National Aeronautics and
Space Administration

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

JANUARY, 1978

FINAL
INSTITUTIONAL
ENVIRONMENTAL IMPACT STATEMENT
MICHOUD ASSEMBLY FACILITY
NEW ORLEANS, LOUISIANA

MSFC - Form 454 (Rev. October 1976)

FACILITIES OFFICE

Final

Institutional

Environmental Impact Statement

Michoud Assembly Facility

New Orleans, Louisiana

January, 1978

George C. Marshall Space Flight Center

National Aeronautics and Space Administration

Table of Contents

Chapter & Section	Page
LIST OF TABLES	iv
LIST OF FIGURES	viii
SUMMARY	x
I: MICHOUD ASSEMBLY FACILITY OPERATIONS AND ENVIRONMENTAL CONDITIONS	1
A. Introduction	1
B. General Description of the Michoud Assembly Facility	2
1. Location	2
2. History	2
3. Present Programs and Activities	6
a. NASA-Related Activities	8
b. Tenant-Related Activities	9
4. Proposed Programs and Activities	10
C. Existing Environmental Conditions	12
1. Relationship to Land Use and Land Use Plans	12
a. Regional Setting	12
b. Michoud Vicinity	13
c. The Michoud Assembly Facility Site	13
2. Detailed Description of Existing Environmental Conditions	21
a. Natural Systems	21
b. Community Systems	54
c. Infrastructure	71
II: PROBABLE ENVIRONMENTAL IMPACTS OF MICHOUD ASSEMBLY FACILITY OPERATIONS	91
A. Impacts of Present MAF Operations	91
1. Relationship to Land Use and Land Use Plans	91
2. Natural Systems	91

Chapter & Section	Page
a. Land and Waters	91
b. Plant and Animal Populations	91
c. Air Quality	92
d. Noise	93
3. Community Systems	93
a. Population, Housing, Government, and Public Services	93
b. Economics	93
c. Archaeological and Historical Values	96
d. Aesthetics	97
4. Infrastructure	97
a. Transportation	97
b. Communication Systems	97
c. Energy Systems	97
d. Water and Sewer Systems	99
e. Solid Waste Systems	100
f. Hazardous Material	100
B. Impact of Proposed Michoud Assembly Facility Operations	101
1. Introduction	101
2. Environmental Effects from Proposed Operations	101
a. Water and Sewer Systems	101
b. Air Quality	103
c. Economy	107
d. Energy Systems	107
e. Solid Waste System	108
C. Cumulative Impacts of the Present and Proposed Michoud Assembly Facility Operations	108
1. Land, Aesthetics, and Natural Systems	108
2. Community Systems	109
3. Infrastructure	110
III: ALTERNATIVES TO PRESENT OPERATING CONDITIONS	111
A. Relocation or Modification of the NASA External Tank Program	111
B. Discontinuation of Tenant Operations	111

Chapter & Section		Page
	C. Closing of Michoud Assembly Facility	112
IV:	ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED	113
	A. Existing Conditions	113
	B. Proposed Operations	114
V:	RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY	115
VI:	IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES	117
VII:	STRUCTURAL AND NON-STRUCTURAL MEASURES WHICH CAN BE TAKEN TO MINIMIZE HARM WHERE UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS ARE ENCOUNTERED	119
VIII:	COMMENTS RECEIVED AND NASA'S RESPONSE	121
LITERATURE CITED AND PERSONAL COMMUNICATIONS		159
APPENDICES		
A:	WATER QUALITY	A-1
	I. Excerpts from the Louisiana Water Quality Criteria	A-1
	II. U.S. Public Health Service Water Criteria for Minerals	A-9
B.	AQUATIC FAUNA OF THE MICHOUD AREA	B-1
C.	HAZARDS ANALYSIS	C-1
	I. Codes, Standards, and Equipment Approval Lists	C-1
	II. Hazardous Materials to be Treated at the Proposed Wastewater Facility at MAF	C-2
D:	AIR QUALITY	D-1
E:	WILDLIFE OF THE MICHOUD AREA	E-1

LIST OF TABLES

Table Number		Page
1	Development on the MAF Site.	16
2	Existing Floor Space Use on Site.	16
3	Salinities near NASA Michoud Assembly Facility (micrograms per liter).	24
4	Coliform Bacteria Counts for Waters around Michoud.	27
5	Average Water Quality Data for Three Stations on the Gulf Intracoastal Waterway Just West of Michoud (mg/l).	27
6	Water Quality at the NOPSI Power Plant Intake near Michoud.	28
7	Water Quality at Various Locations at Michoud (August 4-5, 1975).	28
8	Louisiana Numerical Water Quality Criteria for Surface Waters around the Michoud Assembly Facility.	30
9	1976 EPA Proposed Water Quality Criteria for Heavy Metals, Ammonia, and Arsenic in Marine and Estuarine Waters.	31
10	Intensity of Precipitation at New Orleans (in cm/hr).	32
11	Dominant Vegetation of Brackish Marshes of Southern Louisiana.	35
12	Vascular Plant Species Observed at the Michoud Assembly Facility, New Orleans, Louisiana (August 4-5, 1975).	36
13	Important Furbearers of Louisiana Marshes.	38
14	Endangered Native Wildlife Found in Louisiana.	39
15	1976 Air Pollutant Emissions from Orleans Parish and Michoud Assembly Facility.	40
16	Net Air Pollutant Emissions by Major Source, MAF, 1976, in mtons (and tons) Per Year and as Percentage of Total.	44
17	Industrial Internal Combustion Engines, MAF.	48
18	Population in the New Orleans Area.	55

Table Number		Page
19	Income Characteristics of the Region and Selected Census Tracts in New Orleans East in 1970.	57
20	Housing Characteristics in the New Orleans Area, 1970.	57
21	Major Industries and Employment in the New Orleans SMSA in 1975.	60
22	Annual Major Energy Use at MAF, 1975-76.	77
23	Water Consumption On-Site.	77
24	Chemical Nature of Industrial Wastewaters Produced in Cleaning and Plating at the Michoud Assembly Facility.	82
25	Employment at the Michoud Assembly Facility, March, 1976.	94
26	Employment Types by Agency in March, 1976.	94
27	NASA Budget for the Michoud Assembly Facility in 1976 (in millions of dollars).	95
28	Annual Direct Economic Impacts of the Michoud Assembly Facility (in millions of dollars).	95
29	Total Regional Direct and Indirect Economic Effects of the MAF (in millions of dollars).	96
30	Present Energy Consumption at MAF.	99
31	Estimated Construction Costs of the New Chemical Wastewater Treatment System at MAF.	102
32	Net Air Pollution Emissions by Major Source, MAF, 1980-1982, in mtons (and tons) Per Year, as Percentage of Total.	105
33	Air Pollutant Emissions from Orleans Parish and Michoud Assembly Facility in 1976 and Estimated for 1980-1982 (in mtons/year).	107
34	Present and Projected Annual Energy Consumption at MAF.	108
35	Pesticide Use at MAF for the Control of Weedy Plants, Insects, and Rodents.	146
36	Names and Toxicity of Pesticides Used at MAF.	147

Table Number		Page
B-1	Estuarine and Marine Fishes Likely to be Found in the Michoud Area.	B-2
B-2	Estuarine and Marine Invertebrates Likely to be Found in the Michoud Area.	B-13
D-1	Existing Boilers at MAF.	D-1
D-2	Boiler Emission Factors.	D-1
D-3	Annual Commuter Vehicle Emissions and Supporting Data.	D-2
D-4	Adjusted Vehicle Kilometers Traveled by Employees Commuting to MAF, 1974 (by residence location).	D-3
D-5	Painting Emissions at MAF, 1976.	D-3
D-6	Gross Welding Particulate Emissions, 1976 and 1982.	D-4
D-7	Emission Factors for Industrial Vehicles.	D-4
D-8	Emissions from Industrial Vehicles at MAF, 1976.	D-4
D-9	Estimated Air Pollutant Emissions from Proposed Chiller/Boiler.	D-5
D-10	Hydrocarbon Emissions from Cleaning and Thermal Protection Systems at MAF, 1976 and 1982.	D-5
E-1	Amphibians Likely to be Found in Southeastern Louisiana.	E-2
E-2	Reptiles Likely to be Found in Southeastern Louisiana.	E-5
E-3	Reptiles Likely to be Found Only Infrequently in the Michoud Area.	E-11
E-4	Breeding Birds of Southeastern Louisiana.	E-12
E-5	Birds Likely to be Found in Southeastern Louisiana as Non-Breeding, Migrant Summer and Winter Residents.	E-33
E-6	Birds Likely to be Found in Southeastern Louisiana as Migrants Only.	E-45
E-7	Birds Likely to be Found in Southeastern Louisiana Very Rarely or Irregularly.	E-53
E-8	Mammals Likely to be Found in the Michoud Area.	E-57

Table Number		Page
E-9	Mammals Possibly Occurring in the Michoud Area.	E-62
E-10	Mammals Not Normally Occurring in the Michoud Area for Which There are Confirmed Reports.	E-63

LIST OF FIGURES

Figure Number		Page
1	Michoud Assembly Facility Location in Greater New Orleans.	3
2	Regional Location of MAF in United States.	4
3	Historical Milestones of Michoud Assembly Facility.	5
4	Employment Trends at MAF, 1961-1980.	7
5	NASA Space Shuttle System with External Tank.	8
6	Tenant-Agency Employment Population, 1969-1980, MAF.	11
7	Existing Land Use in New Orleans.	14
8	Proposed Land Use Plan for the New Orleans SMSA, 1990.	15
9	Building Use at MAF.	18
10	Present and Proposed Land Use Areas, MAF.	19
11	Michoud Assembly Facility Geology (from MAF Master Plan, 1968).	22
12	Louisiana Water Quality Stations near Michoud.	25
13	Means and Ranges of Louisiana Water Quality Data for Stations near Michoud, 1971-1975.	26
14	Aquatic and Terrestrial Studies.	29
15	Precipitation Patterns in the New Orleans Area.	33
16	Paths of Hurricanes along the Central Gulf Coast since 1831.	34
17a	Ambient Air Quality in New Orleans, Louisiana.	41
17b	Ambient Air Quality in New Orleans, Louisiana.	42
18	Air Pollution from Vehicles of Commuters to MAF, by Residence Location, as Percent of Total.	47
19	Environmental Noise at MAF.	50
20	Noise Levels Typical of Machinery at MAF.	51

Figure Number		Page
21	Environmentally Sensitive Areas in and around MAF.	53
22	Population Growth, New Orleans SMSA, 1950-1975.	55
23	Selected Census Tracts in Eastern Orleans Parish.	56
24	Residential Location of MAF Employees, 1974.	58
25	Employment Growth, New Orleans SMSA, 1960-1975.	60
26	Employment Trends in Selected Industries, New Orleans SMSA, 1956-1975.	62
27	Unemployment Rate for the New Orleans SMSA and the United States, 1965-March, 1976.	63
28	Archaeological and Historical Sites new Michoud.	65
29	View from Bridge, State Route 47.	67
30	Section of View from Chef Menteur Highway (U.S. 90).	68
31	Michoud Aerial Perspective.	69
32	Section of View from Village de L'Est.	69
33	Transportation Systems, Greater New Orleans Area.	72
34	Vehicular Circulation and Parking.	73
35	Existing Utilities, Part I (Gas, Steam, Chilled Water).	76
36	Existing Utilities, Part II (Water, Sewer, Electricity, Communications).	78
37	Chemical Wastewater System, Present and Proposed.	80
38	Entering and Exiting Volume of Traffic at MAF.	98

SUMMARY

( ) Draft

(X) Final Environmental Statement

Responsible Federal Agency:

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
MSFC, AL 35812

Official Contact:

Mr. J. L. Graham
Code AB-13
MSFC, AL 35812
Phone: (205) 453-1130

1. Name of Action:

(X) Administrative Action

( ) Legislative Action

2. Brief Description:

The Michoud Assembly Facility of George C. Marshall Space Flight Center in New Orleans, Louisiana, is examined for the environmental effects of its present and impending activities. The facility has a dual role. First, it provides support for the National Aeronautics and Space Administration Space Shuttle Program by design and manufacture of External Tanks which will contain liquid fuel for the Orbiter. Second, it provides support and facilities for operations of other governmental agencies and/or their contractors.

3. Summary of Environmental Effects:

Cleaning and degreasing of component parts with trichloroethylene and spray painting release hydrocarbon emissions in excess of Louisiana air quality standards. NASA is currently evaluating the most effective means of control. Slight increases in air pollution do occur from other MAF operations. At present, industrial wastes are disposed of by deep-well injection; however, modification and installation of a waste treatment system will reduce the concentrations and volume to the discharged via the deep-well.

4. Summary of Major Alternatives:

The only major alternative to ongoing and impending activities described in this Institutional Environmental Impact Statement is the cessation of these activities, at major scientific, technological, environmental and economic cost. Other alternatives relate to modifications in certain Michoud Facilities and activities.

5. Comments on this Draft were Requested From:

Federal Agencies:

US Department of Agriculture
- Soil Conservation Service
- National Finance Center, Office of Management and Budget
- New Orleans Computer Center

US Department of Commerce, Office of the Deputy
- Assistant Secretary for Environmental Affairs
  - National Marine Fisheries Service
  - National Oceanic and Atmospheric Administration
  - National Ocean Survey

US Department of Defense
- Defense Contract Audit Agency
- Defense Contract Administration Services
- US Army
  - Corps of Engineers
  - Tank Command

US Navy
- Naval Aerospace Medical Research Laboratory (NAMRL)

US Department of Health, Education and Welfare, Region VI,
- Regional Environmental Officer, Dallas, TX

Public Health Service

US Department of Housing and Urban Development

US Department of the Interior, Office of
- Environmental Project Review
  - Bureau of Land Management
  - Fish and Wildlife Service
  - Geological Survey

US Department of Labor, Occupational Safety and Health Act,
- New Orleans Office

US Department of Transportation

Environmental Protection Agency, Region VI,
- Office of Federal Activities

Advisory Council on Historic Preservation

State of Louisiana Agencies:

- Assistant Attorney General
- Department of Art, Historical, and Cultural Preservation
- Department of Commerce and Industry
- Department of Conservation
- Department of Highways
- Department of Public Works, Atchafalaya Basin Division
- Planning Office
- Bureau of Environmental Health
- Division of Natural Resources and Energy
- Air Control Commission
- Public Services Commission
- State Parks and Recreation Commission
- Stream Control Commission
- Wildlife and Fisheries Commission
- Governor's Council on Environmental Quality
- Citizens' Advisory Board to the Governor's Council on Environmental Quality
- Louisiana Commission on Intergovernmental Relations

Private Agencies:

- The Conservation Foundation
- Ecology Center for Louisiana, Inc.
- League of Women Voters of New Orleans
- Louisiana Advisory Commission on Coastal and Marine Resources
- Louisiana State University
  - Coastal Studies Institute
  - Curator of Anthropology
  - Department of Geography and Anthropology
  - Sea Grant Program
  - State Soil and Water Conservation
- National Audubon Society
- National Sierra Club, New Orleans Region
- National Wildlife Federation
- New Orleans Public Service, Inc.
- New Orleans Sewerage and Water Board
- Orleans Audubon Society
- University of New Orleans Coordinator,
  - Environmental Impact Section, Department of Environmental Affairs
  - Department of Anthropology and Geology
- Wildlife Management Institute

6. Comments Received:

Federal Agencies:

Department of the Army, Tank-Automotive Material Readiness Command
US Department of Transportation, FAA, Region Six
United States Environmental Protection Agency, Region VI
Department of the Army, New Orleans District, COE
United States Department of the Interior
Department of Health, Education, and Welfare
United States Department of Commerce, NOAA
Defense Logistics Agency, DCAS
United States Department of Agriculture, Soil Conservation Service

State of Louisiana Agencies:
- Air Control Commission
- Wildlife and Fisheries Commission
- Department of Transportation and Development

7. Submittal Date:

The Draft Institution EIS was submitted to the Council on Environmental Quality (CEQ), Executive Office of the President and made available to the public in March 1977. The Final Statement is being submitted to EPA and forwarded for notice to the public on .

CHAPTER

Michoud Assembly Facility Operations and Environmental Conditions

I. MICHOUD ASSEMBLY FACILITY OPERATIONS AND ENVIRONMENTAL CONDITIONS

A. Introduction

Soon after the passage of the National Environmental Policy Act in 1969 and the issuance of implementing regulations by the Council on Environmental Quality (CEQ), National Aeronautics and Space Administration (NASA) developed a system for taking environmental factors into consideration in the planning, decision-making and implementing of its actions. The NASA system provided for the development of both "Institutional Environmental Statements" and "Program Environmental Statements."

The program statements represent the full description of the likely environmental effects of a proposed action falling in the category of "major Federal actions significantly affecting the quality of the human environment" and are used in the process of making program and project decisions.

Institutional Environmental Impact Statements were prepared to describe the ongoing activities at each major NASA field installation. They are not considered decision documents and do not describe any proposed actions; instead they describe the cumulative effects of all the typical activities at the field installation in question, most of which considered alone, would be minor from an environmental viewpoint. These statements then provide a description of the baseline against which the environmental effects of proposed new actions at an installation can be assessed as a part of the decision process.

NASA also provides for amendments to both program and institutional environmental statements. For example, Program Environmental Statements are amended if, during the course of the research and development program in question, changes occur in the program that are likely to result in a significant change in the environmental effects described in the original statement. Institutional Statements are amended if proposed construction of new facilities or buildings at an installation or the initiation of new research activities might have a significant environmental effect different from that described in the baseline Institutional Statement. On the other hand, minor construction at or changes in the installation's activities within the general scope of the baseline environmental statement would not ordinarily require an amendment to the statement.

This draft Institutional Environmental Impact Statement for the Michoud Assembly Facility (MAF) of George C. Marshall Space Flight Center (MSFC) consists of a description and analysis of MAF as an operational base for both NASA and NASA-related programs and various Government tenant-agencies and their contractors. Tenant-agencies are governmental agencies or governmental agency contractors which are not involved in a NASA program, but utilize office or manufacturing space at the Michoud Assembly Facility.

In addition to the institutional baseline data previously explained, and more fully described and analyzed in this statement, there are now pending the completion of several actions which are also included in this statement, as more fully described under subsection B.4.

B. General Description of the Michoud Assembly Facility

1. Location.

The Michoud Assembly Facility (MAF) is located 25.6 km (16 mi) east of the New Orleans central business district, as shown in Figure 1. New Orleans is in southeastern Louisiana, about 161 km (100 mi) above the mouth of the Mississippi River. With a total land area of about 945 km^2 (365 mi^2), the city is one of the largest in the United States. Its location in the southern United States is shown in Figure 2. MAF is within the boundaries of Orleans Parish, in what is referred to as the "New Orleans East" section of metropolitan New Orleans. It is characterized by low, flat topography, with marshy areas or drainage canals which facilitate development of former wetlands. The Facility is bounded by the Gulf Intracoastal Waterway to the south, the Michoud Canal to the east, Old Gentilly Road to the north, and the New Orleans Public Service, Inc. Power Plant to the west.

2. History.

The history of Michoud began 200 years ago when a 13,962 hectare (34,500 acre) royal grant of land was obtained by a French merchant from the Governor of the French Colony of Louisiana. The large tract of land took its permanent name from Antoine Michoud, who bought the planation in 1827. It remained in the Michoud family until it was sold in 1910. The two ancient sugar house chimneys of the Michoud planation still stand.

The land was originally acquired by the U.S. government in 1940 when a 405 hectare (1,000 acre) tract of land was purchased by the U.S. Maritime Commission. The area was selected at the outbreak of World War II as the site for a $30 million shipyard for building liberty ships. Historical milestones of Michoud since 1940 are shown in Figure 3.

Because of the swampy nature of the land, a great deal of earth fill-in and the driving of a large amount of piling was required for building foundations. Dredging of a connecting canal from the plant site to the nearby Intracoastal Waterway was also undertaken by the U.S. Army Corps of Engineers.

However, in 1942, the Maritime Commission decided to abandon the liberty ship project. The facility was then used only intermittently during the Second World War to build cargo planes and then again during the Korean War to manufacture tank engines. Peak employment at the facility was about 2,200.

The plant was closed in July, 1953, following the end of hostilities in Korea. The facility remained idle under the supervision of the U.S. Army until September 7, 1961, when it was selected by the National Aeronautics and Space Administration (NASA) for the assembly of the first stages of the Saturn IB and Saturn V launch vehicles used in the Apollo program.

MICHOUD ASSEMBLY FACILITY LOCATION IN GREATER NEW ORLEANS

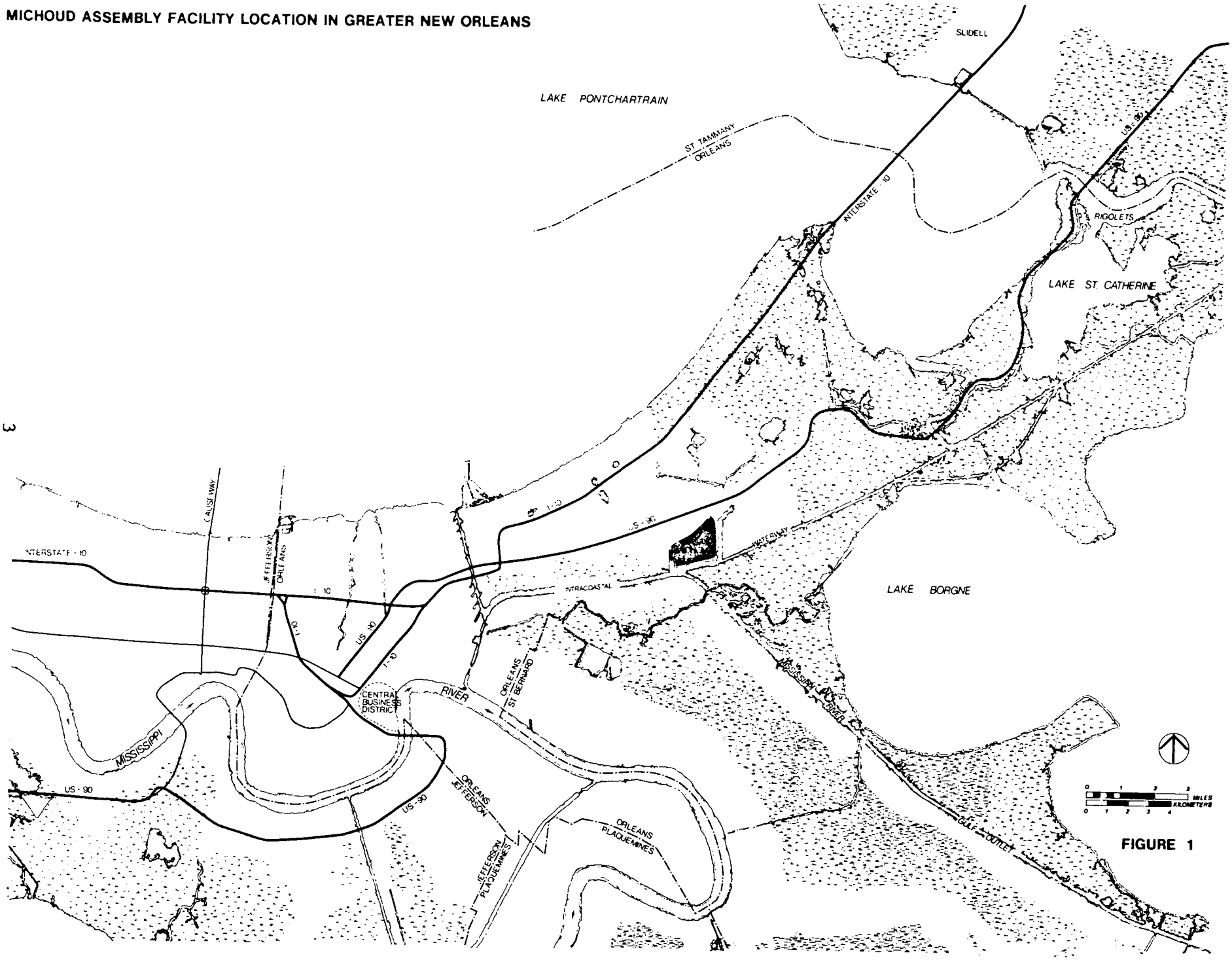


FIGURE 1

Figure 2 Regional Location of MAF in the United States

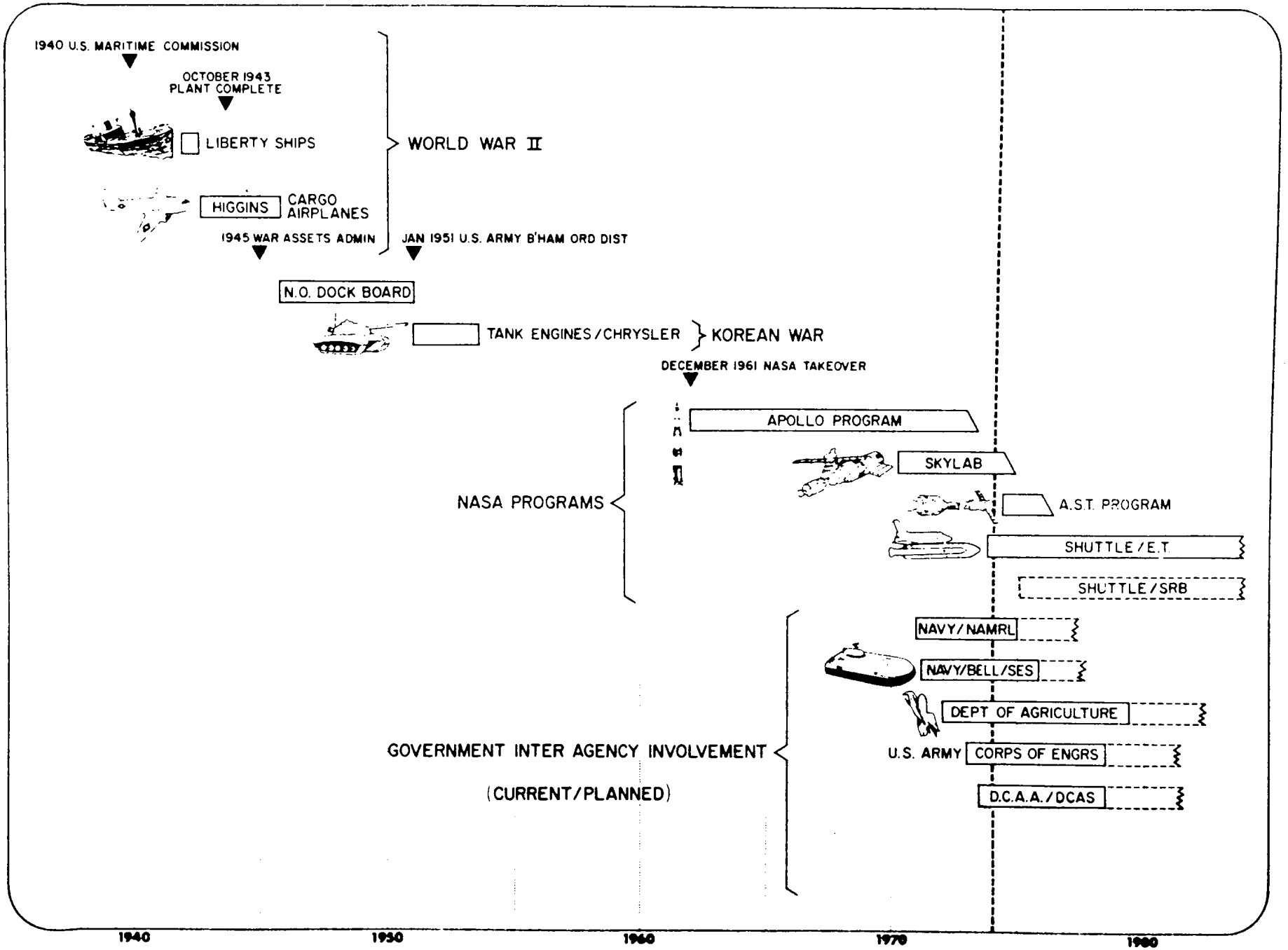


Figure 3 Historical Milestones of Michoud Assembly Facility

There were several reasons for selecting Michoud, a government-owned facility, for the assembly of the Saturn rocket.

- The space program was under an extremely tight timetable to complete its mission of landing a man on the moon before the end of the decade. The Michoud Facility, which had already been used to manufacture airplanes, had many of the necessary buildings and infrastructures in place. Thus, time and money would be saved by upgrading and expanding the existing facility rather than building a new manufacturing facility from scratch.

- The Michoud facility was standing idle, being maintained on a stand-by basis by the U.S. Army at a cost of approximately $140,000 per year.

- It was unlikely that a private contractor would be willing or able to finance the construction of such a massive facility, especially since there was no guarantee of continuing appropriations for the space program once the primary moon-landing mission was accomplished. Figure 4, which shows fluctuating employment trends, supports this thought. Employment declined dramatically between 1966 and 1970, indicating the unpredictable nature of funding for the space program.

- In addition, the MAF had several locational advantages, including the availability of water transportation directly from the site to Marshall Space Flight Center in Huntsville, Alabama and to Cape Canaveral, Florida, where the Saturn rocket would be tested and launched.

Once the Apollo program neared completion, a large percentage of the Michoud facility was no longer being used. Thus in 1970, tenant agencies were permitted to occupy space at Michoud to help defray operating and maintenance expenses. Then, in mid 1973, the MAF was selected by NASA as the site for manufacturing the External Tank, a part of the Space Shuttle program. The factors which lead to the selection of Michoud were similar to the initial reasons outlined for selecting the site for the Apollo program. In addition, a portion of the investment related to Saturn production, such as tooling, a $2.5 million industrial cleaner ("dishwasher") to clean large components, and high-bay exit clearance (12.2 m or 40 ft), could be salvaged to be used again for External Tank production.

3. Present Programs and Activities.

The MAF is a satellite organization of the George C. Marshall Space Flight Center (MSFC) in Huntsville, Alabama. Its primary purpose as a NASA facility is to support the development of the U.S. Space Shuttle. The specific mission at Michoud is the design and assembly of the External Tank, the liquid fuel carrying component for the Space Shuttle. The MAF has been specifically modified and tooled for the fabrication and assembly of space vehicle components.

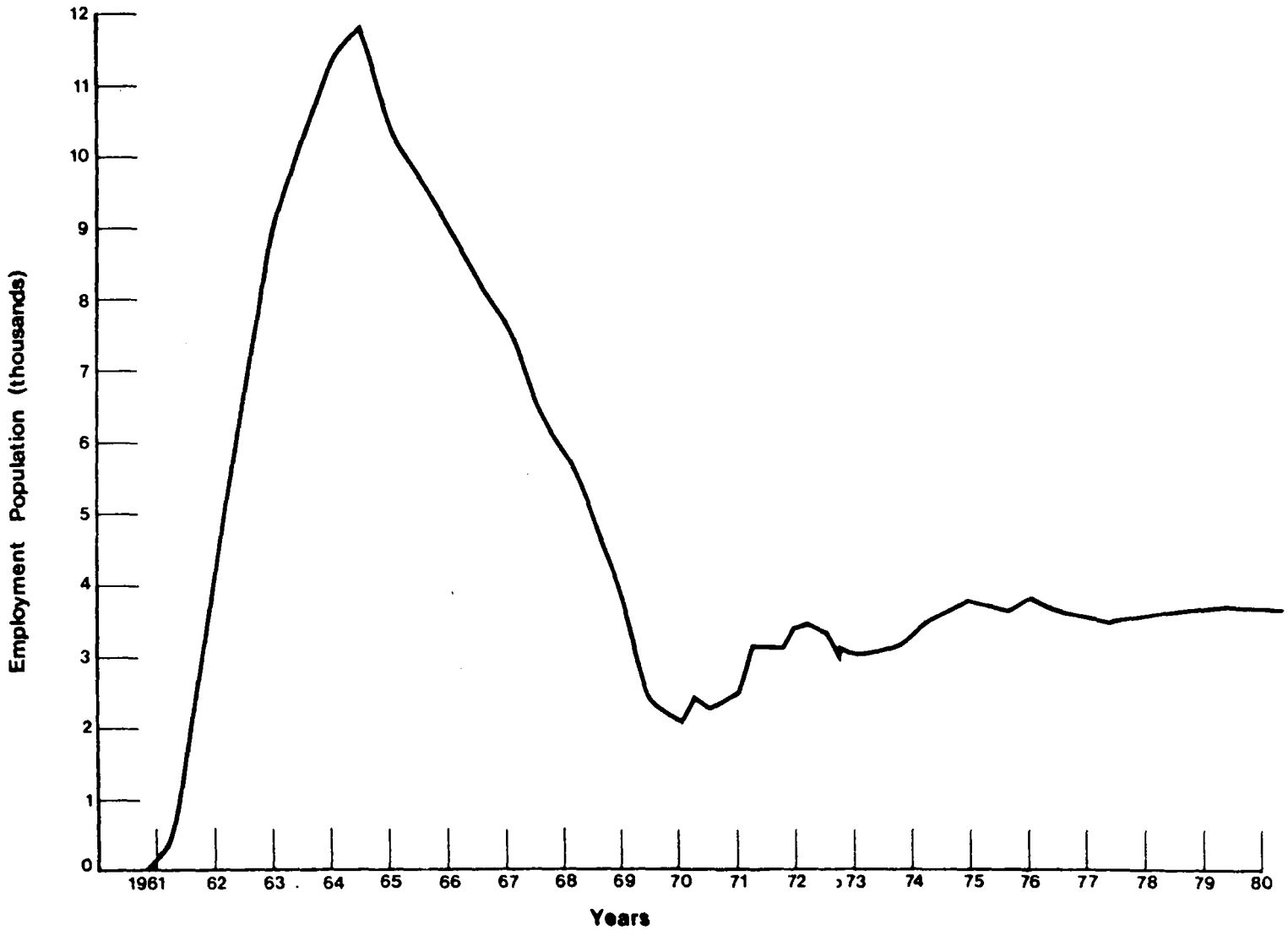


Figure 4 Employment Trends at MAF 1961-1980

Michoud facilities and activities include system engineering, engineering design, manufacturing, fabrication, assembly and testing, laboratory analysis, and total automatic checkout and computer data reduction.

Activities on-site can be separated into two major groups, NASA-Related Activities, and Tenant-Agency Activities.

a. NASA-Related Activities. Development and assembly of the Space Shuttle's External Tank has been contracted by NASA to the Aerospace Division of Martin-Marietta Corporation. The Space Shuttle system consists of an Orbiter (the cargo carrying re-entry vehicle), an attached but separate External Tank (which carries the propellant for the engines of the Orbiter), and two attached, but separable solid fuel Rocket Boosters. This system is shown in Figure 5. The Boosters are recoverable, and the External Tanks are expendable. The Orbiter is unique among spacecraft in that it can complete a runway landing following its mission, and that it can carry a versatile payload for scientific research or other needs. This makes feasible the transport into space of non-astronaut-trained personnel as well as a wide variety of scientific instrumentation.

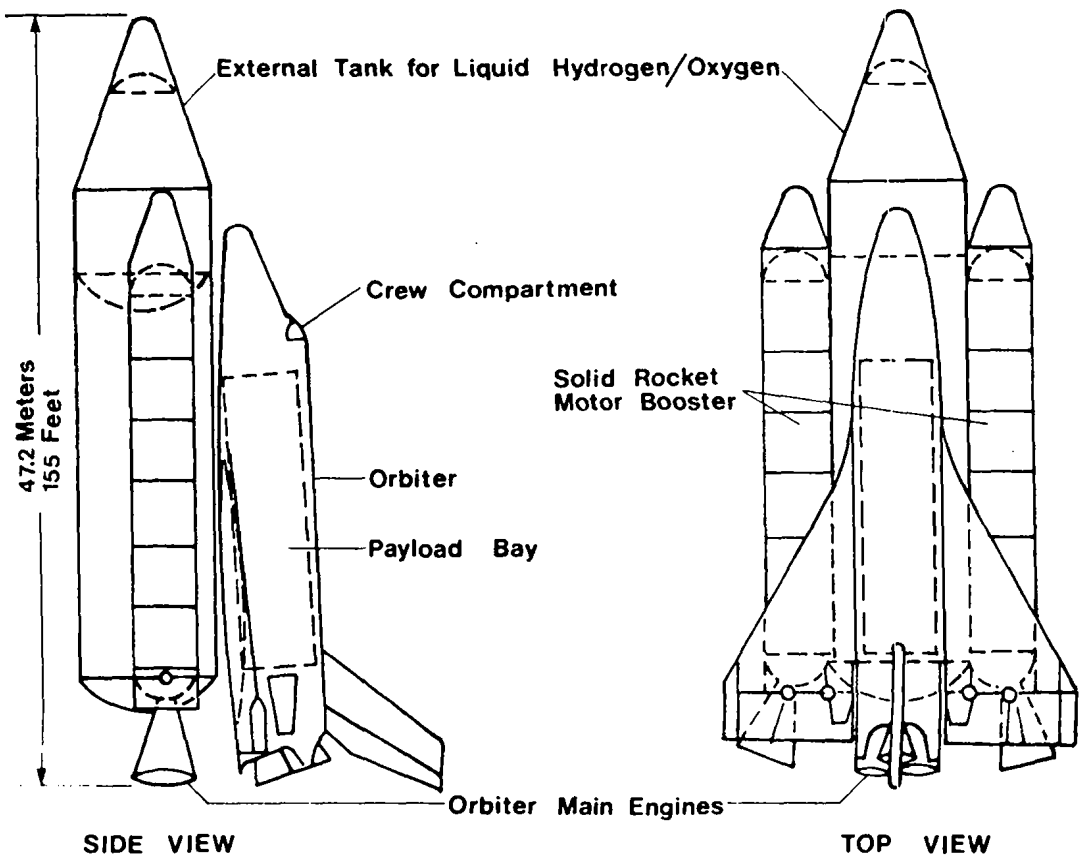


Figure 5 NASA Space Shuttle System with External Tank

Since production of the External Tank is the primary responsibility of NASA at Michoud, a further description of it is warranted. The tank will be 47.2 m (155 ft) long, with a diameter of 8.24 m (27 ft). The tank carries a liquid propellant (liquid hydrogen and liquid oxygen in separate compartments). The propellant continues to provide for propulsion of the Orbiter when parallel burning is discontinued with the ejection of the solid rocket boosters. The tank can carry a propellant load weighing 724,800 kg (1.6×10^6 lbs). When empty, the tank weighs 35,334 kg (78,000 lbs). It is constructed almost entirely of aluminum, but does contain small amounts of stainless steel as well. It is covered with a layer of insulating material for propellant conditioning and heat protection.

The first ground test vehicle has been completed and the second and third units are due to be completed by March 1978. The first flight tank is to be ready in December 1978. The rate of production is to reach 6 to 8 units per year by late 1978. The goal to manufacture 60 tanks a year is expected to be reached by 1983.

NASA's functions as a "landlord" agency at MAF result from the decision by NASA in the early 1970's to allow other governmental agencies to occupy structures left vacant when the Saturn/Apollo program neared completion. A number of tenants (largely federal agencies) were permitted to use available plant and office areas on a NASA permit and proportionate reimbursable cost-share basis, to defray operating expenses. Most of the maintenance functions for the MAF have been contracted by NASA to local private firms. Boeing Services International has the prime responsibility to provide plant services to NASA and the tenant agencies. Subcontracts are held by Reguard to provide security and by Red Janitorial for custodial services.

Approximately 1,770 people are employed in NASA-related activities, representing about 47 percent of employment at MAF. Nearly 75 percent of the NASA-related employment is accounted for by Martin-Marietta, the contractor for manufacture of the External Tanks.

b. Tenant-Related Activities. Tenant-related activities are divided into two major groups: the U.S. Department of Defense and the U.S. Department of Agriculture.

U.S. Department of Defense operations consist of activities by:

- U.S. Navy and its Contractor, Bell Aerospace Company. The Bell Aerospace Company has a wide range of programs including design, development, manufacture, and testing of one prototype Amphibious Assault Landing Craft and broad-based research and technological development programs relating to surface effect ship and air cushion vehicles (ACV).

- Naval Aerospace Medical Research Laboratory (NAMRL). NAMRL has located a detachment at the Michoud Assembly Facility to conduct research measuring the response of humans to acceleration and deceleration impacts.

- U.S. Army Tank Command and its Contractor, Chrysler Corporation. A number of programs and projects are currently under the direction of this command, including an M-60 Tank Retrofit Program which consists of manufacturing and testing of component parts for the U.S. Army M-60A1 and A2 tanks, a program to develop and test battery/power supplies and components for military and commercial applications.

- U. S. Army Corps of Engineers. The New Orleans Area Office occupies office space for approximately 45 people and dock space for a limited number of small boats. The Corps is responsible for inspection and contract administration of all civil works projects, levees and flood control systems for the New Orleans District Office.

- Defense Contract Administration Services and Defense Contract Audit Agency. The offices provide contract administration services, including cost/price analysis support, quality assurance, industrial property management and plant clearance functions, and production and compliance support for U.S. governmental agencies (e.g. NASA, DOD, etc.) as delegated by the procuring contracting officer on an individual contract basis.

U.S. Department of Agriculture operations include the following activities:

- National Finance Center. Responsibilities are to develop and implement programs and procedures to accomplish department-wide centralized payroll and administrative payments, personnel management reporting accounting, and financial reporting.

- New Orleans Computer Center. The Computer Center provides automatic data processing services and business and scientific applications to all elements of the USDA and also to other federal agencies on a reimbursable basis.

Approximately 2000 people are employed in tenant-agency activities. Over 80 percent of tenant-agency employment is accounted for by the Department of Agriculture and Navy/Bell Aerospace. Recent, present, and projected tenant-agency employment populations are shown in Figure 6.

4. Proposed Programs and Activities.

Most of the future programs at MAF will be a continuation of existing NASA-related and tenant-agency operations, as considered elsewhere throughout this report. These ongoing activities provide the baseline for the present Draft Institutional Environmental Impact Statement. As new activities arise Environmental Assessments will be prepared as part of the decision making process as needed.

Expanded or changed activities center around three major proposed operations. These include: (1) increased support for NASA's Space

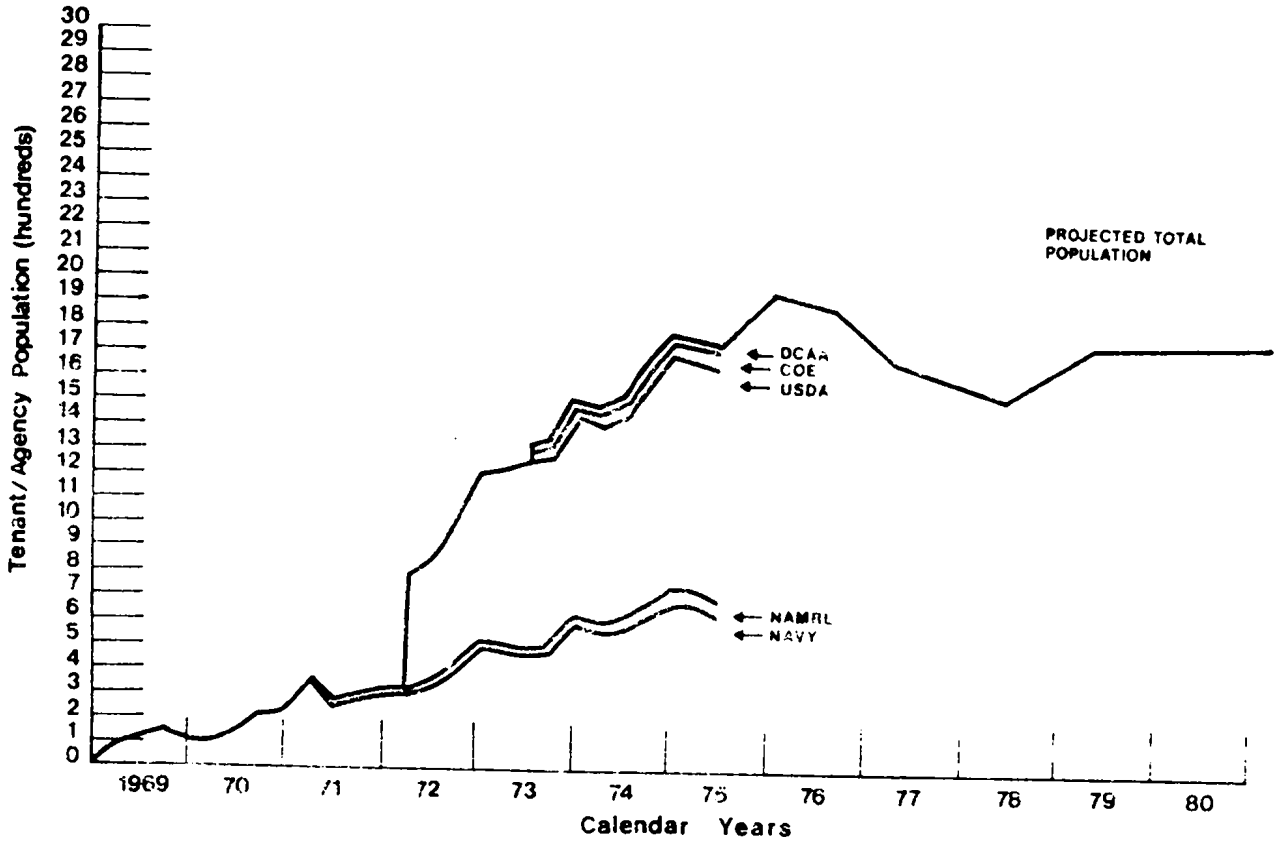


Figure 6 Tenant-Agency Employment Populations 1969 - 1980, MAF

Shuttle System with more intensive production of the External Tank; (2) building of a 2,539 mton (2,800 ton) Surface Effect Ship for the Navy; and (3) a series of acceleration tests and vibration tests at the Naval Aerospace Medical Research Laboratory (NAMRL). The impacts of these expanded activities are discussed separately in a later section of this report. NASA is committed to conform to environmental standards on all projects.

Regarding the External Tank production, there will be a gradual decrease in the number of design and engineering personnel and a continuation of existing production personnel as the test models provide data for higher volume production of the vehicles. Although fewer personnel will be needed, there will be a considerable increase in manufacturing activities. Welding, cleaning, and coating operations will comprise the major portion of these increases. Transportation and shipping of higher volumes of manufacturing supplies will occur. After the tanks are produced (at rates of 24 to 60 a year), they will be transported (with a slight pneumatic pressure) by water to Cape Canaveral in Florida and to the Western Test Range in California. There they will be attached to the Orbiter vehicles for launching.

The proposed Surface Effect Ship for the Navy will be a destroyer escort type vessel. It is designed to ride just above the water on an air cushion which is held in place by rubber and synthetic seals at the bow and stern of the ship. It will be constructed chiefly of aluminum. Current research by the Navy at Michoud is perfecting the quality of the seal material that is required for this proposed new ship. Production would begin after design and mock-up tasks are completed, probably in 1978. By that time, an increase in staff would be necessary, estimated at about 200 additional persons.

NAMRL activities will involve refinement of present acceleration tests with human subjects. These tests will be supplemented with the use of non-human primates to be obtained from the Delta Regional Primate Center in Covington, Louisiana. In addition, NAMRL will be testing human response to the kinds of vibrations to be experienced by personnel who will man the proposed Surface Effect Ship.

C. Existing Environmental Conditions

1. Relationship to Land Use and Land Use Plans.

a. Regional Setting. The growth pattern of the New Orleans area has been largely influenced by natural features (RPC, 1969). Development was initially confined to naturally well-drained areas along the Mississippi River. However, as population growth continued, development spread to the low-lying areas which comprise most of the region's land. Although the New Orleans central business district (CBD) remains active, its growth has suffered from the trend of movement to the suburbs. The completion of the Louisiana Superdome in August, 1975 stimulated construction in the CBD. Projections indicate a reversal of recent trends, resulting in increasing demand for commercial and industrial land in the downtown area.

b. Michoud Vicinity. The Michoud Assembly Facility is located within the Orleans Parish in the eastern section of New Orleans. The City of New Orleans is coextensive with Orleans Parish. Much of the area in New Orleans East is undeveloped lowlands. However, with urbanization occurring at a rapid rate, this portion of the city is experiencing increasing pressure to become developed. Development is occurring in New Orleans East for several reasons:

- The proximity and accessibility of the area to the central business district.
- The location of a number of large industrial employers in the area, including Michoud.
- The availability of vast amounts of undeveloped land.

Existing land use in the immediate vicinity of the Michoud Assembly Facility is commercial and industrial, with many large industrial plants and an industrial office park south of Chef Menteur Highway (U. S. Route 90) and east of Michoud (Figure 7). West of MAF is an electric power plant, New Orleans Public Service, Inc. (NOPSI); south is an estuarine marsh. While several industrial facilities have recently been established in the immediate vicinity of Michoud, a great portion of the area will remain undeveloped due to poor drainage conditions. No residential areas are within one-half mile in any direction; the nearest residences are north of Chef Menteur Highway.

The proposed 1990 Land Use Plan for the New Orleans Standard Metropolitan Statistical Area (SMSA) maintains the existing character of the area around Michoud (Figure 8). The SMSA includes Orleans, St. Bernard, Jefferson, and St. Tammany Parishes. Along the Gulf Intracoastal Waterway, land use would remain industrial. North of Chef Menteur Highway, low and medium density residential and commercial land uses are proposed (RCP, 1973). South of Michoud, the State may designate the adjacent marsh as part of the proposed Blind Lagoon recreation area (COE, 1975).

c. The Michoud Assembly Facility Site. The site is easily accessible by rail, water, and motor vehicles. Vehicles enter the site on Old Gentilly Road by way of Chef Menteur Highway, which is a major east-west arterial parallel to and north of the site. To facilitate access to the Intracoastal Waterway, MAF has its own "Port Michoud." Though not a deep water port--its depth is between 6.7 and 7.6 m (22 to 25 ft)--Port Michoud is capable of handling ships in the 9,070 metric ton (10,000 ton) class.

The Michoud site is 363.2 hectares (896.9 acres) in size. Most of the development on site is located in the northeastern portion where drainage conditions are most favorable. Table 1 shows that approximately 73.4 hectares (181.3 acres), or about 20 percent of the total site area, is devoted to buildings, roads, and parking. The MAF site, including structure and improvements, is valued at approximately $410

EXISTING LAND USE IN NEW ORLEANS

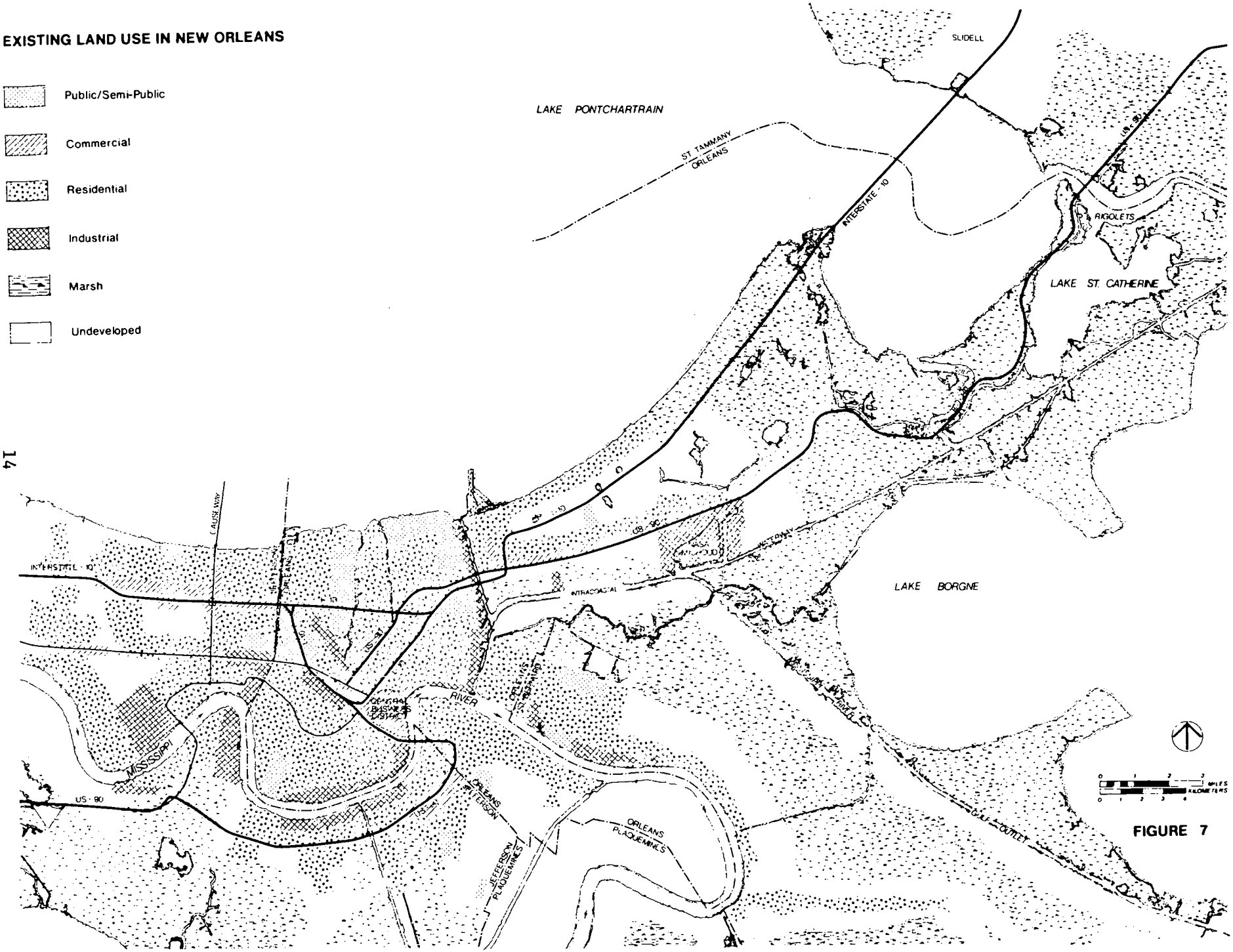


FIGURE 7

PROPOSED LAND USE PLAN FOR THE NEW ORLEANS SMSA, 1990

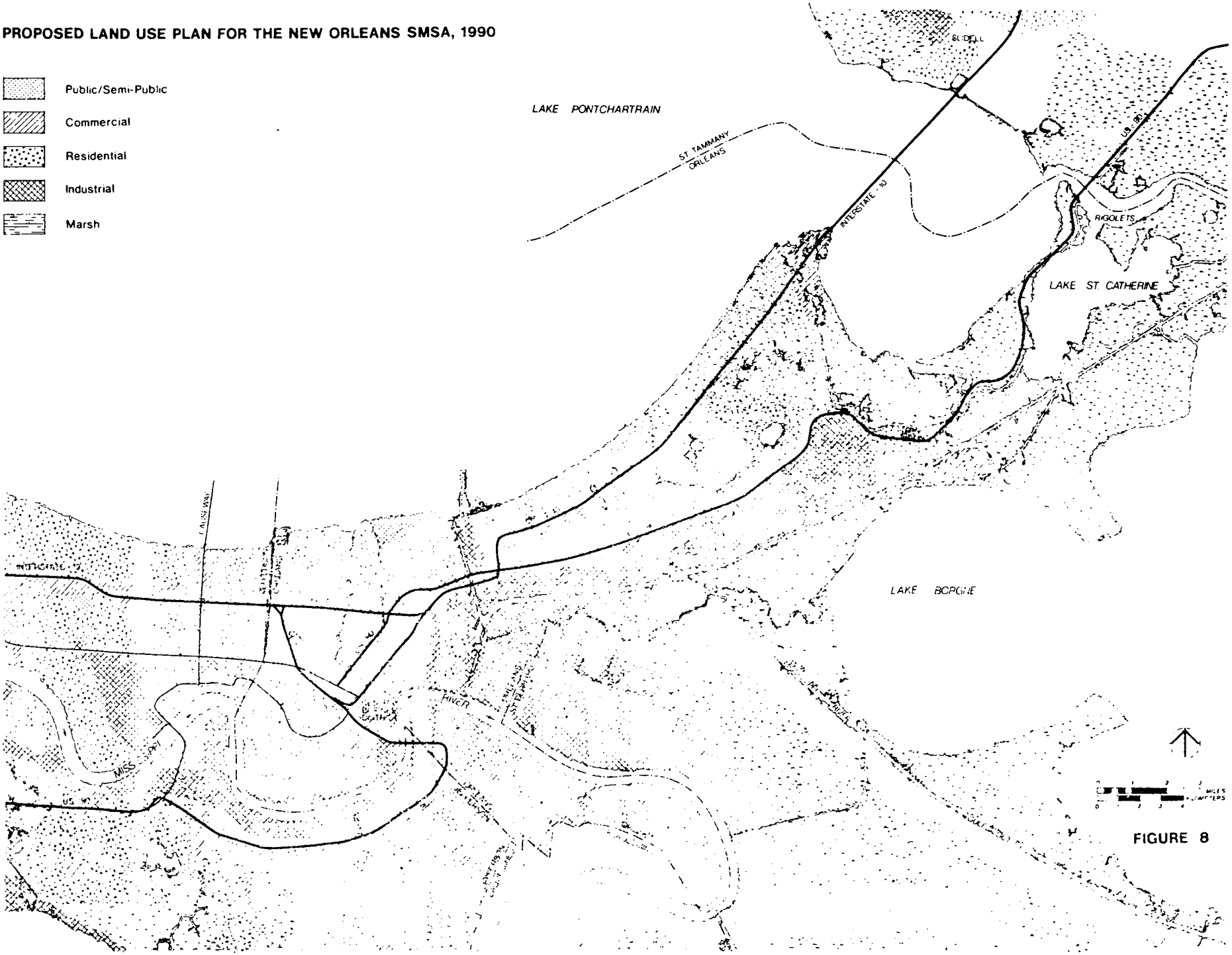


FIGURE 8

million ($35 million in property and $375 million in structures), as estimated in 1975 dollars.

Table 1. Development on the MAF Site.

	Hectares Covered		Acres Covered		Percent of Total Site Area	
Buildings	31.1	73.4	76.9	181.3	8.6	20.2
Parking and Loading Areas	27.7		68.4		7.6	
Roads*	14.6		36.0		4.0	
Vacant	289.8		715.6		79.8	
Total	363.2		896.9		100.0	

*Includes paved and gravel surfaces

Source: Estimates, Dalton·Dalton·Little·Newport, 1976

Over 61 percent of existing floor-space on-site is devoted to manufacturing activities, as shown in Table 2.

Table 2. Existing Floor Space Use On-Site.

Category	Area m^2	Area ft^2	Percent of Total
Office and Administrative	68,820	740,000	21.1
Manufacturing	199,392	2,144,000	61.1
Special Test Facilities	19,251	207,000	5.9
Warehouse and Storage	21,855	235,000	6.7
Miscellaneous Support	17,019	183,000	5.2
Total	326,337	3,509,000	100.0

Source: NASA, 1975

In 1968, a Master Plan was prepared for the Michoud site to depict existing and proposed development (NASA, 1968). An evaluation of the facilities in the Master Plan showed that the majority were in good condition. With the exception of one semi-permanent building currently vacant, all structures are permanent facilities designed to serve a specific purpose for at least twenty-five years.

Present building use at MAF is shown in Figure 9, and is described in the following manner:

- Office and Administrative: This consists of three major facilities: Administration (Building 101), Engineering (Building 102), and Office and Engineering (Building 350).

- Manufacturing: The focus of the manufacturing area is Building 103, with a total area of 171,000 m^2. In addition, Buildings 110 and 303 are currently used as manufacturing areas.

- Special Facilities: High Pressure Test Facility (Building 404), Pneumatic Test Facility (Building 451), Vertical Assembly Building (Building 110), Laboratory Building (Building 111) presently used for special storage, and the NAMRL Acceleration Test and External Tank Prep-to-Ship Facility (Building 420).

- Warehouse and Storage: Support and operations facilities include the Maintenance and Supply Building (Building 203), the Vehicle Component Supply Building (Building 220), and the Hazardous Material Storage Building (Building 221).

- Miscellaneous Support: Buildings devoted to miscellaneous support activities are the Contractor Services Building (Building 320), the Cafeteria and Equipment Building (Building 351), the Maintenance Building (Building 301), and an additional wide range of facilities including drainage pumping stations, small shops, and generator rooms.

The plan for present and proposed land-use at Michoud is shown in Figure 10. The objectives of the land-use plan include prevention or reduction of conflicts in usage, both existing and projected. The plan also includes programmed development for those areas which are most suited for construction, given the limits of topography and the location.

Other factors in the plan are consolidation of compatible land-use function and coordination of vehicular and pedestrian circulation systems. A pneumatic test facility for pressure testing External Tanks for hydrogen with gaseous nitrogen has recently been constructed in the southeastern sector.

In addition, the City of New Orleans has recently applied to use 14.2 hectares (35 acres) of vacant property in the southeastern portion of the site for an educational facility. The City will contract with Delgado College to construct, operate, and administer an educational facility offering training in fire fighting technology, law enforcement, and driver education for local and regional fire and police departments. A separate environmental study is being undertaken through the city for that proposed facility.

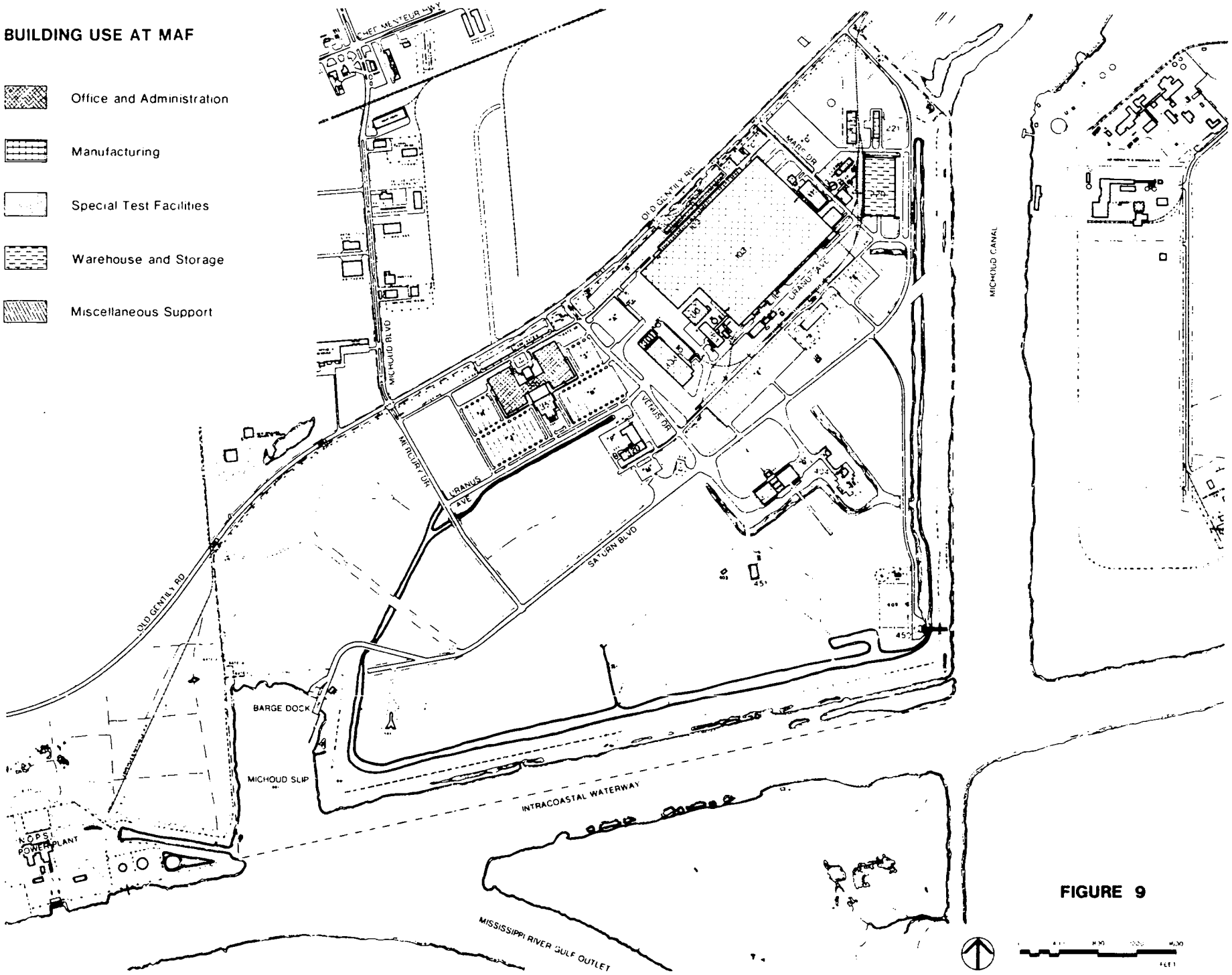

BUILDING USE AT MAF
Office and Administration
Manufacturing
Special Test Facilities
Warehouse and Storage
Miscellaneous Support
CHEF MENTEUR HWY
OLD GENTILLY RD
MICHOUD BLVD
MERCURY DR
URANUS AVE
VENUS DR
SATURN BLVD
MARS DR
GRANDE AVE
MICHOUD CANAL
BARGE DOCK
MICHOUD SLIP
INTRACOASTAL WATERWAY
NOPSI POWER PLANT
MISSISSIPPI RIVER GULF OUTLET

FIGURE 9

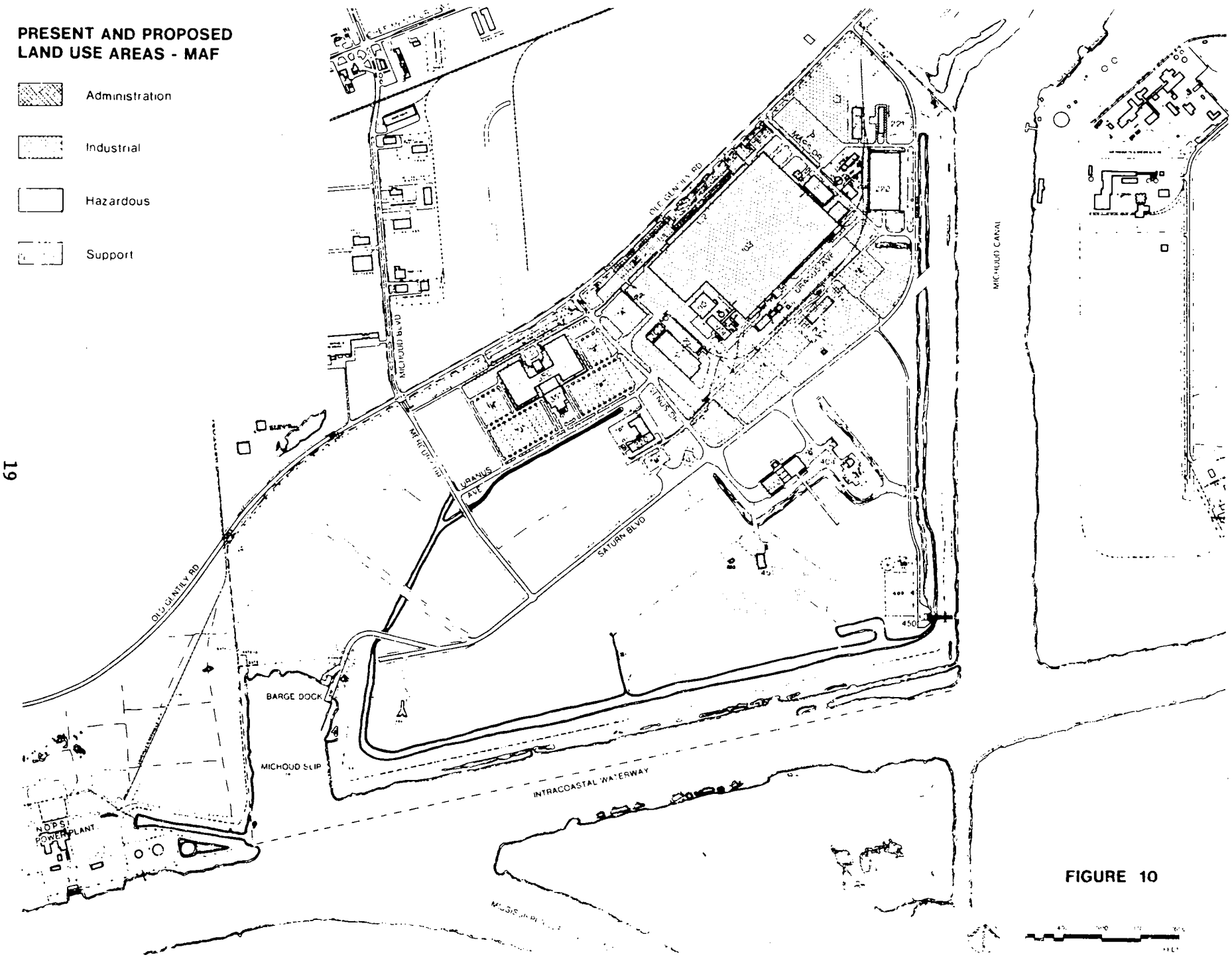

PRESENT AND PROPOSED
LAND USE AREAS - MAF
Administration
Industrial
Hazardous
Support
OLD GENTILLY RD
MICHOUD BLVD
URANUS AVE
SATURN BLVD
MICHOUD CANAL
BARGE DOCK
MICHOUD SLIP
INTRACOASTAL WATERWAY
NOPSI POWER PLANT

FIGURE 10

OUTLINE OF FOLLOWING SUBSECTIONS

2. Detailed Description of Existing Environmental Conditions.

a. Natural Systems. 21

(i) Land and Waters. 21

(a) Geology: 21
(b) Topography: 21
(c) Hydrology: 23
(d) Water Quality: 23

(ii) Climate. 31

(iii) Plant and Animal Populations. 32

(a) Plant Communities: 32
(b) Fisheries: 37
(c) Wildlife: 38

(iv) Air Quality. 39

(a) New Orleans Region: 39
(b) Michoud Assembly Facility Emission Inventory: 40

- Boilers. 40
- Commuters. 43
- Spray Painting. 43
- Welding. 45
- Chemical Processing. 45
- Sandblasting. 46
- Industrial Internal Combustion Vehicles. 48
- Acceleration Sled. 48

(c) Summary of MAF Emissions: 48

(v) Noise. 49

(vi) Environmentally Sensitive Areas. 52

2. Detailed Description of Existing Environmental Conditions.

a. Natural Systems.

