

WETLAND INVENTORY, SURVEY, AND MAPPING  
MIKE MONRONEY AERONAUTICAL CENTER  
FEDERAL AVIATION ADMINISTRATION  
OKLAHOMA CITY, OKLAHOMA

Prepared by

U.S. Army Corps of Engineers, Tulsa District  
Tulsa, Oklahoma  
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TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY ..... iv

1. INTRODUCTION..... 1

    A. Purpose..... 1

    B. Site Locations..... 1

    C. Background Information..... 3

2. METHODS..... 3

3. RESULTS AND DISCUSSION..... 4

    A. Site Description ..... 4

    B. Wetlands Description..... 7

    C. State Wetlands..... 9

    D. Federal and State Regulations..... 9

    E. Comparison of 1998 Inventory and Historical  
        Records on the MMAC..... 12

    F. Literature Cited..... 13

TABLE OF CONTENTS (Continued)

Page

LIST OF TABLES

1. Sites Investigated at Mike Monroney Aeronautical Center, Oklahoma City, Oklahoma, 1998; National Wetlands Inventory Maps (Mustang, OK, and Oklahoma City, OK)..... 2

LIST OF FIGURES

1. The Mike Monroney Aeronautical Center, Oklahoma City, Oklahoma..... 14
2. Site No. 1..... 15
3. Site No. 2..... 16
4. Site No. 3..... 17
5. Site No. 4..... 18
6. Site No. 5..... 19
7. Site No. 6..... 20
8. Site No. 7..... 21
9. Site No. 8..... 22

APPENDICES

- I Definitions
- II Field Data Forms
- III Correspondence

## EXECUTIVE SUMMARY

The Mike Monroney Aeronautical Center (MMAC) is located on extremely disturbed mixed-grass prairie supported by loamy and clayey soils typical of uplands in central Oklahoma. The topography is rolling, with little to only moderate relief. Overall, weather is moderate, including wet springs and mild winters. However, summer conditions are generally dry and hot. Shallow clay soils in combination with these climatic conditions provide (at best) a marginal environment for large upland trees and tend to favor opportunistic rangeland vegetation with scattered woody scrub-shrub species. Upland clay prairies such as these are typically well drained and consequently, not well-suited for wetland establishment.

Literature and field investigations, in combination with National Wetland Inventory (NWI) maps and Geographical Information Systems analyses, indicate that eight areas located on the MMAC demonstrate some hydrological, biological, and soil characteristics indicative of wetlands. Of these, only one area (< 1.0 acre) possesses all the characteristics necessary for classification as a wetland under 33 CFR, Part 328. Generally, the other seven areas convey or store water while providing various degrees of wildlife and aquatic habitat. However, they do not demonstrate all the characteristics consistent with legally recognized definitions of wetlands, as described in 33 CFR, Part 328.4c(2). Although these areas are not considered wetlands, they are protected under Section 404 of the Clean Water Act as AWaters of the United States. It is recommended that planning of any action(s) that could impact any of these areas include a Section 404 Permit action coordinated with the Regulatory Branch of the Tulsa District.

## **1. INTRODUCTION**

### **A. Purpose.**

The purpose of this work is to: 1) inventory, 2) survey, 3) characterize and classify, 4) quantify, and 5) map (delineate) existing potential jurisdictional wetlands at the Mike Monroney Aeronautical Center (MMAC), Oklahoma City, Oklahoma. This report describes services provided by the U.S. Army Corps of Engineers, Tulsa District (TD) regarding the status of wetlands on lands leased and used by the MMAC. The MMAC uses the land to perform Federal Aviation Administration (FAA) missions as authorized by the U.S. Congress through the U.S. Department of Transportation (DOT). The work efforts of the TD were performed as specified in Interagency Agreement FAA-97-2.

