US Army Corps of Engineers
St. Louis District

ENVIRONMENTAL ASSESSMENT WITH DRAFT FINDING OF NO SIGNIFICANT IMPACT

Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report

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October 2010

TABLE OF CONTENTS

References

1.0 Purpose and Need for Action EA-1

1.1 Project Location EA-3

1.2 Project Authority EA-3

2.0 Alternatives Including the Proposed Action EA-6

2.1 Description of the Alternatives EA-6

2.2 Proposed Action/Recommended Alternative EA-9

3.0 Affected Environment and Environmental Consequences EA-17

3.1 Threatened and Endangered Species EA-17

3.2 Noise and Air Quality EA-23

3.3 Water Quality and Aquatic Impacts EA-24

3.4 Soils and Prime Farmland EA-27

3.5 Physiography-Topography EA-28

3.6 Terrestrial Impacts EA-28

3.7 National Forest and Conservation Areas EA-30

3.8 Cultural and Historic Resources EA-31

3.9 Socioeconomic Issues EA-34

3.10 Aesthetic Resources EA-41

3.11 Recreation EA-41

3.12 Hazardous, Toxic and Radioactive Waste Sites (HTRW) EA-42

3.13 Cumulative Impacts EA-43

3.14 Compliance EA-46

References EA-44

Finding of No Significant Impact (FONSI)

FIGURES

EA-1 Typical levee slides EA-2

EA-2 Alton to Gale Organized Levee Districts with design deficiency slides EA-4

EA-3 Lime/Class C fly Ash Injection Technique – Alternative 4 ..... EA-15

EA-4 Levee cross sections for Alternatives 1-4 ..... EA-16

TABLES

EA-1 Station numbers and repair lengths of slides within the Alton to Gale Organized Levee Districts. EA-5
EA-2 List of federally threatened and endangered species and their habitat provided by USFWS on 7 August, 2008. ..... EA-17
EA-3 Compliance review with all applicable environmental regulations and guidelines EA-42

APPENDICES

EA-A – Pertinent Correspondence EA-A-1
EA-B – Illinois and Missouri Species of Concern EA-B-1
EA-C – Risk Screening EA-C-1
EA-D – Sampling Data EA-D-1
EA-E – Drinking Water Data EA-E-1

REFERENCES.

Subject: Alton to Gale Organized Levee Districts, Illinois and Missouri (Continuing, Deficiency Corrections) Letter Report
Thru: Commander, Mississippi Valley Division
Attn: CEMVD-MD-PM
To: CDR USACE (DAEN-CWO-E)
Washington DC 20314-0999

a. Letter Report, LMSEM/LMSED-DG, 1 October 1979, subject as above, with endorsements thereto
b. b. Letter Report, LMSED-PK, 21 November 1986, subject as above, with endorsements thereto (Appendix 1 Main Report).
c. c. Engineer Regulation (ER) 1165-2-119, Modifications to Completed Projects.
d. d. Policy on Correction of Project Deficiencies in Completed Projects that are Operated and Maintained by Local Interests (DAEN-CWR Policy Issue 80-16).
e. e. Assistant Secretary of the Army (ASA) (Civil Works) Memorandum for the Deputy Commander for Civil Works, dated 8 November 2000 (Appendix 2 Main Report).

1.0 PURPOSE AND NEED FOR ACTION

The U.S. Army Corps of Engineers (USACE), St. Louis District has prepared this updated Environmental Assessment (EA) to address the correction of a design deficiency involving the use of inappropriate, high plasticity clays during the construction of numerous levee reaches in the Alton-to-Gale Organized Levee Districts. This EA has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's Regulations (40 Code of Federal Regulations [CFR] 1500-1508), as reflected in the USACE Engineering Regulation (ER) 200-2-2 "Procedures for Implementing NEPA" and ER 1105-2-100 "Planning Guidance Notebook." The following sections include a discussion of the purpose and need, authority, alternatives, affected resources, and impacts of the recommended action and other alternatives. Under the recommended action, no adverse environmental impacts are expected and no mitigation would be required.

The purpose of the project is to repair levee slides in this large, federally constructed, but locally maintained levee system. All levees have heights ranging between 20' and 25', a crown width of 20 feet and side slopes of 1 vertical on 3 horizontal. During construction of these levees locally available materials were used which include highly plastic clays. Highly plastic clays have low residual long-term shear strengths required for proper stability. Embankments in these highly plastic clays require slopes no steeper than 1 vertical on 4 horizontal. As a result, the extreme volume changes, or shrink-swell potential, allows for the formation of deep cracks in the levee during periods of low rainfall. These cracks then fill with water from rain, snowmelt, and floods, which contributes to the continual reduction of embankment strength from pooling within the

cracks while the water is absorbed. As the clay soils in the upper portions of the embankment absorb water and gain weight, the clays at and near the bottom of the embankment lose shear strength. When the embankment weight exceeds the underlying shear strengths, embankment movement (slides) occurs compromising the integrity of the levee. Numerous slides have been repaired throughout the years, the latest in 2008 (Figure EA-1). In the past, the high plasticity soils were replaced with low to medium plasticity soils or the plasticity of the clay soils would be chemically modified with hydrated lime for stabilization. Numerous alternatives, from no action to removal and replacement of the impacted levee segment have been considered. In order to lower the risk of failure and meet the standard USACE criteria for flood control projects, the most current recommendation involves a lime/Class C fly ash injection technique. This method involves injecting slurry of hydrated lime and fly ash at regular intervals into the levee slope using a series of injector rods on a track-mounted vehicle.

Stable levee embankment slopes are required for flood control projects to maintain adequate cross sectional area for the retention of floodwaters. The proposed repairs would be accomplished within the existing levee reaches located in the Alton to Gale levee system. The only planned activities are the correction of the design deficiency through the modification of the high plasticity clay soils and the associated work to establish the turf.

Figure EA- 1 – Typical levee slides

1.1 Project Location

The Alton to Gale Levee System is made up of seventeen small levees grouped together into a combined 200+ mile system on the Middle Mississippi River in the states of Illinois and Missouri. Eleven of these levee districts are addressed in this EA (Figure 2). The levees are all located along the Mississippi River, extending from Alton, Illinois, (Mississippi River Mile 203) to Gale, Illinois, (Mississippi River Mile 46). All eleven are located in Illinois except for the Bois Brule Drainage and Levee District (D&LD) which is located in Perry County, Missouri. Portions of the Alton to Gale levee system, specifically the back levee along the Big Muddy River in the Degognia-Fountain Bluff D&LD and Grand Tower D&LD, a portion of the lower flank levee in the Metro East D&LD, and a portion of the upper flank levee in the Prairie Du Rocher D&LD, have experienced a significant number of levee slides. The levee slides began occurring shortly after the levee system was constructed, and through yearly inspections, additional slides are identified on an annual basis. The levee slides can result in a reduction in the ability of the individual levees to provide the authorized level of flood protection.

The St. Louis District has had an ongoing program to inspect the levees and document the existence of levee slides since 1961. Most of the levee slides reoccur within the same levee district reaches. The levee reaches that have had continuous problems with slope instability and slides are listed in Table 1. Approval is sought to correct the continual occurrence of these levee slides in the specific levee reaches where it has been documented that the wrong type of embankment material was used in the original construction.

1.2 Project Authority

The authority for this project lies in the Flood Control Acts of 1936, 1938 and 1946 for the original construction of the eleven Alton to Gale D&LDs. The Flood Control Act of 22 June 1936 authorized flood protection for the following levee districts: Bois Brule, Clear Creek, Degognia/Fountain Bluff, East Cape Girardeau, Metro East Sanitary District, Fort Chartres, and Preston. The Flood Control Act of 28 June 1938 authorized flood protection for the Grand Tower, Kaskaskia Island, and Wood River D&LD's. The Flood Control Act of 24 July 1946 authorized flood protection for Prairie Du Rocher. Further, Engineer Regulation (ER) 1165-2-119 that addresses "Modifications to Completed Projects," states that, *"Occasionally, a project may deserve modification because its original development was inherently deficient."* Works proposed to correct a design or construction deficiency may be recommended under existing authorization without further Congressional authorization if the proposed action meets all of the conditions of the pertinent ER.

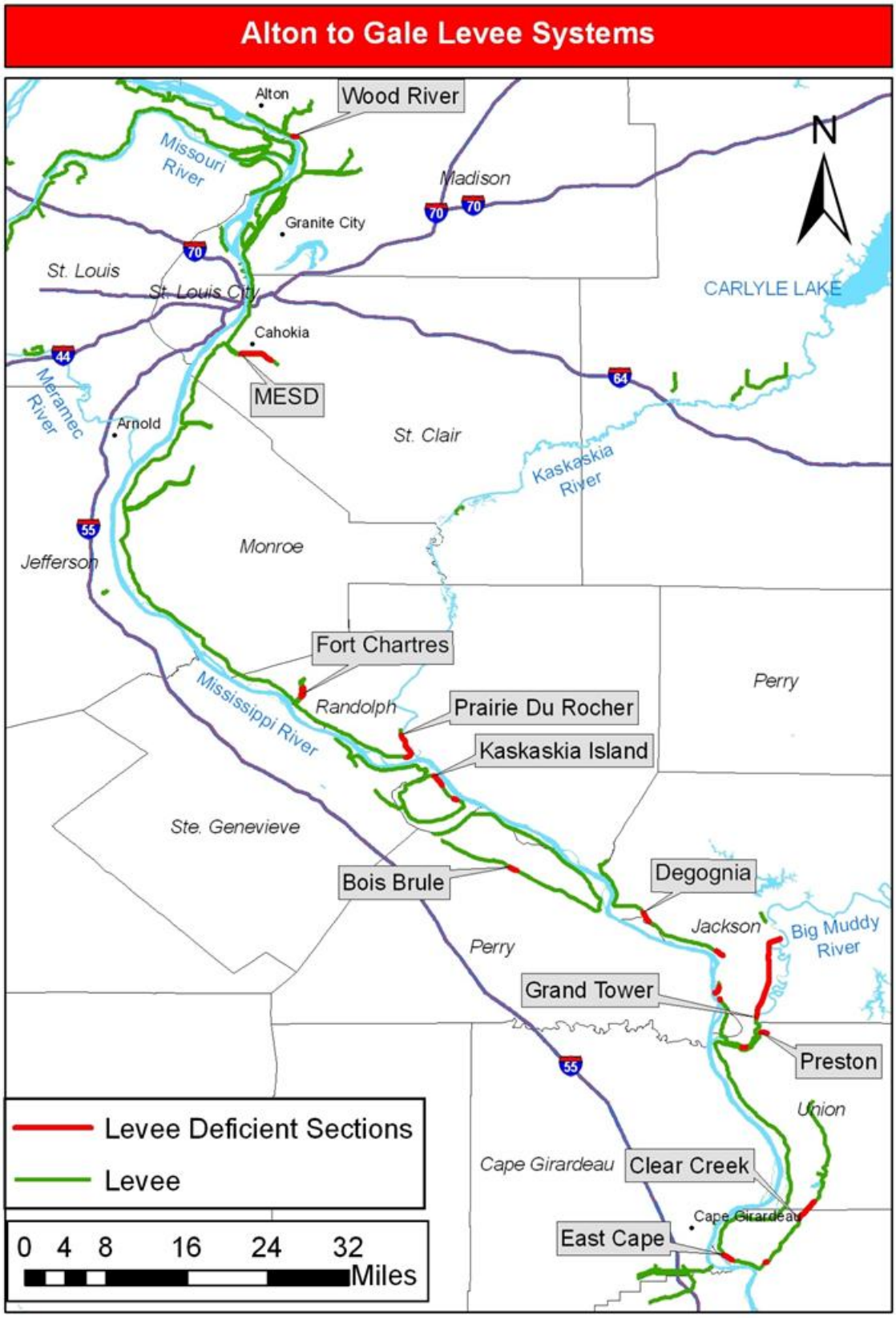

Figure EA-2. Alton to Gale Organized Levee Districts with design deficiency slides.

Alton to Gale Levee Districts	Levee Repair Reach Stationing (Sta.)	Repair Length Linear Feet
Bois Brule D&LD	Sta 1385+00 to Sta 1420+00	3,500 LF
Clear Creek D&LD	Sta 272+00 to Sta 385+00	11,300 LF
Degognia/Fountain Bluff D&LD	Sta 410+00 to Sta 465+00	5,500 LF
	Sta 790+00 to Sta 826+00	3,600 LF
	Sta 947+00 to Sta 1070+00	12,300 LF
East Cape Girardeau D&LD	Sta 355+00 to Sta 400+00	4,500 LF
	Sta 570+00 to Sta 575+00	500 LF
Fort Chartres D&LD	Sta 595+00 to Sta 625+00	3,000 LF
Grand Tower D&LD	Sta 25+00 to Sta 70+00	4,500 LF
	Sta 104+00 to Sta 110+00	600 LF
	Sta 425+00 to Sta 442+00	1,700 LF
	Sta 628+00 to Sta 947+00	31,900 LF
Kaskaskia Island L&D	Sta 335+00 to Sta 395+00	6,000 LF
	Sta 480+00 to Sta 496+00	1,600 LF
MESD (E. St louis D&LD)	Sta 1390+00 to Sta 1530+00	14,000 LF
Prairie du Rocher D&LD	Sta 58+00 to Sta 110+00	5,200 LF
	Sta 700+00 to Sta 840+00	14,000 LF
Preston D&LD	Sta 0+00 to Sta 25+00	2,500 LF
Wood River D&LD	Sta 198+00 to Sta 218+00	2,000 LF
Alton to Gale Levee Districts	**Total Length**	**128,200 LF**

Table EA-1. Station numbers and repair lengths of slides within the Alton to Gale Organized Levee Districts.

2.0 ALTERNATIVES INCLUDED IN THE PROPOSED ACTION

2.1 Description of the Alternatives

2.1.1 General

Other than the No Action alternative, there were four practicable action plans investigated for repairing levee reaches experiencing excessive slope failures because of design deficiency. These alternatives would ensure the USACE authorized level of flood protection with a sufficient factor of safety.

2.1.2 No Action

Under the No Action Alternative, the federal government would not provide 100% funding to repair the design deficiencies of the Alton to Gale levee system. Repairs then would be up to the individual levee districts on a 65%-federal and 35%-levee district cost share. Because of this, it is possible that local funding would not be available or adequate to complete the design deficiency repairs in a safe, timely manner, restoring the levees to their designed level of protection. It is also anticipated that if levee sections composed of the high plastic clays are left unrepaired, new levee slides would develop and existing slides would erode further. This reduced level of levee integrity would increase flood risks throughout the project area.

Numerous areas within the Alton to Gale levee system are deficient and unstable as exhibited by continuous levee slope failures which began shortly after 1961 when the levees were constructed. Quite often levee slides encroach into the levee crowns resulting in a breach of the road system and a safety issue for the traveling public. There are also numerous historic and cultural resources within these same protected areas.

The current practice of repairing individual levee slides does not address the vulnerability of continuous and impending levee slide failures prior to and during flood events. Historically, several years may pass from the time a levee slide occurs and when approval and funding becomes available to repair the slide, leaving the levee section vulnerable during a flood event. The present approach of repairing levee slides after they occur is only a short-term solution, as additional levee slides continue to occur in the deficient levee sections.

2.1.3 Alternative Action Plans

There are four alternative plans for repairing levee reaches experiencing excessive slope failures that were considered. Alternative prescreening process included considering methods that met regulatory requirements, reduce construction footprint, specialized equipment required, weather conditions, funding constraints, amount of acquisition of

real estate interest for construction outside of right of way, minimize the cultural and environmental impacts, construction cost, average annual economic net benefit, and minimize amount of borrow material required. These are the only alternatives identified that would ensure the authorized level of protection has a sufficient factor of safety. Anything less than a factor of safety of 1.4 was considered unacceptable. The first alternative plan is to degrade the affected levee reach by excavating the entire levee embankment material down to natural ground, modify the soils by mixing in a hydrated lime, backfilling these modified materials, and compacting the fill in place. The second alternative is to excavate the upper levee embankment materials down a minimum of seven feet, modify plasticity of the soils by mixing in a hydrated lime, backfilling these modified materials, and compacting the fill in place. The hydrated lime in the first two alternatives would be added in a ratio of 16 pounds of lime per square yard for each ten inch lift. The process consists of two applications of the hydrated lime mixture. The third alternative is to remove and discard the upper levee embankment materials down a minimum of seven feet, replace the high plasticity clays with suitable borrow material consisting of clays with better material characteristics and compacting the fill in place. The fourth alternative involves the use of injection of a lime/Class C fly ash slurry into the levee sideslope using a series of injector rods on a track mounted vehicle. The cross-sections for alternatives 1-3 can be seen in Figure EA-4. The lime/Class C fly ash technique is shown in Figure EA-3.