(i) Land and Waters.

(a) Geology: The Michoud site is on an extension of the St. Bernard delta of the Mississippi River deltaic plain. Subsurface deposits at the site are typically deltaic deposits of gravel, sand, silt, clay, and organic materials. Sand and gravel deposits represent ancestral channels and beaches; organic material deposits represent inter-distributary deposition; silt and clay deposits represent overbank and pro-delta deposits (Eddards et al., 1956).

Massive deltaic deposits over previously deposited fine-grained pro-delta materials result in compaction of the lower deposits. The area remains stable as long as the rate of deposition equals or exceeds the rate of subsidence. A reduction in sediment load to the area generally causes a net subsidence. Relocation of the main channel of the Mississippi River and construction of levees has reduced sediment loads and deposition in the Saint Bernard delta area (Russell and Russell, 1939 and Jones, 1970). The St. Bernard delta region is currently subsiding at a rate ranging from 0.61 to 4.9 m (2 to 16 ft) per 100 years.

The depth of bedrock is typically great in the deltaic depositional area. Soil borings on the site reached a maximum depth of 38.13 m (125 feet) without encountering bedrock (Figure 11). Historically, friction pilings have been required because of the lack of firm foundation strata. Structures with critical settlement tolerances require pilings into the Pleistocene clay and silt unit found at depths ranging from 17 to 20 m (57 to 68 ft) (NASA, 1968).

(b) Topography: The East New Orleans area is typical of the Mississippi delta, being low and flat. Elevation on the Michoud site ranges from 0.6 to 1.5 m (2 to 5 ft) above mean sea level. The entire site is reclaimed marshland with surficial materials composed entirely of man-made fill, a mixture of top soil and river sand.

Groundwater is found at shallow depths on the site, reflecting the effects of sea level and small topographic variation of the water table. The Michoud Assembly Facility lies within the Project Hurricane Flood-plain. The Project Hurricane will occur at least once in 100 years and exceeds the 100-year flood. The 100-year flood has a depth of 0.76 m (2.5 ft) at the facility.

The area directly north of the site between Old Gentilly Road and the Chef Menteur Highway does not lie in the 100-year floodplain and is not subject to flooding (Corps of Engineers, pers. comm.). MAF is currently protected by a levee. In addition, concrete and sheet steel flood walls have been built on top of several portions of the levee.

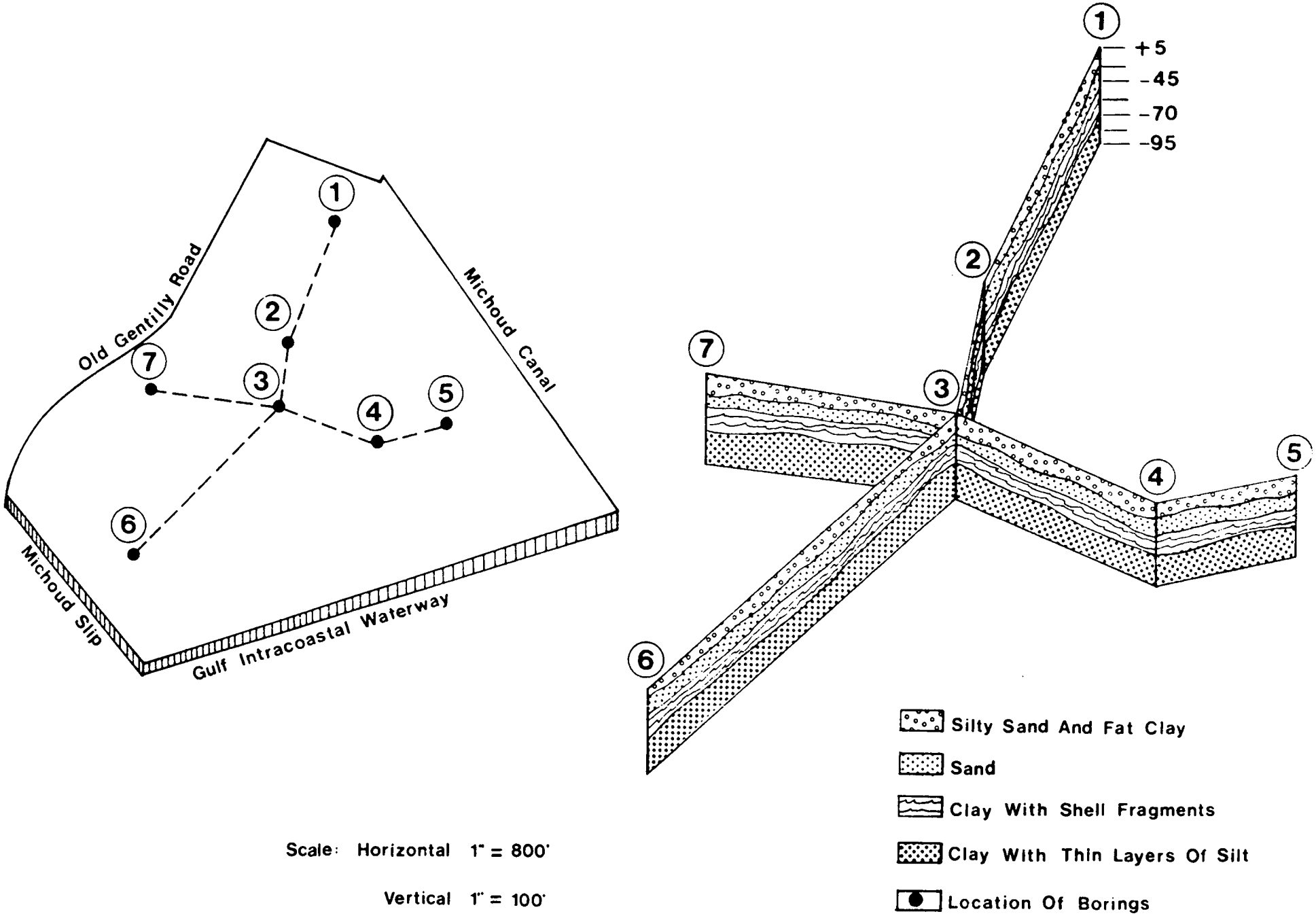


Figure 11 Michoud Assembly Facility Geology (From MAF Master Plan 1968)

(c) Hydrology: Flow in the Gulf Intracoastal Waterway (GIWW) is extremely complex, depending on the effects of wind and lunar tides and discharges through locks connecting the GIWW and the Mississippi River, and from Lake Ponchartrain (COE, 1975). During periods of quiescence, the normal direction of flow in the GIWW is eastward from the Mississippi River to Lake Borgne. Eastward flow is divided at the bifurcation of the GIWW and the Mississippi River Gulf Outlet. Flow in the GIWW continues eastward and enters Lake Borgne, while flow in the Mississippi River Gulf Outlet is southeastward from the GIWW to the Gulf of Mexico (COE, pers. comm.). No rate-of-flow data are available.

Tides in the eastern Mississippi River delta region usually range from 0.3 to 0.6 m (1 to 2 ft) and have a limited effect on flow in the Michoud portion of the GIWW. Wind-induced currents strongly influence flow, at times causing the occurrence of a reversed flow in the channel (Summers, pers. comm.). Flow near the Michoud Assembly Facility is most strongly influenced by currents generated by south and southeast winds. These winds also produce currents ranging in height from 1.8 to 3 m (6 to 10 ft) in swamps of St. Bernard Parish as the winds move across the Gulf and Lake Borgne (State of Louisiana, Geological Survey, 1956). Maximum and minimum stages generated by wind currents on Lake Ponchartrain are +1.8 m and -0.6 m (+6 to -2 ft) (Eddards et al., 1956). The effects of north and west winds on flows in the GIWW are reduced by the distance between bodies of water and the GIWW, the absence of connecting waterways to the north and west and the presence of topographically high areas immediately north and west of the GIWW.

The only source of potable water for the City of New Orleans is the Mississippi River, but significant supplies are obtained from the "700 foot sand" (a layer of sand 700 feet below the surface). In addition, the "200 foot sand" and the "400 foot sand" provide lower quality potable water. Extraction of large quantities of water from the "700 foot sand" has resulted in a declining ground water level in the New Orleans area. This has increased extraction costs and created local salt water intrusion conditions.

Also, extraction has resulted in the partial de-watering of the aquifer. The load of the over-lying sediments has plastically deformed the sand beds because part of the load was borne by the artesian pressure head (Rollo, 1966 and Davis and Rollo, 1970). Leakage of water from over-lying clay beds into the sand results from the reduction in artesian pressure and causes elastic deformation of the clay units. The combined result of plastic deformation of the sand and elastic deformation of the clay is compaction and subsidence of the land surface (Rollo, 1966, refers to Houston, Texas area which is similar to the New Orleans area). Subsidence does exist in the New Orleans area.

(d) Water Quality: In general, the aquatic eco-system of the area is brackish to estuarine in character. Freshwater flows from surface runoff and from the Mississippi River lower the salinity periodically, while saline influxes from the Gulf Outlet elevate salinity values. Using the Venice System of estuarine classification, the Michoud Canal, and the Gulf Intracoastal Waterway are oligohaline to mesohaline (0.5 to 5 ppt and 5 to 18 ppt, respectively). Oligohaline, true estuarine,

euryhaline marine, and migrant species can inhabit such salinity ranges (Day, 1951; 1964). The Michoud drainage reservoir is fresh to brackish.

Michoud lies within the "Fertile Fisheries Crescent," an area of significant productivity for commercial and noncommercial fish and shellfish forms (Gunter, 1967). The numerous bays, bayous, and salt marshes in this area are important in nutrient releases and aquatic reproduction in the Gulf of Mexico. Before drainage, canal work and other development in the study area, salt and estuarine marshes and fresh to brackish water marshes characterized much of Orleans Parish. Drainage, diking, and canal works affected both salinity and nutrient composition of the study area waters. Generally higher salinities, increased circulation of waters, higher runoff rates, and lowered nutrient content (organic materials, nitrogen, and phosphorus) are all thought to have resulted from such developments.

The most comprehensive sets of water quality data available for the Michoud area are those taken for protection of oyster beds by the Louisiana Department of Health (LDH) 1971 to 1975, and those taken by the Corps of Engineers (COE), 1972 to 1973. Data from the four LDH stations closest to Michoud are indicated on Figure 12; the means and ranges of these data are shown in Figure 13. Values of water quality parameters fluctuate markedly in the Michoud area, responding to seasonal and tidal influences (Bradley, pers. comm.). Salinity was observed to be higher at Stations M-23 and M-24 than at M-25 and M-26, as shown in Table 3.

Table 3. Salinities near NASA Michoud Assembly Facility (micrograms per liter).

	Station			
Date	M-23	M-24	M-25	M-26
7 June 1971	11.07	10.39	9.37	6.99
14 August 1971	16.85	22.88	17.26	10.04

The opening of the Mississippi River-Gulf Outlet channel has allowed masses of high salinity water to penetrate far into the delta (Sommers, pers. comm.), which probably accounts for the higher salinities that prevail at Stations M-23 and M-24.

Summarized coliform bacteria count data for the waters around Michoud are shown in Table 4. They indicate that bacterial standards are generally exceeded, probably due to incompletely treated sanitary sewage effluents. One probable source is the wastewater treatment plant owned and operated by the New Orleans Sewerage and Water Board that discharges at the head of the Michoud Canal.

LOUISIANA WATER QUALITY STATIONS

● Louisiana State Department Of Health Sampling Stations

▲ Louisiana Stream Control Commission Water Quality Station

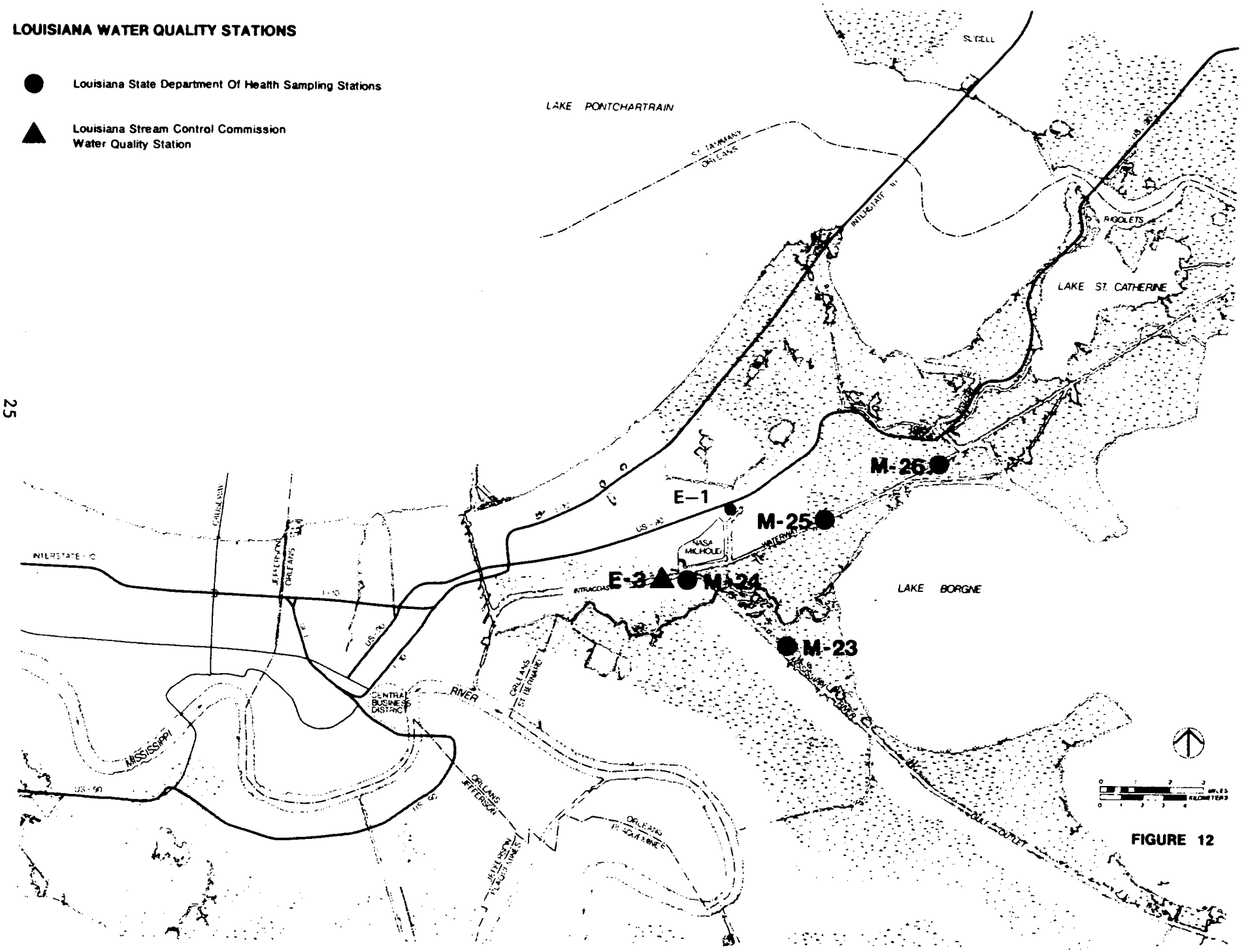


FIGURE 12

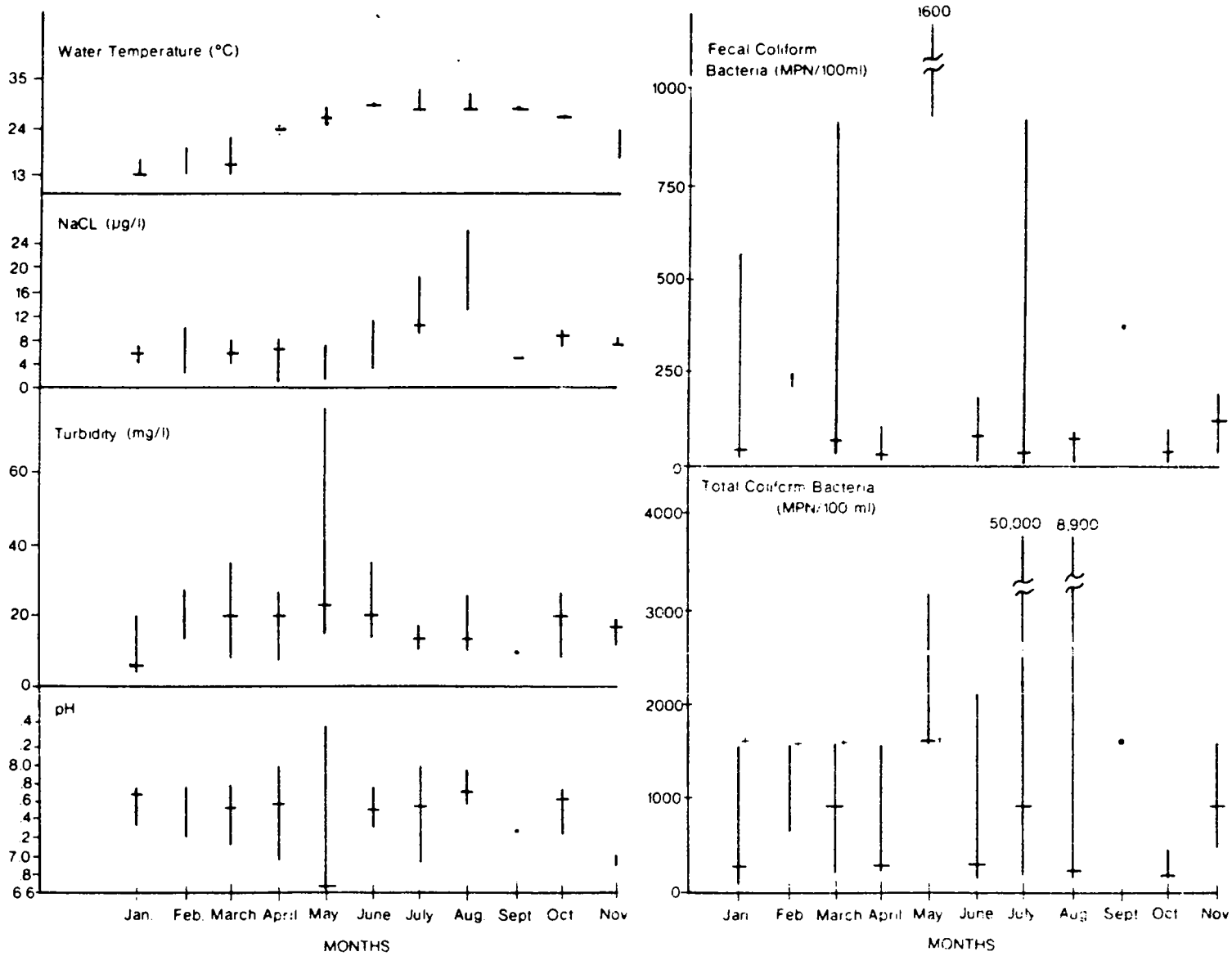


Figure 13 Means And Ranges Of Louisiana Water Quality Data For Stations Near Michoud, 1971-1975

Table 4. Coliform Bacteria Counts for Waters around Michoud.

Location	No. of Samples	Date of Samples	Coliforms MPN* per 100 ml Max.	Min.	Med.	Samples
Intracoastal Waterway at Pipeline X and B Daytoe (M-26)	10	1972	1,600	79	445	70
Michoud Sewage Effluent in Michoud Canal (E—1) Head of Canal (Dead End)	9	1972	14,000	540	1,600	70
Intercoastal Waterway at Michoud Canal (E—1) Head of Canal	10	1972	1,600	46	295	70
Intercoastal Waterway at Mississippi River Gulf Outlet (M-24)	10	1972	7,000	79	395	70
Bayou Bienvenue at Mississippi River Gulf Outlet (M-23)	19	1972	54,000	130	1,600	70

Source: Lake Pontchartrain Basin Water Quality Management Plan, State of Louisiana Stream Control Commission, 1973.

*MPN—Most Probable Number

Corps of Engineers data for their three stations closest to Michoud are summarized in Table 5. These data are noteworthy because they indicate that the waters are heavily contaminated with mercury and occasionally lead. The source of the lead is believed to be from street and parking lot runoff and from other areas contaminated with lead from automobile exhaust (COE, 1975) or from regional manufacturing activities. The mercury comes from unknown source(s). Chemical analyses of sediments taken from the Mississippi River-Gulf Outlet show that these sediments are frequently contaminated with arsenic, cadmium, and mercury in excess of EPA criteria for uncontained dredge spoils disposal (COE, 1975). In all probability, the same is true for sediments in the Gulf Intracoastal Waterway at Michoud, and is not the result of contamination by MAF. MAF has not knowingly discharged these chemicals to surface drainage or to New Orleans Sewerage Treatment plant.

Table 5. Average Water Quality Data for Three Stations on the Gulf Intracoastal Waterway Just West of Michoud (mg/l).

	Organic Pollution				
	BOD5	DO	NH_3-N	NO_3-N	P
At Mississippi River-Gulf Outlet Channel Junction	2.0	8.5	0.43	0.35	0.16
At NOPSI Plant	1.9	7.1	0.34	0.49	0.21
Near Paris Road Bridge (Fig. 28)	9.9	8.5	0.23	0.35	0.92

	Heavy Metals						
	Pb	Hg	Zn	Cd	Cu	As	Cr
At Mississippi River-Gulf Outlet Channel Junction	0.5*	0.15*	<0.1	<0.1	<0.2	0.015	<0.15
At NOPSI Plant	<0.5	0.13*	<0.1	<0.1	<0.2	0.014	<0.15
Near Paris Road Bridge	0.5	0.08*	<0.1	<0.1	<0.2	<0.01	<0.15

* Above proposed EPA criteria.
Source: COE, 1975

Water quality measurements have been published by the State of Louisiana Stream Control Commission for the intake channel of New Orleans Public Service (NOPSI) Power Plant near Michoud. The channel is marked as Station E-3 on Figure 12. These data are presented in Table 6.

Table 6. Water Quality at the NOPSI Power Plant Intake near Michoud.

Parameter	Concentrations	
	mg/l	ug/l
Biochemical Oxygen Demand	2.2	
Chemical Oxygen Demand	349.0	
Total Solids	14,285.0	
Total Dissolved Solids	12,774.0	
Total Suspended Solids	180.0	
Total Volatile Solids	1,331.0	
Nitrate	2.0	
Zinc		50

Source: State of Louisiana Stream Control Commission, 1973.

The data available on water quality around the Michoud area were supplemented by field measurements made on August 4 and 5, 1975. Figure 14 is a map showing the locations of sampling points for these water quality measurements. These measurements are documented in Table 7.

Table 7. Water Quality at Various Locations at Michoud (August 4-5, 1975).

Parameter	Location[a]					
	1[b]	2[c]	3[b]	3[c]	4[b]	5[b]
Temperature (°C)	27.0	27.0	27.0	27.0	30.0	27.5
Dissolved Oxygen (mg/l)	6.7	4.5	6.0	3.5	5.5	5.7
pH	7.5	7.5	7.5	7.0	8.0	8.0
Salinity (ppt[d]) (ug/l)	15	--	11	--	7	5
Conductivity (uohmos/cm)	--	575	--	450	--	--

[a]See Figure 14.
[b]Salt water sample.
[c]Fresh water sample.
[d]Parts per thousand.

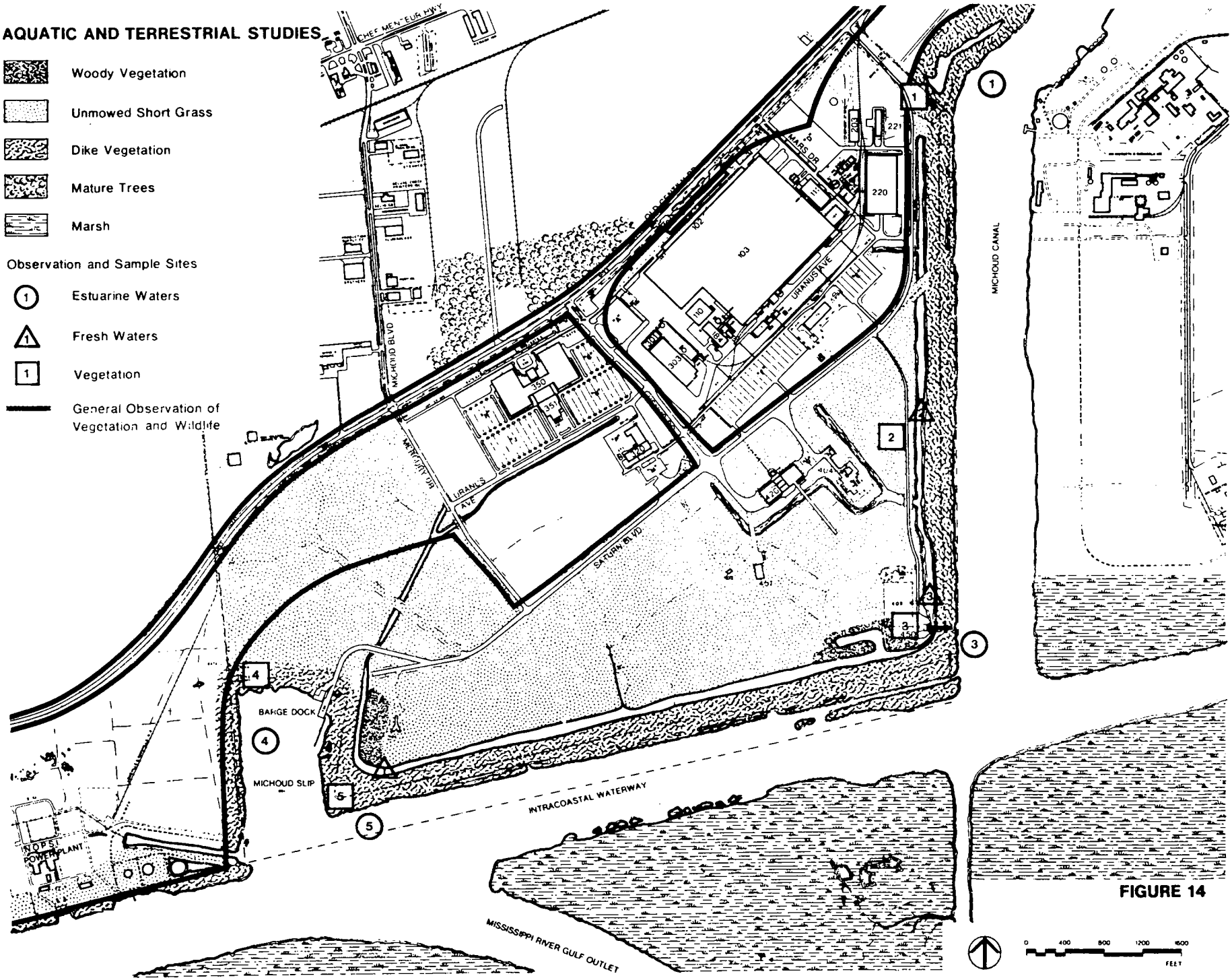

AQUATIC AND TERRESTRIAL STUDIES
Woody Vegetation
Unmowed Short Grass
Dike Vegetation
Mature Trees
Marsh
Observation and Sample Sites
Estuarine Waters
Fresh Waters
Vegetation
General Observation of Vegetation and Wildlife
CHEF MENTEUR HWY
MICHOUD BLVD
MERCURY DR
URANUS AVE
SATURN BLVD
MARS DR
OLD CANAL
MICHOUD CANAL
BARGE DOCK
MICHOUD SLIP
INTRACOASTAL WATERWAY
MISSISSIPPI RIVER GULF OUTLET
NOPSI POWER PLANT
0 400 800 1200 1600
FEET

FIGURE 14

The Louisiana Stream Control Commission has classified the Gulf Intracoastal Waterway and Mississippi River-Gulf Outlet, as Class B waters--suitable for the growth and propagation of fish, other aquatic and semi-aquatic life and wildlife; and suitable for secondary contact recreation such as fishing, boating, or other activities where ingestion of the water is not probable.

Numerical water quality criteria for these waters are shown in Table 8. The general water quality criteria of the state are explained in Appendix A.

Table 8. Louisiana Numerical Water Quality Criteria for Surface Waters around the Michoud Assembly Facility.

	Segment		
Parameter	Gulf Intracoastal Waterway (Miss. State Line)	Miss. R. Gulf Outlet (GIWW to Brenton Sound)	Michoud Drainage Reservoir
Dissolved Oxygen not less than (mg/l)	4.0	4.0	5.0
pH Range	6.5 - 9.0	6.5 - 9.0	6.0 - 9.0
Temperature not higher than (^{o}C)	35	35	32.3
Coliform Bacteria	*	*	

* BACTERIA STANDARDS:

SHELLFISH PROPAGATION: The monthly total coliform median MPN (most probable number) shall not exceed 70 per 100 ml, and not more than 10 percent of the samples ordinarily exceed an MPN of 230/100 ml.

SECONDARY CONTACT RECREATION: Based on a minimum of not less than 5 samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 1,000/100 ml, nor shall more than 10 percent of the total samples during any 30-day period equal or exceed 2,000/100 ml.

SOURCE: State of Louisiana, Stream Control Comm., 1973.

The Gulf Intracoastal Waterway from the Mississippi River to the Mississippi State line has been assigned Interim Numerical Criteria for Minerals, based on minimum acceptable standards established by the

United States Health Service for drinking water purposes (Appendix A). The Louisiana Stream Control Commission, however, has stated that these standards do not apply for chlorides, sulfates, and total dissolved solids because of the estuarine nature of the waterway.

In 1976, the USEPA published proposed water quality criteria, which may be the basis for revision of Louisiana criteria (EPA, 1976). The proposed criteria for heavy metals, ammonia, and arsenic are shown in Table 9 for reference to ambient concentrations shown in Table 5.

Table 9. 1976 EPA Proposed Water Quality Criteria for Heavy Metals, Ammonia, and Arsenic in Marine and Estuarine Waters.

Constituent	Fraction of 96 hr. LC_{50}**	Concentration
Ammonia	NA	0.02 mg/l-Freshwater
Arsenic	NA	50 µg/l-Dom Water Sup.
		100 µg/l-Crop Irrigation
Cadmium	NA	0.4 µg/l-Fresh Softwater - Cladocerans
		4.0 µg/l-Fresh Softwater - Other Less Sensitive Spec.
		1.2 µg/l-Fresh Hard Water-Cladocerans
		12.0 µg/l-Fresh Hardwater - Other Less Sensitive Spec.
		10.0 µg/l-Domestic Water
		5.0 µg/l-Marine Water
Chromium		50 µg/l-Domestic Water Sup.
		100 µg/l-Freshwater
		100 µg/l-Marine
Copper	Freshwater and 0.1 Marine Aquatic Life	1.0 mg/l-Domestic Water Sup.
Lead	0.1 Freshwater	50.0 µg/l-Domestic Water Sup.
Mercury		0.05 µg/l-Freshwater
		2.0 µg/l-Domestic Water Sup.
		0.10 µg/l-Marine
Zinc	0.01 Freshwater	5000 µg/l-Domestic Water Sup.

* In 1976, the USEPA published proposed water quality criteria, which may be the basis for revision of Louisiana criteria (EPA 1976).

** 96 hr. LC_{50} is the lethal concentration to 50% of a group test organisms over a 96 hr. exposure. Source: EPA 1976.

In summary, available water quality data suggest that the waters around Michoud generally meet applicable Louisiana water quality criteria except for coliform bacteria. The latter usually exceed standards. The waters around Michoud tend to exceed proposed EPA criteria for mercury and lead. MAF is not a significant contributor to the substandard water quality. Sanitary sewer discharges are through a New Orleans Treatment facility. There is no known mercury use or discharges at MAF. Some lead may result from washoff from parking lots due to use of leaded gasoline.

(ii) Climate. Southeast Louisiana has a humid subtropical climate modified by the Gulf of Mexico. Monthly mean temperatures range from 13.3°C (55.9°F) in January to 28.6°C (83.4°F) in August.

No prevailing wind direction is identifiable for the area. Winds from varying directions have differing climatic effects. During the summer season, southerly winds provide moist, semi-tropical weather, often resulting in afternoon thundershowers. Westerly and northerly winds result in periods of hotter and drier weather. Southeast Louisiana is subject to alternating influxes of warm tropical air and cool, continental air masses occasionally results in relatively large and sudden temperature drops (Weather Information Center, 1974).

Precipitation at Michoud is rather high, averaging 163 cm (64 in) annually, as shown in Figure 15 (Burk & Assoc., 1973), and occurs in fairly heavy intensities (Table 10). Maximum-intensity precipitation usually occurs in the summer during thunderstorms and tropical storms (Weather Information Center, 1974).

Table 10. Intensity of Precipitation at New Orleans (in cm/hr).

Return Frequency (yr)	Duration (min) 30	60	120
2	7.9	5.1	3.0
5	10.1	6.9	4.6
10	10.7	7.6	5.1
25	12.7	8.9	5.6
50	14.5	10.1	6.9
100	15.2	10.4	7.4

Source: U.S. Department of Commerce, 1955.

Showers and thunderstorms occur an average of 70 to 80 days per year and are often associated with high winds in the fall, winter, and spring. Thunderstorms, which move off Lake Ponchartrain, are usually attended by high winds regardless of the season. From late fall to early spring, thundershowers may occur at any time during the day; however, from late spring to early fall, 80 percent occur between 6 a.m. and 6 p.m. (Weather Information Center, 1974).

During the period 1875 to 1958, 92 tropical cyclones have either moved into Louisiana or close enough to effect the coastal areas of the state (Figure 16). Twenty-nine of these events have been of hurricane intensity with winds in excess of 119 kph (74 mph). Hurricane winds can reach a velocity of 241 kph (150 mph). Fifty-three of the remaining 63 tropical cyclones were attended by gale winds (Weather Information Center, 1974). The portion of Louisiana extending from Timbalier Bay eastward, but excluding the Mississippi River mouth, is likely to experience 45 hurricanes per 100 year period (Weather Information Center, 1974). New Orleans has been hard hit by three hurricanes since 1900. The last was Hurricane Betsy in 1965, which claimed 50 lives due to storm surge flooding resulting from winds of 201 kph (125 mph). Portions of the Michoud Facility were flooded during a previous hurricane in 1947. Since then a dike and storm barrier were erected, and no MAF buildings were flooded in the 1965 hurricane.

(iii) Plant and Animal Populations.

(a) Plant Communities: Most of the Michoud area is characterized by grassy or marsh vegetation. No forests occur on the site. The small

PRECIPITATION PATTERNS IN THE NEW ORLEANS AREA
(From Lake Pontchartrain Basin Water Quality Management Plan 1973)

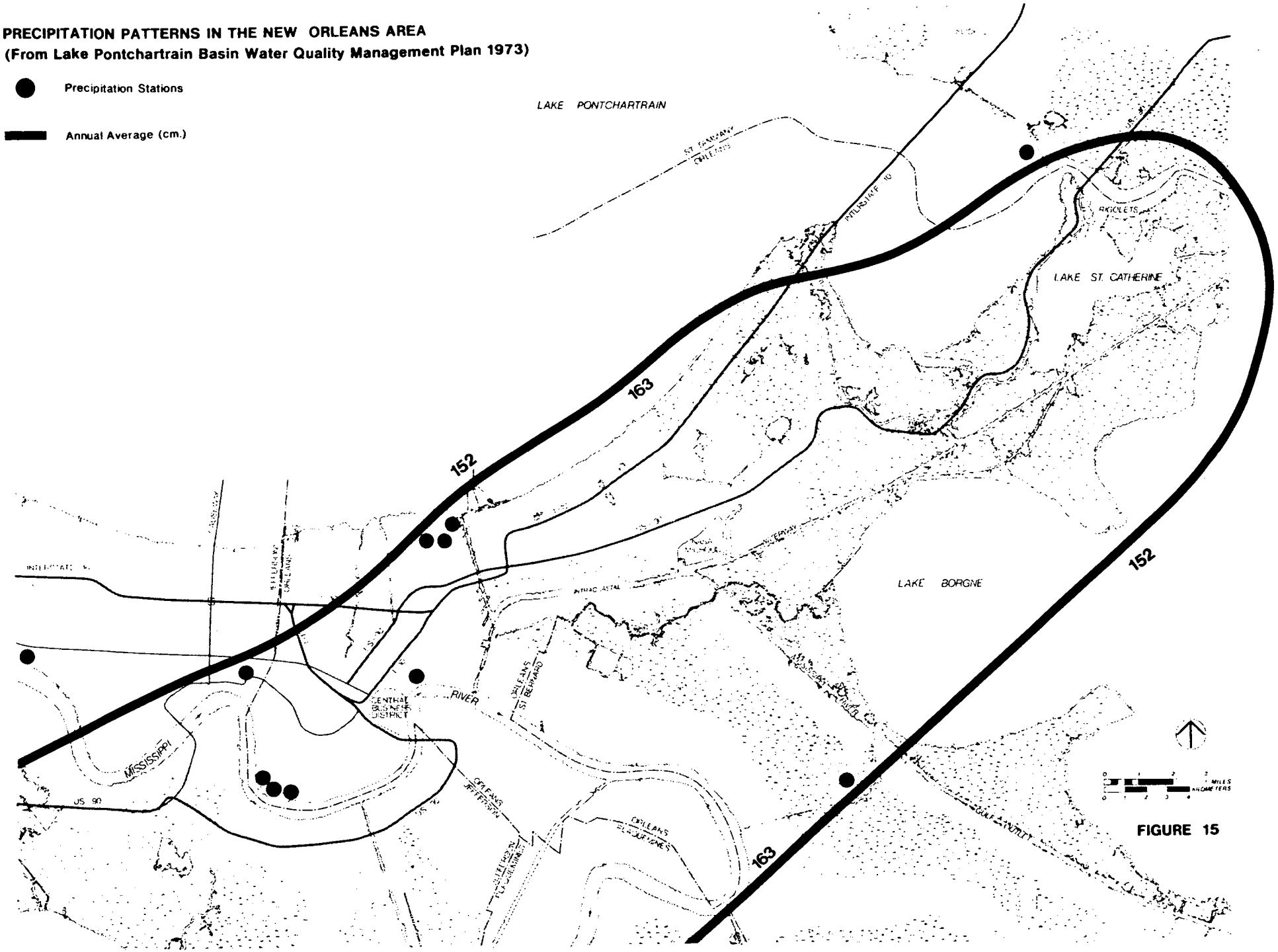


FIGURE 15

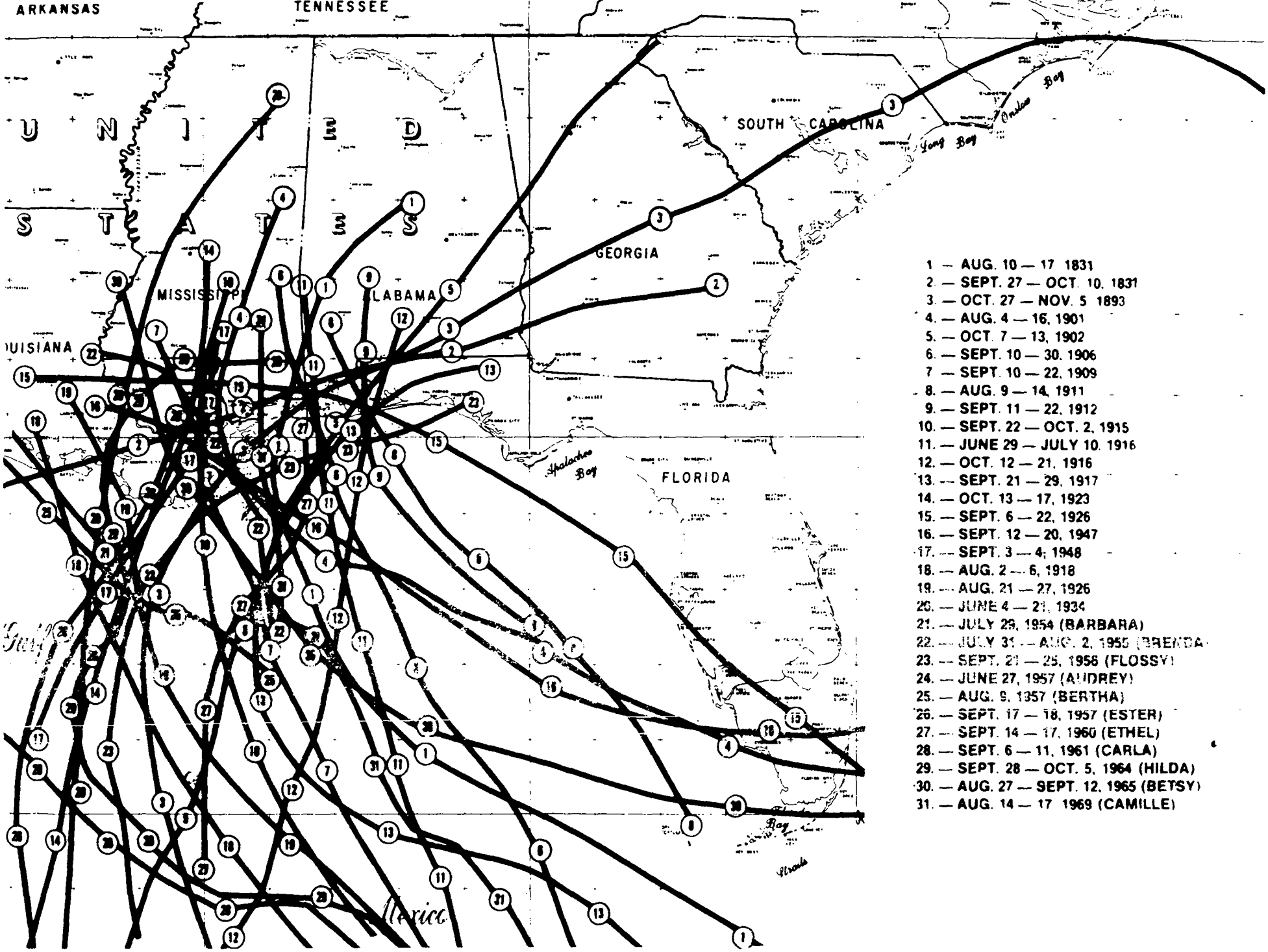


Figure 16 Paths Of Hurricanes Along The Central Gulf Coast Since 1831

amount of woody vegetation is generally of early successional character. The only stand of relatively mature trees is off MAF property north of Old Gentilly Road near the Allis Chalmers facility.

South of the MAF is a brackish marsh (salinity 10 to 20 ppt). Brackish marshes in southern Louisiana typically have dominant vegetation as described in Table 11. These marshes are highly productive in the biological sense, and are important spawning and nursery areas for shrimp and finfish (COE, 1975).

Table 11. Dominant Vegetation of Brackish Marshes of Southern Louisiana.

Species Name	Common Name	Percent
Spartina patens	Wiregrass	68.0
Distichlis spicata	Saltgrass	7.1
Spartina alterniflora	Oystergrass	5.7
Juncus roemerianus	Black Rush	4.5
Scirpus robustus	Coco	4.4
Spartina cynosuroides	Hogcane	3.7
Scirpus olneyi	Three-cornered Grass	3.1
Other		3.5
		100.0

Source: COE, 1975.

Vascular plants were observed at five locations. Figure 14 shows these locations; Table 12 lists the species identified. Thirty-three species representative of 21 families and 32 genera were found at the six locations. Seven species are characterized as plants of disturbed areas, the most notable and visually dominant being the giant ragweed, *Ambrosia*.

Dominant aspect plants include cane (*Arundinaria*), willows (*Salix*), groundsel tree (*Baccharis*), and marsh elder (*Iva*). Characteristic grasses are plants of disturbance (foxtail, *Setaria*) or remnants of the original estuarine marsh vegetation (slough grass, *Spartina*).

Woody plants and mature growths of herbaceous plants generally are confined to shoreline areas adjacent to the canal and to the on-site

Table 12. Vascular Plant Species Observed at the Michoud Assembly Facility, New Orleans, Louisiana (August 4-5, 1975).*

Family	Scientific Name	Common Name	Location: Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	General***
1. Typhaceae	Typha sp.	Cattail	x	x			x		
2. Gramineae	Arundinaria gigantea	Cane	x	x	x	x	x		x
3. Gramineae	Panicum virgatum L.	Panic Grass	x	x	x	x	x		
4. Gramineae	Paspalum sp.	Dallis grass	x	x	x	x	x		
5. Gramineae***	Setaria sp.	Foxtail grass	x	x	x	x	x		
6. Gramineae	Spartina alterniflora	Slough grass	x		x		x		
7. Cyperaceae	Cyperus sp.	Sedge	x	x		x	x		
8. Cyperaceae	Rhynochospora sp.	Beak rush					x		
9. Pontederiaceae	Pontederia cordata	Pickerel-weed							x
10. Salicaceae	Salix sp.	Willow	x	x	x		x		x
11. Fagaceae	Querlcus virginiana	Live oak							x
12. Polygonaceae	Rumex sp.	Dock	x			x			
13. Ranunculacea	Clematis sp.	Clematis vine		x	x		x	x	x
14. Cruciferae***	Capsella Bursa-pastoris	Shepherd's purse				x			
15. Rosaceae	Rubus sp.	Southern dewberry			x				
16. Mimosaceae***	Desmanthus sp.	Sensitive plant	x		x	x			x
17. Leguminosae	Lathyrus sp.	Wild pea	x		x		x		
18. Euphorbiaeae***	Euphorbia sp.	Milk spurge	x			x			
19. Maluaceae	Hibiscus sp.	Rose mallow	x						
20. Lythraceae	Lythrum sp.	Loosestrife	x						
21. Convolvulaceae	Ipomoea sp.	Morning glory	x		x				
22. Verbenaceae	Phyla (Lippia) lanceolata	Fog fruit	x		x				
23. Verbenacea	Verbena sp.	Blue vervain	x	x	x	x	x	x	x
24. Rubiaceae	Diodia virginiana L.	Buttonweed	x	x					
25. Cucurbitaceae***	Citrullus sp.	Watermelon				x			
26. Caprifoliaceae	Sambucus canadensis L.	Common elder		x					
27. Compositae***	Ambrosia artemisiifolia	Lesser ragweed	x	x	x	x		x	x
28. Compositae***	A. bidentata	Giant Ragweed	x	x	x	x	x	x	x
29. Compositae	Aster sp.	Aster	x						
30. Compositae	Baccharis halimifolia	Groundsel tree	x	x	x		x		x
31. Compositae	Eupatorium capillifolium	Dog-fennel	x		x		x		x
32. Compositae	Helenium amarum	Sneezeweed	x		x		x		
33. Compositae	Iva frutescens	Marsh elder	x	x	x		x		x

* Nomenclature follows: Gleason, H.A. and A. Cronquist. 1963. Manual of Vascular Plants. (D. Van Nostrand Company, New York) and Harrar, E. and J. G. Harrar. 1962. Guide to Southern Trees. (Dover Publications, Inc. New York).

** General areas include the Michoud Facility Grounds and natural areas along roadways on and off the site, i.e., Old Gentilly Road and Louisiana State Route 47.

*** Weeds or plants of disturbance (mowed areas, filled areas, or otherwise).

Assistance in plant identification was provided by Mrs. Beverly Poolson and Mr. Howard Clark.

reservoir. These areas are characterized by an unusually high but stable productivity for a recently disturbed environment. Also, they are quite different in species composition from the generally undisturbed marsh vegetation to the south and southeast of the canal. Live oaks (Quercus) are occasionally observed on the Michoud facility grounds and are representative of plantings.

No rare and/or endangered plant species were observed at the site and none are known to occur at other seasons in the year. The possibility of seasonally ephermeral species exists, but could not be documented during the brief period of observation.

(b) Fisheries: Aquatic biota in the Canal, Gulf Intracoastal Waterway and the nearby marshes are significant resources for commercial and recreational fishermen in the study area. An intensive study of the fin fishery in the Mississippi River-Gulf Outlet area disclosed 82 species, of which the spot (Leiostomus exanthurus) was the most abundant at 28 percent (COE, 1975). Two species of anchovies (Anchova mitchilli and A. hepsetus) together comprised 22 percent. Next in abundance was the croaker (Larimus fasiatus). Other important types were menhaden (Brevoontia sp.), sand seatrout (Cyonscion arenarium), channel catfish (Ictalurus punctatus), hogchoker (Trinectes maculatus), and the spotted seatrout (Cynoscion nebulosus).

Among the shellfish, the white shrimp (Panaeus setiferus), brown shrimp (P. aztecus), blue crab (Callinectes sapidus) and the oyster (Crassostrea virginica) are the major commercial species in the area. The shrimps and crab frequent the Gulf Intracoastal Waterway and the brackish marshes near Michoud and are fished there, but the major commercial oyster grounds are further away. The nearest are in Lake Borgne.

Salt water intrusion, steadily increasing over the past 20 years and accelerated by the Mississippi River-Gulf Outlet Channel south of the site, has reduced the commercial oyster productivity of this area by 60 to 65 percent, which greatly concerns the Wildlife and Fisheries Commission and the oyster industry.

The 1970 total commercial value of the finfish and shellfish harvests in Louisiana was $62.5 million, of which shrimp accounted for $31.6 million, menhaden $18.9 million, oysters $3.63 million, crabs $1.1 million, and others $7.3 million (COE, 1975).

Observations at four estuarine sites on or near Michoud in August, 1975 (Figure 14) indicate the area to be productive and relatively unpolluted. Algal development in shallow waters is not excessive or abnormal in relation to other salt marsh systems along the Gulf Coast, but blooms are known to occur in the Michoud area. Blue crabs of various sizes were observed at all sites except the reservoir, and killifishes observed at Site 1 were both numerous and varied in size.

Aquatic biota in the fresh water reservoirs at the three observation sites were plentiful and diverse. Culverts contained minnows, killifishes and fry of other forms of fishes. Productivity of both the

saline and fresh waters in the study area is apparently high. The aquatic biota of the Michoud, brackish marsh and Mississippi River-Gulf Outlet are listed in Appendix B.

(c) Wildlife: Field studies made as a part of this environmental assessment indicate that the proposed site is adjacent to a high quality wildlife habitat, the estuarine marshes. The reservoir and canal systems provide an ideal habitat for wading and shore birds such as little blue herons (*Florida caerulea*) and common egrets (*Casmerodius albus*). Other birds observed on the site include red-winged blackbirds (*Agelaius phoeniceus*), bobolink (*Dolichonyx oryzivorus*) (probably a migrant), terns (*Sterna* sp.), and bobwhite quail (*Colinus virginianus*). A large variety of birds may be expected to frequent the area periodically because of the proximity of the site to the Mississippi Flyway for migratory birds. Many sightings of swamp rabbits (*Sylvilagus aquaticus*) indicate the probability of a sizable population.

Commercially important furbearers that inhabit brackish marshes such as those adjacent to Michoud are listed in Table 13. The 1972-1973 Louisiana fur catch was valued at 9.6 million dollars, about 85 percent of which came from nutria, muskrat, and mink (COE, 1975).

Table 13. Important Furbearers of Louisiana Marshes.

Species Name	Common Name
Myocastor coypus	Nutria
Ondatra zibethica	Muskrat
Mustela vison	Mink
Lutra canadensis	River Otter
Procyon lotor	Raccoon
Didelphis virginiana	Opossum
Mephitis mephitis	Striped Skunk

Source: COE, 1975

A comprehensive listing of Louisiana wildlife, with an indication of those likely to be found on or near Michoud, is presented in Appendix E.

Endangered species of reptiles, birds, and mammals which may occur in southern Louisiana are listed in Table 14. Although none of these have been observed to nest or breed at Michoud, several may breed in the adjacent marshes.

Of the nine rare or endangered species in Table 14, the alligator and eagle would be most likely to frequent the site and adjacent marshes. At least one alligator has been evicted from the Michoud reservoir in recent years. Hypothetically, only the woodpeckers would not be expected to occur in the area, due to the lack of forests.

Table 14. Endangered* Native Wildlife Found in Louisiana.

Common Name	Species Name
REPTILES	
American alligator**	Alligator mississippiensis
BIRDS	
Mississippi sandhill crane	Grus canadensis pulla
Whooping crane	Grus americana
Southern bald eagle**	Haliaetus leucocephalus leucocephalus
American peregrine falcon	Falco peregrinus anatum
Brown pelican*	Pelecanus occidentalis carolinensis
Ivory-billed woodpecker***	Campephilus principalis
Red-cockaded woodpecker	Dendrocopus borealis

* Official endangered list updated FR January 14, 1977.

** These species are deemed most likely to be found on the Michoud property; however, they are not known to nest on the site.

*** This species is believed to be extirpated in Louisiana.

(iv) Air Quality.

(a) New Orleans Region: Air pollution is not a serious problem in metropolitan New Orleans. The area is not highly industrialized, and long periods of air stagnation are rare. Only 10 to 15 days of high meteorological potential for air pollution occur in five years (Schexnayder, pers. comm.). The Environmental Protection Agency has not designated New Orleans an Air Quality Maintenance Area, indicating that the area is expected to meet all ambient air quality standards in 1985. The area does, however, have an ozone problem. In recordings taken in October, November, and December of 1975, the two highest readings were 0.109 parts per million (ppm) and 0.091 ppm. The standard is 0.08 ppm (Louisiana Air Control Commission, Monitoring Division). MAF is believed not to be a contributor to the problem. EPA has made tests on site but have not released results.

Annual ambient air quality data for New Orleans has been published by the Louisiana Air Control Commission through 1974. Summaries for several

pollutants are shown in Figures 17a and 17b. The data collected from the New Orleans Civic Center station, 15 km (9.5 mi) west-southwest of Michoud, may not accurately reflect conditions at MAF. As can be seen in the figure, sulfur oxide pollutants are below legal thresholds, but total suspended particulates and the soiling index have sometimes exceeded standards, probably due to construction near the sampling station.

Carbon monoxide concentrations are very low in the area. Only two violations (both of the eight-hour standard, during major public events in 1973) have been recorded during spot samples collected in the city. The carbon monoxide concentration at Michoud is probably less than 500 micrograms per cubic meters ($\mu g/m^3$) (von Bodungen, pers. comm.); the eight-hour standard is 10,000 $\mu g/m^3$.

Particulate levels measured at the Kaiser Aluminum Plant in Chalmette met the primary standards but violated the secondary standards in 1975. The annual geometeric mean in Chalmette was 65 $\mu g/m^3$, above the 60 $\mu g/m^3$ secondary standard. The two highest twenty-four hour samples (of the ninety-five taken) were 177 and 173 $\mu g/m^3$. Both of these readings were above the 150 $\mu g/m^3$ secondary standard, which may be exceeded only once each year. Since the samples were taken 13 km (7 mi) southwest of Michoud, the data probably does not represent conditions at Michoud, which should be less severe than the general area, since MAF is not a high generator of particulate matter.

Total emissions in the 945 km^2 (365 mi^2) Orleans Parish are shown in Table 15.

Table 15. 1976 Air Pollutant Emissions from Orleans Parish and Michoud Assembly Facility.

Pollutant	Orleans Parish mtons/year	Michoud Facility mtons/year	Michoud Emissions as Percent of Total Parish Emissions
Particulates	15,100	2.7 - 7.0	0.02 - 0.05
Sulfur Oxides	7,750	0.6	0.01
Carbon Monoxide	235,000	69.6	0.03
Hydrocarbons	47,900	53.3	0.11
Nitrogen Oxides	52,500	56.8 - 104.8	0.11 - 0.19

Source: Orleans Parish Emissions, from USEPA National Emissions Data System, August 1975.

(b) Michoud Assembly Facility Emission Inventory: As Table 15 shows, the Michoud Assembly Facility produces 0.01 to 0.19 percent of Orleans Parish air pollution. Table 16 lists the main pollution sources at the Michoud Facility.

- Boilers. The Michoud Assembly Facility contains thirteen boilers, of which six are generally in use at any one time. Others serve alternately as stand-by equipment. Three of the operating boilers are large, 22-37.8 million Calories (90-150

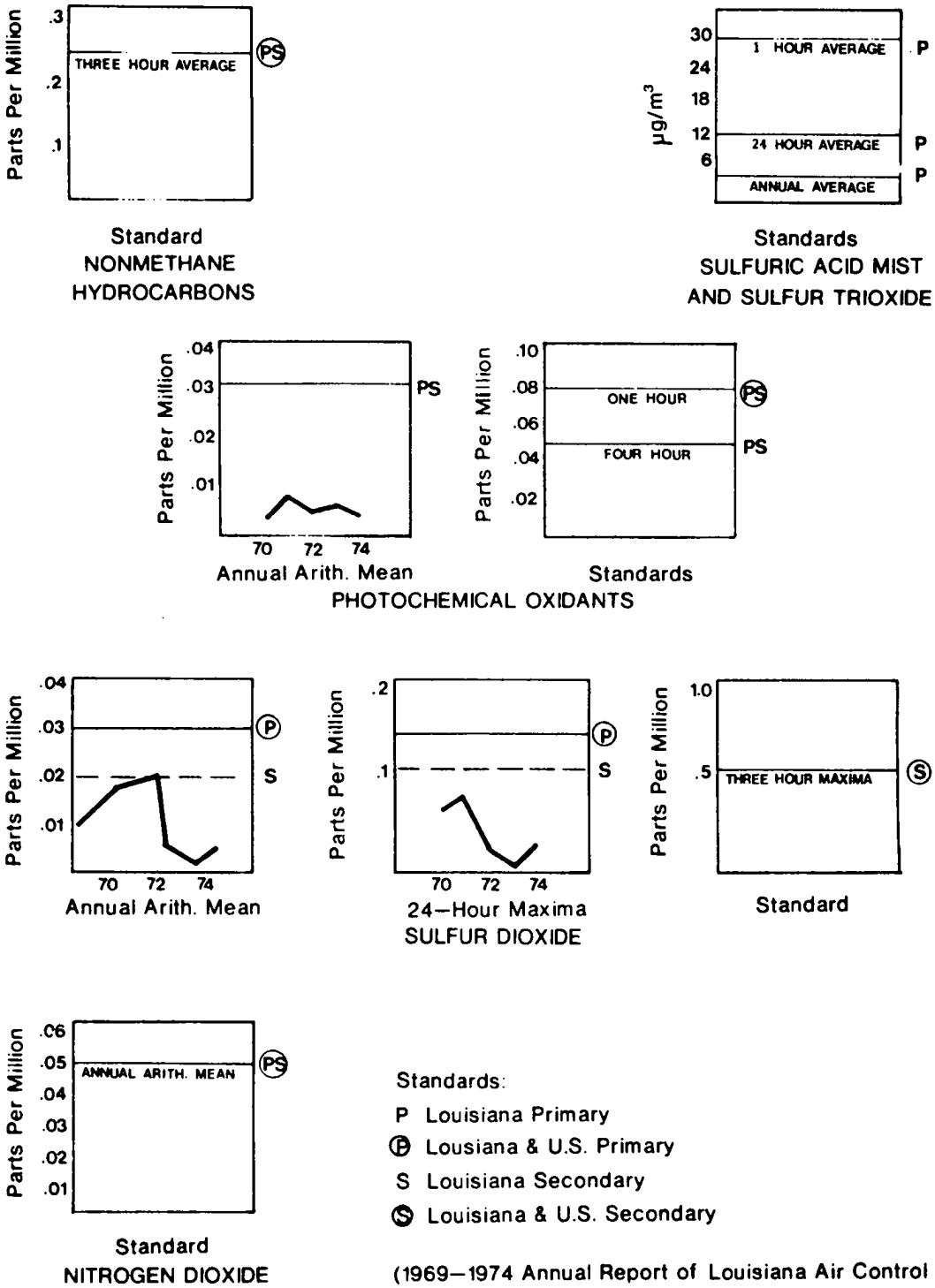


Figure 17a Ambient Air Quality In New Orleans Louisiana

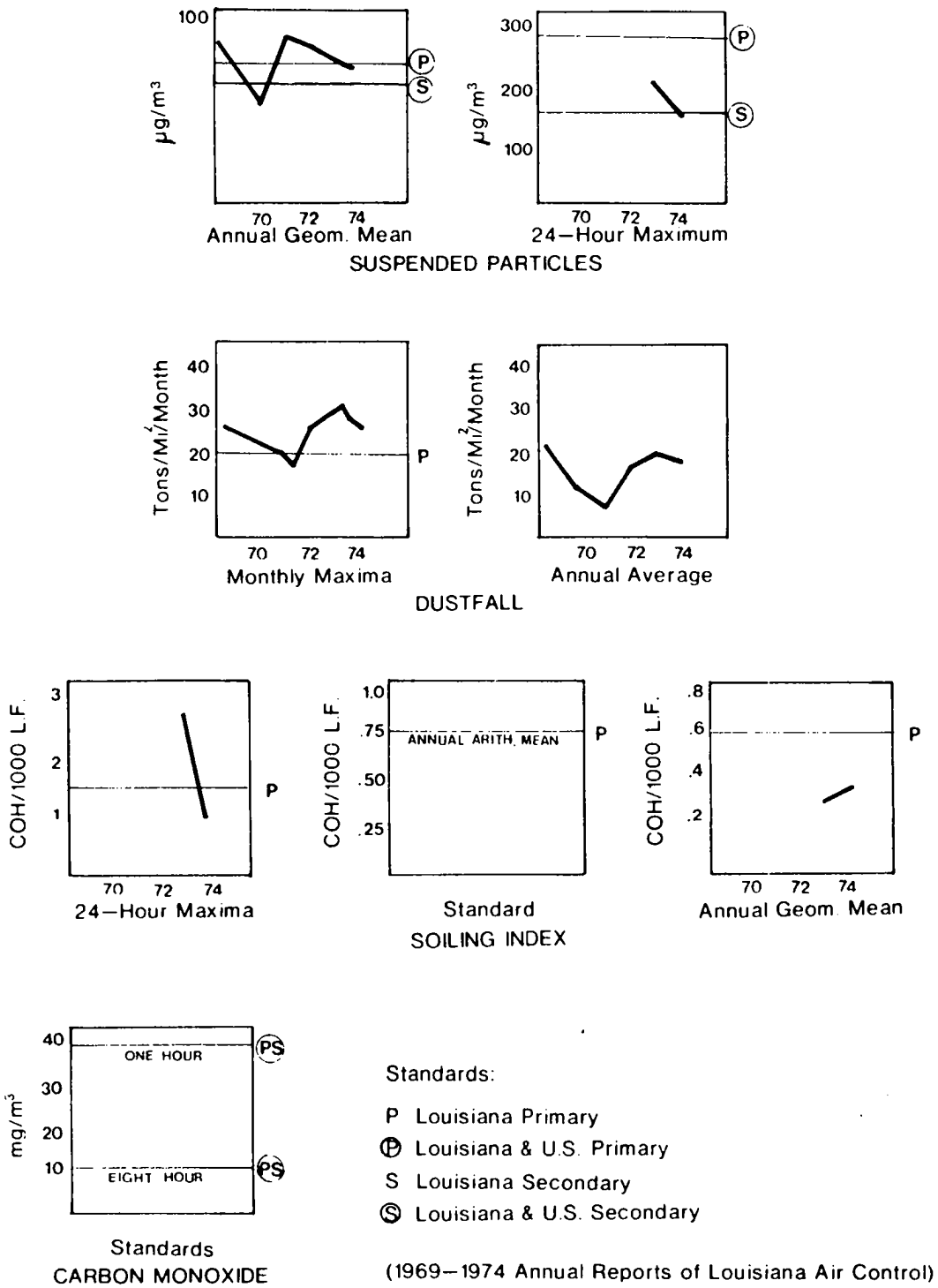


Figure 17b Ambient Air Quality In New Orleans Louisiana

million Btu) units, which produce steam. The other three, .5 - 2.6 million Calories (2-10.2 million Btu), heat water. See Appendix D, Tables D-1 and D-2, for detailed data regarding MAF boilers and emission factors.