### **B. Site Locations.**

The MMAC (Figure 1) is located on lands leased from the Will Rogers World Airport Trust within Sections 27, 28, and 33 in Township 11 North, Range 4 West in southwest Oklahoma City, about 1 mile east of Wheatland. The MMAC is a service and support facility for the FAA and the DOT. The facility supports more than 5,000 employees, students, and contractors who occupy 20 major buildings and 35 smaller structures within a 1,000-acre area. The MMAC conducts centralized training, aircraft fleet maintenance and modification, central warehousing and supply, and aeromedical research, and maintains and administers aircraft and airman records. The MMAC also provides centralized administrative automatic data processing for national programs and engineering support and technical modification and maintenance field guidance for operation and maintenance of assigned facilities in the National Airspace System. The Coast Guard Institute and the Transportation Safety Institute conduct a variety of training missions, while the Civil Aeromedical Institute conducts medical research associated with aviation safety. These institutes are housed on the MMAC campus.

National Wetlands Inventory (NWI) maps indicate that seven possible wetland areas may exist on MMAC lands (U.S. Fish and Wildlife Service, 1985, 1989). One additional area, Site 6, which may be classified as Awetland≅ but was not indicated on the NWI map was found during an on-site investigation on

January 12-15 (Table 1). This wetland was created by backwater effects from a downstream impoundment on adjacent private land immediately south of the MMAC.

Table 1. Sites Investigated at Mike Monroney Aeronautical Center, Oklahoma City, Oklahoma, 1998; National Wetlands Inventory Maps (Mustang, OK, and Oklahoma City, OK).

Map ID	Size	No. <sup>1</sup> Legal Description	Cowardin Classification <sup>2</sup>	(acres)
IMPOUNDED				
1.	T11N, R4W, S28, NE 3 of the NW 3	Palustrine <sup>3</sup> , unconsolidated bottom, permanently flooded, impounded.		1.45
2.	T11N, R4W, S28, NE 3 of the NW 3	Palustrine, emergent, persistent, seasonally flooded, impounded.		2.56
3.	T11N, R4W, S28, NE 3 of the NW 3	Palustrine, emergent, persistent, seasonally flooded, impounded.		0.64
4.	T11N, R4W, S28, NE 3 of the SW 3	Palustrine, unconsolidated shoreline, seasonally flooded, impounded.		0.58
5.	T11N, R4W, S33, SE 3 of the NE 3	Palustrine, open water unknown bottom, permanently flooded, impounded.		2.05
6.	T11N, R4W, S33, SW 3 of the SE 3	Palustrine, forested with broadleaf deciduous, permanently flooded.		9.16
NOT IMPOUNDED				
7.	T11N, R4W, S33, SE 2 of the SE 3	Palustrine, forested with broadleaf deciduous, temporarily flooded.		21.60
8.	T11N, R4W, S27, SW 3	Palustrine, forested with		4.37

of the SW 3

broadleaf deciduous,  
seasonally flooded.

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1 See Figure 1 to reference locations.

2 Cowardin et al. 1977.

3 See Appendix I for definitions of technical terms.

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## **C. Background Information.**

An examination of MMAC records regarding previous wetland surveys, delineations, and Section 404 determinations was conducted revealing very few actions.

May 1994. Action: Nationwide Permit (Section 404 of the Clean Water Act, 33 CFR, Parts 320-330) issued for proposed action(s) at Township 11 North, Range 4 West, Sections 27, 28, and 33. Regulatory documentation did not indicate any delineation of wetlands was performed in association with this action. This permit expired May 1996 (Appendix III).

## **2. METHODS**

Prior to field data collection, a thorough records search was performed to collect data regarding wetlands on the MMAC. This information was collected from NWI maps (U.S. Fish and Wildlife Service, 1985, 1989), Soil Survey Maps (Natural Resource Conservation Service, 1969), Maps of Headwater Streams (U.S. Army Corps of Engineers), Tulsa District Regulatory Branch Section 404 permitting data base, and U.S. Geological Survey topographical maps. Baseline information gleaned from these documents was used to identify jurisdictional waters and wetlands (Section 404, Clean Water Act; 33 CFR Part 320.4(3)).

Data from field surveys in January 12-15, April 13-16, and June 5, 1998 were used to ground-truth baseline information and to characterize existing wetland resources. Where applicable, detailed wetland delineations were performed on any waters and/or wetlands per U.S. Army Corps of Engineers regulations detailed in the ACorps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987). Other waters (i.e., impoundments, excavations, intermittent streams) were not delineated in detail. Field data was collected through early summer to optimize vegetation analysis.