Several measures were eliminated as alternatives by the team which was not determined to be feasible. These alternatives included flattening the slopes (less than 4:1) and installing stability berms. Both alternatives require large quantities of borrow material that is not available, and considerable real estate acquisition. In addition, these alternatives would require relocation of utilities, gravity drains, and other items that are in the area of the levee. Based on the reasons discussed above, these measures are not discussed further as alternatives.

The Selected alternative from the 1986 Letter Report was not considered as an alternative. In the 1986 recommendation, it was recommended that lime stabilization be utilized to repair the existing slides. The current purpose of the letter report is to recommend long term solutions to address the slope stability issue that exists in portions on the Alton to Gale Levee system. Repairing slides as they occur does not provide a long term solution and exposes the levee system to risk once new slides occur.

2.1.3.1 Alternative 1. <u>Lime Stabilization of Entire Levee Section</u>

The first alternative would be to reconstruct the entire levee sections containing high plasticity clays with the double application of hydrated lime stabilization method. The highly plastic materials would be excavated from the levee down 5 feet below the natural ground surface. This material would be mixed with hydrated lime and stockpiled. Prior to placement in the levee embankment, a second application of hydrated lime would be mixed with the stockpiled modified materials. The hydrated lime would be added in a ratio of 16 pounds of lime per square yard for each ten-inch lift. This material would

then be placed at the specified moisture content and compacted in place. Modifying the existing highly plastic materials that make up the upper levee section with the hydrated lime would diminish the unacceptable shrinkage and swelling characteristics that presently exist (Figure EA-4). This plan would require the acquisition of real estate interests for construction and right-of-way.

2.1.3.2 Alternative 2. Lime Stabilization of the Upper Levee Section

The second alternative would be excavation and reconstruction of the upper 7 feet of all levee sections containing high plasticity clays with the lime stabilization method. The excavation would extend ten feet beyond the levee toe and 5 feet below the natural ground surface to effectively key-in the reconstructed material. The excavated material would be mixed with hydrated lime and stockpiled. Prior to placement in the levee embankment, a second application of hydrated lime would be mixed with the stockpiled modified materials. The hydrated lime would be added in a ratio of 16 pounds of lime per square yard for each ten inch lift. This material would then be placed at the specified moisture content and compacted in place. Modifying the existing highly plastic materials that make up the upper levee section with the hydrated lime would diminish the unacceptable shrinkage and swelling characteristics that presently exist (Figure EA-4). This plan would require the acquisition of real estate interests for construction and right-of-way.

2.1.3.3 Alternative 3. Replacement of the Upper Levee Section

The third alternative would remove and discard the upper 7 feet of all levee sections containing high plasticity clays. The excavation would extend ten feet beyond the levee toe and 5 feet below the natural ground surface to effectively key-in the reconstructed material. The upper levee section would be replaced with suitable levee embankment materials obtained from new borrow sources. These suitable materials would consist of low to medium plastic clays. The suitable borrow materials would be excavated, placed at the specified water content, and compacted in place (Figure EA-4). The borrow areas would be reclaimed by the soils removed from the deficient levee section. This plan requires the acquisition of real estate for construction and right-of-way and for new borrow areas which may also serve to elevate the environmental concerns of using this alternative.

2.1.3.4 Alternative 4. Lime/Class C Fly Ash Injection Technique

The lime/Class C fly ash injection alternative is a construction method that involves injecting a mixture of hydrated lime and Class C fly ash at regular intervals into the levee slope using a series of injector rods on a track-mounted vehicle. Injection typically begins at 12 to 18 inches from the surface and proceeds downward at depth increments of approximately 12 to 18 inches. The injector rods are inserted into the levee sideslope on 5-foot center spacing. There is a second phase of injections that are spaced in between the initial injections resulting in 2.5-foot spacing. The typical injection depth will be 10 feet but may need to be revised in those reaches where the slide failure planes have been

found deeper. This will ensure that the injections exceed the depth of the nominal slide failure planes. The injector rods have tips capable of dispersing slurry in a 360-degree pattern. The injector is equipped with a pressure gauge that measures and allows monitoring of the slurry injection pressure. Typical injection pressures range from 50 to 70 psi during normal operations. When lime/Class C fly ash slurry is injected into expansive clays, it fills the cracks that form as a result of shrinking and swelling. The injection process pushes out any free water in the cracks. A chemical reaction takes place between the calcium hydroxide (lime) and the silica and alumina naturally occurring in the clay. The materials combine to form calcium silica hydrates and calcium silica aluminates. These are stabilizing compounds that result in increased shear strength in the weakness planes. It is anticipated that the strength of the slope, as a whole, will increase after theses injections. Globally, for each reach where the injections are performed, the injection process will result in an improved shearing resistance.

2.2 Proposed Action/Recommended Alternative

The "No Action" alternative was considered unacceptable because of the high risk of significant levee failure during floods associated with unrepaired levee slides. The consequences of levee failure relative to health, safety, environmental, and economic viability for the protected cities, towns, villages, industry, transportation, and commercial enterprises were too great to accept. The high plasticity soils must be replaced or chemically modified to lower the risk of failure and meet the standard USACE criteria for flood control projects.

Action alternative four was chosen as the Recommended Alternative 4 because it achieved the same level of repair integrity as any of the other alternatives but with less construction cost and adverse environmental impacts. Additional details regarding this alternative are as follows:

Construction Details

Fly Ash

Class C fly ash is a fine, powdery pozzolanic material made of silica, alumina, iron, and calcium. A pozzolan is a siliceous or siliceous/aluminous material that, when mixed with lime and water, forms a cementitious compound. A pozzolan requires the addition of lime to create the cementitious compound; cement requires only water to begin the binding and hardening process. Fly ash is a byproduct of coal burning at utility plants. As coal is burned, non-combustible mineral impurities in coal evaporate and condense into tiny particles of glass, almost totally spherical in shape. The fly ash particles are removed from the exhaust stream in bag houses or electrostatic precipitators and then stored for later shipment.

Due to its cementing and plasticity qualities, the use of Class C fly ash on U.S. federal funded projects is encourage by its classification as a “recovered” product under the federal Resource Conservation and Recovery Act. Fly ash has been used for over 20

years by the Army Corps of Engineers for levees and for countless highway and subgrade applications. Amending high plasticity clay with Class C has been proven to result in improved soil properties, including increases in stiffness, strength, and freeze-thaw durability as well as reductions in permeability, plasticity, and swelling.

Beneficial uses also include improved fertility of agricultural soils when Class C fly ash is used in conjunction with composted soil. Furthermore, Class C fly ash has been found to prevent leaching of metals and has been applied for this purpose. According to analytical studies conducted over several years, as a cementitious material Class C fly ash has a very low potential for leaching and any leached amounts resulting from stringent laboratory testing are at low levels, not exceeding groundwater compliance criteria.

According to the Risk Screening (see Appendix C) conducted for this project, the Conclusion states:
"The risk screening performed for the use of the lime/Class C fly ash slurry to stabilize levee soils developed the following conclusions.

- The lime/Class C fly ash slurry used to stabilize the levees is not a listed or characteristically hazardous waste.
- The use of lime/Class C fly ash slurry to stabilize levee soils would not adversely impact the pH of the levee soils or runoff (surface water).
- The use of lime/Class C fly ash slurry to stabilize levee soils would not lead to human health impacts.
- The use of lime/Class C fly ash slurry to stabilize levee soils would not lead to ecological impacts.
- The use of lime/Class C fly ash slurry to stabilize levee soils would not lead to adverse agrarian impacts.

These conclusions reflect the volume of lime/Class C fly ash slurry typically injected to stabilize levee soils. Using the typical slurry injection rate of 1.5 dry pounds of slurry per cubic foot of soil to be stabilized, the contribution of the slurry to the entire soil mass is only about 1.5% by weight. The chemistry of the slurry would need to be significantly different than the chemistry of the soils for such a low injection rate to have large impacts. Because the overall chemistry of the lime/Class C fly ash is similar to the chemistry of the soils the results of the screening are understandable."

See sampling data in Appendix D.

Drinking water data (see Appendix E) from towns downstream of levees repaired through the lime/Class C fly ash injection method point to no effect in drinking water quality from the repaired levees. The USACE Memphis and Kansas City districts have amended levees during the past 15 years using the lime/Class C fly ash injection techniques, but limited field data are available regarding localized soil and water impacts, with respect to leaching of metals. Nonetheless, scientific and professional publications that describe various uses of LFA products and procedures indicate minimal environmental impacts to water resources because of leaching processes (*Leaching Behavior of Lime–Fly Ash*

Mixtures, by John L. Daniels, and Gautham P. Da, Department of Civil Engineering and GIEES, University of North Carolina at Charlotte, in Environmental Engineering Science, Volume 23, Number 1, 2006 and IEP - *Coal Utilization By-Products: Current Regulations Governing Coal Combustion By-Products* – Illinois. U.S. Department of Energy, Office of Fossil Energy, http: http://www.netl.doe.gov/technologies/coalpower/ewr/coal_utilization_byproducts/states/illinois.htm)

These information sources are included in the references section in the Risk Screening. In addition, a review of drinking water quality reports from communities along the Mississippi River and its tributaries downstream of amended levees was conducted, with no indications that water supplies were impacted by elevated levels of metals typically found in the Class C fly ash. (*Annual Drinking Water Quality Reports* – West Memphis, AR; Scott City, MO; Cape Girardeau, MO; East St. Louis, IL, 2009 and *Drinking Water System Descriptions and Water Quality Reports, including Violations* – multiple communities bordering the Mississippi River in Randolph, Jackson, Union, and Alexander counties, http://163.191.83.31/dww/Maps/Map_Template.jsp 1999-2009)

The Lower Chariton River Levee in Dalton, Missouri was constructed of high plasticity clays similar to the targeted sections of the Alton to Gale levee system. The fat clays had undergone volume changes associated with desiccation which created a full network of finite joints, seams, and cracks resulting in multiple levee slides. The lower Chariton River Levee slides were repaired by injection with a lime/class C fly ash slurry. A study by North Carolina State University on the Lower Chariton River Levee (*Rehabilitation of Lower Chariton River Levee by Lime/Fly Ash Slurry Injection*, Center for Transportation Engineering Studies Department of Civil Engineering, North Carolina State University Juan I. Baez, Roy J. Borden, James F. Henry) found that treatment with lime/Class C fly ash slurry injection improved the overall average strength characteristics of levee soils by 15 to 30 percent. Since the levee was rehabilitated with the lime/Class C fly ash injection in April 1988, there have been no slope failures, whereas there have been some slides in adjacent, untreated areas.

The primary reason lime/Class C fly ash slurry injection is used in soil stabilization applications is to penetrate any fractures, cracks or voids within the embankment in order to improve the compressive and shearing strength of the high plasticity clays. Secondly, the Class C fly ash reduces the high plasticity clays' potential for shrink swell by cementing the soil grains together much like a portland cement bonds aggregates together to make concrete. Finally, because of the pozzolanic properties of Class C fly ash, when mixed with lime and water, trace heavy metals are locked into the cementitious matrix, reducing their leachability.

For this project, a Class C fly ash consistent with ASTM D 5239, "Standard Practice for Characterizing Fly Ash for Use in Soil Stabilization" will be used for soil stabilization lime/class C fly ash would be proportioned at the ratio of 1 part lime to 3 parts Class C fly ash and would be mixed in the range of 6 to 8 pounds lime/Class C fly ash per gallon of water. Use of less than 6 pounds and more than 8 pounds of lime Class C fly ash per

gallon of water may be used, subject to approval by the Contracting Officer. The lime/Class C fly ash slurry would be continuously agitated during construction.

USACE will follow all applicable American Society of Testing Materials (ASTM) Standards such as *Standard E-2277 – 03* that under section 5.3.2 discusses the "compressive strength of self-cementing fly ash. The higher compressive strengths will be attained when the fly ash is placed and compacted immediately following the addition of water." (*ASTM Standard E-2277 – 03*)

Supply and mix tanks would be equipped with a mechanical agitation system capable of producing and maintaining a uniform mix. The supply tank would have the capability of transferring the lime/Class C fly ash mixture to the injector unit at the required pressure and in the necessary quantities. The tanks would be located and operated in such a manner as to prevent damage to the environment. Berms or other required protection would be provided to prevent spills and excess slurry from entering any wooded areas or watercourses, thus preventing dust particles from being released into the air.

Right Of Way

All lands, easements, or right-of-ways (ROW), required for construction and maintenance and operation of the project would be provided by the non-federal sponsors (NFS). All construction activities by the Contractor would be coordinated by USACE. If the staging areas need to be moved along the levee, they would remain within the existing levee ROW. The NFS for the eleven levee districts identified in the report are responsible for providing the minimum real estate interests described in the final ROW drawings that will be prepared by the St. Louis District. Existing lands, easements, or ROW is held by the NFS in the form of fee estates and permanent easements.

Staging Areas

Off levee staging areas for lime/Class C fly ash slurry mixing and other equipment would be approximately 200 feet by 600 feet. The staging area locations would be determined at the onset of construction. Prior to and during construction the contractor would follow guidelines for staging area selection established in the Statement of Work (SOW) within the awarded contract as defined in the Environmental Protection Plan. Wherever feasible, the repair work and staging would take place from the top of the levee. In general, the Contractor shall confine all activities to areas defined by USACE drawings and specifications. Prior to the beginning of any construction, as specified by the Contracting Officer. The Contractor shall mark any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms. No ropes or cables shall be fastened to or attached to any trees for anchorage unless specifically authorized by USACE. The Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, soil, or other materials displaced into uncleared areas shall be removed by the Contractor.

Berm Construction and Tree Protection
At the toe of each injection area a containment berm or embankment will be built. No borrow material will be required. This is not a compacted soil structure but a small mound of material that will be scraped from the existing soil cover near the toe of the levee. The injection process may produce a small amount of flow from each injection hole. As soon as the operator sees material coming out of the injection hole (point of refusal), any further injection is to be stopped. As required, the overflow amounts would be kept to a minimum. Any injection material that is running freely on the surface, either around the injection rods or out of previous injection holes, is puddled at the toe of the embankment slope, has been spilled, or for any other reason has been judged unsuitable slurry material by the Contracting Officer, shall be defined as wasted slurry. The waste slurry shall be disposed of in an environmentally safe manner. After construction, the berm would be re-graded onto the levee (Figure EA-4).

Another benefit of using the lime/Class C fly ash technique is that construction equipment would not encroach past the toe of the levee. At a number of repair sections for this project there are trees at the toe of the levee and outward batcherlands and fastlands that must be protected. If a berm cannot be built at these areas because of impacts to trees, the contractor, as an alternative, would be required to use all necessary best management practices including but not limited to the use of silt fencing and straw bales to capture and prevent slurry from going beyond the toe of the levee (Figure EA-4).

The Contractor would provide all support equipment necessary to keep the work progressing in a smooth and orderly fashion. The equipment may include, but is not limited to, slurry transport trailers, portable pumps, hoses and other related equipment as required. The Contractor shall minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. The Contractor shall plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations.

Repair of existing slides
In Districts where there are existing slides (Grand Tower and Degognia D&LD's – presently 5 slides), the slides will need to be repaired before any lime/Class C fly ash injection takes place. The slides will be repaired by the lime stabilization method. The material will be removed, mixed with hydrated lime, and compacted and replaced in lifts. Any ROW required will be obtained as discussed above.