The boilers burn 24 million m^3 (847 million standard ft^3) of natural gas per year; No. 2 fuel oil is used as a stand-by fuel. Emissions comply with Louisiana Air Pollution Control Commission regulations, and are listed in Table 16.

Commuters. Employees commuting to the Michoud Assembly Facility average 26.1 km (16.17 mi) per day, according to a spring 1974 poll of the Facility workers. This is discussed in Appendix D, Tables D-3 and D-4. Annual emissions are summarized in Table 16. Commuter emissions assume 95 percent employee attendance, 97 percent arriving by car, and 1.6 people per average car. As Figure 18 indicates, 56 percent of the pollution is emitted from cars from the south and west, 38 percent is from the north and northeast, and 5 percent is from the east Orleans area. The pattern is expected to remain constant through 1980, although the total volume may increase five percent.

The heaviest traveled road bordering the Michoud Assembly Facility, Chef Menteur Highway, carries 16,000 vehicles per day. Assuming a high (i.e., 3,000 $\mu g/m^3$) background carbon monoxide level, the heaviest segment may attain a maximum eight hour carbon monoxide concentration of 7,000 $\mu g/m^3$. This concentration is well within the 10,000 $\mu g/m^3$ state/national standard. The maximum concentration was calculated by the Environmental Protection Agency's HIWAY model using worst weather conditions and a 3.6 km/hr (2.2 mi/hour) speed. The Michoud Assembly Facility contributes a limited amount of traffic to the total traffic on Chef Menteur Highway.

Although future traffic volumes have not been forecast, no violation of carbon monoxide concentration standards is expected in the area.

Spray Painting. Approximately 6,123 liters (1,619 gal) of paint are sprayed at the Michoud Assembly Facility each year. Sources and amounts of paint are shown in Appendix D, Table D-5. The painting releases overspray particles and hydrocarbon solvent vapor.

Particulate matter emitted in spray booths (in Buildings 103, 303, and outside 119) is captured by water curtains containing a paint coagulant; the effluent is discharged to the Chemical Wastewater System.

Hydrocarbons, however, are not captured by the particulate control system. At 0.56 mtons emission per mton of paint

Table 16. Net Air Pollutant Emissions by Major Source, MAF, 1976, in mtons (and tons) Per Year and as Percentage of Total.

Pollutant	Source									
	Boilers[1]	%	Painting[2]	%	On-Site Vehicles[3]	%	Chemical Processing[4]	%	On-Site TOTAL	MAF Commuters[5]
Particulates	2.2-6.5 (2.4-7.2)	81-93	trace	0	0.5 (0.6)	7-19	---	0	2.7-7.0 (3.0-7.8)	10.6 (11.7)
Sulfur Oxides	0.3 (0.3)	50	---	0	0.3 (0.3)	50	---	0	0.6 (0.6)	3.5 (3.9)
Carbon Monoxide	7.4 (8.2)	11	---	0	62.2 (68.4)	89	---	0	69.6 (76.6)	617.8 (679.6)
Hydrocarbons	1.3 (1.4)	2	6.5 (7.1)	12	9.4 (10.0)	18	36.1 (39.7)	68	53.3 (58.2)	85.3 (93.8)
Nitrogen Oxides	52-100 (57-110)	92-95	---	0	4.8 (5.3)	5-8	---	0	56.8-104.8 (57.5-115.0)	91.2 (100.3)

[1] See Appendix D, Table D-2, for emission factors. These were applied to total fuel consumption to give listed emissions.

[2] See Appendix D, Table D-5.

[3] See Appendix D, Table D-8.

[4] See Appendix D, Table D-10.

[5] See Appendix D, Table D-4.

SOURCE: USEPA Compilation of Air Pollution Emission Factors, AP-42. April 1973, revised July 1974, applied to numerical quantities supplied by NASA-MAF.

(USEPA, 1974), painting emits 6.5 mton (7.1 tons) of hydrocarbon vapor per year. This is also shown in Table D-5.

Section A22.9 of the Louisiana Air Control Commission Regulations prescribes that sources which emit over 1.3 kg (3 lbs) of organic solvent per hour or 6.8 kg (15 lbs) per day must incorporate ninety percent efficient incineration, carbon absorption, or an approved equivalent; the Section is interpreted to permit 6.8 kilograms per source per day. One of the four spray booth sources on the Michoud Assembly Facility complies with Section A22.9; the other three exceed allowable amounts, as shown in Table D-5. There is no proposed change in paint consumption through 1982.

Welding. Welding at the Michoud Assembly Facility currently produces 200 kilograms (440 lbs) of metal fume per year, plus an unknown amount of acetylene, ozone, and helium. Direct current tungsten arc welding in a helium atmosphere will emit 50 kilograms of fume per tank constructed. Emissions are below toxic levels. Welding emissions are shown in Appendix D, Table D-6. The fumes are controlled by fiberglass mat filters or electrostatic precipitators followed by waterwash spray scrubbers. Since plant air is cleaned and recirculated, no fumes are released directly to the atmosphere. Virtually all of the ozone and some fumes are captured by chilled water spray scrubbers. Emissions are negligible.

Chemical Processing. Chemical processing refers to three operations. The first is cleaning and degreasing components with trichloroethylene. The second and third refer to cleaning and applying the Thermal Protection System to the External Tanks. Present figures regarding emissions from External Tank operations are based on a production rate of three per year. The proposed maximum rate is 60 per year.

Component part cleaning and degreasing is done in three trichloroethylene vapor vats in Building 103. An estimated average consumption of this chemical is currently 6,935 kg/month, or about 315 kg/day. Louisiana Air Control Commission Regulations (Section A22.9) are interpreted to permit 6.8 kg per source per day. With three sources (vapor vats) at MAF, present calculated emission through loss of liquid trichloroethylene is 105 kg/day. Some of this organic solvent vaporizes from the vapor vats. Some drips off components after immersion in the vats. Some becomes dissolved in water in the washing and rinsing operations after vapor degreasing. The rinse water and drippings are collected in the chemical wastewater system and are stored in the holding pond behind Building 103. Trichloroethylene would probably evaporate into the air there. A portion might remain to be pumped into the deep well, depending in part upon the length of time it remained in the pond. Trichloroethylene is presently under investigation and some carcinogenic effects have been reported from animal tests. There is a possibility that OSHA requirement and air quality standards may be significantly more restricted at sometime in the future.

The next two operations both involve External Tank production. One uses trichloroethylene for cleaning and degreasing of the tanks. This is a liquid spray process, and will be controlled by a carbon adsorption system theoretically rated to be 98 percent efficient. Approximately 45 kg of trichloroethylene will be used for cleaning each tank. At a recovery rate of 95 percent, approximately 23 kg will remain as hydrocarbon emissions per tank. At the present production rate of three tanks per year, hydrocarbon emissions from cleaning external tanks would be 69 kg per year. This is shown in Appendix D, Table D-10. Standards require control if emissions are 6.8 kg/day (1,768 kg/year), or more, per source of hydrocarbon emission. Therefore, the External tank cleaning operation is in compliance with Louisiana air pollution regulations.

The third and final chemical processing is the Thermal Protection System, which protects the contents of the External Tank from excessive heat. This system uses special ablators and foam. Ablators are coatings which absorb aerodynamic and radiated heat to protect underlying materials. Ablators may be attached layers of one or two inches of rigid urethane foam, or layers which are sprayed or attached onto component parts. The ablators char, disintegrate, and vaporize at controlled rates in the course of a flight. Large External Tank surfaces will receive preformed ablators. Smaller components will be sprayed with a silicone ablator slurry. Ablators will be mixed in closed, emission-proof vats. Ablator coatings and the respective hydrocarbons are shown in Appendix D, Table D-10.

An insulation material such as CPR 488 will be blown onto tank surfaces by freon F-11 (trichloroflurometh ane). Ninety-nine percent of the freon is expected to remain within the foam cellular structure. Foam hydrocarbons are shown in Appendix D, Table D-10. About 32 kg (71 x 10^3 lbs) of freon will be emitted per tank.

Application of the total protection system would emit 256 kg of hydrocarbon vapor per tank per year if there were no controls. With proposed carbon bed recovery systems or catalytic converters, emissions are expected to be reduced by 95 to 98 percent. Net emissions therefore would be 5.1 kg (11.3 lbs) of hydrocarbon vapor per External Tank. At present production of three tanks a year, net emissions would reach 15.3 kg (33.9 lbs) per year. This is well within Louisiana air quality standards for hydrocarbons per source per year.

- Sandblasting. The infrequent sandblasting on the Michoud Assembly Facility is restricted to the blasting shed. Cyclone or air bag collectors will be installed on the shed before any future blasting is undertaken. Emissions from sandblasting will thus be negligible.

AIR POLLUTION FROM VEHICLES OF COMMUTERS TO M.A.F.
(By Residence Location, As Percent Of Total)

RESIDENCE LOCATION	PERCENT	
South and West	16.7	
	29.5	
	4.2	
	5.6	
		56.0
North and East	27.6	
	10.4	
		38.0
East Orleans	5.0	
Other	1.0	
		6.0
Total		100.0

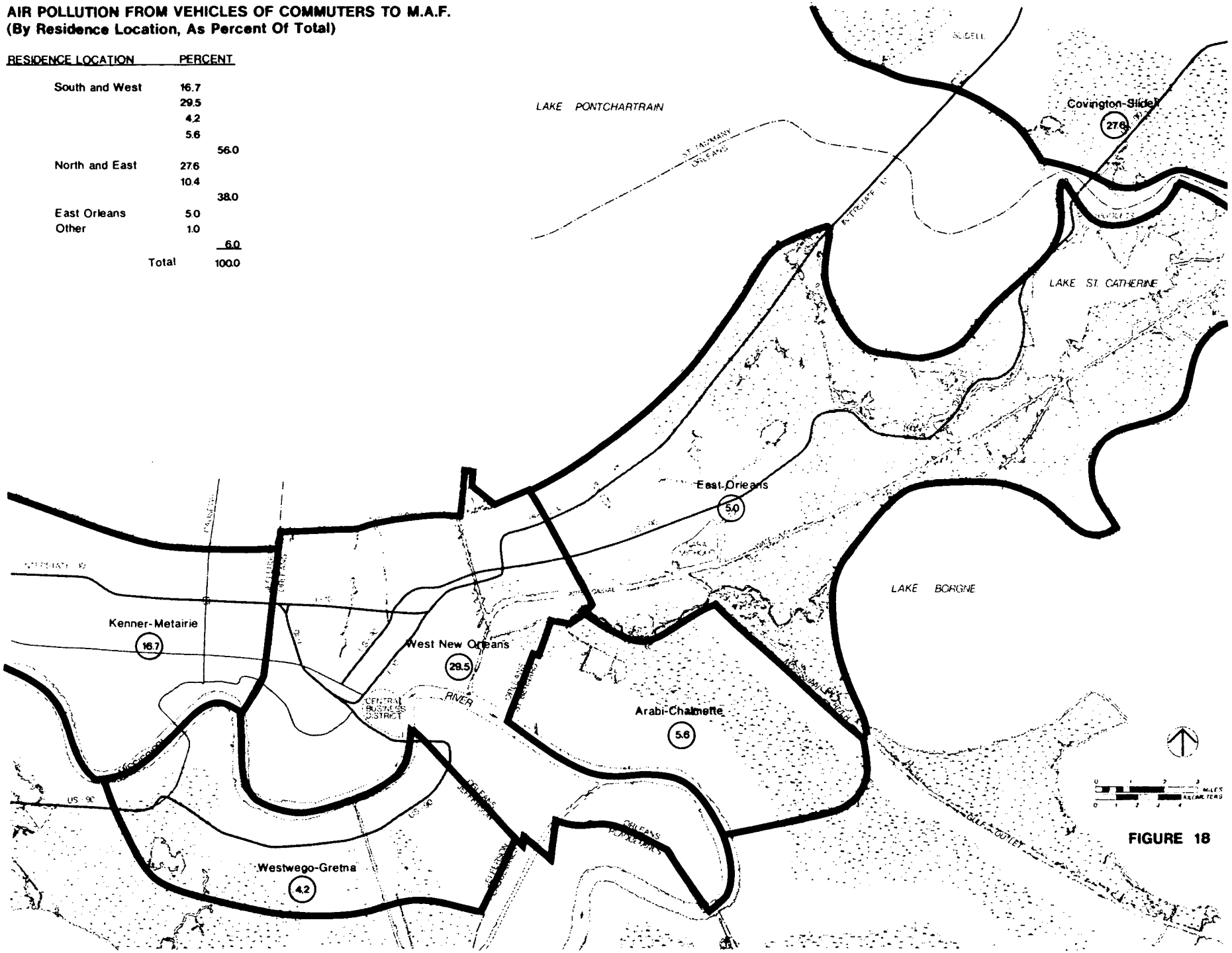


FIGURE 18

- Industrial Internal Combustion Vehicles. One hundred and sixty-three gasoline and diesel vehicles, ranging from fork lifts to cranes, operate on the Michoud Assembly Facility. The vehicles use 238 m^3 (63,000 gal) of gasoline and 75 m^3 (20,000 gal) of diesel oil per year. It is expected that these vehicles will continue to consume these amounts of fuel through 1982.

  Given the range of vehicle types and the incompleteness of emission data, average emission factors for light and heavy gasoline and diesel vehicles were used to estimate emissions. Appendix D, Table D-7, lists emission factors for industrial vehicles. Table D-8 shows net emissions from industrial vehicles at MAF. Table 17 shows the number of vehicles used by various contractors with and without pollution control. All new vehicles purchased have emission controls.

Table 17. Industrial Internal Combustion Engines, MAF.

Contractor	Without Pollution Control	With Pollution Control
Boeing Services International	48	50
Martin-Marietta	60	0
Chrysler	1	0
Bell Aerospace	3	1
Total	112	51

- Acceleration Sled. The Navy Aerospace Medical Research Laboratory uses an acceleration sled propelled by pressured nitrogen. The sled releases a maximum of 566 m^3 (20,200 ft^3; 708 kg) of nitrogen gas per day in no more than eight quick, very localized operations. The free nitrogen disperses quickly in the atmosphere. Since the air itself is about seventy-eight percent nitrogen, the acceleration sled's "effluent" is of no consequence. The average daily output from the operation is about 300 m^3 (10,700 ft^3; 375 kg). Emissions would have to be millions of cubic feet (28,000 cubic meters = one million cubic feet) over short periods before there would be any cause for concern.

(c) Summary of MAF Emissions: In comparison with total Orleans Parish emissions, the percent coming from MAF is insignificant. Measured at the source, emissions from MAF boilers are in compliance with Louisiana regulations. On-site government vehicles produce some emissions and are the chief source of carbon monoxide pollutants at the facility. Many of the vehicles were purchased before emission controls were available or required. New vehicle purchases will comply with current regulations.

Acceleration tests, welding, and sandblasting operations expel either harmless or negligible emissions into the ambient air.

Commuters to MAF generate emissions from their automobiles as they drive between their residences and Michoud. These products, which are summarized in Table 16, can be compared with the total emissions at the Michoud site. It will be noted that more of each of the pollutants are generated by commuters than are produced by operations at MAF, except in the case of nitrogen oxides when the boilers are in full operation.

Hydrocarbon emissions from present paint spraying activities exceed standards by eight percent at one booth and 71 percent at a second, and from 96 to 161 percent at a third. These emissions will be controlled to acceptable levels, and will be discussed further.

Hydrocarbon emissions from chemical processes of cleaning and degreasing with trichloroethylene in three vapor vats also exceed Louisiana regulations. The cleaning process results in a loss which is calculated to be about 26.2 kg per vat per day. This is in excess of an allowable 6.8 kg per day. These emissions will also be controlled, and will be discussed further, in section II. A.2.c.

(v) Noise. A noise survey was conducted as part of this environmental assessment to establish the existing noise situation at Michoud. Ambient noise level readings were made using a Pulsar Model 40 sound level meter (ANSI SI.4 1971 Type 2) set on the "A" scale, slow meter response, with windscreen attached. It was calibrated before and after readings. The results of the analyses are depicted in Figures 19 and 20. The numbers shown represent "L_{10}" or noise levels which are exceeded 10 percent of the time. The major noise-producing machinery and their typical noise levels were identified to assist in understanding current noise levels.

Michoud is relatively isolated from noise-sensitive areas. In the immediate vicinity of the MAF is the Intracoastal Waterway and several industrial establishments. The closest residential areas are north of Chef Menteur Highway.

The site can be characterized as reasonably quiet; no environmental noise problems were identified. Figure 20 shows that outdoor levels on-site are comparable to the levels of average conversation or a moderately noisy household. Figure 19 also illustrates the existing noise situation at several points near the MAF along Old Gentilly Road. The nomograph method for approximate prediction of highway noise levels (Federal Highway Administration, 1973) was used for this analysis. Measurements indicate that traffic noise (represented by the "L_{10}" level) is generated primarily by trucks. Truck traffic originates, in part, from a truck depot located west of Michoud Boulevard on Old Gentilly Road. In addition, the industrial establishments located along Old Gentilly Road also require fairly frequent truck service. During off-peak hours, trucks account for 15 to 20 percent of traffic on Old Gentilly Road.

ENVIRONMENTAL NOISE AT MAF

- ● Mid-day Noise in dBA, L18, 15m. from Source
- ◉ Traffic at Peak Hour in dBA, 30m. and 60 m. from Source
- (1) Source of Noise as Sketched in Figure 20

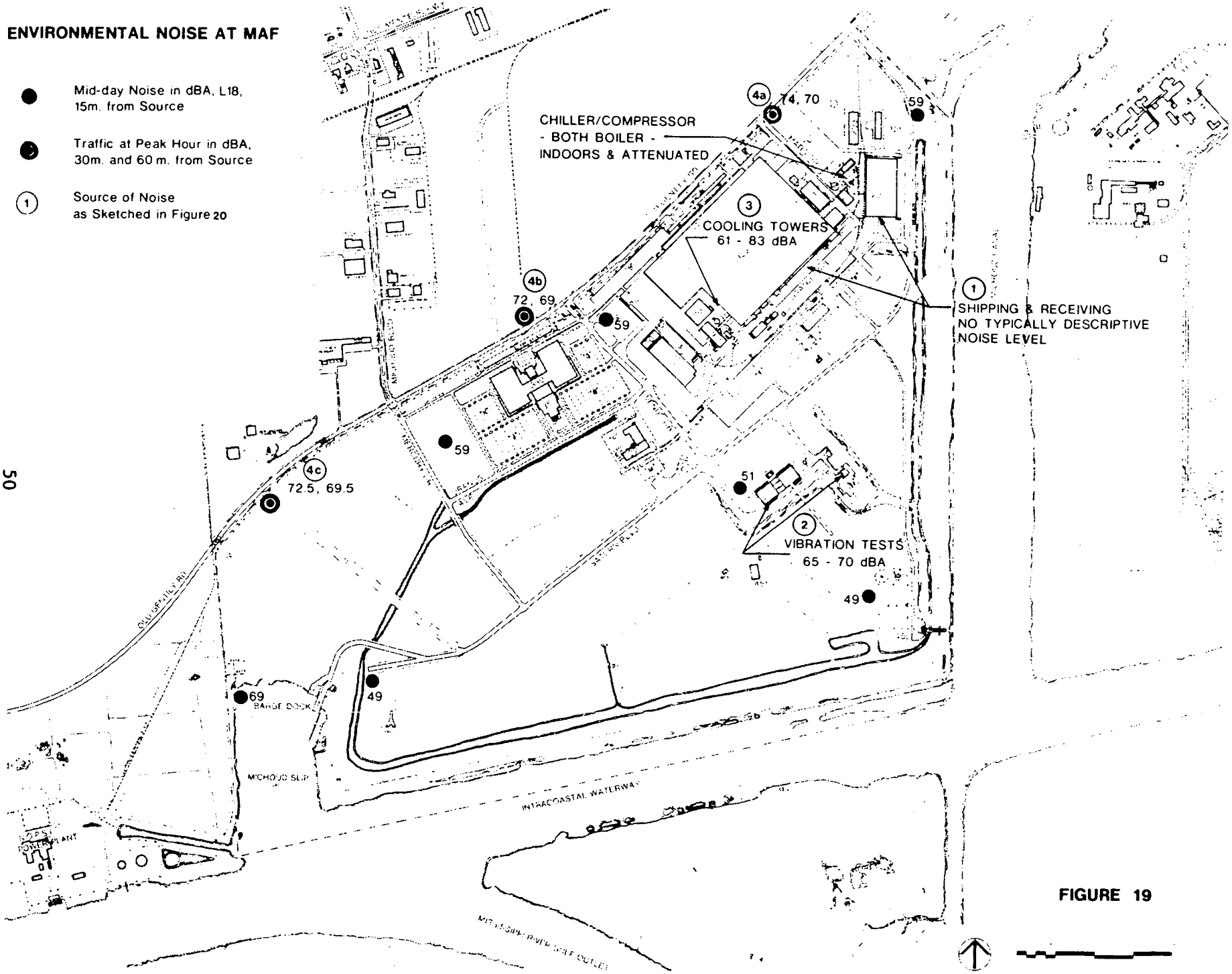


FIGURE 19

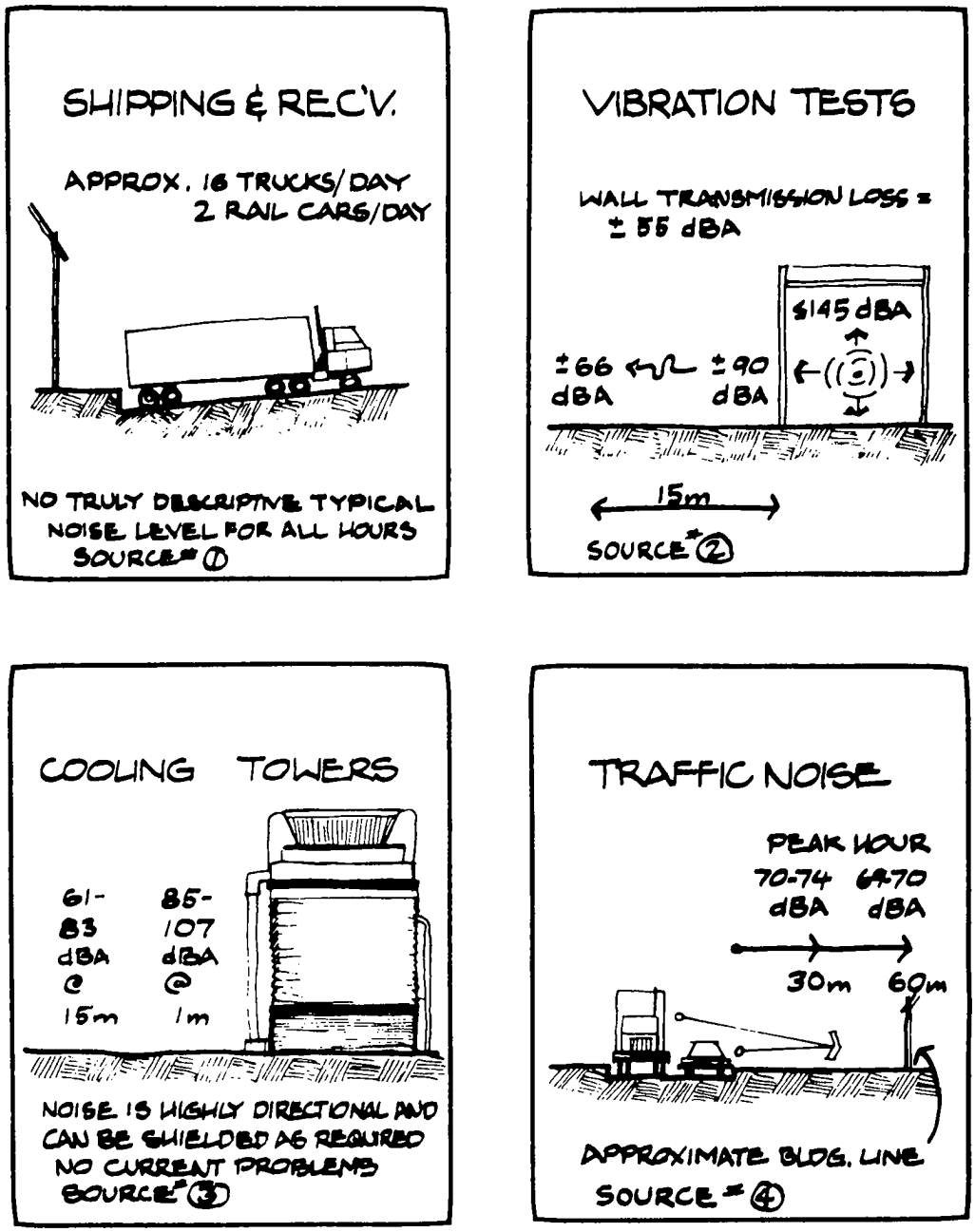


FIGURE 20 NOISE LEVELS TYPICAL OF MACHINERY AT MICHOUD

During the peak hour, Michoud currently generates about 1,630 vehicle trips. Noise from passenger car traffic, however, is not additive to the noise from trucks. Simply stated, truck noise "drowns out" the noise generated by passenger car traffic. While noise from Michoud traffic on old Gentilly Rd. ranges between 57 dBA and 62 dBA at 30 m (98.1 ft), the overall noise level during the peak hour is between 72 dBA and 74 dBA at 30 m, due to the predominant truck noise.

The general noise standard for industrial areas is 75 dBA at the building line. With the minimum building setback at Michoud greater than 45 m (150 ft), no standards are currently being exceeded.

(vi) Environmentally Sensitive Areas.

Environmentally sensitive areas in the New Orleans region are those characterized as:

- highly productive (biologically), containing oyster beds and/or shellfish and finfish resources
- susceptible to damage by construction
- likely to be affected by pollution.

Figure 21 shows environmentally sensitive areas on and near the Michoud Facility. Areas most sensitive include the Michoud Canal as shown, and the marsh south and southeast of the site. Other sensitive areas include shoreline and levee vegetation and the freshwater reservoir on the site.

ENVIRONMENTALLY SENSITIVE AREAS IN AND AROUND MAF

- High Biological Productivity - Estuarine Waters (Commercial and Recreational Fishing and Transportation)
- Shoreline, Marsh, Dike Vegetation
- Freshwater Reservoirs and Drainage Channels
- High Public Use - Fishing, Boating, Shipping

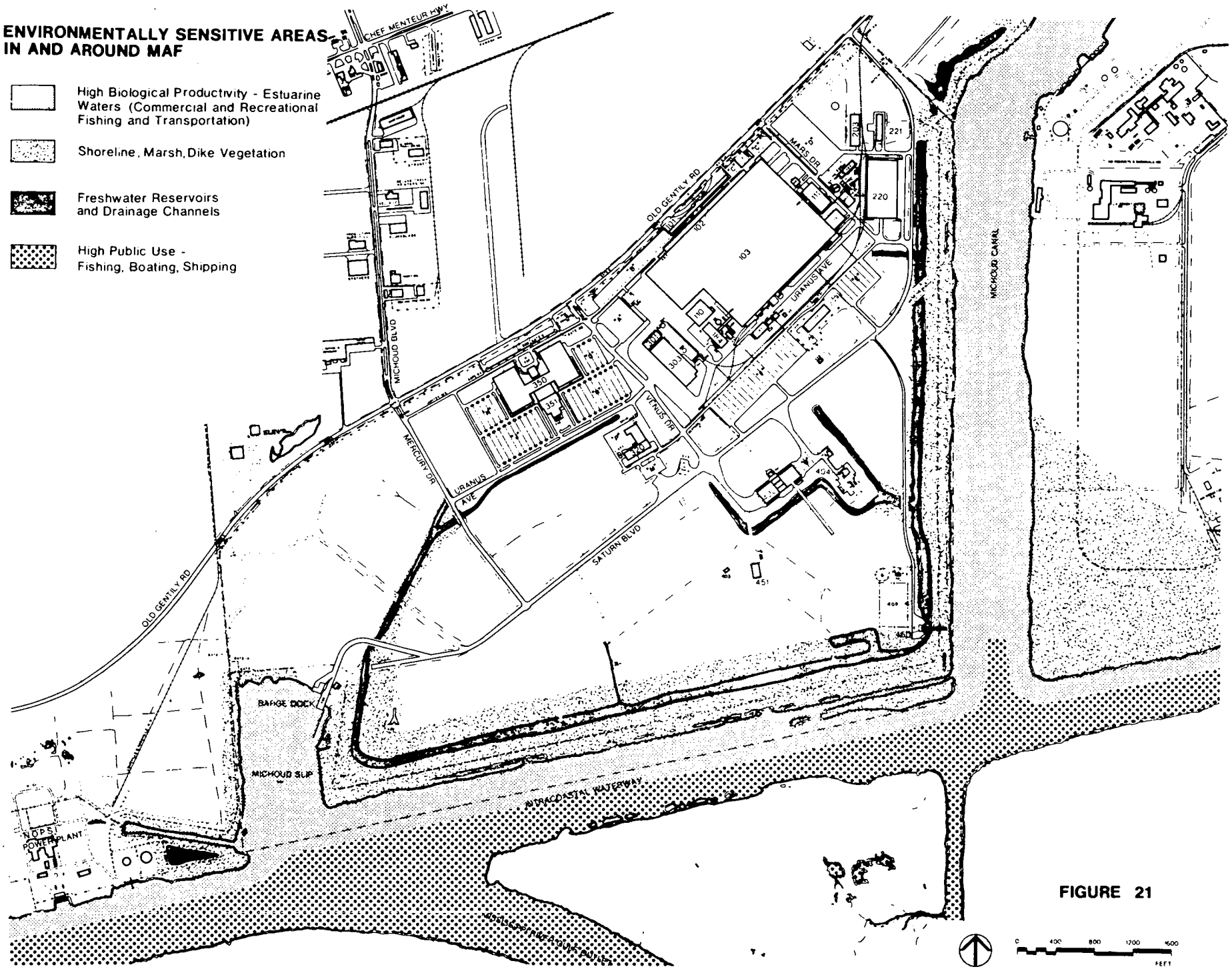


FIGURE 21

OUTLINE OF FOLLOWING SUBSECTIONS

2. Detailed Description of Existing Environmental Conditions.

b. Community Systems 54

(i) Population. 54

(ii) Housing. 57

(iii) Regional Economy. 59

(a) Economic Structure: 59
(b) Growth Rate: 60
(c) Employment Trends: 61

(iv) Government and Public Services. 61

(a) Police and Fire Protection: 61
(b) Education: 61
(c) Recreation and Open Space: 64
(d) Health Care: 64

(v) Archaeological and Historical Values. 64

(a) Pre-History: 64
(b) History: 66

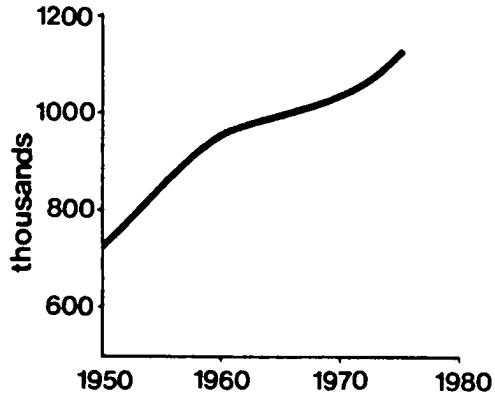
(vi) Aesthetics. 67

(a) Aesthetic Character: 67
(b) Relation to Site Environs: 68
(c) Visual Congeniality: 68
(d) Organization: 68
(e) Identity: 68
(f) Conclusions: 69

b. Community Systems.

(i) Population.

The pattern of population growth from 1950-1975 in New Orleans Standard Metropolitan Area (SMSA) is shown in Figure 22. Eastern Orleans Parish is one of the most rapidly growing areas of the region. While regional population increased 15.4 percent between 1960 and 1970, the population of eastern Orleans Parish increased by 89 percent (Table 18). This area is defined as Census Tracts 17.07, 17.08, 17.09, 17.10, 17.12 and 17.13 for this report (Figure 23). Census Tracts 17.11 through 17.13 had an even higher growth rate of over 212 percent between 1960 and 1970 (The MAF is located in tract 17.13). Even with the rapid growth of this area, it still represented only 4.3 percent of the 1970 Standard Metropolitan Statistical Area (SMSA) population.



Source: U.S. Census and La. Dept. of Employment Security

Figure 22 Population Growth New Orleans SMSA 1950 - 1975

Table 18. Population in the New Orleans Area.

Area	Population 1960	Population 1970	Percent Change	1970 Percent of SMSA
SMSA	907,123	1,046,470	15.4	100.0
Orleans Parish	627,525	593,471	-5.4	56.7
Eastern Orleans Parish*	23,562	44,550	+89.1	4.3

* Defined as Census Tracts 17.07-17.13.

Source: U.S. Census

Movement into the area has been primarily by professional, managerial, and clerical persons. Table 19 shows that median family income is considerably higher in the eastern area than in Orleans Parish or the SMSA in general. However, Census Tract 17.13, the most undeveloped area in eastern Orleans Parish, has a relatively low median income and a relatively high percentage of residents below the poverty level.

SELECTED CENSUS TRACTS IN EASTERN ORLEANS PERISH

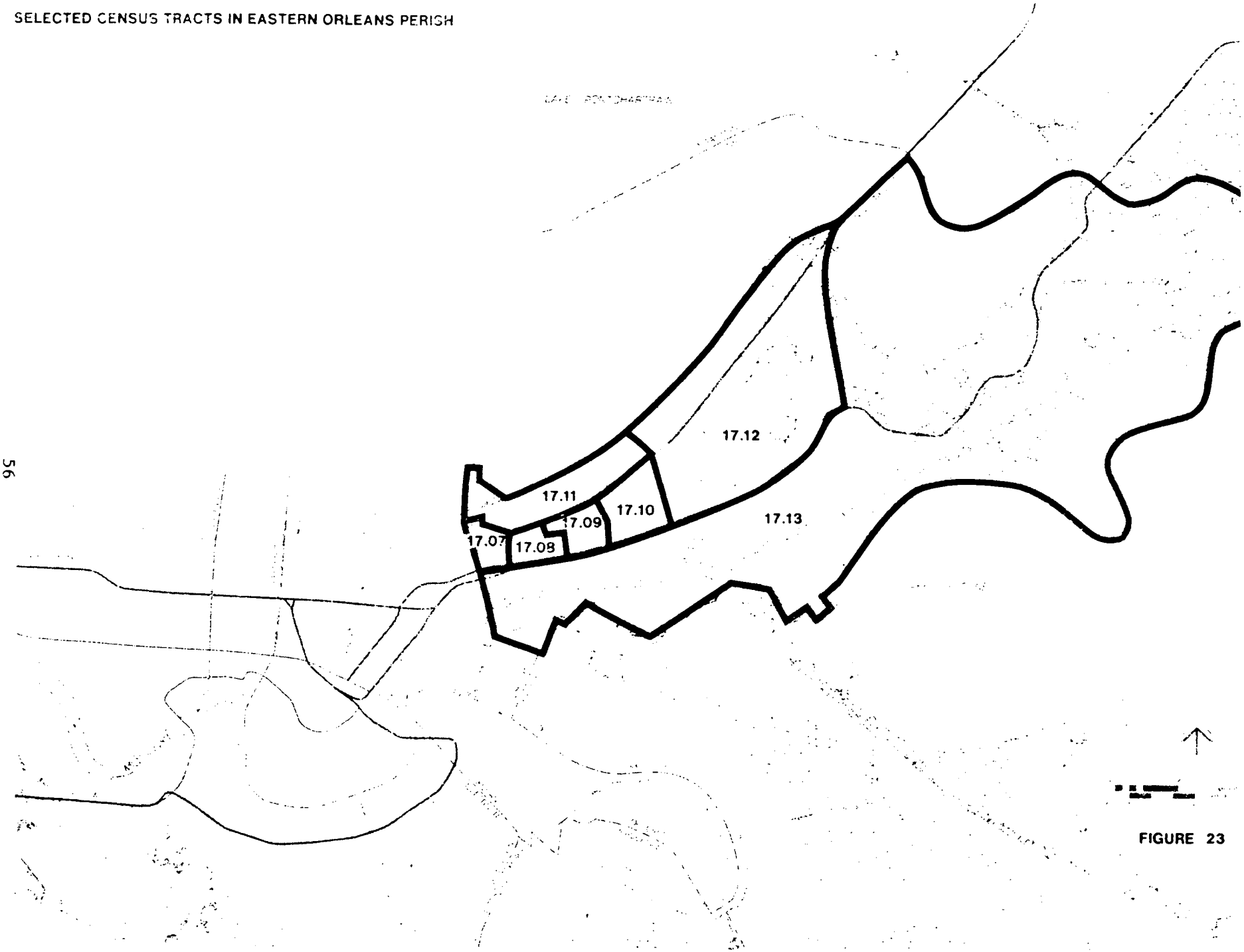


FIGURE 23

Table 19. Income Characteristics of the Region and Selected Census Tracts in Eastern Orleans Parish in 1970.

Area	Median Family Income (dollars/year)	Percent Below Poverty Level
SMSA	8,670	16.4
Orleans Parish	7,745	21.6
Eastern Orleans Parish	10,750	8.2
Tract 17.10	12,000	2.9
Tract 17.12	11,927	4.5
Tract 17.13	8,054	17.8

Source: U. S. Census, 1970.

Projections indicate that the area will experience continued growth through 1990. As population growth continues and resources in Tracts 17.10 and 17.12 are depleted, Tract 17.13 will be the focus of major development efforts, according to the Interim Land Use Plan of June, 1973.

From data obtained by a 1974 car pool survey of MAF employees, a residential living pattern was obtained. Approximately one half of the employees participated in the survey. Tabulation of the data revealed that 53 percent of the employees reside within Orleans Parish. About one-third of these live in the eastern Orleans area. Figure 24 shows the locations and percentage distributions. The remainder of the employees live in various other regions in the New Orleans area.

(ii) Housing. Most housing in the vicinity of Michoud is single-family units in low-to medium-density developments. Median housing values are above the values in the New Orleans SMSA and Orleans Parish, indicating the relative affluence of the area (Table 20).

Table 20. Housing Characteristics in the New Orleans Area, 1970.

	Owner-Occupied Units			Rental Units		
Area	Number	Average Value $	Vacancy Rate %	Number	Average Rent $	Vacancy Rate %
SMSA	318,418	20,000	0.8	152.346	70	3.3
Orleans Parish	191,363	21,000	0.6	115,995	67	9.9
Tract 17.10	1,348	24,200	1.4	181	150	4.4
Tract 17.12	1,445	28,600	1.4	900	147	21.3
Tract 17.13	1,174	11,600	0.4	549	98	33.3

Source: U.S. Census, 1970.

RESIDENTIAL LOCATION OF M.A.F. EMPLOYEES, 1974

PARISH	COMMUNITY	PERCENT
Orleans	Orleans West (36)	
	Orleans East (17)	53
Jefferson	Kenner-Metairie (11)	
	Westwego-Gretna (3)	14
St. Bernard	Arabi-Chalmette	10
St. Tammany	Covington-Slidell	19
	(State of Mississippi)	4
	Total	100

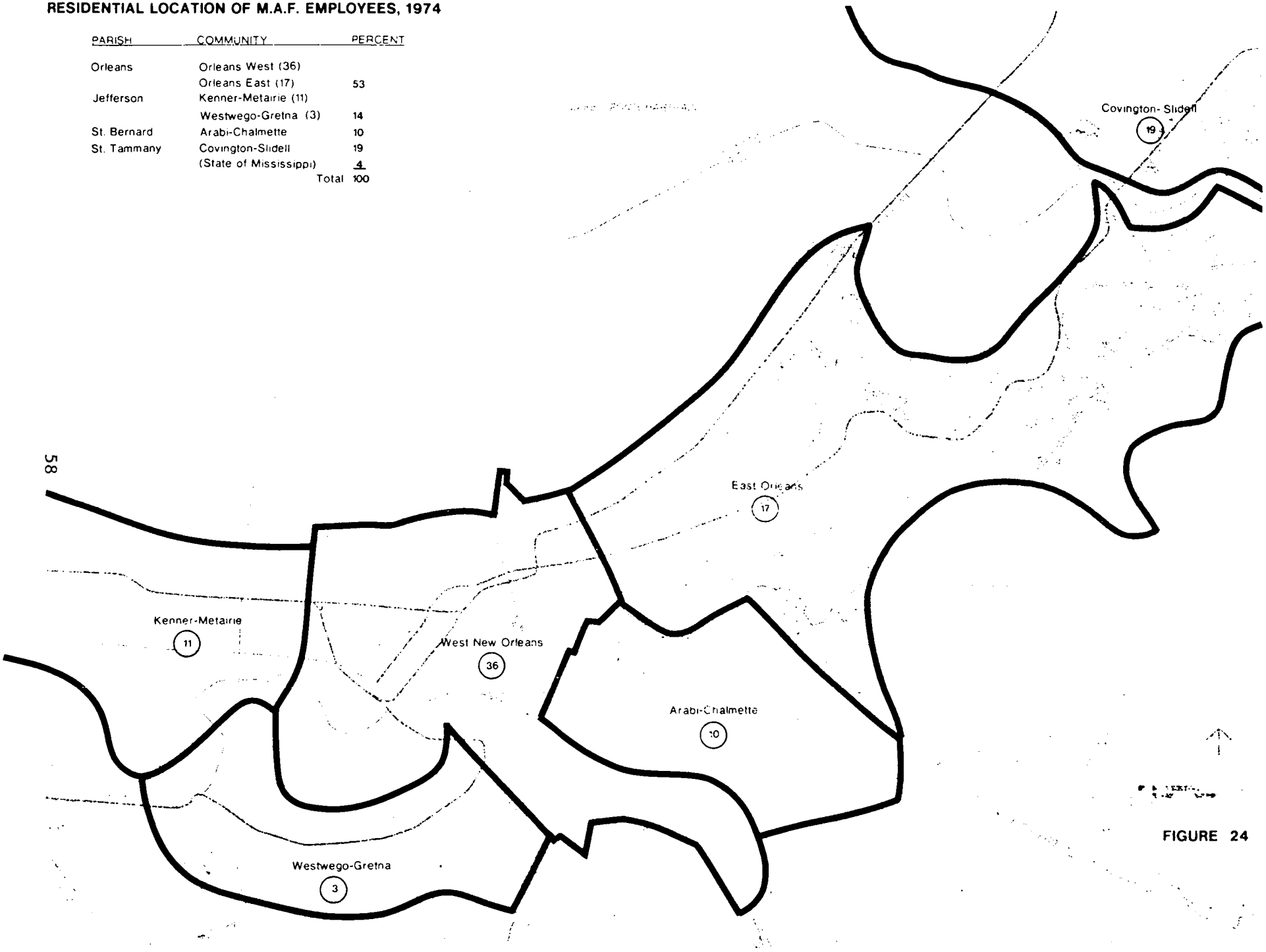


FIGURE 24

Several large-scale developments have been undertaken in eastern Orleans Parish. Village de l'Est, a residential commercial development, was built in the 1960's, partially to accommodate the Michoud population employed for the Saturn/Apollo Program. The decline of the Michoud population in the late 1960's, combined with building foundation problems, resulted in residential vacancies within Village de l'Est.

However, natural migration trends coupled with increasing employment opportunities in the area have created a demand for housing exceeding the present supply. Planned developments will alleviate this shortage within the next several years. One large-scale private development called Orlandia has been planned for the entire eastern Orleans area. This proposal replaces the abandoned Lake Ponchartrain, "New Town-In-Town" plan which was submitted to the Department of Urban Development (HUD). To date, approximately $11.5 million has been expended in the construction of physical improvements to the property (New Orleans Guide, 1976). The first ten years of Orlandia's projected development will involve more than 2,025 hectares (5,000 acres). Target date for opening of the first new Orlandia residential subdivision is June, 1977.

The housing demand generated by employees at Michoud is approximately 3,600 units. This represents about 1.13 percent of occupied housing units in the New Orleans SMSA (U.S. Census, 1970). Slightly more than half of the units are located in Orleans Parish.

(iii) Regional Economy.

(a) Economic Structure: The economic structure of the New Orleans region is dominated by the trade and services sectors. As shown in Table 21, these combined sectors represent over 45 percent of the total employment in the New Orleans SMSA. A significant portion of the trade and services employment is accounted for by the tourist industry.

Transportation-related industries are also important components of the regional economy because of the city's location near the mouth of the Mississippi River. About 16,000 mtons (18,000 tons) of cargo worth $8.2 billion were shipped through public facilities in 1974, making New Orleans the second largest port in the United States (NOEDC, 1975). About 7 percent of regional employment is involved in water transportation, shipbuilding, and repair.

The manufacturing sector accounts for 11.9 percent of regional employment. Unlike northern industrial cities, the New Orleans economy is not structured primarily around the manufacturing sector. Nevertheless, manufacturing is considered an important part of the economy because of its "export" function. The sale of many manufactured goods to other regions of the country provides additional income to the New Orleans region.

Oil and natural gas production is also a major regional industry. The total value of oil and gas produced in Louisiana was $5.6 billion in 1973 (API, 1973). Employment in the New Orleans region was over 15,000

Table 21. Major Industries and Employment in the New Orleans SMSA in 1975.

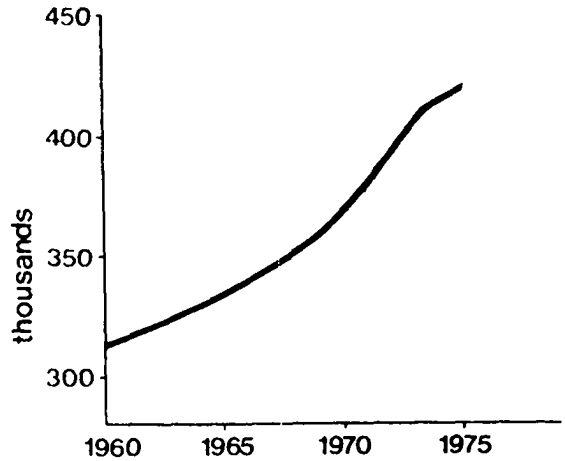
Sector	Employment (thousands)	Percent of Total
Manufacturing	50.0	11.9
(Shipbuilding/repair)	(13.2)	
(Foods)	(10.0)	
Mining	15.5	3.7
Contract Construction	26.7	6.4
Transportation, Communications, Public Utilities	43.6	10.4
(Water Transportation)	(15.9)	
Trade	106.1	25.3
(Wholesale)	(34.2)	
(Retail)	(71.9)	
Finance, Insurance, Real Estate	25.9	6.2
Services and Miscellaneous	83.9	20.0
Government	67.6	16.1
(State and local)	(53.5)	
TOTAL	419.3	100.0

Source: Louisiana Dept. of Employment Security, April, 1976.

in 1975 for the mining and extraction industry. The regional importance of this industry will grow even further if the proposed Louisiana offshore oil port is constructed.

(b) Growth Rate: Employment growth has been rapid in the New Orleans region. Total employment has grown by over 33 percent between 1960 and 1975 and now stands at approximately 419,300 (Figure 25).

Figure 25 Employment Growth New Orleans SMSA 1960 - 1975



Source: U.S. Census and La. Dept. of Employment Security

The most rapidly growing employment sectors are the trade and service industries (Figure 26). Between 1970 and 1975, the services sector grew by over 55 percent and increased its share of regional employment from 18.6 percent to 20 percent. Wholesale and retail trade also grew rapidly, increasing by 17 percent during the same period. The opening of the new Superdome in downtown New Orleans should continue this trend.

While most areas of employment have grown between 1965 and 1975, both the manufacturing and transportation sectors have declined. Manufacturing, after a strong growth period during the early and mid 1960's, has declined steadily in the last decade. Growth in manufacturing employment occurred simultaneously with the start of production on the Saturn rocket at the Michoud Assembly Facility in the early 1960's. As shown in Figure 26, manufacturing employment declined by nearly 16 percent between 1965 and 1975. Manufacturing at Michoud also declined in this period. Employment in the transportation industry has varied considerably over the past decade; its share of regional employment declined from 13.7 percent in 1960 to 10.4 percent in 1975.

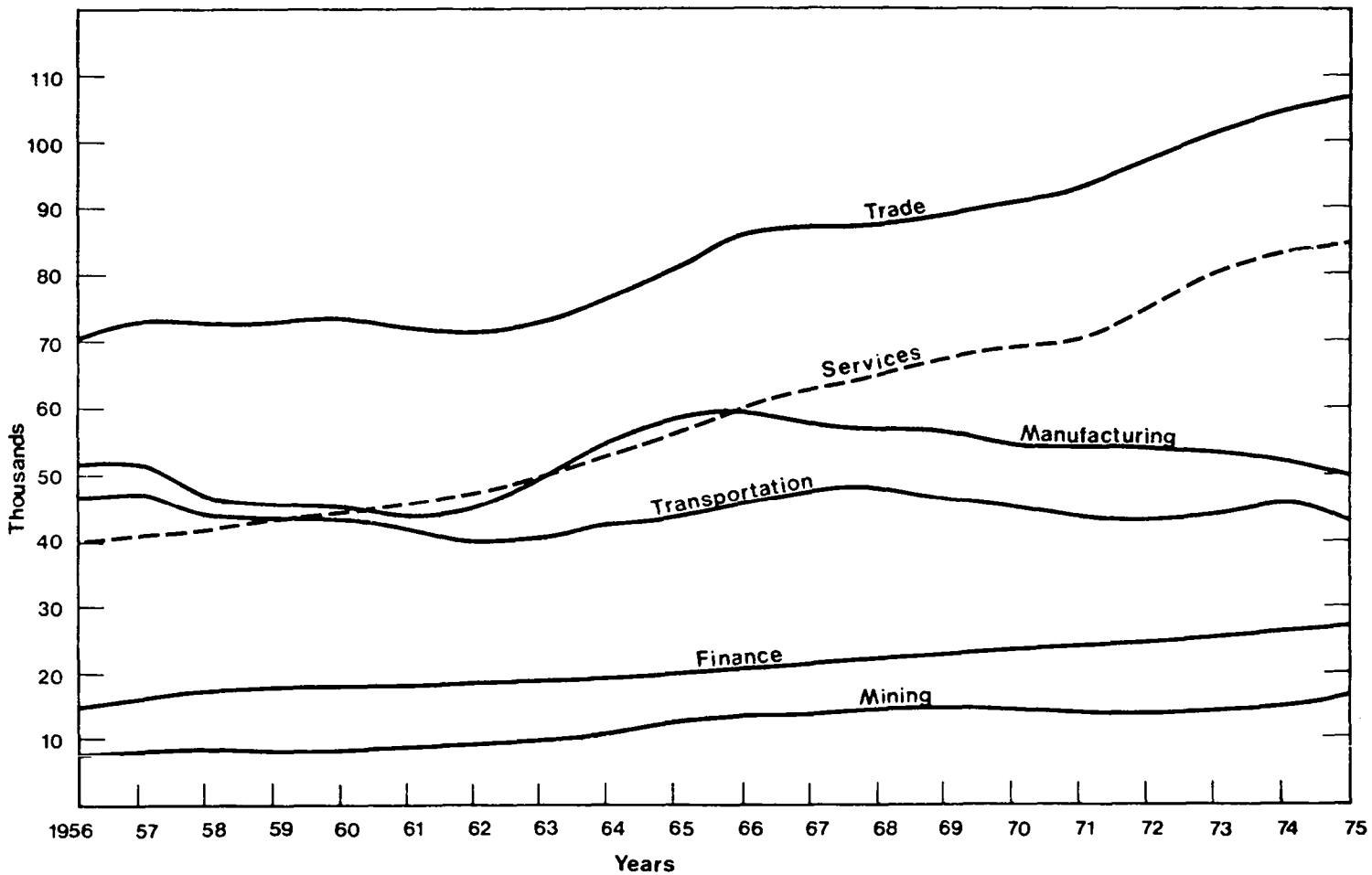
(c) Employment Trends: Over the past decade, unemployment in the New Orleans area has averaged about one percent higher than the national average (Figure 27). Between 1974 and 1975, however, unemployment in New Orleans declined from 7.7 percent to 7.3 percent while the national rate rose from 5.6 percent to 8.5 percent. With the economic recovery starting in late 1975, both the national and area unemployment rates have declined to between 7.3 percent and 7.5 percent. Projections suggest that unemployment levels will continue to decline through 1976.

(iv) Government and Public Services. Governmental functions for the City of New Orleans are administered by the Mayor and his staff. Government services available to the surrounding area include the following:

(a) Police and Fire Protection: A police station and two fire stations within 8 km (5 mi) of Michoud serve the site and surrounding areas. Both police and fire protection are available on site. Water for fire protection is supplied to fire mains from the reservoir system within the Michoud complex and from domestic mains owned by the city.

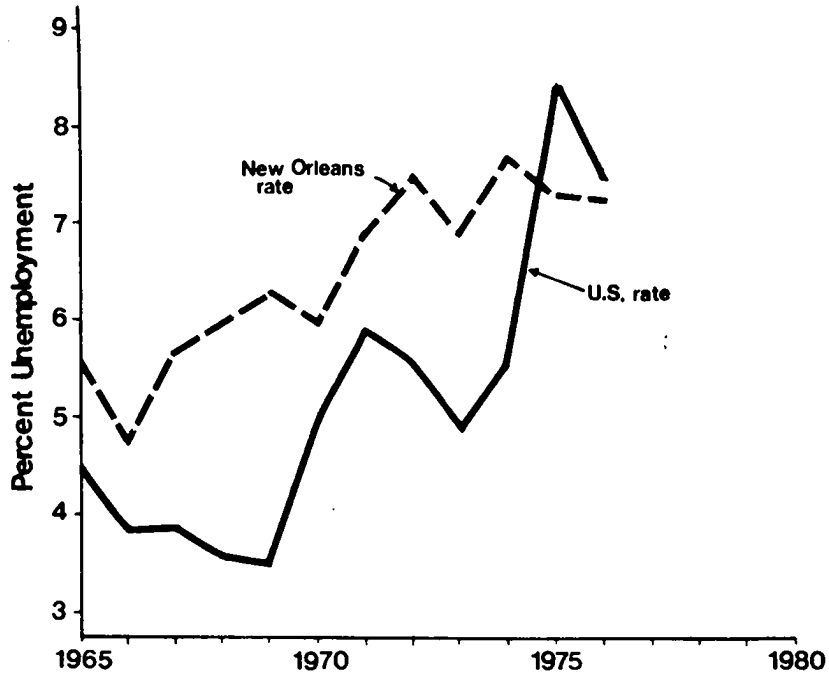
Security measures for the facilities and operations at MAF have been established by a contract with Reguard, a private firm selected through the auspices of the Small Business Administration. These measures include physical barriers, security guard personnel, electronic and mechanical detection and monitoring equipment, floodlights, warning signs and labels, identification badges for personnel, and administrative regulations and procedures. The procedures provide instructions for coordination and implementation of appropriate security measures.

(b) Education: The New Orleans Public School System operates over 125 elementary and secondary education facilities in the area.



Source: Louisiana Dept. of Employment Security

Figure 26 Employment Trends in Selected Industries - New Orleans SMSA 1956 through 1975



Source: La. Dept. of Employment Security and U.S. Dept. of Labor, Bur. of Labor Statistics

Figure 27 **Unemployment Rate for the New Orleans SMSA and the United States 1965 - March 1976**

Three elementary schools and one high school are in the general vicinity of Michoud. Tulane, Loyola of the South, Southern University of New Orleans, Xavier University of New Orleans, and Louisiana State University Medical School are also in the New Orleans area.

Families of Michoud employees contribute approximately 2,825 school-aged children to the schools in the New Orleans region, based on a ratio of 75 school-aged children per 100 employees (SMSA, U.S. Census, 1970). Between 1,400 and 1,550 of these children reside in Orleans Parish, based on living location data.

(c) Recreation and Open Space: The City maintains a number of park lands and recreation areas throughout New Orleans. Four city-owned parks and recreation areas are near the site.

(d) Health Care: New Orleans is an international center for medical treatment due to the location of Tulane and Louisiana State University Medical Schools and the Charity Hospital operated by the State of Louisiana. Most other health care facilities in the area are privately owned.

(v) Archaeological and Historical Values.

(a) Pre-history: There have been human occupants of the New Orleans region and in the immediate vicinity of Michoud at various periods since at least 2500 B.C. This earliest date of habitation for the whole region was established by radiocarbon dates from a dredged midden only 0.8 km (0.5 mi) from the MAF boundary. This site, off Paris Road (Louisiana State Route 47) on the south bank of the Intra-coastal Waterway, was discovered during dredging operations and is labeled "Shell Midden" on the map in Figure 28. Sites such as these are from the Archaic Period of American archaeology. They represent hunting and fishing peoples who gradually built up large piles of discarded shellfish remains in the shell middens now found scattered over the whole southeastern United States. Of the 40 known shell middens from the Archaic Period and later periods in Orleans Parish alone, only 27 have so far survived the ravages of soil subsidence, wave action, and modern residential and industrial development. A representative selection of the shell, beach, and dredge middens in the Michoud region are shown in Figure 28.

After the Archaic Period, the next occupants with distinguishing cultural remnants were representative of the Poverty Point peoples. They built large earthworks of a ceremonial nature. This construction size and style required great amounts of effort. Only a few earth mounds and embankments are known in the New Orleans area, and none near Michoud.

By 400 B.C., other peoples had entered the region, bringing pottery-making skills with them. The name Tchefuncte is applied to this culture. Two large shell middens left by these people are prominent features in the low marshes just north and east of Michoud. Their height of approximately 2.1 m (7 ft) above the marsh provides a base

ARCHAEOLOGICAL AND HISTORICAL SITES NEAR MICHOUD

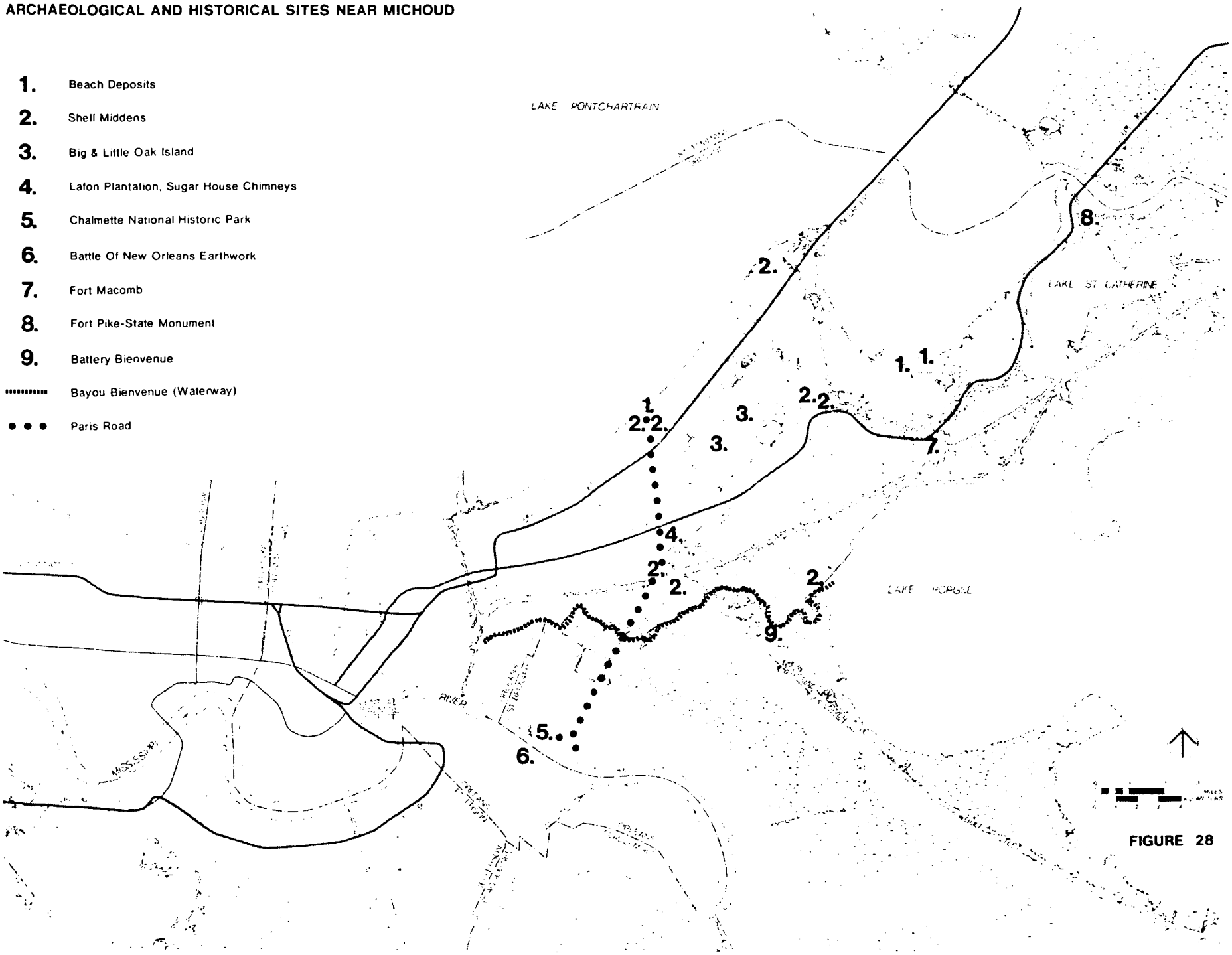


FIGURE 28

for large old oaks and other trees and vegetation. These two middens, Big Oak Island and Little Oak Island, are shown in Figure 28. They are listed in the National Register of Historic Places because of their large size, pottery typology, and dates of development (200 B.C. to 500 A.D.). Little Oak Island midden also contains pottery of the later Marksville tradition, dating to 800 A.D. The protection of these two middens is listed as top priority for preservation of sites of value in Orleans Parish by the Regional Planning Commission (RPC, 1974).

Following Marksville times, large temple mounds were built by people in the southeastern United States, but none of these structures are known to exist in the immediate New Orleans or Michoud area. Middens were still being formed, however, and various types of pottery date these latter shell heaps in stages, up to the times of historic contact with Europeans in the 18th century (RPC, 1969, 1974).

(b) History: The Europeans first arrived to settle in the New Orleans region in 1718, and soon gathered together on the north shore of a major bend in the Mississippi River to form the neighborhood that has since been named the Vieux Carre (French Quarter) of the City of New Orleans. During these times, the Michoud area, except for the Lafon Plantation, remained largely undeveloped because of its marshy topography. The present central business district of New Orleans is just west of the Vieux Carre and centers on Canal Street.

Remains of the Lafon Plantation in the form of two Sugar House Chimneys are the only known items of historic interest on MAF property. These two round brick structures are about 7.6 to 9.1 m (25-30 ft) high and were constructed in the early 19th century. They are in front of the Administration Building (Bldg. 101) on Old Gentilly Road.

Of the 15 sites listed in the National Register for Orleans Parish, 13 of them are from the older, historic sections of New Orleans. In addition to Big and Little Oak Islands mentioned above, the other National Register listing for Orleans Parish is Fort Pike, shown in Figure 28. It is off Highway 90 at the confluence of Lake Pontchartrain and The Rigolets, the major waterway into Lake Borgne. This Fort was begun in 1819, and at one time it protected New Orleans with 400 men and 54 cannons and mortars.

Off Highway 90, south and east of Fort Pike and closer to Michoud, is located Fort Macomb at Chef Menteur Pass. Of the same age as Fort Pike, it is now in ruins but still of historic interest. Shell middens in the area also give it an archaeological interest. A proposal has been made to include both forts in a Rigolet Wildlife Preserve and perhaps have Fort Macomb included in the National Register as well (RPC, 1974).

Other items of historic interest near Michoud are Paris Road (State Route 47, the closest major north-south road just west of Michoud), and Bayou Bienvenue, an early waterway between New Orleans and Lake Borgne. This Bayou now also serves as a major portion of the border between Orleans Parish and St. Bernard Parish to the south. On the Bayou, a

military fortification, Battery Bienvenue, still remains. In St. Bernard Parish, 57 shell middens and mounds are known. The two closest to Michoud are shown in Figure 28. Also in this Parish is Chalmette National Historic Park, closest such park to Michoud. This park includes the Beauregard Plantation House (1832), a Monument (1855), and earthworks near the Mississippi River from the Battle of New Orleans (1815). More earthworks from this battle remain on the opposite bank of the river in Orleans Parish.

(vi) Aesthetics.

(a) Aesthetic Character: Aesthetics is the perception of the visual character of an area by observers from various vantage points. Certain criteria of visual character are outlined and are applied to particular vantage points of the Michoud Site. This process will formulate assessments involving the visual character and impact involving the Michoud Site. Criteria for analysis are as follows:

- relation to site environs
- visual congeniality
- organization and identity.