All data were collected, analyzed, and presented in accordance with Section 404 of the Clean Water Act, Executive Order 11990 (AProtection of Wetlands), and other applicable Federal laws and regulations. High resolution maps were generated by Tulsa District Geographic Information Systems facilities and staff,

clearly identifying and characterizing wetland and water resources within MMAC lands.

This report is prepared in accordance with Tasks 3.2, 3.3, and 3.4 of MMAC Statement of Work, FAA-97-3.

Delineations and/or characterizations generated from this study DO NOT constitute regulatory action(s) regarding compliance with Section 404 of the Clean Water Act nor will any products from this study constitute endorsement or recommend issuance of any Federal permit for the purpose of planning future actions. Consultation with Tulsa District PER Division Regulatory Branch is required by Federal law prior to any action(s) which could potentially affect the status of existing wetlands or waters of the United States.

### **3. RESULTS AND DISCUSSION**

#### **A. Site Description.**

Topography at the MMAC is level to gently rolling, with a majority of the drainage conveyed by Cow Creek and associated tributaries. Soils of the Renfrow-Vernon-Bethany association are deep and shallow, nearly level to sloping, loamy and clayey soils on prairie uplands. Uplands are primarily open, mixed-grass prairie/improved pasture with some woodlands along ephemeral drainages. Bethany silt loam (BeA) 0 to 1% slopes dominate uplands of the western one-third of Section 28 and all but the eastern quarter of Section 33. Renfrow clay loam 1 to 3% slopes (RfB) dominate the remaining uplands. Soils of the BeA type (Loamy Prairie Range) have a loam or silt loam surface layer that is granular and porous, permeable to water, easily penetrated by roots, and have good water storage capacity. This is the most productive range site in the uplands. In minimally-disturbed areas of excellent condition, the climax vegetation is about 80% decreaser grasses, about 5% legumes and forbs, and about 15% increasers. Renfrow clay loams (Claypan prairie) are underlain by compact clay which restricts water movement and plant growth, providing less than ideal substrate for vegetative cover. Soils associated with drainages of the MMAC are primarily RfB, with one drainage located in the northwest quarter of Section 33 underlain by Vernon-Zaneis complex 3 to 5% slopes (VzC). There is a small area associated with a south-flowing tributary to Cow Creek located in the southeast quarter of Section 33 (immediately north of S.W. 89th Street)

which is composed of Breaks-Alluvial land complex (Red Clay Prairie Range). Breaks-Alluvial land complex (Bk) soils absorb water slowly and are considered erodible. Soils in Section 27 and the eastern one-half of Section 28 are highly disturbed and in urban land use. Consequently, they not identified or described by the National Resource Conservation Service (Fisher and Chelf, 1969).

Dominant vegetation on upland grasslands within the MMAC is representative of a disturbed mixed grass prairie (AIImproved Lands≡). Grasses here include bermuda (Cynodon dactylon), brome (Bromus sp.), fescue (festuca sp.), ryegrass (Lolium sp.), sandbur (Cenchrus incertus), crabgrass (Digitaria sp.), Scribner panicum (Panicum scribnerianum), broomsedge (Andropogon virginicus), and Johnsongrass (Sorghum halapense). Herbaceous legumes include vetch (Vicia sp.), sensitive brier (Schrankia nuttallii), yellow sweet clover (Melilotus officinalis), big-hop clover (Trifolium agrarium), white clover (Trifolium repens), and roundhead lespedeza (Lespedeza capita). Other herbaceous vegetation observed includes annual sunflower (Helianthus annuus), compass plant (Silphium laciniatum), various thistles (Salsola sp.), goldenrod (Solidago sp.), giant ragweed (Ambrosia trifida), western ragweed (Ambrosia psilostachya), dandelion (Taraxacum officinale), doc (Rumex sp.), yarrow (Achillea millefolium), Japanese brome (Bromus japonicus), yellow wood sorrel (Oxalis corniculata), daisy fleabane (Erigeron annuus), spring beauty (Claytonia virginica), plantain (Plantago sp.), false garlic (Nothoscordum bivalve), chickweed (Cerastium sp.), tooth-leaved primrose (Oenothera speciosa), Queen Anne=s lace (Daucus carota), nightshade (Physillus sp.), milkweed (Asclepias sp.), bindweed (Convolvulus sp.), poke weed (Phytolacca americana), and prickly pear cactus (Opuntia humifusa).