General Advantages:
- Minimal ROW required for construction
- Reduced cultural and environmental impact since minimal work is required outside the levee footprint
- No tree removal

- Rapid construction
- No excavation required therefore level of protection is not affected during construction

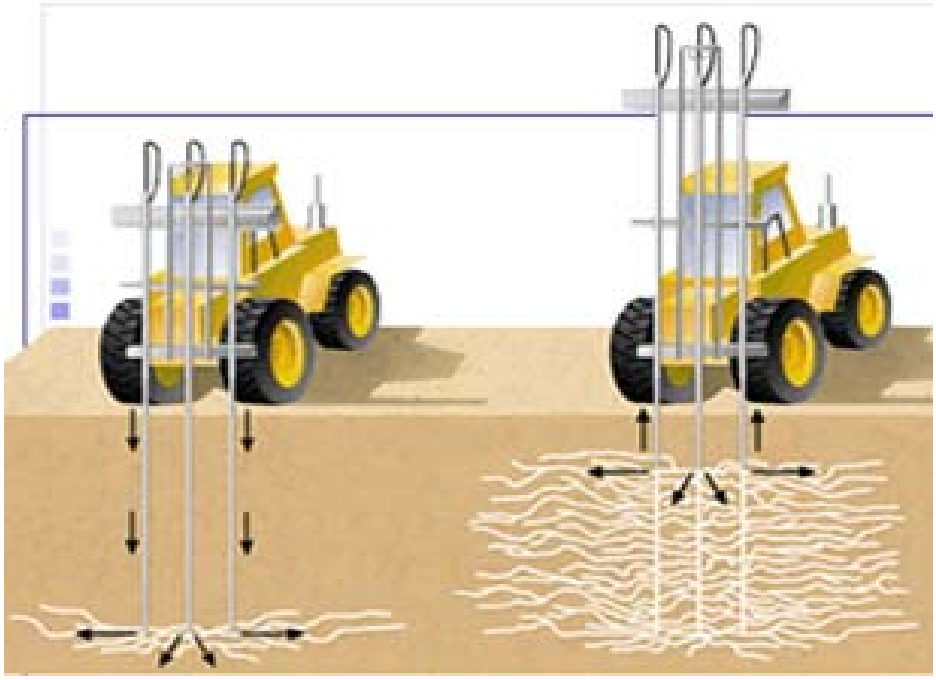

Figure EA-3 - Lime/Class C Fly Ash Injection Technique – Alternative 4

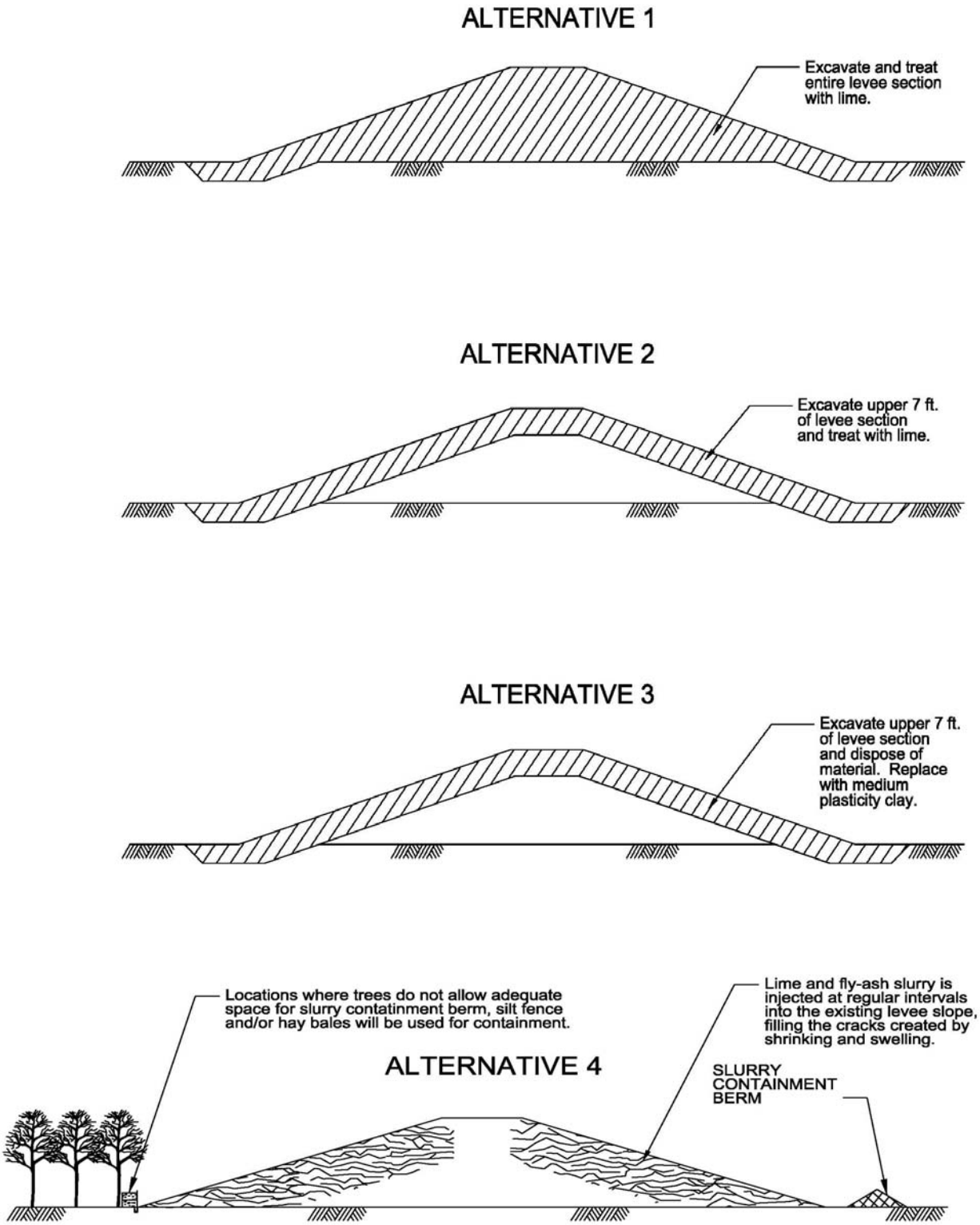

Figure EA- 4. Levee cross sections for Alternatives 1-4

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section identifies the significant resources located in the vicinity of the proposed action, and describes those resources that would be impacted, directly or indirectly, by the proposed levee repairs. Direct impacts are those that are caused by the action taken and occur at the same time and place (40 CFR §1508.8(a)). Indirect impacts are those that are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable (40 CFR §1508.8(b)). Cumulative impacts result from the incremental impact of the action when added to other past, present, and future actions (40 CFR §1508.7. These are further discussed in section 3.13. Effects and impacts are used synonymously in the context of this NEPA document.

The resources described in this section are those recognized as significant by laws, executive orders, regulations, and other standards of national, state, or regional agencies and organizations; technical or scientific agencies, groups, or individual; and the general public.

The Contractor shall minimize interference with, disturbance to, and damage to fish, wildlife, and plants including their habitat. The Contractor shall be responsible for the protection of threatened and endangered animal and plant species including their habitat in accordance with Federal, State, Regional, and local laws and regulations. The Contractor shall use best practices and comply with all applicable laws and regulations pertaining to the effect on natural, social, and economic resources utilized by the surrounding human population.

3.1 Threatened and Endangered Species

3.1.1 Federal Species

In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, the St. Louis District Planning and Environmental Branch requested the U. S. Fish and Wildlife Service provide a list of federally threatened or endangered species that may occur in the vicinity of the proposed project. In an electronic message, dated 7 August, 2008, the U.S. Fish and Wildlife Service (USFWS) (Marion, Illinois) provided this list of species and general habitat preferences (Table 2). Habitat requirements and impacts of the Federal Action alternatives are discussed for each species below. There is no designated critical habitat in the project area at this time for any of these species.

Common Name (Scientific Name)	**Classification**	**General Habitat**
Indiana Bat (*Myotis sodalis)*	Endangered	Caves, mines (hibernacula); small stream corridors with well developed riparian woods; upland forests (foraging)
Gray Bat (*Myotis grisescens*)	Endangered	Caves; feeding-rivers/reservoirs adjacent to forests
Interior Least Tern (*Sterna antillarum*)	Endangered	Bare alluvial and dredge spoil islands
Pallid Sturgeon (*Scaphirhynchus albus)*	Endangered	Large rivers
Decurrent False Aster (*Boltonia decurrens*)	Threatened	Disturbed alluvial soils
Illinois Cave Amphipod (*Gammarus acherondytes*)	Endangered	Karst caves and streams
Sheepnose (*Plethobasus cyphyus*)	Candidate	Rivers

Table EA- 2. List of federally threatened and endangered species and their habitat provided by USFWS on 7 August, 2008.

Indiana Bat (*Myotis sodalis*) forage on flying insects typically along the shorelines of rivers and lakes, in the canopy of trees in floodplains (Humphrey et al. 1977), and in upland forests (Brack and LaVal 1985). In summer, habitat consists of wooded or semi-wooded areas, mainly along streams. Females bear their offspring in hollow trees or under loose bark of living or dead trees. Trees standing in sunny openings are attractive because of warmer air spaces and crevices under the bark. Maternity sites have been reported in riparian areas, floodplain forests, and upland habitats. Limestone caves with pools are preferred for hibernacula during winter (Hall 1962).

Future Conditions with No Action

Without implementation of the recommended action no levee repair would be conducted which is not likely to adversely affect the Indiana Bat.

Future Conditions with Recommended Alternative

Direct Impacts - As planned, deficiency repairs would take place within the footprint of the existing levee with no impact trees.. Therefore, the Recommended Alternative 4 is not likely to adversely affect the Indiana bat.

Indirect and Cumulative Impacts – Indiana Bats would be protected from any adverse affects associated with general levee maintenance, including repair of gravity drains, flood gates and seepage berms.

Future Conditions with non-recommended Alternatives 1, 2, and/or 3

Direct Impacts - Under each of these alternatives there would be the potential and likely adverse impacts to Indiana Bats from tree removal. Maternities and roosting bats are known from a number of the D&LDs, especially in the southern districts according to U.S. Forest Service wildlife expert Biologist at the Shawnee National Forest, Steve Widowski. Because of the required construction procedures, these alternatives would require the removal of roughly 15.5 acres of bottomland hardwoods in the Grand Tower, Degognia, and Prairie Du Rocher D&LDs. The impacts are associated with the need for 15 feet to 30 feet of construction clearance from the levee toe in order to perform the design deficiency repairs. The location(s) of the needed repairs makes impact avoidance impracticable. Site visits have determined that the bottomland hardwoods to be cleared is a mature community comprised of species typical for this habitat type in southern Illinois including ash, hickory, maple, oak and locust of various ages. In addition, specifically for alternative 3, there would potential be additionally adverse impacts to the Indiana Bat from the use of borrow areas.

Indirect, and Cumulative Impacts - Same as Recommended Alternative 4.

Gray Bat (*Myotis grisecens*) occurs in several Illinois and Missouri counties where it inhabits caves both during summer and winter. This species forages over rivers and reservoirs adjacent to forests.

Future Conditions with No Action

Without implementation of the recommended action, no levee repair would be conducted Therefore, this action is not likely to adversely affect to cave habitats and the Gray Bat.

Future Conditions with Recommended Alternative 4

Direct Impacts - The repair would take place within the footprint of the existing levee and no caves would be impacted. The Recommended Alternative 4 is not likely to adversely affect the Gray Bat.

Indirect and Cumulative Impacts –No future actions are known or anticipated in the project area that would adversely impact the Gray Bat and its habitat.

Future Conditions with non-recommended Alternatives 1, 2, and/or 3

Direct, Indirect, and Cumulative Impacts - The repair would take place within the footprint of the existing levee and thus there would be no impact on caves.. No future actions are anticipated in the project area that are likely to adversely impact the Gray Bat and its habitat

Interior Least Tern (*Sterna antillarum*) historic breeding range includes the Mississippi River system (USFWS 1990). Surveys of the Mississippi River have found the majority of breeding colonies occur south of Cairo, Illinois (Jones 2000). However, breeding birds have been found in Alexander, Union and Jackson County, Illinois, which border the Mississippi River. The terns prefer "bare alluvial islands or sandbars" for nesting and utilize the river, backwater sloughs and fish or stock ponds for foraging. During periods of high river stages, when appropriate sandbar habitat is underwater, birds become more opportunistic in terms of nest site selection. They have utilized agricultural fields and/or county roads provided they are temporary "islands" with water surrounding them in order to inhibit predation of their nests, eggs and young. The project area does not possess sufficient nesting habitat for least terns nor does the surrounding areas support adequate "islands" of habitat preferred in desperate times for the birds. It is possible the birds could forage within the Big Muddy River, but generally they prefer backwater sloughs along the Mississippi or fish or stock ponds. Least terns arrive at breeding grounds in late April and the breeding season is complete by early September (USFWS 1990).

Future Conditions with No Action

Without implementation of the recommended action, no levee repair would be conducted. Therefore, this action is not likely to adversely affect the Interior Least Tern.

Future Conditions with Recommended Alternative 4

Direct Impacts - Levee repairs would take place within the footprint of the levee and would not impact any Interior Least Tern habitat. The Recommended Alternative 4 is not likely to adversely affect the Interior Least Tern.

Indirect and Cumulative Impacts – No future actions are known or anticipated in the project area that may affect, but not likely to adversely affect the Interior Least Tern and its habitat.

Future Conditions with non-recommended Alternatives 1, 2, and 3

Direct, Indirect, and Cumulative Impacts - These alternatives would not impact bare alluvial islands or sandbars on the Mississippi River and are not likely to adversely affect

the Interior Least Tern. No future actions are anticipated in the project area that would adversely impact the Interior Least Tern and its habitat

Pallid Sturgeon (*Scaphirhynchus albus)* are distributed throughout the Mississippi and Missouri River basins but are considered a rarity. Pallid Sturgeon forage for fish along the bottom of large rivers (USFWS 1993). Little is known of adults' habitat preferences and even less is known about spawning locations. Pallid Sturgeon are most frequently caught over a sand bottom, which is the predominant bottom substrate within the species' range on the Mississippi River. Recent tag returns have shown that the species may be using a range of habitats in off-channel areas and tributaries of the Mississippi River (Garvey et al. 2010).

Future Conditions with No Action

Without implementation of the recommended action no levee repair would be conducted. Therefore, this action is not likely to adversely affect the Pallid Sturgeon.

Recommended Alternative 4 – Levee repairs would take place within the footprint of the levee and would not impact any Pallid Sturgeon habitat. The Recommended Alternative 4 is not likely to adversely affect the Pallid Sturgeon.

Alternatives 1, 2, and 3 – Because there would are no expected impacts to the mainstem Mississippi River habitats, these alternatives are not likely to adversely affect the Pallid Sturgeon.

Decurrent False Aster *(Boltonia decurrens)* is primarily a floodplain perennial endemic to the floodplains of the Illinois River and its confluence with the Mississippi River (Madison and St. Clair Co., Illinois and St. Charles Co., Missouri) (Smith 2000, Mettler-Cherry 2006). A single disjunct population, reported in 1976, but not found since, was known from Cape Girardeau, Missouri, about 195 km down the Mississippi River from St. Louis (Schwegman and Nyboer 1985; USFWS 1990). Nothing is known concerning this population.

Future Conditions with No Action

Without implementation of the recommended action no levee repair would be conducted. Therefore, this action is not likely to adversely affect the Decurrent False Aster.

Recommended Alternative 4 – It is unlikely that any populations of the Decurrent False Aster occur within the project areas, because most D&LDs are considerably south of existing population center for this species (Smith 2000). In addition, although this species has occasionally been found on levees they generally do not provide suitable habitat (USFWS 1990). Levees slopes are generally dry and would not support Decurrent False Aster populations over extended time periods (Smith et al.1998). Levee repairs would take place within the footprint of the levee and the Recommended Alternative 4 is not likely to adversely affect the Decurrent False Aster.

Alternatives 1, 2, and 3 – Potentially, adverse impacts to Decurrent False Aster would occur under alternative 3 where borrow sites would be required.

Illinois Cave Amphipod (*Gammarus acherondytes*) is listed as endangered in Monroe and St. Clair Counties, Illinois. It is currently known to occur in only a few cave streams of the Illinois sinkhole plain in southwestern Illinois. The contamination of groundwater is probably the greatest threat to this species.

Future Conditions with No Action

Without implementation of the recommended action no levee repair would be conducted. Therefore, this action is not likely to adversely affect the Illinois Cave Amphipod.

Recommended Alternative 4 – This alternative is not likely to adversely impact the Illinois Cave Amphipod or its habitat.

Alternatives 1, 2, and 3 –This alternative is not likely to adversely impact the Illinois Cave Amphipod or its habitat.

Sheepnose (*Plethobasus cyphyus*) is a freshwater mussel listed as a candidate species and is now rare in the rivers of its former range in the Midwest. This species inhabits gravel or mixed sand and gravel habitats in medium to large rivers.

Future Conditions with No Action

Without implementation of the recommended action no levee repair would be conducted. Therefore, this action is not likely to adversely affect the Sheepnose.

Recommended Alternative 4 –This alternative is not likely to adversely impact the Sheepnose or its habitat.

Alternatives 1, 2, and 3 – No adverse impacts to this species or its river habitat would be anticipated under these alternatives.

