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FWS/AES-CMFO

JAN 21 1999

Colonel George H. Hazel
District Engineer
Kansas City District, Corps of Engineers
700 Federal Building
Kansas City, Missouri 64101

ATTN: Mr. Robert Ruf, Planning Division

Dear Colonel Hazel:

This final Fish and Wildlife Coordination Act Report (FWCA) is submitted by the U.S. Fish and Wildlife Service (Service) to the Kansas City District, U.S. Army Corps of Engineers (Corps), for use in Missouri River Levee System Unit L-142 (L-142) General Reevaluation Study at North Jefferson City, Callaway County, Missouri. This report supplements our October 18, 1994 Planning Aid Letter and our February 26, 1996 preliminary Fish and Wildlife Coordination Act Report. This report has been coordinated with the Missouri Department of Conservation (MDC) and incorporates the views and recommendations of that agency.

The Service has prepared this report in accordance with the provisions of the Fish and Wildlife Coordination Act (48 stat. 401, as amended; 16 U.S.C. 661 et seq.) and Section 7 consultation requirements of the Endangered Species Act of 1973, as amended. The report identifies important fish and wildlife resources, including federally listed threatened or endangered species of the project area, expected impacts to these resources from the preferred alternative, and recommended measures for resource mitigation and enhancement. We would like to review the plans and specifications for the project when they become available.

Project Development History and Alternatives Considered

The proposed L-142 is a flood levee located on the left descending bank of the Missouri River at North Jefferson City, Missouri (enclosure 1). The purpose of the L-142 project is provide protection against a 100-year flood for the Jefferson City Airport, ABB Manufacturing Plant, Air National Guard Facility, Jefferson City Waste Water Treatment Plant and various commercial businesses. The project has gone through several reevaluations and alternative analyses. The existing Capitol View Levee along the high bank of the Missouri River provides protection for the project area from an approximate 10-year flood event.

The 1991 preliminary plan was 6.4 miles of levee averaging about 15.8 feet high extending from Turkey Creek on the upstream end to Niemans Creek Tributary Ditch at the downstream end,

parallel with Mokane Road at the edge of the regulatory floodway on the riverward side. The alignment would have protected North Jefferson City, including Cedar City, west of Highway 54, the airport, waste water treatment plant, Air National Guard facility, Cedar City, and a number of commercial facilities. In 1993, an alternative was developed which reduced the levee length to about 5.4 miles by moving the downstream tie-back nearer to the airport and excluding undeveloped land at the downstream end. After the 1993 flood, a modification to the alternative reduced the length of the levee to about 4.6 miles by excluding the Cedar City area.

A third alternative assumes that a Missouri Highway and Transportation Department (MHTD) project will be constructed as part of the Corps without-project condition. The MHTD intends to construct flood protection along the upstream side of Highway 54 to prevent the road from being overtopped by future flood events. The 1.3 mile alignment of the MHTD project appears to be compatible with the L-142 project. This alignment would require only 3.3 miles of additional levee to complete the line of protection. This proposed levee would begin at Highway 54 and extend 2.2 miles along the landward side of Mokane Road. The levee would then turn to the northeast and tie back into the high ground on Highway 94.

A fourth alternative is very similar to the third alternative but the tie-back section of the levee will go in a north direction rather than a northeast direction as in the third alternative. The result is that approximately 320 floodplain acres will no longer be protected by alternative four.

Project Description and Study Area

The newly proposed alternative is similar to the fourth alternative but the western length of the tie-back is no longer associated with Highway 54 and instead runs between 1,000 and 2,000 feet west of Highway 54. Impervious and random borrow sites are shown on enclosure # 1. We understand that the Corps is no longer proposing to dredge sand from the Missouri River channel for levee construction. This report addresses the new alternative as the Corps' recommended plan.

The entire study area is located within the floodplain of the Missouri River. According to Thom and Wilson (1980), the Missouri River and its floodplains and terraces, are part of the Big Rivers natural division and contain deep alluvial, productive soils. Presettlement natural features included bottomland and upland forest, some wet prairie, marshes, sloughs, chutes, islands, sand bars, oxbow ponds, and rivers. Aside from the airport, commercial facilities and waste water treatment plant, the proposed levee is designed to protect, the study area is primarily small grain crop production, such as corn, soybeans, and wheat.

