone to expand their quarry south of the Holcim project site was the only such project identified and will result in direct impacts to 1.5 miles of jurisdictional streams. Again however, permit conditions impose stream mitigation requirements that would result in the replacement of streams on a minimum 1:1 basis and together with the Holcim project would result in the creation of 4.7 miles of streams.

Table 8-1. Summary of Projects Effecting “Waters of the US” in the Vicinity of the Lee Island Site \*Denotes addition by USACE

Project Name	Applicant	Permit No.	Date/Year	River Mile	Wetland Impact	Stream Impact	Forest Impact	Mitigation
<b>Past Projects</b>								
Quarry Development and Expansion	Brickeys Stone Co.	2122	August 1998	136	0	1.5 mi	0	1.5 miles of jurisdictional stream
Dredging	Jotori Dredging Co.	2126	September 1998	139-154	0	0	0	
Rock/Gravel Loading Area Construction and Maintenance Dredging	Mississippi Lime Co.	2150	March 1999	125.5	0	0	0	
Expansion of Existing Barge Fleeting Facility (30 barges)	Brickeys Stone Co.	2226	June 2000	135.8	0	0	0	
Rush Island, Barge Unloading and Fleeting Facility	AmerenUE	2238	August 2000	140	0	0	0	
Maintenance Dredging (open water disposal)	Chemical Lime Co.	2286	May 2001	126.0	0	0	0	
Dredging	Southern Illinois Sand Co.	2322	April 2002	78-155	0	0	0	
<b>Present Projects</b>								
Rush Island, Railroad Loop Track	AmerenUE	2334	May 2002	140	5.75 ac	0		12.5 acres of wetlands
Lee Island Project (harbor, quarry, cement plant)	Holcim (US) Inc.	2259	December 2000	138-139	14 ac	3.2 mi		3.2 miles of jurisdictional streams, 61 acres of wetland creation, enhancement and restoration
<b>Reasonably Foreseeable Future Projects</b>								
Interchange Development at I-55 and Highway TT	MoDOT	Permit applicability not known at this time			Unknown	0	Unknown	
* Plant Expansion	Mississippi Lime	Permit applicability not known at this time			Unknown	0	Unknown	
* Fleeting	Chemical Lime	Permit applicability not known at this time			Unknown	0	Unknown	
<b>Total</b>					19.75 ac	4.7 mi		73.5 acres of wetlands, 4.7 miles of streams

Performance of compensatory wetland and stream mitigation, as reviewed and required by the USACE, on the above actions would result in no anticipated significant cumulative impacts.

### **Stormwater Runoff Impacts**

For purposes of analysis, it is assumed that each of the projects in Figure 8-2 and Table 8-1 involve some stormwater run-off. It is also recognized that activities associated with industrial operations must utilize stormwater controls under general or site-specific permits. In addition, given the context of the Mississippi River (i.e., a very large, turbid river that has been heavily modified for commercial navigation activities), cumulative impacts must reach a higher threshold to achieve a level of significance.

As demonstrated in Holcim’s submitted Water Resources and Hydrology Report, the proposed Holcim project would not cause a significant change in the water quality or quantity of Isle du Bois Creek or the Mississippi River. Considering the proper installation and effectiveness of

stormwater controls in minimizing and mitigating potential water quality degradation, the USACE concludes no significant adverse cumulative impact would result to the water quality or quantity of Isle du Bois Creek or the Mississippi River.

### **Barge Fleeting Impacts**

The assessment of potential water-related cumulative impacts from barge fleeting is primarily associated with potential effects to fish and other similar aquatic life. In addition to Holcim, several other projects in the area involve fleeting operations. While such operations may entrain fish, resulting in individual stress and/or mortality, there is no evidence that significant adverse impacts from those fleeting or barging operations have occurred to fish populations or communities. In addition, the proposed Holcim fleeting area and others (Rush Island, Brickeys) are located in areas near the deeper river channel with reduced habitat complexity, and therefore avoid potential impacts to fish associated with the increased habitat diversity on the Illinois side of the Mississippi River (wing dams, unconsolidated bottom features, island tips, etc.).

Therefore, although the project would increase the amount of local barge traffic, the cumulative impact of the increases attributable to the fleeting areas within the area of analysis should not be significant. The USACE also considers the fact that near shore fleeting operations may result in cumulative bank stability problems. Bank stability problems can induce erosion and habitat changes. Similarly, the USACE evaluates each proposed fleeting action for potential cumulative impacts to private/public features, which may inadvertently change river morphology. In this evaluation, the proposed Holcim fleeting operation would occur along a riverbank with existing rip rap protection, resulting in no significant adverse cumulative impacts. The USACE would also require Holcim, as well as other future fleeting companies, to monitor bankline stability and apply corrective measures, when necessary, to abate potential bank stability problems.

### **Dredging Impacts**

Dredging actions that may occasionally occur in the area of analysis would be those maintenance dredging or commercial dredging operations identified in Figure 8-2 and Table 8-1. For example, Southern Illinois Sand Company has applied for a permit to re-authorize its existing commercial sand dredging operation between RM 78 and 155. Jotori Dredging received a permit in 1998 that re-authorized its dredging of sand between RM 139 and 154. Rush Island's fleeting area is in relatively deep water and therefore is not expected to require frequent, if any, periodic maintenance dredging. The Brickeys Stone fleeting area is in shallower water and may require periodic maintenance dredging. Expected impacts from each of these operations include the elevation of suspended solid concentrations in the immediate vicinity of the dredge or discharge point. As a result, direct mortality of benthic organisms entrained by the dredges, and potential smothering of benthos in areas subject to open water disposal could occur. Impacts to areas directly affected by dredging, however, are expected to be temporary, as recolonization of such areas by benthic invertebrates can be expected to occur within one or two years.

While not identical, dredging activities cause similar actions that the river system naturally undergoes. The Mississippi River is in a near constant state of carrying away and redepositing sediment loads. As such, future sediment accumulations requiring removal by maintenance dredging equipment are typically the result of the river's natural deposition. Maintenance dredging activities would relocate the river's deposited materials to either an open water location or to an approved disposal site. Dredging's potential cumulative effect on bed load degradation was recently evaluated and determined not to cause adverse or significant effects, as stated by the USACE Chief of Rivers/Potomology Section. In addition, dredging has the effect to physically relocate sediments in a similar manner as the river. Most aquatic species found in the

Mississippi River are acclimated to the frequent and natural changing conditions within the Mississippi River. As such, the USACE does not consider Holcim's potential future maintenance dredging actions to be causation for adverse or significant cumulative impacts. In addition, current regulations require the USACE to coordinate any future in-river dredging proposals with the FWS to ensure no threatened or endangered species are directly or cumulatively impacted.