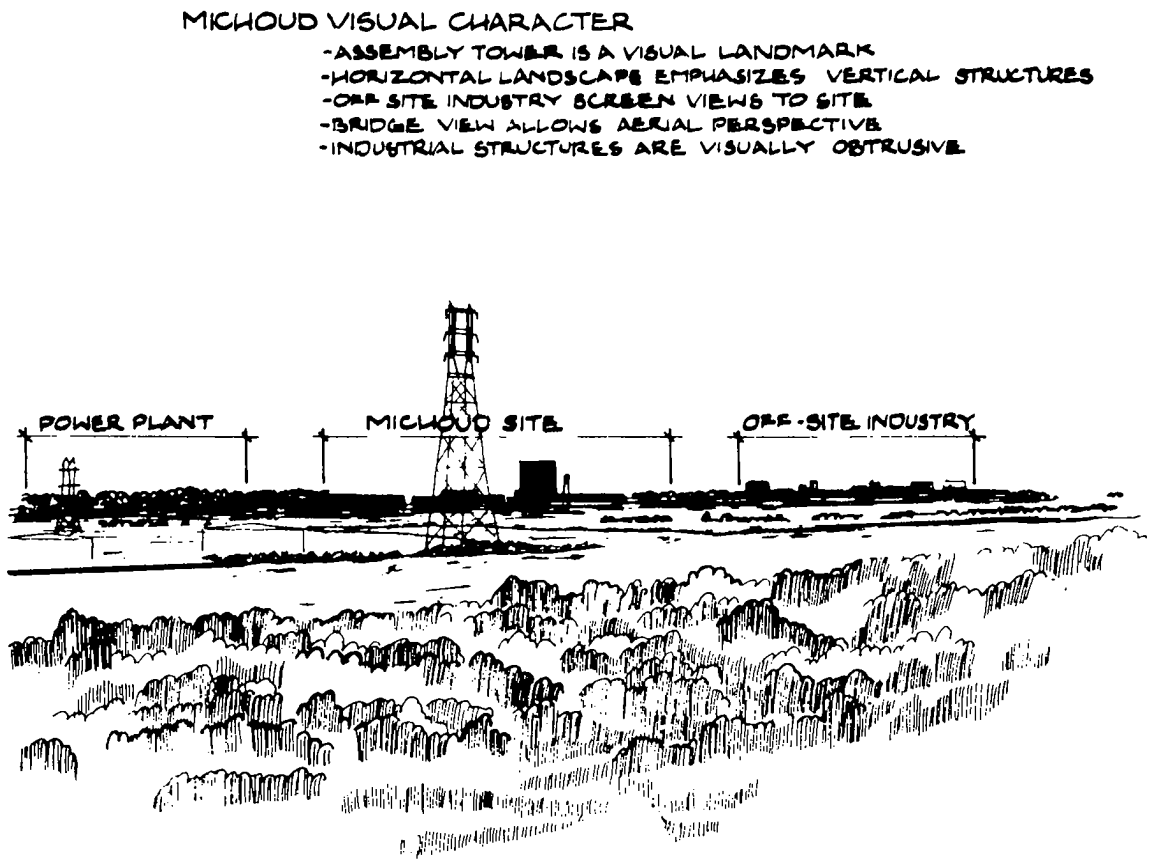


FIGURE 29 VIEW FROM BRIDGE STATE ROUTE 47

(b) Relation to Site Environs: The existing landscape can be described as extremely flat with evidence of recent efforts to gain land by draining and filling (Figure 29). Natural, irregularly shaped bayou canals have been replaced by the rectilinear pattern of waterways and levees. Vegetation is spotty and shows signs of disturbance. While the Intracoastal Waterway and the Michoud Canal provide a strong boundary on two sides of the site, these waterways are not easily perceptible because of the flatness of the terrain. Finally, the general appearance of the landscape is often muted by atmospheric haze associated with the Gulf and inland waterways.

(c) Visual Congeniality: The automobile is the most common means of access to the site. There is little accomodation for the pedestrian. Therefore, roadway vantage points are the most likely viewpoints to the site (Figure 30). There are three main such points: the State Route 47 bridge (Paris Road) over the Intracoastal Waterway, Chef Menteur Highway (U.S. 90), and Old Gentilly Road (Figure 31).

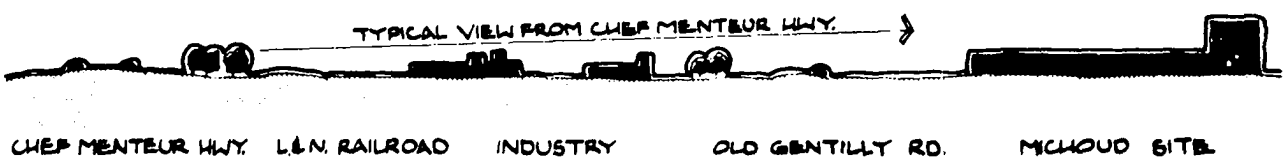


Figure 30 Section of View From Chef Menteur Highway (U.S. 90)

The buildings on the site are massive, and the surrounding grounds are of a compatible scale, thereby reducing the visual impact. The buildings on the site share a similar form. Most are low structures which blend into the horizontal landscape (Figure 29). In addition, the buildings are subdued in color, making them less obtrusive.

(d) Organization: Ideally, the observer should be able to perceive the pattern of buildings and elements on the site. The site is defined by waterways and roadways, yet it lacks a single, unifying spatial character. Buildings and vegetative plants can articulate space, but the eye is distracted by the industrial skyline. The buildings on site share a somewhat uniform horizontal character, yet there are varying materials and styles that reflect functions rather than a united visual image.

(e) Identity: The site does have a strong visual identity. The Vertical Assembly Building tower is the dominant image on the horizon that can be viewed at great distances (Figure 29). In this sense, the viewer is left with a visual memory of the site. The front of the site along Old Gentilly Road presents a less coherent image. Reception and work areas are seen simultaneously. Fences, gate houses, and parking areas provide an institutional identity.

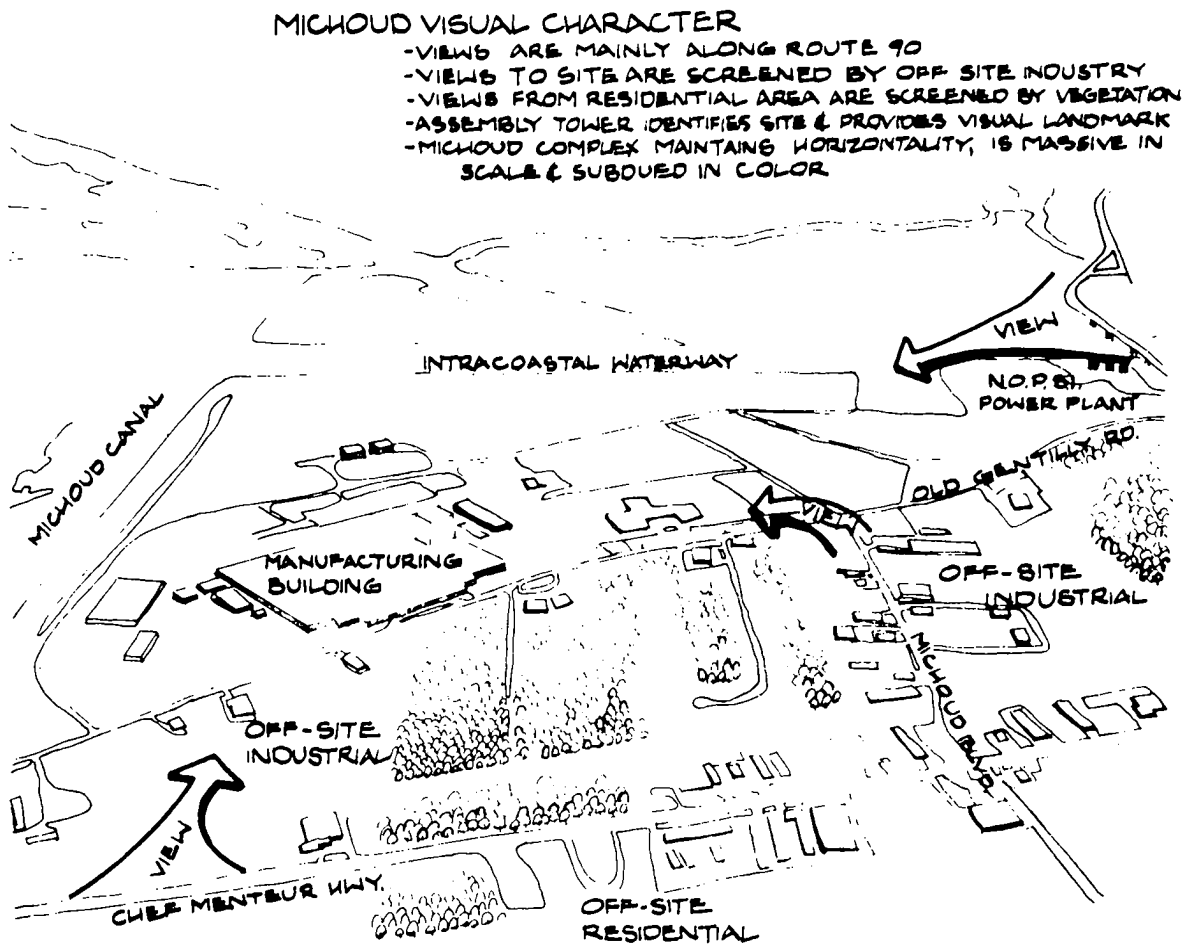


FIGURE 31 MICHOUD AERIAL PERSPECTIVE

(f) Conclusions: The Michoud site presents an image similar to that of other industrial parks. The elements on the site lack a visual cohesiveness, and it is difficult for the average viewer to understand the spatial pattern and form. Neighboring industries present vertical structures such as smoke stacks and transmission towers which distract the eye and lend to the visual discontinuity (Figure 29). These less harmonious aspects are mitigated by the large scale of the site, which lengthens viewing distances and subdues the visual obtrusiveness. Residential areas to the north of the site are buffered from these industries by space and vegetation, limiting the visual impacts mainly to those along the roadways (Figure 32).

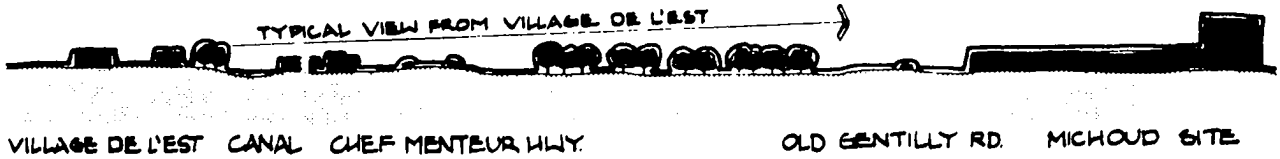


Figure 32 Section Of View From Village de L'est

OUTLINE OF FOLLOWING SUBSECTIONS

2. Detailed Description of Existing Environmental Conditions.

c. Infrastructure. 71

(i) Transportation System. 71

(ii) Communication Systems. 74

(iii) Energy Systems. 74

(a) Heating and Cooling System: 74
(b) Electric Power: 75
(c) Natural Gas: 75
(d) Combined Energy Consumption: 75

(iv) Water and Sewer Systems. 75

(a) The Water Distribution System: 75
(b) The Sanitary Sewer System: 77
(c) The Storm Sewer System: 79
(d) Chemical Wastewater System: 79

- Chemical Cleaning and Finishing. 81
- Major Component Cleaning. 82
- Vertical Assembly. 82
- Quality Control and Materials Processing Laboratories. 82
- Demineralizer Regeneration. 83
- Air Pollution Control Liquid Effluents. 83

(e) Other Wastewaters: 83

(v) Solid Waste System. 84

(vi) Hazardous Materials. 84

(a) Introduction: 84
(b) Hazardous Materials Used at MAF: 84
(c) Disposal Pathways: 86

- Liquids. 86
- Solids. 86

(d) Types of Failures. 86
(e) Steam Boiler: 87
(f) Hazardous Material Storage Building: 87
(g) Pneumostatic Test Facility: 88
(h) Cryogenic Storage: 88
(i) Pesticide Use at Michoud Assembly Facility: 88

c. Infrastructure.

(i) Transportation System:

The Michoud Assembly Facility is easily accessible by water, rail, and highway, as shown in Figure 33. Two airports also serve the region. The New Orleans Lakefront Airport at Lake Pontchartrain handles local business and recreational traffic. New Orleans International Airport, west and north of the central business district, is served by several major international airlines. Michoud is 41 km (25 mi) east of the International Airport and 13 km (8 mi) southeast of Lakefront Airport.

The Port of New Orleans, second largest sea terminal in the country, is served by nearly 100 steamship lines. More than 5,000 ships enter the port annually. The Gulf Intracoastal Waterway (GIWW) runs directly south of the site. Michoud is served by a small port (Port Michoud) off the GIWW which can accommodate barges or ships in the 9,070 mton (10,000 ton) dead-weight (tdw) class.

Railroad service is provided on the site by the Louisville and Nashville Railroad. The 1968 Master Plan proposes a southern extension of the rail system to provide ship or barge rail service at the Michoud Slip and an eastern extension to provide more rail service throughout the Michoud complex.

In recent years, the Interstate Highway System has greatly expanded vehicular routes to the New Orleans region. The construction of Interstate 10 has facilitated the rapidly expanding area of eastern New Orleans where the Michoud site is located. Chef Menteur Highway (U.S. Route 90) is the other major east-west route in the area of Michoud. Extensive commercial strip development is occurring along this highway.

Bus service to the Michoud Assembly Facility is provided by the New Orleans Public Service, Inc. (NOPSI). Buses run east-west along Chef Menteur Highway and stop on Old Gentilly Road at the front entrance of NASA. Informal estimates suggest that only a small percentage of MAF employees use the bus to commute to work.

The internal vehicular circulation system at Michoud, shown in Figure 34, is designed to move automobile, trucks, and buses quickly and easily through the site. During peak hours, two gates off Old Gentilly Road provide access, with the main entrance at the intersection of Old Gentilly Road and Venus Drive. Saturn Boulevard serves as a major arterial within the site, providing access to major facilities and parking areas.

On exterior streets surrounding the Michoud site, traffic flows steadily both eastbound and westbound even during peak periods. When employment at Michoud is high, work shifts are staggered to eliminate potential congestion at the gates and on local roadways.

Parking at Michoud is available for a maximum of 5,727 vehicles. In 1968, when the employee population was 12,000, the Master Plan showed

TRANSPORTATION SYSTEMS GREATER NEW ORLEANS AREA

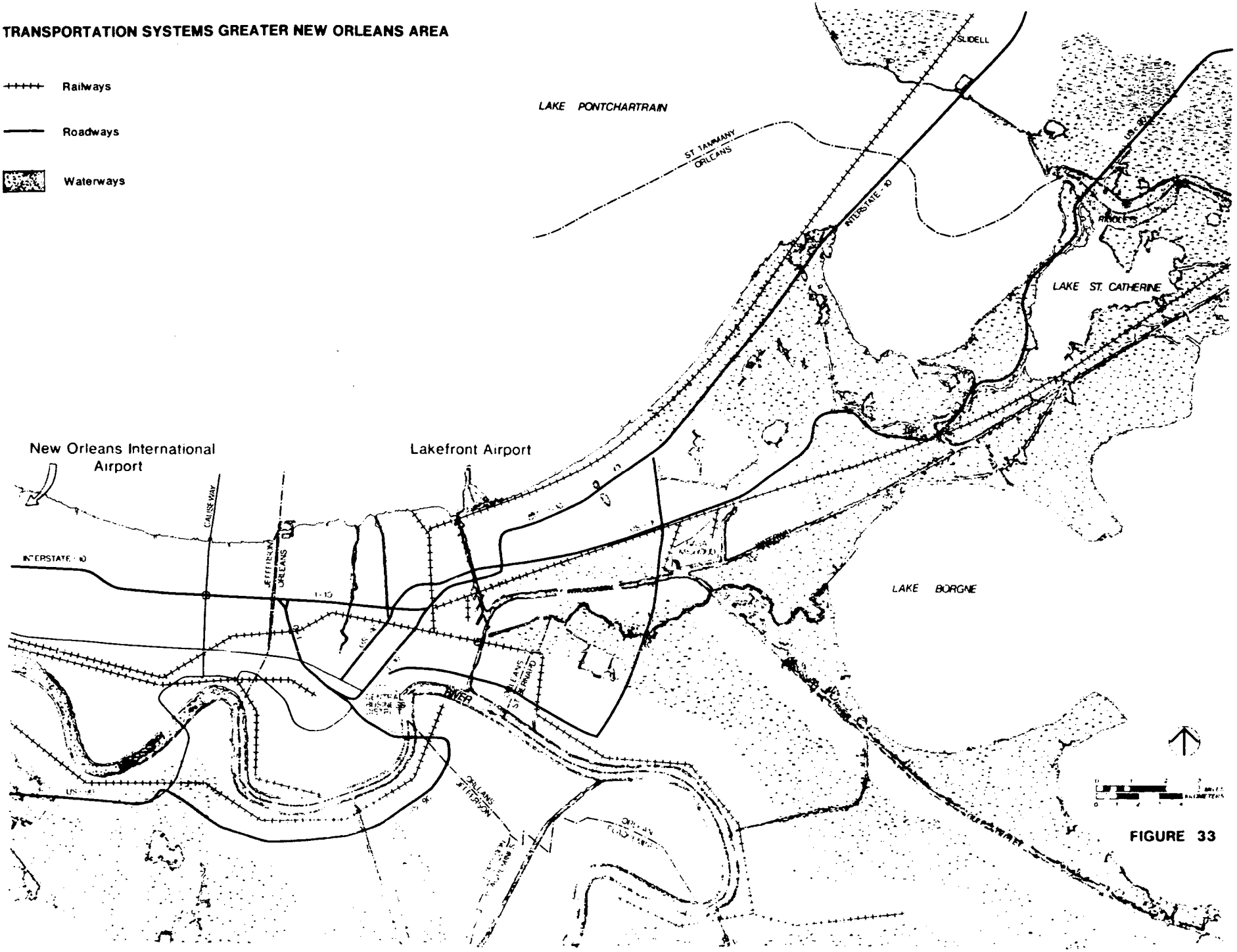


FIGURE 33

VEHICULAR CIRCULATION AND PARKING

Parking Areas

Circulation Routes

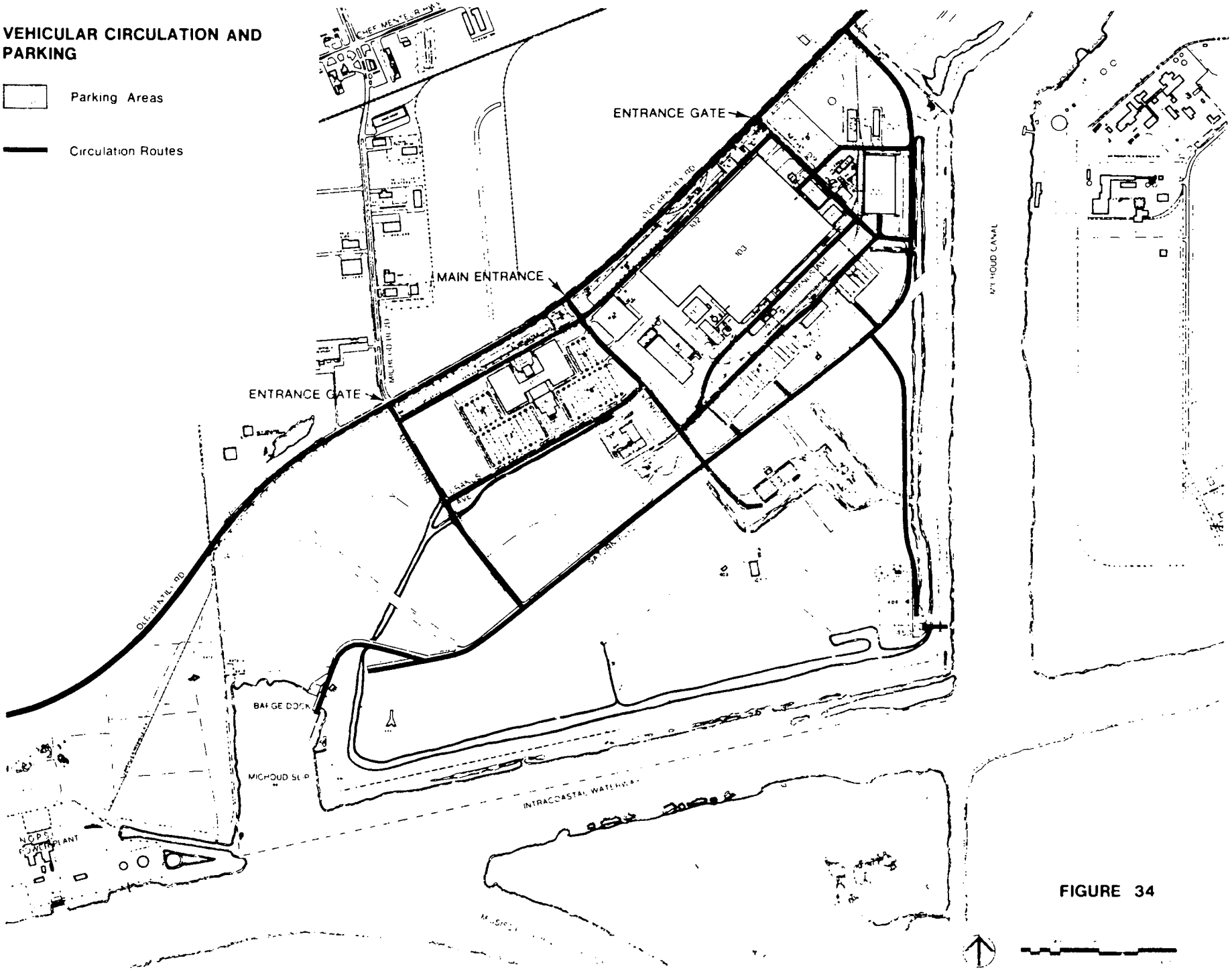


FIGURE 34

an average of 4,577 vehicles. This number has declined with the considerably reduced work force, but the available parking remains. Approximately 2,150 to 2,200 automobiles are parked on the site by the present employee force of approximately 3,800. MAF employee commuting is discussed in Appendix D, Table D-3. Residential locations for the commuter sample are shown in Figure 24.

(ii) Communication Systems. The main communications system at MAF consists of 3,100 Centrex main telephone lines from Southern Bell Telephone and Telegraph. The lines come from the Bell facility across U.S. 90 just north of Michoud. All calls at MAF, whether NASA- or tenant-related, come to the central automatic switchboard. For this service, Southern Bell submits one bill to NASA, which in turn bills various tenant agencies for reimbursement.

Western Union also serves the facility, but it is available only for NASA and NASA-related operations. Two facsimile communication systems exist at MAF. One is for NASA contract agencies and NASA, and the other is available to all agencies at the facility.

NASA operates an interfacility regional computer, located in the town of Slidell, 35.2 km (22 miles) northeast of MAF off Interstate 10 in St. Tammany Parish. This facility provides remote direct access and computer-to-computer communications among the NASA systems at Michoud, Marshall Space Flight Center (Alabama), the National Space Technology Lab (NSTL) (Mississippi), Kennedy Space Center (Florida), and the Johnson Space Center (Texas). NASA and NASA-contract agencies have access to this computer system, but it is not available to the tenant agencies. One of the tenants, U.S. Department of Agriculture, operates the New Orleans Computer Center at MAF. This center provides extensive computer services for the USDA nationally. It also can be used on a reimbursable basis by other federal agencies.

Internal communications among and within the various buildings are supplemented by a paging-public address system. Initially established when NASA occupied the whole facility, segments of it can be operated independently. Its current use is largely confined to the various tenants and NASA as desired. An emergency over-ride system still prevails in case of need and can be used for facility-wide warnings of hurricanes, floods, and fires. All but a few buildings are included in this present public address emergency system.

(iii) Energy Systems.

(a) Heating and Cooling Systems: The current capacity of the boiler plant facilities at Michoud is more than adequate for current demand. Steam distribution within the Michoud complex is shown on Figure 35. Steam is generated for the Michoud complex in three separate steam plants located in Buildings 207, 130, and 351. Five natural gas fired boilers with a combined capacity of 1.6×10^5 kg/hr (3.6×10^5

lb/hr) of saturated steam at 14.7 kg/cm^2 (210 psig) comprise the central system.

All condensate is returned by 37 condensate pumping stations through 7.8 and 12.7 cm (3 and 5 in) headers to a main condensate receiver of 29 m^3 (7,700 gal) capacity located within the central system. The condensate is then de-aerated, heated, and pumped with make-up water into the boilers.

Chilled water used for air conditioning and manufacturing process requirements is produced by several independent refrigeration plants within the complex and is distributed as shown in Figure 35.

(b) Electric Power: Electric power for the Michoud Assembly Facility is purchased from the New Orleans Public Service, Inc. and received through their 115 kV feeder lines by two master substations. The power voltage is reduced to 13.8 kV and distributed to secondary low voltage substations located at convenient points throughout the site (Figure 36).

Full load capacity of the two master substations is 60 MVA. Present service is about 40 percent of capacity, or 24 MVA.

(c) Natural Gas: The New Orleans Public Service, Inc. supplies Michoud with natural gas through a 25 cm (10 in) gas main pressure gauged at 5.6 kg/cm^2 (80 psig). Distribution within the site is by pipes varying from 10 to 25 cm (4 to 10 in), by routes shown in Figure 35. The majority of the natural gas supplied to MAF is consumed by the boiler in Building 207 for plant heating and air conditioning.

(d) Combined Energy Consumption: Major energy use on-site is given in Table 22. Total energy utilization shown in equivalents is 3.4 x 10^{11} kilocalories, or 1.35 x 10^{12} Btu.

(iv) Water and Sewer Systems:

(a) The Water Distribution System: Water for the Michoud Assembly Facility is purchased from the Sewer and Water Board of New Orleans and supplied by a 0.3 m (12 in) main located along Old Gentilly Road. The water is used for many systems: process water, fire protection, steam, chilled water, de-ionized water and sanitary supply. There are two water storage reserve tanks, one at ground level with 3,785,000 liter (1,000,000 gal) capacity and one elevated with 757,000 liters (200,000 gal) capacity.

EXISTING UTILITIES PART 1

- Gas
- Steam
- Chilled Water
- Chillers

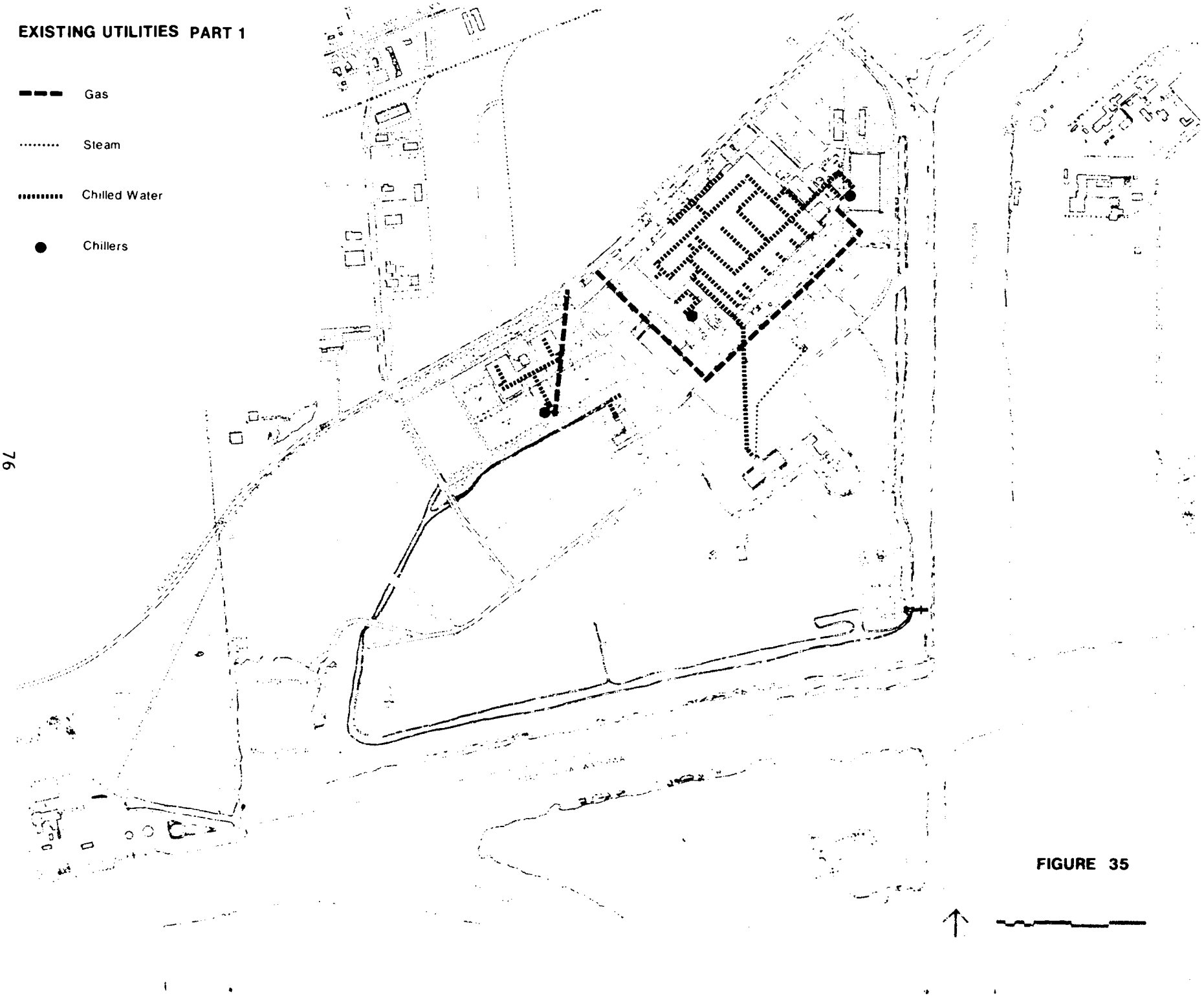


FIGURE 35

Table 22. Annual Major Energy Use at MAF, 1975-1976

Energy Source	Purpose	Quantity Used	Million Kilocalories	Million Btu
Electricity	Power, cooling	89,250,000 kWh	70,970	280,513
Natural Gas	Heating, dehumidification, steam	847,100,000 std. ft^3	220,960	873,360
Diesel Oil	On-site industrial vehicles	20,000 gal	683	2,700
Gasoline	On-site vehicles	63,000 gal	1,992	7,872
Gasoline	Employee commuting	1,456,000 gal*	46,028	181,930
TOTAL			340,633**	1,346,375***

* Based on 18.2 million miles per year at 12.5 miles/gallon. See Appendix D, Table D-3.

** 3.4×10^{11} kilocalories.

*** 1.35×10^{12} Btu.

Water is distributed in three basic loads: the Manufacturing and Test areas, the Engineering Office and support areas, and the Saturn Dock area (as shown in Figure 36). In the Manufacturing and Test areas, storage tank booster pumps maintain a constant water pressure of 4.2 kg/cm^2 (60 psi). Water consumption on site is shown in Table 23.

Table 23. Water Consumption On-Site.

	Peak Monthly Consumption		Yearly Consumption*	
Year	10^5 m^3	10^6 gal	10^5 m^3	10^6 gal
1967	2.07	54.67**	19.9	527.96
1975	1.42	37.63***	14.1	372.10

Notes: * Estimated
** August
*** June

Source: City of New Orleans.

(b) The Sanitary Sewer System: The MAF is served by the sanitary sewer system of the City of New Orleans. The sanitary sewage from this area is discharged to an activated sludge sewage treatment plant

EXISTING UTILITIES PART 2

- Water
- Sewer
- Electrical
- Substation
- Communications (Underground)

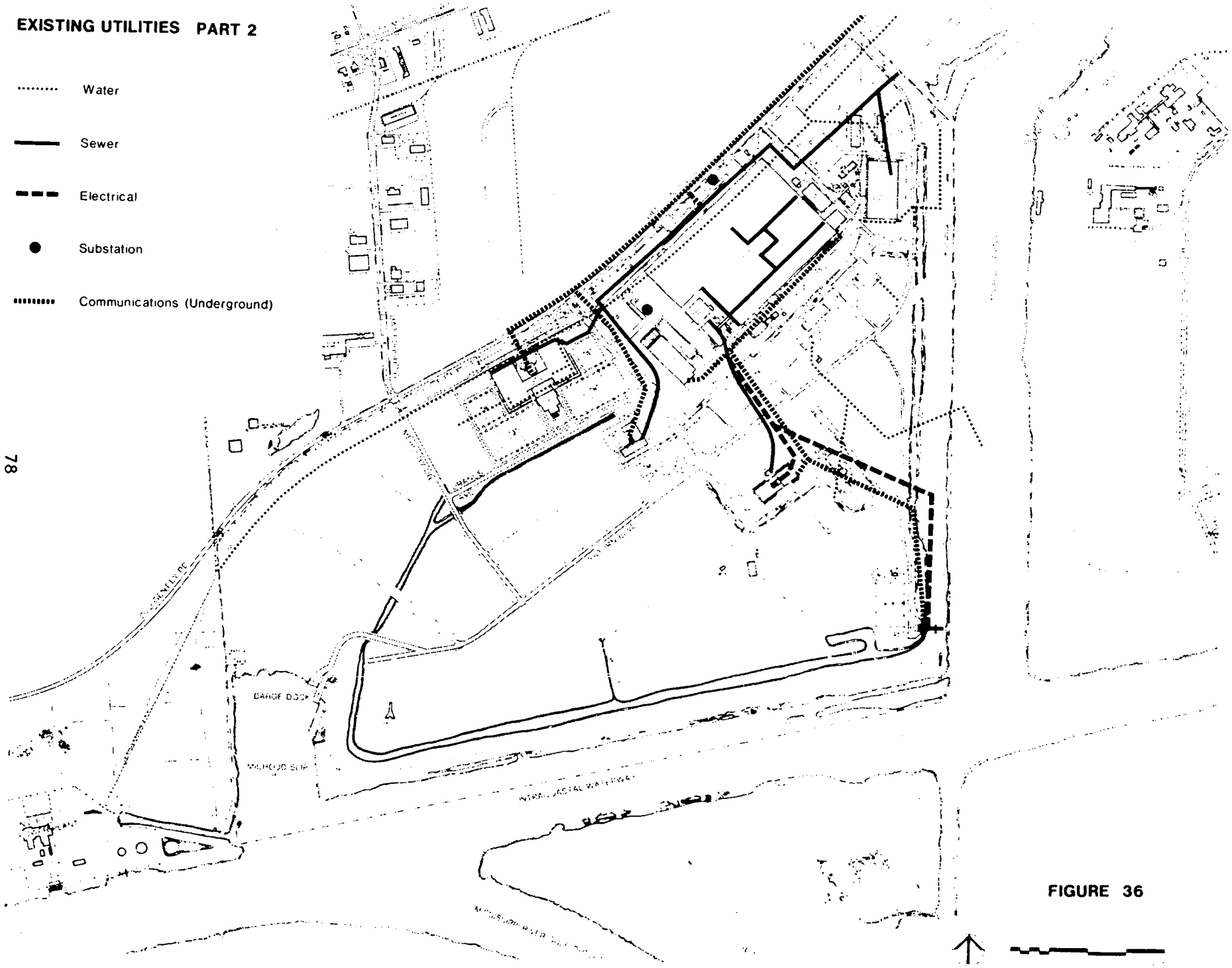


FIGURE 36

near Michoud that is owned and operated by the New Orleans Sewerage and Water Board. This plant, located 0.6 km (1 mi) from the facility, has a capacity of approximately 7,570 m^3 (2 x 10^6 gal) per day. The plant is currently operating near capacity (NASA, 1975).

The sanitary sewer system at Michoud is shown in Figure 36. It consists of a network of collector lines and pumping stations which collect the effluent and deliver it through a 0.3 m (12 in) force main to the publicly operated sewage treatment plant. The total capacity of the sewage ejector pumps is 11.4 m^3/min (3,000 gpm).

(c) The Storm Sewer System: The storm drainage system at MAF is composed of open drainage ditches and catch basins connected to subterranean lateral lines which deliver the storm water to an "L"-shaped reservoir within the site along the east and south boundaries.

The storm drainage system is broken down into four major areas. Area 1 comprises the northeast quadrant of the site containing Buildings 101, 102, 103, and 207 as the primary structures, and this quadrant drains storm water eastward by gravity through a 2.44 m (96 in) and a 1.83 m (72 in) underground line into the east reservoir.

Area 2 includes an area on either side of Venus Drive; the drainage through one pumping station and by gravity flows westward through the main drainage ditch south of Uranus Avenue to the west end of the collection reservoir.

Area 3 is south of Building 103, generally the southeastern quadrant, which drains by gravity to the east collection reservoir.

Area 4, comprising the southwest portion of the site, drains by gravity through various ditches and underground collectors to the south drainage reservoir. The level of the reservoir is below the level in Michoud Canal. Therefore, any movement of water through the soil will be an inward flow instead of a discharge of toxic material.

All storm water runoff retained in the reservoir flows to the southeast corner of the facility where it is removed periodically from the site by a pumping station. The station has four 237 m^3/h (62,500 gpm) diesel-powered pumps. Storm water is discharged to Michoud Canal. This capacity is adequate to handle the entire rainfall of the 100-year, 30-minute storm (i.e., a storm of an intensity to be expected only once every 100 years), assuming the entire amount that fell on the MAF ran off within half an hour. This reservoir also serves as a reserve source of water for fire-fighting purposes.

(d) Chemical Wastewater System: Chemical wastewaters are collected from the manufacturing areas by means of a separate system depicted in Figure 37. The Main Manufacturing Building (Building 103) is served by two main trunk lines of vitrified clay pipe (VCP), with lateral connectors of the same material. Another VCP trunk serves the Vertical Assembly Building (Building 110), the demineralized water tank and chemical tank farm area, the Systems Engineering Building (Building 130), and a small part of the Main Manufacturing Building. This is a sump system. For chemical wastewaters that might degrade the VCP, there

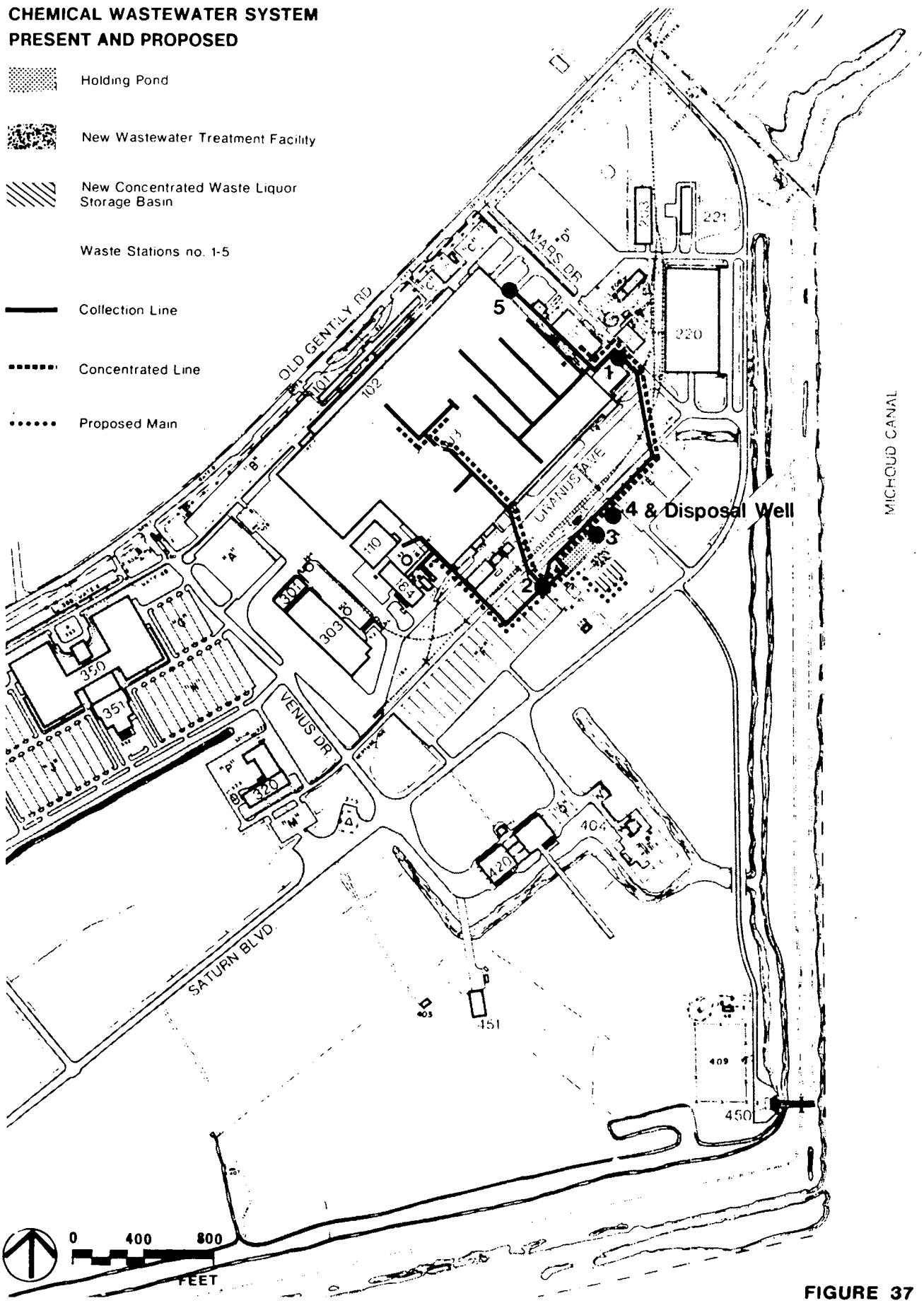

CHEMICAL WASTEWATER SYSTEM
PRESENT AND PROPOSED
Holding Pond
New Wastewater Treatment Facility
New Concentrated Waste Liquor Storage Basin
Waste Stations no. 1-5
Collection Line
Concentrated Line
Proposed Main
OLD GENTILLY RD
MARS DR
URANUS AVE
VENUS DR
SATURN BLVD
MICHOUD CANAL
4 & Disposal Well
1
2
3
5
0
400
800
FEET

FIGURE 37

are two separate force mains serving the Main Manufacturing Building that are made of polyvinyl dichloride (PVDC).

Both of these collecting systems discharge to a wastewater holding pond of 37,850 m^3 (1 x 10^6 gal) capacity. The surface dimensions of the pond are 32.6 x 99.7 m (107 x 327 ft). The wastewater holding pond is a diked reservoir with earthen sides and a 10.2 cm (4 in.) concrete slab bottom. The side walls have a slope of 3 to 1 and 5.1 cm (2 in.) gunite liner. Any leakage from the holding pond would result in a noticeable level drop in the pond and would discharge to the storm reservoir where it could receive emergency treatment before being discharged. Ultimate disposal of the wastewaters is by injection into a deep well (Well No. 2), currently at a depth of 1,740 m (5,800 ft.). The very fine sand at this depth has been consolidated with an epoxy compound in a radius of approximately one meter (3 ft) to retard infiltration of sand into the well. Injection is accomplished by a natural gas fueled pump of 1.5 m^3 per min (400 gpm) capacity, backed up by two electric-powered pumps with the same total capacity. As wastewater is drawn from the pond, it passes through two cylindrical epoxy sand filters that provide openings in the range of 0.76 to 1.02 mm (0.03 to 0.04 in.). These filters are periodically backwashed with potable water, and the washings are discharged to the storm sewer system.

The injection well consists of two concentric pipes. The outer pipe, of 14 cm (5.5 in) diameter, is the downpipe for wastewater. The inner pipe, of 6 cm (2.4 in), is the downpipe for backwashing sand and other debris out of the well. Wastewater from the holding pond is used for backwashing the well. Sand is collected in two sand traps, and water is returned to the pond. The sand traps are flushed on the ground about twice a week. The average daily pumpage into the well is 0.38 m^3 per minute (100 gpm) at 84.4 kg/cm^2 (1,200 psi).

Another well (Well No. 1) was previously used but was capped off in 1967 because of clogging. Well No. 2, which was placed in operation at that time, was originally drilled to 2,000 m (6,665 ft), but is now working at the shallower depth noted above due to clogging. The capacity and useful life of this well are therefore considered limited.

The chemical wastewater system and the nature of the wastewaters treated are described in detail in the Preliminary Engineering Report on Review of the Industrial Wasterwater Treatment Facility at MAF, dated November, 1975. Chemical wastewaters as related to industrial activities are described below.

- Chemical Cleaning and Finishing. Both Martin-Marietta and Chrysler clean and plate small metal components. Metal parts are immersed in tanks of cleaning or plating solutions and alternately conveyed and dipped in adjacent rinse tanks of demineralized water. During conveyance, solutions drip from the components onto the grill-type floor and thence into the chemical wastewater system. The rinse tanks are continously filled with demineralized water, with the overflow going to the chemical wastewater system. Spent cleaning and plating solutions are periodically dumped into the chemical wastewater system. The nature of the solutions and the backwash for the ion exchange demineralizers is shown in Table 24.

Table 24. Chemical Nature of Industrial Wastewaters Produced in Cleaning and Plating at the Michoud Assembly Facility.

Martin-Marietta		Chrysler	
Trade Name	Major Component(s)	Trade Name	Major Component(s)
Turco 4215S	phosphates	Turco 4215	phosphates
Wyandotte Mil-Etch	sodium hydroxide	Wyandotte Mil-Etch	sodium hydroxide
Turco 4461	nitric acid	Allied Kelite-Isoprep 177	ND
Iridite 14-2	chromic acid	NA	phosphoric acid
Oakite 90	sodium hydroxide	Parco 210	phosphates
NA	nitric acid	Parcolene 2	phosphates
NA	Acetic acid		
NA	hydrogen peroxide		
Rhodine 213	nickel chloride & hydrochloric acid		
Metex BA	phosphoric acid and sulfuric acid		
Nacconol	sodium dichromate		
NA	trichloroethylene (traces)		

NA: "Not Applicable" ND: "No Data"

• Major Component Cleaning. Martin-Marietta cleans fabricated components prior to coating by spraying in special "cleaning enclosures." All liquid wastes from this operation (listed below) flow into the chemical wastewater system.

Trade Name	Major Component(s)
Turco 4215	phosphates
Turco Smut	chromates and nitric acid
Iridite 14-2	chromic acid and nitric acid
Aerowash "A"	5% phenyl ether and metasilicate

• Vertical Assembly. In the Vertical Assembly Building (VAB), Martin-Marietta completes assembly of the External Tank. The liquid oxygen (LO_2) tank is hydrostatically tested with demineralized water, and both the LO_2 and the liquid hydrogen (LH_2) tank are chemically cleaned. The solutions used are the same as for cleaning major components except for deletion of Turco Smut. All used trichloroethylene liquid and vapor passes through the trichloroethylene recovery systems. Over 98% of trichloroethylene laden vapors are recovered by the adsorbtion unit. The recovered waste liquid tricholorethylene is pumped to a special receiving tank and is distilled for reuse. All wastewaters flow into the chemical wastewater system.

• Quality Control and Materials Processing Laboratories. Martin-Marietta operates two laboratories, using relatively small amounts of isopropyl alcohol, sodium hydroxide, and hydrochloric and sulfuric acids. All liquid wastes enter the chemical wastewater system.

• Demineralizer Regeneration. The ion exchange resins in Building 130 are regenerated by backwashing with sulfuric acid and sodium hydroxide for the cation and anion exchangers, respectively. Wastewaters, which essentially contain the salts present in the incoming tap water in more concentrated form, are collected in the chemical wastewater system.

• Air Pollution Control Liquid Effluents. Wastewaters from the control of airborne effluents of painting operations are also collected in the chemical wastewater system. Inasmuch as all the chemical wastewaters from the manufacturing areas are injected into the disposal well, they have no influence on surface waters. They also have no influence on the aquifers in the New Orleans area because of the very great depth of discharge. Trace amounts of trichloroethylene, isopropyl alcohol, and perhaps other organic solvents evaporate from the wastewaters while in the holding pond, but the amounts are so small as to be inconsequential.

(e) Other Wastewaters: Blowdown from cooling towers and boilers is discharged into the storm drainage system at MAF. Cooling tower blowdown contains concentrated salts from the evaporation of make-up water, and chemicals added as corrosion inhibitors and algal growth inhibitors--sodium bichromate, zinc sulfate, chlorine, hypochlorite, and/or sulfuric acid. Boiler blowdown consists of concentrated salts from the evaporation of boiler make-up water and trisodium phosphate added as internal boiler treatment. Zeolite water softeners are used to pretreat boiler make-up water. The zeolite is recharged with brine, the amount required being about 136 kg (300 lb) of sodium chloride daily. These materials are presently discharged in the surface drainage canals of MAF prior to discharge to the Gulf Intracoastal Waterway. NASA is investigating other means of disposal of blowdown waters. Chemicals used in the water of coolers and boilers may be changed to other kinds that can be discharged more harmlessly into the waterways. Alternatively, the proposed Industrial Wastewater Treatment Facility includes a chrome destruct system through which these blowdown wastewaters could be channeled. Current volumes of these wastewaters are no more than about 100 gallons a day. Present sampling methods from the reservoir have shown no evidence of the chemicals listed above.

Port Michoud is the berth for two uncovered barges used to transport fuel oil and two covered barges used in the past to transport rocket bodies. At the present time, very little fuel transfer occurs at the barge dock. Ten barge shipments are received annually; the majority of these are shipments of component parts rather than fuel. At full production, approximately twenty barge shipments will be received at the MAF.

Diesel fuel No. 2 is directly transferred from the barge to a tank truck driven onto the barge. All equipment for the transfer is on the barge and is constantly monitored during the transfer by trained personnel. Small spills, should they occur, would be contained on the deck of the barge where clean-up would begin immediately. The hazard of large-scale spills would exist if rupture of a barge occurred. This event has the greatest likelihood of occurring during a severe tropical cyclone or

hurricane when a fuel barge might be driven aground and is considered an unlikely worst possible event under present and future barge operations.

In the future barges will be used to transport External Tanks. Small amounts of paint from maintenance of the barges enter the waters of the Michoud slip. There are occasional small bilge spills consisting primarily of a lanolin-based corrosion inhibitor. This material is biodegradable, non-toxic, and has a high flash point. There has been little problem in the past in transferring oil from the barges to land-based facilities. Any spill that might occur would be small and easily contained within the slip prior to clean-up. In short, no significant impacts are associated with the shipping activities at Port Michoud.

(v) Solid Waste System. Operations and activities at MAF generate about 22.68 mtons (25 tons) of solid wastes per day, mostly in the form of paper and paper products. Some garbage from the employee cafeteria in Building 351 is also present. These wastes are deposited in dumpster carts at the buildings of origin and are removed daily by an outside contracting firm. An incinerator by the barge dock near the MAF border is no longer in use. The refuse contractor transports the solid wastes to an off-site disposal landfill. Future plans to burn this solid waste to generate steam for heating and cooling are referred to under Proposed MAF Operations below.

Metal scrap is also produced by manufacturing activities. Such metals are sorted by type at the building of origin and sold as scrap to private contractors who remove them from the site.

Backwashing activities from the chemical wastewater system bring up small quantities of sand from the injection well. This sand accumulates in the wastewater holding pond, and is occasionally removed and piled up along the sides of the pond.

(vi) Hazardous Materials.

(a) Introduction: The analysis of potential hazards released to the area surrounding the Michoud Assembly Facility (MAF) is based on a "worst possible event" caused by mechanical breakdown or personnel error. The objective of this analysis is to determine the impact of this "worst possible event" on the surrounding area and on persons not directly employed by NASA or the tenants of the MAF. In addition, an assessment of the probability of the "worst possible event" occurring will be discussed.

(b) Hazardous Materials Used at MAF: At present, four categories of hazardous materials are used in the fabrication and assembly facilities at the MAF: (1) materials testing equipment which uses ionizing radiation for non-destructive testing, (2) solvents, (3) cleaners, and (4) insulating foams and bonding materials. Other solutions used in metal fabrication and industrial plating are also used at the MAF.

Radioactive sources are contained in a variety of materials testing equipment, including portable x-ray sources, dew point indicators, beta thickness gauges, and static meters. The maximum activity of these sources ranges from 100 milliCuries of Co_{60} to 5 microCuries of Sr_{90} and Tl_{204} (one Curie = 3.7×10^{10} disintegrations per sec). These sources, normally well shielded in the instruments, are used only by specially trained personnel. The potential hazard associated with these sources is minimal because of their construction and the standard guides for their operation by specially trained personnel. Because of the small quantities employed, accidental release from the MAF would have a negligible impact on the surrounding area.

Solvents are used in the MAF primarily during fabrication of specialized insulation and ablator surfaces used in the external oxidizer and fuel tanks of the Space Shuttle. Primary hazards include fire and subsequent explosion and high toxicity of the solvents. Accidental release of these solvents into the external environment could result in fire, explosion, or poisoning of persons outside of the MAF. Because of safety procedures in standards and other codes outlined below, these are remote possibilities.

Cleaners are used in the preparation of metal surfaces prior to and during fabrication for the special insulating materials used in the External Tanks. The atmospheric emissions of volatile solvents and cleaners present a potential toxicity hazard if ventilation and filtering equipment used to capture these emissions fails. Environmental goals are either to limit the emission of volatile organic materials to no more than 1.36 kg (3 lb) per hour up to 6.8 kg (15 lb) per day, or to have a control system 90 to 98 percent efficient, according to available technology. Other solvents contained in solid wastes are removed before disposal to a sanitary landfill.

The insulating foams present hazards to personnel because of the organic solvents used as dispersion fluids and because of the potential for dust explosions of these materials. Protection of the operating and manufacturing personnel is provided through protective clothing (including respiratory and eye protection, coveralls, boots and gloves) and emergency self-contained breathing apparatus. Adherence to fire and other safety codes of the New Orleans Building Code, Fire Code, and Plumbing Code protects both personnel and physical facilities. See Appendix C for sources of standards.

Solvents and cleaners are stored in a total of six tanks in a "tank farm" between Buildings 110 and 103. Three of these tanks have a capacity of 60,560 liters (16,000 gal) each. They are used to store clean, recirculating, or dirty trichloroethylene, respectively. In each tank, the space above the liquid is maintained by a nitrogen purge system to prevent evaporation of the hydrocarbons. Three other tanks, each with a capacity of over 946 liters (250 gal), are used to store alkaline cleaners in the tank farm. The cleaners are for External Tank operations in Building 110.

A seventh tank in the tank farm is a 2,838,750 liter (750,000 gal) storage tank for demineralized water. There are concrete dikes around some of the

tanks in the tank farm, and NASA intends to provide dikes for the remaining ones.

An aircraft-type hydraulic fluid is stored in two tanks, each with a capacity of over 946 liters (250 gal). These tanks are underground beneath the main manufacturing building, Building 103. This fluid is used to run a 20-foot Merson press, a 40-foot Niles boring machine, and a 27-foot Niles boring machine, all in Building 103.

Another storage facility at MAF not discussed elsewhere is a 1,289 liter (340 gal) tank for diesel fuel next to Building 175. This fuel is kept in reserve for liquid nitrogen vaporization.

(c) Disposal Pathways:

• Liquids: Liquid wastes are removed from the facility through one of four systems, depending on the nature of the waste: a storm sewer system which enters the Gulf Intracoastal Waterway, a sanitary sewer system which enters the municipal facilities, and a chemical waste injection well, and by hauling off site. After processing of the industrial wastes for separation and recovery of solvents, the remaining liquids are pumped into a deep injection well for long-term isolation from the environment. Should the injection well cease functioning temporarily the storm reservoir inside the dike is large enough to provide for emergency treatment to reduce chromate and heavy metal concentration to acceptable levels under favorable weather conditions. As appropriate, other hazardous solid and liquid wastes are disposed of off site by contractors in accordance with State and EPA regulations.

A new waste treatment facility is being planned for MAF to meet the Louisiana State requirements for discharge to surface water. An application for an NPDES permit has been filed with EPA, Region IV Office and the facility will meet requirements of the permit when issued.

These systems are physically separate from each other, reducing to a very low probability uncontrolled releases into a system not designed to handle a particular class of waste liquids. Screens to the suction intake of the chemical waste injection well are backwashed occasionally with potable water to remove trapped solids. This backwash is discharged into the storm sewer system which discharges into the storm collection reservoir. Storm drainage is provided through a series of open channels adjacent to the levee along the Intracoastal Waterway where it is pumped over the levee into the waterway. Fish currently inhabit these channels. Should a fish kill occur on-site because of toxic materials in the run-off water, corrective measures would be taken prior to any discharge into the Intracoastal Waterway. No hazardous material would normally enter the Intracoastal Waterway from this pathway.

• Solids: Innoxious solid waste is removed from the site by contractors and disposed of in accordance with State and EPA regulations. Before leaving the site, volatile solvents are recovered from the solid waste to reduce the potential for fire or explosion off-site to minimal levels.

(d) Types of Failures: There is a low probability of personnel error in managing waste liquids in the sanitary and industrial disposal streams, because these disposal pathways are maintained as parallel and completely separated systems with no physical connection between the systems. Therefore, no cross-overs of the different waste streams can occur.

If the injection well temporarily ceases operation, the industrial wastewater is stored on-site in a 3,785 m^3 (1×10^6 gal) chemical waste holding pond. After allowing the evaporation of volatile components of the industrial waste stream, the wastewater may be pumped into the storm drainage system after careful testing to determine its hazards limits. The storm drainage system is below the Estuarine water level and must be forced pumped to exit the Michoud facility.

Most of this flow is rinse water with very little chemical contamination and represents minimum hazard to water quality in the waterway.

A new surface on-site Industrial Wastewater Treatment Facility will be constructed as a FY-78 project, and initial operation is planned to begin in late 1979 or 1980. This plant will replace the injection well currently used for the disposal of industrial waste water as the primary disposal system. It is planned that the existing injection well be used to dispose of effluents from the surface treatment plant and also as a backup for the treatment plant when required.

Additional hazards which may have impact upon the surrounding area could originate from oil spills during fuel transfer at the MAF barge dock and in the disposal at the sanitary landfill of toxic organic solvents which cannot be placed in the injection well.

Toxic fluids are stored on-site prior to shipment for disposal by a specially qualified state-licensed subcontractor. These materials are then disposed of off-site by the subcontractor in accordance with Environmental Protection Agency (EPA) regulations. The principal hazards associated with these transfers are leaking containers, possible fire, and incidental groundwater contamination from container leaks. Inspection by trained and licensed personnel reduces these transfer hazards to a minimum.

(e) Steam Boiler: A gas-fired steam boiler produces steam for space heating, production, and equipment operation. Steam pressure at the boiler is approximately 1,500 kiloNewtons per m^2 (220 psi); at the end of the steam line distribution system, pressure falls to 48 kiloNewtons per m^2 (7 psi). Steam distribution lines are primarily above ground and on bridges when necessary to cross roadways and other access routes.

All current boiler safety codes are met with periodic re-inspections carried out to determine continued certification of the boiler equipment and associated distribution system. Operation of this facility is by licensed stationary boiler engineers and other trained personnel.

Operating experience with steam pressure at these low to intermediate levels has indicated that these steam boiler systems are extremely reliable over long periods of time and constitute only negligible risk to life and property.

(f) Hazardous Material Storage Building: This building was designed for the storage of hazardous materials. Explosion-shielded electrical systems, a deluge sprinkler system, and concrete block fire-resistant construction are used throughout the building. Because of the construction methods and distance from the property lines of MAF, this building, under worst possible conditions of fire and explosion, should prevent impact beyond the property boundaries. Its relative isolation from buildings which house large numbers of employees offers further reduction of potential hazard.

(g) Pneumostatic Test Facility: The pneumostatic test facility (Building 451) is designed to pressure test the integrity of the liquid hydrogen tank used in the External Tank program for the Space Shuttle. This building has been designed for maximum safety of base personnel. Its location, 183 m (600 ft) away from the nearest building, is based on calculations derived from the procedures manual AMCR-385 (Army Materials Command Report) for explosive potential energy. The building itself features numerous safety devices and interlocks, including special pressure-release valves, visual and audio warning devices to indicate that a test is in progress, and interlocks to prevent pressure from exceeding test specifications. During testing, a roadblock to the test building will limit access to the test area. All test operations are conducted from a test bunker designed to withstand the maximum overpressure which might occur in the event of a tank failure. For such a tank failure to occur, however, four safety systems would have to cease functioning simultaneously. The operating procedures directed by a single test conductor, combined with mechanical and structural design features, serve to reduce the potential hazards of this operation to a negligible level.

(h) Cryogenic Storage: Liquid nitrogen (LN_2) is stored in standard cryogenic tanks located 244 m (800 ft) southeast of the main assembly building. The LN_2 is converted to nitrogen gas (GN_2) and stored in three pressure tanks of 96.2 m^3 (3,398 ft^3) capacity at 2,070 kiloNewtons per m^2 (3,500 psi). These tanks are constructed to American Society of Materials Engineers (ASME) standards for unfired pressure vessels; these standards require component testing, certification, and periodic recertification of all welds and metal plates. The greatest potential hazard from rupture of the LN_2 tanks arises from carbon steel structures which become extremely brittle and weakened when subjected to extreme cold. The isolation of this facility from other buildings limits the degree of this hazard.

Personnel operating these facilities will wear face- and eye-protective equipment, loose gloves, and other protective clothing. In addition, they have had specialized training in the handling of LN_2. Small

amounts of oxygen gas, acetylene, and other gases for welding are also stored in pressure vessels in the maintenance sheds on the facility. None of these storage facilities is considered a hazard to MAF personnel or to the adjacent community.

(i) Pesticide Use at Michoud Assembly Facility: The objective of the pesticide program is conservation of the health and well-being of personnel and protection of plants and building by effectively and efficiently controlling target pests while minimizing any associated hazard to the environment. The program is an ongoing one; however, it is under continual review and may vary from year to year in accordance with the pests to be controlled, pesticide effectiveness, registration restrictions, state and federal agency guidance, and other factors.

Pest control is accomplished by non-chemical methods whenever practical. The persistance of some pests, however, and the impracticality or unavailability of natural or alternate means of control dictate some degree of chemical usage. Pesticide selection is based on advise from pertinent federal and state agencies and information contained in handbooks and other publications, including those from the U.S. Department of Agriculture.

In the selection and use of pesticides, consideration is given to:

- Avoidance when possible of residual type pesticides as-well-as those which are highly toxicity.
- Protection of sensitive areas.
- Potential for adverse environmental effects.
- Impacts on acquatic, animal, and plant life.
- Protection of the applicator and other personnel.

Proposed pest control projects are submitted annually to NASA headquarters for incorporation into a "Report of Pesticides Used at NASA Installations." The report includes information relative to the pest to be controlled, pesticide to be used (together with the form, strength, and rate and technique of application) acreage to be treated, sensitive areas, precautionary measures, monitoring, etc. The collated projects are submitted to the Federal Working Group on Pest Management for their review and for any recommendations deemed necessary to achieve effective pest control while preventing or minimizing undesirable effects to health or the environment.

CHAPTER II

Probable Environmental Impacts of Michoud Assembly Facility Operations

II. PROBABLE ENVIRONMENTAL IMPACTS OF MICHOUD ASSEMBLY FACILITY OPERATIONS

A. Impacts of Present MAF Operations

1. Relationship to Land Use and Land Use Plans.

The area around MAF is currently zoned for industrial use and is also designated as an industrial area in the 1990 Land Use Plan. Many industrial facilities are already established in this section of the parish. Since it is one of the few sections available for development within proximity to the New Orleans central business district, it is likely that industrial expansion will occur in the future. Increased development, however, is dependent upon the implementation of feasible drainage plans.

2. Natural Systems.

a. Land and Waters. Available data suggest that the waters around MAF generally meet Louisiana water quality criteria. An exception is coliform bacteria, probably because of the effluent from the New Orleans Water and Sewerage Board located at the head of Michoud canal across from MAF. This plant treats sanitary sewer wastes from MAF and other neighboring facilities.

Lead and mercury contaminants also have been found in waters near MAF. The lead may be from car exhaust washed off parking lots, but the source of the mercury is not known. There is no reason to suspect that MAF is the source.

b. Plant and Animal Populations. The data presented in Chapter I indicate only two kinds of polluting activity that might have potentially significant effects on plant and animal populations on and around MAF. These are (1) the use of pesticides and (2) the discharge of cooling tower blowdown and backwashings from the chemical wastewater holding pond filter to the storm water drainage system. As indicated in Section I.C.2.c. of the present report, the amounts of pollutants entering the surface waters are very small and are rapidly diluted. No fish kills have been observed in the drainage canal system on MAF nor in the Gulf Intracoastal Waterway and marshes in the vicinity of MAF (Stagg, pers. comm.).

Another possible threat to wildlife arises from the maintenance and use of laboratory animals at the Naval Aerospace Medical Research Laboratory (NAMRL) at MAF, since these animals could be a source of infectious wildlife diseases. Such a possibility is very remote, however, because the animals are acquired from laboratory-reared stock or, in the case of some primates, from wild stock which has been held in quarantine at the Delta Regional Primate Research Center. The animals are housed in secure animal care facilities which meet the requirements of the American Laboratory Care Association. The staff of NAMRL includes three veterinarians who are responsible for the health of the animals.

Wastes from animal cages are kept in a holding tank after undergoing a grinding process and are periodically released into the municipal sewer system after receiving approval of the city authorities. Since no diseased animals are used at NAMRL, it is most unlikely that animal pathogens would enter the sewer system through this disposal method.

In summary, no significant impacts on native wild plant and animal populations are seen as a result of ongoing or proposed operations at MAF.

c. Air Quality. New Orleans is not an Air Quality Maintenance Area, and the addition of pollutants from MAF into this relatively clean air is negligible. Present operations at MAF generate from 0.01 to 0.19 percent of measured pollutants in Orleans Parish. The pollutants include particulates, sulfur oxides, carbon monoxide, and nitrogen oxides. Nitrogen oxides, produced mostly from fuel burned in boilers at MAF, represent the highest percentage (0.19) of MAF pollutants in relationship to total emissions in the Parish. Automobiles carrying commuters generate more pollutants than are produced by MAF operations, except in the case of nitrogen oxides when the boilers are at full production.

Activities at MAF produce no violations of Louisiana emission standards except in the case of excessive hydrocarbons. These come from two sources: spray painting and cleaning of component parts with trichloroethylene. Present emission controls at the four paint booths at the site are effective for removal of particulates, but the hydrocarbons escape. The quantity of paint applied in the booths is the basis for estimating the amount of the pollutant that is released. In three of the four, the rate of release exceeds the permitted standards, as shown in Appendix D, Table D-5. Release of up to 6.8 kg/day, or 1,768 kg/year, per source is permitted by state standards before further control is required. Control of the excess emissions will be achieved with an appropriate carbon adsorption system for each booth. An afterburner is another option, but the volumes of vapors involved probably would not justify investment in this more elaborate equipment.

Excessive hydrocarbons are also emitted during cleaning and degreasing of components with trichloroethylene. About 45 kg/day of hydrocarbons are emitted from each of the three vapor-degreasing vats. Since only 6.8 kg/day per source is allowed without control, control of these emissions will be necessary. This can be accomplished in several ways. A proper hood and a carbon adsorption system can be used that will recover vapors escaping from the heated vat and from components removed from the vat. Procedures can be modified to increase the length of time components are allowed to drip over the vat after degreasing. Components can also be exposed to a warm air flow under a hood which would hasten drying and make it more complete. This air would also pass through a carbon adsorption system for additional recovery of trichloroethylene. In this manner, components would contain a minimum amount of the hydrocarbons when they are washed and rinsed in the next stage. This procedure would also keep most of the hydrocarbons out of the chemical wastewater system and preclude significant evaporation loss at the holding pond.

Hydrocarbon vapors resulting from application of TPS materials in vertical assembly building are contained within the individual application enclosures and are exhausted through a catalytic converter where over 98% of the hydrocarbons are removed prior to exhausting to the atmosphere.