The western length of the new levee alignment will pass through what once was Cedar City. Cedar City was heavily damaged during the 1993 flood. The Federal Management Agency (FEMA) along with Jefferson City, through the Section 1362 Flooded Property Purchase

Program, purchased the flood-damaged property and provided the property owners the opportunity to relocate to nonflood-prone areas. It is our understanding that because of the 1362 program, Jefferson City agreed to accept title to the property and agreed to maintain it as open space for public use. Public use includes restoring flood plain values and providing recreation, wetland and open space resources (44CFR(d)(2)(xii)).

The Federal Aviation Administration has guidelines that restrict the construction of any habitat that may "attract" wildlife near airfields. The guidelines were originally directed at the construction of landfills but have since been modified to include any wildlife habitat (FAA Order 5200.5A). Development of habitat is not supposed to occur within 5,000 feet of the end of a runway that supports only piston powered aircraft and within 10,000 feet of the end of a runway that supports turbine powered aircraft. Both types of aircraft utilize the Jefferson City Airport. We understand that the FAA has requested that the Missouri Department of Transportation (MoDOT) determine the safety of proposed and existing wildlife habitat in and around the airport. MoDOT has preliminarily determined that the proposed 33 acre wetland mitigation site in the northwest corner of the project area could be constructed provided that the wetland remains a vegetated, perennial-type wetland and not an "open water duck pond" (Valerie Hansen, KC Corps, September 8, 1998).

Fish and Wildlife Resources

Rick Hansen and Joanne Grady, Service biologists from the Columbia Field Office, conducted a field reconnaissance of the project area on September 15, 1994. Given the reevaluation level of the current study, Mr. Hansen and Ms. Grady observed baseline conditions in order to gain information for a qualitative description of aquatic and terrestrial resources.

On May 2, 1995, Rick Hansen and Galen Rasmussen, Corps' biologist from the Planning Branch, conducted a field reconnaissance to evaluate wetlands and possible borrow areas in or near the study site. Borrow site locations observed were in agricultural fields east of the airport, agricultural fields between Mokane Road and the Missouri River and scour holes on the river south of the Jefferson City Airport. Within one week of the May 2 field trip, the entire study area was under water until mid-June.

In September, Rick Hansen conducted an after-the-flood field reconnaissance and determined that the study area did not look appreciably different than in May. Scour holes were observed in an area severely damaged from the 1993 flood about 1½ miles east of the airport. Sand redeposition occurred in the area between Mokane Road and the river. It appeared that no crops were planted in the study area in 1995. Approximately 100 unidentified shorebirds and 35 blue-winged teal were in the palustrine emergent wetland that parallels Mokane Road.

The aquatic and terrestrial environments in the study area are characteristic of the present day Missouri River floodplain of the project area. The original character of the river has been

significantly modified due to the Corps' Missouri River Bank Stabilization and Navigation Project. The lower Missouri River, including the reach adjacent to the project site, has been channelized. The transformation of the lower Missouri River from a wide, braided channel to a single main channel has eliminated many islands, sandbars, sloughs, and backwater areas that were especially important for fish spawning and nursery habitat. The once extensive areas of bottomland forested wetlands and marsh have been primarily converted to agricultural uses. A map from the Missouri River Commission's 1892 survey of the Missouri River shows that the river channel adjacent to the study area was approximately 4100 feet wide compared to an approximate width of 2000 feet today (enclosure 2).

The final National Wetland Inventory (NWI) maps (enclosure 3) indicate that the following wetlands occur in and around the project area:

PEMA - Temporarily Flooded Palustrine Emergent Wetland
PEMC - Seasonally Flooded Palustrine Emergent Wetland
PUBGx - Excavated Unconsolidated Bottom Intermittently Exposed Palustrine Wetland
PSS1C - Seasonally Flooded Broad-leaved Deciduous Scrub Shrub Wetland

There are approximately 55 acres of wetlands within the area of the recommended plan (including the protected land and the footprint of the proposed levee). These wetlands were identified from a NWI map and site visits. The PEMA and the PEMC (40 acres) are herbaceous marshes that may be farmed during dry years. The PUBGx (11 acres) is located next to the ABB Facility and the PSS1C (four acres) was located along a drainage ditch/disturbed creek channel and is probably a transition between a forested area and a former herbaceous wetland.