With regard to the Holcim project, the cumulative impacts expected from any potential maintenance dredging are minimal for the following reasons:

- dredging would not be required to construct the Holcim fleeting areas;
- dredging activity during construction of the harbor would be physically separated from the Mississippi River until the final connection is made;
- periodic in-river maintenance dredging is not expected to be required on an annual basis;
- any in-river maintenance dredging would be accomplished with less disturbing hydraulic dredging equipment;
- all dredged material would be disposed of in an approved non-jurisdictional upland location and not in the Mississippi River; and
- fauna of the Mississippi River are generally tolerant of water quality conditions characterized by high turbidities.

Any sediment plumes from other dredging actions are not likely to combine with sediment from the project, especially considering the relative infrequency of dredging operations in this reach and the distance between the various actions. Hydraulic dredging and upland disposal as proposed by Holcim would have the advantage of further minimizing turbidity from suspension of sediments as well as eliminating potential impacts to benthic invertebrates on the river bottom from the settling of suspended material. Consequently, the proposed dredging operations at the site, in addition to other dredging projects/activity on the Mississippi River, should not cause significant cumulative impacts to Mississippi River water quality or aquatic habitat.

### **Isle du Bois Creek Impacts**

Potential cumulative impacts to Isle du Bois Creek were also considered by evaluating other projects (past, present or reasonably foreseeable) within the Isle du Bois Creek watershed. The only such project identified is the proposed development of an interchange on I-55 at Route TT. MoDOT maintains a revolving 5-year plan that identifies proposed roadway improvements. The current plan (2002-2006 Highway and Bridge Construction Program) identifies construction of a new interchange at the Route TT overpass at I-55. The interchange design also consists of replacing the existing bridge at Route TT. This project is identified as an economic development project with the right of way being funded by Holcim. This project would occur within the Isle du Bois Creek watershed, but direct impacts to Isle du Bois Creek are not anticipated as any construction activity would likely not occur within 500 feet of the stream channel (Route TT is approximately 1,400 feet from the channel). Additionally, proper use of erosion and sedimentation controls, as required by MDNR, would prevent any degradation of the water quality or aquatic resources of Isle du Bois Creek. In contrast, wetland restoration would actually enhance the riparian corridor along Isle du Bois Creek. Therefore, the Holcim project would not cause any identifiable cumulative impacts within the Isle du Bois Creek watershed.

## **Upland-Related Effects**

### **Background and Area of Analysis**

The primary cumulative impact concerns within upland areas are those associated with the direct loss of land cover types and the associated impacts to flora and fauna, and at a landscape level—forest fragmentation, and its resultant impacts on neotropical migratory birds. In order to assess the projects potential for cumulative impacts within upland areas, an analysis was undertaken to evaluate the regional availability of forestlands and other habitats. The USACE considers the appropriate geographic scope of analysis, when considering potential upland-related cumulative effects, to include the southern half of Jefferson County and all lands within Ste. Genevieve County. This geographic area is approximately 495,000 acres in size and is considered to be a sufficiently large enough area that contains a sufficient composition of forested lands and other natural cover types to provide a context within which cumulative impacts may be assessed.

Figure 8-3 and Table 8-2, (shown below and depicted in Holcim's EA), provides a summary of the analysis performed and includes a presentation of the trends in land cover from 1975 to 1990 using existing data from the Center for Agricultural Resource and Environmental Systems (CARES) database (USEPA, 1994) and the Missouri Spatial Data Information System (MSDIS) (Missouri Resource Assessment Partnership (MoRAP), 1999). The USACE considers these data sets to represent the best information available and no further attempt was made to validate or field verify land cover designations within the geographic area under consideration. It should be noted that the two datasets were presented in different formats (shape file versus grid) and are, therefore, not entirely compatible. In addition, some merging of land use classifications was performed to resolve differences in the land cover classification nomenclature between the two years. Additionally, these differences also account for some of the discrepancies in acreages among categories. For example, "dolomite glade" was a category that was present in the 1990 database but was not used in 1975. Conversely, "transitional areas" was a cover type in 1975 but not in 1990.

Table 8-2. Trend in Cover Types within Ste. Genevieve County and the Southern Half of Jefferson County from 1975 to 1990

Cover Type	Geographic Area				Project Site**		Project Impacts**		
	1975*		1990†		Acres	%	%		%
	Acres	%	Acres	%			Acres of Site	% of Area	
<b>Agriculture/Grasslands</b>									
Active Farm Field	164,594	33.2	193,406	39.1	77	2.0	18	0.5	0.003
Old Field					189	4.8	4	0.1	0.001
Subtotal	164,594	33.2	193,406	39.1	266	6.8	22	0.6	0.004
<b>Forest</b>									
Total Deciduous Forest	257,323	52.0	257,230	52.0	3,356	85.4	1,192	31.5	0.241
Mixed Forest	57,041	11.5	33,230	6.7					
Evergreen Forest	1,711	0.3	2,333	0.5					
Total Forest	316,075	63.8	292,793	59.1	3,356	85.4	1,192	31.5	0.241
<b>Dolomite Glade</b>									
			411	0.1	8	0.2	0	0	0
<b>Wetlands‡</b>									
Farmed Wetland (FW)					46.8	1.2	12.1	0.3	0.002
Palustrine Emergent (PEM)			24	0	18.5	0.5	0	0	0
Palustrine Forested (PFO)	192	0	1,717	0.3	68.0	2.0	1.9	0	0.0004
Palustrine Scrub-Shrub (PSS)			11	0	7.6	0.2	0	0	0
Palustrine Unconsolidated Bottom (PUB)					0.3	0	0	0	0
Subtotal	192	0	1,752	0.4	141.0	3.9	14	0.4	0.003
<b>Urban/Developed</b>									
	10,535	2.1	3,543	0.7	130	3.3	94	2.4	0.019
<b>Barren</b>									
	28	0	138	0					
<b>Water</b>									
	2,287	0.5	3,046	0.6	15	0.4	0	0	0
<b>Transitional Areas</b>									
	1,378	0.3							
<b>Total</b>	495,089	100.	495,089	100.	3,916	100.	1,322	34.8	0.267

\* Calculated for Ste. Genevieve and S. Jefferson Counties, USEPA, 1994

† Calculated for Ste. Genevieve and S. Jefferson Counties, MoRAP, 1999

\*\* MACTEC, Inc.