3.1.2 State Species

A list of Illinois and Missouri endangered, threatened, and special concern species that could potentially occur within the project area can be found in Appendix B. During construction, all attempts would be made to avoid or minimize adverse impacts and disturbance to these species. In the recommended approach, all work can be accomplished from the top and slopes of the levee to inject the lime/fly ash material. See Section 2.2 for a discussion of staging areas, ROW, and berm construction, and on-site responsibilities of the Contractor. Placement and construction of access roads, staging areas etc., would be coordinated with the Illinois Department of Natural Resources and

the Missouri Department of Conservation (in the case of the Boise Brule D&LD) to assure minimal adverse impacts to these species.

3.2 Noise and Air Quality

Future Conditions with No Action

Without implementation of the recommended action, no levee repair would be conducted. Therefore, there would be no noise or air quality impacts.

Future Conditions with Recommended Alternative. 4

Direct Impacts – Air Quality - Construction activities would cause dust and exhaust fumes from construction equipment. These impacts are considered short term. Equipment operation, activities, or processes performed by the Contractor shall be in accordance with all Federal and State air emission and performance laws and standards. The Contractor shall keep construction activities under surveillance, management and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with the laws of the State or States in which the work is being performed and all Federal emission and performance laws and standards. In the event that air pollution occurs due to the Contractors actions, the Contractor shall take all necessary steps to rectify the situation to the satisfaction of the Contracting Officer. Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal, State, and/or local allowable limits at all times. The mixture would be contained in a truck and go by hose into mixing system. The Health and Safety Plan would be enforced for all workers. Also, Because the material is in a slurry and wet, it is not anticipated that any particles from the lime/Class C fly ash would become airborne during the injection process. Furthermore, USACE will include in its Environmental Protection Plan requirements for safeguards and complete cleanup of any excess material resulting from the injection process.

Noise - The proposed project would be expected to temporarily increase noise levels near repair sites. The U.S. Environmental Protection Agency has set a limit of 85 decibels on the A scale (the most widely used sound level filter) for eight hours of continuous exposure to protect against permanent hearing loss. Based upon similar construction activities conducted by USACE in the past, noise above this level would not be expected to occur for periods longer than eight hours. The Contractor shall keep construction activities under surveillance and control to minimize environmental damage by noise. The Contractor shall comply with the local allowable limits, and all rules and provisions of the State or States in which the work is being performed.

Indirect and Cumulative Impacts – These impacts would be associated with future slide or levee repairs, including repair of gravity drains, flood gates and seepage berms. as well as general levee and maintenance – primarily mowing. Speculatively, maintaining

reliable, trustworthy levee systems between Alton to Gale promotes social and economic growth and development in the floodplain – ultimately this could have future impacts to noise and air quality.

Future Conditions with non-recommended Alternatives 1,2, and/or 3

Direct, Indirect, and Cumulative Impact - Same as Recommended Alternative 4.

3.3 Water Quality and Aquatic Resources

Fly Ash
Fly ash is a fine, powdery pozzolanic material made of silica, alumina, iron, and calcium. A pozzolan is a siliceous or siliceous/aluminous material that, when mixed with lime and water, forms a cementitious compound. A pozzolan requires the addition of lime to create the cementitious compound; cement requires only water to begin the binding and hardening process. Fly ash is a byproduct of coal burning at utility plants. As coal is burned, non-combustible mineral impurities in coal evaporate and condense into tiny particles of glass, almost totally spherical in shape. The fly ash particles are removed from the exhaust stream in bag houses or electrostatic precipitators and then stored for later shipment.

For this project, Class C fly ash would be used for soil stabilization. Lime/Class C fly ash would be proportioned at the ratio of 1 part lime to 3 parts fly ash and would be mixed into slurry in the range of 6 to 8 pounds lime/Class C fly ash per gallon of water. Use of less than 6 pounds and more than 8 pounds of lime/Class C fly ash per gallon of water may be used, subject to approval by the Contracting Officer as per the specifications for the injected material. The lime/Class C fly ash mixture shall be continuously agitated.

Supply and mix tanks shall be equipped with a mechanical agitation system capable of producing and maintaining a uniform mix. The supply tank shall have the capability of transferring the lime/Class C fly ash mixture to the injector unit at the required pressure and in the necessary quantities. The tanks shall be located and operated in such a manner as to prevent damage to the environment. Berms or adequate protection shall be provided to prevent spills and excess slurry from entering any wooded areas or watercourses.

The Contractor shall provide all other support equipment necessary to keep the work progressing in a smooth and orderly fashion. The equipment may include, but is not limited to, slurry transport trailers, portable pumps, hoses and other related equipment as required. The location of any staging areas shall be coordinated with the Contracting Officer.

Due to its cementing and plasticity amending qualities, the use of Class C fly ash on U.S. federal funded projects is encouraged by its classification as a “recovered” product under

the federal Resource Conservation and Recovery Act. According to studies (see References below), because of the chemical reaction that takes place with lime/Class C fly ash, and water, trace heavy metals are locked into the cement matrix, no longer able to leach into the ground.

The beneficial use of lime/Class C fly ash in the repair of levees will amend the plasticity of the clay soils and provide a solid cementitious, encapsulated structure. Thus, the repaired levees will provide flooding protection for communities along the waterways served by the levees. As cited earlier, it has been found the lime/Class C fly ash grout used with the injection method effective for preventing further slides and for containing any leachate. USACE will oversee all repairs and insure adherence by the contractor to all applicable ASTM Standards regarding the composition of the lime/Class C fly ash slurry, the application methodology, the USACE Environmental Protection Plan, and all water quality federal and state guidances.

No jurisdictional wetlands, waterways or other Waters of the United States would be affected by the proposed access, repair and construction methods associated with this project. As such, the St. Louis District, Regulatory Branch determined that no Section 404 Clean Water Acts permits would be required to complete the project as proposed.

Future Conditions with No Action

Without implementation of the recommended action, no levee repair would be conducted. Therefore, there would be no water quality impacts associated with the project.

Future Conditions with Recommended Alternative 4

Direct Impacts - It is anticipated that construction activities would have no impact on local water quality or other aquatic resources. After injection, lime/Class C fly ash forms a cementitious compound within hours (primarily depending on temperature) of injection. Although there are waterways and wetlands close and even adjacent to the construction area the Environmental Protection Plan Statement of Work within the awarded contract would require the Contractor to confine all activities to areas defined by the drawings and specifications and detail any issues of concern such as slurry run-off. The Contractor would be required to provide effective protection for waterways and wetlands and cease work if rain is eminent which would cause lime/Class C fly ash slurry to drain into aquatic areas. The Contractor would minimize environmental pollution and damage that may occur as the result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work would be protected during the entire duration of the contract. The Contractor would plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Further, the Contracting Officer would notify the contractor in writing of any observed noncompliance with Federal, State or local environmental laws or regulations, permits, and other elements of the contractor's Environmental Protection Plan. The contractor would, after receipt of such notice, inform the Contracting Officer

of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken.

As described above (section 2.1.3.4), the Contractor would construct small earthen berms along the levee toe for the length of the job and adjacent to drainage channels to eliminate accidental entry of slurry into area watercourses. The earthen berms would be of sufficient size to capture any slurry at the levee toe. Any slurry that is running freely on the surface (either around injection rods or out of previous injection holes), is puddled at the toe of the embankment slope, has been spilled, or for any other reason has been judged unsuitable slurry material by the Contracting Officer, shall be defined as wasted slurry. In situations where trees or wetlands would be impacted by berm construction the Contractor, as an alternative, would be required to use all necessary best management practices including but not limited to the use of silt fencing and hay bales, to capture and prevent slurry from going beyond the toe of the levee. No adverse impacts to any wetlands are expected during these repairs. The Contractor shall comply with all applicable environmental Federal, State, and local laws and regulations regarding disposal of slurry. Compliance with all Federal, State, and local laws and ordinances is compulsory.

In order to ensure that water quality compliance is maintained, the contractor would supply the appropriate information documenting the quality of the fly ash meets all applicable state and federal standards. All aspects of the mixing and injection process would be documented within the environmental protection plan submittal along with all the best management practices that would be used to minimize the risk associated with this process.

Any slurry that is running freely on the surface (either around injection rods or out of previous injection holes), is puddled at the toe of the embankment slope, has been spilled, or for any other reason has been judged unsuitable slurry material by the Contracting Officer, shall be defined as wasted slurry. The waste slurry that is puddled at the toe of the levee slope shall be disposed of in an environmentally safe manner.

Post-construction, where needed, the levee would be seeded to prevent erosion. Earthwork brought to final grade shall be finished as indicated and specified. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils.

Indirect and Cumulative Impacts – These impacts would be associated with future slide or levee repairs. Speculatively, maintaining reliable, trustworthy levee systems between Alton to Gale promotes social and economic growth and development in the floodplain – ultimately this could have future impacts to water quality and aquatic resources.

Future Conditions with non-recommended Alternatives 1, 2, and/or 3

Direct Impacts - As above, under these alternatives it is anticipated that construction activities would have only minor localized impacts to water quality or other aquatic resources. Repairs could cause short term run-off from erosion if rain should occur during construction. Post-excavation, the levee would be seeded to prevent erosion. However, under alternative 3 additional impacts to water quality and other aquatics could be possible depending on the selection of borrow areas. Appropriate coordination and mitigation would have to be conducted.

Indirect and Cumulative Impacts – Same as Alternative 4, these impacts to water quality and aquatic resources would be associated with future slide or levee repairs.

3.4 Soils and Prime Farmland

Future Conditions with No Action

Without implementation of the recommended action, no soils or prime farmland would be impacted from construction. However, as noted in Section 2.1.2, left unrepaired, the unstable levee slopes result in a significantly high risk of levee embankment failure due to the reduced cross-sectional area for floodwater retention. Should a failure occur during a high water event, a breach in the flood protection system is highly probable. If one slide area completely fails, the entire area protected by the levee could be completely inundated in a matter of hours potentially impacting thousands of acres of soils and prime farmland. Mississippi River floods are known to deposit thousands of tons of sand over the floodplain (flood of 1993). Soils and prime farmland could also be impacted by pollutants from industrial facilities in the levee system which include petroleum storage facilities, chemical plants, and metals production plants. Rural and agricultural pollutants could impact soils and prime farmland resources for years after flooding.

Future Conditions with Recommended Alternative 4

Direct Impacts - Under the Recommended Alternative 4, no agricultural lands or areas of prime farmland would be impacted by construction of the project.

Indirect and Cumulative Impacts – These impacts would be associated with future slide or levee repairs, depending on the extent of repair and if borrow material would be required. Speculatively, maintaining a reliable, trustworthy levee systems between Alton to Gale promotes social and economic growth and development as well as continued agricultural use of the floodplain – ultimately this could have negative future impacts to soils and prime farmland.

Future Conditions with non-recommended Alternatives 1, 2, and/or 3

Direct – Same as Recommended Alternative 4.

Indirect, and Cumulative Impacts - Only under Alternative 3 would there be the potential for impacts to soils and prime farmland. Again, this would depend on the choice and/or location of borrow site(s).

3.5 Physiography-Topography

Future Conditions with No Action

Without implementation of the recommended action, no levee repair would be conducted. Therefore, there would be no changes to the current physiography-topography.

Future Conditions with Recommended Alternative 4

Direct Impacts - All of the levees covered in this environmental assessment were constructed between 1936 and 1965 under provisions of various authorizing legislation. All levees had an average height of 20 feet, a crown width of 20 feet and side slopes of 1V on 3H. The levee and construction and staging areas would be returned to pre-slide conditions after repair work is completed.

Indirect and Cumulative Impacts – These impacts would be associated with future slide or levee repairs.

Future Conditions with non-recommended Alternatives 1, 2, and/or 3

Direct Impacts - Under these alternatives there would be temporary changes to the topography as a result of levee excavation during construction. Once the soils are mixed with hydrated lime the levee would be re-constructed. Additionally, under alternative 3 there would there be the potential for impacts to physiography-topography based on the choice of borrow site(s).

Indirect, and Cumulative Impacts - These impacts would be associated with future slide or levee repairs.

3.6 Terrestrial Impacts

Future Conditions with No Action
Without implementation of the recommended action, no or infrequent levee repair would be conducted. Therefore, the greatest terrestrial impact would result from the repair of individual slides by the respective levee district(s). Impacts, then would depend on the methods used to repair the slides.

Future Conditions with Recommended Alternative 4

Direct Impacts – Short-term adverse terrestrial impacts would be expected from construction. A considerable amount of adverse soil disturbance would take place from the crawler-type tractor used for injection. This disturbance will be limited to the levee slopes and crown. The proposed repair area does not generally provide "quality" wildlife habitat because of regular disturbances from mowing and other maintenance activities. Therefore, it is unlikely that the repair area supports significant wildlife populations. Additionally, some wildlife species (small mammals) would surely be temporarily displaced during construction. There would be no adverse impacts to any federally listed threatened or endangered species.

According to the Environmental Plan, the Contractor would confine all activities to areas defined by the drawings and specifications. Prior to the beginning of any construction, as specified by the Contracting Officer, the Contractor would mark any land resources to be preserved within the work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor would not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without approval. No ropes, cables, or guys would be fastened to or attached to any trees for anchorage unless specifically authorized. The Contractor would provide effective protection for land and vegetation resources at all times.

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings submitted by the Contractor as part of the Environmental Protection Plan to be preserved, would be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques. The Contractor would restore landscape features damaged or destroyed during construction operations outside the limits of the approved work area.

Earthwork brought to final grade would be finished as indicated and specified in the Environmental Plan. Side slopes and back slopes would be protected as soon as practicable upon completion of rough grading. All earthworks would be planned and conducted to minimize the duration of exposure of unprotected soils. Disturbed soils would be replanted with a standard levee/berm seed mix of perennial rye grass, tall fescue, winter wheat, and Bermuda grass.

Indirect and Cumulative Impacts – These impacts would be associated with future slide or levee repairs. Speculatively, maintaining reliable, trustworthy levee systems between Alton to Gale promotes social and economic growth and development as well as continued agricultural use of the floodplain – ultimately this could have future impacts to terrestrial plant and animal communities throughout the project area.

Future Conditions with non-recommended Alternatives 1, 2, and/or 3

Direct Impacts - Considerable terrestrial impacts would be expected under each of these alternatives from tree clearing, hydrated lime mixing, and other construction activities mentioned. Because of the necessary construction actions, these alternatives would require the removal of roughly 15.5 acres of bottomland hardwoods in the Grand Tower, Degognia, and Prairie Du Rocher D&LD's. The impacts are associated with the need for 15 feet to 30 feet of construction clearance from the levee toe in order to grade and work the soil. Vegetation would be completely removed from the work site and impacts to resident wildlife could be significant. In addition, a mitigation plan would need to be implemented. The levee and construction and staging areas would be returned to pre-slide conditions after repair work is completed. Under alternative 3, additional impacts would be expected because of the need for borrow site(s).

Indirect, and Cumulative Impacts - Same as Recommended Alternative 4. These impacts would be associated with future slide or levee repairs. Speculatively, maintaining reliable, trustworthy levee systems between Alton to Gale promotes social and economic growth and development as well as continued agricultural use of the floodplain – ultimately this could have future impacts to terrestrial plant and animal communities throughout the project area.

3.7 National Forest and Conservation Areas

Seven of the levee districts (Degognia and Fountain Bluff, Grand Tower, Preston, Clear Creek, East Cape Girardeau, Miller Pond, and North Alexander levee districts) combined protects 14,000 acres of U.S. Forest Service (USFS) Shawnee National Forest. With a significant portion of the 14,000 acres protected by Grand Tower and Degognia and Fountain Bluff levee districts, these districts are without benefit of any tax revenue from these Federal lands. The Illinois Department of Natural Resources (IDNR) owns and operates over 6,000 acres in the Union County State Fish and Wildlife Area that is protected by Preston, Clear Creek, East Cape Girardeau, Miller Pond, and North Alexander levee districts.

Future Conditions with No Action

Under the No Action Alternative, there would be no impacts to these areas. All repairs would be conducted within the present footprint of the levee.

Future Conditions with Recommended Alternative 4

Direct Impacts – No direct impacts to these natural areas would occur under this alternative.

Indirect and Cumulative Impacts – No indirect or cumulative impacts to these natural areas are anticipated under this alternative.

Future Conditions with non-recommended Alternatives 1, 2, and/or 3

Direct, Indirect, and Cumulative Impacts - Some impacts to U.S. Forest Service Land would be expected under each of these alternatives from tree clearing, hydrated lime mixing, and other construction activities. Because of the necessary construction actions, these alternatives would require the removal of roughly 15.5 acres of bottomland hardwoods in the Grand Tower, Degognia, and Prairie Du Rocher D&LD's. The impacts are associated with the need for 15 feet to 30 feet of construction clearance from the levee toe in order to grade and work the soil. Vegetation would be completely removed from the work site and impacts to resident wildlife could be significant. In addition, a mitigation plan would need to be implemented. The levee and construction and staging areas would be returned to pre-slide conditions after repair work is completed. Under alternative 3, additional impacts would be expected because of the need for borrow site(s).