The NWI map was used to identify an additional 60+ acres of wetlands in the project area. These included forested, scrub shrub, and emergent wetlands most occurring southeast of the project area.

In July, 1998, Doug Berka, Mark Frazier and Jim Ptacek of the Regulatory Branch conducted both offsite and onsite investigations to determine the jurisdictional limits of wetlands under Section 404 of the Clean Water Act. They determined that there were approximately 113 acres of wetlands in and near the project site. They described the wetlands as farmed, emergent and wooded (enclosure 4).

The Callaway County Soil Survey indicates that approximately 60% of the project area on the landward side of the proposed levee consists of hydric soils (Waldron silty clay and Booker silty clay). There are some remnant swales and depressional areas throughout the area. The entire area has been hydrologically altered either by the construction of levees and/or drainage ditches or the placing of tiles. Due to these hydrological modifications, five percent or less of the area is likely to retain wetland hydrology.

The Callaway County Soil Survey also indicated that approximately 40% of the project area on the riverward side of the proposed levee consisted of hydric soils (Waldron silty clay and Booker silty clay) prior to the flood of 1993. Several wetlands were created or destroyed due to scouring and subsequent filling during this flood. Many of these scour areas provide habitat for wetland plants, invertebrates, amphibians, reptiles, fish, waterfowl and other birds, and mammals. Numerous wetland plants were observed on the riverward side of the proposed levee on September 15, 1994 (Enclosure 5). Of particular importance to wildlife are smartweeds *Polygonum* spp., docks *Rumex* spp., barnyard grass *Echinocloa crusgalli*, rice cutgrass *Leersia oryzoides*, spike rush *Eleocharis* spp., and pin oak *Quercus palustris*.

None of the wetlands on the landward side of the proposed levee appeared to provide high quality wildlife habitat. The wetlands are dry during the majority of the year, although pools may temporarily form in the low spots. The temporary waters of wetlands on both sides of the proposed levee are capable of providing breeding grounds and seasonal habitat for amphibians and reptiles likely to inhabit the project area (see Table 1)

Table 1 - Amphibians and Reptiles Likely to Occur in the Project Area

American toad	*Bufo americanus*
Fowler's toad	*Bufo fowleri*
leopard frog	*Rana pipiens*
spring peeper	*Hyla crucifer*
cricket frog	*Acris crepitans*
chorus frogs	*Pseudacris triseriata*
bullfrog	*Rana clamitans*
common snapping turtle	*Chelydra serpentina*
painted turtle	*Chrysemys picta*
eastern hognose snake	*Heterodon platyrhinos*
northern water snake	*Nerodia sipedon*
midland brown snake	*Storeria dekayi*
eastern garter snake	*Thamnophis sirtalis*

Many fish species inhabit the Missouri River, its tributaries, overflow chutes, and scour areas. The scour holes on the riverward side of the proposed levee, which were created during the flood of 1993, increased the diversity of habitats for these species. A careful selection of borrow areas on the riverward side of the proposed levee, and the protection of existing depressional areas, may also increase the habitat diversity for riverine fish species likely to be found adjacent to the project (see Table 2).

Table 2 - Riverine Fish Species that Occur in the Missouri River Adjacent to the Project