Because most of the minimally-developed areas west of the commercial/industrial complex (Section 28) were part of a World War II air base, much of the flora associated with the long-abandoned structures are ornamental shrubs and flowers. Lilac, purple iris, honeysuckle, and domestic rose are abundant along vestigial fence lines, roadways, driveways, and building foundations. Lands in Section 28 west of Halaby Street were historically farmed and/or hayed prior to World War II and continue to be mowed and hayed without cultivation or grazing. Lands in the eastern half of Section 33 have been

recently cultivated and are presently disturbed by construction activities associated with radar training facilities. Several oil production facilities (pump jacks) are scattered throughout Sections 28 (west of Halaby Street) and 33. Improved lands comprise 651.4 acres within the MMAC (Figure 1).

Upland woodlands on the MMAC are limited to a narrow corridor of 30.3 acres bounded on the north by S.W. 59th Street between Foster Street on the east and Halaby Street on the west, terminating 0.5 mile south (Figure 1). This assemblage of scrub-shrub woodlands interspersed with prairie openings is relatively young (<40 years), small in size, and not very diverse (typically dominated by American elm (Ulmus americana) and hackberry (Celtis occidentalis). It has been significantly disturbed from land uses associated with MMAC missions. Roads, underground utility and gas lines, radar facilities, and pedestrian traffic partition and disrupt these woodland resources, diminishing benefits to wildlife. Other upland woody species on the MMAC include eastern red cedar (Juniperus virginianus), redbud (Cercis canadensis), sandplum (Prunus angustifolia), rough-leaved dogwood (Cornus drummondii), blackberry (Rubus allegheniensis), and buck brush (Symphoricarpos orbiculatus).

Riparian woodlands (36.7 acres) on the MMAC are associated with three major and two minor tributaries to Cow Creek (a tributary to the South Canadian River) located just east of MacArthur and a short (75 meters) controlled drainage that flows south to north from the detention pond immediately east of the radar facility on Halaby Street, south of S.W. 59th Street. The Cow Creek tributaries generally drain northwest to southeast. These habitats, although more productive than the scrub-shrub uplands, are narrow and are also disturbed from activities associated with MMAC missions. Cottonwood (Populus deltoides) and black willow (Salix nigra) are common within the channels and along the banks of all tributaries, while elm and hackberry provide the majority of cover throughout the riparian corridor. Herbaceous cover of the understory includes poison ivy (Toxicodendron radicans), curly doc (Rumex crispus), spike rush (Eleocharis sp.), goldenrod (Solidago sp.), and bur chervil (Anthriscus caucalis). The Cow Creek tributary located at the south-central extremity of Section 33 also supports the only bottomland hardwood habitat located at the MMAC. This small strip (3.0 acres) of relatively young bottomland habitat is composed of Honey

locust (Gledistia triacanthos), American elm, and cottonwood trees, with a maximum height of approximately 40 feet. This area is likely in transition as the floodplain of the stream has recently been exposed to backwater effects from downstream impoundment creating conditions favorable for establishment of bottomland species (Figure 1).

A significant portion of MMAC lands (310.8 acres) is comprised of the commercial/industrial complex where the majority of administrative, maintenance, training, and research missions are performed. Land use includes the flight line, all buildings and facilities (administrative, technical, leisure), most paved roads, security facilities, oil production sites, and parking lots. Primarily located in the eastern one-third of Section 28 and the western one-third of Section 27, fragments of this land use are distributed throughout the entire MMAC. Radar antennae, along with associated technical and operations buildings, and oil production sites are found throughout Sections 27, 28, and 33. Generally, this land use is urban in character. Management and anthropogenic activity is intensive, excluding sensitive plant and animal species. Most woody vegetation is exotic ornamental, with bermuda and/or fescue grasses dominating most yards. Bald cypress (Taxodium distichium), hackberry, elm, various oaks (Quercus sp.), and redbud are abundant throughout this area.