‡ Note: wetlands from 1975 and 1990 do not represent NWI wetland mapping or field delineation and are, therefore, not comparable to Lee Island site data. For a more representative assessment of wetland trends and impacts see Figure 8-2.

## **Analysis of Cumulative Effects**

### **Land Cover Impacts**

Primary land cover types within the geographic region under consideration were agriculture/grasslands and forest, which together, accounted for approximately 97 to 98 percent of the area. Less well-represented cover types included wetlands (0.4 percent in 1990), urban/developed lands (2.1 percent in 1975) and water (0.6 percent in 1990). A comparison of the two datasets indicates that between 1975 and 1990 the amount of agricultural/grassland within the geographic area increased by approximately 5.9 percent (approximately 29,000 acres). Conversely, the amount of forestland decreased from 63.8 percent to 59.1 percent (approximately 23,000 acres). This reduction however, appears to have been primarily associated with the conversion of mixed forest rather than deciduous or evergreen forest (see Table 8-2). Additionally, this decrease may be offset by a general trend of increasing forestland statewide. As presented by Zerr et al. (2003) forested cover within the state of Missouri increased by approximately 179,000 acres from 1984 to 2000. Increased attention to wetland related laws/mapping over the intervening years from 1975 to 1990 probably accounts for the apparent increase in wetland acreage (from 192 acres to 1,752 acres) and is likely an artifact of mapping methodology. It is likely that the loss of forested areas over the 15-year time interval corresponds to conversion of forested lands to agricultural uses coupled with expanding residential and commercial development.

Table 8-2 also provides a comparative summary of the Holcim project impacts to each land cover type. While the Holcim project (through development of the quarry) would impact approximately 1,120 acres of forestland over the life of the project, as previously discussed, these impacts would occur incrementally and correspond to a rate of forestland conversion (average of 12 acres per year) that is insignificant. In addition, these impacts would be compensated for by ongoing land reclamation beginning approximately 8 to 10 years after the quarry is opened. Table 8-2 also indicates that the conversion of the forestland is not significant within the context of the area of geographic analysis. For example, the total forest impact attributable to the project is equivalent to only 0.241 percent of the total area of analysis and 0.463 percent of the forestland within the same area. In addition, the forested uplands, which are not considered under the direct jurisdiction of the USACE, would be adequately mitigated by reclamation. Reclamation requirements by the MDNR typically do not require reforestation of reclaimed areas. Thus, the Holcim action would return a major portion of the temporarily lost forested areas. When considering upland related cumulative impacts under most USACE evaluated actions, few result in the mitigation offered by Holcim. As such, the USACE is confident that Holcim's proposed reclamation and reforestation actions would not cause long-term adverse or significant cumulative impacts.

An investigation was conducted to identify other past, present, and reasonably foreseeable future projects that may have an impact on the terrestrial ecosystems of the geographic area of analysis. Past and present projects identified included a general trend in residential and commercial development and other quarrying operations.

With regard to residential and commercial development, no large-scale reasonably foreseeable future projects were identified in either southern Jefferson County or Ste. Genevieve County. However, the trend of "suburban sprawl" in the St. Louis region is well established. For example, proposed developments associated with USACE Public Notices from 1988 to 2002

resulted in the conversion of more than 2,600 acres of lands (primarily uplands with only minor jurisdictional acreage triggering the need for a USACE permit) within the St. Louis area to developed uses.

With regard to quarries, operations vary in terms of overall size of the bonded area and in terms of the life of the permitted area. Several operations were identified that have the potential to impact upland resources (Table 8-3). However, little can be inferred as to the overall cumulative impact of these operations as information about the specific resources affected by each of these projects is not known. In each case however, the operations are, like the Holcim project, characterized by a slow annual expansion rate, and are permitted facilities that have MDNR-approved mine plans which require reclamation of the mined areas.

Table 8-3. Summary of Other Permitted Quarry Operations within the Geographic Area

Operator and Comments	Acres
Holcim - Lee Island - Current –Posted bond for 64 acres	64 bonded
Holcim – Lee Island – Pending Hearing Posted additional bond for 68 acres (68 acres – development) included in 100 year permit 1261 acres	68 bonded 1,261 at 100 yrs
Brickeys Stone, LLC – Current – 03/15/01 to 07/15/01 Long Term Mine Plan – 50 years (72 acres - lake /110 acres - wildlife)	182
Fred Weber, Inc. Festus, Missouri Expires in 2010 (native grasses, hardwood forests, intermittent glades)	274
Unimin Corp. Pevely, Missouri (unmanaged wildlife habitat)	258
River Cement – Current – 12/11/2000 to 10/31/2001 217 acres limestone – Festus, Missouri Long term Mine Plan – 3 years (clay)	217
Tower Rock Stone, Ste. Genevieve, Missouri Long Term Mine Plan through 2012 – 566.5 acres	359

Source: MDNR Land Reclamation Program.

Potential impacts to flora and fauna as a result of land cover conversion include loss of breeding and foraging habitat, direct mortality (particularly for plants and less mobile fauna), exposure to “edge” effects (i.e., increased light penetration along new forest edges, modification in temperature regimes, increased potential for establishment of noxious or exotic species), and reduced population sizes. While such potential impacts may occur with land cover alteration, it is impossible to fully evaluate such impacts within the context of this project (or other individual projects) as such impacts are extremely localized, and site specific. In spite of this lack of specificity, the USACE further concludes that the Holcim project would not result in a significant cumulative impact to flora and fauna for the following reasons:

1. **Slow Rate of Quarry Expansion and Habitat Conversion.** After the development of the plant and quarry within the first 10 years, the rate of expansion would be extremely slow. In the context of other land disturbances occurring in the geographic region (e.g., development of commercial and residential areas which has resulted in the extensive conversion of open lands (mostly non-jurisdictional uplands requiring no USACE notification/authority), often at a rate that far exceeds the annual conversion rate anticipated for the Holcim project), the rate of impact to upland habitats is extremely small and does not result in significant impact to the resource.