pallid sturgeon	*Scaphirhynchus albus*[1]
paddlefish	*Polydon spathula*[2]
shortnose gar	*Lepisosteus platostomus*
longnose gar	*Lepisosteus osseus*
carp	*Cyprinus carpio*
silver chub	*Hybopsis storeriana*
speckled chub	*Hybopsis aestivalis*
flathead chub	*Hybopsis glacilis*
sturgeon chub	*Macrhybopsis gelida*[3]
sicklefin chub	*Macrhybopsis meeki*[3]
emerald shiner	*Notropis atherinoides*
silverband shiner	*Notropis shumardi*
river shiner	*Notropis blennius*
red shiner	*Notropis lutrensis*
mimic shiner	*Notropis volucellus*
western silvery minnow	*Hybognathus argyritis*
bluntnose minnow	*Pimephales notatus*
bigmouth buffalo	*Ictiobus cyprinellus*
smallmouth buffalo	*Ictiobus bubalus*
river carpsucker	*Carpiodes carpio*
channel catfish	*Ictalurus punctatus*
blue catfish	*Ictalurus furcatus*
flathead catfish	*Pylodictis olivaris*
white bass	*Morone chrysops*
largemouth bass	*Micropterus salmoides*
warmouth	*Lepomis gulosus*
green sunfish	*Lepomis cyanellus*
bluegill	*Lepomis macrochirus*

[1]Federally-listed endangered species
[2]Federal species of concern
[3]Federal candidate species

The Missouri River floodplain is part of a major waterfowl migratory route. Along the river floodplain thousands of geese and ducks pass by with the changing seasons. As a result of their long migrations and associated expenditure of energy, they stop along the way to feed on waste

grain or unharvested row crops. Waterfowl species include Canada goose *Branta canadensis*, snow goose *Chen caerulescens,* mallard duck *Anas platyrhynchos*, wood duck *Aix sponsa,* blue-winged teal *Anas discors* and the green-winged teal *Anas carolinensis*. The Canada goose, wood duck and mallard may also nest in the area. Even though the seasonal wetlands are not considered high quality, they do provide "stop-over" habitat for migrating waterfowl such as were observed on the September, 1994 field trip.

The project area probably provides seasonal and permanent habitat for other birds (see Table 3)

Table 3 - Birds that may occur in the project area

northern harrier	*Circus cyaneus*
red-tailed hawk	*Buteo jamaicensis*
red-shouldered hawk	*Buteo lineatus*
bald eagle	*Haliaeetus leucocephalus*[1]
american kestrel	*Falco sparverius*
great egret	*Casmerodius albus*
cattle egret	*Bubulcus ibis*
great blue heron	*Ardea herodias*
green heron	*Butorides virescens*
sora	*Porzana carolina*
american coot	*Fulica americana*
killdeer	*Charadrius vociferus*
solitary sandpiper	*Tringa solitaria*
greater yellowlegs	*Totanus melanoleucus*
least sandpiper	*Erolia minutilla*
semipalmated sandpiper	*Ereunetes pusillus*
barred owl	*Strix varia*
rough-winged swallow	*Stelgidopteryx ruficollis*
marsh wren	*Telmatodytes palustris*
yellow warbler	*Dendroica petechia*
yellow throat	*Geothlypsis trichas*
eastern meadowlark	*Sturnella magna*
red-winged blackbird	*Agelaius phoeniceus*
american goldfinch	*Spinus tristus*
dickcissel	*Spiza americana*
song sparrow	*Melospiza melodia*
white-throated sparrow	*Zonotrichia leucophrys*

[1]Federally-listed threatened species

The project area may provide habitat for several of Missouri's mammals (see Table 4).

Table 4 - Mammals that May Occur In the Project Area

oppossum	*Didelphis virginiana*
Indiana bat	*Myotis sodalis*[1]
muskrat	*Ondantra zibethicus*
beaver	*Castor canadensis*
meadow vole	*Microtus pennsylvanicus*
deer mouse	*Peromyscus leucopus*
eastern cottontail	*Sylvilagus floridanus*
raccoon	*Procyon lotor*
striped skunk	*Mephitis mephitis*
mink	*Mustela vison*
coyote	*Canis latrans*
white-tailed deer	*Odocoileus virginianus.*

[1]Federally-listed endangered species

Fish and Wildlife Impacts of Alternatives and Recommended Plan

The current plan will affect more wetland acres and open space than the proposal (Alternative Four) that was addressed in our preliminary Fish and Wildlife Coordination Act Report dated February 26, 1996.