3.8 Cultural and Historic Resources

3.8.1 Description of Existing Historical and Cultural Resources

The project area(s) encompasses a long stretch of levees along the Mississippi River. The majority of the deficient levee sites are located in rural, primarily agricultural, areas. However, some are located in urban settings. After the sites to be corrected were identified, record searches for previous archaeological investigations and existing cultural resources in Missouri and Illinois were conducted for the areas adjacent to the deficient sections. A summary of those findings, organized by drainage and levee district are provided below.

Bois Brule Drainage and Levee District—There have been limited surveys in the project area associated with drainage ditches and pumping stations.

Kaskaskia Island Drainage and Levee District—The nearest survey to the project area occurred on the western side of the district. No sites have been recorded in the vicinity of the project area.

East Cape Drainage and Levee District—All levee sections have been surveyed. There are no historic properties within the project area. There would be no significant effects.

Prairie du Rocher /Fort Chartres —Site 11R322 is situated at the southwest end of the deficient levee segment lying along Matthews Road. Along the deficient levee segment paralleling Lock and Dam Rd. there are four sites that, although not immediately adjacent to the levee, might be impacted by construction activities: 11R153, 11R154, 11R175, and 11R176.

Clear Creek Drainage and Levee District—Site 11Un28 is located to the north of the longest levee section. There are no sites recorded in the immediate vicinity of the proposed project location.

Grand Tower Drainage and Levee District— Site 11Ja71 lays between two deficient levee segments along Brunkhorst and Front Streets.

Preston Drainage and Levee District—The relevant levee area has been surveyed and no sites were recorded.

Degognia Drainage and Levee District—There have been no surveys or sites recorded in the vicinity of the deficient levee segments.

Wood River Drainage and Levee District—This area has been extensively surveyed and no sites have been recorded in the project area.

Of the nine districts, the project areas in East Cape, Preston, and Wood River have been surveyed and no sites have been recorded. Bois Brule, Kaskaskia Island, and Degognia have had limited or no surveying near the deficient levee sections. Prairie du Rocher/Fort Chartres, Clear Creek and Grand Tower have known sites in the general vicinity of the deficient levee sections. For the latter six districts, additional historic properties surveys would be required for any construction that occurred off of the disturbed soil of the levee.

Prehistoric Indian artifact and early settlement historic and cultural resources are found throughout the Alton to Gale levee districts. The Metro East Sanitary District levee protects the Cahokia Mounds. The United Nations Educational, Scientific, and Cultural Organization (UNESCO) in 1982 designated the Cahokia Mounds as a World Heritage Site that was inhabited from about A.D. 700 to 1400. The Fort Chartres levee district protects Fort de Chartres that was erected by the France's colonial government in 1720 and later used by the British military. The Kaskaskia Island levee district protects the historic resources of a French colonial community of Kaskaskia founded in 1703. King Louis XV of France gave a 650-pound church bell to the people of the Illinois Country. The church bell was cast in LaRochelle, France in 1741 and is on display. After the American Revolution, Kaskaskia served as the Territorial seat of government between 1809 and 1818 when in it became the first Illinois State Capital. One of the houses in Dozaville, a two-story brick residence, was first constructed on the site of the eighteenth century Kaskaskia. In 1818, this structure was the residence of Shadrah Bond, Illinois first Governor. The house was dismantled and rebuilt in its present form in Dozaville after an 1881 Mississippi River channel shift threatened the village.

3.8.2 Effects of the Alternatives Considered and Recommended Plan on Cultural and Historic Resources

Each of the non-preferred alternatives would result in moderate to extensive impacts to any cultural resources within the project area. In addition to the earth movement required in reconstructing the levees, removal of all trees and undergrowth within 50 feet of the levee toe would create further potential for having an impact on historic properties. Any access roads necessary for heavy equipment and any additional borrow areas would require clearance surveys prior to construction. These compliance activities could add materially to the cost of the project.

The preferred alternative of lime/Class C fly ash injection technology to repair damaged levees poses the least potential impact to historic properties. Primary access to work areas would be served by the levee road system. Access roads for heavy earthmoving equipment would not be required, nor would additional borrow areas. The elimination of access roads across adjacent areas and reduction in borrow areas will substantially reduce the potential for damage to historic properties. In those cases where the injection must occur from the slope of the levee, the potential effect will be limited to the disturbed area of the toe of the levee. The temporary containment berm/barrier at the toe of the levee will also be created in this area of disturbed soil. The primary concern is the positioning of staging areas. However, the contracting Statement of Work will specify that vehicle parking and slurry mixing be conducted on the top of the levee unless such action is unfeasible. In that case, the staging areas required for preparation of the lime/Class C fly ash mixture will be positioned to avoid impacts to historic properties. Finally, any excess mixture will be disposed of and mitigated in areas where no impacts to historic properties will occur. None of this material will remain onsite after the completion of construction.

3.8.3 Construction Effects on Historical and Cultural Resources

For the repair of deficient areas using lime-injection technology (Alternative 4), there would be no impacts in those areas where the preparation and lime-injection takes place from the top of the levee. Also, since access would be along the existing levee roads, no impacts are anticipated due to equipment movement. As stated in Section 3.8.2, there is a minor possibility for impacts to occur where the injection of the lime slurry must be made from the slope of the levee, dependent upon how far down the slope the equipment must move. There is also the potential for impacts to occur in the staging areas if use of the levee is not feasible.

In the case of those historic properties identified in Section 3.8.1, construction activities associated with Alternative 4 will be coordinated to avoid all impacts. Regarding areas in which no surveys have been conducted, any unanticipated access roads, staging areas, and disposal sites potential impacts are to be addressed in accordance with the programmatic agreement (PA) executed with the Illinois Historic Preservation Agency (IHPA). The PA stipulates the general nature of potential impacts when specific information is unavailable prior to construction and outlines the responsibilities of the

signatories and the procedures for ensuring compliance with appropriate statutes and regulations. (See appendix for copies of correspondence with IHPA and copy of PA) [NOTE: TO BE INCLUDED IN FINAL DRAFT]

In addition to the consultation with IHPA, consultation with Native American Tribal organizations is also required to ensure compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. St. Louis District has previously established consultation agreements with 29 tribal organizations that have ties to, or an interest in, the District's region. These tribes were contacted and provided the opportunity to comment on the proposed undertaking (see appendix for correspondence).

Cultural Resource Compliance

All actions taken for the remediation of the levee deficiencies will be in accordance with the National Historic Preservation Act of 1966, as amended (NHPA). The NHPA requires that any Federal undertaking consider the effects to historic properties and consultation with State Historic Preservation Officers and the Advisory Council on Historic Preservation. This act is further codified in 36 CFR Part 800, *Protection of Historic Properties.* Should any actions result in the collection of data or material from historic properties, such information and objects shall be cared for in accordance with 36 CFR Part 79, *Curation of Federally Owned and Administered Archaeological Collections.*

3.9 Socioeconomic Issues

Future Conditions with No Action

Without implementation of the recommended action, no levee repair would be conducted. The consequences of levee failure and breach in the flood protection system would be catastrophic to health, safety, environmental, and stifle economic viability for the protected cities, towns, villages, industry, transportation, and commercial enterprises. Rural and agricultural economies could be distressed for years after flooding. There are also numerous historic and cultural resources within these same protected areas

The Federal Government has spent more than $32 million on individual slide repairs within the levee reaches identified in Table EA-1 that did not lower the amount of risk to the levee districts. Consequences of a levee failure to retain floodwater anywhere along the levee would result in complete inundation of the entire flood protection system. For each flood protection system the losses would be great. For example, the Wood River Levee protects six municipalities, refineries, chemical processing plants, and ammunition plants. The loss of the Wood River Levee system would not only have notable economic impacts in the traditional measurement of losses (current estimate $1.8 billion dollars) but would have the added implication of creating an environmental contamination scenario not experienced on any inland waterway system to date. When the U.S. EPA was contacted for information on potential effects, they likened such an occurrence to that

experienced as a result of the Exxon Valdez. Not only would the land protected by the levee experience significant contamination from oil, oil byproducts and chemicals used in the refining process, but also the Mississippi River system itself would be impacted. At a conservative estimate of $125,000 per acre of clean up costs, a loss of this levee would result in environmental damages exceeding $2,000,000,000 (two billion dollars), not including the relocation costs of residents and future loss of agriculturally productive land.

The Metro East Sanitary District (formerly East St. Louis Levee) would leave 13 municipalities, 86,000 acres of urbanized area inundated and over 143,000 residents homeless. The 86,000 acres have hundreds of heavy and light industries, airports, steel and chemical processing plants, transportation hubs, hospitals, and numerous Superfund sites. Property damage is estimated to exceed $3 Billion in the event of catastrophic failure. The Fort Chartres levee is one of three levee districts that protect 46,500 acres and approximately 600 residences and farms. Prairie du Rocher Levee protects 13,000 acres and the historic village of Prairie du Rocher with potential damage to the Corps of Engineers Kaskaskia Lock and Dam. The levee system that is protected by Grand Tower and Degognia – Fountain Bluff levees protects eight towns and villages, 50,600 acres with estimated property values of $150 million, including the Grand Tower power plant. There is also a large coal loading facility at Cora, Illinois that would result in high environmental damages to the area. There is also a potential for overtopping the upper flank of the downstream levee system commonly referred to as the Big Five levee system. The Big Five levee system is made up of Preston, Clear Creek, East Cape Girardeau, Miller Pond, and North Alexander levees districts and protects six villages and 46,000 acres which include portions of the Shawnee National Forest and state wildlife area. The Kaskaskia Island levee protects two historic villages and 9,600 acres. Bois Brule levee protects three villages, airport, and 26,060 acres. Two major manufacturers are located in the levee district and employ over 1,000 people from the surrounding area. Safety, property values, and economic viability of the areas protected by poor performing levee reaches are at risk. The high costs for individual slide repairs and long term solutions are well beyond the financial capabilities of the individual levee districts for levee maintenance and operations.

The present approach of simply repairing individual levee slides puts the system at great risk for flooding during periods with high river stages. Historically, several years pass from the time a levee slide occurs and when funding becomes available to repair the slide, leaving the levee section vulnerable during a flood event. In addition, the present approach is only a short term solution, as levee slides continue to occur in the deficient levee sections. Existing levee slides have encroached into the levee crowns resulting in a breach of the road system, as well as a safety issue for the traveling public. The current practice of repairing only the slide area does not address the vulnerability of continuous and impending levee slide failures.

Future Conditions with Recommended Alternative 4

Direct Impacts – Repair of the slides is imperative for maintaining the integrity of the flood protection levees. Short term social economic impacts such as delays or rerouting in traffic, some closing of public or private sector facilities could be anticipated during construction activities of this project.

Indirect and Cumulative Impacts –These impacts would be associated with future slide or levee repairs, including repair of gravity drains, flood gates and seepage berms. In addition, speculatively, maintaining reliable, trustworthy levee systems between Alton to Gale would promote social and economic growth and development in the floodplain – ultimately this could have positive future impacts to the state of the socioeconomics within this area covering over 150 miles of Mississippi River floodplain.

According to the U. S. Department of Housing and Urban Development, "Economic development is an important part of strengthening communities by creating and retaining jobs". [(1)] The creation of jobs that could reasonably be expected to occur or continue once the levee slides are repaired throughout the Alton to Gale Organized Levee System, would invariably lead to or complement other types of development such as single-family and multi-family housing, commercial and service industry, retail, and industrial developments.

Job creation would bring more people to the area, and more people would create a demand for services, thereby creating a demand for new, improved, and/or an expansion of infrastructure. Examples of infrastructure include roads and bridges; recreation and open spaces such as parks, sports facilities and community gardens; public or institutional facilities such as hospitals, airports, and cultural attractions; utility and sewer capacity; and health and human, and environmental services.

The Alton to Gale Levee System falls primarily within Madison and St. Clair Counties, Illinois, which are located in the southwestern part of the state. The East-West Gateway Council of Governments states that "Southwest Illinois has more than $9 billion dollars in its economic development pipeline"; and that "in recent years the area has seen significant new investments in commercial, office and institutional projects across the region while major industrial facilities are reinvesting in and expanding their operations in the Metro East". In addition, "public and private investment in the region's infrastructure has created a transportation network that makes Madison, St. Clair, and Monroe counties prime locations for development and their development potential will only be enhanced upon completion of the new Mississippi River Bridge." [(2)]

It is clear that "growth and development can improve quality of life by adding services, creating opportunity, and enhancing access to amenities. But it can also drive disinvestment, reduce competitiveness, and degrade the environment." [(3)] "Smart growth", techniques such as master planning, zoning, and land use planning enhance the safety and livability of communities through the efficient application of programs that balance growth and conservation.

USACE does not control what may be developed within the 100-year floodplain. It is the primary responsibility of local municipalities to control urban and rural growth and development within the project levee system's districts. However, USACE in cooperation with Madison and St. Clair Counties will continue performing and be open to additional outreach initiatives with communities and municipalities about non-structural flood risk management measures that can help protect property and financial investments before a flood disaster happens.

Even with FEMA-certified structural levee protections in place (i.e., all levee slides repaired within the Alton to Gale Levee System); there is still a risk of flooding in the study area. From a risk standpoint, FEMA-certified protection from, for example, a 100-year flood event is loosely defined as the levee system provides protection from a computed level flood event having a probability of occurrence of 1.0 percent, or 1 chance (year) out of 100 (years), which is where the '100-year' label comes from (i.e., once in 100 years). However, the specific definition is the FEMA-certified levee system in place, would provide protection against a computed level flood event having that 1.0 percent probability of occurrence *in any given year*. Hypothetically, if this 100-year or 1.0 percent level flood event occurred last year, there is still a 1.0 percent probability of this same level flood event happening this year, next year and every year thereafter. The risk of a 1.0 percent probability flood event is a very rare risk, yet every year that 1.0 percent risk of occurrence exists, as well as the risk of even rarer percentage probability, higher level flood events for higher level of protection levees, such as levees providing '500-year' protection. Therefore, there are many non-structural measures that can be implemented and steps that can be taken by the Counties, residents and business-owners to help reduce damage to homes, business and other financial investments within the floodplain to provide additional protection against such risk.

Non-structural measures can be used to help reduce damage from flood events. Such measures include elevating homes and businesses with foundation walls, piers, posts/columns, piles, and fill; non-structural floodwalls and levees; non-structural floodwalls and levees with closures; dry flood-proofing and wet flood-proofing; flood warnings such as sirens and posted signage; flood warning preparedness instruction; public service announcements about the risk of flooding; purchasing flood insurance; and possible relocation and buyout and acquisition options. [(4)]

It is reasonable to expect the project area to experience some increase in economic growth and development due to repair of the levee system because future plans depend on the levee repair keeping FEMA from de-certifying the levee districts; however, there is no indication that a rapid or significant increase in development will arise "solely due to" the repair of the levee or that an increase in economic growth and development will arise "in addition to" the growth and developments already slated to occur.

The "smart growth" management, planning initiatives, and code enforcement instruments already adopted or in draft form pending adoption, by St. Clair County and Madison

County, IL include but are not limited to the following:

Comprehensive Plans and Comprehensive Land Use Plans, generally plan for growth and development up to twenty years in the future. Madison County's 2020 Land Use Plan considers the preservation or construction of greenways; public preserves; designated urban areas; parks; wetlands; planned high and low density residential, commercial, retail, industrial areas; and preservation of agricultural areas and open spaces. [(6)] Specific land use and development goals, objectives and policies in the St. Clair County Comprehensive Plan (April 15, 2008 Draft) pending adoption by the St. Clair County board, include the following activities [(5)]:

- Encourage clustered commercial development to minimize stripping out of major highway frontage (primarily municipal decisions).
- Ensure compatibility and coordinate development around Scott AFB/MidAmerica Airport.
- Direct development toward existing developed areas and areas capable of being provided water and sewer service; minimize scattered development in unserved rural areas (important; improve FPA decision process).
- Maintain strong residential base, encourage development of a broad range of housing choices, and encourage clustered residential development that reinforces the concepts of neighborhood and community.
- Encourage commercial development that meets the needs of neighborhoods and communities.
- Minimize conflict between commercial and residential areas.
- Create opportunities for planned industrial development.
- Ensure compatible development (or no development) around Cahokia Mounds.