A small portion of MMAC lands is surface water (4.3 acres) that is impounded in four small ponds located in Sections 28 and 33. One emergent wetland (No. 3) is adjacent to one of these surface water resources (No. 2) and is probably maintained by hydrology associated with that impoundment.

#### **B. Wetland Descriptions.**

Sites 1, 2, 4, and 5 are impoundments that were constructed for agricultural purposes prior to establishment of the MMAC. These ponds are not likely to be classified as wetlands under provisions of Section 404 of the Clean Water Act (33 CFR, Part 323.4(3)) and were not delineated in detail due to clear boundaries established at or near the shoreline. The upland vegetative community of these improved lands (i.e., bermuda, brome, fescue, ryegrass, sandbur, crabgrass, Scribner panicum, broomsedge, and Johnsongrass) is frequently established to the shoreline of these ponds. Some narrow black willow stands have developed in scattered distribution along impoundments 1,

2, and 5. However, much of the shoreline is dominated by upland grasses, forbs, and shrubs. The boundary of the shoreline-upland interface of these ponds generally exists within 1 meter of the bank (Figures 2, 3, 5, and 6). These areas are non-jurisdictional and should be considered AWaters of the United States $\cong$  (33 CFR Part 328.3a(4)), with statutory protection under Section 404 of the Clean Water Act.

Site 3 is a jurisdictional wetland dominated by a small stand of black willow supported by the high water table created from impoundment of wetland No. 2. Immediately upstream of the willow stand is a narrow depression approximately 30 meters in length which is dominated by spike rush (Eleocharis sp.). Lengthy (greater than 28 days) inundation is evident. The soil type at this location is Renfrow clay loam (1-3% slopes). Hydric Soils of Oklahoma (1991) indicates that RfB is good for commercial agricultural cultivation, and small concave areas are potential wetlands. This soil can be hydric due primarily to ponding on the soil surface for long to very long duration during the growing season. Herbaceous vegetation includes spike rush, doc weed (Rumex sp.), sedge (Cyperus sp.), and Queen of the Prairie (Filipendula sp.). This should be considered a wetland as defined in 33 CFR, Part 328.4c(2). The boundary of the wetland-upland interface is presented in Figure 4 and detailed delineation data are in Appendix II.

Site 6 supports a small bottomland hardwood vegetative community dominated by honey locust, hackberry, elm, and cottonwood. Although no impoundment associated with this site exist on MMAC lands, this relatively young bottomland hardwood community has established as a result of downstream impoundment on adjacent private lands. Aerial photography presented in Cleveland County Soil Survey maps indicate the impoundment was constructed between 1943 and 1973. The soil type at this location is Breaks-Alluvial land complex. Neither Hydric Soils of Oklahoma (1991) nor the National Hydric Soils List (National Resource Conservation Service), 1995, show this soil as a hydric soil under any conditions. The boundary of the riparian-upland interface is presented in Figure 7. This riparian/bottomland woodland provides quality wildlife habitat and is considered AWaters of the United States $\cong$  (33 CFR, Part 328.3a(7)), with statutory protection under Section 404 of the Clean Water Act.

Site 7 is an ephemeral conveyance which drains a large portion

of the lands in Section 28, forming a confluence with Cow Creek in Section 34, southeast of the MMAC. The soil type at this location is Renfrow clay loam (1-3% slopes). Hydric Soils of Oklahoma (1991) indicates that this soil is good for commercial agricultural cultivation, and small concave areas are potential wetlands. Conditions for Ahydric≅ classification of Renfrow clay loam (1-3% slopes) are presented in the Site 3 description. The riparian corridor associated with this drainage is dominated by hackberry, elm, cottonwood, and black willow. Herbaceous vegetation is limited to goldenrod and smart weed, while woody vegetation dominates the understory which consists of poison ivy, virginia creeper, wild strawberry, and blackberry. Because intensive vegetation management actions (i.e., mowing, haying) occur on adjacent uplands, the riparian-upland interface clearly follows a line established by these management actions (Figure 8). This riparian woodland is associated with an ephemeral tributary to Cow Creek and supports several facultative wetland species in the understory. However, soils are non-hydric, and hydrologic characteristics necessary for jurisdictional status are not apparent. Additionally, no obligated wetland vegetation was observed during January, April, or June. This riparian corridor, in similar respect to Site 6, provides wildlife habitat but is not a jurisdictional wetland. This area should be considered AWaters of the United States≅ (33 CFR, Part 328.3a(5)), with statutory protection under Section 404 of the Clean Water Act.