As noted previously, there are approximately 113 acres of wetlands in the project area. The Service has estimated that approximately 38.6 acres of emergent and farmed wetlands will be directly impacted by either the construction of the levee or from excavation to obtain borrow material. The post-project use of the area cannot be predicted, but the Service is estimating that approximately 24.5 acres of farmed and emergent wetlands may be indirectly impacted as a result of upgrading the levee system. It appears that 49.8 acres of farmed, emergent and forested wetlands will not be impacted by the proposed project (Enclosure 6). The Service's assessment of project-related direct, indirect and no impact of the 21 wetland sites identified by the Regulatory branch can be found in Enclosure 7.

At the request of the Corps, we quantitatively assessed habitat impacts of project construction using the Wildlife Habitat Appraisal Guide (WHAG). The WHAG analysis was provided to the Corps in the preliminary FWCA. The use of a WHAG analysis wasn't useful in evaluating the impacts of project construction. The WHAG methodology wasn't sensitive enough to analyze impacts as small as nine acres. The evaluation species may not adequately reflect wildlife

species using these types of wetlands. Therefore, our comments and recommendations concerning impacts of the project were based upon field reconnaissance information.

It is our understanding that the Corps is proposing to remove fill to a depth of six feet or less at the three impervious borrow sites. These borrow sites are 33, 71 and 25 acres in size. Site 1 is approximately 33 acres in size and is being considered as a potential mitigation site for project impacts to wetlands.

The Service believes that the Corps should mitigate the direct impacts to existing emergent wetlands at a 1.5 to 1.0 ratio. Because 19.8 acres of emergent wetland are to be directly impacted, then it would be necessary to restore 29.7 acres of non-wetland habitat to wetland habitat. We believe the proposed 33 acre mitigation site will accomplish the required mitigation. The Service believes that the 18.8 acres of farmed wetland can be mitigated at a 1.0 to 1.0 ratio. Valerie Hansen indicated that the mitigation for farmed wetlands may be accomplished at the two remaining impervious borrow sites. It is our understanding that once mitigation is completed, the Missouri Department of Natural resources will accept management responsibilities for the proposed wetland mitigation sites. If this is the case, then we recommend that the Corps attempt to mitigate for impacts to farmed wetlands along the Katy Trail in the northern impervious borrow site.

A reliable source of water may be the limiting factor in creating wetland habitat at either site. Turkey Creek borders site 1 on the west side and could provide water to help support the hydrological requirements of the wetland. There is a stream that runs at the toe of the bluff on the north side of Highway 94 that could provide the hydrological requirements for site 2. On every field reconnaisance conducted by the Service, water was observed in that stream. It might be necessary to remove additional fill from the borrow area to create the mitigation wetland. Because they are impervious material borrow sites, they are more likely to retain water than the sandy soil at other sites on the floodplain.

Wetland mitigation sites should be irregular in shape and have an irregular bottom contour. Because both sites are situated along the Katy Trail, they could provide enhanced recreational benefits for trail visitors. Trails, observation towers and interpretive information could promote wetland and floodplain values.

We previously recommended in the preliminary FWCA report that "All borrow material should be taken out of the bird strike zone around the Jefferson City Airport. The MDOT has determined that it okay to develop the mitigation site provided the wetland remains a vegetated, perennial-type wetland and not an open water duck pond. We agree that the proposed wetland mitigation site should not be a open water duck pond but recommend that standing water of up to three feet deep should occur on at least 50 percent of the mitigation site to provide the needed aquatic habitat for a variety of wildlife species such as amphibians and reptiles. Open water,

seasonally, is very important for migratory species such as wading birds, shorebirds and waterfowl. Therefore, the Corps should establish criteria for the wetland restoration that will provide open water especially during the spring, early summer and fall months.

Threatened and Endangered Species Comments

In accordance with Section 7 of the Endangered Species Act (ESA), we have determined that the following federally-listed species may occur in the project area. No designated critical habitat occurs in the project area:

Endangered	
Indiana bat	*Myotis sodalis*
Pallid sturgeon	*Scaphirynchus albus*
Threatened	
Bald eagle	*Haliaeetus leucocephalus*

The preceding table includes federally-listed species that may occur in the project area, and does not constitute consultation nor fulfill requirements under Section 7(a)(2) of the ESA. When specific project information is made available, we will be able to provide more detailed comments. If the Corps of Engineers determines that a project may affect listed species, formal or informal consultation should be requested with this office.