Short and Long Range Transportation and Growth Management Plans of Madison County study IL-255 interchanges and the widening of lanes, improved access management, improved street signal operations, proposed construction of new roads, and widening of roads.[(6)] St. Clair County's Transportation and Circulation draft Comprehensive Plan will include the following goals, objectives and policies [(5)]:

- Provide safe, efficient, and affordable transportation system.
- Coordinate County thoroughfare system planned improvements with Interstate, State, and local systems.
- Minimize disruption of residential areas with the thoroughfare system.
- Reduce the incidence of congested thoroughfares in existing built-up areas.
- Reduce travel times within and through the County.
- Improve access management and limit curb cuts along major thoroughfares.
- Support a variety of public transportation modes; enhance effectiveness of MetroLink.

- Ensure viability of St. Louis Downtown Airport for general corporate and aircraft maintenance (Midcoast) aviation.
- Use abandoned railroads for roadway corridors.
- Construct an outer beltway to the JB Bridge (controversial—discuss in public meetings).
- Construct a new Mississippi River Bridge.
- Develop MidAmerica Airport for commercial and freight air service.

Enterprise Zones, which are areas targeted for economic revitalization encourage economic growth and investment in distressed areas by offering tax advantages and incentives to businesses locating within the zone boundaries. Madison County plans for designated Enterprise Zones along the Mississippi River in the cities of Alton, East Alton, Wood River, Hartford and South Roxana, Granite City, Madison and Venice. [(6)] St. Clair County's vision for Economic Development is to [(5)]:

- Reserve portions of the Kaskaskia River corridor for industrial use and direct appropriate industrial growth to the corridor (Port District and KIDC making slow progress; lacks interstate access; not as important as Mississippi River corridor).
- Recruit industries that utilize and enhance multi-modal transportation opportunities and available land.
- Diversify the County's economy by attracting transportation and distribution businesses.
- Direct transportation and distribution businesses to the American Bottoms to take advantage of the existing transportation infrastructure.
- Correct infrastructure and environmental problems, particularly in the American Bottoms.
- Encourage redevelopment in the American Bottoms through public investments.
- Develop the Mississippi Riverfront (the core should be entertainment/recreation—casino, park, hotel, marina—and north and south should be industrial/ports).

Ordinances enforce safety and enhance the livability of communities. Madison County enforces a Fill Ordinance, Liquor Ordinance, Noise Ordinance, Zoning Ordinance, Private Sewage System Ordinance, Recycling Ordinance, Storm Water and Erosion Control Ordinance, Subdivision Control Ordinance, Cell Tower Ordinance. [(6)] St. Clair County has a substantial list of ordinances that are targeted at enforcing the management of growth and development and include (but are not limited to) airport regulations, flood plain code, liquor, property maintenance, zoning, sanitary landfill code, and nuisances. St. Clair County's Draft Comprehensive Plan also includes utility and quality of life goals, objectives and policies than will produce code ordinances to manage growth and future development. Examples of such include but are not limited to [(5)]:

- Create multi-functional detention basins for recreation/conservation.

- Ensure adequate easements in new developments for maintenance of drainage systems.
- Coordinate with the National Flood Insurance Program (NFIP) for floodplain mapping and flood insurance qualification.
- Encourage rehabilitation of sewer systems in existing areas where redevelopment is projected.
- Discourage approval of development in unserved areas; require geological suitability analysis where on-site sewage disposal systems are proposed.
- Encourage review of FPA expansion requests based on long-range, cost-effective service provision.
- Ensure utility system capacity to accommodate future development.
- Ensure availability of utilities to support the County's economic development initiatives.
- Minimize loss of sustainable prime farmland; maintain the agricultural heritage and economy of the southern County (evaluate County's LESA related to weighting of value of prime farmland).
- Minimize wetland destruction; create new wetlands to mitigate threatened wetlands.

Detailed growth management and development plans for St. Clair County and Madison County can be found at www.co.st-clair.il.us/Departments/Building+and+Zoning/default.htm and www.co.madison.il.us/Planning/landuse.shtml; or by calling each county directly.

Sources:

(1) U. S. Department of Housing and Urban Development. http://portal.hud.gov/portal/page/portal/HUD/topics/economic_development. Retrieved from the internet August 5, 2010.
(2) East-West Gateway Council of Governments. www.swillinoislevees.com/html/employers.htm. Retrieved from the internet August 5, 2010.
(3) Smart Growth Network Online. http://www.smartgrowth.org/about/default.asp Retrieved from the internet August 5, 2010.
(4) U. S. Army Corps of Engineers. National Nonstructural/Flood Proofing Committee. www.nwo.usace.army.mil/nfpc.
(5) St. Clair County, IL Building and Zoning Department. April 15, 2008 Draft Comprehensive Plan. www.co.st-clair.il.us/Departments/Building+and+Zoning/default.htm.
(6) Madison County, IL Planning Department. www.co.madison.il.us/Planning/landuse.shtml. Retrieved from the internet August 5, 2010.

Future Conditions with non-recommended Alternatives 1, 2, and/or 3

Direct Impacts – Same as the Recommended Alternative 4.

Indirect, and Cumulative Impacts – Under these alternatives, the levees would be returned to their designed level of integrity similar to the Recommended Alternative 4. Therefore, future socioeconomic impacts would result from growth and development in the protected floodplain.

3.10 Aesthetic Resources

Future Conditions with No Action

Without implementation of the recommended action, no levee repair would be conducted. Therefore, there would be no immediate aesthetic impacts.

Future Conditions with Recommended Alternative 4

Direct Impacts – Aesthetic impacts would be limited to temporary alteration of levee ground cover and presence of construction equipment. Short-term disturbance of the landscape would occur during construction activities. After revegetation the area would have the same quality as preconstruction.

Indirect and Cumulative Impacts – These impacts would be associated with future general maintenance, including repair of gravity drains, flood gates and seepage berms.

Future Conditions with non-recommended Alternatives 1, 2, and/or 3

Direct Impacts – Similar to Recommended Alternative 4 but more extensive short-term damage to the levee groundcover. The contractor would need to clear a minimum of 15 feet from the toe of the levee outward for mixing the soils with hydrated lime. Alternative 3 would require the use of borrow material for re-construction; this would further impact the aesthetics.

Indirect, and Cumulative Impacts. Same as Recommended Alternative 4.

3.11 Recreation

Popular recreational activities within the Alton to Gale levee districts include hunting, fishing, hiking, and bird watching in the adjacent floodplain forests.

Future Conditions with No Action
The increase in the number of slides and the expansion of existing slides under the no action alternative would have negative long term impacts on recreation. For example, slides that breach the top of the levee pose a threat to any recreational vehicle traffic. Access to natural areas adjacent to the levees would be reduced.

Future Conditions with Recommended Alternative 4

Direct Impacts - Construction equipment and activities would cause temporary disturbance and access to recreation activities within the vicinity of the repair area.

Indirect and Cumulative Impacts - Maintaining reliable, trustworthy levee systems between Alton to Gale would promote increased recreational activities in the floodplain.
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Future conditions with non-recommended Alternatives 1, 2, and 3 – Same as above.

3.12 Hazardous, Toxic and Radioactive Waste Sites (HTRW)

Future Conditions with No Action

Without implementation of the recommended action, no levee repair would be conducted. Therefore, there would be no HTRW concerns.

Future Conditions with Recommended Alternative 4

Direct Impacts - There are no recognized environmental conditions that would indicate a risk of HTRW contamination within the project area. Soils from previous levee construction are known to be free from hazardous waste.

Available research on the beneficial use of fly ash documents that commercially available fly ash is proven to meet the definition of non-hazardous material by characteristic through laboratory testing, including the USEPA Toxicity Leaching Procedures.

Illinois law 415 IL CS5/Section 3.135 states that agencies proposing flowable fill/grout projects for beneficial use (modifying soil) shall notify the IEPA, documenting the quantity and certification of the Coal Combustion Byproduct (CCB) in this case Class C fly ash. This law further states that CCB shall not exceed Class I Groundwater standards for metals as determined by ASTM D3987-85 testing methodology.

Indirect and Cumulative Impacts –These impacts would be associated with future slide or levee repairs, including repair of gravity drains, pump stations, culverts, flood gates, relief wells and seepage berms. In addition, speculatively, maintaining reliable, trustworthy levee systems between Alton to Gale would promote social and economic growth and development in the floodplain – ultimately this could have future impacts to the aesthetics of this area covering over 150 miles of Mississippi River floodplain.

Future Conditions with non-recommended Alternatives 1, 2, and/or 3

Direct, Indirect, and Cumulative Impacts - Under these alternatives, a Phase I HTRW study would have to be conducted because construction would take place beyond the toe of the levee.

3.13 Cumulative Impacts

3.13.1 History of Levee Slides and Repairs.

The Alton to Gale Levee System began as numerous private small levees built during the depression years. During the 1940's and 1950's the Government created the combined system by raising existing levees and building new levees within the newly established levee districts. Existing gravity drains, culverts, and gates at drainage structures were modified and new ones constructed. Pump stations were engineered and constructed to evacuate interior drainage. Levee seepage controls consisting of relief wells and seepage berms were constructed throughout the levee system during the 1950's and 1960's. All levees have heights ranging between 20 and 25 feet, a crown width of 20 feet and side slopes of 1 vertical on 3 horizontal. Locally available materials were used for construction, which include highly plastic clays.

Years 1968 to 1978
Between 1968 and 1978, USACE repair of the slides consisted of removing all of the material from the slide area to a depth of one to two feet below the slide plane, placing a one-foot thick sand drain and then replacing the original material in a semi-compacted state. The sand drain method was found to be ineffective and was abandoned. After 1975, the slide repair consisted of removing all of the material from the slide area to a depth of one to two feet below the slide plane and adding 4 to 5 percent hydrated lime, by weight, to the material as it was replaced.

Years 1979 to 1984
Since October 1979, there has been an increase in the number and severity of levee slides. In 1979, the District submitted a request for Public Law 84-99 funds in the amount of $1,155,000.00 for use in repair of 47 slides in this levee system. In September 1980, the request was disapproved and the District was informed that Construction General Funds would not be provided. Funding was not obtained through FY 82. During the summer and fall of 1983, 119 slides were repaired using Construction General, “Jobs Bill” Funding, for a total estimated cost of $1,954,000.00. All of the 1983 slides were repaired using the “Lime Stabilization” Method.

Years 1985 to 1993
In the spring of 1985 a levee inspection of the Alton to Gale levee system documented the existence of 97 new slides that had developed since the completion of repairs under the “Jobs Bill” program. These levee slides were repaired using 100 percent Federal funds. After a levee inspection in 1988, an additional 23 levee slides were identified. Repair of these additional 23 slides was cost-shared with the local levee districts. Most

of the levee slides required the excavation of a large portion of the levee embankment slope. Inspection trenches were excavated to determine the actual failure surfaces.

The excavated slide materials were then spread in layers over a stockpile area where the first application of hydrated lime was mixed together with the excavated materials. These soils were allowed to chemically react with the free calcium in the lime for a least a day. The second application of hydrated lime was mixed together with the soils that continued to reduce the plasticity of the soils. The modified-material was then replaced and compacted. No levee slides have occurred in the repair areas that used this method for material modification and stabilization.

Years 1994 and 1996
After the long inundation of the levees during the 1993 Flood, followed by another inundation during the 1995 Flood, 117 levee slides occurred throughout the Alton to Gale Levee System. During the massive repair efforts to restore flood protection, PL 84-99 authority was sought and approved and 100 percent Federal funding for the repair was approved. Repairs were then made in the Alton to Gale levee system using the above described lime stabilization method. No new levee slides have occurred in these repaired areas.

Years 1997 to 2001
During the summer and fall of 2001, 44 slides were approved by the ASA(CW) to be repaired using Construction General Funds with an overall cost of $3.2 million. One hundred percent of these slides occurred within the Prairie Du Rocher, Degognia - Fountain Bluff, and the Grand Tower levee reaches that were all repaired using the described lime stabilization method. No new levee slides have occurred in these repaired areas.

Years 2002 to Present
Since completion of the latest levee slide repair contract, 17 additional levee slides were discovered in the July 2002 inspection. The back levees along the Big Muddy River have a total of eight slides of which Grand Tower D&L District has five and Degognia-Fountain Bluff D&L District has three. Grand Tower D&L District has two additional riverside slides that developed in the Mississippi River front levee. The lower flank levee in the East St. Louis & Vicinity D&L District has two landside slides. Kaskaskia Island D&L District has two landside slides. Clear Creek D&L District has two landside slides on the back flank levee. The Wood River D&L District had one landside slide on the lower flank levee that was repaired by levee district in the Fall of 2002. Based on the historical frequency of the development of slides in this levee system, new slides are anticipated prior to the approval of this report.

Inventory of Slides
An inventory has been maintained of all slides that have been repaired by the Federal Government since the year 1961. Records for repairs prior to 1961 are not available.

The recorded slides have occurred within the same reaches due to the inappropriate high plasticity clay soils used during the levee construction.

Public Law 84-99 Eligibility Status of Existing Levee System
All levees in the Alton to Gale levee system are inspected on a yearly basis. St. Louis District personnel perform inspections in the Fall. The levee districts are performing the required operations and maintenance as defined in the original operation and maintenance agreements. All Alton to Gale levee districts have been rated as acceptable or minimally acceptable for Public Law (PL) 84-99 eligibility. Seven of the levee districts (Degognia and Fountain Bluff, Grand Tower, Preston, Clear Creek, East Cape Girardeau, Miller Pond, and North Alexander levee districts) combined protect 14,000 acres of U.S. Forest Service (USFS) Shawnee National Forest. With a significant portion of the 14,000 acres protected by Grand Tower and Degognia and Fountain Bluff levee districts, these districts are without benefit of any tax revenue from these Federal lands. The Illinois Department of Natural Resources (IDNR) owns and operates over 6,000 acres in the Union County State Fish and Wildlife Area that is protected by Preston, Clear Creek, East Cape Girardeau, Miller Pond, and North Alexander levee districts. Clear Creek levee district does not receive any tax revenue from IDNR on the 6,000 acres in their levee district. The USFS and IDNR do provide some minor maintenance to the levee districts but no tax revenue. The financial burden placed on the affected levee districts is tremendous and is worsening since the USFS and IDNR are acquiring additional lands that have provided tax revenue in the past. The PL 84-99 eligibility requirements for well maintained levees are becoming more stringent with revisions in Engineering Regulation 500-1-1, "Civil Emergency Management Program," dated 30 September 2001. The levee districts with levee slides are downgraded even when the problem is not within the levee district's maintenance but due to improper construction using high plasticity clay materials. The levee districts want to maintain their levees for their own protection and maintain their eligibility for PL 84-99 funds if needed during and after a flood. However, levee slides continue and most levee district infrastructure is old, worn, deteriorated, and in need of replacement or rehabilitation which is and will continue to require the majority of the resources within these levee districts.

In addition to the above work on levees in the Alton to Gale Organized Levee Districts, USACE, St. Louis District, has undertaken rehabilitation and reconstruction activities of existing flood protection systems at seven other locations along the Mississippi River. This includes proposed work at the Wood River Flood Protection System, Chain of Rocks (Madison County, Illinois), City of St. Louis (Missouri), East St. Louis (Madison and St. Clair Counties, Illinois), Prairie du Pont (St. Clair and Monroe Counties, Illinois), Bois Brule (Perry County, Missouri), and Cape Girardeau (Cape Girardeau County, Missouri). Construction has started at two projects (Chain of Rocks, East St. Louis), but the others are in the planning/approval stage. Relief well rehabilitation and installation of new relief wells are construction features common to all these projects, except for Cape Girardeau. USACE is the sole agency or entity doing this kind of work on flood protection systems along the Mississippi River. All projects are expected to give rise to temporary adverse impacts to air quality and noise. Construction work by others in the vicinity of these projects is likely to occur concurrently with the proposed work (if

approved and funded), and is likely to include a variety of industrial, commercial, or transportation-related activities at single locations. No significant cumulative impacts on the environment have been identified.

Levee Maintenance
Levee maintenance cumulative impacts would be primarily associated with maintenance mowing and are expected to be short-term and minimal. It is the responsibility of local interests to develop an organization capable of providing for the efficient operation and maintenance of the flood control works during normal stages of the river. Levee slopes must be mowed periodically to discourage the growth of weeds and saplings. A good mowing program will enhance a dense sod that will resist wave wash and erosion during periods of high water. Grass on the levee and seepage berms should be kept at a height less than 14 inches. The grass should be cut back to a height of approximately 4 to 6 inches during the growing season. It may be necessary to mow the levee at least two or three times each year to maintain a stand of grass within these prescribed limits. The height of the grass should be at least 8 inches when it becomes dormant prior to winter.