Site 8 is a severely disturbed stream primarily impacted by storm water conveyances which drain the runways of Will Rogers World Airport and the FAA tarmac. This stream reach which constitutes the headwaters of Cow Creek is narrow and receives backwater effects by a downstream impoundment (Peachy Lake) in Section 34, southwest of the MMAC. The narrow riparian strip associated with this stream is dominated by elm, hackberry, rough leaved dogwood, and sandplum. Woody shrub vegetation includes trumpet vine, honeysuckle, and buckbrush. Herbaceous vegetation is similar to Site 7 and is limited in abundance. In similar contrast to Site 7, this back-watered stream and marginal riparian corridor are clearly bounded by intensively disturbed upland grasslands (Figure 9). The Oklahoma County Soil Survey (Fisher and Chelf, 1969) does not indicate a soil type for this location, probably due to extensive surface excavation activities associated with construction of the adjacent airport runway. Soils are non-hydric, hydrology is

characteristic of pooled surface water (i.e., an impoundment), and obligated wetland vegetation was not observed. This area should be considered Waters of the United States (33 CFR, Part 328.3a(7)), with statutory protection under Section 404 of the Clean Water Act.

**C. State Wetlands.**

The State of Oklahoma (Oklahoma Conservation Commission) has indicated that these sites have the potential for hydric soils (Appendix III).

**D. Federal and State Regulations.**

There are several Federal laws and State regulations that affect the management of Federal lands or installations in regard to jurisdictional wetlands. The following provides information about these laws.

**The Clean Water Act, Section 404(e)**

This Act authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue individual permits for specific categories of activities involving discharge of dredged or fill material if the activities are similar in nature and will cause only minimal adverse effects singly or cumulatively. Permits for certain types of construction activities are conditioned on the issuance of a Section 401 water quality certification or a State section 404(g) permit, unless exempted by the provisions of Section 404(r). Individual permit applications are submitted for agency review, including the USFWS for ESA issues.

**The National Environmental Policy Act (NEPA)**

This statute, legislated in 1969, declared a national policy to use all practicable means and measures in a manner calculated to foster and promote the general welfare to create and maintain conditions under which man and nature can exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations of Americans.

Section 102 of the NEPA is the principal operative section and directs that all Federal agencies shall:

- 1) Use a systematic, interdisciplinary approach which integrates natural and social sciences and environmental design arts in planning and decision making;
- 2) Identify and develop methods to insure that presently unquantified environmental amenities and values may be given consideration in decision-making along with economic and technical considerations;
- 3) Study, develop, and describe appropriate alternatives to recommended courses of action in any proposal that involves unresolved conflicts concerning alternative uses of available resources;
- 4) Support international programs to prevent decline of mankind=s world environment;
- 5) Initiate and utilize ecological information in the planning and development of resource-oriented projects;
- 6) Assist the Council on Environmental Quality established by this Act.

Subsection 102(2)(c) requires Federal agencies to include a detailed Environmental Impact Statement (EIS) in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. Prior to preparing an EIS, the responsible Federal official shall consult with and obtain comments from any Federal agency which has jurisdiction by law or special expertise with respect to any environmental impact involved. The EIS and comments and views of appropriate Federal, State, and local agencies that are authorized to develop and enforce environmental standards shall be available to the President of the Council on Environmental Quality and the public and shall accompany the proposal through the existing agency review process.

**Rivers and Harbors Act of 1890**

Mississippi River Levees: Congress replaced language in earlier river and harbor appropriation acts allowing the Mississippi River Commission to build or repair levees only for navigation purposes and not to prevent flood damages, with more relaxed authority to spend appropriated funds for the general improvement of the river, for the building of levees, [and] promote the interests of commerce and navigation. This initiated Corps activities to provide general flood relief along the Mississippi River. This was the first comprehensive anti-obstruction law.