Bald eagles have become more common nesters in Missouri, largely because of increased management efforts. A formerly active nest (active in 1992) occurs approximately two miles upstream of the proposed site in a cottonwood tree on the left descending bank. The nest was not active during the flood of 1993 and the eagles have not returned to the nest since then. The nest is presumed no longer active.

The federally-listed endangered Indiana bat (*Myotis sodalis*) may occur within the project area during the spring and summer. Indiana bats spend the winter hibernating in caves in the Ozarks. During April and May, females migrate north and establish small maternity colonies in suitable sites within wooded riparian areas, floodplain forests, or upland woodlots. Maternity roost sites tend to be in dead or dying trees greater than 9 inches in diameter at breast height and with loose or exfoliating bark. Trees most likely to have loose or exfoliating bark are dead oaks, hickories, elms, green and white ash, silver maple, and eastern cottonwood, or living shagbark hickory. Preferred roost sites are located in forest openings, at the forest edge, or where tree canopy is sparse, and within 1 km (0.6 mi.) of water.

Because it appears that no forested areas will be impacted in constructing the proposed project, we believe that any potential impact to the Indiana bat would be insignificant and therefore

conclude that the project is not likely to affect this species.

The Missouri River, within the proposed area, is also within the historic range of the pallid sturgeon. The range of the pallid sturgeon is primarily the Missouri River and the Mississippi River downstream of its confluence with the Missouri River. Pallid sturgeon require large, turbid, free-flowing, braided-channel riverine habitat with sandy and rocky substrates. Modifications to this species' habitat have blocked movements, destroyed or altered its spawning areas, reduced its food sources or its ability to obtain food, altered water temperatures, and changed the hydrograph of the large riverine habitat it requires to successfully complete its life cycle. Over-fishing, pollution, and hybridization also may have led to the species' dramatic decline and ultimate listing as endangered.

It is our understanding that no dredging of sand from the river will be necessary for borrow material, therefore any potential impact to the pallid sturgeon would be insignificant and conclude that the project t is not likely to adversely affect this species.

The Service does not expect the project to adversely affect the bald eagle, Indiana bat or the pallid sturgeon provided that the borrow sites are located on the floodplain and no mature riparian timber is destroyed by this project. If the Corps should decide that dredging in the Missouri River is necessary for borrow material such that the pallid sturgeon may be affected, then formal or informal consultation should be initiated with this office.

Discussion and Recommendations:

This FWCA addresses the current action alternative for the L-142 project. The Service has presented a general description of the project area, and some of the major natural features and fish and wildlife resources present. Land-use changes and their impacts to natural aquatic, terrestrial, and wetland communities have been discussed.

A WHAG analysis was not useful for assessing present and future fish and wildlife habitat conditions at the project site. Our recommendations for wetland mitigation requirements are a result of field reconnaissance, a literature search, and best professional judgement.

Only small remnant wetlands occur on the landward side of the proposed levee. These farmed and emergent wetlands are seasonally inundated primarily from local drainage into the depressional areas. It is expected that the proposed project will not have a significant effect on the hydrology of the landward wetlands.

Our recommendations address the use of the proposed borrow areas as mitigation for the construction of the proposed levee. It appears that water may be the limiting factor in determining whether or not the borrow areas are suitable as wetland mitigation sites.

The following recommendations are provided to assist the Corps in developing a project proposal for the MRLS Unit L-142 that would benefit fish and wildlife and their habitats.

1. Since channelization and levee construction have already resulted in the loss of riparian and wetland habitats in the Missouri River basin, these habitats should be avoided to the maximum extent practicable when selecting borrow sites for the proposed levee, and compensatory mitigation should be undertaken for unavoidable impacts.

2. The Corps should create wetland mitigation habitat to compensate for the loss of wetland acreage due to the construction of the project. Final acreage will be determine when final alignment and borrow areas are identified.