2. **Preservation of Extensive Buffer Areas.** Holcim’s commitment to preserve 2,200 acres of buffer for use as wildlife habitat would provide for the long-term support of indigenous floral and faunal species. This preservation would include interior upland forests, the bottomland forests of Isle du Bois Creek, and the bluff area between the quarry and Lee Island, and would be sufficiently large to continue to support a high diversity of species within the site. Additionally, the undisturbed presence of such an extensive buffer system would provide a valuable source from which resident faunal populations may disperse into the reclaimed quarry site. Dispersal of such species is expected to occur at different rates for different species depending on their particular life history and habitat requirements, and would be in accordance with the development of suitable habitats on the reclaimed site.
3. **Reclamation of the Quarry Site.** Anticipated impacts to upland resources at the project site would be offset by a long-term reclamation strategy that would sequentially restore upland habitats after the first 8 to 10 years of initial plant construction and quarry operations. Unlike the effects of residential and commercial development, the Holcim project would entail the reclamation of the site to natural habitats that can be used by indigenous wildlife.
4. **Overall Commitment to Habitat-based Conservation Measures.** Holcim has provided commitment to extensive habitat-based conservation measures (see Section 6.6.2 in Holcim’s EA) that would improve habitat quality and may increase bird diversity and use of the site. For example, restoration of a tallgrass prairie in the southwestern portion of the site would benefit grassland dependent birds that may also be impacted by small habitat patch sizes within the region.

### **Habitat Fragmentation Impacts**

Transitional areas between forest lands and open cover types (e.g., grasslands) have long been recognized as “edge” areas that often contain a greater species richness than that of each of the adjoining communities. While such areas are often characterized by greater species richness, it is also recognized that the diminishing area of contiguous natural habitats (e.g., forest) is detrimental to particular species that are area sensitive. Of particular concern is the potential impact of habitat fragmentation on neotropical migratory birds. Relative area-sensitivity of a number of bird species found on the Holcim site by WBS has been reported by Herkert et al. (1993) (Table 8-4 from Holcim’s EA). Additional concerns center on the increased vulnerability of forest nesting species to the fragmentation of forestlands and its associated edge effects. The following discussion assesses the potential cumulative impacts of the Holcim project in the context of these issues.

In overview, it appears that the cover type of the geographic area under consideration (i.e., southern Jefferson and Ste. Genevieve counties) is characterized as fragmented as a result of the long history of mixed uses. Jefferson County, in particular, demonstrates a high degree of fragmentation (see Figure 8-3 in Holcim’s EA), and reflects the suburbanization of much of this area. Similarly, Ste. Genevieve County appears to exhibit some degree of fragmentation, which has largely been attributable to agricultural uses. However, selected portions of Ste. Genevieve County (including the Brickey Hills area) are dominated by larger tracts of deciduous forest. For example, other large tracts of largely contiguous forested land are likely to remain intact within the geographic area of analysis including approximately 10,000 acres within the Brickey Hills, nearly 11,000 acres south of Lawrenceton, approximately 16,000 acres in the vicinity of Hawn State Park, approximately 15,000 acres northeast of Coffman, and approximately 25,000 acres in southern Ste. Genevieve County north and east of Womack (see Figure 8-3 in Holcim’s EA).

Preservation of forestlands within the region is an important component to enhancing the long-term support to neotropical migrants. In particular, the preservation of large, relatively contiguous tracts of forestland is important to those woodland birds that are highly area sensitive (see Table 8-4). Within the region, it should also be noted that, with respect to Ste. Genevieve County, little additional fragmentation had occurred from 1975 to 1990, suggesting a higher degree of stability in the forested cover within these areas. Several land areas are in public ownership and would therefore, be preserved as relatively stable forested area. Notably, this includes Hawn State Park (4,953 acres) and lands within the Mark Twain National Forest near Womack (approximately 25,000 acres).

Table 8-4. Area Sensitivity\* of Selected Forest and Grassland Bird Species Observed† at the Holcim Site

<b>Forest Birds</b>		
<b>High Sensitivity</b>	<b>Moderate Sensitivity</b>	<b>Low Sensitivity</b>
Broad-winged hawk	Yellow-billed cuckoo	Downy woodpecker
Pileated woodpecker	Hairy woodpecker	Red-headed woodpecker
Least flycatcher	Acadian flycatcher	Red-bellied woodpecker
Yellow-throated vireo	Scarlet tanager	Great crested flycatcher
Black-and-white warbler	Summer tanager	Eastern wood-pewee
Worm-eating warbler	Red-eyed vireo	Blue jay
Ovenbird	Northern parula	Brown-headed cowbird
American redstart	Yellow-throated warbler	Common grackle
Brown creeper	Louisiana waterthrush	Northern cardinal
	Kentucky warbler	Indigo bunting
	White-breasted nuthatch	Gray catbird
	Tufted titmouse	Carolina wren
	Blue-gray gnatcatcher	House wren
	Wood thrush	Black-capped chickadee
		American robin
<b>Grassland Birds</b>		
<b>High Sensitivity</b>	<b>Moderate Sensitivity</b>	<b>Low Sensitivity</b>
Northern harrier	Eastern meadowlark	Northern bobwhite
		Red-winged blackbird
		American goldfinch
		Field sparrow
		Song sparrow
		Common yellowthroat

Source: \* Herkert et al., 1993.

† WBS, 2002a and 2002b.

Holcim has also ensured the preservation of a significant amount of natural habitats. Preservation of the buffer coupled with a commitment to create and restore additional habitats would provide for the continued support of neotropical migratory birds. Specific measures that would benefit this group of birds include:

- **Buffer Preservation.** In areas where forest patches are reduced in size (e.g., less than 1,000 acres, the habitat suitability of these areas to such sensitive species as ovenbird and pileated woodpecker may be reduced (Herkert, et al, 1993). In the case of the Holcim site, however, overall forest patch size (and hence, suitability of such areas for woodland wildlife species) would remain large due to the voluntary preservation of the predominantly non-jurisdictional, forested buffer (approximately 2,200 acres) coupled

with the progressive reclamation of the quarry to an ultimately forested condition. The buffer and the undisturbed area outside the 100+ year quarry boundary are dominated by forested lands (2,164 acres) which would provide extensive habitats that would ensure the continued support of neotropical migrants. Additionally, these lands have a high degree of contiguity that would also provide suitable habitat for highly area-sensitive forest species.