In summary, present operations at MAF have no significant adverse impact on air quality, except in the amount of hydrocarbons released. This will be controlled at the sources by appropriate measures as described.

d. Noise. The noise survey conducted at MAF identified no outdoor noise problems on the site. In view of the absence of noise-sensitive areas within the immediate vicinity, it is concluded that there are no adverse noise impacts from operations at Michoud.

3. Community Systems.

a. Population, Housing, Government, and Public Services. Nearly all of the 3,800 MAF employees reside within the New Orleans Standard Metropolitan Statistical Area (SMSA). These employees support a total population of about 10,750 (based on a ratio from the 1970 Census which shows that there are 2.83 persons per employed worker). This figure represents about 1.03 percent of the total population in the SMSA. The total population supported by MAF is a figure that can be used to measure the approximate impact of the Michoud Facility on housing, government, and public services of the area.

If all activities at MAF were totally closed down, the unemployment of 3,800 persons would place a temporary but serious strain on several public and social services. The unemployment rate for New Orleans was 7.3 percent during 1975, about the same as the national rate by the end of 1975. It is problematic whether MAF employees with specialized research, development, and manufacturing skills or the white-collar government workers would be able to find other employment in the New Orleans Metropolitan area. This number, in turn, would affect housing availability, school population, need for health services, police and fire protection, and the like.

For the present, one may conclude that the local communities have adapted, albeit sometimes with difficulty, to the fluctuating employee population at Michoud. This population variation is shown in Figure 4. Any additional sudden changes, in either direction, would create a temporary impact on the community. Whether the impacts were adverse or beneficial would depend upon the direction of the change and the services or needs to be met.

b. Economics. The MAF has had a distinct economic impact on the New Orleans regional economy. Since the beginning of NASA programs at Michoud in December of 1961, the MAF has been a major employment center in the New Orleans region. Peak employment at the facility was approximately 12,000 in 1964. With the curtailment of the Saturn/Apollo program in 1968-69, employment dropped sharply at Michoud. Current employment on-site is 3,766 (Table 25).

The impact of increased employment at Michoud during the mid-1960's was significant for the East Orleans area. Many commercial establishments were constructed along Chef Menteur Highway (Route 90) during this period to support the increased population. For example, three motels were

Table 25. Employment at the Michoud Assembly Facility, March, 1976.

Category	Total	Percent of Total
NASA-Related Personnel	1,768	47
Tenant-Agency Personnel	1,998	53
TOTAL	3,766	100

constructed in the immediate vicinity of Michoud between 1962 and 1966. Many of these establishments suffered economic hardships when employment declined sharply at the MAF.

(i) Employment Mix. During the mid 1960's, manufacturing was the dominant activity at Michoud. However, as shown in Table 26, "white collar" workers now account for 75 percent of on-site employment. Tenant agencies are even more heavily concentrated in the white-collar areas; almost 90 percent of the workers occupy clerical and administrative positions.

Table 26. Employment Types by Agency in March, 1976.

Category	White-Collar*		Blue-Collar**		TOTAL
	Number	% of Total	Number	% of Total	
NASA-Related					
NASA	36	100	0	0	36
Martin Marietta	956	77	284	23	1,240
Defense Contract Administration Services	44	100	0	0	44
Maintenance/Security	5	1	443	99	448
Subtotal	1,041	59	727	41	1,768
Tenant-Agency Related					
Navy/Bell Aerospace	520	75	175	25	695
Army/Chrysler	140	74	50	26	190
Naval Aerospace Medical Research Lab	58	100	0	0	58
U.S. Dept. of Agriculture	980	100	0	0	980
U.S. Army Corps of Engineers	56	100	0	0	56
Defense Contract Audit Agency	19	100	0	0	19
Subtotal	1,773	89	225	11	1,998
TOTAL ON-SITE	2,814	75	952	25	3,766

* Management, professional, office, and clerical workers.
** Skilled, semi-skilled, and unskilled labor.

Source: NASA Michoud Facility Operations Office and personal interviews, March, 1976.

(ii) Budgetary Impacts. NASA's annual budget for the Michoud Facility is approximately $9.4 million (Table 27). As the "landlord agency" for this site, NASA is responsible for the operation, maintenance and security of all buildings on-site. To defray costs of operating the facility, tenant agencies are charged a user fee per square foot of occupied building space. In 1976, it is estimated that $2.5 million dollars will be paid to NASA in user charges by tenant-agencies.

Table 27. NASA Budget for the Michoud Assembly Facility in 1976 (in millions of dollars).

Category	Maintenance & Security	Utilities	Other	Total
Support Martin-Marietta	3.05	1.48	0.55	5.08
NASA Idle Plant	1.07	0.51	0.19	1.78
Support Tenant	1.51	0.73	0.27	2.50
TOTAL	5.63	2.72	1.01	9.36*

*Does not include $0.7 million allocated in 1976 for capital expenditures.

Source: NASA Michoud Business Management office and Facility Operations Office, March, 1976.

Although NASA is the controlling agency at Michoud, it directly (not through contractors) accounts for only a small portion of the dollars generated by the facility. It is estimated that the Michoud Facility directly generates approximately $107 million per year in total expenditures (Table 28). Approximately 70 percent of this is spent locally.

Table 28. Annual Direct Economic Impacts of the Michoud Assembly Facility (in millions of dollars).

Agency	Wages & Salaries	Goods & Services	Total	Percent Spent Locally	Total Spent Locally
NASA	5.0[a]	5.1	10.1	85	8.6
Martin-Marietta	17.0	34.5[b]	51.5	67	34.5
Defense Contract Administration Services	0.6	0.1	0.7	90	0.7
Navy/Bell Aerospace	9.0	12.0	21.0	60	12.6
Army/Chrysler	3.0	2.8	5.8	60	3.5
Naval Aerospace Medical Research Lab	0.5	1.0	1.5	67	1.0
U.S. Dept. of Agriculture	11.0	5.0	16.0	85	13.6
U.S. Army Corps of Engineers[c]	0.6	0.1	0.7	90	0.6
Defense Contract Audit Agency	0.1	0	0.1	90	0.1
TOTAL	46.8	60.6	107.4	70	75.2

Notes: [a]Assumes 75 percent of budget (excluding utilities) goes for wages.
[b]Includes $2.5 million for capital expenditures.
[c]Estimated.

Source: NASA and personal communications, March, 1976.

When both direct and indirect multiplier effects are accounted for, the MAF generates about $112 million annually in the New Orleans Region (Table 29). The general magnitude of indirect economic effects was estimated by using a regional multiplier of 1.5 (Bonner, 1968; Caffrey, 1971).

Table 29. Total Regional Direct and Indirect Economic Effects of the MAF (in millions of dollars).

Category	Total Regional Direct Effects	Total Regional Indirect Effects	Total
Wages & Salaries	$ 47	$ 23	$ 70
Goods & Services	28	14	42
TOTAL	$ 75	$ 37	$112

Source: Estimates, Dalton·Dalton·Little·Newport, 1976

c. Archaeological and Historical Values. Distance mitigates almost all the potential impacts of the present MAF on the archaeological and historical sites described. Visitors to any of these locations who travel on Paris Road and Chef Menteur Highway (U.S. 90) would be able to see at least the tall tower of the NASA complex, if not more of the facility. However, the sight is not an offensive one, and the installation is not dissimilar to other industrial and business-oriented buildings in the immediate vicinity. The historic sugarhouse chimneys of the Lafon Plantation on MAF property are easily seen from Old Gentilly Road in the grassy area in front of the NASA Administration Building (No. 101). Residential expansion eastward towards Big and Little Oak Islands threatens this National Register site. However, the islands are 4.7 km (2.8 mi) from the border of MAF and are not likely to be affected by any of the activities of the facility at its present location.

A review of archaeological and historical information prepared by the Regional Planning Commission (RCP, 1969, 1974) showed no known sites of regional or local interest on MAF property, except the chimneys noted above.

Since ancient shell middens have been turned up in dredging operations on the Intracoastal Waterway very close to the MAF boundary, it is possible that other middens exist in the immediate vicinity and on the MAF grounds. If activities at MAF require continued maintenance and further dredging of Michoud Channel and Michoud Slip, or other excavations on land, the appearance of heavy shell deposits may indicate evidence of prehistoric occupation. Pottery sometimes is also found among the shells. The pottery fragments help indicate periods of cultural evolution of the people involved. Especially in this event, an archaeologist would be called upon to provide and obtain additional information about the early occupation and previous residents of the present MAF territory. Appropriate action will be taken in regards to the requirements of the Historical Preservation Act for the MAF-controlled property.

The records of the Louisiana State Art, Historical, and Cultural Preservation Agency in the capital in Baton Rouge do not indicate any additional buildings of historical or architectural merit in the Michoud area. However, since they have not made a survey, the possibility remains that significant unrecorded features may exist in the area (Gibbens, pers. comm.).

d. Aesthetics. The buildings and structures are already well established at the site. Natural and cultivated grasses have grown over much of the area that was disturbed during previous construction and expansion. The visual impact is that of many differing man-made structures arranged on a flat topography and bounded and intersected by man-made lines of waterways, roadways, train tracks, and power lines. Few plantings or other natural features soften this massive industrial image.

4. Infrastructure.

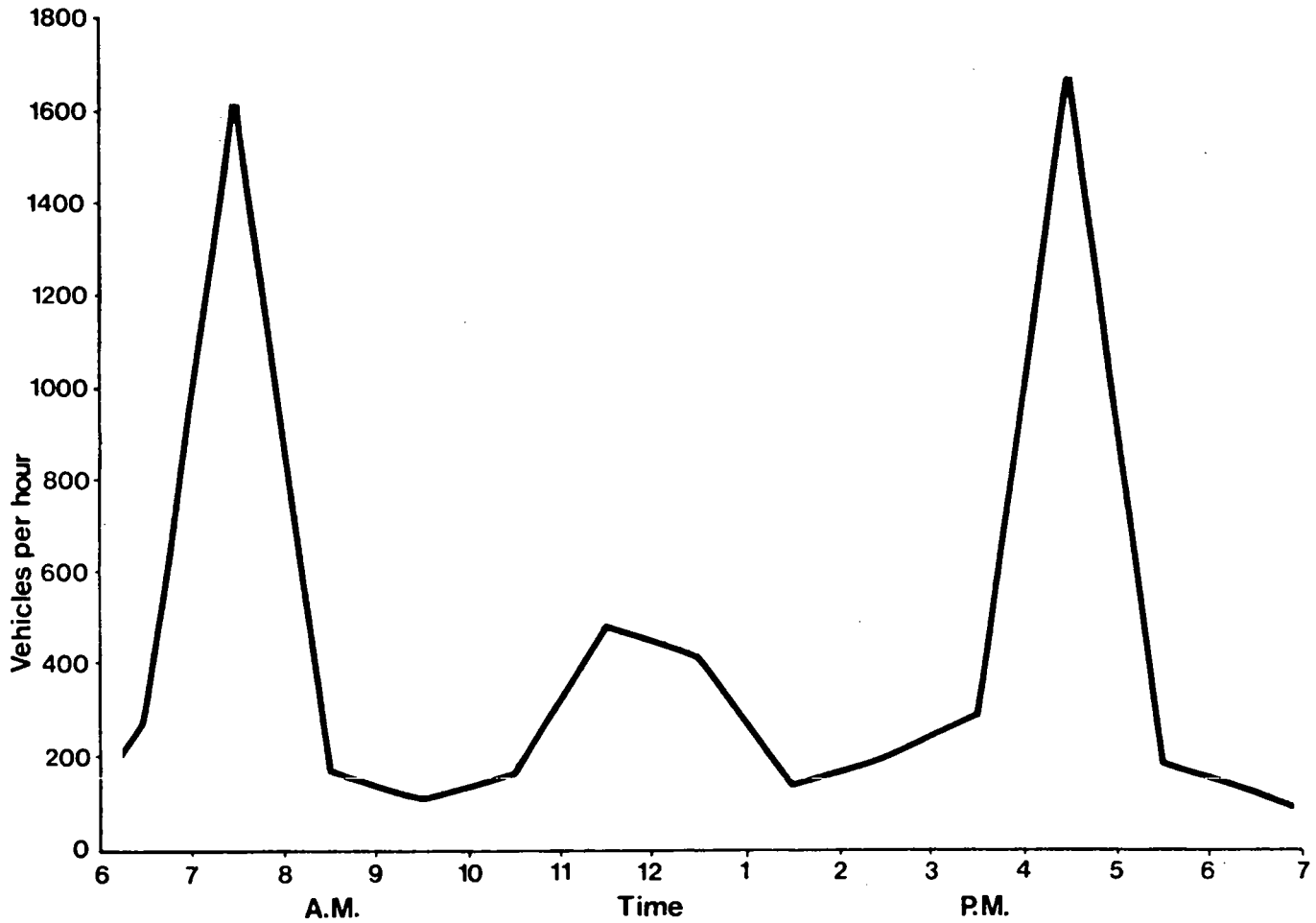
a. Transportation. The only notable impact on the transportation system from the Michoud Facility concerns traffic. Between 2,150 and 2,200 employee vehicle trips are made to and from MAF each day. This represents 113,150 vehicle-kilometers (70,150 vehicle-miles) traveled daily by MAF employees. See Appendix D, Table D-3 for information about employee commuting.

Michoud generates a major portion of the peak hour traffic in the vicinity of the site. Figure 38 shows that the entering and exiting volumes at MAF are concentrated in a very narrow time frame. Traffic counts at the two major exit gates at Michoud indicate that about 1,630 vehicles exit during the peak hour. This represents a peak hour departure rate of about 75 percent. Between 40 percent and 50 percent of the peak hour traffic on Old Gentilly Road is accounted for by Michoud.

The service level characteristics of the Michoud Boulevard/Old Gentilly Road intersection are excellent during most of the day. Only during the height of the peak hour does the intersection service level drop below acceptable conditions.

Proposed highway facilities changes in the MAF area are the construction of Interstate 510 along the alignment of Paris Road from I-10 to the Mississippi River Gulf Outlet Bridge by the Louisiana Department of Transportation and Development and the extension of both Almonaster Avenue and Dwyer Road eastward from their present termini. The future impact on MAF would be a slight inconvenience during construction. The improvement in traffic flow and resurfaced roadway will be an aid to MAF employees. Some additional pollution can be expected from automobile exhaust.

b. Communication Systems. The various communications systems used on-site were established when employment at MAF was considerably higher than it is at the present time. The peak population reached almost 12,000 employees. Present and projected programs aim at only slightly more than 4,000 persons. The systems are still in good condition and are under-utilized, given the present occupancy. Even if all projected plans for increases in NASA and tenant activities materialize, the communication systems will be able to accommodate the changes without stress. Therefore, no adverse impacts to this system are anticipated.



SOURCE: NASA, February, 1976

Figure 38 Entering and Exiting Volume of Traffic at MAF

c. Energy Systems. The present energy systems serving MAF (heating, cooling, electrical power, and natural gas) have been described in detail in Chapter I. With one exception, the various systems were found to be more than adequate to serve energy needs of the facility at the present time. An uncertainty does exist regarding the future supply of natural gas for the New Orleans region. In the event that gas becomes less available within the next few years, MAF will convert to fuel oil as an alternative source of energy. This alternative is taken into consideration in the discussion of impacts of MAF operations on air quality.

Preliminary studies to date on the possibility of conversion to coal as an alternate energy source have not shown the project to be economically justified due to problems of fuel deliveries and plant conversion. Coal handling facilities, rail line extension, storage, dust control, fire protection, and a new boiler would be required.

The immediate area is known to have producing gas and oil wells (Lake Pontchartrain). MAF has never had any seismic tests performed. Development of such energy sources, if they exist at MAF, would have to be cost effective in making MAF independent of other sources.

Present energy consumption at MAF is summarized in Table 30. Btu and kilocalorie equivalents are shown in Table 22.

Table 30. Present Energy Consumption at MAF.

Energy Source	Quantity	Year
Electricity	89,250,000 kWh	1975
Natural gas	27,200,000 m^3 (847,100,000 std. ft^3)	1975
Government vehicle fuel gasoline	238,140 liters (63,000 gal)	1976
diesel oil	75,600 liters (20,000 gal)	1976

d. Water and Sewer Systems. MAF utilized 14.1×10^5 m^3 (372.1×10^6 gal) of water, purchased from the New Orleans Sewerage and Water Board in 1975. Service and supply systems are adequate for present demand.

The sewerage system at MAF was designed for a capacity needed for peak employment. It is presently more than adequate. The same Board that supplies water to MAF manages the sewerage system, and their Michoud

Sewage Treatment was also capable of handling the peak load (pers. comm., Brehm).

The storm sewer system has functioned satisfactorily, and no MAF buildings have been flooded since 1947. Since then, dikes and storm barriers have been constructed and, combined with the drainage system, have protected the facility from heavy rains and storms. The chemical wastewater system, in need of modification, is discussed below. At the present, screens from the suction intake of the system's well are backwashed occasionally with potable water to remove trapped solids. This backwash is discharged into the storm collection reservoir. No adverse effect of this procedure has been observed, but it could be a potential problem if volumes were increased or chemical constituents changed.

e. Solid Waste Systems. Burnable wastes at Michoud are currently transported to an off-site landfill. In view of future land development, such landfills offer a positive impact to the area. However, from the point of view of maintaining natural lowland areas to absorb rain and to harbor local flora and fauna, the impact is negative. Alternative use of these burnable wastes has been discussed under Energy Systems above.

Any dredging spoils resulting from maintenance to the MAF dock facility (unlikely) can be dumped in low spots on MAF property near the dock facility which is presently being used for disposal of scrap concrete, block, and broken brick and tile.

f. Hazardous Material. The previous discussion of hazardous materials (Section I.C.2.c.vi.) concerned the reduction or elimination of potentially hazardous situations by appropriate structural and procedural measures. No adverse impacts are anticipated from potentially hazardous materials at MAF.

B. Impact of Proposed Michoud Assembly Facility Operations

1. Introduction.

It will be recalled that proposed operations at MAF include the following: an expansion of External Tank production from the present rate of about two per year up to a maximum of 60 per year by 1983; the development and production of amphibious Assualt Landing Craft beginning by 1980; and a new set of acceleration experiments with non-human primates at NAMRL.

The net employee population increase from these activities is predicted to be approximately 200 persons. This represents an increase of five percent over the existing level. Procurement and transportation of additional supplies and materials and transportation of these to MAF will also increase. Therefore, the additional combined payroll and purchases will have positive impact on the economy of the region. Increased manufacturing operations, primarily welding and chemical processing, could also affect air and water quality. Increased energy supplies will also be needed in the expanded manufacturing processes. The impacts of these activities is discussed in the sections below. The predicted five percent increase in employee population is not expected to have a noticeable impact upon such New Orleans community systems as government, housing, public services, transportation and the like. The same is probably true for most MAF facilities.

In addition to the proposed activities discussed previously, two modified institutional systems are planned: a proposed new system for chemical wastewater treatment, and a new waste-fired boiler/chiller. Since the introduction of these two facilities will also affect some of the activities discussed below, they are included in order to provide a comprehensive analysis.

2. Environmental Effects From Proposed Operations.

a. Water and Sewer Systems. In view of the expected production of wastewater in excess of the capacity of the disposal well when the External Tank program goes into full production, the history of well clogging, and the possible unacceptability to the EPA of deep injection for disposal of wastewaters, MAF plans to construct a chemical wastewater treatment plant in fiscal year 1978 or 1979. The proposed plant will consist of a new 1,893 m^3 (0.5×10^6 gal) holding pond, pretreatment facilities, and final polishing facilities. In addition, there will be a new force main between the Vertical Assembly Building (VAB) and demineralizer area to the new holding pond and some modifications to the existing force mains. The new chemical wastewater systems and its relationship to the existing system is shown in Figure 37.

Dilute rinse waters, which will be produced continually in large volumes, will be treated separately from the concentrated waste liquors which are of relatively small volume and dumped only at intervals of up to a year. Dilute rinse waters will be conducted to the existing holding pond, which will serve as a surge tank, and subsequently passed through activated carbon and demineralizers and then reused for rinsing. Thus, large volumes of water will be conserved; the major loss will occur

through evaporation from the holding pond. Cooling tower and boiler blowdown will be transported to the holding pond. Concentrated liquors will be conducted to the new holding pond, which will be compartmented to segregate wastes on the basis of chemical characteristics. Simple acid or base wastes will be neutralized. Wastes containing chromate, nickel, or phosphate will be pre-treated by addition of chemicals for pH adjustment and chemical reduction. Precipitated salts of nickel and phosphorus will be removed by centrifugation. Reduced chromates will be processed in a chrome destruct-clarifier system, and the resulting insoluble salts will be removed by centrifugation. The new chemical wastewater system for concentrated liquors will also be used to process concentrated regenerant wastes from the rinse water demineralizers. Treated water from the new system will be finally disposed of through the existing injection well. Solid residues will be disposed of in a landfill or will be processed for reclamation of the chemicals through a contractor.

The costs for the proposed system described above are presented in Table 31, which is based on the 1975 Preliminary Engineering Report for Industrial Wastewater Treatment Facility at Michoud Assembly Facility.

Table 31. Estimated Construction Costs of the New Chemical Wastewater Treatment System at MAF.

Dilute Rinse Water Subsystem	
Materials	$ 1,128,000
Labor	106,000
Sub-Total	$ 1,234,000
Concentrated Liquors Subsystem	
Materials	$ 320,750
Labor	136,000
Sub-Total	$ 456,750
Total for Both Subsystems	$ 1,690,750
Contingencies, 20%	338,150
Escalation, 10%	202,890
Job Coordination, 9%	200,860
Engineering and Design, 7.5%	167,350
Total	$ 2,600,000

If the proposed new chemical wastewater treatment facility is constructed at MAF, it is reasonable to project no significant impact of increasing External Tank production on water quality, with the possible exception of an impact on groundwater if the solid residues were improperly disposed of in a landfill. For a discussion of this issue, see Section II.B.2.e. below. The economic impact of construction of the proposed treatment facility would also be negligible. Much of the money would be spent outside the New Orleans area for materials not available locally. Construction would involve disturbance of the soil. If digging exposes any shell middens or archaeological sites presently unknown, communication with the appropriate authorities will be made.

Another issue to be considered with respect to wastewaters is the additional load that increasing employment at MAF from approximately 3,800 to approximately 4,000 persons will have on the existing municipal sewage treatment plant now serving MAF. The public sewer system serving the facility was designed to handle peak capacity (approximately 12,000 employees), and it is still in good condition. Expansion of residential development north of the site has not yet reached the region served by the Michoud-area treatment plant. If the Orlandia development does become a reality, sewer service would not be through the New Orleans Sewage and Water Board Michoud plant. Instead, an interceptor is planned which would convey the wastewater to another plant near Florida Avenue (Brehm, pers. comm.). Therefore, no significant impacts on sanitary sewage treatment are anticipated from the expansion of activities at MAF.

b. Air Quality. The future will bring changes in boiler operation (possibly including a new, small chiller/boiler), commuter travel, welding, and chemical processing at the Michoud Assembly Facility. A new Louisiana air control compliance Schedule Form will be required.

Estimated total emissions for one year in the 1980-1982 time period are shown in Table 32. The data in the table was based on the assumption of worst possible conditions: (1) the proposed chiller/boiler would be operational and contributing pollutants; (2) fuel consumption for boilers would increase 34 percent; and (3) present 1976 rates of excessive hydrocarbon emissions would not yet be effectively controlled. In addition, the table shows relative pollutant conditions if natural gas is replaced by No. 6 fuel oil.

- Boilers. Because of proposed expanded activities, NASA officials estimate a 34 percent increase in the need for heat. Therefore, natural gas consumption and the resultant pollutants would also increase 34 percent. The new figure would be 36 x 10^6 m^3 (1.3 x 10^9 standard cubic feet) per year by 1980. If natural gas is not available, conversion to No. 6 residential fuel oil is proposed. By 1980, 34 x 10^6 liters (9 x 10^6 gallons) will be consumed per year. Number 6 fuel oil will produce 0.27 milligrams/Calorie (0.15 lbs/million Btu) particulate emissions. Louisiana standards allow up to 1.08 milligrams/Calorie (0.6 lbs/million Btu) particulate emissions. Therefore, the MAF horizontally fired boilers will satisfy Louisiana regulations. The No. 6 fuel oil would be limited to 0.7 percent sulfur by weight (pers. comm., Orey Tanner). A switch to fuel oil would have the greatest impact of any changes contemplated for MAF. Table 32 shows significant increases in emissions of all pollutants if fuel oil were burned; however, such increases still would not jeopardize maintenance of ambient air quality standards for the area.

- Spray Painting. Activities involving paint at MAF for 1980-1982 are predicted to be at about the same level as in 1976. Table 32 shows hydrocarbon emissions at worst possible conditions, with emissions at 1976 levels and no additional controls. See also Appendix D, Table D-5. With controls, the predicted hydrocarbon emissions would be reduced.

- Industrial Internal Combustion Vehicles. Fuel consumption per year by on-site vehicles is expected to remain about the same for 1980-1982 as for 1976. See Appendix D, Table D-8. If a substantial number of new vehicles with emission controls is purchased and utilized by then, the pollution from this source can be expected to decrease.

- Welding. Welding will increase as a result of the NASA Space Shuttle program and, if it becomes a reality, the U.S. Navy Surface Effect ship building program. In spite of the increase, air pollutants from this source will remain negligible. Current control systems will continue to operate. Continued recirculation and filtration of plant air will prevent release of any significant emissions into the ambient air.

- Chemical Processing. As previously discussed, chemical processing refers to three major operations. The first, cleaning and degreasing of components with trichloroethylene, has already been described (Section I.C.2.a.iv.). It is expected that about the same amount of cleaning and degreasing will be done per year between 1980-1982. Therefore, the present emission figure for hydrocarbons, 36,100 kilograms (36.1 mtons), is used in computing the projected annual rate. This is shown in Appendix D, Table D-10. This amount of hydrocarbon emission assumes the worst possible condition and is based on complete absence of control for this pollutant. If appropriate controls and vapor recovery systems, such as hoods and carbon adsorption, are installed and functioning by 1980 or 1982, the emissions of hydrocarbons through vapor degreasing will be reduced considerably. As discussed previously, hydrocarbons probably are currently being emitted at a rate of 45 kg/day per source. This assumes the consumption of 3,000 kg/month of trichloroethylene, 22 working days a month, and three vapor vat sources. The standard is 6.8 kg/day per source.

Table 32. Net Air Pollution Emissions by Major Source, MAF, 1980-1982, in mtons (and tons) per year, as Percentage of Total.

Pollutant	SOURCE: Boilers[1]	%	Chiller/Boiler[2]	%	Painting[3]	%	On-site Vehicles[4]	%	Chemical Processing[5]	%	ON-SITE TOTAL	MAF Commuters[6]
If Boilers use Natural gas:												
Particulates	2.9-8.7 (3.2-9.6)	12-30	20 (22)	86-68	trace	0	0.5 (0.6)	2-2	---	0	23.4-29.2 (25.8-32.2)	11.1 (12.2)
Sulfur Oxides	0.4 (0.4)	5	7.0 (8.1)	91	---	0	0.3 (0.3)	4	---	0	7.7 (8.8)	3.7 (4.1)
Carbon Monoxide	9.9 (11.0)	10	30 (33)	29	---	0	62.2 (68.4)	61	---	0	102.1 (112.4)	339.8 (373.8)
Hydrocarbons	1.8 (2.0)	3	9.0 (9.9)	14	6.5 (7.1)	9	9.4 (10.0)	15	37.8 (41.6)	59	64.5 (70.6)	49.4 (54.3)
Nitrogen Oxides	70-130 (77-150)	84-91	9 (9.9)	11-6	---	0	4.8 (5.3)	5-3	---	0	83.8-143.8 (92.2-165.2)	61.8 (68.0)
If Boilers use No. 6 Fuel Oil:												
Particulates	94 (100)	82	20 (22)	17	trace	0	0.5 (0.6)	1	---	0	114.5 (122.6)	11.1 (12.2)
Sulfur Oxides	460 (510)	98	7 (8.1)	2	---	0	0.3 (0.3)	-	---	0	467.3 (518.4)	3.7 (4.1)
Carbon Monoxide	17 (19)	16	30 (33.0)	27	---	0	62.2 (68.4)	57	---	0	167.0 (184.0)	339.8 (373.8)
Hydrocarbons	12 (13)	16	9 (9.9)	12	6.5 (7.1)	8	9.4 (10.0)	13	37.8 (41.6)	51	74.2 (81.2)	49.4 (54.3)
Nitrogen Oxides	330 (360)	96	9 (9.9)	3	---	0	4.8 (5.3)	1	---	0	343.8 (375.2)	61.8 (68.0)

1 See Appendix D, Table D-2 for emission factors used in these calculations.
2 Assumes facility is operational.
3 If hydrocarbon emissions remain uncontrolled.
4 See Appendix D, Table D-8. Amount of fuel for vehicles is estimated to be the same in 1980 as in 1976.
5 See Appendix D, Table D-10.
6 See Appendix D, Table D-4.

Table 34. Present and Projected Annual Energy Consumption at MAF.

Energy Source	1975-76		1982 (Estimated)		Change
	Million kilocalories	Million Btu	Million kilocalories	Million Btu	(Million kilocalories)
Electricity	70,970	280,513	160,807	647,458	+ 89,837
Natural Gas	220,960	873,360	339,096*	1,340,300*	+ 118,136
Fuel Oil**	0	0	0*	0*	-----
On-Site Vehicles					
Gasoline	1,992	7,872	1,992	7,872	0
Diesel Fuel	683	2,770	683	2,770	0
Commuter Vehicles	46,028	181,930	48,330	191,027	+ 2,302
TOTAL	340,633	1,346,375	550,908	2,189,357	+ 210,375***

* If natural gas is not available, MAF will convert to No. 6 fuel oil; in that case, these figures would change.

** Approximately 17 million kilocalories (68 million Btu) of No. 2 fuel oil is stored at MAF for emergency boiler firing.

***This quantity can also be expressed as 2.1×10^{11} kilocalories (0.34×10^{11} Btu).

e. Solid Waste System. The existing landfill is a dump-and-cover operation with minimal cell excavation because of the high groundwater table. Should a new chemical wastewater treatment facility be constructed on the MAF, solid materials to be disposed of in the landfill would consist predominantly of insoluble salts, including salts of nickel and chromium. Potential pollution from these materials should be minimal, provided that the materials are covered quickly and with sufficient thickness of soil cover to prevent exposure of the solid waste. Since the materials are insoluble, they would not enter the local groundwater system. The landfill should be operated in such a manner as to minimize surface erosion and potential transport of the materials to a possibly active environment.

C. Cumulative Impacts of the Present and Proposed Michoud Assembly Facility Operations

1. Land, Aesthetics, and Natural Systems.

MAF operations are consistent with present and proposed land use plans. They are also in keeping with the aesthetic character of the surrounding industrial neighborhood.

MAF does not appear to be causing any direct adverse impact on the water quality of the area. The sewage treatment plant at the head of Michoud Canal which treats wastes from the developed areas around Michoud, including MAF, may be source of coliform bacteria reported

in the waterways near MAF. It is possible that the reported lead contaminants enter by way of rainwater run-off from parking lots serving industrial and commercial establishments in the area, including MAF. The source of mercury in the neighboring waters is not known, but there is no reason to suspect that this contaminant comes from MAF. Backwash from the waste chemical injection well has not been observed to cause any adverse impact, but it could become a potential source of contaminants if volumes increased or chemical composition changed.

There is no evidence that any of the activities of MAF have any significant adverse impacts on the local plant or animal populations, except in the case of operations to rid the site of pests, as discussed in the section or Pesticide Use. Impact of pesticide use on non-target organisms appears to be nil.

No operations at MAF produce an adverse noise impact on the surrounding community. It is a relatively quiet location.

The New Orleans region has relatively clean air, especially for an American city of its size. MAF is presently contributing at most only 0.19 percent of any given pollutant to the emissions listed for New Orleans Parish. This percentage, resulting from nitrogen oxide emissions, is produced almost exclusively by the burning of natural gas, a relatively clean fuel. If the facility is forced to convert to fuel oil, emissions from the boilers, especially sulfur oxides, will increase sharply. However, they will remain within acceptable levels for the Parish.

Hydrocarbon emissions from component cleaning with trichloroethylene and from spray painting are presently above allowed standards at several sources at MAF. Changes in procedures and emission control equipment have been suggested and are under investigation. Attempts are being made to reduce these emissions to acceptable levels by the best means available.

2. Community Systems.

At the present time, the employees at MAF and their dependents represent an estimated 1.03 percent of the total New Orleans metropolitan population. The community has been in a period of adjustment since 1968 from the decline in peak employment which had been about three times the present level. With the proposed modest employment increases of about 200 persons over the next four years, there is no difficulty anticipated for the community in absorbing these new employees and their dependents.

The economic impacts will come from a five percent increase in payroll and proportionate purchasing and services expected by the expanded programs. The present total budget for all activities at MAF is approximately $107.4 million per year, of which about 70 percent is spent locally. Using a regional multiplier to show secondary expenditures within the community resulting from the initial MAF budget, local economic value generated by current operations is about $112 million per year. This will increase as the proposed expansions become operational.

No sites listed in the National Register for Historic Places are located close enough to MAF to receive any adverse impacts from MAF operations. The two historic chimneys in front of the NASA Administration Building (Building 101) are the only known sites of archaeological interest on MAF property listed by either the Regional Planning Commission or the State of Louisiana staff archaeologist at the Art, Historical, and Cultural Preservation Agency. The chimneys are prominently located and surrounded by mowed grass in an attractive setting. When future plans call for breaking ground, an archaeological survey will be part of the early planning activities.

3. Infrastructure.

Michoud employees are responsible for about one-half of the rush hour peak traffic loads occurring twice each week day on Old Gentilly Road outside the gates of MAF. These impacts are of very short duration. Traffic flow during the rest of the day is excellent.

Communication systems at MAF are more than adequate to handle the present and projected internal needs.

Annual energy consumption will increase at MAF in proportion to the increase in proposed activities achieved each year. Consumption of the various forms of fuel for energy at present, and estimated for 1982, is shown in Table 34. A small amount of energy would be conserved by burning MAF-generated refuse in a proposed new heating and chilling system for one building on the site.

Water and sewer utilization will undergo changes after a proposed new chemical wastewater treatment system is constructed. The new plant would filter and conserve water, neutralize acids and bases, and precipitate heavy metal and phosphate salts for reclamation or deposit in a suitable landfill. If this system is constructed as proposed, chemical wastewaters resulting from present and expanded operations will be effectively treated to prevent any significant negative impact on the environment. If the system is not constructed, the present system will be inadequate to handle increased chemical wastewater loads projected for the near future. The capacity of the off-site public sanitary sewer system is adequate for present and proposed use.

Hazardous materials storage and handling at MAF should provide no adverse impacts as long as the operators adhere to regulations, codes, and procedures.

CHAPTER III

Alternatives to Present Operating Conditions

III. ALTERNATIVES TO PRESENT OPERATING CONDITIONS

A. Relocation or Modification of the NASA External Tank Program

Another location considered for the construction of the External Tank was the U.S. Navy installation at Seal Beach, California. However, it was determined that the size of the facility would limit its capacity to no more than 20 tanks a year. Since the NASA goal was a maximum of 60 tanks a year, it was decided that the California site was too small.

Air Force Plant Number Two, in Tulsa, Oklahoma was also considered. This facility met floor space requirements but was rejected because it had no equipment or tools that could be adapted for External Tank production.

No other available site except Michoud has an adequate amount of floor space and a set of production tools and equipment of the kind required. In addition, the Michoud site has high bay doors at the plant for convenient removal of the very large finished tanks. Michoud also is especially convenient to highways, railroads, and a seaport on the site. The port will be used for shipping of the completed External Tanks by water to their place of assembly with the other elements of the Space Shuttle at Cape Canaveral in Florida and at the Western Test Range in California.

Another option for NASA would have been to design and produce a smaller version of the External Tank. However, it was decided that if the size of the tank were reduced, its fuel capacity would not be enough to allow the Orbiter to carry a payload of sufficient weight to justify the effort to place it into orbit.

A third option would have been for NASA to use a space vehicle requiring no External Tank at all. In such a case, the versatility and efficiency of the Space Shuttle program would be lost. Further space explorations would then be limited to those using vehicles which could not be recovered for future missions. In a modification of those previous programs in order to be more efficient and economical, the Space Shuttle program was conceived to allow personnel and a wide variety of research instrumentation to be placed into orbit with the same basic vehicular components, many of which would be utilized again and again. The External Tank is essential to such a system.

B. Discontinuation of Tenant Operations

The possibility exists of not permitting other government agencies and contractors to use the site. If this were done, a portion of the site would stand idle. However, it would still need to be maintained at considerable expense to NASA for possible future need. The tenant agencies' user fees provide a means of defraying these maintenance costs. The tenant agencies also benefit by having ready-made locations for their own operations without having to invest additional amounts of money or time in seeking new facilities. These same agencies offer a boost to the economy of the New Orleans region with their payrolls and purchases of goods and services.

C. Closing of Michoud Assembly Facility

An option remains to shut down the entire MAF site. For reasons stated above, this has not been considered a valid plan of action. External Tank production is vital to NASA's Space Shuttle program, and the presence of the tenant agencies is an economically sound operation that brings both NASA and New Orleans positive benefits.

CHAPTER IV

Adverse Environmental Effects Which Cannot Be Avoided

IV. ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

A. Existing Conditions

No evidence was found of any significant adverse effect on plant or animal life or on water quality by operations at the Michoud Assembly Facility. However, the chemical wastewater system requires upgrading, especially if the External Tank program is escalated as planned. Chemical wastes are currently pumped into a deep injection well which has a limited life. The backwash to clean filters for this pump is currently drained into the storm sewer system reservoir. From here it is eventually pumped into the Intracoastal Waterway. After the proposed Industrial Wastewater Treatment Facility for MAF becomes operational, such procedures should no longer be necessary.

Regarding air quality, operations at MAF generate 0.19 percent or less of each of the pollutant totals reported from Orleans Parish. The air quality in the parish is sufficiently good that it has not been named an Air Quality Maintenance Area by the U.S. EPA.

Within the MAF, present painting and component cleaning operations emit hydrocarbons in excess of allowable standards. These can be reduced to acceptable levels by the addition of carbon adsorption systems and/or other procedures.

Automobiles driven by commuters to MAF contribute pollutants to the greater New Orleans area, and represent an indirect impact of Michoud operations. Of these pollutants, carbon monoxide is the highest. Pollution levels of emissions attributed to automobiles are within acceptable limits in New Orleans Parish at the present time.

About one half of the peak hour traffic on Old Gentilly Road near Michoud comes from commuters to and from the facility. Except during the morning and evening rush hours, the traffic flow is smooth. During rush hours, noise and air pollution and some congestion occur, but not above acceptable limits.

Energy in the form of natural gas, electricity, gasoline, and fuel oil is consumed on the site. These are all irretrievable resources, the consumption of which creates an adverse, if relatively insignificant, impact on the total energy supply available to the country for other purposes.

There are potentially hazardous materials and chemicals used and stored at MAF. These should create no adverse impacts upon the environment as long as the operators adhere to the regulations, codes, and proper procedures.

B. Proposed Operations

The number of employees on-site is projected to increase about five percent (200 persons) by 1980-1982. As a result, there will be slight increases in traffic, automobile exhausts, and a need for housing, community services, parks, recreational capabilities, and other elements discussed previously. This increase will not be large enough to create a significant impact upon the existing environment.

External Tank production is projected to increase from about two or three a year to a maximum of 60. Cleaning and coating External Tanks involves the use of several chemicals which could result in excessive emissions of hydrocarbons. These emissions will be controlled by a carbon adsorption system rated about 98 percent efficient. If adequate controls and procedures are applied to the emission of hydrocarbons in the component degreasing operation, this source of pollutants can also be in compliance with regulations by 1980-1982. These controls will be installed as part of the plant operations as needed.

Expanded manufacturing operations will increase the amount of welding to be done, but existing controls are sufficient to mitigate any negative air quality impact.

A possible change in boiler fuel from natural gas to No. 6 fuel oil may be required. The latter will produce many times more emissions than the former. An increase in total boiler fuel consumption is projected as well. In spite of these two possible levels of emission increase, total pollutant levels will not cause the area to exceed standards.

Solid wastes resulting from this facility will either be deposited in a suitable landfill site or be commercially processed for recovery of metals. With proper covering, no adverse impacts are anticipated from the landfill operation.

CHAPTER V

Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

V. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

In exchange for a small amount of air pollution, some short-duration increases in traffic, and the consumption of energy resources, the Michoud Assembly Facility is making specialized long-term programs possible. These include:

A. Support for the NASA Space Shuttle System by development and production of the External Tank.

B. Research and development into new types of water surface vessels and materials by the Navy and its contracting agencies.

C. Contribution to knowledge of body stress and performance while experiencing acceleration and vibration by research and experimentation at the Naval Aerospace Medical Research Laboratory.

D. Computer and other administrative services for nationwide U. S. Department of Agriculture operations.

E. Development and production of component parts for the U. S. Army Tank Command.

F. Administrative services and support for two Defense Contract agencies.

G. Provision of office and dock space for inspection and administration activities of the U.S. Army Corps of Engineers.

The MAF is not now a highly productive environment in the biological sense. Continuation of present activities at MAF and the additional proposed activities will have no major adverse effect on the biological productivity of MAF or on surrounding natural areas.

CHAPTER VI

Irreversible and Irretrievable Commitment of Resources

VI. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The land which MAF occupies has been committed to NASA and the tenant-agencies for their programs. This precludes alternative uses of the same location. In the early 1940's, before being occupied by NASA, the natural estuarine marshland of MAF was drained and filled. Pilings were driven into the ground to provide a firm foundation for buildings and other structures. This man-made transformation of the land changed its function. It had been a spongy reservoir for rain and storm waters, and a natural habitat for estuarine flora and fauna. Now, a levee, drainage canal, and pump system protect the man-made structures from flooding. The new function does not provide the same natural surroundings for pre-existing estuarine flora and fauna. For example the drained and filled land can no longer absorb as much rain water in the same manner. However, the adaptation of the land to the newer function appears to be adequate, and another degree of balance and stability has been achieved at the site.

The combined budget of all MAF occupants represents an annual commitment of about 107 million dollars of public money that therefore cannot be expended on other operations or at other locations. The total value of the facility, in terms of replacement costs, was estimated at 410 million dollars in 1975. This commitment of resources, in the form of federal money, precluded other uses of the same dollars over the period of years during which development of the facility took place.

The present annual energy consumption at MAF represents 3.4×10^{11} kilocalories (1.35×10^{12} Btu) that is not available for performing other functions at MAF or elsewhere. The energy is consumed in the form of natural gas, electricity produced by fossil fuels, diesel fuel, and gasoline, all of which are non-renewable resources.

CHAPTER VII

Structural and Non-structural Measures Which Can Be Taken to Minimize Harm Where Unavoidable Adverse Environmental Effects Are Encountered

VII. STRUCTURAL AND NON-STRUCTURAL MEASURES WHICH CAN BE TAKEN TO MINIMIZE HARM WHERE UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS ARE ENCOUNTERED

The use of trichloroethylene to clean and degreast components in vapor vats produces hydrocarbon emissions in excess of standards. These emissions can be controlled to an acceptable standard by the following procedures. A proper hood and carbon adsorption system can recover vapors which escape from the heated vats and from components removed from the vats. The degreased components can be allowed to remain suspended over the vats for a longer period of time before they are removed, to permit more trichloroethylene to drip back into the vat. Cleaned components can be exposed to a warm air flow under a hood which would hasten drying and cause more complete removal of the chemical from the surfaces. This air containing more vapor would also pass through the carbon adsorption system for additional recovery efficiency. By using this system, components would have a minimum amount of trichloroethylene on them when they reached the washing and rinsing areas. Thus, the excessive hydrocarbons would be kept out of the chemical wastewater system and would not be transported to the holding pond where they would be dissipated by evaporation, and would not be expected to persist for the several days needed to pass through both the waste lagoon and, in the event the lagoon leaked, the storm reservoir. Should significant reduction or control of trichloroethylene be required, it will be a problem throughout the metal finishing industry and appropriate action will be taken to meet the requirement of new standards either by increasing controls and/or changing to another cleaning or degreasing process.

Hydrocarbons are also emitted in excess of standards in three of the spray-painting booths on the site. Here, too, the carbon adsorption system is very effective in recovering the emissions. Therefore, it or a similar system should be used for the booths in order to comply with pollution regulations. These and other methods to control excessive hydrocarbon emissions are currently under study. NASA is committed to reducing the emissions to an acceptable level.

The installation of an Industrial Wastewater Treatment Facility at MAF as proposed and discussed would solve several environmental problems simultaneously. Many chemicals would be recovered, water would be recycled, the injection well could be closed, and the storm reservoir would not receive potential pollutants from the pump filter backwash. Care with the landfill deposition of solid wastes by proper covering will isolate them from an active biological environment. Monitoring will consist of those required by the NPDES permit when issued and will not likely include conductivity, pH, sampling for cyanides, and hexavalent chromates.

Present vehicles for on-site activities can gradually be replaced by those that pollute the air less. This procedure will reduce total emissions from such sources in the course of a few years.

CHAPTER VIII

Comments Received and NASA's Response

Louisiana Air Control Commission

State Office Building
Phone (504) 527-5115

P.O. Box 60630
New Orleans 70160

April 25, 1977

Mr. Duward L. Crow
Associate Deputy Administrator
National Aeronautics and Space Administration
Washington D.C 20546

Re: Institutional EIS Michoud
Assembly Facility, New Orleans, La.

Dear Mr. Crow:

The above referenced EIS has been reviewed by this agency. The following commentary is offered.

The report states that the facility is not in compliance with the Louisiana Air Control Commission's Regulations dealing with the release of volatile organic compounds. There are numerous indications that the violations will be corrected, however the report never indicates exactly when this will happen. Early compliance with the hydrocarbon emission limitations is imperative.

Very truly yours,

Gustave Von Bodungen

Gustave Von Bodungen, P. E.
Chief, Air Quality Section
Office of Health Services &
Environmental Quality

OT/ylw

cc: EPA Enforcement Division

Louisiana Air Control Commission, New Orleans, Louisiana

Comment: The Air Control Commission noted the lack of compliance with Louisiana Air Control Commission regulations dealing with the release of volatile organic compounds (i.e., hydrocarbon emissions), and inquiries as to when compliance will occur.

Response: Since the draft statement was prepared, the Boeing Services (NASA) facility listed in Table D-5 has acted to reduce hydrocarbon effluents by 95%. Bell/Aerospace (Navy) activities have been discontinued. Chrysler (Army) has reevaluated its projected use of paint and will not exceed the limit of 6.8 kg/day. Martin-Marietta (NASA) has had the Federal Water Pollution Control Act and the Clean Air Act (PL 92-500 and PL 91-904, as amended) requirements included in their contract and have been informed through DCAS that any painting requirement that results in venting hydrocarbons in excess of 6.8 kg/day will require 95% control. The final EIS has been modified to indicate compliance with these levels of emission (see Table D-5, page D-3).

DEPARTMENT OF THE ARMY
US ARMY TANK-AUTOMOTIVE MATERIEL READINESS COMMAND
WARREN, MICHIGAN 48090

DRSTA-IZD

MAY 1977

Office of the Administrator
National Aeronautics and Space Administration
Washington, D.C. 20546

Dear Sir:

Upon review of the Institutional Environmental Impact Statement of the Michoud Assembly Facility, New Orleans, Louisiana, it is determined that the U.S. Army Tank-Automotive Materiel Readiness Command and its contractor, Chrysler Corporation, a tenant related activity, in performance of current programs and projects at MAF have no adverse impact on the environment.

Therefore, no corrective action is deemed necessary.

Sincerely yours,

Joseph Voldrich

JOSEPH VOLDRICH
C, Tank Systems Division
Procurement & Pdn Directorate

Department of the Army, U.S. Army Tank-Automotive Materiel Readiness Command

Comment: The U.S. Army Tank-Automotive Materiel Readiness Command and its contractor, Chrysler Corporation, a tenant related activity in performance of current programs and projects at MAF, have no adverse impact on the environment and no corrective action is deemed necessary.

Response: NASA took exception to this comment. As indicated in the comments of the Louisiana Air Control Commission, emissions of hydrocarbons by Chrysler Corporation activities exceed the Commission's regulations dealing with volatile organic compounds. NASA, through the Defense Contract Administration Services Management Area, New Orleans, requested Chrysler Corporation to comply with the regulations and Chrysler has assured NASA it will do so.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION SIX

750 Florida Boulevard
Baton Rouge, Louisiana 70801

May 2, 1977

IN REPLY REFER TO

Mr. Duward L. Crow
Associate Deputy Administrator
National Aeronautics and Space
Administration
Washington, D. C. 20006

Dear Mr. Crow:

We appreciate the opportunity to review the draft Institutional Environmental Impact Statement for the NASA Michoud Assembly facility in New Orleans, Louisiana.

There are several proposed highway facilities in the vicinity of the Michoud facility which may affect the DEIS discussions on transportation and air analysis. The Louisiana Department of Transportation and Development proposes to construct Interstate 510 along the alignment of Paris Road from I-10 to the Mississippi River Gulf Outlet Bridge. In addition, the city of New Orleans has plans to extend both Almonaster Avenue and Dwyer Road eastward from their present termini. These projects will alter the traffic flow in the Michoud facility area and should be considered in the analysis of future impacts. We recommend that you contact the Louisiana Department of Transportation and Development and the New Orleans Department of Streets for specific details on these projects.

Sincerely yours,

for M. C. Reinhardt
Division Administrator

U.S. Department of Transportation (DOT)

Comment: The DOT, Federal Highway Administration, Region VI, pointed out that there are several highway facilities being proposed in the MAF vicinity; Interstate 510 from I-10 to the Mississippi River Gulf Outlet Bridge, and an extension of Almonaster Avenue and Dwyer Road eastward from their present termini. DOT suggested that these proposals will alter traffic in the MAF area and should be considered in the analysis of impacts.

Response: The final EIS has been modified to include discussion of the proposed highway facilities changes near MAF, such as construction of Interstate 510 along Paris Road from I-10 to the Mississippi River Gulf Outlet Bridge by Louisiana Department of Transportation and the extension of both Almonaster Avnue and Dwyer Road east and from their present termini by New Orleans Department of Streets. As indicated on page 97, the project's impact on MAF would be a slight inconvenience to MAF employees during the construction period and a reduction in auto emissions from improved traffic flow.

State of Louisiana

WILDLIFE AND FISHERIES COMMISSION

J. BURTON ANGELLE
DIRECTOR

NEW ORLEANS 70130

EDWIN EDWARDS
GOVERNOR

22 April 1977

Mr. Duward L. Crow
Associate Deputy Administrator
National Aeronautics & Space Administration
Washington, D. C. 20546

RE: Draft Institutional Environmental Impact Statement, Michoud Assembly Facility New Orleans, LA

Dear Mr. Crow:

Personnel of the Louisiana Wildlife & Fisheries Commission have reviewed the above referenced project and offer the following comments:

On page 39, Table 14: Brown pelican populations in southeast Louisiana are increasing and not extirpated. The official list of endangered species has been updated several times in the Federal Register since January 4, 1977 (Volume 39, #3).

We appreciate the opportunity to review this project during the early planning stages.

Sincerely,

J. Burton Angelle,
Director

JBA:FD:ms

Louisiana Wildlife and Fisheries Commission

Comment: The Wildlife and Fisheries Commission reported that the brown pelican population in southeast Louisiana is increasing and not extirpated as indicated on page 39, Table 14, and that the official list of endangered species is continually being updated.

Response: The final EIS has been revised to correct Table 14 (see page 39).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

FIRST INTERNATIONAL BUILDING
1201 ELM STREET
DALLAS, TEXAS 75270

May 24, 1977

Mr. Duward L. Crow
Associate Deputy Administrator
National Aeronautics and
Space Administration
Washington, D.C. 20546

Dear Mr. Crow:

We have reviewed the Draft Institutional Environmental Impact Statement for the Michoud Assembly Facility (MAF) of George C. Marshall Space Flight Center consisting of a description of MAF as an operational base for NASA, NASA-related programs, various government tenant agencies, and their contractors. The Michoud Assembly Facility (MAF) is located 25.6 km (16 miles) east of the New Orleans Central Business District. MAF is within the boundaries of Orleans Parish. The facility is bounded by the Gulf Intracoastal Waterway to the south, the Michoud Canal to the east, Old Gentilly Road to the north, and the New Orleans Public Service, Inc., Power Plant to the west.

The specific mission at Michoud is the design and assembly of the External Tank, the liquid fuel carrying component for the Space Shuttle. The MAF has been specifically modified and tooled for the fabrication and assembly of space vehicle components.

We offer the following comments for your consideration in developing the Final Institutional Environmental Impact Statement:

1. In the near future, new regulations will be written under Section "C" of the Safe Drinking Water Act, PL 93-523, on permitting and repermitting of injection wells. The final EIS should give information on the present permit for the existing injection wells and methods to be used to dispose of waste if the injection wells fail to meet requirements under the new law.

2. The final EIS should give the locations of the approved disposal sites for solid wastes, hazardous materials and liquid waste.

3. On page 83 it is stated that blowdown water from boilers is discharged into the Gulf Intracoastal Waterways. The final EIS should discuss the status of application for a National Pollutant Discharge Elimination System (NPDES) permit for this discharge.

4. The final EIS should give the status of the NPDES permit application on the storm water reservoir which is pumped out periodically into Michoud Channel. The reservoir receives the following known industrial wastes:

a. On page 86, it is stated when the injection well temporarily ceases operation the waste water may be pumped into the storm drainage system.

b. On page 81, it is stated there are two epoxy filters which are used to filter waste water prior to injection into deep wells. These filters are periodically backwashed and the washings are discharged to the storm sewer system.

These comments classify your Draft Environmental Impact Statement as LO-2. Specifically, we have no objections to the project; however, we are requesting more information on permits for injection wells, disposal of various wastes and discharge points which should come under a NPDES permit. The classification and the date of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions, under Section 309 of the Clean Air Act.

Definitions of the categories are provided on the attachment. Our procedure is to categorize our comments on both the environmental consequences of the proposed action and on the adequacy of the impact statement at the draft stage, whenever possible.

We appreciate the opportunity to review the Draft Environmental Impact Statement, and we would be happy to discuss our comments with you. Please send us two copies of the Final Environmental Impact Statement at the same time it is sent to the Council on Environmental Quality.

Sincerely yours,

John C. White

John C. White
Regional Administrator

Enclosure

ENVIRONMENTAL IMPACT OF THE ACTION

LO - Lack of Objections

EPA has no objections to the proposed action as described in the draft impact statement; or suggests only minor changes in the proposed action.

ER - Environmental Reservations

EPA has reservations concerning the environmental effects of certain aspects of the proposed action. EPA believes that further study of suggested alternatives or modifications is required and has asked the originating Federal agency to re-assess these aspects.

EU - Environmentally Unsatisfactory

EPA believes that the proposed action is unsatisfactory because of its potentially harmful effect on the environment. Furthermore, the Agency believes that the potential safeguards which might be utilized may not adequately protect the environment from hazards arising from this action. The Agency recommends that alternatives to the action be analyzed further (including the possibility of no action at all).

ADEQUACY OF THE IMPACT STATEMENT

Category 1 - Adequate

The draft impact statement adequately sets forth the environmental impact of the proposed project or action as well as alternatives reasonably available to the project or action.

Category 2 - Insufficient Information

EPA believes the draft impact statement does not contain sufficient information to assess fully the environmental impact of the proposed project or action. However, from the information submitted, the Agency is able to make a preliminary determination of the impact on the environment. EPA has requested that the originator provide the information that was not included in the draft statement.

Category 3 - Inadequate

EPA believes that the draft impact statement does not adequately assess the environmental impact of the proposed project or action, or that the statement inadequately analyzes reasonably available alternatives. The Agency has requested more information and analysis concerning the potential environmental hazards and has asked that substantial revision be made to the impact statement. If a draft statement is assigned a Category 3, no rating will be made of the project or action, since a basis does not generally exist on which to make such a determination.

United States Environmental Protection Agency, Region VI

Comment: EPA advises that new regulations will be written under Section (c) of PL 93-523, The Safe Drinking Water Act, on permitting injection wells, and requested that the final EIS indicate the current status of the permit and methods to be used for waste disposal if the injection wells fail to meet requirements under the new law.

Response: The initial request to drill the No. 1 well was made July 10, 1963, for MAF by Dow Industrial Service to the New Orleans District Office, Minerals Division, Department of Conservation, State of Louisiana. The request to drill the No. 2 well was requested May 8, 1967, by Irion LaFarque, Jr. A request to rework the No. 1 well was made by G. Gausch Jr. of an A.E. firm on September 24, 1977. The work was completed in early October, and the well is presently operable. Currently there are two wells in existance at MAF, both of which inject waste at the 5000 ft level. The injected material is believed to remain within the approximate boundary of MAF and does not impact any water supply. The new waste treatment facility being proposed will enable MAF to conserve water, recycle chromium, and provide effluent concentrations to meet 1985 EPA requirements. It is our understanding that no permit application for the MAF injection wells is presently required.

Comment: The final EIS should give the location of the approved disposal sites for solid waste, hazardous material, and liquid waste.

Response: Solid wastes (paper, cardboard, wood) are separated for recycling where possible. The rest are transported to a city of New Orleans operated landfill. Hazardous materials such as concentrated chemicals are disposed of via a state-approved disposal contractor. Waste insulation (urethane foam) is disposed of by Brown-Ferris, New Orleans Waste System Division, Metairie Road, Louisiana, in a hazardous classification landfill (state inspected). Liquid waste (unreacted) foam material is sent to Rollins, Baton Rouge, Louisiana, for disposal in an EPA approved incinerator. Trichloroethylene is recycled by distillation where possible or sold as surplus for purposes requiring less stringent specifications.

Comment: The commentor stated that blowdown water from the boilers is discharged into the Gulf Intracoastal Waterway and the final EIS should discuss the status of application for the NPDES permit for this discharge.

Response: The draft EIS actually stated that blowdown from cooling towers and boilers is discharged into the storm drainage system. This drainage system collects and controls all the fresh water behind the dike, and extending along the east, and south and up around Building 350. The dike separates the drainage ditch from the Intercoastal waterway and the Michoud canal. Most of the water comes from rainfall and the level in the drainage system is below the level of the Michoud canal. The discharge from the drainage system is under the control of the facility and must be pumped up and out to the Intercoastal waterway. The total waste water

discharged from the boilers is less than 100 gal/day. Monitoring of plant and fish life and chemical analysis has failed to show evidence of chromium at the discharge point. When the new waste treatment facility is completed, waste from the cooling towers and boilers will be transported to the waste treatment facility and treated. An application for an NPDES permit in connection with the new treatment facility was filed on February 25, 1977 (Application No. LA00052256) with the Region VI of EPA.

Comment: The final EIS should give the status of the NPDES permit on the storm reservoir when: (1) the injection well temporarily ceases operation and (2) the backwash of epoxy filters is discharged.

Response: If the injection well temporarily ceases functioning, the storm reservoir (drainage ditch) is large enough that batch chemical treatment, in place, could be provided to reduce heavy metal concentrations to an acceptable level. The principal pollutant to the injection well is the corrosion inhibitor used in hydrostatic testing of the tanks. The backwash from the epoxy filters consists mainly of fine sands from the 5000 ft level that pass the well's outlet screen. The small amount of any toxic material trapped on the sand surface is diluted with wash water and then discharged to the drainage ditch for further dilution. Effluent from the reservoir will be monitored and regulated to the levels required by the NPDES. The reservoir will serve as an equalization pond for both the treatment facility effluent and filter backwash. The well will be maintained for emergency use as long as it remains operational and is permitted by the State of Louisiana.

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

IN REPLY REFER TO
LMNPD-RE

31 May 1977

Mr. Duward L. Crow
Associate Deputy Administrator
National Aeronautics and Space
Administration
Washington, DC 20546

Dear Mr. Crow:

The draft institutional environmental impact statement for the Michoud Assembly Facility, New Orleans, Louisiana, was forwarded from our Office of the Chief of Engineers, Washington, to this office for review and response. The statement has been reviewed relative to environmental impacts related to the US Army Corps of Engineers' functional area of responsibility and expertise identified in appendixes II and III of the Council on Environmental Quality's guidelines.

We have the following comments to offer:

a. Page 21, paragraph 1, line 2. We suggest changing "sub-delta" to "delta" and "delta" to "deltaic plain." Similarly, in paragraph 2, line 7 of the same page, "sub-delta" should be "delta."

b. Page 23, paragraph 3. This paragraph should be corrected to indicate that the Mississippi River is the only source of potable water for the City of New Orleans.

c. Page 23, paragraph 4. This paragraph summarizes a quote from Rollo, 1966, pp. 34-35 which indicates that partial dewatering of the aquifer causes subsidence of the land surface. This statement, however, pertains to Houston, Texas. Regarding New Orleans, Rollo states on page 35 that "Subsidence in the New Orleans area as a result of water-level decline has not been discerned, but may exist." In light of this, the paragraph should be revised accordingly.

LMNPD-RE
Mr. Duward L. Crow

31 May 1977

d. Page 31, table 9. This table should be updated to reflect the 26 July 1976 EPA water quality criteria.

e. General. We recommend that the statement consider the possibility of conversion to coal as a source of energy and the probable impacts of such conversion on waterways, waterborne traffic, and harbors and terminal facilities.

Thank you for the opportunity to review the draft statement.

Sincerely yours,

LTC, CE

for EARLY J. RUSH III
Colonel, CE
District Engineer

Copy furnished: (5 cy)
Mr. Charles Warren
Council on Environmental Quality

Department of the Army, New Orleans District, Corps of Engineers

Comment: A change of the words "subdelta" to "delta" and "delta" to "deltaic plain" to improve clearness of meaning.

Response: The wording in the final EIS on page 21 has been modified accordingly.

Comment: The Mississippi River is the only source for potable water for the City of New Orleans as opposed to your statement on page 23, Paragraph 3, that it is the major source.

Response: The final EIS has been revised to state that the City of New Orleans' Water System's only source of potable water is the Mississippi River. However, it should be noted that bottled potable water is brought into New Orleans, and that there is a bounty of water in the area, such as surface drainage, groundwater, and brackish water which, with suitable treatment (desalination, distillation, etc.) could be upgraded to potable standards.

Comment: The reference cited, Rollo 1966, pertains to Houston, Texas, and that subsidence in the New Orleans area as a result of water-level decline has not been discerned, but may exist, and the EIS should be corrected.

Response: The final EIS has been revised (see page 23) to correct the reference and to state that subsidence is known to exist throughout the Michoud area, part of east New Orleans, and at a number of locations in the general area. The subsidence may result from a number of causes: clearing land, housing developments, drainage channels, and excessive pumping.

Comment: Table 9 on page 31 should be updated to July 26, 1976. EPA water quality criteria.

Response: The final EIS has been updated to the 1976 EPA criteria.

Comment: The EIS should consider the possibility of conversion to coal as an alternate energy source and the transportation impact on waterway harbors and terminal facilities.

Response: Preliminary studies to date indicate that such a conversion is inadvisable at this time. However, as explained in the Introduction in this EIS (page 1), this statement is an institutional statement and not decision document for future proposals on site. Should future planning assessments indicate the feasibility of such conversion, NASA will file a supplemental EIS, if warranted.

United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

In Reply Refer To:
PEP ER-77/344

JUN 1977

Mr. Duward L. Crow
Associate Deputy Administrator
National Aeronautics and Space
Administration
Washington, D. C. 20546

Dear Mr. Crow:

We have completed our review of the draft environmental statement for the Michoud Assembly Facility, New Orleans Parish, Louisiana, sent to us April 5, 1977. The Michoud Assembly Facility is an existing commercial and industrial complex; the proposed expansion of activities does not dedicate any new lands to single-purpose use. Our review indicates several areas of concern to this Department; these include cultural resources, recreation resources, oil and gas resources, and water quality.

The statement reveals (page 96) an awareness that cultural resource values may be encountered during construction activities. We strongly suggest that an archeological survey be made prior to any new land disturbance rather than, as appears to be the plan, waiting until disturbance reveals possible evidence of prehistoric occupation.

The project description notes existing parks in the area of the project (page 64), but does not indicate their location. Recreation areas, including recreation waters, should be identified and their locations shown in the final document. The project's probable impact on these areas, if any, and measures to mitigate harm should also be discussed.

The facility is underlain by sediments that may contain petroleum resources; this area of the Gulf coast has extensive active oil and gas production. The statement should include an evaluation as to potential for oil and gas production from the tract.

Discussion of proposed operations should include mention of any earth moving required for facility operations. For example, if maintenance dredging is required for Michoud Slip, which contains the large dock, this should be noted including the disposal plan for any dredge spoils.

The storm-water reservoir presently receives wastes such as blowdown from cooling towers and boilers, back wash from the chemical-wash injection-pump screens and potentially also spills of chemicals outside of buildings. It is indicated that present sampling methods have shown no evidence of chemicals discharged with the blowdown. These methods should be described. Table 7 should list the chemicals added as erosion inhibitors as part of the analyses.

The statement should describe monitoring procedures for the wastewater retention pond and should include enough details of the pond's structure to permit assessment of the possibility of leakage through the earthen sides or through any flaw that might develop in the bottom lining.

We appreciate the opportunity to review your statement and hope that our comments prove helpful.

Sincerely,

Heather L. Ross

Acting
D[illegible]

[illegible]t SECRETARY

United States Department of the Interior

Comment: It is suggested that an archeological survey be made prior to new land disturbance for prehistoric occupation.

Response: The entire site is reclaimed with marshland materials composed entirely of fill or top soil and river sand. Before construction of any new facility, an archeological survey will be part of the early planning activities (see page 110).

Comment: Existing park locations including recreational waters are not shown in the document. Such locations should be shown and the project's probable impact, if any, should be discussed.

Response: On page 65 of the draft and final EIS, locations 5, 6, and 8 are park areas, and on page 65 Lakes Pontchartrain, St. Catherine, and Borgne were identified as recreational waters. The final EIS reflects that the small fluctuation in personnel at MAF will insignificantly affect or impact the area parks or recreational capabilities (see page 114).

Comment: The statement should include an evaluation of potential oil and gas production which may be contained in sediments.

Response: The final EIS has been revised (page 99) to include a discussion of such evaluations.

Comment: Maintenance dredging, if required at MAF's dock facility, should be discussed as to the dredged spoils disposal plan.

Response: Any dredging spoils can be dumped in low spots on MAF property near the dock facility which is presently being used for disposal of scrap concrete, blocks, and broken bricks and tile. The final EIS reflects this information (see page 100).