Section 6: This was the first law that prohibited the discharge into navigable waters of wastes which shall tend to impede or obstruct navigation, except under permit from the Secretary of War.

Section 7: Prohibited the building of structures in navigable waters outside harbor lines or the building of bridge piers and abutments anywhere in those waters without permission of the Secretary of War, except for bridges previously authorized.

Section 8: Authorized the Secretary of War to remove wrecks that obstruct navigation if they remain obstructions for longer than 2 months.

Section 9: Prohibited private persons from defacing river and harbor improvements or taking possession of such improvements.

Section 10: Provided criminal sanctions for creating or permitting the continuance of any unauthorized obstruction to navigation.

Section 12: Authorized the Secretary of War to establish harbor-lines where he thinks it necessary.

### **Executive Order 11990, 24 May 1977, Protection of Wetlands**

This order directs Federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands.

Section 2 of this order states that, in furtherance of the National Environmental Policy Act of 1969, agencies shall avoid undertaking or assisting in new construction located in wetlands unless there is no practical alternative. Each

agency will provide opportunity for early public review of plans and proposals for construction in wetlands, including those whose impact is not significant enough to require preparation of an EIS. Section 9 exempts assistance provided for emergency work essential to protecting lives, health, and property performed pursuant to Sections 305 and 306 of the Disaster Relief Act of 1974. (This order was amended to delete reference to the Water Resources Council in Section 6 by Executive Order 12608 dated September 9, 1987.)

**E. Comparison of 1998 Inventory and Historical Records on the MMAC.**

An examination of MMAC records regarding prior wetland surveys, delineations, and Section 404 determinations was conducted revealing very little activity. Although several wetland investigations have been recorded, the TD has only three records regarding wetland determinations at MMAC. These actions included the issuance of one permit (Appendix III) and two letters indicating no permits were needed.

**F. Literature Cited.**

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Office of Biological Services, Fish and Wildlife Service, U.S. Department of the Interior. Washington, D.C. FWS/OBS-79/31. 131pp.

Fisher, Carl F. and John V. Chelf. 1969. Soil Survey of Oklahoma County. USDA Soil Conservation Service, Stillwater, Oklahoma. 70pp.

National Resource Conservation Service. 1991. Hydric Soils of Oklahoma. Soil Interpretive Legend, Oklahoma County, OK.

Figure 1.

Figure 2.

Figure 3.

Figure 4.

Figure 5.

Figure 6.

Figure 7.

Figure 8.

Figure 9.

**APPENDIX I**  
**DEFINITIONS**

## DEFINITIONS

**Broadleaved-deciduous:** Woody angiosperms (trees or shrubs) with relatively wide, flat leaves that are shed during the cold or dry season (i.e., elm, cottonwood, honey locust, or hackberry).

**Emergent:** Hydrophytes which are erect, rooted, herbaceous angiosperms that may be temporarily to permanently flooded at the base but do not tolerate prolonged inundation of the entire plant; i.e., bulrushes (*Scirpus* sp.), saltmarsh cordgrass.

**Hydrophyte:** Any plant growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

**Hydric soil:** Soil that is wet long enough to periodically produce anaerobic conditions, thereby influencing the growth of plants.

**Jurisdictional wetland:** A wetland that possesses characteristics (biotic and abiotic) consistent with descriptions and definitions set forth and specified in 33 CFR Part 328.

**Obligate Hydrophytes:** Species that are found only in wetlands (i.e., cattail, as opposed to ubiquitous species that grow either in wetland or on upland, such as red maple).

**Palustrine:** Describes all non-tidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5‰. It also includes wetlands lacking such vegetation, but with all the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m at low water; and (4) salinity due to ocean-derived salts less than 0.5‰.

**Persistent emergent:** Emergent hydrophytes that normally remain standing at least until the beginning of the next growing season (i.e., cattails and bulrushes).

APPENDIX II  
FIELD DATA FORMS

**APPENDIX III**  
**CORRESPONDENCE**