3.14 Compliance

3.14.1 Fish and Wildlife Coordination Act

Project plans have been coordinated with the U.S. Fish and Wildlife Service, Illinois Department of Natural Resources and Missouri Department of Conservation. Informal scoping and correspondence for this EA took place during the spring of 2008 and again in Fall and Winter 2009, 2010. Within this time frame there was modification to the alternatives based on a Value Engineering Report that recommended the lime/Class C fly ash alternative. In addition, new slides had developed in the project area. Further federal coordination was finalized in a letter from the USFWS (See Appendix A for pertinent correspondence) dated 21 June 2010. In their letter, the USFWS concurs that the proposed project is not likely to adversely affect the species evaluated in this EA. This precludes the need for further action on this project as required under Section 7 of the Endangered species act of 1973, as amended. If implemented, the project, as proposed, would be in full compliance. Should this project be modified, or new information indicate listed or proposed species may be affected, consultation or additional coordination with the USFWS, as appropriate, would be initiated.

3.14.2 Executive Order 11988 (floodplain management)

Under this Executive Order, Federal agencies are to "provide leadership and shall take action to reduce the risk of flood loss, to minimize the impacts of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains." Based on the extent of levee damage that currently exists, it is prudent to repair the levee slides to restore the original level of flood protection. By reducing the future risk of flood loss and minimizing the impacts on existing vegetation in the floodplain, this proposed project is in full compliance with this Executive Order.

3.14.3 Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations)

Executive Order 12898 requires "to the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report of the National Performance Review, each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its program, policies and activities on minority population and low-income populations…" All work is within the footprint of the existing levee. The project would not disrupt or displace any residential or commercial structures.

Also included with environmental justice are concerns pursuant to EO 13045, Protection of Children from Environmental Health Risks and Safety Risks. This EO directs Federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children under the age of 18. These risks are defined as "risks to health or to safety that are attributable to products or substances that the child is likely to come into contact with or ingest." This work has been reviewed for compliance with these orders and it has been determined that the proposed action alternative would not adversely affect or have significant impacts on the health or environment of minority or low-income populations

3.14.4 Clean Water Act (Sections 401 and 404) (See discussion under Water Quality and Aquatic Resources, Section 3.3)

The lime/Class C fly ash injection method could cause short term run-off from erosion if rain should occur during construction. Post-construction, where needed, the levee would be seeded to prevent erosion. As described above (Section 2.2), the Contractor shall construct small earthen berms along the levee toe for the length of the job and adjacent to drainage channels to eliminate accidental entry of slurry into area watercourses or other wetlands. The earthen berms shall be of sufficient size to capture all excess slurry at the levee toe. Any slurry that is running freely on the surface (either around injection rods or out of previous injection holes), is puddled at the toe of the embankment slope, has been spilled, or for any other reason has been judged unsuitable slurry material by the Contracting Officer, shall be defined as wasted slurry. In situations where trees or wetlands would be impacted by berm construction the contractor, as an alternative, would be required to all necessary best management practices including but not limited to the use silt fencing and hay bales, to capture and prevent slurry from going beyond the toe of the levee. In order to ensure that water quality compliance is maintained, the contractor must supply the appropriate information documenting the quality of the fly ash meets all applicable state and federal standards. All aspects of the mixing and injection process must be documented within and environmental protection plan submittal along with all the BMP's that would be used to minimize the risk associated with this process.

Slurry water shall be clean, fresh, and shall contain no materials deleterious to the slaking process or the lime/fly-ash/soil chemical reactions. If it is intended to use non-potable water, the suitability of non-potable water must be so demonstrated by the Contractor to the Contracting Officer.

No jurisdictional wetlands, waterways or other Waters of the United States would be affected by the proposed access, repair and construction methods associated with this project. As such, the St. Louis District, Regulatory Branch determined that no Section 404 Clean Water Acts permits would be required to complete the project as proposed.

3.14.5 Farmland Protection Policy Act of 1981

The proposed project would not result in the conversion of any prime, unique, or state or locally important farmland to nonagricultural uses.

3.14.6 Executive Order 13186 - Responsibilities of Federal Agencies to Protect Migratory Birds

These migratory bird conventions impose substantive obligations on the United States for the conservation of migratory birds and their habitats, and through the Migratory Bird Treaty Act, the United States has implemented these migratory bird conventions with respect to the United States. This EO directs Executive departments and agencies to take certain actions to further implement the Act.

The Recommended Alternative 4would consider migratory birds and take every step practical to minimize impacts to their habitat. No adverse impacts are anticipated.

3.14.7 Executive Order 11990 (Protection of Wetlands)

Under this Executive Order, Federal agencies shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities.
The proposed action would be conducted within the footprint of the levee – from the toe to the levee crest. No staging areas or other construction areas would encroach or impact wetlands. Therefore, the proposed levee repairs are in full compliance with this Executive Order.

3.14.8 Bald and Golden Eagle Protection Act of 1940

On August 9, 2007 the bald eagle was removed from the federal list of threatened and endangered species. It remains protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. The Bald and Golden Eagle Protection Act prohibits unregulated take of bald eagles. The Fish and Wildlife Service recently finalized a rule defining “take” that includes “disturb.” “Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering

behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior" (USFWS 2007).

All repairs under the Recommended Alternative 4 would take place within the footprint of the existing levee. Currently, there are no known nest trees in the vicinity of any repair areas. Repair activities are not anticipated to disturb Bald or Golden Eagles.

3.14.9 Environmental Regulatory Constraints

The Recommended Alternative 4 was subject to compliance review with all applicable environmental regulations and guidelines. The National Environmental Policy Act would be considered as in partial compliance until the District Engineer's signing of the Finding of No Significant Impact. The National Historic Preservation Act would be considered as in partial compliance until there is concurrence from the State Historic Preservation Officer on the District's EA conclusions.

Federal Policies	Compliance
Bald Eagle Protection Act, 42 USC 4151-4157	Full
Clean Air Act, 42 USC 7401-7542	Full
Clean Water Act, 33 USC 1251-1375	Full
Comprehensive Environmental Response, Compensation, and Liability Act, 42 USC 9601-9675	Full
Endangered Species Act, 16 USC 1531-1543	Full
Farmland Protection Policy Act, 7 USC 4201-4208	Full
Fish and Wildlife Coordination Act, 16 USC 661-666c	Full
Food Security Act of 1985, 7 USC varies	Full
Migratory Bird Treaty Act, 1918	Full
Land and Water Conservation Fund Act, 16 USC 460d-4601	Full
National Environmental Policy Act, 42 USC 4321- 4347	Partial[1]
National Historic Preservation Act, 16 USC 470 et seq.	Partial[2]
Noise Pollution and Abatement Act, 42 USC 7691-7642	Full
Resource, Conservation, and Rehabilitation Act, 42 USC 6901-6987	Full
Rivers and Harbors Appropriation Act, 33 USC 401-413	Full
Water Resources Development Acts of 1986 and 1990	Full
Floodplain Management (EO 11988 as amended by EO 12148)	Full
Prevention, Control, and Abatement of Air and Water Pollution at Federal Facilities (EO 11282 as amended by EO's 11288 and 11507)	Full
Protection and Enhancement of Environmental Quality (EO 11991)	Full
Protection and Enhancement of the Cultural Environment (EO 11593)	Full
Protection of Wetlands (EO 11990 as amended by EO 12608)	Full

Full compliance: having met all requirements of the statute for the current stage of planning
1 Full compliance to be achieved with the District Engineer's signing of the Finding of No Significant Impact
2 Full compliance to be achieved with the State Historic Preservation Officer's concurrence in the District's EA conclusions.

Table EA-3. Compliance review with all applicable environmental regulations and guidelines

3.14.10 Relationship between Short-Term Use and Long-Term Productivity

The local short-term impacts of the recommended action and the use of resources for it are consistent with the maintenance and enhancement of long-term productivity for the local area, region, and nation. Creation of the project would support growth and development of employment and population in the region. Levee integrity is critical for floodplain protection.

3.14.11 Irreversible or Irretrievable Commitments of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. Irreversible effects primarily result from use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected

resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural site). The proposed levee repairs would result in few direct and indirect commitments of resources; these would be related primarily to on site construction and future operation and maintenance.

Construction would require the expenditure of materials that are generally not retrievable - fossil fuels, labor, and fly ash construction materials. Construction would require a large, one-time investment of federal funds that are not retrievable. The commitment of these resources is based on the concept that residents both within the project area, as well as the region and nation, would benefit by improvements in the integrity of the levees. The levee repairs would provide a positive influence on the economy of the local area and region. No irreversible or irretrievable commitment has been identified which would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative. No commitment of resources has occurred that would prejudice the selection of any alternative before making a final decision on this project.

LIST OF PREPARERS

St. Louis District	**Role**
Ms. Marilyn Lowe	Project Manager
Mr. Keith McMullen, Regulatory Specialist	Regulatory Permits
Mr. James Barnes, District Archaeologist	Archeological Compliance
Mr. Kenneth Cook, Biologist	Environmental Assessment

COORDINATION WITH OTHER STATE AND FEDERAL AGENCIES

This draft EA and FONSI would be provided to the following State and Federal agencies for their review, comments, and concurrence during the 30 day public comment period.

U.S. Fish and Wildlife Service	State and local elected officials
U.S. Environmental Protection Agency	Levee Districts
U. S. Forest Service	County Commissioners
Federal Emergency Management Agency	Local County Boards
Natural Resources Conservation Service	National Corn Growers Association
Illinois Department of Natural Resources	National Grain and Feed Association
Illinois Environmental Protection Agency	American Land Conservancy
Illinois State Historic Preservation Office	The Nature Conservancy
Illinois Emergency Management Agency	Sierra Club, Midwest Office
Illinois Department of Transportation	Izaak Walton League, Midwest Office
Missouri Department of Conservation	
Missouri Emergency Management Agency	

To assure compliance with the National Environmental Policy Act, Endangered Species Act, and other applicable environmental laws and regulations, coordination with these agencies would continue as required throughout the planning and construction phases of the proposed levee repairs.

REFERENCES

Ash Grove Resources. 2006. *Fly Ash Product Information*. Retrieve from http://www.ashgroveresources.com/product.html

Baez, J.I, Borden, R.H, and Henry, J.F. 1991. Rehabilitation of the Lower Chariton River levee by lime/fly ash slurry injection. *Transportation Research Record*, 1310, 117-125. Retrieved from: http://pubsindex.trb.org/view.aspx?id=364533

Beck, M.A, Daniels, L.W., and Eick, M. 2007. Leachate chemistry of mixtures of fly ash and alkaline coal refuse. *Proceedings of the 2007 World of Coal Ash (WOCA)*, Kentucky. Retrieved from: http://www.p2pays.org/ref/45/44881.pdf

Brack, V., Jr., and LaVal, R.K.1985. Food habits of the Indiana bat in Missouri. *Journal of Mammalogy*, 66, 308-315.

Bricka, R. M., Jones, and Larry W.1993. An evaluation of factors affecting the solidification/ stabilization of heavy metal sludge. Final Report. Army Engineer Waterways Experiment Station. Vicksburg Ms Environmental Lab. Retrieved From: http://www.stormingmedia.us/82/8214/A821462.html?searchTerms=lime~fly~ash

Cement and Concrete Environmental Considerations. 1993. Environmental Building News (EBN) 2:2 Engineering and Environmental Specifications of State Agencies for Utilization and Disposal of Coal Combustion Products: Volume 1 – DOT Specifications. Final report.

Cho, H., Shah, S.N., and Jeong, Y. 2002, May. Developed wellbore abandonment grout with fly ash. *Proceedings of the Offshore Technology Conference*, Houston, Texas.doi: 10.4043/14283-MS. Retrieved from: http://www.onepetro.org/mslib/servlet/onepetropreview?id=OTC-14283-MS&soc=OTC

Committee on Cementitious Stabilization. Cementitious stabilization. A2J01. TRB. Retrieved from: www.trb.org/publications/millennium/00016.pdf

Daniels, J.L. and Das, G.P. 2006, Leaching Behavior of Lime/Fly Ash Mixtures. *Environmental Engineering Science*, 23(1), 42-52.

Das, G. P. 2007. Ash weathering controls on contaminant leachability.(Doctoral dissertation, University of North Carolina 2007). Retrieved from: https://e-scholar.uncc.edu/dspace/bitstream/2029/113/1/umi-uncc-1079.pdf

Dockter, B. A., and Jagiella, D. M., 2005. Engineering and Environmental Specifications of State Agencies for Utilization and Disposal of Coal Combustion Products: Volume 1 – Dot Specifications. University of North Dakota Energy & Environmental Research Center.

Environmental Impact of Construction and Repair Materials on Surface and Ground Waters Summary of Methodology, Laboratory Results, and Model Development, 2001 National Cooperative Highway Research Program Report 448

Ferguson, E.G., and Mackiewicz, S.M. 2005. Stabilization of soil with self-cementing coal ashes. *Proceedings of the at 2005 International Ash Utilization Symposium*, Kentucky. Retrieved from: http://www.flyash.info/2005/108mac.pdf

Garcez, I., and Tittlebaum, M.1985. Investigation of leachability of subbituminous fly ash enhanced road base material. *Materials Research Society Symposium Proceedings*, 43.

Garvey, J.E., E.J. Heist, R.C. Brooks, D.P. Herzog, R.A. Hrabik, K.J. Killgore, J. Hoover, and C. Murphy. 2010. Current status of the pallid sturgeon in the Middle Mississippi river: habitat, movement, and demographics. St. Louis district, US Army Corps of Engineers.

Goswami, R.K., and Mahanta,C. 2006. Leaching characteristics of residual lateritic soils stabilised with fly ash and lime for geotechnical applications. *Waste Management*, 26, 466-481

Hall, J.S. 1962. A life history and taxonomic study of the Indiana bat, *Myotis sodalis*. *Reading Public Museum and Art Gallery Science Publication*, 12, 3-68.
Holloway, J.A. 1994. Lime-fly ash injection of levees. *Report prepared for the Kansas City District, U.S. Army Corps of Engineers.* Retrieved from: http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD=ADA285413

Huber, W. C., Eldin, N. N., Williamson, K. J., Azizian, M .F., et al. 2001. Environmental impact of construction and repair materials on surface and ground waters summary of methodology, laboratory results, and model development, *2001 National Cooperative Highway Research Program Report 448.*

Humphrey, S.R., Richter, A.R., and Cope, J.B. 1977. Summer habitat and ecology of the endangered Indiana bat, *Myotis sodalis.* *Journal of Mammalogy*, 58(3), 334-346.

Hyun, D. M., Dermatas, D. 2006**.** An evaluation of lead leachability from stabilized/solidified soils under modified semi-dynamic leaching conditions. *Engineering Geology*, 85 (1-2), 67-74. Retrieved from:
http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V63-4JKRTWD-1&_user=10&_coverDate=05%2F26%2F2006&_rdoc=1&_fmt=high&_orig=search&_origin=search&_sort=d&_docanchor=&view=c&_searchStrId=1453676684&_rerunOrigin=scholar.google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=b7a855775b7b2d3840cd5ed8de0dd1bb&searchtype=a

Hyun, D. M., and Dermatas, D. 2007. Arsenic and lead release from fly ash stabilized/solidified soilsunder modified semi-dynamic leaching conditions. *Journal of Hazardous Materials*,141 (2),_ 388-394. Retrieved from: http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6TGF-4K3KCGR-2&_user=10&_coverDate=03%2F15%2F2007&_rdoc=1&_fmt=high&_orig=search&_origin=search&_sort=d&_docanchor=&view=c&_searchStrId=1453678948&_rerunOrigin=scholar.google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=78fcd6a224ab05b0dd67bcf6784b85da&searchtype=a

Jiang J,G, Xu X,, and Zhang Y.2006. Investigation of leaching characteristics of heavy metals during cement stabilization of fly ash from municipal solid waste incinerator. *Huan Jing Ke Xue*. Dec 27. 2564-9. PMID: 17304859 [PubMed - indexed for MEDLINE] Retrieved from: http://www.ncbi.nlm.nih.gov/pubmed/17304859

Joint Departments of the Army and Air Force, USA, TM 5-822-14/AFMAN 32-8010, Soil stabilization for pavements, 25 October 1994. Retrieved from: http://www.army.mil/usapa/eng/DR_pubs/dr_a/pdf/tm5_822_14.pdf

Jones, K. H. 2000. Population survey of the interior least tern on the Mississippi River from Cape Girardeau, Missouri to Vicksburg, Mississippi. Report prepared for the Memphis District, U.S. Army Corps of Engineers.