3. The Corps should make a specific determination whether FAA/MDOT Bird Strike Zone Guidelines are applicable in selecting project mitigation sites. The Service has determined that the impervious borrow areas might be suitable as possible mitigation sites depending on the interpretation of FAA guidelines. If the Corps should determine that mitigation must be located outside of the FAA zone, then the Service should be contacted to assist in selecting new site(s).

4. Borrow areas and wetland mitigation areas should be irregular in shape and have an irregular bottom providing both shallow and deep water habitat. The Corps should determine whether a reliable source of water is available for the wetland mitigation sites before implementing the plans.

5. Levees should be seeded with warm season grasses such as switch grass.

6. A buffer strip around the borrow areas should be planted with a mixture of warm season grasses, shrubs and trees that occur on the floodplain of the Missouri River.

7. Mitigation and borrow areas should be associated with the Missouri Department of Natural Resources' Katy Trail as much as possible.

8. The Corps should consider the creation of an enhancement site to further increase fish and wildlife values in the vicinity of the project site.

9. The Corps should mitigate for the losses of open space and floodplain values in the Cedar City area which was purchased under the Section 1362 Flooded Property Purchase Program.

10. If possible, the random borrow areas should be hydrologically connected to the Missouri River and provide water depths of eight feet or deeper.

11. Brush shelters should be placed in the borrow areas to provide shelter for both fish and wildlife species.

12. Islands should be created in the borrow areas to provide a safety barrier against predators.

Should you have questions concerning these comments and recommendations, or if we can be of any further assistance, please telephone Rick Hansen at (573) 876-1911.

Sincerely,

R. Mark Wilson

R. Mark Wilson
Field Supervisor

Enclosures

cc: MDC; Jefferson City, MO (Attn: Daniel J. Witter)
MDC; Jefferson City, MO (Attn: Amy Salveter)
MDNR; Jefferson City, MO (Attn: Tom Lange)
SEMA; Jefferson City, MO (Attn: Destin Frost)
FEMA; Kansas City, MO (Attn: Regional Director)