Comment: The wastewater discharges to the storm water reservoir from sources such as cooling tower, boiler blowdown, backwash from well fitters, and potential spill were discussed in relation to sampling, analysis methods, and inhibitors. It was requested that those methods be described and that any erosion inhibitors used be listed in Table 7.

Response: Samples taken were from scattered points along the course of flow. They were taken from surface by grab technique and were tested using standard chemical analysis for hexavalent chromium, the corrosion inhibitor used in the cooling towers. Concentration decreased as the flow moved from near Building 220 past point 2 (Fig. 14) to values less than 0.05 at point 3. The reservoir plant life, fish, and amphibians have always remained active, healthy, and alive, indicating that toxic conditions do not exist. The outlet is frequently (daily to weekly) observed for pollution and fish kills. No erosion inhibitor is used. The corrosion inhibitor used did not show up frequently enough to warrant inclusion in Table 7 as a typical constituent. The total discharge is

less than 100 gal/day and is diluted by rainwater and groundwater. The final EIS better describes operations of the waste water retention pond and the storm reservoir.

Comment: The statement should describe monitoring procedure for the wastewater retention pond and details of the pond's structure to asses the possibility of leakage through the earthen sides or bottom.

Response: The wastewater holding pond is a diked reservoir lined with a 2 in. gunite liner over a 4 in. concrete slab. The side walls have a slope of 3 to 1. Leakage would be noted by a water level drop and would discharge to the storm water reservoir. The storm water reservoir is enclosed on the lower side by a levee, and water must be pumped over the levee to be discharged to the Michoud Canal and Intracoastal Waterway on the southeast corner of MAF. Any leakage will be from the Michoud Canal inward, as the water level is higher than the level of the storm reservoir. Any leakage from the waste pond would be an observed increase in toxic concentration at the pump station which is always inspected before water is discharged. The final EIS reflects this information (see page 81).

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20201

June 10, 1977

Mr. Duward L. Crow
Associate Deputy Administrator
Office of the Administrator
National Aeronautics and Space Administration
Washington, D.C. 20546

Dear Mr. Crow:

We appreciate the opportunity to review the draft Environmental Impact Statement on the Michoud Assembly Facility, New Orleans, Louisiana.

1. The area near the facility is one of significant fisheries resource for both commercial and sport harvesting. The resource includes finfish, shellfish and crustacean species.

2. The compound trichloroethylene is used as a degreasing and cleaning agent in one of the steps of the operation. According to a statement in Chapter VII, some residues of trichloreoethylene remain on the materials when they reach the washing and rinsing area and therefore, are contained in the wastewater from this part of the operation. The report does not state what levels of trichloroethylene could be expected to be in the wastewater from the use of this compound. Since the Bureau of Foods has prepared a document for publication in the Federal Register to rescind the use of trichloroethylene as a component of food contact articles (Sec. 121.2520 & 121.2623) due to its possible carcinogenicity, we feel that data on levels of trichloroethylene in the wastewater would be helpful in evaluating any possible public health problem in seafood which may become exposed to this compound.

3. Currently, backwash water from the cleaning of chemical waste filters is drained into the storm sewer system and eventually reaches the Intercoastal Waterway. Since this backwash solution could contain such hazardous materials as xylene, toluene, naphtha chromic acid, etc., we feel that data on the levels of these compounds found in the Intercoastal Waterway should be available so that the data can be evaluated as to possible public health hazard.

4. The report also indicates that both mercury and lead have been detected in the neighboring waters, however, there is no indication as to the levels of these two metals. We would be interested in knowing whether any of the marine food species contain levels of mercury exceeding the guideline of 0.5 part per million.

5. The use of pesticides in a pest control program is cited, however, the types and levels of application of the pesticides is not stated in the report. This information would be of interest to the agency since many pesticides are potential public health hazards.

6. The proposed new chemical treatment facility is expected to replace the now existing injection well for treating chemical wastes. The report states how the waste will be separated according to chemical characteristics, however, it does not state how the waste will be monitored to determine how well the process is working and to what levels are these compounds finally reduced. This is important since the possibility of some of the waste being dumped into the sewage or storm water systems will exist.

7. Analysis of marine food species for metals, pesticides, trichloroethylene and other residues should be performed.

Sincerely,

Charles Custard
Director
Office of Environmental Affairs

Department of Health, Education, and Welfare

Comment: MAF is located in an area of commercial and sport fisheries resources and since the discharge of trichloroethylene with rinse water is potentially harmful due to its possible carcinogenicity, the Bureau of Foods plans to rescind its use as a component of food contact articles (HEW is requesting that data on the levels of trichloroethylene in waste water be included in the final EIS). In addition, the rinse water, at times, may also contain xylene, toluene, naphtha, chromic acid, etc. A concern was also expressed that backwashing of deep well filters (chemical waste) being discharged to storm drains would allow these compounds to enter the Intracoastal Waterway and contribute to the public hazard (HEW letter, items 1, 2, and 3).

Response: We appreciate HEW's concern for danger to fisheries resources and the possibility of hazardous chemicals entering the food chain. However, this concern can be alleviated by understanding the volume and concentration of the effluent and the configuration of the drainage system. While the total volume discharged to the ejection wells is large, the concentration of chemicals in that volume is small and only a small amount of backwash drains to the storm reservoir ("borrow pit") and is further diluted. The reservoir lies along the south and east just inside the levee. The level of this reservoir is maintained below the Intracoastal Waterway so that there is an inflow of groundwater from Michoud Canal and rainwater. The reservoir is pumped from submerged inlets up to the waterway and does not drain by gravity. The plant and animal life surface condition (oil film) in the reservoir is frequently observed and occasionally analysis for chromates is performed. The plants and animals living in the reservoir have always been healthy, indicating no pollution of the reservoir. Chromates, the most persistent of the hazardous chemicals, have always been at acceptable concentrations. The volatile chemicals are never allowed to build up in the waste lagoon such that a film can be observed. This indicates levels less than approximately 10 ppm. No oil films have been observed at reservoir outlets either. Trichloroethylene is volatile and would not be expected to persist for the several days needed to pass through both the lagoon and the reservoir. Since it is also acutely toxic, discharge of any large quantity would result in observable fish kills in the reservoir area. Due to numerous other industrial sources in the area, we do not believe that sampling outside the levee area would be very meaningful since observations to date show acceptable levels. Chapter VII of the final EIS has been modified in response to these comments.

Comment: The pesticide control program documentation was cited for lack of information on levels and types of pesticides used (item 5).

Response: The lack of documentation as to type and amounts of pesticide was intentional due to the rapid changes in regulation at the time the draft was being prepared. There are three persons at MAF (1 civil service, 2 contractors) who have received State of Louisiana training

and certification as pesticide applicators. At one time Mirex was used to control fire ants, later this changed to Diazinon, and at present Chlordane is being used to spot-treat ant hills.

On-site monitoring of personnel and weather conditions is carried out according to standards outlined in the MAF Pest Control Program, which is revised and maintained annually. This program is also reviewed by the Federal Working Group in Pest Management to assure compliance with rules and recommended application rates (NASA, 1975).

Standard safety procedures used during the application of pesticides include: (1) wearing of protective clothing (including rubberized trousers or aprons to protect the lower body), (2) clean and correctly operating applicator equipment, and (3) proper training and certification of personnel. State and Federal standards for training certification followed at MAF include: the Federal Insecticide, Fungicide, and Rodenticide Act (86 Stat. 973) 7 U.S.C. 135 et seq, 40 CFR 162.8 (highly toxic pesticides); Worker Protection Standards for Agricultural Pesticides, FR 39 No. 92, 10 May 1974; and the Louisiana Pesticide Control Act (L.R.S. Title 3, Chapter 12, Part I, Section 1621-1642). Certification under this act will be required of all applicators after October 21, 1977. In addition, EPA regulations on the certification of pesticide applicators (40 CFR 171: 39 FR 36446 and amended 40 FR 11698) and EPA regulations on the disposal and storage of pesticide and pesticide containers (40 CFR 165; 39 FR 15236) are followed at the MAF (pers. comm., Stag).

Pesticides are groups of chemicals which control populations of plants, insects, fungi, and rodents (herbicides, insecticides, fungicides, and rodenticides).

Insecticides can be classified according to physiological action, residual behavior, chemical makeup, and formulation. They can be used to destroy specific pests, based on their mode of action. Fungicides are used to prevent or control the growth of fungi which may cause rot, leaf spots, mildew, rust, or other plant diseases. Herbicides have either a broad spectrum or narrow spectrum, depending on the number of target organisms intended for each. Herbicides can be applied as pre-planting, pre-emergence, or post-emergence treatments, depending upon the target plant and the life cycle of the preferred plant. Rodenticides are usually applied as baits which kill a rodent population in the area where bait is applied.

Target organisms include insects and rodents which may enter building and cafeteria spaces at the MAF; selected target insects on the 121.4 improved hectares (300 acres) of the 363.0 hectare (896.9 acres) site (except mosquito fogging); and certain weedy plants which occur in the landscaped areas.

Table 35 summarizes pesticide use at MAF. Specific groups of target organisms include cheatgrass, crabgrass, dandelions, fire ants, aphids, cutworms, wooly caterpillars, red spider mites, cockroaches, spiders, silverfish, mosquitos, rats, mice, and termites.

Several methods of pesticide applications are used to achieve effective control. These include general spraying, spot-treatment, and the use of bait stations. Adequate hygiene is an important part of pest management both inside and outside of buildings.

Application rates and the method of pesticide dispersal are given in Table 35. Flying insects are controlled primarily by vapor strips inside the building spaces and by Malathion fogging outside of buildings. Pival, or Indandione, an anticoagulant, is used at bait stations for the control of rats. The organic phosphate Diazinon is used in buildings for non-flying insect control.

Weeds are controlled by semi-annual applications of Havar-X, which acts as a soil sterilant in areas where plants are not desired, such as parking areas and other pavement aprons.

The principal hazards and pathways associated with acute pesticide exposure are through the skin (dermal exposure) and breathing (inhalation exposure). Pesticides enter through the skin at different rates. The most rapid absorption is through the scrotal area, where the rate is 12 times that of the forearm. This high rate approximates direct injection into the blood stream. The toxicity of the pesticides is given in Table 36.

Inhalation exposure is most common during application in confined areas such as buildings or crawl spaces. Additional pathways include ingestion through contact with smoking materials or chewing gum while the operator is applying the pesticides. Early symptoms of pesticide exposure, such as headache, dizziness, fatigue, or numbness, indicate that any contaminated clothing should be removed immediately and that any pesticide contact points should be thoroughly washed.

Pesticides may enter surface waters through runoff or accidental spillage. However, the use of Diazinon, Malathion, and Baygon, which do not show bioaccumulativity, reduces the impact of these hazards to non-target organisms in the surface waters. Chlordane was used only for local application and outbreaks of particular target organisms, reducing to a low level the amount of this pesticide entering surface waters.

The use of non-persistent carbamate and organophosphate insecticides limits their impact on atmospheric systems and on the solid waste disposal pathways at MAF. Periodic fogging with Malathion may result in accidental destruction of non-target aquatic invertebrates and vertebrates in drainage channels of MAF if spillage of the concentrated pesticide occurred. Approximately 27.22 kg (60 lb) of Malathion are used with each application. The drainage canals have a capacity of approximately 2.1×10^5 m^3 (7,507,495 ft^3), based on an average depth of 1.5 m (5 ft). Assuming even dilution due to spray dispersion, the average concentration would be approximately 0.14 ppm (0.14×10^{-6}) Malathion in water compared with a toxicity level for finfishes of 1.0 ppm (1×10^{-6}) Malathion in water (Table 36). In addition, Malathion does not accumulate in the food chain and is degradable in the environment. No reports of shellfish or

Table 35. Pesticide Use at MAF for the Control of Weedy Plants, Insects, and Rodents.

Target Organisms	Pesticide	Rate of Application	Frequency of Application	Persistence
Weedy plants: cheatgrass, crabgrass, dandelion	Havar-X wE*	8.97 kg/ hectare (8 lb/ acre)	Semi-annual-February, November	2-18 months
Fire Ants	Chlordane, wE	Spot-treat ant hills	Annual-November	
Aphids, cutworms, wooly caterpillars, red spider mites	Malathion wE	To point of runoff, on 500 shrubs and trees.	3 times per year-March, June, September	1-7 days outside
Cockroaches, spiders, silverfish	Diazinon wE	As required in a building 3.791/93 m^2 (1 gal/1,000 ft^2)	Monthly	1-7 days
Mosquitos	Malathion wE	Fog 243 hectares (600 acres) 0.02 kg/hectare (0.1 lb/acre)	Spring, Summer, Fall	1-4 weeks
Flying insects	Hi-Kill vapor strip	N/A**	Summer	
Rats, mice	Pival	0.23 kg/ station (8 oz/station)	Continuous	
Termite control	Chlordane wE	15.14 liters/ 3.05 m (4 gal/ 10 ft) around building perimeter.	March-April as required	
Cockroaches, spiders	Blias-K with Baygon	N/A (Cafeteria)	Weekly	1-4 weeks

* wE water soluble emulsion is prepared according to instructions for the target organism.

** N/A: Not applicable.

Source: NASA 1975 (and later revisions).

Table 36. Names and Toxicity of Pesticides Used at MAF.

Trade Name	Chemical Name	Chemical Class	Toxicity (in rats)	Action	Limits in Air Occupational Standard	Aquatic Toxicity (Finfish)
Hyvar	Uracil, 5-bromo-3-isoprophyl-6-methyl-	Uracil	Oral LD50* 3750 mg/kg			Not Available
Pival	1,3-indandione, 2-pivaloyl-	Indandione	Oral LD50 150 mg/kg	Prevents blood clotting	100 ug/m3	Not Available
Chlordane	4,7-methanoindan, 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7,7a-tetrahydro-	Chlorinated Hydrocarbon	Oral LD50 283 mg/kg skin LD50 700 mg/kg	Affects central nervous system	500 ug/m3	TLm96** under 1 ppm
Malathion	Succinic acid, mercapto-, diethyl-ester, S-ester with 0,0 dimethyl phosphorodithioate	Organic phosphate	Oral LD50 599 mg/kg	Neurotoxic; deactivates cholinesterase	15 mg/m3	TLm96 under 1 ppm
Diazinon	Phosphorothioic acid, 0,0-diethyl 0-(2-isoprophyl-6-methyl-4-pyrimidinyl) ester	Organic phosphate	Oral LD50 76 mg/kg	Neurotoxic; deactivates cholinesterase		TLm96 under 1 ppm
Baygon	Carbamic acid, methyl-, 0-isopropoxy-phenyl ester	Carbamate	Oral LD50 83 mg/kg	Neurotoxic		TLm96 10 to 1 ppm

* LD50: Lethal dose for 50 percent of target population.

** TLm 96: 50 percent death after 96 hr of exposure at concentration indicated.

finfish kills in the Gulf Intracoastal Waterway have been recorded by the State of Louisiana. This indicates that the combination of sufficient dilution, short biological half-life, proper procedures, and retention time on-site has prevented this potential hazard from having any perceptible negative impact.

Comment: The Industrial Wastewater Treatment Facility (IWTF), planned for replacement to the injection well description did not explain the effluent monitoring and discharge concentrations (item 6).

Response: The IWTF is now being designed. Also the NPDES discharge permit under Public Law 92-500 is still being negotiated with the Region VI, EPA Office. Discharges will be within the permit's allowable limits or there will be no legal discharge. Monitoring will be by a combination of electronic and chemical analysis and subject to permit requirements. The final EIS has been changed to show monitoring to include conductivity, pH, and analysis for cyanide and hexavalent chromium.

Comment: HEW requested that analysis of marine food species for metals, pesticides, trichloroethylene, and other residues be performed. Interest was expressed in knowing if mercury exceeded 0.5 ppm (items 4 and 7).

Response: Analysis of marine food species are performed regularly in this area by the State of Louisiana Wildlife and Fisheries Commission and various areas are closed to fishing when contamination occurs. Levels of mercury and lead were given in Table 5 to indicate that other pollution sources discharge to this waterway and that this is a highly industrialized area. As long as lead is a gasoline additive, some lead may be discharged due to parking lot drainage. Processes at MAF discharge no mercury or lead compounds.

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230
(202) 377-3111

June 14, 1977

Mr. Duward L. Crow
Associate Deputy Administrator
National Aeronautics and
Space Administration
Washington, D. C. 20546

Dear Mr. Crow:

This is in reference to your draft environmental impact statement entitled "Michoud Assembly Facility, New Orleans, Louisiana." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving three (3) copies of the final statement.

Sincerely,

Sidney R. Galler

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Enclosure - Memo, National Ocean Survey, May 27, 1977

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SURVEY
Rockville, Md. 20852

C52/JLR

MAY 27 1977

TO: William Aron
Director
Office of Ecology and Environmental Conservation

FROM: Gordon Lill
Gordon Lill
Deputy Director
National Ocean Survey

SUBJECT: DEIS #7704.17 - Michoud Assembly Facility, New Orleans, Louisiana

The subject statement has been reviewed within the areas of NOS responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

The following comment is offered for your consideration.

The information on tides and currents contained in this statement is accurate and adequate. The terminology is somewhat archaic and could be misleading. The term "lunar tides" should be "tide" or, at worse, "astronomic tides." Solar tides also are significant in the Gulf region. The term "wind-induced tides" may also be misleading. At NOS, "wind set-up" is preferred for such nontidal components of water level and "wind-induced currents" for nontidal fluctuations in the current due to wind stress.

United States Department of Commerce
National Oceanic and Atmospheric Administration

Comment: The Associate Deputy Administrator requested three copies of the final statement and endorsed a letter from NOAA which stated that the information on tides and currents are accurate and adequate, but the terminology is archaic and misleading. It is suggested that the term "Lunar tides," and "wind-induced tides" read either "wind setup" or "wind-induced current."

Response: We appreciate the suggested correction and the terms tide and wind-induced current will be used in the final EIS on page 23.

DEFENSE LOGISTICS AGENCY
DEFENSE CONTRACT ADMINISTRATION SERVICES MANAGEMENT AREA
NEW ORLEANS
P. O. BOX 29300
NEW ORLEANS, LOUISIANA 70189

IN REPLY REFER TO DCRA-GNQ-A77-01L

10 June 1977

SUBJECT: Review of NASA's Institutional Environmental Impact Statement Michoud Assembly Facility, New Orleans, Louisiana

National Aeronautics and Space
Administration
Attn: Mr. Crow
Office of the Administrator
Washington, DC 20546

Dear Mr. Crow:

This office has reviewed the subject document and has evaluated the DCAS's role in response to the data set forth in the document and offers the following comments:

1. The environmental statement clearly points out that the hydrocarbon emissions at MAF are in excess of the Louisiana Air Quality Standard.

Based on the permitted amount of hydrocarbon emissions of 6.8 kg/day the data compiled reveals that the Martin Marietta Company is in excess of the Louisiana Air Quality Standard by 137 kg. Chrysler Corporation at MAF, mainly conducting work on defense department contracts, has exceeded the standard by some 1,264 kg and Boeing Services by 260 to 328 kg. The main source of the hydrocarbon emissions, presently at MAF, are from spray painting activities. It is the opinion of this office that contractors at MAF subject to DCAS's cognizance be evaluated to determine ways and means of bringing these contractors within the legal limit as set forth by the Louisiana Air Quality Control Agency and provide remedies for any future or projected activities that may be a source of excess hydrocarbon emissions.

2. Another problem area concerns the trichoroethylene emissions from the cleaning of the External Tanks and other External Tank components. The External Tanks will be cleaned in Cell E of Building 110. It is assumed that 95% of the trichoroethylene vapor will be captured by carbon absorption. The projected maximum annual net at 60 ship sets per year by 1982 is 1,380 kg, well within the air

standard limits of 1,768 kg established by the Louisiana Air Quality Control Agency.

The External Tank components cleaning does, however, pose a considerable problem and does require an active resolution. The components are cleaned in Building 103. Consumption is based on the 15,000 gallons used in 1976 (SP Gravity - 1.466) with a projected and current trichoroethylene emissions of 83,226 kg/per year far exceeding the maximum limits of 1,768 kg/per year set by the Louisiana Air Quality Control Agency. Vapor recovery units are being installed to reduce this consumption. This office recommends that an in-depth evaluation be made of this area to bring the trichoroethylene emissions within the limits set forth by the Louisiana Air Quality Control Agency.

Sincerely,

CHARLES J. GUINN
Major, USAF
Commander

cc:
DCRA-GNQ-A/R. Delaney
NASA/J. Wood

Defense Logistics Agency

Comment: The reviewer commented on the problem of the several paint spray booths with excess hydrocarbon emissions by Chrysler Corporation, Boeing Services, and trichloroethylene emissions in cleaning of the External Tanks, and the need to bring the emission within allowable limits.

Response: Defense Contract Administration Services, Management Area, New Orleans, has been requested to insure compliance by contractors with Louisiana Air Control Commission for those contracts managed by DCAS. Steps have been taken to install equipment and controls for NASA operations. Since circulation of the draft EIS, certain changes have been made. These changes are described in Table D-3 in the final EIS. (See page 122, Response to Louisiana Air Control Commission). We believe that these changes will bring MAF within compliance. All contractors are required to comply with the air and water pollution laws as part of their contractual requirements. To actually insure that emission levels are not exceeded, inventory control and stack monitoring by the contractor will be required to insure compliance.

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Post Office Box 1630, Alexandria, La. 71301

June 13, 1977

Mr. Duward L. Crow
Associate Duputy Administrator
National Aeronautics and Space Administration
Washington, D.C. 20546

Dear Mr. Crow:

Re: Institutional Environmental Impact Statement,
Michoud Assembly Facility, New Orleans, La.

We have reviewed the March, 1977, draft of the referenced environmental impact statement as requested. This document appears to be adequate as an institutional statement in describing the cumulative effects of the activities at the Michoud Facility. We have no additional comments to make at this time.

Sincerely,

Harry A. Rucker
Alton Mangum Acting
State Conservationist

cc: Kent Milton, SCS, Alexandria
Gerald L. Lanman, Acting Director, Evt. Services Div., Washington, D.C.
J. Vernon Martin, Director, SCS, Fort Worth, Texas
Council on Environmental Quality, Washington, D.C.

State of Louisiana
Department of Transportation and Development

EDWIN EDWARDS
GOVERNOR

GEORGE A. FISCHER
SECRETARY

Office of Highways

P. O. Box 44245 Capitol Station Baton Rouge, Louisiana 70804

May 4, 1977

NATIONAL AERONAUTICS & SPACE
ADMINISTRATION
DRAFT INSTITUTIONAL ENVIRONMENTAL
IMPACT STATEMENT
MICHOUD ASSEMBLY FACILITY,
NEW ORLEANS, LOUISIANA

Mr. J. L. Graham
Code AB-13
Marshall Space Flight Center,
Alabama, 35812

Dear Mr. Graham:

For your information and use in the preparation of the Final Institutional Environmental Impact Statement for the Michoud Assembly Facility, the Louisiana Department of Transportation and Development and the U.S. Department of Transportation are planning a major transportation facility in the Michoud area. The proposed facility, I-510, will be located approximately along the present alignment of Paris Road from I-10 to the Mississippi River Gulf Outlet Bridge. The highway will be a four-lane divided highway with control-of-access.

If you desire further information about this proposed highway, please contact this office.

Sincerely,

Henry G. Pylant

for GEORGE A. LANDRY
PUBLIC HEARINGS &
ENVIRONMENTAL ENGINEER

GAL/GLD/orh
cc: Mr. W. T. Taylor, Jr.
Mr. S. L. Poleynard
Mr. D. D. White
Mr. J. E. Boagni, Jr.
Mr. J. R. Reid

Department of Transportation and Development, Office of Highways

Comment: The Louisiana Department of Transportation and Development and the U.S. Department of Transportation propose the construction of a four-lane divided highway with control-of-access (route I-510) along the present alignment of Paris Road from I-10 to the Mississippi River Gulf Outlet Bridge.

Response: The final EIS has been modified to reflect these detailed changes and their impact on future MAF activities (see response to U.S. Department of Transportation, page 126).

Literature Cited and Personal Communications

LITERATURE CITED

American Petroleum Institute (API). 1973. Cited in: Economic Development Council. Oil & Gas, Business Research Dept., Chamber of Commerce of the New Orleans area.

Bonner, Ernest R. 1968. The economic impact of a university on its local community. AIP Journal, Sept., 1968.

Burk and Associates. 1973. Lake Pontchartrain Basin water quality management plan. Prepared for the State of Louisiana.

Caffrey, John and Herbert Isaacs. 1971. Estimating the impact of a college or university on the local economy. American Council on Education, Washington, D. C.

COE. (See U.S. Army Corps of Engineers).

Davis, G. H. and J. R. Rollo. 1970. Land subsidence related to decline of artesian heat at Baton Rouge, Lower Mississippi Valley, U.S.A. Land Subsidence: Proceedings of the Tokyo Symposium, Sept., 1969, 1: 174-84.

Day, J. H. 1951. The ecology of South African estuaries. Part I: A review of estuarine conditions in general. Transcripts of the Royal Society of South Africa, 33: 53-91.

Day, J. H. 1964. The origin and distribution of estuarine animals in South Afirca. Monograph. Biology, 14: 159-173. The Hague, Holland.

Eddards, M. L., L. R. Kister, and G. Scarcia. 1956. Water resources of the New Orleans area, Louisiana, U.S. Geological Survey, Washington, D.C. Circular No. 374.

Federal Highway Administration. (See U.S. Dept. of Transportation,)

Gleason, H. A. and A. Cronquist. 1963. Manual of vascular plants. D. Van Nostrand Company, New York.

Gunter, Gordon. 1967. Some relationships of estuaries to the fisheries of the Gulf of Mexico. In: G. H. Lauoff (ed.), Estuaries. American Association for the Advancement of Science, Washington, D.C.

Harrar, E. and J. G. Harrar. 1962. Guide to southern trees. Dover Publications, Inc., New York.

Jones, P. H. 1970. Hydrology of quaternary delta deposits of the Mississippi River. In: Hydrology of deltas. Bucharest Symposium, May, 1969. Vol. I. IASH and UNESCO.

Literature Cited (Continued)

Louisiana Air Control Commission Laboratory. 1969-1974. Annual Reports. State of Louisiana Department of Health, Baton Rouge, Louisiana.

Louisiana Department of Employment Security. 1976. Area manpower review. New Orleans, Louisiana.

Louisiana Department of Health. 1971-1975. (Water quality data).

Louisiana Geological Survey. 1956.

Louisiana Stream Control Commission. 1973. Lake Pontchartrain Basin water quality management plan, State of Louisiana.

National Aeronautics and Space Administration. (NASA) 1972. Environmental statement for the Space Shuttle Program (Final Statement). Washington, D.C.

_____. 1968. Master plan, George C. Marshall Space Flight Center, Michoud Assembly Facility, Vol. 2.

_____. 1975. Michoud Assembly Facility pest control program for calendar year 1976. Manuscript on file in Facilities Operations Office, NASA Michoud, New Orleans, Louisiana.

_____. 1975. Preliminary Draft EIS for the George C. Marshall Space Flight Center's Michoud Assembly Facility.

_____. Preliminary Engineering Report for Industrial Wastewater Treatment Facility at Michoud Assembly Facility, December, 1975.

_____. Michoud Assembly Facility. Feb., 1976. Unpublished traffic counts.

New Orleans Economic Development Council (NOEDC). 1975. Industrial advantages brochure. New Orleans, Louisiana.

New Orleans Guide. February 18, 1976. The Guide Newspaper Corporation. New Orleans, Louisiana.

Regional Planning Commission (RPC) for Jefferson, Orleans, St. Bernard, and St. Tammany Parishes. 1974. Historic preservation planning. Prepared by Comprehensive Planning Associates.

_____. 1969. Historic sites inventory. New Orleans, La.

_____. 1969. History of regional growth of Jefferson, Orleans, and St. Bernard Parish, Louisiana.

Literature Cited (Continued)

_____. 1973. Interim land use plan. Prepared by N-Y Associates, Inc. New Orleans, Louisiana.

Rollo, J. R. 1966. Groundwater resources of the Greater New Orleans, Louisiana area. Louisiana Geological Survey, Department of Conservation, Baton Rouge, Louisiana. Water Resources Bulletin No. 9.

Russell, R. J. and R. D. Russell. 1939. Mississippi River delta sedimentation. In: Parker Trask (ed.), Recent marine sediments, Dover Publications.

U.S. Army Corps of Engineers (COE). 1975. Engineer District: New Orleans, Louisiana. Composite draft environmental statement for operation and maintenance work on three navigation projects in the Lake Borgne vicinity, Louisiana.

_____. 1972-1973. (Water quality data.)

U.S. Department of Commerce. 1974. City and County Data Book. Bureau of the Census.

U.S. Department of the Interior, National Park Service. 1974. The National Register of Historic Places, Supplement. Washington, D.C.

U.S. Department of Labor. 1975. Bureau of Labor Statistics. Cited in: New Orleans Area Manpower Review, April, 1976.

U.S. Environmental Protection Agency. 1974. Compilation of air pollutant emission factors. GPO, Washington, D.C. AP-42, 3rd supplement.

U.S. Department of Transportation, Federal Highway Administration. 1973. Fundamentals and abatement of highway traffic noise. Prepared by Bolt, Beranek, and Newman, Inc.

Water Information Center. 1974. Climates of the states. Vol. 2. Water Information Center, Inc., New York.

PERSONAL COMMUNICATIONS

Barr, D.: Supervisor of Boiler Plant, Boeing Services International, Michoud Assembly Facility, 1976.

Bradley: Water Quality Division, Fish and Wildlife Commission, 1976.

Brehm, Stuart: New Orleans Sewerage and Water Board, 1976.

Clark, Howard: Biologist, General Electric Co., NASA National Space Technology Laboratories, Bay St. Louis, Miss., Aug. 5, 1975.

Cleveland Air Pollution Control Division, May, 1976.

Gibbens, Dorothy H.: Staff Archaeologist, Art, Historical and Cultural Preservation Agency, Baton Rouge, Louisiana, June 2, 1976.

Louisiana Air Control Section: Monitoring Division, New Orleans, Louisiana, June, 1976.

Poolson, Beverly: Biologist, Global Associates, NASA National Space Technology Laboratories, Bay St. Louis, Mississippi, Aug. 5, 1975.

Schexnayder, Joel W.: Meteorologist, U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration.

Stag, Philip: Louisiana Department of Agriculture, Bureau of Technical Services, Baton Rouge, Louisiana, June, 1976.

Summers, Max: Louisiana Stream Control Commission, Fish and Wildlife Division, Oysters Division.

Tanner, Orey: Permit Division, Louisiana Air Control Section, Division of Air Control and Occupational Health, New Orleans, Louisiana, July, 1976.

U.S. Army Corps of Engineers (COE), New Orleans, Louisiana District: 1975-1976.

Von Bodungen, Gus: Louisiana Air Control and Occupational Health Division, New Orleans, Louisiana, August, 1975.

APPENDIX A

Water Quality

APPENDIX A-I:EXCERPTS FROM THE LOUISIANA WATER QUALITY CRITERIA (1973).

ANTI-DEGRADATION STATEMENT:

It is the policy of the Louisiana Stream Control Commission that all interstate waters and intrastate waters, portions thereof, and coastal waters whose existing quality exceed the approved water quality standards will be maintained at their existing high quality unless and/or until it has been affirmatively demonstrated to the Louisiana Stream Control Commission that such changes are justifiable as a result of desirable and economic or social development, and further that such changes will not interfere with or become injurious to the user of the waters as described in the water quality standards. The Louisiana Stream Control Commission will disapprove any waste discharge that will cause water quality degradation of interstate waters and intrastate waters, portions thereof, and the coastal waters of Louisiana below the standards adopted by the State of Louisiana and approved by the United States Environmental Protection Agency without complying with the Federal and State of Louisiana laws applicable to the attainment of water quality standards. Any industrial, public, or private project or development that would constitute a new source of pollution or an increased source of pollution to any of the waters in Louisiana will be required, as part of the initial project design, to provide the highest and best degree of waste treatment available under existing technology consistent with the best practice in the area affected under the condition applicable to the project or development. Consistent with the provision of the Federal Water Pollution Control Act as amended (1972) the Louisiana Stream Control Commission will keep the United States Environmental Protection Agency informed of its activities and will furnish the United States Environmental Protection Agency informational reports, in such form as the Administrator of the United States Environmental Protection Agency may, from time to time reasonably require to carry out his function under the Federal Water Pollution Control Act Amendments of 1972. The Louisiana Stream Control Commission will consult and cooperate with the United States Environmental Protection Agency on matters that are proper consideration of the Federal Agency; the United States Environmental Protection Agency will reciprocate in matters that are a proper consideration of the Louisiana Stream Control Commission.

BASES FOR CRITERIA:

The quality criteria for the waters of Louisiana are based on their present and potential uses and the existing water quality indicated in data accumulated through monitoring programs of various agencies.

In accordance with Annex Number B of the United States Environmental Protection Agency's letter of January 18, 1973, addressed to the Honorable Edwin Edwards, Governor of Louisiana, a number of streams and water bodies which were not listed in previous standards are included in these revised criteria. In some cases, adequate water quality and flow data to establish standards were not available. Criteria for these streams and water bodies were established, based upon the best information available. Should the data indicate the need, the criteria will be revised and submitted to the Louisiana Stream Control Commission and the United States Environmental Protection Agency for approval.

The Division of Water Pollution Control maintains an extensive water quality monitoring network and also conducts frequent extensive stream surveys and special studies. Whenever data acquired from the above or other sources indicate the need, the division will recommend revised standards to the Louisiana Stream Control Commission. Should the Commission concur with the need

for revision, the revised standards will be submitted to the United States Environmental Protection Agency for approval.

GENERAL:

With few exceptions, which in the main exist in estuarine waters affected by tidal influx or other waters adversely affected by natural phenomena, the streams of Louisiana contain waters of a quality suitable for any legitimate use without imposition of undue hardship on the user.

In the few cases attributable to man's activities where the quality criteria are such that the water quality is not suitable for all legitimate uses, it is anticipated that future developments (e.g. leaching from the soil of accumulated chlorides from oil field brines) will be such that the quality criteria may be periodically modified until all legitimate uses are possible. Even in the case of naturally degraded waters there is the expectation that controls, such as isolation of limited watersheds with high salt content and structures to limit tidal intrusion, may permit future upgrading of quality criteria in such cases.

The criteria for Louisiana are designated in main to preserve existing water quality as it relates to suitability for various uses. In several instances, where existing technology permits, provisions have been made for upgrading water quality.

It is the position of Louisiana that the criteria contained herein are those that are reasonable on the basis of the present quality of our waters, present and future water uses and the best practicable waste water treatment under any conditions.

It is also our understanding that these criteria are not fixed for all time, but are subject to future revision. The nature of future revisions of these criteria will be strongly influenced by many factors. Among these are the following:

(1) As a downstream or bordering state in all cases involving interstate streams, Louisiana's criteria will be affected by the quality of water received from its upstream and neighborning states.

(2) As the most downstream state Louisiana's water quality will be affected by low and mean flows when interstate rivers become subject to flow regulation and diversion projects.

(3) Changes in technology and natural conditions may permit upgrading or relaxation of numerical values, provided such relaxation does not materially affect the suitability of the water for legitimate uses.

GENERAL CRITERIA:

The following general criteria are applicable to the surface waters of the State of Louisiana and specifically apply with respect to substances attributed to waste discharges or the activities of man as opposed to natural phenomena.

Natural waters may, on occasion, have characteristics outside the limits established by these criteria; in which case these criteria do not apply. The criteria adopted herein relate to the condition of water as affected by waste discharges or man's activities.

These general criteria do not supercede specific exceptions to any one or more of the following if the exception is specifically stated in a specific water quality standard. All waters of the state shall be capable of supporting desirable diversified aquatic life.

(1) AESTHETICS - The waters of the state shall

be maintained in an aesthetically attractive condition and shall meet the generally accepted aesthetic qualifications.

(2) COLOR - True color shall not be increased to the extent that it will interfere with present usage and projected future use of the streams and water bodies.

(3) FLOATING, SUSPENDED AND SETTLEABLE SOLIDS - Free from substances that will produce distinctly visible turbidity, solids or scum, nor shall there be any formation of slimes, bottom deposits or sludge banks attributable to waste discharges from municipal, industrial, or other sources including agricultural practices.

(4) TASTE AND ODOR - Taste and odor producing substances shall be limited to concentrations in the waters of the state that will not interfere with the production of potable water by reasonable water treatment methods, or impart unpalatable flavor to food fish, including shellfish, or result in offensive odors arising from the waters or otherwise interfere with the reasonable use of the waters.

(5) TOXIC SUBSTANCES - None present in quantities that alone or in combination will be toxic to animal or plant life. In all cases the level shall not exceed the $TLM_{96}/10$. Biossay techniques will be used evaluating toxicity utilizing methods and species of test organisms suitable to the purpose at hand. In cases where the stream is used as a public water supply the level of toxic substances shall not exceed the levels established by the United States Public Health Service drinking water standards latest edition.

(6) OIL AND GREASE - There shall be no free or floating oil or grease present in sufficient quantities to interfere with the designated uses, nor shall emulsified oils be present in sufficient quantities to interfere with the designated uses.

(7) FOAMING OR FROTHING MATERIALS - None of a persistent nature

(8) NUTRIENTS - The naturally occurring nitrogen-phosphorus ratio shall be maintained. On completion of detailed studies on the naturally occurring levels of the various macro and micro nutrients the state will establish numerical limits on nutrients where possible.

(9) TURBIDITY - There shall be no substantial increase in turbidity from ambient conditions due to waste discharges.

(10) OTHER MATERIALS - Limits on other substances not specified in these revised water quality standards shall be in accordance with recommendations set by the Louisiana Stream Control Commission and/or the Lousiana Health and Social and Rehabilitation Services Administration for municipal raw water sources.

CLASSIFICATION OF SURFACE WATERS:

The surface waters of the state will be divided into the following categories for ease of classification. Where the geographical coverage of a particular identified water or segment is subject to interpretation, e.g., East Cote Blanche Bay, the segment limits shall be defined by the maps included in the standards.

1. River Basin Waters - those surface inland waters comprising the lakes, reservoirs, major rivers and their tributaries and including the tidal portion of the river to the extent that it is confined in a channel. (This definition specifically does not apply to impoundments constructed solely for waste treatment purposes.)

2. Coastal Basin Waters - those surface inland waters exclusive of number one (River Basin Waters) discharging or flowing or otherwise communicating with bays or the gulf including the tidal portion of streams to the extent that they are confined in channels.

3. Bay Waters - all tidal waters exclusive of those included in river basin waters, coastal basin waters, and gulf waters.

4. Gulf Waters - those waters which are not included in or form a part of any bay or estuary but which are a part of the open waters of the Gulf of Mexico to the limit of Louisiana's jurisdiction.

WATER USE CLASSIFICATION.

Policy:

It is the policy of the State of Louisiana that all state waters should be protected for recreational uses in and/or on the water and for the preservation and propagation of desirable species of aquatic biota as part of the Louisiana Water Quality Management Program. Use and value of water for public water supplies, agricultural, industrial, and other purposes as well as navigation, shall also be considered in setting standards, but in no case, except as provided below, shall the criteria supporting these uses be permitted to interfere with recreational uses and the preservation of desirable species of aquatic biota.

Recreational uses will be specified as either "primary contact" or "secondary contact." Desirable species of aquatic biota will be specified as "fresh warm water," or "marine waters." All future designations of stream uses and their associated criteria must, at a minimum, adhere to these classifications except as provided below.

Exceptions:

Some waters, because of naturally occurring poor quality, man-made pollution or technological limitations may qualify for an excepted classification. This determination, however, will be made on a case-by-case basis following the analyses of each such area. In all cases where exceptions are proposed the concurrence of the

Regional Administrator of the United States Environmental Protection Agency will first be obtained. In any case where the exception is based on technological limitations, the exception will be temporary, i.e., the exception will be reviewed at least every three years as required by Section 303 (c) of Public Law 92-500.

In applying this policy, the terms "recreational uses" and "desirable species of aquatic biota" will be given common sense application. The existance of man-made pollution will be reviewed as a problem to be solved, not as an impediment against assigning this use classification.

"Desirable species of aquatic biota" refers to the range of aquatic biota indigenous to an area, and not to species that could and/or do not live in the area in question due to man's activities.

The most stringent criteria specified for each parameter shall be applicable where waters are classified for multiple uses.

CLASS A: WATER CONTACT RECREATION AND OTHER USES (PRIMARY CONTACT)

A surface raw water source intended for uses where the human body may come in direct contact with the raw water to the point of complete body submergence. The raw water may be ingested accidentally and certain sensitive body organs such as eyes, ears, nose, etc., may be exposed to the water. Although the water may be ingested accidental it is not intended to be used as a potable supply unless acceptable treatment is applied. Water may be used for swimmming, water skiing, skin diving, other similar activities, or as a raw water source for public water supply, support and propagation of aquatic fish and wildlife, agricultural, industrial and navigational uses.

CLASS B: FISH, WILDLIFE AND OTHER AQUATIC AND SEMI-AQUATIC LIFE, SECONDARY CONTACT RECREATION AND OTHER USES

A surface raw water source, suitable for the growth and propagation of fish, other aquatic and semi-aquatic life both marine and fresh water: waterfowl, fur bearers; and wildlife. This water may be used for warm water fish habitat, wildlife habitat, and other similar uses. This water is also suitable for secondary water contact recreation such as fishing, wading, boating, or activities where ingestion of the water is not probable or as a raw water source public water supply, agricultural, industrial and navigational uses.

Criteria for Class A and B are equal to or more stringent than those applicable for public water supply use as stated in the report of the National Technical Advisory Committee to the Secretary of the Interior on the Water Quality Criteria. However, when a water body is used as a public water supply it shall be identified as such in the standards for the stream and/or segment where the use occurs.

NUMERICAL CRITERIA

These numerical criteria apply to the specific waters of Louisiana identified in the tables, their navigable tributaries, distributaries and ancillary streams and waterbodies (unless such tributaries, distributaries and ancillary streams or waterbodies are specifically identified and have numerical standards listed in this book) and specifically apply with respect to substances of conditions attributed to waste discharges or activities of man as opposed to natural phenomena.

pH - The pH range represents minimum and maximum conditions throughout the segment with reasonable gradients applying towards segment boundries. In all cases the pH shall fall within the range of 6.0 to 9.0 unless otherwise

specified in the tables. No discharge of wastes shall cause the pH of the water body to vary by more than one (1) pH unit within the specified pH range for that segment where the discharge occurs. (This does not apply in the Mixing Zone.)

CHLORIDES, SULFATES & DISSOLVED SOLIDS - Values for these parameters apply to the approximate midpoint of the segment with reasonable gradients applying towards segment boundries. Values listed in the standards in general represent the arithmetic mean of existing data plus one standard deviation.

DISSOLVED OXYGEN - The following Dissolved Oxygen values represent minimum for the type of water specified. These values shall apply at all times except in naturally dystrophic waters or where natural conditions cause the Dissolved Oxygen to be depressed. For short periods of time, diurnal variations below the standard specified may occur. However, no waste discharge or activity of man shall lower the Dissolved Oxygen concentration to the point where the diurnal variation falls below the specified minimum.

FRESH WATER - For a diversified warm water biota including game fish, the daily D.O. concentration shall be above 5 mg/l assuming normal seasonal and daily variations are above this concentration. However, they may range between 5 and 4 mg/l for short periods of time during a 24-hour period, provided the water quality is favorable in all other respects.

ESTUARINE WATER - Dissolved oxygen concentrations in estuaries and tidal tributaries shall not be less than 4 mg/l at any time or place except in naturally dystrophic waters, or where natural conditions cause D.O. to be depressed.

COASTAL WATER - Dissolved Oxygen concentration in surface coastal waters shall be greater than 5 mg/l except when the upwellings and other natural phenomena may cause this value to be depressed.

TEMPERATURE - The temperature standards enumerated in the tables, in most cases, represent maximum values obtained from existing data. However, in a few cases a limited number of unusually high temperatures in the range of 35° - 36° C have been deleted as it is felt that these values were recorded during conditions of unseasonably high temperatures and/or unusually low flows or water levels and, therefore, do not represent normal maximum temperatures.

In order to protect a diversified warm water biota including game fish, the following temperature criteria shall apply (except when natural conditions cause the temperature to be raised above these limits).

The standard shall consist of two parts, a temperature differential and a maximum temperature. The temperature differential represents the maximum permissable rise above ambient conditions. There shall be no addition of artificial heat once the ambient temperature reaches the maximum temperature specified in the standards.

FRESH WATER - Temperature differential

(1) Maximum of 5° F (2.8°C) rise above ambient for streams and rivers.

(2) Maximum of 3°F (1.7°C) rise above ambient for lakes and reservoirs.

MAXIMUM TEMPERATURE - 90°F (32.2°C) except where otherwise listed in the tables or due to natural conditions.

ESTUARINE AND COASTAL WATERS

- Temperature differential

(1) Maximum of 4°F (2.2°C) rise above ambient during the period October through May.

(2) Maximum 1.5°F (0.83°C) during the period June through September.

MAXIMUM TEMPERATURE - 95°F (35°C) except when natural conditions elevate temperature above this level.

These temperature criteria shall not apply to privately owned reservoirs, or reservoirs constructed solely for industrial cooling purposes.

Bacterial Standards

The bacterial standard applicable to a particular stream segment depends upon the use classification of that individual stream segment. Limitations are placed on either fecal coliform content, MPN total coliform content, or a combination of both in order to achieve the stream sanitary quality required for the most restrictive water usage.

The tables in this document listing applicable criteria for each individual Louisiana stream segment designate one of the following four standards as applicable according to present and anticipated usage of the segment waters:

Standard #1 PRIMARY CONTACT RECREATION - Based on a minimum of not less than 5 samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 200/100 ml. nor shall more than 10 percent of the total samples during any 30-day period exceed 400/100 ml.

Standard #2 SECONDARY CONTACT RECREATION - Based on a minimum of not less than 5 samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 1,000/100 ml. nor shall more than 10 percent of the total samples during any 30-day period equal or exceed 2,000/100 ml.

Standard #3 PUBLIC WATER SUPPLY - The monthly arithmetic average of total coliform MPN (most probable number) shall not exceed 10,000/100 ml. nor shall the monthly arithmetic average of fecal coliforms exceed 2,000/100 ml.

Standard #4 SHELLFISH PROPAGATION - The monthly total coliform median MPN (most probable number) shall not exceed 70 per 100 ml. and not more than 10 percent of the samples ordinarily exceed an MPN of 230/100 ml.

APPLICATION OF STANDARDS

Flow Conditions: Except where indicated below the water quality standards specified herein shall apply during all flow conditions.

Chemical Parameters: The chemical parameters (except Dissolved Oxygen) represent maximum values, for the segment specified in the tables. These standards shall apply at all times except when natural conditions cause them to be exceeded.

Dissolved Oxygen: The Dissolved Oxygen values represent miminum values for the type of water specified. These values shall apply at all times except in naturally dystrophic waters or where natural conditions cause the Dissolved Oxygen to be depressed; for short periods of time diurnal variations below the standard specified may occur. However, no waste discharge or activity of man shall lower the Dissolved Oxygen concentration to the point where diurnal variation falls below the specified minimum.

Temperature: The temperature standards represent maximum values and shall apply in all cases except when unusual natural conditions of extremely low flow and unseasonably high temperatures may cause the established temperature standard to be exceeded. There shall be no addition of artifical heat once the ambient temperature reaches the maximum specified in the standards.

General Criteria and Other Parameters: The general criteria and other criteria not specifically discussed above shall apply at all times except when natural conditions may cause the standard to be exceeded.

Mixing Zones: The total area and/or volume of a stream assigned to mixing zones will be limited to that which will: (1) not interfere with biological communities or populations of important species to a degree which is damaging to the ecosystem; (2) not diminish other beneficial uses disproportionately.

Zones of Passage: In river streams, reservoirs, lakes, estuaries and coastal waters, zones of passage are continuous water routes of the volume, area and quality necessary to allow passage of free-swimming and drifting organisms with no significant effects produced on their populations. These zones must be provided wherever mixing zones are allowed.

Because of varying local physical and chemical conditions and biological phenomena no single value can be given on percentage of river (or stream) width necessary to allow passage of critical free-swimming and drifting organisms so that negligible or no effects are produced on their populations. As a guideline and except when otherwise specified by the Louisiana Stream Control Commission in a valid waste discharge permit the Mixing Zone will be limited to no more than 1/4 of the cross sectional area and/or volume of flow of stream or estuary, leaving at least 3/4 free as a zone of passage.

EXCEPTIONS

The water quality standards will not apply to:

(1) Effluents

(2) With the exception of the general criteria the water quality criteria will not apply to water in mixing zones as defined above or in a valid waste discharge permit from the Louisiana Stream Control Commission and/or a National Pollution Discharge Elimination System Permit.

APPENDIX A-II

U. S. Public Health Service Water Criteria for Minerals

Constituent or characteristic	Permissible criteria	Desirable criteria
Inorganic chemicals:	(mg/l)	(mg/l)
Alkalinity	Narrative	Narrative
Ammonia	0.5 (as N)	<0.01
Arsenic	0.05	Absent
Barium	1.0	do
Boron	1.0	do
Cadmium	0.01	do
Chloride	250	<25
Chromium, hexavalent	0.05	Absent
Copper	1.0	Virtually absent
Dissolved oxygen	≥4 (monthly mean) ≥3 (individual sample)	Near saturation
Fluoride	Narrative	Narrative
Hardness	do	do
Iron (filterable)	0.3	Virtually absent
Lead	0.05	Absent
Manganese (filterable)	0.05	do
Nitrates plus nitrites	10 (as N)	Virtually absent
pH (range)	6.0–8.5	Narrative
Phosphorus	Narrative	do
Selenium	0.01	Absent
Silver	0.05	do
Sulfate	250	<50
Total dissolved solids (filterable residue).	500	<200
Uranyl ion	5	Absent
Zinc	5	Virtually absent

APPENDIX B

Aquatic Fauna of the Michoud Area

APPENDIX B. AQUATIC FAUNA OF THE MICHOUD AREA

The tables in this section were obtained from the draft environmental statement for Corps of Engineers projects in the Mississippi River-Gulf Outlet area (COE, 1975). They are based on reviews of the pertinent literature. Table D-1 lists the marine and estuarine fishes likely to be found in the Michoud area, while Table D-2 lists the estuarine and marine invertebrates including the shellfish.

Definition of terms. The term "Coop:" refers to the Cooperative Gulf of Mexico estuarine inventory. "Blx:" refers to the Biloxi Marsh Complex study. Terminology of abundant, common, and rare are defined as follows:

Rare - The animal is known to normally occur in the project area but in a less density, i.e., in low numbers per unit area. In instances where the animal approaches the geological limits of its distribution, its occurrence is probably best described as "rare," although it may occasionally be found in numbers approaching the category "common."

Common - The animal is well-distributed throughout the project area and can be expected to occur in fairly large numbers.

Abundant - The animal is found in large numbers throughout the project area (high density).

It should be pointed out that the above terms have different numerical applications for different species. For instance, the occurrence for the alligator snapping turtle and the southern leopard frog are designated as "common" in both cases. However, within the entire project area there are many more southern leopard frogs than alligator snapping turtles. This is due to the fact that one acre of habitat, equally suited for the species, can support more southern leopard frogs than alligator snapping turtles. But both species, according to their expected distribution patterns are common in the project area. Therefore, the respective densities of two or more species under the same occurrence designation (rare, common, or abundant) may be very different from each other, depending on the particular ecological and behavioral requirements and/or preferences of the species involved.

Table B-1: Estuarine and Marine Fishes Likely to be Found in the Michoud Area.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
REQUIEM SHARKS (CARCHARIIDAE)						
Carcharhinus leucas Bull Shark	New York to Mexico	Gulf waters				Common
Carcharhinus limbatus Blacktip Shark	New England to Mexico Pacific Coast	Gulf waters				Common
Carcharias taurus Sand Shark	New England to Brazil	Offshore estuarine				N.A.
SAWFISH (PRISTIDAE)						
Pristis pectinatus Smalltooth Sawfish	New Jersey to Mexico	Gulf waters				Rare
ELECTRIC RAYS (DASYATIDAE)						
Dasyatis sabina Atlantic Stingray	Chesapeake Bay to Mexico	Gulf waters				Common
Dasyatis sayi Bluntnose Stingray	New York to Mexico	Gulf waters				Rare
Dasyatis americana Southern Stingray	New Jersey to Brazil	Inshore dependant				N.A.
GARS (LEPISOSTEIDAE)						
Lepisosteus spatula Alligator Gar	Gulf drainage; Mississippi River north to St. Louis	Fresh-Blackish waters	Coop:	Commercial		Rare
Lepisosteus oculatus Spotted Gar	Iowa and Nebraska to the Gulf	Fresh-Brackish waters				Rare

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Lepisosteus osseus Longnose Gar	Minnesota to Vermont, south to Gulf	Fresh-brackish waters				Rare
TARPONS (ELOPIDAE)						
Elops saurus Ladyfish	Cape Cod to Mexico	Estuaries	Coop:	Commercial(1)		Common
Megalops atlantica Tarpon	Maine to Mexico	Estuaries				Common
HERRINGS (CLUPEIDAE)						
Alosa chrysochloris Skipjack Herring	Gulf northward to Minnesota	Gulf waters anadromous				Common
Brevoortia patronus Gulf Menhaden	Florida to Mexico	Estuaries	Coop:	Commercial(1)		Abundant
Dorosoma cepedianum Gizzard Shad	Minnesota to St. Lawrence and New Jersey, south to Gulf	Fresh-Brackish waters	Coop:	Commercial(1)		Uncommon
Dorosoma petenense Threadfin Shad	Gulf, Florida to Mexico	Fresh-Brackish waters				Common
Harengula pensacolae Scaled Sardine	Florida to Mexico	Estuaries				Common
ANCHOVIES (ENGRAULIDAE)						
Anchoa hepsetus Striped Anchovy	Cape Cod to Mexico	Estuaries				Common
Anchoa mitchilli Bay Anchovy	Gulf of Mexico	Estuaries				Abundant

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
LIZARDFISH (SYNODONTIDAE)						
Synodus foetens Inshore Lizardfish	Cape Cod to Mexico	Estuaries				Common
SEA CATFISH (ARIIDAE)						
Bagre marinus Gafftopsail Catfish	Cape Cod to Mexico	Estuaries	Coop:	Commercial(1)		Abundant
Galeichthys felis Sea Catfish	Cape Cod to Mexico	Estuaries	Coop:	Commercial(1)		Abundant
XXX						
FRESHWATER CATFISHES (ICTALURIDAE)						
Ictalurus furcatus Blue Catfish	Minnesota to Ohio, southward into Mexico	Fresh waters	Sportfish(3)			Uncommon
Ictalurus punctatus Channel Catfish	Great Lakes southward to the Gulf	Fresh waters	Sportfish(3)			Common
Pylodictis olivaris Flathead Catfish	Mississippi Valley	Fresh waters, large rivers	Sportfish(3)			Uncommon
FRESHWATER EEL (ANGUILLIDAE)						
Anguilla rostrata American eel	Maine to Mexico	Most Gulf, but catadromous				Common
SNAKE EELS (OPHICHTHIDAE)						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Myrophis punctatus Speckled Worm Eel	Florida to Mexico	Estuaries				Rare
Ophichthus gomesi Shrimp Eel	South Carolina to Mexico	Gulf waters				Abundant
NEEDLEFISH (BELONIDAE)						
Strongylura marina Atlantic Needlefish	Maine to Mexico	Estuaries				Common
FLYING FISH (HEMIRAMPHIDAE)						
Hyporhamphus unifasciatus Halfbeak	Massachusetts to Mexico, Pacific Coast	Gulf waters				Common
KILLIFISH (CYPRINODONTIDAE)						
Cyprinodon variegatus Sheepshead Minnow	Cape Cod to Mexico	Fresh-Brackish waters				Abundant
Fundulus grandis Gulf Killifish	Florida to Mexico	Estuaries				Common
Fundulus similis Longnose Killifish	Florida to Texas	Fresh-Brackish waters				Common
Adinia xenica Diamond Killifish	Florida to Mexico	Estuaries				Common
Lucania parva Rainwater Killifish	Gulf of Mexico	Fresh-Brackish waters				Common
LIVEBEARERS (POECILIIDAE)						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Mollienesia latipinna Sailfin Molly	South Carolina into Mexico	Near coast, fresh waters				Common
PIPEFISHES (SYNGNATHIDAE)						
Syngnathus scovelli Gulf Pipefish	Florida to Mexico	Estuaries				Common
SEA BASS (SERRANIDAE)						
Centropristis philadelphicus Rock Sea Bass	South Carolina to Mexico	Gulf waters				Common
TRIPLETAILS (LOBOTIDAE)						
Lobotes surinamensis Tripletail	Cape Cod to Mexico	Estuaries				Common
JACKS (CARANGIDAE)						
Caranx hippos Crevalle Jack	Massachusetts to Mexico	Estuaries	Coop: Commercial Blx: Sportfish			Common
Chloroscombrus chrysurus Atlantic Bumper	Cape Cod to Mexico	Estuaries				Common
Oligoplites saurus Leatherjacket	Massachusetts to Mexico, California	Estuaries	Blx: Sportfish			Common
Trachinotus carolinus Florida Pompano	Cape Cod to Mexico	Estuaries	Blx: Sportfish			Common
Vomer setapinnis Atlantic Moonfish	Cape Cod to Mexico	Gulf waters				Common

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
MOJARRAS (GERREIDAE)						
Gerres cinereus Yellowfin Mojarra	Florida to Mexico	Gulf waters				Rare
DRUMS (SCIAENIDAE)						
Aplodinotus grunniens Freshwater Drum	Great Lakes southward into Mexico	Fresh waters				Common
Bairdiella chrysura Silver Perch	New York to Mexico	Estuaries	Coop:	Commercial		Abundant
Cynoscion arenarius Sand Seatrout	Florida to Mexico	Estuaries	Coop:	Commercial		Abundant
Cynoscion nebulosus Spotted Seatrout	New York to Mexico	Estuaries	Coop: Blx:	Commercial Sportfish[2]		Abundant
Larimus fasciatus Banded Drum	Chesapeake Bay to Mexico	Gulf waters				Common
Leiostomus xanthurus Spot	Cape Cod to Mexico	Estuaries	Coop:	Commercial		Abundant
Menticirrhus americanus Southern Kingfish	New Jersey to Mexico	Estuaries	Coop:	Commercial		Common
Menticirrhus littoralis Gulf Kingfish	Chesapeake Bay to Texas	Offshore, Inshore and surf				N.A.
Micropogon undulatus Atlantic Croaker	New York to Mexico	Estuaries	Coop: Blx:	Commercial Sportfish[2]		Abundant
Pogonias cromis Black Drum	New York to Mexico	Estuaries	Coop: Blx:	Commercial Sportfish[2]		Common

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Sciaenops ocellata Red Drum	New York to Mexico	Estuaries	Coop: Commercial			Common
Cynoscion nothus Silver Seatrout	Maryland to Mexico	Estuaries				Common
PORGIES (SPARIDAE)						
Archosargus probatocephalus Sheepshead	Cape Cod to Mexico	Estuaries	Coop: Commercial			Common
Lagodon rhomboides Pinfish	Cape Cod to Mexico	Estuaries	Coop: Commercial			Common
SPADEFISH (EPHIPPIDAE)						
Chaetodipterus faber Atlantic Spadefish	Cape Cod to Mexico	Estuaries	Coop: Commercial			Common
WRASSES (LABRIDAE)						
Lachnolaimus maximus Hogfish	North Carolina to Mexico	Gulf waters				Common
CUTLASSFISH (TRICHIURIDAE)						
Trichiurus lepturus Atlantic Cutlassfish	Cape Cod to Mexico	Estuaries	Coop: Commercial			Common
MACKEREL AND TUNAS (SCOMBRIDAE)						
XXX						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Scomberomorus maculatus Spanish Mackerel	Maine to Mexico, California	Estuaries				Common
SLEEPERS (ELEOTRIDAE)						
Dormitator maculatus Fat Sleeper	South Carolina to Mexico	Estuaries				Common
Eleotris pisonis Spinycheeked Sleeper	South Carolina to Mexico	Estuaries				Common
GOBIES (GOBIIDAE)						
Gobioides broussonneti Violet Goby	Florida to Mexico	Gulf waters				Common
Gobionellus boleosoma Darter Goby	North Carolina to Mexico	Estuaries				Abundant
Gobionellus hastatus Sharptail Goby	North Carolina to Mexico	Estuaries				Common
Gobiosoma bosci Naked Goby	Cape Cod to Mexico	Estuaries				Common
Microgobius gulosus Clown Goby	Chesapeake Bay to Texas	Estuaries				Common
Evorthodus lyricus Lyre Goby	Chesapeake Bay to Mexico	Estuaries				Common
Gobionellus shufeldti Freshwater Goby	North Carolina to Mexico	Estuaries				Common
Gobionellus stigmaticus Marked Goby	Cape Cod to Mexico	Estuaries				Rare

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
SEAROBINS (TRIGLIDAE)						
Prionotus tribulus Bighead Searobin	Long Island to Mexico	Gulf waters	Coop:	Commercial		Common
COMBTOOTH BLENNIES (BLENNIDAE)						
Chasmodes saburrae Florida Blenny	Florida to Mexico	Gulf waters				Common
BUTTERFISH (STROMATEIDAE)						
Peprilus alepidotus Southern Harvestfish	Cape Cod to Mexico	Estuaries				Abundant
Poronotus triacanthus Butterfish	Maine to Mexico	Gulf waters	Coop:	Commercial		Common
MULLETS (MUGILIDAE)						
Mugil cephalus Striped Mullet	New York to Mexico, California	Fresh-Brackish waters	Coop:	Commercial		Abundant
SILVERSIDE (ATHERINIDAE)						
Membras martinica Rough Silverside	Gulf of Mexico	Fresh-Brackish waters				Abundant
Menidia beryllina Tidewater Silverside	Florida to Mexico	Fresh-Brackish waters	Coop:	Commercial		Abundant
THREADFINS (POLYNEMIDAE)						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Polydactylus octonemus Atlantic Threadfin	Cape Cod to Mexico	Gulf waters				Abundant
LEFT-EYE FLOUNDER (BOTHIDAE)						
Citharichthys spilopterus Bay Whiff	New Jersey to Mexico	Estuaries	Coop: Commercial			Common
Etropus crossotus Fringed Flounder	North Carolina to Mexico	Estuaries				Abundant
Paralichthys albigutta Gulf Flounder	North Carolina to Mexico	Estuaries	Coop: Commercial			Common
Paralichthys lethostigma Southern Flounder	New York to Mexico	Estuaries	Sportfish, commercial			Common
SOLES (SOLEIDAE)						
Achirus lineatus Lined Sole	Southern Atlantic and Gulf coasts	Occasionally enters fresh waters				Common
Trinectes maculatus Hogchoker	Cape Ann to Mexico	Estuaries	Coop: Commercial			Abundant
TONGUEFISH (CYNOGLOSSIDAE)						
Symphurus plagiusa Blackcheek Tonguefish	North Carolina to Mexico	Estuaries				Common
CLINGFISH (GOBIESOCIDAE)						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Gobiesox strumosus Skilletfish	Chesapeake Bay to Mexico	Estuaries				Common
PUFFERS (TETRAODONTIDAE)						
Sphaeroides nephelus Southern Puffer	New Jersey to Mexico	Estuaries				Abundant
PORCUPINEFISH (DIODONTIDAE)						
Chilomycterus schoepfi Striped Burrfish	Massachusetts to Mexico	Gulf waters				Rare
TOADFISH (BATRACHOIDIDAE)						
Opsanus beta Gulf Toadfish	Florida to Mexico	Estuaries				Common
Porichthys porosissimus Atlantic Midshipman	South Carolina to Mexico	Gulf waters				Common

(1) Classified as a commercial species according to the Cooperative Gulf of Mexico Estuarine Inventory and Study.

(2) Classified as a sportfish species according to the Study of Estuarine Sportfishes in the Biloxi Marsh Complex.

(3) Generally accepted as sportfishes.

This species list was developed from the following sources: Cooperative Gulf of Mexico Estuarine Inventory and Study; Study of Estuarine Sportfishes in the Biloxi Marsh Complex; How to Know the Freshwater Fishes, by Eddy: Deep draft Access to the ports of New Orleans and Baton Rouge, Louisiana.