Kostarelos, D., Reale, D. 2004. Optimum dose of lime and fly ash for treatment of hexavalent chromium-contaminated soil. *Water, Air, and Soil Pollution: Focus*, 6, 171–189

Ledbetter, W.B, and McKerall, W.C. 1982.Variability and control of class c fly ash. *Journal of Cement, Concrete and Aggregates (CCA).* 4(2).

Leelavathamma, B. 2005. Effect of class c fly ash on the California bearing ratio behavior of soil-fly ash mixes and layered systems. *Journal of Testing and Evaluation (JTE)*, 33(2).

Li, Y., MinZhang, P.S.,He , Z., and Her, B. 2002. Utilization of Fly Ash and Urban Yard Waste as Soil Amendments to Improve Soil Fertility, Final Report, May 1, 2002.

McDonald, L.M., and Simmons, J. 2004. Effects of Large-Scale CCB Applications on Groundwater, Case Studies, April 15, 2004.

Mettler-Cherry, P.A., Smith, M., and Keevin, T.M. 2006. Habitat characterization and geospatial metapopulation dynamics of threatened floodplain species *Boltonia decurrens* using a GIS. *Wetlands*, 26, 336-348

Misra, A. 2005. University of Missouri, Kansas City, Crushed Aggregates from Class C Fly Ash, Draft Final Report to Combustion Byproducts Recycling Consortium, Leaching Potential discussion, 33-35, October 31, 2005.

Misra, A. 2000. Utilization of western coal fly ash in construction of highways in the Midwest. *Prepared for Mid-America Transportation Center*.

National Research Council. 2001. National Cooperative Highway Research Program (NCHRP) Report 448: Environmental impact of construction and repair materials on surface and ground waters-Summary of methodology, laboratory results, and model development. Transportation Research Board.

Rafalowski, M. 2006. Fly ash facts for highway engineers: Fly Ash in Soil Improvement. U.S. Department of Transportation. Retrieved from: http://www.fhwa.dot.gov/pavement/recycling/fach07.cfm

Ramme, B., and Tharaniyil, M. 2004. Chapter 8: Fly Ash Metal Matrix Composites. We Energies Coal Combustion Products Utilization Handbook (2nd Edition). 193-200. Retrieved from: http://www.we-energies.com/environmental/ccp_handbook_ch8.pdf

Ramme, B., and Tharaniyil, M. 2004. Chapter 9: Environmental Considerations of We Energies Coal Combustion Products and Regulatory Requirements. *We Energies* Coal Combustion Products Utilization Handbook (2nd Edition). 203-228. Retrieved from: http://www.we-energies.com/environmental/ccp_handbook_ch9.pdf

Recycled Materials Resource Center (RMC). 2008. The user guidelines for waste and byproduct material in pavement construction. Retrieved from: http://www.rmrc.unh.edu/tools/uguidelines/cfa54.asp

Rusch K.A, Guo T., and Seals R.K. (2002) Stabilization of phosphogypsum using class C fly ash and lime: Assessment of the potential for marine applications. J Hazard Mater. 2002 Jul 22;93(2):167-86.PMID: 12117464 [PubMed - indexed for MEDLINE]. Retrieved from: http://www.ncbi.nlm.nih.gov/pubmed/12117464

Tensar Earth Technology Technical Report. 1998. Chemical and mechanical stabilization of subgrades and flexible pavement sections. Retrieved From: http://Www.Tensarcorp.Com/Uploadedfiles/Spectra_Ttn_Br10.Pdf

Schwegman, J. E. and Nyboer, R. W. 1985. The taxonomic and population status of Boltonia decurrens (Torr. & Gray) Wood. *Castanea*, 50,112-115.

Sen, T., Mishra, U. (2010). Usage of industrial waste products in village road construction. *International Journal of Environmental Science and Development*, 1(2).

Smith, M., Thomas, K.n and Mettler-McClure. P.. 1998. Relating site characteristics of a threatened floodplain plant species to flood frequency and duration. Proceedings of Seventh Annual Conference of the Illinois Groundwater Consortium: Research on agricultural chemicals in Illinois groundwater. VIII: 54-62

Smith, M. 2000. Year 2000 inventory and assessment of decurrent false aster (Boltonia decurrens). Report prepared for the Rock Island District, U.S. Army Corps of Engineers.

U.S. Army Corps of Engineers. 1986. Policy on Correction of Project Deficiencies in Completed Projects that are Operated and Maintained by Local Interests. Letter Report, Repair of Flood Works, Alton-to-Gale Organized Levee Districts and Mississippi River at St. Louis, Missouri Project. St. Louis District, U.S. Army Corps of Engineers.

USFWS (U.S. Fish and Wildlife Service). 1990. Decurrent false aster recovery plan. U.S. Fish and Wildlife Service, Twin Cities, Minnesota. 26 pp.

USFWS (U. S. Fish and Wildlife Service). 1990. Recovery plan for the interior population of the least tern (Sterna antillarum). U. S. Fish and Wildlife Service, Twin Cities, Minnesota. 90 pp.

USFWS (U.S. Fish and Wildlife Service). 1993. Pallid sturgeon recovery plan. U.S. Fish and Wildlife Service, Bismarck, North Dakota. 55 pp.

USFWS (U.S. Fish and Wildlife Service). 2006 Species Profile: Bald Eagle (*Haliaeetus leucocephalus*). Available at http://ecos.fws.gov/speciesProfile/SpeciesReport.do?spcode=B008 (Accessed December 14, 2006).

USFWS (U.S. Fish and Wildlife Service). 2007. Protection of Eagles; Definition of ‘‘Disturb’’. Federal Register 72(107): 31132- 31139.

United Facilities Criteria (UFC), Soil Stabilization for Pavements, Prescribed by MIL-SD 3007, used for all DoD projects, Class C Fly Ash discussion in Section 3-3, January 16, 2004.

U.S. Army Engineer Research and Development Center (ERDC) on aggregates including ash, Section N, p. 22,

University of Memphis engineer students tour West Memphis levee worksite. River Watch Online, Issue #7 - February 22, 2008. Retrieved from: http://www.mvm.usace.army.mil/RWOnline/RW_2008/RW_022208/Flyash.htm

United States Environmental Protection Agency . April 5, 2010. Materials characterization paper in support of the proposed rulemaking – identification of nonhazardous secondary materials that are solid waste coal combustion residuals - coal fly ash, bottom ash, and boiler slag. Retrieved from: http://www.epa.gov/waste/nonhaz/define/pdfs/coal-combust.pdf

United States Environmental Protection Agency (U.S.EPA). 2009. Technology performance review: selecting and using solidification/stabilization treatment for site remediation. EPA/600/R-09/148. Retrieved from: http://www.epa.gov/nrmrl

UNjobs. 2010. *Soil cement construction*. Retrieved from: http://unjobs.org/tags/soil-cement-construction.

U.S. Army Corps of Engineers. 2002. Institute for Water Resources. IWR Report 96-PS-3. January 2002 (update). Retrieved from: http://www.usace.army.mil/CECW/Pages/envdref.aspx

Utility Solid Waste Activities Group (USWAG). http://www.uswag.org/

Wang, T.,Wang, J., and Ladwig, K. 2007. The leachability and speciation of arsenic and selenium in coal fly ash. *Proceedings of the 2007 World of Coal Ash Conference(WOCA)*, Kentucky. Retrieved from: www.worldofcoalash.org/2005/ashpdf/75wan.pdf

White, D.J., Harrington, D., and Thomas, Z. 2005. Fly ash soil stabilization for non-uniform subgrade soils, volume I: engineering properties and construction guidelines. Final report. Retrieved from: http://www.intrans.iastate.edu/reports/tr461_vol1.pdf

Wilson, A. 1993, March 1. Cement and Concrete: Environmental Considerations. *Environmental Building News*. Retrieved from http://www.buildinggreen.com/auth/article.cfm/1993/3/1/Cement-and-Concrete-Environmental-Considerations/?

Woodward, M.L. 2007. Deep mixing application in New Orleans. *International Water Power and Dam Construction magazine* (IWP&DC).

XRD.US. 2005. *Powder diffraction of fly ash.* Retrieved from: http://www.xrd.us/applnote/fly ash.htm

ADDITIONAL RESOURCES

American Coal Ash Association (ACAA). http://www.acaa-usa.org/

The Ash Library. http://www.flyash.info/

Carlson, J.R, Bonala, M.V.S, Reddi, L.N. 2001. *Evaluation of fly ash admixtures for final cover and composite liner applications. Prepared for Sunflower Electric Power Corporation*. Retrieved from: http://wvwri.nrcce.wvu.edu/programs/CBRC/reports/cbrcw10.pdf

Concrete Network. 2010. *Fly ash - Making concrete stronger, more durable, easier to work with.* Retrieved from: http://www.concretenetwork.com/concrete/concrete_admixtures/fly_ash.htm

Concrete Network. 2010. *Concrete Admixtures*. Retrieved from: http://www.concretenetwork.com/concrete/concrete_admixtures/

CEQ Regulations for Implementing NEPA. http://ceq.hss.doe.gov/ceq_regulations/regulations.html

Griffin Soil. 2010. Technical papers and articles: PH of lime - stabilized soils. Retrieved from: http://www.griffinsoil.com/ph_of_lime_stabilized_soils

Hayward Baker, Inc . http://www.haywardbaker.com/#

Headwaters Resources. http://www.headwaters.com/

Heebink, *L*.V., and Hassett, D. J. 2001. Coal *fly ash* trace element mobility in soil stabilization. *Proceedings of the 2001 International Ash Utilization Symposium*, Kentucky. Retrieved from: http://www.flyash.info/2001/envben2/64heebin.pdf

Harris,P., Von Holdt, J., Sebesta, S., and Scullion, T. 2006. Recommendations for stabilization of highsulfate soils in Texas. FHWA/TX-06/0-4240-3.Texas Transportation Institute, The Texas A&M University System College Station. *Prepared for Texas Department of Transportation and the Federal Highway Administration.* Retrieved from: http://tti.tamu.edu/documents/0-4240-3.pdf

Kentucky Ash Education Web Site. http://www.caer.uky.edu/kyasheducation/index.html

O'Neill, M., Lombard, K., Onkin, B., et al. 2006. Power plant combustion byproducts for improved crop productivity of agricultural soils. Project Number 02-CBRS-W09. Final Report. *Prepared for U.S. Department of Energy National Energy Technology Laboratory, and The Combustion Byproducts Recycling Consortium.* Retrieve from: http://wvwri.nrcce.wvu.edu/programs/cbrc/reports/02-CBRC-W9.pdf

EPA National Center for Environmental Research. Final report: Development of an environmentally friendly and economical process for plugging abandoned wells (Phase II). Retrieved from: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/87

Parsons, R. L., and Kneebone, E. 2005. Field performance of fly ash stabilised subgrades. *Ground Improvement*, 9 (1), 33–38

Petry, T.M., and Little, D. 2003. Review of stabilization of clays and expansive soils in pavements and lightly loaded structures-history, practice, and future. In Jeffery Russell (ED), *Perspectives in Civil Engineering: Commemorating the 150th Anniversary of the American Society of Civil Engineers.* 307-320.

Pflughoeft-Hassett, D.F. 2004. Leaching characteristics of fly ash– activated carbon from mercury control technologies- Final Report. University of North Dakota Energy & Environmental Research Center. Retrieved for: http://www.undeerc.org/carrc/Assets/dfph-CinergyFinalReport.pdf

Rusch, K. A., Seals, R.K., and Gutierrez-Wing, M.T. 2010. Preparation of an application for approval to use stabilized phosphogypsum as a fill material for coastal protection devices. Final report. Publication No. 01-197-235. Louisiana State University. *Prepared for Florida Institute of Phosphate Research. Retrieved from:http://www1.fipr.state.fl.us/fipr/fipr1.nsf/129fc2ac92d337ca85256c5b00481502/b496bd5d2cb09f5e8525770b00552dc5/$FILE/01-197-235Final.pdf*

Standard Specification for Chemical Admixtures for Concrete, ASTM C494 / C494M -10

Standard Test Method for Shake Extraction of Solid Waste with Water, ASTM D3987

West Virginia Water Research Institute. 2007. Combustion Byproducts Recycling Consortium [Data file]. Available from West Virginia University Web site. Retrieved from: http://wvwri.nrcce.wvu.edu/programs/cbrc/

DRAFT FINDING OF NO SIGNIFICANT IMPACT
REPAIR OF FLOOD CONTROL WORKS
ALTON-TO-GALE ORGANIZED LEVEE DISTRICTS, ILLINOIS

The U.S. Army Corps of Engineers (USACE), St. Louis District, proposes to address the correction of a design deficiency involving the use of inappropriate, high plasticity clays during the construction of eleven levee reaches in the Alton-to-Gale Organized Levee Districts, Illinois and Missouri.

I have reviewed the information in this Environmental Assessment, along with data obtained from Federal and State agencies having jurisdiction by law or special expertise, and from the interested public. I find that repair of portions of the Alton-to-Gale Organized Levee Districts due to design deficiency is essential to maintaining levee integrity and would not significantly affect the quality of the human environment.

This finding of no significant impact is based on the following factors:

1. Evaluation of other pertinent data and information on levee damage repairs. As part of this evaluation, I have considered the following project alternatives.

a. Four practicable alternative engineering solutions for repairing reaches of levees experiencing excessive sliding.

b. No Federal action ("No Action" Alternative).

2. The possible consequences of the lime/Class C fly ash injection method, Recommended Alternative 4, have been studied for physical, environmental, cultural, social and economic effects, and engineering feasibility. Significant factors evaluated as part of my review include.

a. If no repairs are accomplished, the levee system would continue to deteriorate to the point that protection would be jeopardized during the next flood event of any significance.

b. Under the lime/Class C fly ash injection method there is a possibility that some excess slurry may spill from the injection holes. The Contractor shall construct earthen berms or other adequate protection along the levee toe for the length of the job and adjacent to drainage channels to eliminate accidental entry of slurry into area watercourses or other wetlands. The earthen berms shall be of sufficient size to capture all excess slurry at the levee toe. Any slurry that is running freely on the surface (either around injection rods or out of previous injection holes), is puddled at the toe of the embankment slope, has been spilled, or for any other reason has been judged unsuitable slurry material by the Contracting Officer, shall be defined as wasted slurry. In situations where trees or wetlands would be

impacted by berm construction the contractor, as an alternative, would be required to all necessary BMP's including but not limited to the use silt fencing and hay bales, to capture and prevent slurry from going beyond the toe of the levee. In order to ensure that water quality compliance is maintained, the contractor must supply the appropriate information documenting the quality of the fly ash meets all applicable state and federal standards. All aspects of the mixing and injection process must be documented within and environmental protection plan submittal along with all the BMP's that would be used to minimize the risk associated with this process. All waste slurry would be disposed of in an environmentally safe manner.

c. No significant adverse terrestrial impacts would be expected. Vegetation (cool season grasses) and possibly some wildlife (small mammals) would be impacted during construction.

d. No Federally endangered or threatened species would be adversely impacted by the levee repairs.

e. Repair activities would cause temporary erosion, noise, and air pollution. Proper construction guidelines and soil management techniques would minimize these impacts. Impacts would be short term and minor. The aesthetic and recreational quality of the area would be temporarily reduced by construction activities. Shortly after construction completion, aesthetic and recreational quality would return to pre-construction conditions. Upon completion of the repairs, all construction equipment would be removed.

f. Construction/repair activities associated with this project would have no significant effect upon archaeological remains or historic properties. In the event that unknown archaeological remains or historic properties are encountered in the construction/repair process, a Programmatic Agreement has been executed with the Illinois Historic Preservation Agency to ensure that any impacts are avoided or mitigated.

g. No adverse socioeconomic impacts or impacts to prime farmland from the proposed levee repairs would occur.

h. No jurisdictional wetlands, waterways or other Waters of the United States would be affected by the proposed access, repair and construction methods associated with this project. As such, the St. Louis District, Regulatory Branch determined that no Section 404 Clean Water Acts permits would be required to complete the project as proposed.

3. Based on my analysis and evaluation of the alternative courses of action presented in this Environmental Assessment, I have determined that repairing the levee slides using the lime/Class C fly ash injection technique would not have significant effects on the quality of the human environment. Therefore, it is my determination that an Environmental Impact Statement is not required.

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Date

Thomas E. O'Hara, Jr.
Colonel, U.S. Army
District Engineer