- **Native Prairie Restoration.** The restoration of native prairie within the southern portion of the site would benefit migratory and resident grassland and prairie species (e.g., northern harrier, grasshopper sparrow, etc.). This habitat has been greatly reduced over all of its former range and Holcim's voluntary restoration of this 150-acre non-jurisdictional, upland area would support grassland Neotropical migrant species.
- **Isle du Bois Creek Floodplain Wetland Restoration.** The enhancement of 22.8 acres of farmed wetlands to scrub shrub (ultimately forested wetlands) within the floodplain of Isle du Bois Creek would have the effect of reforesting cultivated fields and restoring their natural functions. After such areas have had sufficient time to develop, this would ultimately reduce the fragmentation of this bottomland ecosystem. This would provide increased contiguity of forest within the Holcim site and would effectively enhance the Isle du Bois Creek riparian corridor.
- **Lee Island Wetland Enhancement and Creation.** The enhancement of 12.8 acres (farmed wetlands) and creation of 25.5 acres on Lee Island to a complex of emergent and scrub shrub/wooded wetlands would benefit wetland and water-dependent species including wading birds (e.g., great blue heron, egrets, etc.), waterfowl and shorebirds.
- **Preservation of the Bluff Area.** Studies performed by the WBS have shown that the non-jurisdictional bluff area supports particularly high concentrations of neotropical migratory species during peak migration periods. Preservation of the 400-foot wide bluff area would provide continued support for neotropical migrants during their movements along the Mississippi flyway.

It should be noted that while much of the Holcim site contains non-jurisdictional, upland forested areas, some effects of fragmentation (due to previous farming, logging, and quarrying activities) have already occurred on the project site, as evidenced by the presence of the brown-headed cowbird within much of the site (WBS, 2001). The brown-headed cowbird was present in nearly all transect surveys performed by the WBS and suggests that despite the site's dominance by wooded cover types, there is a significant amount of forest edge along old ridge roads, agricultural fields and other disturbed areas. This suggests that neotropical migrants nesting within the interior of the project site are presently being affected by cowbird parasitism. Consequently, neotropical migrants would not be subjected to a new threat to reproductive success as a result of the project. Conservation measures within the buffer (including habitat enhancement and management) would further enhance the quality and contiguity of forestlands on the Holcim site and may be effective in reducing the incidence of cowbird parasitism on the site.

A USACE accredited Wildlife Biologist and a member of the Illinois Ornithological Records Committee reviewed the WBS studies and Holcim's EA regarding potential impacts to bird species. Based on this review and evaluation, the USACE concurs that the Holcim site, in general, has areas of contiguous forest, however, many fragments of varying habitat types exist due to the numerous disturbances to the area over the past decades. The appearance of Brown-headed Cowbirds (*Molothrus ater*) at the Holcim site, in good numbers, further solidifies the fact that habitat fragmentation on site has a detrimental effect on nesting songbirds as a result of

cowbirds, known for their nest parasitism. Removing cowbirds from any site can be very costly and usually a futile effort. Therefore, habitat improvement programs, such as reforestation and enhancement of existing forested habitats could potentially improve nesting site possibilities for the currently affected neotropical species nesting on the Holcim site. The buffer areas established on site should continue to support the various avian species recorded by the World Bird Sanctuary during their field surveys.

With regard to several specific species, the USACE's expert determined that the Cerulean warbler is not significant since these birds would likely prefer the large bottomland floodplain habitat which is on the Illinois side of the river at this location, while the adjacent habitat on the Missouri side at the Holcim location is very rolling, hilly and not a bottomland hardwood forest.

In addition, the heron rookery on the Illinois side of the river consisting of Great Blue herons (*Ardea herodias*) across from the Holcim project, should not be impacted as a result of the project. Herons and egrets generally are not susceptible to "noise pollution". As demonstrated by the existing, very large rookery, located in Alorton, Illinois, (St. Clair County), where literally thousands of Cattle, Snowy and Great Egrets, as well as Black-crowned Night-Heron and Little Blue heron nest. This site is located approximately 50 feet from an extremely busy railroad switchyard where constant and consistent noises occur. The birds are apparently accustomed to this disturbance and continue to thrive at this site, the largest such rookery in the Metropolitan St. Louis area.

The USACE acknowledges that unavoidable impacts to forested areas on the Holcim site would cause some detrimental impacts to avian species. However, avoidance and minimization measures have lessened the original proposed disturbances. Furthermore, the fact that impacts would slowly occur over a period of years, allows for compensatory mitigation measures, in the form of reforestation and forest enhancement, to provide alternative foraging, resting and breeding habitats for the avian species that currently, and likely, would continue to utilize the site.

Based on the evaluation of other past, present, and reasonably foreseeable future actions as discussed previously, coupled with the findings of other analyses of potential project impacts as presented in previous sections of this document (and other documents incorporated by reference), the USACE concludes that the Holcim project would not result in significant adverse cumulative impacts associated with forest fragmentation.

### **Air-Related Effects**

Missouri would not issue air permits for projects if they would, alone or cumulatively, cause or contribute to violations of air quality standards. The Missouri air regulations include an ongoing requirement that all future major projects (not to be confused with the USACE determination that the proposed action does not warrant classification as a major federal action) in this region make the same cumulative demonstrations to show that their project, along with all others, would not significantly degrade the region's air quality. Thus, there is an inherent cumulative-impact safeguard in the air permitting analysis. Holcim's modeling results for its air permit demonstrate to the USACE that its air emissions, and those of others in the region, would not have a cumulative adverse effect on air quality. The state's air quality regulations also require that any

future projects would have to make the same demonstration. Therefore, there should be no adverse cumulative impacts on local or regional air quality from the Holcim project in conjunction with other projects.

In summary, the USACE independently determined that there would be no significant cumulative adverse environmental impact from the incremental impact of the Holcim project when considered together with other past, present, and reasonably foreseeable future projects in the area.

### III. Findings:

A. Other authorizations: Water quality certification: Date 13 November 2002 issued x denied \_\_\_ Special conditions Yes x No \_\_\_

B. Public notice P-2259 was jointly issued by the USACE and MDNR Water Pollution Control Program on 6 November 2000, and sent to approximately 150 parties, including Federal and State agencies. A subsequent public notice (P-2259a), dated 6 December 2000, provided a 30-day comment period extension and also advertised availability of a Public Workshop. A public workshop was held on 24 January 2001, and was open to all interested parties. At the Public Workshop, the comment period was extended until 5 February 2001. All comments received during the official public notice comment period are considered under this evaluation. In addition, comments received after the official public notice comment closing period, and deemed relevant and pertinent by the USACE, are considered under this evaluation.