Table B-2: Estuarine and Marine Invertebrates Likely to be Found in the Michoud Area.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
PROTOZOA						
MASTIGOPHORA (Flagellates)						
Anisonema sp.	Throughout	Litter in a variety of habitats from woods to marsh	Throughout	Resident	Rare	Rare
Bodo sp.	Throughout	Litter & soils in a variety of habitats from woods to marsh	Throughout	Resident	Rare	Rare
Euglena sp.	Throughout	Hard water - swamps & marsh	Throughout	Resident	Common	Common
HELIZOA (Sun animals)						
Actinophrys sp.	Throughout	Litter & water in marsh	Throughout	Resident	Common	Common
RHIZOPODA (Amoeba)						
Mayorella sp.	Throughout	Litter & water in variety of habitats from woods to marsh	Throughout	Resident	Common	Common
Arcella sp.	Throughout	Litter & water in variety of habitats from woods to marsh	Throughout	Resident	Common	Common
Euglypha sp.	Throughout	Litter, soils & water in a variety of habitats from woods to marsh	Throughout	Resident	Common	Common

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Trinema sp.	Throughout	Litter, soils & water in a variety of habitats from woods to marsh	Throughout	Resident	Common	Common
CILIATA (Ciliate)						
Coleps sp.	Throughout	Hard waters, marshes	Throughout	Resident	Common	Common
Colpoda sp.	Throughout	Litter, soils & water in a variety of habitats from woods to marsh	Throughout	Resident	Rare	Rare
Cyrtholophosis sp.	Throughout	Litter, soils & water in a variety of habitats from woods to marsh	Throughout	Resident		
Didinium sp.	Throughout	Water in a wide variety of habitats	Throughout	Resident	Common	Common
Halteria sp.	Throughout	Litter, soils & water in a variety of habitats from woods to marsh	Throughout	Resident	Abundant	Abundant
Vorticella sp.	Throughout	Litter, soils & water in a variety of habitats from woods to marsh	Throughout	Resident	Common	Common
CTENOPHORA (Comb jellies)						
Berce pyata Sea Purse	Atlantic & Gulf Coasts	Gulf & bays > 5 ppt salinity	Coastal	Resident	Rare	Rare

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Mnemiopsis macradyi Venus girdle	Atlantic & Gulf Coasts	Gulf & bays > 5 ppt salinity	Coastal	Resident	Common to abundant	Common to abundant
PORIFERA (Sponges)						
Cliona celata Boring sulfur sponge	Throughout	Gulf	Coastal	Resident	Abundant	Abundant
Haliclona sp. Finger sponge	Temperate	Gulf	Coastal	Resident	Rare	Rare
BRYOZOA (Moss animals)						
Amathia sp.		Nearshore littoral zone	Coastal	Resident	Rare	Rare
Membranipora membranace Fairy's lace	Throughout	Gulf, bays	Coastal	Resident	Common	Rare
Bugula sp. Sea moss	Throughout	Gulf, bays	Coastal	Resident	Abundant	Abundant
Zoobotryon pellucidum	Throughout	Gulf, bays	Coastal	Resident	Abundant	Abundant
BRACHIOPODA (Lamp shells)						
Glottidea pyramidata	Gulf of Mexico	Offshore littoral	Coastal	Resident	Rare	Rare
ANNELIDA (Worm)						
Nereis succinea	Throughout	Gulf, bays > 2 ppt salinity	Coastal	Resident	Common	Common
GASTROPODA (Snails)						
Littorina irrorata Marsh periwinkle	Florida to Texas	Marshes, 0-5 ppt salinity	Coastal	Resident	Common	Common

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Melampsis bidentata Melampsis snail	Florida to Texas	Salinity > 3 ppt, vegetation	Coastal	Resident	Common	Common
Neritina reclivata Smooth periwinkle	Florida to Texas	Marshes 0-5 ppt, salinity	Coastal	Resident	Common	Common
PELECYPODA (Clams)						
Mytilopsis leucophaeta Fresh-water mussel	New York to Mexico	Bays, ponds 1-13 ppm	Coastal	Resident	Abundant	Abundant
Rangia cuneata Marsh clam	Florida to Texas	Bays, marshes 1-15 ppt	Coastal	Resident	Common	Common
Crassostrea virginica Oyster	Canada to Mexico	Bays, lakes 5-15 ppt	Coastal	Resident	Common	Common
Modiolus demissus Ribbed mussel	Florida to Texas	Vegetation in saline marshes	Coastal	Resident	Common	Common
Brachidontes recurvus Hooked mussel	Cape Cod to Texas	Oyster reefs	Coastal	Resident	Common	Common
Mulina lateralis Dwarf surf clam	Maine to Texas	Beaches, marshes	Coastal	Resident	Abundant	Abundant
CEPHALOPODA (Squid)						
Lolliguncula brevis	Gulf of Mexico	Gulf, bays > 10 ppt	Coastal	Resident	Common	Common
CLADOCERA (Water fleas)						
Evadne tergestina	Atlantic & Gulf Coasts	Gulf, bays > 20 ppt	Coastal	Resident	Common	Common
Penilia avirostris	Temperate	Gulf, bays > 15 ppt	Coastal	Resident	Common	Common

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Podon polyphemoides	Atlantic & Gulf Coasts	Gulf, bays > 10 ppt	Coastal	Resident	Common	Common
COPEPODA						
Acartia tonsa	Temperate	Ponds, bays, & gulf to 2 ppt salinty	Coastal	Resident	Abundant	Abundant
Caligus sp.	Temperate	Gulf & bays > 15 ppt salinity	Coastal	Resident	Rare	Rare
Centropages spp.	Temperate	Bays & gulf > 10 ppt salinity	Coastal	Resident	Abundant	Abundant
Corycaeus spp.	Temperate	Gulf & bays > 15 ppt salinity	Coastal	Resident	Common	Common
Ergasilus sp.	Throughout	Gulf, rivers 0-15 ppt	Throughout	Resident	Common	Common
Eucalanus sp.	Temperate	Gulf, bays > 10 ppt	Coastal	Resident	Rare	Rare
Euchaeta marina	Temperate	Gulf, bays > 20 ppt	Coastal	Resident	Rare	Rare
Eurytemora affinis	Atlantic Ocean, Gulf	Gulf, bays 5-32 ppt	Coastal	Resident	Common	Common
Halicyclops fosteri	Atlantic, Pacific, Gulf Coasts	Bays, ponds 2-30 ppt	Southern one-third	Resident	Common	Common
Labidocera aestiva	Atlantic, Gulf Coasts	Gulf, bays > 5 ppt	Coastal	Resident	Abundant	Abundant
Oncaea mediterranea	Temperate	Gulf, bays > 15 ppt	Coastal	Resident	Common	Common

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Paracalanus sp.	Temperate	Gulf, bays > 10 ppt	Coastal	Resident	Rare	Rare
Sapphirina nigromaculata	Throughout	Gulf, bays > 10 ppt	Coastal	Resident	Common	Common
Temora sp.	Throughout	Gulf, bays > 10 ppt	Coastal	Resident	Common	Common
Tortanus sp.	Atlantic & Gulf Coasts	Gulf, bays > 10 ppt	Coastal	Resident	Common	Common
Undulina vulgaris	Temperate	Gulf, bays > 5 ppt	Coastal	Resident	Common	Common
ISOPODA (Aquatic sow bugs)						
Aegathoa oculata	Atlantic & Gulf Coasts	Gulf, bays > 10 ppt	Coastal	Resident	Common	Common
Edotea montosa	Atlantic & Gulf Coasts	Gulf, bays > 5 ppt	Coastal	Resident	Rare	Rare
Livonea ovalis	Gulf, Atlantic Coast	Gulf, bays > 1 ppt	Coastal	Resident	Common	Common
Cassidinea lunifrons	Atlantic, Gulf Coasts	Gulf, bays > 10 ppt	Coastal	Resident	Rare	Rare
AMPHIPODA (Scuds)						
Corophium spp.	Throughout	Waters > 2 ppm	Throughout	Resident	Common	Common
Gammarus spp.	Throughout	Gulf, bayous, bays	Throughout	Resident	Common	Common
DECAPODA (Crab & Shrimp)						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Callinecies sapidus Blue crab	Novia Scotia to Texas	Gulf, bays, 0-35 ppt	Coastal	Resident	Common to abundant	Common to abundant
Penaeus aztecus Brown shrimp	New Jersey to Texas	Gulf, bays > 5 ppt	Coastal	Resident	Common to abundant	Common to abundant
Uca pugnax Fiddler crab	Cape Cod to Mexico	Mud flats	Coastal	Resident	Common	Common
Palaemonetes intermedius Grass shrimp	New York to Texas	Brackish water	Coastal	Resident	Common	Common
Palaemonetes vulgaris Grass shrimp	Massachusetts to Texas	Brackish-saline water	Coastal	Resident	Common	Common
Pagurus longicarpus Hermit crab	Atlantic, Gulf Coasts	Shallow water, mud flats > 15 ppt	Coastal	Resident	Common	Common
Squilla empusa Mantis shrimp	Atlantic, Gulf Coasts	Gulf, bays > 10 ppt	Coastal	Resident	Common	Common
Rhithropanopeus harrisii Mud crab	Canada to Mexico	Vegetation in bays 2-25 ppt	Coastal	Resident	Common	Common
Acetes americanus carolinae Netclinger	North Carolina to Texas	Gulf, bays > 5 ppt	Coastal	Resident	Common	Common
Leander tenuirornis	Subtropical & tropical	Vegetation at salinity > 5 ppt	Coastal	Resident	Common	Common
Macrobrachium ohione River shrimp	Gulf Coasts, Mississippi River Valley south from Ohio	Bays < 20 ppt	Throughout	Resident	Common to abundant	Common to abundant
Macrobrachium acanthurus River shrimp	North Carolina to Texas	Bays < 10 ppt	Throughout	Resident	Common	Common
Sesarma reticulatum Square-backed crab	Massachusetts to Texas	Salt marshes	Coastal	Resident	Common	Common

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Penaeus fluvatilis White shrimp	New York sent to Cape Canaveral; Pensacola to Mexico	Gulf, bays > 5 ppt	Coastal	Resident	Common to abundant	Common to abundant
Xiphopeneus kroyeri Seabob	Gulf of Mexico	Gulf, bays > 10 ppt	Coastal	Resident	Common	Common
MYSIDACEA						
Neomysis Possum shrimp	Pacific, Gulf Coasts	Brackish bays, ponds	Coastal	Resident	Common	Common
CUMACEA						
Leptocuma minor	Gulf of Mexico	Gulf, bays > 10 ppt	Coastal	Resident	Rare	Rare
CIRRIPEDIA						
Balanus sp.	Temperate & tropical	Gulf, bays > 5 ppt	Coastal	Resident	Rare	Rare
INSECTA (Insects)						
ODONATA (Dragonflies & Damselflies)						
Anax junius	Throughout	Fresh, brackish ponds	Throughout	Resident	Common	Common
Anomalagrion hastatum	Eastern part	Fresh, brackish ponds	Throughout	Resident	Rare	Rare
Cannacria gravida	Southern part	Brackish marsh	Coastal marsh	Resident	Abundant	Abundant
Enallagma signatum	Throughout	Ponds, marshes	Throughout	Resident	Common	Common
Epiaschna heros	Eastern part	Streams, swamps	Throughout	Resident	Common	Common

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Erythemis simplicicollis	Throughout	Swamps, ponds	Throughout	Resident	Abundant	Abundant
Erythrodiplax bernice	All except northwest	Saline, brackish marshes	Coastal	Resident	Common	Common
Ischnura posita	Throughout	Ponds, streams,	Throughout	Resident	Common	Common
Ischnura ramburi	Throughout	Fresh, brackish ponds	Throughout	Resident	Abundant	Abundant
Libellula needhami	Throughout	Fresh, saline swamps, ponds	Southern part	Resident	Abundant	Abundant
Libellula vibrans	Throughout	Swamps, ponds, marshes	Throughout	Resident	Common	Common
Pachydiplax longipennis	Throughout	Fresh, brackish ponds, streams	Throughout	Resident	Abundant	Abundant
Pantala flavescens	Throughout	Fresh, brackish ponds	Throughout	Resident	Common	Common
Pantala hymenea	All except northwest	Ponds, marshes	Throughout	Resident	Rare	Rare
Tramea carolina	Throughout	Fresh, brackish ponds, marshes	Throughout	Resident	Common	Common
CHAETOGNATHA (Arrow worms)						
Saggita hispida	Throughout	Gulf, bays > 10 ppt	Coastal	Resident	Common	Common
CEPHALOCHORNATA (Lancers)						
Branchiostoma Amphioxus	Throughout	Sandy gulf shores	Coastal	Resident	Common	Common
UROCHORDATA (Urochordates)						
Oikopleura sp.	Temperate & tropical	Gulf, bays > 10 ppt	Coastal	Resident	Common	Common

APPENDIX C

Hazards Analysis

I. CODES, STANDARDS, AND EQUIPMENT APPROVAL LISTS

1. New Orleans Building Code
2. New Orleans Fire Code
3. New Orleans Plumbing Code
4. NFPA #13 Installation of Sprinkler Systems
5. NFPA #30 Storage Handling and Use of Flammable Liquids
6. NFPA #33 Spray Finishing Using Flammable Materials
7. NFPA #80 Installation of Fire Doors and Windows
8. NFPA #90-A Air Conditioning and Ventilating Systems
9. NFPA #91 Blower and Exhaust Systems for Dust, Stock and Vapor Removal and Conveying
10. NFPA #101 Building Exits Code (Life Safety Code)
11. NFPA #70 National Electrical Code
12. ANSI #B9.1 Safety Code for Mechanical Refrigeration (ASHRAE #15-58)
13. ASME Boiler and Pressure Vessel Code
14. U.L. Inc. Building Materials Directory
15. U.L. Inc. Fire Resistance Index
16. Factory Mutual Equipment Approval Guide
17. OSHA Safety and Health Standards as follows:

1910.37	Means of Egress, General
1910.106	Flammable and Combustible Liquids
1910.107	Spray Finishing Using Flammable and Combustibel Materials
1910.159	Automative Sprinkler Systems
1910.163	Local Fire Alarm Signaling Systems
1910.309	National Electric Code

II. Hazardous Materials to be Treated at the Proposed Wastewater Treatment Facility at Michoud Assembly Facility.

Key to Abbreviations

ihl:	inhale	kg:	kilogram
hmn:	human	m:	meter (m^3: cubic meter)
mus:	mouse	M:	minute
TCLo:	lowest toxic dose	H:	hour
ppm:	parts per million	W:	week
mppfc:	million particles per cubic foot	ims:	intramuscular
		I:	intermittent
TWA:	time weighted average over an 8-hour work day	orl:	oral
USOS:	United States Occupational Standards	scu:	subcutaneous
		ivn:	intravenous
LD50:	lethal dose for 50% of the test population	CL:	ceiling limit
mg:	milligram		

Source: NASA. 1975. Marshall Space Flight Center, Michoud Assembly Facility. Preliminary Engineering Report on Review of the Industrial Wastewater Treatment Facility.

Trade Name	Chemical Name	Potential Hazard(1)	Exposure Permitted
Allied Kelite Isoprep 177 Phosphoric Acid	phosphoric acid	ihl-hmn TCLo: 100 mg/m^3	TWA 1 mg/m^3
Parker Co. Parco 210	phosphate	(Incomplete information)	(Incomplete information)
Parker Co. Parcolene 2	phosphate	(Incomplete information)	(Incomplete information)
----------	xylene	ihl-hmn TCLo: 200 ppm	Annual Total USOS, TWA 100 ppm
Nitric Acid	nitric acid	ihl-rat LC50: 49 ppm	TWA 2 ppm (5 mg/m^3)
Diversey 300 Diversey 301 Diversey 302	hydrochloric acid	ihl-rat LC50: 4701 ppm/30M	USOS-air: CL 5 ppm
Sodium Cyanide	cyanide	scu-mus LDLo: 10 mg/kg	USOS (skin) 5 mg/m^3

Trade Name	Chemical Name	Potential Hazard	Exposure Permitted
----------	chromic acid	ihl-hmn TCLo: 110 mg/M	USOS CL 0.1 mg/m^3
----------	sulphuric acid	ihl-hmn TCLo: 800 ug/m3	TWA 1 mg/m3
----------	silica	orl-rat LD50: 3160 mg/kg	10 mg/m^3 250 mppcf
----------	sodium dichromate	ims-rat TDLo: 140 mg/kg/WI	USOS CL 100 ug/m3
Aerowash "A"	5% Phenyl ether wetting agent	orl-rat LD5o: 3320 mg/kg	----------
----------	naphtha vapors	ihl-rat LDLo: 1600 ppm	air TWA 100 ppm
----------	toluene	ihl-hmn TCLo: 200 ppm	air TWA 200 ppm
----------	methyl isobutyl ketone	ihl-hmn TCLo: 200 ppm	air TWA 100 ppm
----------	heptane	ihl-hmn TCLo: 1000 ppm	air TWA 500 ppm
----------	isobutyl ketone	ihl-rat TCLo: 2000 ppm	----------
----------	cyclohexanone	ihl-hmn TCLo: 50 ppm	air TWA 50 ppm
----------	methane, trichlorofluroro-		air TWA 1000 ppm
----------	ethylene, trichloro	ihl-hmn TCLo: 160 ppm/83M	air TWA 100 ppm
----------	methyl ethyl ketone	ihl-rat LDLo: 2000 ppm/4H	air TWA 200 ppm
----------	M-butanol, 1 butanol, 2-methyl-	orl-rat LD50: 4920 mg/kg	----------
----------	1 butanol, 3 methyl	orl-rat LD50: 3380 mg/kg	air TWA 100 ppm
----------	carbon	ivn-rat LD50:	----------

Note: (1) Toxic substance and their effects are under constant review and will be revised periodically

APPENDIX D

Air Quality

Table D-1. Existing Boilers at MAF.

Building	Capacity 10^6Btu/hr.	Use	% of Time Operating Summer	% of Time Operating Winter	Hours Day	Days Week	Percent of Capacity
130	75	steam	--	--	--	--	--
207	90	steam	*3 boilers on		12	5	143 x 10^6 Btu/hr.
	112.5	steam	1 boiler on		24	2	36 x 10^6 Btu/hr.
	112.5	steam					
	90	steam					
	150	steam					
320B	2	heat domestic water	20%	20%	24	7	100%
	--	reheat water	--	--	--	--	--
	--	reheat water	--	--	--	--	--
351	10.2	reheat water	30%	80%	12	5	40%
	10.2	reheat water	--	--	--	--	--
	3.3	steam	100%	100%	8	5	50%
	3.3	steam	--	--	--	--	--

* The combination of boilers used in building 207 changes frequently.

Table D-2. Boiler Emission Factors.

Pollutant	Natural Gas [2] (Industrial Process Boiler) kg/10^6m^3	No. 6 Fuel Oil [1,2] (Industrial-Commercial Unit) kg/10^3l
Particulates	30-240	2.75
Sulfur Oxides	9.6	13.48
Carbon Monoxide	272	0.5
Hydrocarbons	48	0.35
Nitrogon Oxides	1920-3680	9.6

[1] 0.7% Sulfur Fuel Oil
[2] Horizontally-Fired Unit
Source: USEPA "A Compilation of Air Pollutant Emission Factors, AP-42," 4/73 as revised through 7/74.

Table D-3. Annual Distances Commuted from Various Locations as Reported by MAF Employees Responding to 1974 Car Pool Survey.

Residential Location*	Respondents		Annual Commuting Distance	
	Number	Percent	Vehicle Km	Percent
West New Orleans	626	36.0	4,000,000	29.5
Slidell-Covington	324	19.0	3,760,000	27.6
East New Orleans	295	17.0	660,000	4.9
Metairie-Kenner	192	11.0	2,260,000	16.7
Arabi-Chalmette	180	10.0	760,000	5.6
Mississippi	58	3.5	1,420,000	10.4
Westwego-Gretna	54	3.0	560,000	4.2
Other	8	0.5	140,000	1.1
TOTAL	1,737	100.0	13,560,000	100.0

*See Figure 24 for map showing residential locations.

Discussion

In May of 1974, all MAF employees were asked to respond to a car pool survey. Fourty-six percent (1,737 persons) responded. Based upon postal zip codes of the respondents' addresses, average distances were calculated to produce the data in the table above. Assumptions in preparing the table include the following:

- Average daily attendance = 95%
- Car occupancy rate = 1.6 persons
- Number of working days per year = 260
- Straight-line distance from center of zip code area was corrected by a factor of 1.4 to approximate actual distance.
- Distances were multiplied by two to show round trips.
- Total number commuting by auto = 97%

In addition, the average distance between the respondents' residences and MAF was calculated by multiplying the straight-line distances from each zip code zone times the number of persons in each zone, times the correction factor of 1.4. This product was then divided by the total number of respondents. The average one-way distance was calculated as 26.08 km (16.17 mi) per day; round trip distance per day, 52.16 km (32.34 mi).

If one can use this sample of just under one half in estimating the annual round-trip VKT (vehicle kilometers traveled) of the total MAF employee population, daily round trips would total 113,150 km (70,150 mi), or approximately 29.4 million km (18.2 million mi) per year. This estimate is used to obtain estimated pollution emissions in Table D-4.

Table D-4. Annual MAF Commuter Vehicle Emissions.

Pollutant	1976 Emission Factor (gram/km)	1976 Total Emissions (kg/year)	1980 Emission Factor (gram/km)	1980 Total Emissions (kg/year)
Particulates	0.36	10,591	0.36	11,121
Sulfur Oxides	0.12	3,530	0.12	3,707
Carbon Monoxide	21.0	617,820	11.0	339,801
Hydrocarbons	2.9	85,318	1.6	49,426
Nitrogen Oxides	3.1	91,202	2.0	61,782

Notes:

1976 total vehicle distance traveled = 29,420,000 km (18,200,000 mi). See Table D-3 and discussion for data supporting this estimated distance.

1980 total vehicle distance traveled is based on an expected 5 percent increase in employee population (30,891,000 km, or 19,110,000 mi).

Emission factors assume an average of 40.2 km (25 mi) per hour speed, and are adjusted for ages and varieties of vehicles estimated to be driven in the United States for the years treated. It will be noted that some emission factors are expected to decrease by 1980 as the percentage of vehicles with pollution controls increases. Emission factors are from U. S. EPA AP-42 (USEPA, 1974).

Table D-5. Annual Hydrocarbon Emissions from Spray Painting at MAF, 1976.

Source		Annual Amounts of Paint Used		Hydrocarbon Emissions		Excess Hydrocarbon Emissions (kg)
Contractor	Building	liters	(gal)	kg	(lbs)	
Martin-Marietta (NASA)	103	1,790	(473)	1,768	(3,880)	None
Chrysler (Army)	103	1,159	(306)	1,233	(2,713)	None
Boeing Services (NASA)	119	500	(132)	27	(59)	None
TOTAL		3,449	(911)	3,028	(6,652)	

Discussion

Paint volume per year is shown in Table D-5 for each source. Based on an average weight of 1.9 kg per liter of paint, and an emissions factor of 560 kg of hydrocarbon emissions per 1,000 kg of paint, the listed hydrocarbon emissions have been calculated. State of Louisiana air control regulations allow up to 6.8 kg per source per day, or 1,768 kg per source per year, without additional control. The first three booths are used throughout the year. Hydrocarbon emissions from two of these exceed regulations and will need further controls. The fourth booth (Boeing Services) is used only six to eight weeks per year. Based on the permitted amount of 6.8 kg/day, the fourth booth is allowed to emit from 204 to 272 kg of hydrocarbons without further control. As shown in the table, it too emits hydrocarbons in excess of allowable standards during its 6 to 8 weeks of operation annually.

Table D-6. Gross Welding Particulate Emissions, 1976 and 1982.

	SOURCE			
	Martin-Marietta	Chrysler (or Army Contractor)	Bell (or Navy Contractor)	TOTAL
1976 Emission (kg/ton per year)	95/0.1	80/0.1	11/0.01	190/0.2
Emission per ship set (kg/ton)	48/0.05	---	---	48/0.05
1982 Emission, at 60 ship sets per year (kg/ton per year)	2,850/3.1	80/0.1	11/0.01	2,900/3.2

The Welding Particulate Emission Factor (FUME = 0.02 x Mass of Rod Consumed) is from the Cleveland, Ohio Air Pollution Control Agency, 1976. Net welding emissions will be negligible.

Table D-7. Emission Factors for Industrial Vehicles.

	EMISSIONS									
	grams/mile				grams/mile					
					Gasoline			Diesel		
	Car*	Heavy Gasoline	Diesel Car	Heavy Diesel	Car	Heavy	Avg.	Car	Heavy	Avg.
Particulates	0.54	0.85	0.73	1.2	5.4	5.1	5.3	7.3	6.0	6.7
Sulfur Oxides	0.13	0.26	0.63	2.4	1.3	1.6	1.4	6.3	12.0	9.0
Carbon Monoxide	110.00	140.00	1.70	20.4	1100.0	840.0	970.0	17.0	102.0	60.0
Hydrocarbons	18.90	17.00	0.45	3.4	189.0	102.0	146.0	4.5	17.0	11.0
Nitrogen Oxides	3.40	9.50	1.60	34.0	34.0	57.0	46.0	16.0	170.0	93.0
Assumed miles/gallon	10.00	6.00	10.00	5.0						

* Auto Emission Factor is for a 1968 Vehicle at 15 MPH. All Factors from USEPA, 1974.

Table D-8. Emissions From Industrial Vehicles at MAF, 1976.

	Gasoline @ 63,000 Gal.	Diesel @ 20,000 Gal.	TOTAL	
			kg	Pounds
Particulates	334	134	468	1,030
Sulfur Oxides	88	180	268	592
Carbon Monoxide	61,000	1,200	62,200	13,700
Hydrocarbons	9,200	220	9,420	20,800
Nitrogen Oxides	2,900	1,860	4,760	10,500

Table D-9. Estimated Air Pollutant Emissions from Proposed Chiller/Boiler.

Pollutant	Emission Factor (lb. emission per ton of refuse) [Commercial Unit]	Annual Emission (6,500 tons per year) kg	tons
Particulates	7	20,000	20
Sulfur Oxides	2.5	7,000	8
Carbon Monoxide	10	30,000	30
Hydrocarbons	3	9,000	10
Nitrogen Oxides	3	9,000	10

Discussion

Louisiana requirements will vary depending on whether the unit is considered an incinerator or a boiler. An incinerator may emit 0.2 grains of particulate matter per standard cubic foot dry flue gas at 50% excess air, or 12% carbon monoxide; it must be multichambered with at least 1500°F in the second chamber. A boiler may emit 0.6 pounds of particulate matter per million Btu input. Both must have 2000 ppm or less sulfur in the flue gas and must meet capacity standards.

An incinerator emitting average (USEPA, AP-42) amounts of pollution appears to satisfy Louisiana standards. Average emissions are used to estimate pollution from the proposed unit. The estimate is quite inexact because the incinerator/boiler is in the first stage of consideration.

Table D-10. Hydrocarbon Emissions from Cleaning and Thermal Protection Systems at MAF, 1976 and 1982.

Operation and Component	Hydrocarbon	Emissions (kilograms) Per ship set gross	net	1976[1]	1982[2]
Cleaning External Tanks[3]	trichloroethylene	450	23	69	1,380
Cleaning other components[4]	trichloroethylene	---	--	83,226 kg/year	83,226 kg/year
Ablator Coating[5,6]					
airdrying primer	naptha solvent	6.8	0.1	0.3	6
silicone bonder base	heptane/xylene solvent	17.3	0.3	0.9	18
silicone albator	heptane/xylene solvent	68.7	1.4	4.2	84
polyvinyldiene chloride sealer in water latex vehicle; less than 1% volatile hydrocarbon (e.g. butylcellosolve acetate)		.3	T	T	0.4
Urethane foam coating (tanks & components)[5,6]					
epoxy primer	cyclohexanone, M-Butanol, MEK, MIBK, and xylene	127.8	2.6	7.8	156
urethane foam	freon F-11	32.0	0.6	1.8	36
polyvinyldiene chloride sealer	(as above)	2.8	0.1	0.3	6
		705.7	28.1	83,310	84,912

1. Assumes 3 ship sets per year.
2. Maximum annual net at 60 ship sets per year by 1982.
3. External Tanks will be cleaned in "Cell E" of Building 110. Assumes 95% capture of trichloroethylene vapor by carbon adsorption, from gross to net.
4. Components are cleaned in Building 103. Consumption is based on the 15,000 gallons used in 1976 (Sp Gravity—1.466). Vapor recovery units are installed to reduce this consumption.
5. Ablator and foam are installed in Building 103 and 110.
6. Reduction from gross to net assumes 98% recapture through carbon adsorption.

APPENDIX E

Wildlife of the Michoud Area

APPENDIX E. WILDLIFE OF THE MICHOUD AREA

The tables in this section were obtained from the draft environmental statement for Corps of Engineers projects in the Mississippi River-Gulf Outlet area (COE, 1975). They are based on reviews of the pertinent literature.

Amphibians And Reptiles

The following tables present information relative to amphibians and reptiles:

Table E-1 Amphibians likely to be found in southeastern Louisiana.

Table E-2 Reptiles likely to be found in southeastern Louisiana.

Table E-3 Reptiles likely to be found only infrequently in the Michoud area.

Definition of terms on the amphibians and reptile tables

Resident - Found throughout the year.

Wandering migrant - Passage through the area, or a brief stay while en route to another area.

Common - Usually seen and of regular occurrence.

Uncommon - Not usually seen but of regular occurrence.

Abundant - Almost always seen and of high population densities.

Rare - Seldom seen and of low population densities.

Casual - Occasionally seen but seldom occurs.

Birds

Data on birds are presented in four tables based on residence classes:

Table E-4 Breeding birds of southeastern Louisiana.

Table E-5 Birds likely to be found in southeastern Louisiana as non-breeding, migrant summer and winter residents.

Table E-6 Birds likely to be found in southeastern Louisiana as migrants only.

Table E-7 Birds likely to be found in southeastern Louisiana very rarely or irregularly.

Definition of terms on the bird tables

(a) Very common to abundant, at least locally.

(b) Uncommon or only moderately common, but found regularly in small numbers.

(c) Rare; found frequently, not every day, but to be expected particularly at certain times of the year.

(d) Very rare or irregular; not found every week, or even every month during its season, sometimes skipping a year or more, but when present, possibly locally common for a short period.

Mammals

Data on mammals are presented in three tables based on residence class:

Table E-8 Mammals likely to be found in the Michoud area.

Table E-9 Mammals possibly occurring in the Michoud area.

Table E-10 Mammals not normally occurring in the Michoud area for which there are confirmed reports.

Definition of terms used on the mammal tables.

Resident - Found throughout the year.

Wandering migrant - Passage through the area, or a brief stay while en route to another area.

Common - Usually seen and of regular occurrence.

Uncommon - Not usually seen but of regular occurrence.

Abundant - Almost always seen and of high population densities.

Rare - Seldom seen but regularly occurs.

Casual - Seldom occurs but occasionally seen.

Accidental - Not normally occurring, introduced either intentionally or unintentionally.

Table E-1. Amphibians likely to be found in southeastern Louisiana.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
MUDPUPPIES, WATERDOGS						
Necturus beyeri Gulf Coast Waterdog	Gulf Coast streams, Mobile Bay to southeast Texas.	Sandy, springfed streams	Southern one-half	Resident	Rare	Rare
AMPHIUMA						
Amphiuma means tridactylum Three-toed Amphiuma	Southeast Missouri and Oklahoma to the Gulf.	Ditches, sloughs, pools, ponds	Throughout	Resident	Common	Uncommon[1]
SIRENS						
Siren intermedia nettingi Western Lesser Siren	Mississippi Valley; west to eastern Texas.	Shallow waters; ditches, ponds	Throughout	Resident	Common	Uncommon[1]
MOLE SALAMANDERS						
Ambystoma texanum Small-mouthed Salamander	Ohio to southern Iowa, south to the Gulf.	Near ponds, swamps rivers	Throughout	Resident	Common	Uncommon[1]
Ambystoma talpoideum Mole Salamander	South Carolina to northern Florida and Louisiana.	Burrower, in damp places	All except southwest and north	Resident	Rare	Rare[1]
Ambystoma opacum Marbled Salamander	New England to northern Florida, west to east Texas.	Moist sandy areas to dry hillsides	Throughout	Resident	Common	Uncommon[1]
Ambystoma maculatum Spotted Salamander	Southern Georgia and east Texas, north to Wisconsin and Maine.	Moist areas, shallow waters	All except southwest corner	Resident	Rare	Rare[1]
Ambystoma tigrinum tigrinum Eastern Tiger Salamander	New York to Minnesota, south to Texas and northern Florida; absent from Appalachians.	Lakes, ponds, swamps	Southeastern part	Resident	Rare	Rare[1]
NEWTS						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Diemictylus viridescens louisiannensis Central Newt	Lake Superior to eastern Texas, east to South Carolina.	Swales, swamplands, river bottoms, ponds	Throughout	Resident	Rare	Rare[1]
LUNGLESS SALAMANDERS						
Desmognathus fuscus brimleyorum Central Dusky Salamander	Ouachita Mountains in Arkansas to Gulf of Mexico.	Small streams	Throughout	Resident	Common	Uncommon[1]
Eurycea bislineata cirrigera Southern Two-lined Salamander	North Carolina to northern Florida west to Mississippi River.	Creek or river swamps, woods	Southeastern part	Resident	Rare	Rare[1]
Manculus quadridigitatus Dwarf Salamander	North Carolina to Florida, west to eastern Texas.	Low swampy areas	All except northeast corner	Resident	Common	Uncommon[1]
SPADEFOOT TOADS						
Scaphiopus holbrooki Eastern Spadefoot Toad	New England to Florida, west to central Louisiana; absent from uplands.	Forests, sandy loose soils	Eastern one-half	Resident	Rare	Rare[1]
TOADS						
Bufo woodhousei fowleri Fowler's Toad	New England to Gulf Coast, west to Michigan and Louisiana.	Sandy areas, around shores, river bottoms	Throughout	Resident	Abundant	Uncommon[1]
Bufo woodhousei velatus East Texas Toad	Southern Louisiana through eastern Texas.	Lakes, ponds, fields	Throughout	Resident	Rare	Rare[1]
Bufo valliceps Gulf Coast Toad	Eastern Louisiana through south-central Texas.	Ditches, fields	Southern one-half	Resident	Common	Uncommon[1]
TREEFROGS AND THEIR ALLIES						

Table E-1. Amphibians (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence in Project Area
Acris crepitans crepitans Northern Cricket Frog	Long Island to Louisiana and eastern Texas.	In or near shallow sluggish waters	Throughout	Resident	Abundant	Uncommon[1]
Hyla crucifer crucifer Northern Spring Peeper	Maine to Minnesota, south to east Texas and northern Alabama.	Woods, brush, near ponds, swamps	Throughout	Resident	Abundant	Uncommon[1]
Hyla cinerea Green Treefrog	Delmarva Penninsula to Florida Keys; west in Gulf to Texas, north to Illinois.	Swamps, lake or stream borders	Throughout	Resident	Common	Common
Hyla squirella Squirrel Treefrog	Virginia to Florida Keys, west to southern Texas.	Brush, woods, gardens	Southern two-thirds	Resident	Common	Uncommon[1]
Hyla versicolor versicolor Eastern Gray Treefrog	Maine to Minnesota, south to Louisiana and northern Florida.	Arboreal in small trees, shrubs	All except northwest corner	Resident	Common	Uncommon[1]
Pseudacris triseriata feriarum Upland Chorus Frog	New Jersey to northern Florida, west to eastern Texas.	Ponds, bogs, marshes, swamps, woodlands	Throughout	Resident	Common	Uncommon[1]
NARROW-MOUTHED TOADS						
Gastrophryne carolinensis Narrow-mouthed Toad	Maryland to Florida Keys, west to east Texas.	Swamp and stream borders	Throughout	Resident	Common	Uncommon[1]
TRUE FROGS						
Rana catesbeiana Bullfrog	Nova Scotia to central Florida, west to Wisconsin and Nebraska.	Lakes, ponds, bogs, rivers, streams	Throughout	Resident	Common	Uncommon[1]
Rana grylio Pig Frog	South Carolina to south Florida, west to southeast Texas.	Lakes, marshes, cypress bays	Southern one-third	Resident	Common	Uncommon[1]
Rana clamitans clamitans Bronze Frog	North Carolina to northern Florida, west to Texas, north to southern Illinois.	Swamps, bayheads, streams	Throughout	Resident	Common	Uncommon[1]
Rana pipiens sphenocephala Southern Leopard Frog	New Jersey to south Florida, west to Texas, north to central Indiana.	Shallow waters, wet grounds	Throughout	Resident	Abundant	Common

The above species are expected to occur according to range maps of Conant.
(1) Are not expected to occur in a salt marsh type habitat.

Table E-2. Reptiles likely to be found in southeastern Louisiana.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
CROCODILIANS						
Alligator mississipiensis American alligator	North Carolina to Florida Keys, west to Texas.	Swamps, lakes, bayous, marshes	Near coast	Resident	Uncommon	Uncommon
SNAPPING, MUSK, MUD TURTLES						
Chelydra serpentina Common Snapping Turtle	Southern Canada to Gulf, Atlantic Ocean to Rocky Mountains.	Rivers, swamps, lakes, marshes	Throughout	Resident	Abundant	Uncommon[1]
Macroclemys temmincki Alligator Snapping Turtle	Kansas to southwest Indiana, south to Texas and northern Florida.	Rivers, lakes, marshes	Throughout	Resident	Common	Uncommon[1]
Sternothaerus odoratus Stinkpot	New England to Wisconsin, south to Texas and Florida.	Shallow, still waters	Throughout	Resident	Common	Uncommon[1]
Sternothaerus carinatus Razor-Backed Musk Turtle	Arkansas to southeast Oklahoma, south to central Texas and Mississippi.	Swamps, rivers, streams, marshes	Throughout	Resident	Common	Uncommon[1]
Kinosternon subrubrum hippocrepis Mississippi Mud Turtle	Missouri to Louisiana and east central Texas.	Bayous, lagoons, swamps	Throughout	Resident	Common	Uncommon[1]
BOX, WATER TURTLES						
Terrapene carolina major Gulf Coast Box Turtle	Gulf Coast, Florida panhandle to eastern Texas.	Essentially terrestrial	Southern one-fourth	Resident	Common	Uncommon[1]
Malaclemys terrapin pileata Mississippi Diamondback Terrapin	Gulf Coast, Florida panhandle to western Louisiana.	Marshes, estuaries	Coastal plain	Resident	Common	Common
Graptemys kohni Mississippi Map Turtle	Mississippi Valley, Missouri and Illinois southward.	Rivers, lakes	All except Florida Parishes	Resident	Common	Uncommon[1]
Chrysemys picta dorsalis Southern Painted Turtle	Southern Illinois to northwest Alabama and the Gulf.	Rivers, lakes, marshes, swamps	Eastern one-half	Resident	Common	Uncommon[1]

Table E-2. Reptiles (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Pseudemys scripta elegans Red-Eared Turtle	Northern Indiana to New Mexico, south to Florida panhandle.	Rivers, lakes, swamps, marshes	Throughout	Resident	Abundant	Uncommon[1]
Pseudemys concinna mobilensis Mobile Cooter	Florida panhandle to extreme southeast Texas.	Gulf Coast streams	Southern one-half	Resident	Common	Uncommon[1]
Pseudemys floridana hoyi Missouri Slider	Southern Illinois and southeast Kansas to the Gulf.	Rivers, marshes, swamps, lakes	Throughout	Resident	Rare	Rare[1]
Deirochelys reticularia miaria Western Chicken Turtle	Southeast Missouri and Oklahoma, south to east Texas and Louisiana.	Still waters	All except Florida Parishes	Resident	Common	Uncommon[1]
Deirochelys reticularia reticularia Eastern Chicken Turtle	North Carolina to Mississippi River in southwest Mississippi.	Still waters	All east of Mississippi River	Resident	Uncommon	Uncommon[1]
SOFTSHELL TURTLES						
Trionyx muticus calvatus Gulf Coast Smooth Softshell	West Pennsylvania to South Dakota, south to Texas and Mississippi.	Streams, rivers	Throughout	Resident	Common	Uncommon[1]
Trionyx spinifer asper Gulf Coast Spiny Softshell	North Carolina to Mississippi and Florida.	Rivers, ponds	Southeastern two-thirds	Resident	Common	Uncommon[1]
Trionyx spinifer emoryi Texas Spiny Softshell	Arkansas to southern California and south to Texas and Louisiana.	Streams, rivers	Throughout	Resident	Rare	Rare[1]
ANOLES, FENCE LIZARDS						
Anolis carolinensis carolinensis Green Anole	Southeast Virginia to Key West, west to Oklahoma and Texas.	Trees, ground vegetation	Throughout	Resident	Abundant	Abundant
Sceloporus undulatus undulatus Southern Fence Lizard	South Carolina to central Louisiana, south to Gulf.	Rail fences, logs stumps	Southeastern one-half	Resident	Rare	Rare[1]

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
WHIPTAILS						
Cnemidophorus sexlineatus Six-Lined Racerunner	Maryland to Florida Keys, west to Wyoming and Texas.	Open, well-drained areas	Throughout	Resident	Rare	Rare[1]
SKINKS						
Lygosoma laterale Ground Skink	New Jersey to Florida Keys, west to Kansas and Texas.	Woodland floor and brush	Throughout	Resident	Common	Uncommon[1]
Eumeces fasciatus Five-Lined Skink	New England to northern Florida, west to Texas and Wisconsin.	Cutover woods	Throughout	Resident	Common	Uncommon[1]
Eumeces laticeps Broad-headed Skink	South Pennsylvania to Florida, west to Kansas and Texas.	Woodland	Throughout	Resident	Common	Uncommon[1]
Eumeces inexpectatus Southeastern Five-Lined Skink	Virginia to Florida Keys, west to Louisiana.	Woods, brush, arboreal	Eastern one-third	Resident	Rare	Rare[1]
GLASS LIZARDS						
Ophisaurus ventralis Eastern Glass Lizard	North Carolina to Florida, west to Louisiana.	Wet meadows, fields, pine flatwoods	Southeast one-fourth	Resident	Rare	Rare[1]
Ophisaurus attenuatus attenuatus Western Slender Glass Lizard	Wisconsin to Nebraska, south to Texas and Louisiana.	Dry grasslands or open woods	All except Florida Parishes	Resident	Rare	Rare[1]
COLUBRIDS						
Natrix cyclopion cyclopion Green Water Snake	Southern Illinois to Gulf, Florida panhandle to Texas.	Ponds, marshes, bayous, swamps	All except extreme northwest	Resident	Common	Common
Natrix rhombifera rhombifera Diamond-backed Water Snake	Southeast Iowa to Gulf, Alabama to Texas.	Most aquatic habitats	Throughout	Resident	Common	Common

Table E-2. Reptiles (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Natrix erythrogaster flavigaster Yellow-Bellied Water Snake	Central Georgia to southeast Iowa, south to Texas and the Gulf.	Rivers, swamps, marshes, lakes	Throughout	Resident	Rare	Rare[1]
Natrix sipedon confluens Broad-banded Water Snake	Southern Illinois to central Texas and Gulf Coast	Marshes, swamps	Throughout	Resident	Common	Uncommon[1]
Natrix sipedon clarki Gulf Salt Marsh Snake	Gulf Coast from Southern Texas to west-central Florida.	Coastal beaches swamps, marshes	Coastal Plain	Resident	Common	Common
Natrix grahami Graham's Water Snake	Iowa and Illinois to Louisiana and Texas.	Ponds, streams, bayous, swamps	Throughout	Resident	Common	Common
Natrix rigida Glossy Water Snake	Virginia to central Florida, west to central Texas.	Swamps, lakes, ponds	Throughout	Resident	Abundant	Abundant
Storeria dekayi wrightorum Midland Brown Snake	Wisconsin to the Carolinas and Gulf Coast.	Marshes, woods, brush	All except southwest	Resident	Common	Common
Storeria occipitomaculata occipitomaculata Northern Red-bellied Snake	Nova Scotia to southern Georgia, west to Dakotas, Oklahoma, Louisiana.	Open woods	All except southwest	Resident	Rare	Rare[1]
Thamnophis sirtalis sirtalis Eastern Garter Snake	New England to Minnesota, south to east Texas and Florida.	Marshes, woods, damp grounds	Throughout	Resident	Rare	Rare[1]
Thamnophis sauritus proximus Western Ribbon Snake	Wisconsin to southeast Colorado, south to Louisiana and Texas.	Semi-aquatic, near streams	Throughout	Resident	Common	Common
Haldea striatula Rough Earth Snake	Virginia to northern Florida, west to Kansas and Texas	Fields, debris	Throughout	Resident	Rare	Rare[1]
Haldea valeriae elegans Western Smooth Earth Snake	Southern Indiana to eastern Kansas south to Gulf.	Fields, deciduous forests	Throughout	Resident	Rare	Rare[1]
Heterodon platyrhinos Eastern Hognose Snake	New Hampshire to southern Florida, west to Texas and South Dakota.	Sandy areas	Throughout	Resident	Rare	Rare[1]

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Diadophis punctatus stictogenys Mississippi Ringneck Snake	Southern Illinois to the Gulf, Alabama to east Texas.	Near swamps, springs, damp woods	Throughout	Resident	Rare	Rare[1]
Farancia abacura reinwardti Western Mud Snake	Alabama to east Texas, north to southern Illinois.	Swamps, lowlands	Throughout	Resident	Common	Common
Coluber constrictor flaviventris Eastern Yellow-bellied Racer	North Dakota and Iowa to Texas and southern Louisiana.	Fields, grassland brush, open woods	Southern one-third	Resident	Common	Uncommon[1]
Masticophis flagellum flagellum Eastern Coachwhip	North Carolina to south Florida, west to Texas, Oklahoma, Kansas.	Dry flatwoods, swamps, rugged terrain	Throughout	Resident	Rare	Rare[1]
Opheodrys aestivus Rough Green Snake	New Jersey to Florida Keys, west to Kansas and Texas.	Riparian vegetation arboreal	Throughout	Resident	Common	Common
Elaphe guttata guttata Corn Snake	New Jersey to south Florida, west to southern Louisiana.	Woods, pine barrens, rocks	Southeastern one-third	Resident	Rare	Rare[1]
Elaphe obsoleta spiloides Gray Rat Snake	Southern Indiana to Louisiana and southwest Georgia.	Woods, brush, fields, arboreal	Eastern one-half	Resident	Common	Common
Cemophora coccinea Scarlet Snake	New Jersey through Florida, west to Louisiana and Oklahoma.	Soils suitable for burrowing	Eastern one-half	Resident	Rare	Rare[1]
Lampropeltis getulus holbrooki Speckled Kingsnake	Illinois to Nebraska, south to east Texas and Alabama.	Swamps, woods	Throughout	Resident	Rare	Rare[1]
Lampropeltis doliata amaura Louisiana Milk Snake	South Arkansas and southern Oklahoma to Gulf Coast.	Open woods, fields	All except Florida Parishes	Resident	Rare	Rare[1]
CORAL SNAKES						

Table E-2. Reptiles (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Micrurus fulvius tenere Texas Coral Snake	Southern Arkansas and Louisiana to central Texas.	Lowlands	All except Florida Parishes	Resident	Rare	Rare[1]
PIT VIPERS						
Agkistrodon contortrix contortrix Southern Copperhead	Virginia to Florida, west to Arkansas and Texas.	Lowlands near swamps and streams	Throughout	Resident	Uncommon	Uncommon
Agkistrodon piscivorus leucostoma Western Cottonmouth	Southern Illinois to southwest Alabama, west to Kansas and Texas.	Swamps, bayous	Throughout	Resident	Abundant	Abundant
Sistrurus miliarius streckeri Western Pigmy Rattlesnake	Southern Missouri and eastern Oklahoma, south to the Gulf.	Nearby water	Throughout	Resident	Uncommon	Uncommon
Crotalus horridus atricaudatus Canebrake Rattlesnake	Virginia to Florida, west to central Texas, north to Illinois.	Cane thickets, swamplands	Throughout	Resident	Uncommon	Uncommon

The above species are expected to occur according to range maps of Conant.
(1) Would not usually be expected to occur in a salt marsh type habitat.

Table E-3. Reptiles likely to be found only infrequently in the Michoud area.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
SEA TURTLES						
Chelonia mydas mydas Atlantic Green Turtle	Warmer parts of Atlantic and Gulf Coasts, north to Massachusetts.	Shallow marine waters	Coastal waters	Wandering Migrant	Casual	Casual
Eretmochelys imbricata imbricata Atlantic Hawksbill	Atlantic and Gulf coasts, north to Massachusetts.	Shallow waters along coasts	Coastal waters	Wandering Migrant	Casual	Casual
Caretta caretta caretta Atlantic Loggerhead	Atlantic and Gulf coasts, north to Newfoundland.	Shallow waters along coasts	Coastal waters	Wandering Migrant	Casual	Casual
Lepidochelys kempi Atlantic Ridley	Gulf and Atlantic coasts.	Shallow waters along coasts	Coastal waters	Wandering Migrant	Casual	Casual
Dermochelys coriacea coriacea Atlantic Leatherback	Open seas along Gulf and Atlantic coasts.	Deep offshore waters	Coastal waters	Wandering Migrant	Casual	Casual
GECKOS						
Hemidactylus turcicus turcicus Mediterranean Gecko	Introduced at Key West, Miami, New Orleans, Brownsville.	Nocturnal, near human habitations	Introduced into New Orleans	Resident	Rare	Rare

Table E-4. Breeding birds of southeastern Louisiana.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
GREBES						
Podilymbus podiceps Pied-billed Grebe	Throughout, breeds Maine to Ind. & south to Colo. & N.C. resident southward	Lakes, ponds, coastal marshes & bays	Throughout	Wide spread winter common summer	Abundant	Common
PELICANS						
Pelecanus occidentalis Brown Pelican	Coasts from Cape Hatteras to Mex. & along Pacific from Wash. to Mex.	Bays, beach	Coastal areas	Permanent resident	Rare, U.S. list of endangered fauna	Unlikely
CORMORANTS						
Phalacrocorax auritus Double-crested Cormorant	Breeds in north central states, & some coastal areas, migrant in New Eng. & Miss. Valley, winters on all coasts and up northern rivers	Bays	Throughout	Some breed, most winter residents	Moderately common to rare	Moderately common to rare
Phalacrocorax olivaceus Olivaceous Cormorant	Winter resident, some permanent in Tex. and wouthwest La. coasts	Bays	Most in south-west coastal	Permanent	Moderately common	Moderately common
ANHINGAS						
Anhinga anhinga Anhinga*	Cape Hatteras to Tex. on coast inland up Miss. Valley	Bottomland forest	Throughout	Permanent resident	Moderately common	Moderately common
HERONS AND BITTERNS						
Ardea herodias Great Blue Heron	Breeds from Maine to Wash. & south to Oreg. & Va., permanent resident in most of country south of this	Bottomland forest, fields, marsh	Throughout	Permanent resident	Moderately common	Moderately common
Butorides virescens Green Heron	Breeds from Maine to Dak. & south to Tex. & Fla., also along Pacific coast, resident on southern Calif., Ariz., & Fla.	Bottomland forest, marsh	Throughout	Permanent resident	Common summer, rare winter	Common summer rare winter

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Florida caerulea Little Blue Heron	Breeds on Atlantic coast Maine to Fla. & up Miss. Valley & in Tex., resident in Fla. & along coast Gulf to Tex.	Bottomland forest, marsh	Throughout	Common summer moderate winter	Common to moderately common	Common to moderately common
Bubulcus ibis Cattle Egret	Resident along Gulf coast from Fla. to Tex., naturalized	Fields	Throughout	Permanent resident	Common	Unlikely
Dichromanassa rufescens Reddish Egret	Permanent resident on coast of Tex., summers on La. coast, winters in southern Fla.	Marshes, bays	Coast	Summer resident	Moderately common summer, rare winter	Moderately common summer, rare winter
Casmerodius albus Great Egret	Breeds in Miss. Valley, along Atlantic coast & Central Valley of Calif., resident south of Cape Hatteras & on Gulf & Calif. coasts, winters inland southwest	Bottomlands, fields marshes, bays	Throughout (breeds north)	Permanent resident	Common summer moderat	Common summer, moderately common winter
Egretta thula Snowy Egret	Breeds on Atlantic Coast south of N.J., Gulf Coast, Pacific Coast south of San Francisco, inland in Gt. Basin, Central Valley of Calif., Tex., & La.	Bottomlands, field marshes	Throughout	Permanent resident	Common summer moderat	Common summer, moderately common winter
Hydranassa tricolor Louisiana Heron	Breeds Mass. to Va., resident from Va. to Tex. along coast	Bottomland forests marshes	Coastal	Permanent resident	Common	Common
Nycticorax nycticorax Black-crowned Night Heron	Summers through, permanent resident on west coast, Gt. Basin, & southeast coast	Bottomland forests marshes	Throughout	Permanent resident	Common	Common
Nyctanassa violacea Yellow-crowned Night Heron	Breeds N.Y. to Ga. & west to Okla., resident Fla. to Mex. on coast	Bottomland forests marshes	Throughout	Permanent resident	Rare winter	Rare winter
Ixobrychus exilis Least Bittern	Breeds east of plains and in central Calif., resident in s. Calif., Fla. & Tex.	Bottomland forests marshes	Throughout	Permanent resident	Common summer extremely r. winter	Common summer, extremely rare winter

Table E-4. Breeding birds (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Botaurus lentiginosus American Bittern	Summers throughout, winters in south	Marshes	Throughout	Permanent resident	Moderate winter, rare summer	Unlikely
STORKS						
Mycteria americana Wood Stork	Winters Fla. to Tex., breeds La.	Bottomland forest marsh	Throughout part coastal	Permanent resident	Common summer, rare otherwise	Common summer, rare otherwise
IBISES AND SPOONBILLS						
Plegadis falcinellus Glossy Ibis	Atlantic Coast winters southern U.S. Atlantic Coast	Coastal marshes, fresh and salt	Throughout, breed Miss. R. delta in La.	Permanent resident	Moderately common	Moderately common
Plegadis chihi White-faced Ibis	Breeds in central Calif., & Nev., Tex., & La., migrates in southwest & central U.S.	Bottomland forest, fields, marshes	Coastal	Permanent, especially summer	Common	Common
Eudocimus albus White Ibis	Resident Fla. to Tex. along coast	Coastal marshes	Coastal to Ponchatovia	Permanent resident	Common summer, moderately common winter	Common summer moderately common winter
Ajaia ajaja Roseate Spoonbill	Breeds in s. Fla. & Tex., and La.	Coastal marshes	Coastal, breed s.w. La	Permanent resident	Common	Unlikely
SWANS, GEESE, DUCKS						
Dendrocygna bicolor Fulvous Tree-duck	Summers from central Calif. to Mex., along Tex. coast to La., migrant up Atlantic Coast to Va.	Fields, marsh, bays	Throughout	Summer mostly	Common winter, rare summer	Common winter rare summer
Anas fulvigula Mottled Duck	Permanent resident s. Fla. & La. through Tex. along coast	Marsh	Coastal areas	Permanent	Common summer, moderately common winter	Common summer moderately common winter

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Anas acuta Pintail*	Breeds north central states & Pacific northwest, resides Calif., winters N.Y. to central Calif. & south	Fields, marshes, bays	Throughout, esp. coastal	Sept.-April occasionally breeds in coastal marshes	Common winter	Common winter
Anas discors Blue-winged Teal	Summers from Gt. Lakes to Pacific south to central Calif. & down, occasionally breed in s. U.S.	Marsh, bays	Throughout	Migrant some breed	Common spring & fall, rare summer	Common spring & fall, rare summer
Aix sponsa Wood Duck	Breeds Maine to Minn., south to Tex. & Ga., resident Ga. to Tex. & Wash. to central Calif.	Upland and bottomland forests	Throughout	Permanent resident	Moderately common	Unlikely
Oxyura jamaicensis Ruddy Duck	Winters all coasts, migrant throughout, breeds northcentral and northwest states	Marsh, bays	Throughout	Winter resident, occasionally breeds	Common winter, rare summer	Common winter rare summer
Lophodytes cucullatus Hooded Merganser	Breeds Maine to Wash. & s. to La., & N.Y., winters along Pacific Coast & Atlantic & Gulf Coasts	Bottomland forest, bays	Throughout	Permanent resident	Moderately common to rare	Moderately common to rare
VULTURES						
Cathartes aura Turkey Vulture	Breeds throughout, winters in southern half of country	Upland and bottomland forests, brush, fields, marsh, bays	Throughout	Permanent resident	Common	Common
Coragyps atratus Black Vulture	Resident N.Y. to Kans. & s. to Tex. & Fla.	Upland and bottomland forests, brush, fields, often absent coastal marshes	Throughout	Permanent resident	Common	Common

Table E-4. Breeding birds (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
KITES, HAWKS, EAGLES						
Elanoides forficatus Swallow-tailed Kite	North Carolina to Tex.: coastal & inland	Swamps, marsh, river banks	River areas, part s.e. La.	Summer resident breeds	Rare	Unlikely
Ictinia mississippiensis Mississippi Kite	Breeds Ga. through Tex. along coast & up Miss. Valley to Ill.	Upland and bottom land forests, brush	Throughout	Summer resident breeds	Common summer to rare winter	Common summer to rare winter
Accipiter striatus Sharp-shinned Hawk	Breeds in north central states N. winters along Atlantic & Gulf Coast w. to Calif., resident in west	Upland and bottom land forests	Throughout	Winter resident some breed	Moderately common	Unlikely
Accipiter cooperii Cooper's Hawk	Breeds in north central states N. England, perm resident in rest of country except s. Calif. & Atlantic & Gulf Coasts where it winters	Upland and bottom land forests, brush	Throughout breeds	Permanent resident	Rare	Unlikely
Buteo jamaicensis Red-tailed Hawk	Breeds in northern parts of country, resident southward	Upland and bottom land forests, brush, fields, marsh	Throughout	Permanent resident, breeds	Rare summer, common winter	Rare summer common winter
Buteo lineatus Red-shouldered Hawk	Breeds N. Eng. through Ohio, resident southward & in Calif., s. of San Francisco	Upland and bottom land forests brush, fields, marsh	Throughout	Permanent resident	Common winter	Common winter
Buteo platypterus Broad-winged Hawk	Breeds e. of Gt. Plains, winters in southern Fla.	Upland and bottom land forests	Throughout	Summer resident breeds	Common summer	Unlikely
Haliaeetus leucocephalus Bald Eagle	Winters e. of Rockies, resident locally in several states	Shorelines, brush, marsh, bays	Southern half	Permanent resident	Rare, U.S. List of Endangered Fauna	Unlikely

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
OSPREYS						
Pandion haliaetus Osprey	Breeds in northwestern states, Calif., Ariz., & parts of Atlantic & Gulf Coasts, migrant throughout rest of country	Marsh, bays	Throughout, breeds coast	Summer resident breeds	Rare	Unlikely
CARACARAS, FALCONS						
Falco peregrinus Peregrine Falcon	Winters from N.Y. through Nebr. to Wash. and southward	Bottomland forest, brush, field, marsh	Throughout	Winter resident breeds	Rare, U.S. List of Endangered Fauna	Unlikely
Falco sparverius American Kestrel	Breeds in n. half of country, resident in s. half, winters in Tex.	Fields	Throughout	Winter resident some breeds	Common	Unlikely
QUAIL, PARTRIDGES, PHEASANTS						
Colinus virginianus Bobwhite	Resident from N.Y. to Nebr. & s. to Tex. & Fla., also in Wash. & Oreg.	Brush, fields, some brushy coastal islands	Throughout	Permanent resident	Common	Common
RAILS, GALLINULES, COOTS						
Rallus elegans King Rail	Breeds Mass. to Minn. & s. to Tex. & Fla., resident Chesapeake Bay to Tex. and up Miss. Valley	Marsh	Throughout	Permanent resident	Common	Common
Rallus longirostris Clapper Rail	Resident in saline coastal marshes from Mass. to Tex. in s. Calif.	Marsh	Coastal areas	Permanent resident	Common	Common
Rallus limicola Virginia Rail	Breeds Maine to Wash. s. to Calif. & N.Y., resident on Pacific Coast, migrant thru rest but winters N.Y. to Tex. on coast	Fields, marsh	Throughout	Winter resident	Moderately common	Moderately common

Table E-4. Breeding birds (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Porphyrula martinica Purple Gallinule	Breeds Ga., Miss., Ala., La., & Tex. resident on Gulf Coast	Brush, fields, marshes	Throughout	Summer resident	Common summer, rare winter	Common summer rare winter
Gallinula chloropus Common Gallinule	Breeds N.Y. to Minn. & s. to Tex. & Ga., resident along Atlantic & Gulf Coasts from Cape Hatteras to Mex.	Bottomland forests marsh, bays	Throughout	Permanent resident	Common summer rare winter	Common summer rare winter
Fulica americana American Coot	Summers throughout, winters on coast	Fields, marsh, bays	Throughout resident	Permanent winter, rare summer	Common rare winter	Common summer
OYSTERCATCHERS						
Haematopus palliatus American Oystercatcher	Resident on coast, Cape Hatteras to Mex., summers Va. to N.Y.	Beach	Barrier Islands	Summer resident	Rare	Unlikely
AVOCETS, STILTS						
Himantopus mexicanus Black-necked Stilt	Summers in southwest and along Gulf Coast, from Tex. to Miss. & in Fla.	Fields, marsh	Coastal	Permanent resident	Common summer, rare winter	Common summer rare winter
Recurvirostra americana American Avocet	Summers in western U.S., some winters on Gulf & s. Calif. coasts	Fields, marsh	Coastal	Winter resident, possible occasional breeding	Common winter, moderately common summer	Common winter moderately common summer
PLOVERS, SURFBIRDS, TURNSTONES						
Charadrius wilsonia Wilson's Plover	Breeds Chesapeake Bay to S.C., resident Ga. to Mex. on coast	Fields, marsh	Coastal	Permanent resident	Moderately common summer, rare winter	Moderately common summer, rare winter

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Charadrius vociferus Killdeer	Breeds New England & Appalachian Mts. & Gt. Basin, resident on Pacific Coast & throughout rest of country	Fields, marshes	Throughout	Permanent resident	Common, moderately common summer	Common, moderately common summer
SANDPIPERS AND ALLIES						
Catoptrophorus semipalmatus Willet	Breeds N. Dak. to Wash. & s. to Ore. & Nebr., migrant southward, winters on Calif. coast, resident Va. to Tex. on coast	Marsh, beach	Coastal areas	Permanent resident	Common	Common
Philohela minor American Woodcock	Summers in eastern U.S., winters on southeast coast	Upland and bottomland forests, brush, fields	Throughout	Permanent resident rare summer	Common winter,	Common winter rare summer
GULLS, TERNS						
Larus atricilla Laughing Gull	Breeds New England coast, resident from Cape Hatteras to Fla.	Fields, marsh, bays, beach	Coastal	Permanent resident	Common	Common
Gelochelidon nilotica Gull-billed Tern	Breeds Chesapeake Bay to Fla. & in s. Calif, winters along Gulf Coast	Marsh, bays, beach	Coastal	Permanent resident moderately common summer	Common winter, common summer	Common winter, moderately
Sterna forsteri Forster's Tern	Breeds in Ore. & Minn., migrant throughout, winters on coasts s. of Cape Hatteras & San Francisco	Bays, beach	Coastal	Migrant, permanent resident	Common	Common
Sterna hirundo Common Tern	Breeds in Dakotas & Minn., migrant in eastern states, winters on Gulf Coast	Marsh, bays, beach	Throughout	Winter resident, breeds	Moderately common, rare summer	Moderately common, rare summer
Sterna fuscata Sooty Tern	Breeds on Dry Tortugas, Fla. Atlantic & Gulf Coast during hurricanes	Offshore waters, sandy isles	Chandeleur Islands	Summer resident, breeds	Rare	Unlikely

Table E-4. Breeding birds (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Sterna albifrons Least Tern	Breeds on Atlantic & Gulf Coasts & up Miss. River & its westware tributaries	Beach	Coastal	Summer resident	Common summer,	Common summer rare winter
Thalasseus maximus Royal Tern	Breeds Md. to Va., resident in coast from Va. to Monterey, Calif.	Marsh, bays, beach	Coastal	Permanent resident	Common	Common
Thalasseus sandvicensis Sandwich Tern	Coast, N.C. through Tex.	Marsh, bays, beach	Coastal	Winter resident	Common summer, rare winter	Common summer rare winter
Hydroprogne caspia Caspian Tern	Breeds various places, Gt. Lakes, La., Tex., migrant throughout eastern U.S. also in west central states	Bottomland forest, marsh, bays	Throughout	Permanent resident	Common	Common
SKIMMERS						
Rynchops niger Black Skimmer	Resident along Atlantic & Gulf Coasts from Mass. s.	Coastal islands, bays	Coastal part, Chandeleur Islands	Permanent resident	Common	Common
PIGEONS, DOVES						
Columba livia Rock Dove*	Permanent resident throughout	Fields, buildings	Throughout	Permanent resident	Common	Unlikely
Zenaida asiatica White-winged Dove	Breeds in s. Tex. & N. Mex. & La. some winter	Brush, fields	Coastal	Winter resident breeds	Moderately common	Unlikely
Zenaida macroura Mourning Dove	Breeds New England & northcentral states resident throughout rest of country	Brush, fields	Throughout	Permanent resident	Common	Unlikely
Columbina passerina Common Ground Dove	Resident from S.C. to Tex. along coast & N. Mex. & Ariz.	Brush, fields	Throughout	Permanent resident	Rare in summer, moderately common in winter	Unlikely

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
CUCKOOS, ANIS, ROADRUNNERS						
Coccyzus americanus Yellow-billed Cuckoo	Breeds throughout except extreme northwest & northcentral states	Upland and bottom-land forests, brush, marsh	Throughout	Summer resident breeds	Common summer, rare winter	Common summer rare winter
Geococcyx californianus Roadrunner*	Permanent resident, Ark. to Calif. & southward	Upland forest, brush, fields	Western areas	Permanent resident	Moderately common	Unlikely
Crotophaga sulcirostris Groove-billed Ani	Winters in s. La., resident in s. Tex. & southward	Fields, marsh	Coastal, in-frequently throughout	Winter resident, breeds (Triumph)	Moderately common winter	Unlikely
BARN OWLS						
Tyto alba Barn Owl	Resident throughout except Great Basin & Appalachians	Upland and bottom-land forests, brush, fields, buildings	Throughout	Permanent resident	Common	Unlikely
TYPICAL OWLS						
Otus asio Screech Owl*	Permanent resident throughout	Upland and bottom-land forest, brush	Throughout	Permanent resident	Common	Unlikely
Bubo virginianus Great Horned Owl	Permanent resident throughout	Upland and bottom-land forests	Throughout	Permanent resident	Common	Unlikely
Strix varia Barred Owl	Resident in eastern 2/3	Upland and bottom-land forests, marsh	Throughout	Permanent resident	Common	Common
GOATSUCKERS						
Caprimulgus carolinensis Chuck-will's-widow	Breeds from N.J. to Kans. & s. to Tex. & Fla.	Upland and bottom-land forests & coastal woods winters occasionally	Throughout	Summer resident breeds	Common summer, rare winter	Unlikely

Table E-4. Breeding birds (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Chordeiles minor Common Nighthawk	Breeds throughout	Upland and bottom-land forests, brush, fields	Throughout	Summer resident, breeds	Common summer, rare winter	Unlikely
SWIFTS						
Chaetura pelagica Chimney Swift	Breeds in eastern U.S., migrant through plains	Brush, fields, buildings	Throughout	Summer resident breeds	Common in summer	Unlikely
HUMMINGBIRDS						
Archilochus colubris Ruby-throated Hummingbird	Breeds east of plains	Upland adn bottom-land forests, brush, fields	Throughout	March-Oct. breeds	Common, rare winters	Unlikely
KINGFISHERS						
Megaceryle alcyon Belted Kingfisher	Summers northern U.S., resident southeast & west coast	Bottomland forest fields, marsh	Throughout exp. southern	Permanent resident	Common Sept.-April moderately common summer	Common Sept.-April, moderately common summer
WOODPECKERS						
Colaptes auratus Common Flicker	Breeds New England, Minn. & Mont., resident Miss. to N. Dak. south to Tex. & Fla., winters central Tex.	Upland and bottom-land forests, fields	Throughout	Permanent resident	Common	Unlikely
Dryocopus pileatus Pileated Woodpecker	East of plains & Pacific northwest resident	Upland and bottom-land forests	Throughout	Permanent resident	Common	Unlikely
Centurus carolinus Red-bellied Woodpecker	Resident Md. to Minn. & s. to Tex. & Fla.	Upland and bottom-land forests	Throughout	Permanent resident	Common	Unlikely
Melanerpes erythrocephalus Red-headed Woodpecker	Breeds in northcentral states, resident in eastern half of U.S.	Upland and bottom-land forests	Throughout	Permanent resident	Common	Unlikely