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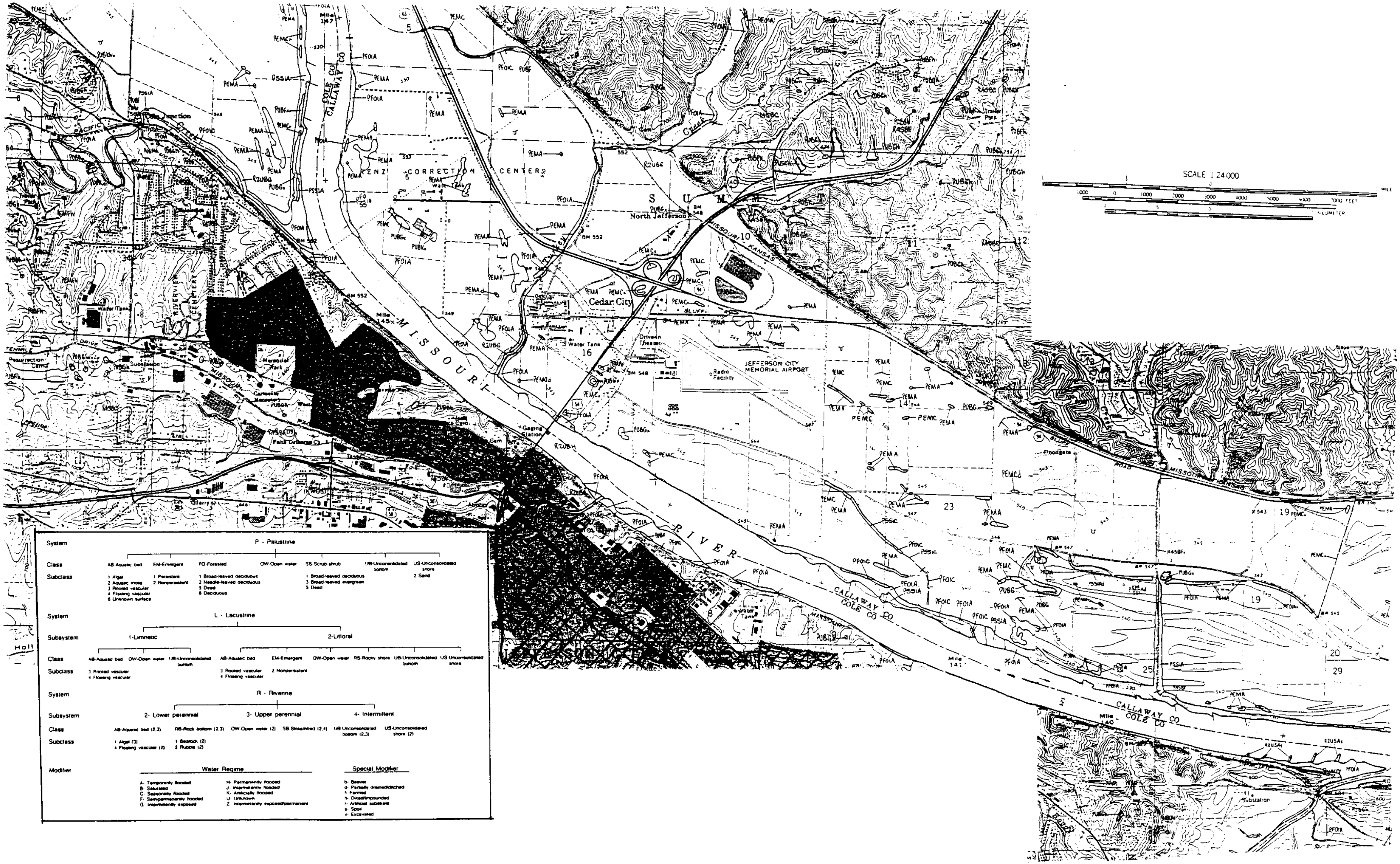
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COLE CO
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Mile 140
JEFFERSON CITY MEMORIAL AIRPORT
Radio Facility
Cedar City
North Jefferson
CORRECTION CENTER
Water Tank
Gaging Station
Drive-in Theater
Floodgate
Substation
Memorial Park
Riverview Cemetery
Resurrection Cem
MISSOURI KANSAS
BLUFF
System
P - Palustrine
Class
AB-Aquatic bed
EM-Emergent
FO-Forested
OW-Open water
SS-Scrub-shrub
UB-Unconsolidated bottom
US-Unconsolidated shore
Subclass
1 Algal
2 Aquatic moss
3 Rooted vascular
4 Floating vascular
6 Unknown surface
1 Persistent
2 Nonpersistent
1 Broad-leaved deciduous
2 Needle-leaved deciduous
5 Dead
6 Deciduous
1 Broad-leaved deciduous
3 Broad-leaved evergreen
5 Dead
2 Sand
System
L - Lacustrine
Subsystem
1-Limnetic
2-Littoral
Class
AB-Aquatic bed
OW-Open water
UB-Unconsolidated bottom
AB-Aquatic bed
EM-Emergent
OW-Open water
RS-Rocky shore
UB-Unconsolidated bottom
US-Unconsolidated shore
Subclass
3 Rooted vascular
4 Floating vascular
3 Rooted vascular
4 Floating vascular
2 Nonpersistent
System
R - Riverine
Subsystem
2- Lower perennial
3- Upper perennial
4- Intermittent
Class
AB-Aquatic bed (2,3)
RB-Rock bottom (2,3)
OW-Open water (2)
SB-Streambed (2,4)
UB Unconsolidated bottom (2,3)
US-Unconsolidated shore (2)
Subclass
1 Algal (3)
4 Floating vascular (2)
1 Bedrock (2)
2 Rubble (2)
Modifier
Water Regime
A- Temporarily flooded
B- Saturated
C- Seasonally flooded
F- Semipermanently flooded
G- Intermittently exposed
H- Permanently flooded
J- Intermittently flooded
K- Artificially flooded
U- Unknown
Z- Intermittently exposed/permanent
Special Modifier
b- Beaver
d- Partially drained/ditched
f- Farmed
h- Diked/impounded
r- Artificial substrate
s- Spoil
x- Excavated