1. Summary of comments received: See attached document entitled "Response To Comments."

2. Evaluation: I have reviewed and evaluated, in light of the overall public interest, the documents and factors concerning this permit application as well as the stated views of other interested agencies and the concerned public. In doing so, I have considered the possible consequences of this proposed work in accordance with regulations published in 33 CFR, Part 320 to 330 and 40 CFR, Part 230.

a. Evaluation of Compliance with 404(b)(1) guidelines (restrictions on discharge, 40 CFR 230.10). (A check in a block denoted by an asterisk (\*) indicates that the project does not comply with the guidelines.)

i. Alternatives test:

*	1)	Based on the discussion in II B, are there available, practicable alternatives having less adverse impact on the aquatic ecosystem and without other significant adverse environmental consequences that do not involve discharges into "waters of the United States" or at other locations within these waters?
___	Yes	<u>x</u>
___	No	___

*		2) Based on II B, if the project is in a special aquatic site and is not water-dependent, has the applicant clearly demonstrated that there are no practicable alternative sites available? (Note: the USACE has determined that the project is water dependent; see Response to Comments Section 5.2)
<u>x</u>	<u>      </u>	
Yes	No	

ii. Special restrictions. Would the discharge:

*		1) violate state water quality standards
<u>      </u>	<u>x</u>	
Yes	No	

*		2) violate toxic effluent standards (under Section 307 of the Act)
<u>      </u>	<u>      </u>	
Yes	No	

*		3) jeopardize endangered or threatened species or their critical habitat
<u>      </u>	<u>x</u>	
Yes	No	

*		4) violate standards set by the Department of Commerce to protect marine sanctuaries
<u>      </u>	<u>x</u>	
Yes	No	

	*	5) Evaluation of the information in II, C and D above indicates that the proposed discharge material meets testing exclusion criteria for the following reason(s).
<u>x</u>	<u>      </u>	
Yes	No	

(x) based on the above information, the material is not a carrier of contaminants

( ) the levels of contaminants are substantially similar at the extraction and disposal sites and the discharge is not likely to result in degradation of the disposal site and pollutants would not be transported to less contaminated areas

( ) acceptable constraints are available and would be implemented to reduce contamination to acceptable levels within the disposal site and prevent contaminants from being transported beyond the boundaries of the disposal site

iii. Other restrictions. Would the discharge contribute to significant degradation of "waters of the U.S." through adverse impacts to:

*		a) human health or welfare, through pollution of municipal water supplies, fish, shellfish, wildlife and <u>special aquatic sites</u> ?
<u>      </u>	<u>x</u>	
Yes	No	

*		b) life stages of aquatic life and other wildlife?
---	--	--

x    
Yes    No

\*

         x    
Yes    No

\*

         x    
Yes    No

  x           
Yes    No

c) diversity, productivity and stability of the aquatic ecosystem, such as loss of fish or wildlife habitat, or loss of the capacity of wetlands to assimilate nutrients, purify water or reduce wave energy?

d) recreational, aesthetic and economic values?

iv. Actions to minimize potential adverse impacts (mitigation). Would all appropriate and practicable steps (40 CFR 230.70-77) be taken to minimize the potential adverse impacts of the discharge on the ecosystem? See attached special conditions and water quality certification.

b. General Evaluation (33 CFR 320.4(a)):

i) The relative extent of the public and private need for the proposed work... There is a substantial public need for a continued and reliable source of cement for construction of buildings, roadways, infrastructure, etc. Privately, Holcim has a pressing need for additional low-cost portland cement production capacity to maintain and expand the company's market share in the River market. Holcim's reliance on imported cement in the face of growing demand for cement in the River market illustrates the company's need for this project.

ii.) The practicability of using reasonable alternative locations and methods to accomplish the objective of the proposed structure or work... Based upon the previously discussed alternatives review, the USACE concluded that only the Lee Island site practicably met all of Holcim's purposes and needs, including availability for purchase. Holcim's competitors already own many of the viable sites along the Mississippi River between St. Louis and Scott City, Missouri. The concentrated presence of other competitive cement plants/quarries in this portion of the Mississippi River further demonstrates the quality and quantity of limestone reserves and need for plant locations on this stretch of river. The few potential sites that are not owned by competitors were reasonably disqualified by Holcim for one or more of the reasons previously discussed, including lack of size, lack of access to an adequate transportation infrastructure, navigation and safety hazards, lack of availability for acquisition, and/or environmental concerns. In addition, the USACE's independent review of appropriate maps and field observations determined that alternative sites, where quarry and harbor/fleeting areas were possible, would result in wetland and/or stream impacts similar to and likely greater than the proposed Lee Island site. The USACE's knowledge and expertise in this region confirms that the proposed Lee Island site is the only practicable alternative site that meets the purposes and needs of this geographically required project.

iii.) The extent and permanence of the beneficial and/or detrimental effects that the proposed structures or work may have on the public and private uses

to which the area is suited.... The installation of mooring structures and initiation of fleeting operations should not impede the public usage (navigation or other uses) of the Mississippi River and its resources. The remaining structures and work associated with the action would occur within Holcim's nearly 4,000-acre privately owned project area. The private ownership of the site makes direct public usage of the project site a moot point. This document has thoroughly evaluated the project and concluded that Holcim's actions, considering such factors as the large buffer area, and the mitigation and conservation measures, would not result in detrimental effects to the public's usage of the area in the vicinity of the project. Holcim's proposed mitigation and conservation measures would adequately return temporarily impacted resources and beneficially affect (restore and increase) the riparian and wetland features/functions currently found in the project area.

3. Determinations:

c. Finding of No Significant Impact (FONSI) (33 CFR, Part 325). Having reviewed the information provided by the applicant, all interested parties and the assessment of environmental impacts contained in Part II of this document, I find that this permit action will not have a significant impact on the quality of the human environment. Therefore, an Environmental Impact Statement will not be required.

d. 404 (b)(1) Compliance/Non-compliance Review (40 CFR 230.12).

( ) The discharge complies with the guidelines.

(x) The discharge complies with the guidelines, with the inclusion of the appropriate and practicable conditions (see attached special conditions and water quality certification) to minimize pollution or adverse effects to the effected ecosystem.

( ) The discharge fails to comply with the requirements of these guidelines because:

( ) There is a practicable alternative to the proposed discharge that would have less adverse effect on the aquatic ecosystem, and that alternative does not have other significant adverse environmental consequences.