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Dendrocopos villosus Hairy Woodpecker	Permanent resident throughout	Upland and bottom-land forests	Throughout	Permanent resident	Common	Unlikely
Dendrocopos pubescens Downy Woodpecker	Resident throughout except parts of southwest	Upland and bottom-land forests	Throughout	Permanent resident	Common	Unlikely
Dendrocopos borealis Red-cockaded Woodpecker	Permanent, southeast U.S.	Long-leaf pine forests, rarely hardwoods	Throughout	Permanent resident	Uncommon U.S. List of Endangered Fauna	Unlikely
FLYCATCHERS						
Tyrannus tyrannus Eastern Kingbird	Breeds from Maine to Wash. & s. to Tex. & Fla.	Brush, fields	Throughout	Summer resident,	Common March-Sept.	Common March-Sept.
Tyrannus verticalis Western Kingbird	Breeds from Minn. to Tex. west to Pacific, migrant in s. Tex. & La.	Bottomland forests brush, fields	Throughout	Migrant, breeds (rarely)	Rare to uncommon	Rare to uncommon
Muscivora forficata Scissor-tailed Flycatcher	Breeds in Okla., Tex., & northwest La.	Brush, fields	Throughout	Migrant, some reside breed s.w. coastal	Common fall & spring, otherwise rare	Unlikely
Myiarchus crinitus Great Crested Flycatcher	Breeds east of Gt. Plains, resident in s. Fla.	Upland and bottom-land forests	Throughout	Summer resident breeds	Common in summer	Unlikely
Sayornis phoebe Eastern Phoebe	Breeds e. of Rockies & n. of line from Okla. to Va., resident in Tex. winters e. of Rockies in south	Brush, fields	Throughout	Winter resident breeds, n.w. La.	Common winter, rare summer	Common winter rare summer
Empidonax virescens Acadian Flycatcher	Breeds N.Y. to S. Dak. & s. to Gulf	Bottomland forests fields, marsh	Throughout	Summer resident breeds	Common summer	Common summer

Table E-4. Breeding birds (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Contopus virens Eastern Wood Pewee	Breeds in eastern half of country	Upland and bottom-land forests	Throughout	Summer resident breeds	Common summer, rare otherwise	Unlikely
LARKS						
Eremorphila alpestris Horned Lark	Permanent resident throughout except southeast states	Fields	Throughout	Resident Dec.-Sept. breeds	Rare	Unlikely
SWALLOWS						
Iridoprocne bicolor Tree Swallow	Breeds in Wash., Ore., Minn., New England., Mont., & Wyo., winters on Atlantic & Gulf Coasts, migrant in rest of country	Bottomland forest fields, marsh	Throughout part coastal marsh	Winter resident in south, breeds	Common Sept.-April	Common Sept.-April
Stelgidopteryx ruficollis Rough-winged Swallow	Breeds throughout, resident in La. & Tex. on coast	Bottomland forest, fields, marsh, bays	Winters in s. summers in n.	Mainly summer, some permanent	Rare winter common summer	Rare winter, common summer
Hirundo rustica Barn Swallow	Summers throughout except southeast	Bottomland forest, fields, marsh, buildings	Throughout	Migrant some breed part. coastal islands	Common fall & spring	Common fall & spring
Progne subis Purple Martin	Breeds e. of Rockies & in Pacific Coast	Brush, fields, marsh, buildings	Throughout	Summer resident breeds	Common Feb.--Aug. otherwise ext. rare	Common Feb.--Aug. otherwise ext. rare
JAYS, MAGPIES, CROWS						
Cyanocitta cristata Blue Jay	Resident from Rockies e. & from Canada to Gulf	Upland and bottom-land forests, brush, fields	Throughout	Permanent resident	Common	Common

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Corvus brachyrhynchos Common Crow	Resident throughout except breeds in Mont. & winters in Nev., Ariz. & N. Mex.	Upland and bottom-land forests, brush, fields, marsh	Throughout	Permanent resident	Common	Common
Corvus ossifragus Fish Crow	Atlantic & Gulf Coastal Plains & in-land up Miss. Valley & southern rivers	Upland and bottom-land forests, brush, fields marsh	Throughout	Permanent resident	Common	Common
CHICKADEES, TITMICE, ETC.						
Parus carolinensis Carolina Chickadee	N.Y. to Kans. & s. to Gulf	Upland and bottom-land forest	Throughout	Permanent resident	Common	Unlikely
Parus bicolor Tufted Titmouse	Resident Mo. to Minn. s. to Tex. & Fla.	Upland and bottom-land forest, brush	Throughout	Permanent resident	Common	Common
NUTHATCHES						
Sitta carolinensis White-breasted Nuthatch	Permanent resident e. of Mo. & in western states	Oak & oak-pine forests	Northern half of state, a few in Fla. Parishes	Permanent resident	Common	Unlikely
Sitta pusilla Brown-headed Nuthatch	Resident along Coastal Plain from N.Y. through Tex.	Upland forest	Throughout	Permanent resident	Common	Unlikely
WRENS						
Thryothorus ludovicianus Carolina Wren	Resident from N.Y. to Minn. & s. to Tex. & Fla.	Upland and bottom-land forests, brush, buildings	Throughout	Permanent resident	Common	Common
Telmatodytes palustris Long-billed Marsh Wren*	Breeds northern half of country except Rockies, winters southern 1/4 & resident from n. Fla. to Ga. & e. Fla. to Tex.	Marsh	Throughout nests only in coastal marshes	Permanent resident coast, winters inland	Common coastal, uncommon to common elsewhere	Common coastal uncommon to common elsewhere

Table E-4. Breeding birds (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
MOCKINGBIRDS, THRASHERS						
Dumetella carolinensis Gray Catbird	Breeds Maine to Wash. & s. to N. Mex & Ga., winters on Atlantic & Gulf Coasts	Bottomland forests brush, fields	Throughout common north	Migrant, some permanent	Common April--Oct. otherwise rare	Common April--Oct. otherwise rare
Mimus polyglottos Northern Mockingbird	Resident N.Y. to San Francisco & southward	Upland and bottomland forests, brush, fields, buildings	Throughout	Permanent resident	Common	Common
Toxostoma rufum Brown Thrasher	Summers e. of Rockies to Atlantic & n. of Okla. to Va., resident s. of this area	Bottomland and upland forest, brush fields	Throughout	Permanent resident	Common	Common
THRUSHES, SOLITAIRES, BLUEBIRDS						
Turdus migratorius American Robin	Breeds in New England & n. central states resident southward except from Fla. to Ariz. where winters	Upland and bottomland forests, brush fields	Throughout	Permanent resident breeds n. 2/3	Common	Common
Hylocichla mustelina Wood Thrush	Breeds Maine to Minn. & s. to Tex. & Fla.	Upland and bottomland forest, brush	Throughout not common to coastal areas	Summer residents, breed	Common March-Oct. otherwise ext. rare	Unlikely
Sialia sialis Eastern Bluebird	Breeds Maine to Mont., & s. to Kans. & Va., resident southward	Brush, fields	Throughout	Permanent	Moderately common	Moderately common
GNATCATCHERS, KINGLETS						
Polioptila caerulea Blue-gray Gnatcatcher	Summers from N.Y. to Minn. southward to Gulf & southwest, resident throughout southern U.S.	Upland and bottomland forests	Throughout	Permanent resident, more common summer	Common summer, moderately common winter	Unlikely
SHRIKES						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Lanius ludovicianus Loggerhead Shrike	Breeds in northern third of country resident south	Upland forest, brush, fields	Throughout	Permanent resident	Common	Common
STARLINGS						
Sturnus vulgaris European Starling	Permanent resident through except winter in s. Calif., Ariz., N. Mex. & Tex.	Upland and bottomland forests, brush, fields, buildings	Throughout	Permanent resident	Common	Common
VIREOS						
Vireo griseus White-eyed Vireo	Breeds N.Y. to Nebr. s. to Fla. & Tex.	Brush, thickets	Throughout	Summer resident, some permanent in south, breeds	Common March-Oct. otherwise rare	Common March-Oct., otherwise rare
Vireo flavifrons Yellow-throated Vireo	Breeds Maine to Minn. & s. to Tex. & Fla.	Upland and bottomland forests, brush	Throughout	Summer resident, breeds	Common March-Aug., ext. rare otherwise	Common March-Aug., extreme rare otherwise
Vireo olivaceus Red-eyed Vireo	Breeds Maine to Wash. & s. to Tex. & Fla.	Upland and bottomland forests	Throughout	Summer resident breeds	Common in summer	Unlikely
Vireo gilvus Warbling Vireo	Breeds throughout except parts of Tex. & extreme southeast	Bottomland forests	Throughout	Summer resident breeds	Common in summer	Unlikely
WOOD WARBLERS						
Mniotilta varia Black-and-white Warbler	Breeds east of Rockies, permanent resident in s. Fla.	Upland and bottomland forests	Throughout northern 2/3	Summer resident, breeds	Common in summer	Unlikely

Table E-4. Breeding birds (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Parula americana Northern Parula Warbler	Breeds east of Plains	Upland and bottomland forests, brush	Throughout	Summer resident breeds	Common March-Oct. ext. rare winter	Common March-Oct. ext. rare winter
Dendroica pinus Pine Warbler	Breeds Maine to Minn. & s. to Mo. & Va. resident southward	Upland and bottomland forests, brush	Throughout	Permanent resident	Common	Common
Dendroica dominica Yellow-throated Warbler	Breeds Md. to Ill. & s. to Tex. & Fla.	Upland and bottomland forests brush wet, wooded bottomland swamps	Throughout	Summer & spring resident, ext. rare winter breeds	Common spring & summer, ext. rare winter	Common spring & summer, ext. rare winter
Dendroica discolor Prairie Warbler coastal states	Permanent resident Fla, breeds e. of Miss., migrant in central coastal states	Dry woods	Northern part of Fla. Parishes, northern, fall southward to coast	Summer resident, rare winter breeds	Common spring & summer, ext. rare winter	Unlikely
Setophaga ruticilla American Redstart	Breeds across northern U.S. e. of Miss., migrant southward swamps	Upland and bottomland forests,	Throughout	Summer resident, rare winter, breeds	Common spring & summer, ext. rare winter	Common spring & summer, ext. rare winter
Seiurus motacilla Louisiana Waterthrush	Migrant Atlantic & Gulf Coastal, breeds & summers Ga. to Mich, Nebr. eastward	Bottomland forests swamps	Transient souther, summer resident northern	Summer resident, breeds	Common spring & summer	Common spring & summer
Limnothlypis swainsonii Swainson's Warbler	Breeds in southeast U.S.	Brush	Throughout	Summer resident, breeds	Common spring & summer	Common spring & summer

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Helmitheros vermivorus Worm-eating Warbler	Breeds east central states & migrant southward	Upland and bottom-land forests	Throughout	Summer resident, breeds	Uncommon spring & summer	Unlikely
Protonotaria citrea Prothonotary Warbler	Md. to Minn., s. to Fla. & Tex. breeds	Upland and bottom-land forests, swamps lakes, bayous	Throughout	Summer resident, breeds	Common spring & summer	Common spring & summer
Geothlypis trichas Common Yellowthroat	Maine to Wash. & s. to Calif. & Va. resident along coasts Va. to s. Calif. breeds all 49 continental states	Brush, fields, marsh	Throughout	Permanent resident, breeds n.	Common summer un-common winter	Common summer uncommon winter
Geothlypis formosa Kentucky Warbler	Breeds N.Y. to Minn. & s. to Tex. & Fla.	Upland and bottom-land forests	Throughout	Summer resident, breeds	Common spring & summer	Unlikely
Wilsonia citrina Hooded Warbler	Breeds east of plains	Upland and bottom-land forests	Throughout	Summer resident, ext. rare winter, breeds	Common spring & summer	Unlikely
Icteria virens Yellow-breasted Chat	Breeds throughout except New England & Minn.	Brush, dense thickets	Throughout	Summer resident, ext. rare winter, breeds	Common spring & summer ext. rare winter	Common spring, & summer, ext. rare winter
WEAVER FINCHES						
Passer domesticus House Sparrow	Permanent resident throughout	Fields, buildings	Throughout	Permanent resident	Common	Common
BLACKBIRDS, ORIOLES, MEADOWLARK						

Table E-4. Breeding birds (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Sturnella magna Eastern Meadowlark	Breeds in N. Eng. to Minn, resident from N.Y. to Kans. & s. to Tex. & Fla.	Fields	Throughout	Permanent resident	Common	Common
Sturnella neglecta Western Meadowlark	Breeds Wisc. to Wash. s. to Ida. & Nebr., resident Wash. to Okla. s. to Tex. & Calif., winters e. Tex. & La.	Fields	Throughout	Resident fall-spring breeds	Moderately common fall-spring	Moderately common fall-spring
Agelaius phoeniceus Red-winged Blackbird	Breeds in northern third resident in southern parts	Fields, marsh	Throughout	Permanent resident	Common	Common
Icterus spurius Orchard Oriole	Breeds east of Rockies	Upland and bottomland forest, brush	Throughout, including coastal marshes	Summer resident breeds	Common summer, & ext. rare winter	Common summer ext. rare winter
Icterus galbula Northern Oriole*	Breeds east of Rockies except migrant on Atlantic & Gulf Coastal Plains	Upland and bottomland forests, marsh	Throughout -	Summer resident breeds	Common summer, ext. rare winters	Common summer ext. rare winters
Cassidix mexicanus Great-tailed Grackle	Resident from N.J. along coast to Tex. (1)	Field, marsh	Coastal	Summer resident, breeds	Moderately common spring & summer ext. rare winter	Moderately common spring & summer, ext. rare winter
Cassidix major Boat-tailed Grackle	Resident from N.J. along coast to Tex. (1)	Fields, marsh	Coastal	Permanent resident	Common	Common
Quiscalus quiscula Common Grackle	Breeds e. of Rockies in northern states, resident e. of Rockies in southern 2/3 of country	Upland forest, fields, marsh	Throughout	Permanent resident	Common	Common
Molothrus ater Brown-headed Cowbird	Breeds in northern states, resident from Mass. to Calif. & south	Bottomland forests, brush, fields	Throughout	Permanent resident	Common	Common
TANAGERS						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Piranga rubra Summer Tanager	Breeds N.Y. to Mo. & s. to Tex. & Fla. also in Ariz. & N. Mex.	Upland and bottom-land forests, brush	Throughout	Summer resident breeds	Common summer, ext. rare winter	Common summer ext. rare winter
GROSBEAKS, FINCHES, SPARROWS						
Cardinalis cardinalis Northern Cardinal	East of 100th meridian	Upland forest, brush, fields	Throughout except coastal marshes	Permanent resident	Common	Unlikely
Guiraca caerulea Blue Grosbeak	Breeds in southern half of country	Upland forest, brush, fields	Throughout	Permanent resident, rare winter breeds	Common summer, ext rare winter	Common summer ext. rare winter
Passerina cyanea Indigo Bunting	Breeds east of plains	Upland and bottom-land forests, brush	Throughout breeds except coastal marshes & along coastal ridges	Summer resident breeds	Common summer, ext. rare winter	Unlikely
Passerina ciris Painted Bunting	Breeds Atlantic Coast from S.C. s. to Fla. Gulf Coast from Ala. thru Tex. & up Miss. Valley	Upland and bottom-land forests brush	Throughout	Summer resident breeds	Common summer, ext. rare winter	Common summer ext. rare winter
Spiza americana Dickcissel	Winters on Atlantic Coast, breeds in central states	Brush, fields	Throughout	Summer resident breeds	Common summer, rare winter	Common summer ext. rare winter
Spinus tristis American Goldfinch	Summers in northern half, winters throughout	Upland and bottom-land forest, brush, fields	Throughout	Winter resident, rare summer, breeds	Common winter, rare summer	Common winter rare summer

Table E-4. Breeding birds (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Pipilo erythrophthalmus Rufous-sided Towhee	Breeds in northern third, winters in central states, resident in rest of country	Upland and bottom-land forests, brush	Throughout in winter, southeast in summer	Permanent resident	Common	Common
Ammodramus savannarum Grasshopper Sparrow	Breeds in northern half, winters in southern half	Fields	Throughout	Winter resident breeds	Moderately common Oct.-April	Unlikely
Ammospiza maritima Seaside Sparrow	Breeds on Atlantic Coast n. of Chesapeake Bay & resident s. thru Tex.	Fields, beach	Coastal	Permanent resident	Common	Common
Chondestes grammacus Lark Sparrow	Breeds Ohio to Wash. & s. to Calif. & La., resident central Calif., Tex. & N. Mex. winters on Tex. coast	Upland forest, brush, fields	Throughout	Summer resident in n., breeds	Common summer ext. rare winter	Common summer ext. rare winter
Aimophila aestivalis Bachman's Sparrow	Breeds Va. to Ill, & s. to Tex. & N.C., resident southward	Brush, fields	Throughout	Permanent resident	Moderately common	Moderately common
Spizella passerina Chipping Sparrow	Breeds in northern 2/3 of country resident in southwest and southeast winters along Gulf Coast, Tex. to Fla.	Upland forest, brush and fields sometimes coastal ridges	Throughout	Permanent resident	Common	Common
Spizella pusilla Field Sparrow	Breeds from N.Y. to Minn. & s. to Kans. & N.J., resident s. of this area, winters on Gulf Coast	Fields	Throughout	Permanent resident	Common	Unlikely

Table E-5. Birds likely to be found in southeastern Louisiana as non-breeding, migrant summer or winter residents.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
LOONS						
Gavia immer Common Loon	Breeds in northern states, migrants throughout, winters along all coasts	Large bodies water bays and lagoons, coastal belt	Throughout	Migrant & winter resident on coast	Moderately common winter	Moderately common winter
Podiceps auritus Horned Grebe	Migrant northern, Miss, flyway winter resident, coastal areas	Large lakes, bays	Coast, Pacific southeast	Migrant & winter resident on coast	Moderately common winter	Moderately common winter
STORM PETRELS						
Oceanites oceanicus Wilson's Storm-petrel	Migrant, Atlantic Coast, Gulf of Mex., June-Sept.	Open seas	Gulf of Mex. coast	April-Sept.	Rare	Rare
PELICANS						
Pelecanus erythrorhynchos White Pelican*	Migrant w. of Miss., breeds locally in w. and midwest, winters in s. Calif. & Fla. to Tex. on coast	Marshes, bays, beach	Coastal areas	Winter resident	Common to rare	Common to rare
FRIGATEBIRDS						
Fregata magnificens Magnificent Frigatebird	Summer visitor, Cape Hatteras to Tex & Calif. coast to San Francisco	Marshes and bays	Coastal areas & islands	Summer resident	Common	Common
SWANS, GEESE, DUCKS						
Branta canadensis Canada Goose	Breeds in northwest, winters on Pac. Coast, Atlantic Coast, Miss. Valley & in Tex. Ariz. & N.M.	Fields, marshes, bays	Winters on coast	Winter	Moderately common	Moderately common
Anser albifrons White-fronted Goose	Migrant through central states, & on Pac. Coast, winters Central Valley of Calif., coast of Tex. & w. of Mississippi River	Fields, marshes bays	Winters on coast	Winter	Common	Common

Table E-5. Birds, summer or winter residents (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Chen caerulescens Snow Goose	Migrant through central states, New Eng. & northwest states, winters on Gulf from La. to Tex., on central Atlantic Coast & Pacific Coast, short-stopped in central U.S.	Fields, marshes	Migrant throughout, winters on coast	Winter	Common winter, ext. rare summer	Common winter, ext. rare summer
Anas platyrhynchos Mallard	Breeds in n. central states, resident on Pacific Coast & northwest & central Atlantic Coast, winters southward	Coastal marshes	Coasta, occasional breeding	Winter	Common winter, rare summer	Common winter, rare summer
Anas rubripes Black Duck	Breeds from Ohio to N.Y. & n. & also along Atlantic Coast to Cape Hatteras, winters from N.Y. to Ohio	Bottomland forests fields, marshes	Throughout	Winter	Moderately common to rare	Unlikely
Anas strepera Gadwall	Breeds in northwest, winters from N.Y. to Tex. & Wash. then south	Fields, marshes, bays	Throughout	Winter	Common to rare	Unlikely
Anas crecca Green-winged Teal	Western & northeastern U.S.	Marsh, bays	Throughout	Winter	Common	Common
Anas clypeata Northern Shoveler	Breeds in north central & northwest states, winters on Pac. Coast, across Ariz. & N. Mex., Tex., & on Gulf & s. Atlantic Coasts, migrant through rest of country	Fields, marshes, bays	Throughout	Winter	Common	Common
Anas americana American Wigeon	Breeds on northwest & Gt. Basin, winters southward	Marshes, bay	Throughout partially coastal	Winter	Common	Common
Aythya americana Redhead	Breeds north central states, migrant throughout, winters on all coasts except New England	Bays	Throughout	Winter	Common	Common
Aythya collaris Ring-necked Duck	Breeds in Minn., winters on Pac. Coast, Tex. & from N.Y. to Ill. & s. to Tex. & Fla., migrant in rest of country	Marshes, bays	Throughout	Winter	Common	Common

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Aythya valisineria Canvasback	Winters on Atlantic, Pacific & Gulf Coasts, summers in northwest states	Fields, marshes, bays	Coastal areas	Winter	Common to rare	Unlikely
Aythya marila Greater Scaup	Winters on all coast, migrant throughout	Marshes, bays	Coastal areas	Winter	Moderately common	Moderately common
Aythya affinis Lesser Scaup	Breeds in north central states, winters on all coasts up Miss. Valley	Marshes, bays	Throughout	Winter	Common	Common
Bucephala clangula Common Goldeneye	Winters throughout, residents in New England & near Gt. Lakes	Upland and bottom land forests, bays	Throughout	Winter	Moderately common to rare	Unlikely
Bucephala albeola Bufflehead	Resident Sierra Nevada, winters throughout except north central states	Fields, marshes, bays	Throughout	Winter	Moderately common to rare	Unlikely
Clangula hyemalis Oldsquaw	Winters coastal areas, Gt. Lakes	Coastal and inland waters	Coastal & throughout	Winter	Rare	Rare
Mergus serrator Red-breasted Merganser	Migrant east of Rockies & on Pac. Coast, winters on all coasts	Bays	Coastal	Winter resident	Moderately common	Moderately common
KITES, HAWKS, EAGLES						
Circus cyaneus Marsh Hawk	Breeds in New England & north central states, resident Pac. northwest & area s. of Gt. Lakes, winters southward	Fields, marsh	Throughout	Winter	Common winter	Common winter
CARACARAS, FALCONS						
Falco columbarius Merlin	Breeds north central states & mtn. states, resident in northwest states, winters in Pac. Coast, s. central states along Atl. and Gulf Coasts, La. to Tex.	Fields, marsh	Coastal areas	Winter	Rare	Unlikely

Table E-5. Birds, summer or winter residents (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
RAILS, GALLINULES, COOTS						
Porzana carolina Sora	Breeds in n. half of country, winters from Va. to Tex. along coast, resident on central Calif. coast, migrant in rest of country	Fields, marshes	Throughout	Winter	Moderately common	Moderately common
Coturnicops noveboracensis Yellow Rail	Winters on Calif., Gulf, and s. Atl. Coasts, migrant throughout U.S.	Fields, marsh	Southern half	Winter	Moderately common	Moderately common
PLOVERS, SURFBIRDS, TURNSTONES						
Charadrius semipalmatus Semipalmated Plover	Migrant throughout except w. of Rockies, winters on Gulf Coast	Bays, beach	Coastal areas	Winter	Common to rare	Common to rare
Charadrius melodus Piping Plover	Breeds in Dakotas, migrant in central states, some winters on Gulf Coast	Beach	Throughout	Migrant some winter	Common to rare	Common to rare
Charadrius alexandrinus Snowy Plover	Resident on Pac. Coast, migrant in western states, winters on Gulf Coast	Beach	Throughout	Winter	Rare	Rare
Pluvialis squatarola Black-bellied Plover	Winters along Atl., Pac., & Gulf Coasts	Fields, marsh, beach	Coastal	Winter	Common winter, rare summer	Common winter, rare summer
SANDPIPERS AND ALLIES						
Limosa fedoa Marbled Godwit	Breeds in Ida. & Mont., migrant to s. Calif. winters, migrant on Atl. Coast to Va. & winters to Mex. on coast	Wet meadows, beaches, marsh	Coastal	Migrant, winter resident	Moderately common fall to spring	Moderately common fall to spring
Numenius americanus Long-billed Curlew	Breeds in n. Rockies, winters on Calif., Tex., & Fla. coasts, migrant in southwest states	Fields, marshes, beach	Coastal	Migrant, some winter	Moderately spring & fall, moderately common winter	Moderately spring & fall moderately common winter

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Tringa melanoleuca Greater Yellowlegs	Winters on coast, Md. to Mex. & up Pac. Coast to San Francisco, also N. Mex. & Ariz., migrant throughout	Beach, marsh shore	Coastal	Migrant spring, fall some winter	Common spring & fall	Common spring & fall
Tringa flavipes Lesser Yellowlegs	Migrant throughout, winters Atl. & Gulf Coastal Plain La. to Tex.	Marsh, beach	Throughout	Migrant, some permanent	Common spring & fall	Common spring & fall
Arenaria interpres Ruddy Turnstone	Migrant e. of plains & in Wash. & Ore., winters Va. s. to Tex. on coast & on Pac. to San Francisco	Beach	Coastal	Migrant, some winter	Common spring & fall, moderately common winter	Common spring & fall, moderately common winter
Capella gallinago Common Snipe	Breeds in northern third, winters in southern 2/3	Fields, marsh, lakeshore	Throughout	Winter	Common fall thru spring	Common fall thru spring
Limnodromus griseus Short-billed Dowitcher	Migrant in Wash. e. of plains, winters on Pac. Coast s. of San Francisco & from Ga. to Tex.	Fields, marshes, beach	Coastal area	Migrant, some winter	Common spring & fall, moderately common winter	Common spring & fall, moderately common winter
Limnodromus scolopaceus Long-billed Dowitcher	Migrant throughout, winters Ga. to Tex. along coast and on Pac. Coast n. to San Francisco	Fields, marshes, beach	Coastal area	Migrant, some winter	Common spring & fall, moderately common winter	Common spring & fall, moderately common winter
Calidris canutus Red Knot	Migrant near Gt. Lakes & on Atl. & Pac. Coasts	Beaches	Coastal	Migrant, winter resident	Moderately common	Moderately common

Table E-5. Birds, summer or winter residents (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Calidris alba Sanderling	Migrant throughout except Tex. & Okla., winters all coasts	Beach	Coastal	Migrant, winter resident	Common fall thru spring, rare summer	Common fall thru spring, rare summer
Calidris pusilla Semipalmated Sandpiper	Migrant throughout except Rockies & Calif., winters Gulf Coast	Marsh, beach	Coastal	Migrant, some winter	Common spring & fall, moderately common winter, rare summer	Common spring & fall, moderately common winter, rare summer
Calidris mauri Western Sandpiper	Migrant throughout, winters on coast Va. thru Tex. & Pac. Coast	Marsh, beach	Coastal	Migrant, winters Aug.-May	Common Aug.-May	Common Aug.-May
Calidris minutilla Least Sandpiper	Migrant throughout except winters on Atl. & Gulf Coastal Plains, N.Y. to Tex. & Pac. Coast	Wet meadows & lakeshores inland seashore & mud flats	Throughout	Migrant, winter, some year-round	Common Aug.-April	Common Aug.-April
Calidris fuscicollis White-rumped Sandpiper	Migrant e. of Rockies	Marsh, beach	Coastal & inland	Summer resident	Common summer	Common summer
Calidris bairdii Baird's Sandpiper	Migrant, central states	Fields, marshes	Throughout	Migrant	Moderately common spring & fall	Moderately common spring & fall
Calidris melanotos Pectoral Sandpiper	Migrant throughout	Wet fields, marsh beach, grassy lakeshores	Throughout	Migrant	Common spring & fall	Common spring & fall
Calidris alpina Dunlin	Migrant in eastern half, winters on all coasts	Marsh, beach	Throughout, mostly coastal	Winter resident	Common fall thru spring	Common fall thru spring
GULLS, TERNS						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Larus argentatus Herring Gull	Winters on coasts & along rivers, migrant throughout, breeds on n. Atl. Coast & near Gt. Lakes	Marsh, bays, beach	Coastal & Mis River	Winter resident	Common winter	Common winter
Larus delawarensis Ring-billed Gull	Breeds in northwest, migrant throughout, winters on all coasts & up major rivers	Marsh, bays, beach	Throughout, esp. south	Winter resident	Common winter	Common winter
Larus pipixcan Franklin's Gull	Breeds in north central states, migrant through central states	Marsh, bays, beach	Western & coastal	Winter resident	Rare	Rare
Larus philadelphia Bonaparte's Gull	Migrant from Maine to Wash. & s. Tex. & Fla., winters on Atl., Pac., & Gulf Coasts	Marsh, bays, beach	Coastal areas	Winter resident	Moderately common to rare	Unlikely
Chlidonias niger Black Tern	Summers in northern states from Gt. Lakes to Pacific, migrant throughout	Marsh, bays, beach	Throughout	Summer resident	Common summer, rare winter	Common summer rare winter
TYPICAL OWLS						
Speotyto cunicularia Burrowing Owl	Breeds from Dakotas to Wash. & s. to Okla. & Ore., resident from Tex. to Calif. & s., winters in e. Tex. & La., resident in Fla.	Fields	Throughout, most frequent southern parishes	Winter resident	Rare	Unlikely
Asio flammeus Short-eared Owl	Resident across northern part of country	Brush, fields, marsh	Throughout, most frequent southern parishes	Winter resident	Rare	Rare
SWIFTS						
Chaetura vauxi Vaux's Swift	Migrant western states, summer resident northwestern states	Buildings, fields	Southeastern La.	Winter resident	Rare	Unlikely
HUMMINGBIRDS						

Table E-5. Birds, summer or winter residents (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Selasphorus rufus Rufous Hummingbird	Migrant western U.S., breeds western Wash. Ore. & Canada, winter Mex.	Upland, bottomland forest, brush, fields	Southern	Winter resident	Rare	Rare
WOODPECKERS						
Sphyrapicus varius Yellow-bellied Sapsucker	Breeds New England, Minn., N. & S. Dak. & Mont., resident in Appl. Mts Calif. & southern Rockies, winters southward, migrant in Gt. Basin & n. plains	Upland and bottom-land forests	Throughout	Winter resident	Common winter, rare spring	Unlikely
CREEPERS						
Certhia familiaris Brown Creeper	Summers across northern states, win-ters e. of Rockies & resident w. of Rockies	Upland and bottom-land forests	Throughout	Oct.-March winter res-ident	Moderately common in winter	Unlikely
WRENS						
Troglodytes aedon House Wren*	Breeds Maine to Wash. & s. to Calif. & Va., winters along Atl. Coastal Plain s. of Va. & Gulf Coastal Plain	Upland and bottom-land forests, brush, buildings	Throughout (part. s. in winter)	Sept.-April winter resident	Common winter	Common spring
Troglodytes troglodytes Winter Wren	Breeds New England, Ida. & Wash., resident on Pac. Coast s. to Los Angeles winters Mass. to Ky. & s. to Tex. & Fla.	Upland and bottom-land forests, brush	Throughout	Oct.-March winter resident	Common in winter	Unlikely
Thryomanes bewickii Bewick's Wren	Breeds Penn. to Kans., permanent resident Ohio to Calif, & southward winters on southeast coasts	Brush, fields	Throughout	Oct.-March winter resident	(See Lowrey) Common in winter	N.A.
Cistothorus platensis Short-billed Marsh Wren*	Summers northeast & north central states, migrant southeast, winters Atl. & Gulf Coasts	Upland fields, coastal grassey marshes	Common southern, un-common northern	Oct.-March winter resident	Common winter	Common winter

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
THRUSHES, SOLITAIRES, BLUEBIRDS						
Catharus guttatus Hermit Thrush	Breeds in New England Rockies, resident in Calif., N. Mex. & Ariz., winters from N.Y. to Tex. & Fla.	Upland and bottom-land forests	Throughout	Oct.-March winter resident	Common winter	Unlikely
GNATCATCHERS, KINGLETS						
Regulus satrapa Golden-crowned Kinglet	Winters in northern states, resident in Sierra, Rockies & Appl. Mts., winters Miss. to Calif, & south	Upland and bottom-land forests	Throughout	Winter resident	Common in winter, rare otherwise	Unlikely
Regulus calendula Ruby-crowned Kinglet	Breeds in Rockies & Cascades, resident U.S. Rockies & Sierra, winters Miss. to Calif, & south	Upland and bottom-land forests	Throughout	Winter resident	Common winter	Common winter
PIPITS, WAGTAILS						
Anthus spinoletta Water Pipit	Breeds in Cascades & Rockies, winters Md. to Wash. & s. to Calif. & Fla., migrant in central part of country	Fields, marsh, beach	Throughout	Winter resident	Common winter	Common winter
Anthus spragueii Sprague's Pipit	Breeds Dakotas and Mont., migrant in central U.S. winters Tex. & La.	Fields	Western parts	Winter resident	Uncommon winter	Unlikely
WAXWINGS						
Bombycilla cedrorum Cedar Waxwing	Permanent resident Maine to Minn. & s. to Colo. & Tenn., also in coastal Wash. & Ore., winter resident in areas s. of these	Upland and bottom-land forests	Throughout	Winter resident	Common winter	Unlikely
VIREOS						

Table E-5. Birds, summer or winter residents (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Vireo solitarius Solitary Vireo	Breeds in western & Appl. Mt. state migrant in central U.S., winters from Va. to Mex. on coast & across Tex. & N. Mex.	Upland and bottomland forests	Throughout, part. souther	Winter resident	Uncommon	Unlikely
WOOD WARBLERS						
Vermivora celata Orange-crowned Warbler	Breeds Ida. & Wash., s. to Calif. & N. Mex., migrant e. of this, winters Ga. to s. Calif.	Upland and bottomland forests, brush	Throughout, part. souther	Winter resident	Common winter	Common winter
Dendroica coronata Yellow-rumped Warbler*	Breeds New England & Minn., winters Calif. coast Ariz., Tex., & Gulf & s. Atl. Coast & up Miss. Valley to Mo.	Upland and bottomland forests, brush, fields	Throughout (myrtle thickets in s.e. partic.)	Winter resident	Common winter	Common winter
Dendroica palmarum Palm Warbler	Breeds in New England, migrant e. of plains, winters on Atl. Coast, Md. thru Tex.	Upland and bottomland forests, brush, fields	Throughout more common eastern Fla. Parishes	Winter resident, south part	Moderately common, rare winter	Moderately common, rare winter
BLACKBIRDS, ORIOLES, MEADOWLARKS						
Euphagus carolinus Rusty Blackbird	Migrant in northern half of country e. of Rockies, winters N.Y. to Colo. s. to Tex. & Fla.	Upland and bottomland forests, brush, fields	Throughout	Winter resident	Common	Common
Euphagus cyanocephalus Brewer's Blackbird	Breeds from Gt. Plains to Pacific, winters from Tenn. to Nebr., to Calif. & s. to Mex.	Brush, fields	Throughout	Winter resident	Common	Common
GROSBEAKS, FINCHES, SPARROWS						
Pheucticus ludovicianus Rose-breasted Grosbeak	Breeds Maine to N. Dak. & s. to Nebr. & N.Y., migrant southward	Upland and bottomland forests	Throughout including coastal ridge	Extremely rare winter resident	Common spring uncommon fall	Unlikely

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Pheucticus melanocephalus Black-headed Grosbeak	Summers western U.S., migrant central, winters Mex.	Upland and bottom-land forests	Wharf in La.	Winter resident	Rare	Unlikely
Carpodacus purpureus Purple Finch	Resident in New England & Pac. Coast, winters throughout except plains	Upland and bottom-land forests, brush	Throughout	Winter resident	Rare	Rare
Spinus pinus Pine Siskin	Canada, western mts. U.S., winter throughout	Woods	Varies	Winter resident	Rare	Unlikely
Passerculus sandwichensis Savannah Sparrow	Breeds north central states, resident on Pac. Coast, winters N.Y. to Nev. & s. to Ariz. & Fla.	Fields	Throughout	Winter resident	Common	Common
Ammodramus henslowii Henslow's Sparrow	Winters southeast coastal states, migrant central eastern, breeds northeastern	Broomsedge, pine-flats, sometimes thickets	Esp. Fla. Parishes	Winter resident	Common to moderately common	Common to moderately common
Ammospiza leconteii Le Conte's Sparrow	Migrant eastern central, breed north central, winter southeast	Broomsedge fields	Southwestern coast, also prairies near Gulf beaches	Winter resident	Common	Common
Ammospiza caudacuta Sharp-tailed Sparrow	Breeds in Maine & N. Dak., winters on Atl. & Gulf Coasts N.Y. thru Tex.	Fields	Coastal marshes	Winter resident	Common	Common
Pooecetes gramineus Vesper Sparrow	Breeds northern half of country, winters in southern half	Fields	Throughout	Winter resident	Common	Common
Junco hyemalis Dark-eyed Junco*	Resident in New England & Appalachians, winters throughout except extreme southwest	Upland and bottom-land forests, brush	Throughout	Winter resident	Common	Common
Zonotrichia querula Harris' Sparrow	Breeds northern Canada, migrant to Kans., Okla., & Tex., occasionally to lower Miss. Valley	Hedgerows, overgrown pastures, brush	Shreveport infrequently	Winter resident	Rare	Unlikely

Table E-5. Birds, summer or winter residents (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Zonotrichia leucophrys White-crowned Sparrow	Resident on Pac. Coast & northern Rockies, winters N.J. to Nev. & s. to Ariz. & Ga.	Hedgerows, overgrown pastures, brush	Throughout	Winter resident	Moderately common	Moderately common
Zonotrichia albicollis White-throated Sparrow	Migrant in central states, winters Miss. to Kans. & s. to Tex. & Fla. also N. Mex., Ariz., & Calif. coast	Upland and bottomland forests, brush	Throughout	Winter resident	Common	Common
Passerella iliaca Fox Sparrow	Breeds in w. states, migrant in northern areas; winter N.Y. to Kans. & s. to Tex. & Fla.	Upland and bottomland forests, brush	Throughout	Winter resident	Moderately common	Moderately common
Melospiza lincolnii Lincoln's Sparrow	Breeds on northeast U.S. to southwest U.S., winters on southern states	Brush, fields	Throughout sometimes coastal ridges migrant	Winter resident	Moderately common (common spring)	Unlikely
Melospiza georgiana Swamp Sparrow	Breeds Maine to N. Dak. & s. to Wis. & Mass., winters southward	Bottomland forest fields	Throughout	Winter resident	Common	Common
Melospiza melodia Song Sparrow	Resident Maine to Wash. s. to Calif. & Va., winters s. of this area	Upland & bottomland forests, brush	Throughout	Winter resident	Common	Common
Calcarius lapponicus Lapland Longspur	Winters northern states	Open fields	Irregular most of state	Winter resident	Rare	Unlikely

Table E-6. Birds likely to be found in southeastern Louisiana as migrants only.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Tryngites subruficollis Buff-breasted Sandpiper	Migrant on Atlantic Coast and through central states	Fields	Throughout	Migrant	Moderately common spring & fall	Unlikely
PHALAROPES						
Steganopus tricolor Wilson's Phalarope	Breeds Minn. to Wash. south to Calif. and Nebr., migrant southward	Marsh, bay	Coastal	Migrant	Moderately common spring &	Moderately common spring & fall
CUCKOOS, ANIS, ROADRUNNERS						
Coccyzus erythropthalmus Black-billed Cuckoo	Breeds Maine to Mont. and south to Kans. and Penn., migrant southward	Upland and bottom-land forests, brush, marsh	Throughout	Migrant	Moderately common spring & fall	Moderately common spring & fall
GOATSUCKERS						
Caprimulgus vociferus Whip-poor-will	Breeds Maine to Minn. s. to Ark., Va. winters along coast, Va. to Tex.	Upland and bottom-land forests, brush	Throughout	Migrant very rare winter resident	Common spring rare fall	Common spring rare fall
Chordeiles acutipennis Lesser Nighthawk	Breeds in Tex., winters from central Mexico to South America	Woods, marsh	Southern	Migrant	Rare	Rare
FLYCATCHERS						
Empidonax flaviventris Yellow-bellied Flycatcher	Migrant in eastern half, breeds in New England	Upland and bottom-land forests	Throughout	Migrant	Rare	Unlikely
Empidonax traillii Willow Flycatcher	Breeds Maine to Wash. s. to Calif. & Tex. as well as across northern U.S. migrant southward	Brush	Throughout	Migrant	Rare spring common fall	Rare spring, common fall
Empidonax alnorum Alder Flycatcher				Migrant	Rare spring common fall	

Table E-6. Birds, migrants only (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
KITES, HAWKS, EAGLES						
Buteo lagopus Rough-legged Hawk	Migrant U.S. Breeds Canada		Throughout	Winter migrant	Rare	Rare
PLOVERS, SURFBIRDS, TURNSTONES						
Pluvialis dominica American Golden Plover	Migrates northward through central U.S.	Fields, marsh	Throughout	Spring migrant	Common spring	Common spring
SANDPIPERS AND ALLIES						
Limosa haemastica Hudsonian Godwit	Migrates through central U.S.	Wet meadows, beaches, rice-fields	Coastal & some inland	Spring & fall migrant	Rare	Rare
Numenius phaeopus Whimbrel	Migrant on Atlantic and Pacific Coasts. Winters S. Calif. and Fla. coasts	Fields, marsh	Coastal	Spring migrant	Common spring only	Common spring only
Bartramia americana* Upland Sandpiper	Breeds Mexico to Mont. and south to Kans. and N.Y. migrant south-ward	Cultivated fields and pastures	Throughout	Migrant spring & fall	Common spring & fall	Unlikely
Tringa solitaria Solitary Sandpiper	Migrant throughout	Bottom land forest, marsh, bays	Throughout	Migrant spring & fall	Common, spring & fall	Common spring & fall
Actitis macularia Spotted Sandpiper	Breeds n. of Va. to Calif. Migrant southward. Winters on S. Atla., Fla. & Calif. Migrant in rest of country	Marsh	Throughout	Migrant, possible permanent resident	Common, spring & fall	Common, spring & fall
Micropalama himantopus* Stilt Sandpiper	Migrant east of Rockies	Fields, marsh	Throughout	Spring & fall	Common in spring, moderately common fall	Common spring moderately common fall

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Empidonax minimus Least Flycatcher	Breeds Maine to Ida. & s. to Nebr. & migrant south of this area except Fla. Ga., & Ala.	Upland and bottom-land forests	Throughout	Migrant	Rare spring common fall	Unlikely
Nuttallornis borealis Olive-sided Flycatcher	Breeds across northern U.S. in western states, migrant throughout except southeast	Upland and bottom-land forests	Throughout	Migrant	Ext. rare spring, rare fall	Unlikely
Pyrocephalus rubinus Vermilion Flycatcher	Breeds Ariz., Tex., & N.M. winters in La. & Tex.	Fields, periphery of small ponds in willows	Throughout	Winter resident	Rare	Unlikely
SWALLOWS						
Riparia riparia Bank Swallow	Summers throughout except Gt. Basin and Atlantic and Gulf Coastal Plains where it is migrant	Marsh, bays	Throughout	Migrant spring, late summer, fall	Moderately common	Moderately common
Petrochelidon pyrrhonota Cliff Swallow	Breeds throughout except southeast where migrant	Marsh, bays,	Throughout	Migrant spring & fall	Common spring, moderately common fall	Common spring spring, moderately common fall
THRUSHES, SOLITAIRES, BLUEBIRDS						
Catharus ustulatus Swainson's Thrush	Breeds in New England & Pacific northwest, migrant southward	Upland and bottom-land forests	Throughout	Migrant	Common spring, moderately common fall	Common spring moderately common fall
Catharus minimus Gray-cheeked Thrush	Migrant east of Rockies	Upland and bottom-land forests	Throughout	Migrant	Common spring moderately common fall	Common spring moderately common fall

Table E-6. Birds, migrants only (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Catharus fuscescens Veery	Breeds Maine to Wash., s. to Colo. in Rockies and from S. Dak. to N.J. migrant southward	Upland and bottom-land forests, brush	Throughout	Migrant	Common spring, moderately common fall	Common spring moderately common fall
VIREOS						
Vireo altiloquus Black-whiskered Vireo	Florida Keys, Florida Gulf Coast	Woods, coast	Extreme southern, may nest coastal	Migrant, April, May only	Rare to extremely rare	Unlikely
Vireo philadelphicus Philadelphia Vireo	Migrant east of plains	Upland and bottom-land forests, brush	Throughout	Migrant	Rare spring common fall	Rare spring common fall
WOOD WARBLERS						
Vermivora chrysoptera Golden-winged Warbler	Breeds from Penn. to Minn. & south to Mo. & N.C., migrant south of this except along s. Atlantic coast	Upland and bottom-land forests, brush	Throughout	Migrant	Common April & September	Common April & September
Vermivora pinus Blue-winged Warbler	Breeds from Gt. Lakes s. to Ark. & Ga., migrant southward	Brush, fields	Throughout	Migrant	Common April & September	Common April & September
Vermivora peregrina Tennessee Warbler	Migrant east of Rockies, breeds extreme northern U.S.	Upland and bottom-land forests, brush	Throughout	Migrant	Common spring & fall	Common spring & fall
Vermivora ruficapilla Nashville Warbler	Breeds in New England, around Gt. Lakes and Wash., migrant throughout except Gt. Basin and Rockies	Upland and bottom-land forests, brush, fields	Throughout	Migrant	Moderately common spring & fall	Moderately common spring & fall

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Dendroica petechia Yellow Warbler	Breeds throughout except s. Atlantic & Gulf Coastal Plains	Upland and bottomland forests, brush	Throughout	Migrant ext. rare residents	Common spring & late summer; otherwise extremely rare	Common spring & late summer otherwise extremely rare
Dendroica pensylvanica Chestnut-sided Warbler	Breeds in northeastern U.S. migrant southward	Brush and upland forests	Throughout often common on coastal ridges	Migrant	Common spring, uncommon fall	Common spring uncommon fall
Dendroica cerulea Cerulean Warbler	Breeds N.Y. to Minn. s. to Ark. & Ga., migrant from Va. to Tex.	Bottomland forest and brush	Throughout	Migrant	Common spring & late summer	Common spring & late summer
Dendroica caerulescens Black-throated Blue Warbler	Breeds New England, Gt. Lakes, & Appalachian Mountains, migrant southward	Upland forests, brush	Throughout	Migrant ext. rare winter residents	Rare spring & fall	Rare spring & fall
Dendroica virens Black-throated Green Warbler	Breeds in northern tier of states east of Rockies, migrant southward	Upland and bottomland, forests, brush	Throughout esp. northern & coastal	Migrant ext. rare winter winter regular in delta	Common spring & fall	Common spring & fall
Dendroica tigrina Cape May Warbler	Winters W. Indies, migrates northward through Fla.	Primarily arboreal	Gulf Coast	Spring migrant	Rare in spring	Unlikely
Dendroica fusca Blackburnian Warbler	Breeds in n. Minn. & from N.Y. north migrant from Minn. south to Gulf (except At. Coast Plain)	Upland and bottomland forests	Throughout	Migrant	Uncommon spring, fall moderately common	Unlikely

Table E-6. Birds, migrants only (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Dendroica magnolia Magnolia Warbler	Breeds N. England, migrant through eastern half except Fla.	Upland and bottomland forests	Throughout esp. northern and coastal	Migrant	Common spring & fall	Unlikely
Dendroica striata Blackpoll Warbler	Migrant N.Y. to Ida. and s. to La. and Fla., breeds in N. England	Upland and bottomland forests	Throughout	Spring migrant	Common spring only	Unlikely
Dendroica castanea Bay-Breasted Warbler	Migrant east of plains	Upland and bottomland forests, marsh	Throughout	Migrant	Common spring, uncommon fall	Common spring uncommon fall
Seiurus aurocapillus Ovenbird	Breeds Maine to Dakotas & s. to Ark. & N.C., migrant south winters in Fla.	Upland and bottomland forests, brush	Throughout	Migrant	Moderately common, spring & fall	Moderately common, spring & fall
Seiurus noveboracensis Northern Waterthrush	Breeds in extreme northern states Migrant east of Rockies, winters in s. Fla.	Upland and bottomland forests, brush	Throughout	Migrant extremely rare winter resident in south	Uncommon spring, common fall	Uncommon spring, common fall
Oporornis philadelphia* Mourning Warbler	Breeds New England and Gt. Lakes, migrant east of Rockies	Brier thickets, dense grass	Shreveport north, spring	Migrant	Rare spring uncommon fall	Rare spring, uncommon fall
Wilsonia pusilla Wilson's Warbler	Breeds in Rockies & Cascades, migrant throughout except Ga. & Fla.	Upland and bottomland forests, brush	Throughout	Migrant	Rare spring & fall	Rare spring & fall
Wilsonia canadensis Canada Warbler	Migrant throughout eastern U.S.	Bottomland forests and brush	Throughout	Migrant	Uncommon spring, common fall	Uncommon spring, common fall
BLACKBIRDS, ORIOLES, MEADOWLARKS						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Dolichonyx oryzivorus Bobolink	Breeds in northern states, migrant from N.Y. to Nebr. and south to Gulf	Brush, fields, marsh	Throughout	Spring migrant	Rare to extremely rare, common spring	Rare to extremely rare, common spring
Xanthocephalus xanthocephalus Yellow-headed Blackbird	Marshes of Gt. Plains, migrant southward	Marshes	Irregular, mostly southern	Spring migrant	Extremely rare, rare spring	Extremely rare, rare spring
TANAGERS						
Piranga ludoviciana Western Tanager	Breeds in western states, migrant eastward to La.	Upland and bottom-land forests	Southern	Spring migrant	Extremely rare, rare spring	Unlikely
Piranga olivacea Scarlet Tanager	Breeds Maine to N. Dak. and south to Mo. and Md.	Upland and bottom-land forests, brush	Northern, & coastal ridges	Spring migrant	Rare to extremely rare, common spring	Rare to extremely rare, common spring

Table E-7. Birds likely to be found in southeastern Louisiana very rarely or irregularly.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
LOONS						
Gavia stellata- Red-throated Loon	Northeast U.S., Atlantic coast, winter & migration	Water-associated	Southern La.	Rare Dec.-March	Rare/unlikely	Unlikely
GREBES						
Aechmophorus occidentalis Western Grebe	Northwest states, winter, Pacific coast	Lakes, bays, coasts	Coastal	Winter	Rare	Very rare
FULMARS, SHEARWATERS, PETRELS						
Puffinus gravis Greater Shearwater	Breeds in Tristan de Cunha Islands, migrates May & June north over western Atlantic	Ocean	Chandeleur Sound, Miss. Delta	Summer migrant	Rare	Rare
Puffinus lherminieri Audubon's Shearwater	Migrant western Atlantic (near southeast U.S. coast), breeds West Indies	Open seas	Coast, one in Cameron Parish one in Miss. Delta	March, July respectively	Rare	Rare
STORM PETRELS						
Oceanodroma leucorhoa Leach's Storm petrel	Migrant, Pacific Ocean, migrant Atlantic Ocean	Open seas	Southeast of Miss. River, Delta, Jefferson Parish		Rare	Rare
GANNETS AND BOOBIES						
Sula dactylatra Blue-faced Booby*	Dry Tortugas, Fla, in summer	Offshore waters	South of Miss Delta	Summer	Rare	Rare
Sula leucogaster Brown Booby	Gulf Coast, rare in Calif.	Offshore waters	Miss. R. mouth Chandeleur Is	Summer, fall	Rare	Rare
Morus bassanus Northern Gannet	Migrant, New England coastal Atlantic, breed northern latitudes, winter resident, southwest Atlantic Coast	Offshore waters	Chandeleur Islands	Spring	Rare	Rare

Table E-7. Birds, very rare or irregular (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
SWANS, GEESE, DUCKS						
Olor columbianus Whistling Swan	Northern states migrant, winters in Calif, mid-Atlantic Coast	River & lake & ocean shores	Atlantic Coast	Winter	Rare	Unlikely
Branta bernicla Brant*	Breeds Arctic, migrant northeast U.S. winter, mid-Atlantic coast	Coastal bays	N.O., Pass Christian area	Winter	Rare	Unlikely
Anas cyanoptera Cinnamon Teal	Breeds in western states, migrant in south central areas to La.	Ponds, marshes, protected bays	Coastal parishes	Oct.-April	Rare	Rare
Melanitta deglandi White-winged Scoter	North Atlantic Coast winter, Pacific Coast winter, migrant, breed, Canada	Offshore waters, coasts	Coastal parishes	Oct.-May	Rare	Rare
Melanitta nigra Black Scoter	N.A.	Offshore waters	Coastal parishes	Winter/ spring	Rare	Unlikely
Mergus merganser Common Merganser	Winters northern states and central states, breeds Canada	Usually inland fresh-water birds	Inland	Winter resident	Rare	Unlikely
KITES, HAWKS, EAGLES						
Aquila chrysaetos Golden Eagle	Permanent resident, western U.S. winter resident east and coast	Mountains, tundra grasslands, deserts	Coastal & somewhat inland questionable in MR-GO area	Winter resident	Rare	Unlikely
RAILS, GALLINULES, COOTS						
Laterallus jamaicensis Black Rail	Breeds in Atlantic and central states, migrant southward, winters on Gulf Coast	Fields, marsh	Throughout	Winter resident	Rare	Rare
SANDPIPERS AND ALLIES						

Table E-7. Birds, very rare or irregular (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range in State	Seasonal Status	Abundance in Region	Occurrence in Project Area
Calidris maritima Purple Sandpiper	Winters Atlantic Coast	Rocky Shores	One recorded Cameron Parish, possible elsewhere	April	Extremely rare	Unlikely
Calidris ferruginea Curlew Sandpiper	Northern U.S., breeds in Siberia winters in old world	Beach	One recorded Cameron Parish, possible elsewhere	September	Rare	Rare
JAEGERS AND SKUAS						
Stercorarius pomarinus Pomarine Jaeger	Migrant, Atlantic & Pacific Coastal areas	Open sea, offshore waters	Coastal areas	Migrant summer	Rare	Rare
Stercorarius parasiticus Parasitic Jaeger	Migrant, Atlantic & Pacific Coastal areas	Open sea, offshore waters	Coastal	Possibly year-round	Rare	Rare
Catharacta skua Great Skua	Winter, northeast Atlantic Coast winter, Pacific Coast	Open sea, coastal waters	Northern Chandeleur Sound	June	Extremely rare unlikely	Rare
GULLS, TERNS						
Larus hyperboreus Glaucous Gull	Winters northern Atlantic Coast	Marsh, bays, beaches	Several sightings, one Lake Pontchartrain	Dec.-May	Rare	Rare
PIGEONS, DOVES						
Columba fasciata Band-tailed Pigeon	Rocky Mountains, winter, western N.A.	High mountain forests	Lafayette, Webster Parishes, Lake Pontchartrain	Winter	Rare, unlikely	Unlikely

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
FLYCATCHERS						
Myiarchus tyrannulus Wied's Crested Flycatcher	Southwest, summer	Deciduous woods & sagouro deserts	Extreme southeast La.	Nov.-Jan.	Rare	Unlikely
Myiarchus cinerascens Ash-throated Flycatcher	Southwest summer, summers Wash. to Texas, migrant east Texas and La.	Deciduous woods & mesquite, sagouros	South La., part north, or delta region	Oct.-April migrant	Rare	Rare
NUTHATCHES						
Sitta canadensis Red-breasted Nuthatch	Resident in New England & Appalachians & west of Rockies, winters throughout	Upland forest, bottomland forest, brush	Throughout	Winter resident	Rare La.	Rare
MOCKINGBIRDS, THRASHERS						
Oreoscoptes montanus Sage Thrasher	Summer northwest U.S., winter, southwest U.S.	Desert	La. coast	Midwinter, migrant	Rare	Rare
VIREOS						
Vireo bellii Bell's Vireo	Breeds central states & central Valley of Calif.	Upland & bottomland forests, brush	Western, occassionally throughout	Summer resident, breeds	Moderately common March-Aug., extremely rare otherwise	Unlikely
WOOD WARBLERS						
Oporornis tolmiei* MacGillivray's Warbler	Summer northwest U.S., migrant southwest	Dense thickets	Coastal Parishes	Migrant	Rare	Rare
GROSBEAKS, FINCHES, SPARROWS						

Table E-7. Birds, very rare or irregular (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Hesperiphona vespertina Evening Grosbeak	Breeds northeast U.S. & western onto southward, seldom winters as far south as Gulf	Upland forests	Shreveport, Natchitoches, elsewhere	Nov.-May	Extremely rare	Unlikely
Calamospiza melanocoryn Lark Bunting	Summer, central northern states, migrant central west, winter central south	Short grass prair	cGrande Isle 52 Triumph, Plaq. 73	Migrant	Rare	Rare

Table E-8. Mammals likely to be found in the Michoud area.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
OPOSSUMS						
Didelphis virginiana Virginia Opossum	Extreme southern Canada southward, west to central Kansas. Introduced into Pacific states.	Wooded areas, coastal marshes, agricultural fields.	Throughout	Resident	Common	Common
SHREWS						
Cryptotis parva Least Shrew	South Dakota south to Texas, east to Connecticut and Florida.	Grassy fields, thickets along woodland edges.	Probably throughout	Resident	Common	Uncommon[1]
PLAINNOSE BATS						
Myotis austroriparius Southeastern Myotis	Southeast Oklahoma east to south-central Indiana southward.	Buildings, caves, hollow trees, quarter.	All except southwest	Resident	Uncommon	Uncommon
Pipistrellus subflavus Eastern Pipistrelle	Maine to eastern Great Plains, south to central Florida and Mexico.	Caves, tunnels, crevices.	All except southwest	Resident	Common	Common
Eptesicus fuscus Big Brown Bat	Almost entirely throughout.	Caves, tunnels, hollow trees, buildings.	Northern four-fifths	Resident	Uncommon	Uncommon
Lasiurus borealis Red Bat	Entire, except for southern Florida and Rocky Mountains.	Wooded areas, caves.	All except southern coastal areas.	Resident	Common	Common
Lasiurus seminolus Seminole Bat	Southern New York south to southern Florida, west to southern Texas.	Wooded areas.	All except localized areas.	Resident	Common	Common
Lasiurus intermedius Northern Yellow Bat	Atlantic and Gulf coastal plains from Virginia through Florida to Texas.	Wooded areas.	Most of southern two-thirds.	Resident	Common	Common

Table E-8. Mammals, likely to be found (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Nycticeius humeralis Evening Bat	Northeast Nebraska to central Pennsylvania southward.	Buildings, hollow trees.	Probably throughout.	Resident	Common	Common
Plecotus rafinesquii Rafinesque's Big-eared Bat	Northwest Arkansas to southern Virginia, south to central Florida.	Buildings, caves.	All except coastal plain	Resident	Common	Common
FREETAIL BATS						
Tadarida brasiliensis Brazilian Free-tailed Bat	Entire southern part.	Buildings, hollow trees.	All except coastal plain.	Probably Migratory	Common	Common
BEARS						
Euarctos americanus American Black Bear	Rocky Mountains, Appalachians, Sierras; Minn., Wis., Mich.; localized in southeast states.	Forests, swamps.	All except coastal plain.	Resident	Rare	Rare[1]
RACCOONS						
Procyon lotor Northern Raccoon	All except portions of Rocky Mountains and arid southwest.	Woodlands near water.	Throughout	Resident	Common	Common
WEASELS, SKUNKS, ETC.						
Mustela frenata Long-tailed Weasel	All except small area in southwest.	All land habitats near water.	Highly localized.	Resident	Rare	Rare
Mustela vison North American Mink	All except arid southwest.	All aquatic habitats.	Statewide	Resident	Common	Common
Lutra canadensis Neartic River Otter	All except arid southwest.	Along aquatic habitats.	Statewide, but local.	Resident	Uncommon	Uncommon
CATS						
Lynx rufus Bobcat	All except midwestern corn belt.	Swamps and forests.	All except coastal plain.	Resident	Uncommon	Uncommon
SQUIRRELS						

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
Sciurus niger Fox Squirrel	North Dakota to western New York, southward.	Open hardwood, pine forests.	All except coastal plain	Resident	Uncommon	Uncommon[1]
Sciurus carolinensis Gray Squirrel	Northern Minnesota south to eartern Texas, eastward.	Hardwood forests.	All except coastal plain	Resident	Uncommon	Uncommon[1]
Glaucomys volans Southern Flying Squirrel	Central Minnesota south to eastern Texas, eastward.	Woodlots and forests.	All except coastal plain	Resident	Common	Uncommon[1]
MICE, RATS, LEMMINGS, VOLES						
Reithrodontomys fulvescens Fulvous Harvest Mouse	Southeastern Kansas and southern Missouri to Arizona and southwestern Mississippi.	Grasslands, weedy fields.	Throughout	Resident	Common	Common
Peromyscus leucopus White-footed Mouse	North Dakota east to South Carolina, south to central Alabama and	Wooded, brushy areas.	All except coastal plain	Resident	Common	Common
Peromyscus gossypinus Cotton Mouse	Southeastern Oklahoma to southeastern Virginia, south to southern Florida and Texas.	Wooded areas, swampland	All except coastal plain	Resident	Common	Common
Neotoma floridana Eastern Wood Rat	Western Connecticut south to central Florida, west to Texas and eastern Colorado.	Hummocks, swamps.	Probably throughout	Resident	Common	Common
Oryzomys palustris Marsh Rice Rat	New Jersey to Kansas, south to east Texas and Florida.	Marshes, grass and sedge areas.	Throughout	Resident	Abundant	Abundant
Sigmodon hispidus Hispid Cotton Rat	Virginia to southern California, southward.	Grassy fields, thickets.	Throughout	Resident	Abundant	Abundant
Ondatra zibethicus Common Muskrat	Throughout except parts of California, Oregon, Nevada, Utah, Texas, N. Mexico, Alabama, Georgia, Florida, and S. Carolina.	All aquatic types with emergent vegetation.	Southern and northeast parts.	Resident	Common	Abundant

Table E-8. Mammals, likely to be found (cont.)

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
OLD WORLD RATS AND MICE						
Rattus norvegicus Norway Rat	Throughout	Associated with human inhabitation	Throughout	Resident	Common	Common
Rattus rattus Roof Rat	Throughout	Associated with human inhabitation	Throughout	Resident	Common	Common
Mus musculus House Mouse	Throughout	Buildings, fields	Throughout	Resident	Common	Common
NUTRIA						
Myocastor coypus Nutria	Introduced widely, primarily in coastal marshes.	Marshes, swamps, ponds, lakes.	Throughout	Resident	Abundant	Abundant
HARES AND RABBITS						
Sylvilagus floridanus Eastern Cottontail	Western North Dakota south to New Mexico, eastward.	Heavy brush, weedy thickets.	All except coastal plain	Resident	Common	Common
Sylvilagus aquaticus Swamp Rabbit	Southeastern Kansas to southwestern Indiana, southward.	Swamp, marshes, wet bottomlands.	Throughout	Resident	Abundant	Abundant
DEER						
Odocoileus virginianus White-tailed Deer	Throughout except California, Nevada, Utah and parts of Oregon Idaho, Colorado, New Mexico, and Arizona.	Forests, swamps, open brushy areas	Throughout	Resident	Abundant	Abundant
ARMADILLOS						
Dasypus novemcinctus Nine-banded Armadillo	Southeast Kansas through Gulf Coast states to southern Florida, south through Texas.	Woodlands, brushy areas.	All except coastal marshes.	Resident	Common	Uncommon

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
DOLPHINS AND PORPOISES						
Stenella plagiodon Spotted Dolphin	N. Carolina to Texas, Atlantic Ocean and Gulf of Mexico.	Offshore waters.	Coastal waters.	Wandering Migrant	Rare	Rare
Tursiops truncatus Atlantic Bottle-nosed Dolphin	Atlantic and Gulf Coasts, Cape Cod to Texas.	Inshore waters.	Coastal waters.	Wandering Migrant	Uncommon	Uncommon
FINBACK WHALES						
Balaenoptera physalus Fin-backed Whale	Atlantic, Pacific and Gulf Coasts.	Offshore waters.	Coastal waters.	Wandering Migrant	Rare	Rare
Balaenoptera borealis Sei Whale	Atlantic, Pacific and Gulf Coasts.	Offshore waters.	Coastal waters.	Wandering Migrant	Rare	Rare

The above species are expected to occur within the project area according to range maps of Lowery.
(1) Not expected to occur in salt marsh type habitat.

Table E-9. Mammals possibly occurring in the Michoud area.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
SHREWS						
Blarina brevicauda Short-tailed Shrew	Maine to North Dakota south to Texas and Florida.	Forests, marshes, swamps, grasslands	All except coastal plain.	Resident	Common	Uncommon
WEASELS, SKUNKS, ETC.						
Mephitis mephitis Striped Skunk	Locally absent in arid southwest.	Semi-open woods, brushland, prairie	Absent from southeast.	Resident	Common	Uncommon
MICE, RATS, LEMMINGS, VOLES						
Ochrotomys nuttalli Golden Mouse	Vermont to Missouri and south to east Texas and northern Florida.	Pine-hardwood forests, swamps.	Northwest and southeast.	Resident	Common	Uncommon
Reithrodontomys humulis Eastern Harvest Mouse	Maryland to western Arkansas southward.	Old fields, marshes.	Highly local in south.	Resident	Uncommon	Uncommon
DOLPHINS AND PORPOISES						
Globicephala macrorhyncha Short-finned Pilot Whale	Coastal waters from New Jersey to Texas.	Offshore, deep waters.	Gulf coast.	Wandering Migrant	Uncommon	Uncommon
The above species are near the range fringes and may possibly occur within the project area, according to Lowery.						

Table E-10. Mammals not normally occurring in Michoud area for which there are confirmed reports.

Scientific and Common Name (Family Name Capitalized)	Range in United States	Habitat/Location	Range In State	Seasonal Status	Abundance In Region	Occurrence In Project Area
DUGONG AND MANATEE						
Trichechus manatus West Indian Manatee	Coasts from North Carolina to southern Florida, west in Gulf to Texas.	Inshore marine waters.	Coastal water	Wandering Migrant	Casual	Casual
OPOSSUMS						
Marmosa alstoni Alston's Mouse Opossum	Introduced in New Orleans.	1 Collected at dock, 1 at nearby marsh.	New Orleans vicinity	Potential Resident	Accidental	Accidental
Marmosa mexicana Mexican Mouse Opossum	Introduced in New Orleans.	Collected at unloading dock.	New Orleans vicinity	Potential Resident	Accidental	Accidental
These species are reported, by Lowery, as casual or accidental sightings.						

NASA—MSFC

U.S. GOVERNMENT PRINTING OFFICE 1977—740-193/193 REGION NO. 4