( ) The proposed discharge would result in significant degradation of the aquatic ecosystem under 40 CFR 230.10(b) or (c).

( ) The discharge does not include all appropriate and practicable measures to minimize potential harm to the aquatic ecosystem.

( ) There is not sufficient information to make a reasonable judgment as to whether the proposed discharge would comply with the guidelines.

e. Public interest determination: I find that issuance of a Department of the

Army permit (with special conditions), as prescribed by regulations published in 33 CFR Parts 320 to 330, and 40 CFR Part 230:

<u>  x  </u> is not contrary to the public interest		_____ is contrary to the public interest
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Recommended by:

\_\_\_\_\_  
Date

\_\_\_\_\_  
Charles Frerker  
Team Leader, Rivers/Corps Section

Reviewed by:

\_\_\_\_\_  
Date

\_\_\_\_\_  
Danny D. McClendon  
Chief, Regulatory Branch

Approved by:

\_\_\_\_\_  
Date

\_\_\_\_\_  
C. Kevin Williams  
Colonel, St. Louis District

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**Appendix A**  
**List of Studies**

**(All studies are incorporated by reference as a part of the USACE EA)**

1. Phase I Cultural Resources Survey and Assessment (American Resources Group (ARG), 2000) - The objectives of the survey were to identify cultural resources (historical or archaeological) located within the project area and provide a preliminary assessment of their eligibility for listing to the National Register of Historical Places (NRHP).
2. Navigation Impact Study (Waterway Simulation Technology, Inc., May 24, 2000) - A navigation impact study was conducted by Waterway Simulation Technology, Inc. to determine if the proposed project would effect navigation on the Mississippi River. Coordination occurred between the study team and the U.S. Coast Guard, the River Industry Action Committee (RIAC) and the USACE. This study was included as Appendix E of the Section 404/401 and Section 10 Permit Application Companion Report.
3. Hydrogeologic Investigation (Leggette, Brashears & Graham, Inc. (LBG), 2000) - This report detailed the results of subsurface drilling and testing conducted at the site. Information included regional and site-specific hydrogeology, joint/fracture trend analysis, and hydraulic conductivity testing. This information has subsequently been updated in several geotechnical reports (STS Consultants, Ltd., 2001 and LBG, 2001).
4. Preliminary Jurisdictional Wetland Determination Report (ESE, August 8, 2000) - A wetland determination report was completed, identifying wetlands and waters of the United States that were considered to be jurisdictional within the property boundaries. Ninety-seven wetland plots, high resolution aerial photography, historical photographs, topography, soil survey maps, and hydrology data were used to describe the approximately 141 acres of wetlands at the site. Coordination occurred with USACE, and included the Natural Resources Conservation Services (NRCS) where there were potential jurisdictional wetlands within active agricultural areas.
5. Section 404/401 and Section 10 Permit Application Companion Report (ESE, August 8, 2000) - This report provides a description of the project, characterization of the project site including information about the regulated resources on the site, information about design alternatives that had been considered, proposed mitigation measures, and preliminary environmental analysis. The following studies are included: Appendix A--Terrestrial Ecological Characterization, Appendix B--Threatened and Endangered Species, Appendix C--Mississippi River Substrate and Unionid (Mussel) Survey, Appendix D--Other Site Features and Upland Hydrogeologic Conceptual Model, and Appendix E--Lee Island Cement Plant Navigation Impact Study.
6. Phase II Investigation at Site 23SG1 (ARG, 2000) - The objectives of this effort were to assess the historical significance of site 23SG1. A field investigation was conducted to map and characterize this site.

7. Short-Term Site Assessment and Avian Population Survey (World Bird Sanctuary, March 31, 2001) - The World Bird Sanctuary conducted an initial bird habitat suitability assessment and late winter/early spring (March) bird population survey on the project site.
8. Research Design and Methodology for Phase III Data Recovery Operations at Site 23SG1 (ARG, November 2000) – This study presents a plan for data recovery operations at Site 23SG1. Holcim, the USACE, and the SHPO have signed a Memorandum of Agreement dated January 2, 2002 that, among other things, requires Phase III data recovery operations for Site 23SG1 in accordance with this plan.
9. Estimation of the Impacts of the Proposed Holnam Lee Island Facility on Ozone Attainment and the Draft St. Louis SIP Ozone Attainment Demonstration (Environ International Corporation, May 8, 2001) - This study determined that the Lee Island facility would not jeopardize the St. Louis region's attainment of the 1-hour ozone standard. The conclusions are based on results of a photochemical modeling exercise where Missouri's State Implementation Plan (SIP) demonstration was modified to include the Lee Island cement plant and compared to the existing demonstration model.
10. Analysis of the Ozone Air Quality Impacts of the Proposed Holnam, Inc. Portland Cement Manufacturing Plant (Alpine Geophysics, May 14, 2001) – This study, prepared for USEPA Region VII, determined that the predicted overall impact of the Lee Island facility on peak ozone levels in the St. Louis area would be very small. The size of the predicted impacts (both positive and negative impacts were predicted) were considered far too small to be declared statistically significant. The conclusions were based on results of a photochemical modeling exercise where Missouri's State Implementation Plan (SIP) demonstration was modified to include the Lee Island cement plant and compared to the existing demonstration model.
11. The Economic Impact of the Lee Island Cement Plant in Ste. Genevieve County (Southeast Missouri State University, July 2001) – This report provides an analysis of the economic impacts arising from the construction of the proposed facility on Ste. Genevieve and Jefferson counties and the state of Missouri, and impact on tax revenues.
12. Soils Report, Quarry Site, Project (Brown Soil Services, 2001) – The soils report provides a detailed map of the proposed quarry area soils and describes the different soil types (e.g., silt, clay, etc.), and soil thickness.
13. Draft Biological Assessment (Harding ESE, September 10, 2001) – A Biological Assessment (BA) was completed at the request of the U.S. Fish and Wildlife Service (USFWS) and USACE as part of the informal consultation process under the Endangered Species Act. Species reviewed included the Indiana bat, gray bat, bald eagle, Hine's emerald dragonfly, pallid sturgeon, least tern, and peregrine falcon. This draft was submitted to obtain FWS review and advice on Holcim's analysis and proposed conservation measures.

14. Aquatic Resource and Water Quality Characterization Report (Harding ESE, November 1, 2001) – This report provides results of aquatic and water quality sampling of Isle du Bois Creek, tributary streams (e.g., Raddy Hollow, etc.), and selected springs/seeps. Spring, summer, and storm event water quality sampling results are presented. Spring and summer fish sampling results are also presented. The water quality results were compared to similar Ozark streams.
15. Vegetation Survey and Community Type Map (Harding ESE, November 1, 2001) – This study presents descriptions and a map of the natural plant communities (e.g., mesic forests, dolomite glades, etc.) identified at the site. Information (plants and community types) from the Preliminary Jurisdictional Wetland Determination Report is integrated into this report in order to provide a comprehensive evaluation of the vegetative communities and plant species found at the site. This information would be used in the reclamation and site management plans.
16. Spring Migratory and Summer Breeding Bird Site Assessment (World Bird Sanctuary, December 10, 2001) – The World Bird Sanctuary conducted a comprehensive survey to identify migratory and breeding bird species utilizing the site. The work included identifying neotropical migratory species, and mapping areas currently being utilized by bird populations.
17. The Long Term Land Reclamation Strategy of the Proposed Holcim Lee Island Cement Manufacturing Facility (Holcim, revised January 2002) - This plan was submitted to the MDNR Land Reclamation Program with the plant quarry permit application. The plan provides the chronology of quarrying, and outlines the goals and objectives of the reclamation strategy.
18. Biological Assessment (Harding ESE, January 10, 2002) – The Biological Assessment (BA) was completed at the request of the U.S. Fish and Wildlife Service (USFWS) and USACE as part of the informal consultation process under the Endangered Species Act. Species reviewed included the Indiana bat, gray bat, bald eagle, Hine’s emerald dragonfly, pallid sturgeon, least tern, and peregrine falcon.
19. Endangered Species Investigation Bat Survey Report (WDHES, January 10, 2002) – This study utilized mist netting, radio tagging, and acousting monitoring to determine the use of the site by bats, including the Indiana and gray bats. This information would assist in designing on-site conservation and mitigation measures.
20. Amphibian and Reptile Relocation Study (Harding ESE, March 1, 2002) – This document provides a brief overview of the scientific literature on the relocation of herpetofauna (amphibians and reptiles). Additional information is presented evaluating the potential to relocate on-site amphibians and reptiles prior to the commencement of quarrying activities.
21. Wetland and Stream Mitigation Plan (Harding ESE, March 26, 2002) – This plan describes the potential wetland and stream impacts associated with the project and the mitigation proposed by Holcim. This plan was originally submitted to the USACE and MDNR on November 7, 2001, but was later revised (with only minor changes) and re-submitted to the USACE, and to MDNR as part of Holcim’s application for a water quality certification.

22. Supplemental Alternatives Analyses (Harding ESE, March 29, 2002) - This report addresses additional information about alternatives requested by various commenters, including project site alternatives (alternative off-site locations), quarry plan alternatives (underground mining and avoidance of Wolf Hollow), and fill disposal area alternatives.
23. Geochemical Analysis of Ground Water and Unconsolidated Earth Materials at the Proposed Harbor (LBG, March 27, 2002) – This study analyzes groundwater and soil samples collected on Lee Island at the site of the proposed harbor. This information was used to evaluate potential impacts from either the placement and storage of the harbor excavation material on-site, or its beneficial use or storage off-site. A report on this study has been prepared for submission to MDNR as part of Holcim’s application for an individual site-specific stormwater permit for activities associated with harbor construction.
24. Addendum for the Aquatic Resource and Water Quality Characterization Report (Harding ESE, May 2, 2002) – This report provides supplemental information including: fall season (2001) fish and water quality sampling results, and spring/fall benthic invertebrate sampling results.
25. Water Resources and Hydrology Report (STS Consultants, Ltd., LBG and ESE, May 7, 2002) – This study evaluates the potential for water quality and hydrologic impacts associated with the change from pre-project conditions to those that result during phased project development and reclamation. Surface water models were used to quantify potential impacts associated with the cement plant, quarry, and fill areas. Proposed mitigation measures to prevent potential impacts are presented.
26. Harbor Excavation Material Storage Option Study (Holcim, 2001-2002, unpublished) – This on-going study involves the identification of potential, additional alternatives for the storage of the harbor excavation material. While on-site locations were identified inside the quarry boundary, the goal remains to identify a storage area or beneficial use off-site.
27. Avian Fall and Winter Site Assessment and Population Survey (World Bird Sanctuary, July 1, 2002) – The World Bird Sanctuary surveyed bird usage of the site during fall and winter.
28. Mississippi River Base Flood Modeling – “No Rise” Certificate Documentation (STS Consultants, Ltd., October 12, 2002) – This study shows that construction of the in-river fleeting cells and harbor would not cause any increase in flood levels.
29. A Market Study of the Effect of Quarries on the Value of Nearby Real Estate (David Nunn and Joe Rose, The Nunn Company, November 12, 2002) – This study examined the effect of quarries in Missouri on the property values of surrounding landowners by investigating quarries in Ste. Genevieve County, Jefferson County, Clarksville, and Jefferson City, using paired sales analysis techniques and interviews with real estate appraisers and other professionals.

30. Blast Vibration Site Evaluation, Holcim (US) Inc., Lee Island Facility (Vibra-Tech, December 3, 2002) – This study measured ground vibrations produced from blasting at three primary test sites in order to determine the likely effects on uncontrolled structures and wells surrounding the project site. Typical ground vibration response was found indicating full blasting operations can be conducted without damage to aboveground or underground structures beyond 1,000 feet.
31. Modeling Evaluation of Particulate Matter Emissions and Associated Air Quality Impacts from the Proposed Holcim Quarry (URS Corporation, February 14, 2003) – This study evaluated worst-case PM<sub>10</sub> and PM<sub>2.5</sub> concentrations in the ambient air from the project site fenceline outward for two scenarios – initial construction and year ten of quarry operations (including mining activities, reclamation activities, and cement plant emissions).
32. Avian Spring Migration and Summer Breeding Grounds Site Assessment and Population Survey (World Bird Sanctuary, April 15, 2003) – additional study by the World Bird Sanctuary.
33. Potential Impacts of Mercury Air Emissions From the Proposed Holcim Lee Island Project on Fish in the Mississippi River (AER, Inc., April 2003) – This study addresses comments related to the impact of mercury air emissions.
34. Isle du Bois Creek and Mississippi Floodplain Evaluation (STS Consultants, Ltd., April 25, 2003) – This study shows that the project would meet the applicable flood ordinance criteria.