

4.0 ENVIRONMENTAL CONTEXT

Planning for the transportation system must take into account the impacts that improvements are likely to have on both the natural environment and the environmental context of human activity. By providing appropriate consideration of environmental impacts early on in the planning process, the metropolitan transportation plan (MTP) increases opportunities for inter-agency coordination, enables expedited project delivery, and promotes outcomes that are more environmentally sustainable than they might otherwise have been.

4.1 ENVIRONMENTAL ASPECTS OF THE METROPOLITAN PLAN

Legislative Mandates and Regulatory Requirements

Federal regulations require the MTP to address environmental concerns in two primary ways: (1) By engaging in a process of consultation during development of the plan; and (2) By providing a discussion of potential mitigation measures that may be necessary to offset environmental impacts related to implementation of the plan.

The MPO shall consult, as appropriate, with State and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation concerning the development of the transportation plan (23 CFR 450.322(g)).

The requisite consultation must involve (“as appropriate”) a comparison of the MTP with conservation plans or maps adopted by the state (“if available”) and comparison of the transportation plan with inventories of natural or historic resources (again “if available”). Regarding mitigatory measures that may be necessary to comply with environmental law or regulatory guidance, the metropolitan planning regulations stipulate that the long-range plan shall include the following:

A discussion of types of potential environmental mitigation activities and potential areas to carry out these activities, including activities that may have the greatest potential to restore and maintain the environmental functions affected by the metropolitan transportation plan (23 CFR 450.322(f)(7)).

It is not necessary for this discussion to address the mitigation that may be associated with implementation of specific projects. It is sufficient to focus attention on “policies, programs, or strategies.” There is also an expectation that the discussion will reflect “consultation with Federal, State, and Tribal land management, wildlife, and regulatory agencies.” However, the MPO is allowed to set reasonable time limits for the conduct of this consultative process.

The *National Environmental Policy Act* of 1970 (NEPA) established the basic framework for integrating environmental considerations into Federal decision-making. Federal regulations relating to NEPA define five possible types of mitigation (40 CFR 1508.20):

- Avoiding the impact altogether by not taking a certain action or parts of an action.

- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

Section 4(f) of the *U. S. Department of Transportation Act* of 1966 (49 U.S.C. §303) mandates special protection for property in publicly owned parks, recreational areas, wildlife and waterfowl refuges, and historic sites. The law states that such property cannot be used for transportation purposes unless there is no *feasible and prudent* alternative, the action includes all possible planning to minimize harm to the property, or a *de minimis* impact determination is made.

Special protection is also afforded designated population groups under Executive Order 12898: *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations* signed by President Clinton in 1994. It seeks to reaffirm the intent of Title VI of the *Civil Rights Act* of 1964, NEPA and other federal laws, regulations and policies by establishing the following *Environmental Justice* (EJ) principles for all federal agencies and agencies receiving federal funds (including MPOs):

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

Environmental Screening of Proposed MTP Projects

Detailed project-specific environmental impact evaluations are beyond the scope of a long-range regional transportation plan that identifies scores of improvements for implementation over a quarter of a century. However, in developing the 2040 MTP, an environmental screening process was used to assess the relative likelihood of significant environmental impacts resulting from each of the projects considered. This process made use of available inventories, previously assembled for relevant natural and cultural resources, as well as socioeconomic and demographic data generated by the U. S. Census Bureau. Studies

undertaken to identify potential impacts associated with a proposed project generally address all of the following areas of environmental concern:

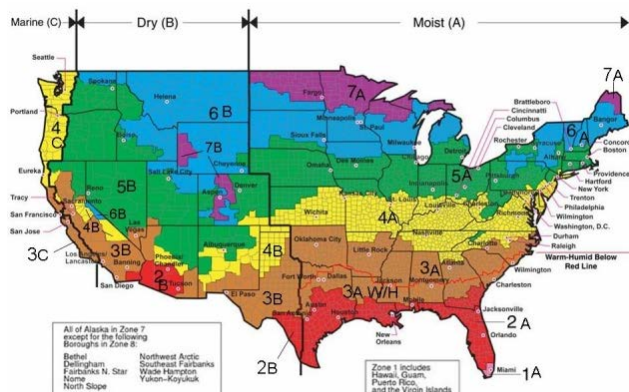
- Hazardous materials
- Air quality
- Noise
- Wetlands and jurisdictional waters of the United States
- Threatened and endangered plant and animal species habitat
- Floodplains
- Farmlands
- Parks and other recreational areas
- Historic sites and structures
- Archaeological sites
- Neighborhoods and community resources
- Areas with high concentrations of low-income households or individuals classified as belonging to minority racial or ethnic groups.

The environmental screening process used to evaluate projects considered for inclusion in the 2040 MTP will be described in detail later in this chapter (see Section 4.4).

4.2 REGIONAL ENVIRONMENTAL CONTEXT

Climate, Topography, Land and Water Resources

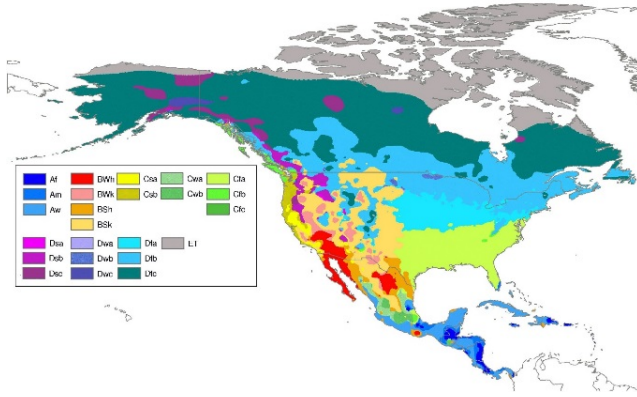
According to the International Energy Conservation Code (IECC) classification of climate regions in the United States, the three Mississippi Gulf Coast counties—Hancock, Harrison and Jackson—are located in Zone 2 (see figure at left). The IECC zones are numerically coded from 1 to 8, with the lowest number corresponding to the highest temperatures and the highest number corresponding to the lowest temperatures.



Within the continental United States, only the southernmost tip of the Florida peninsula falls within Zone 1. Zone 2 includes portions of all five states bordered by the Gulf of Mexico—Texas, Louisiana, Mississippi, Alabama and Florida—as well as part of Georgia and portions of two western states, Arizona and California. Only the

most southerly counties in Mississippi and Alabama fall within the Zone 2 boundary; the overwhelming majority of counties in both states are located in Zone 3. Each zone is further subdivided into wet and dry

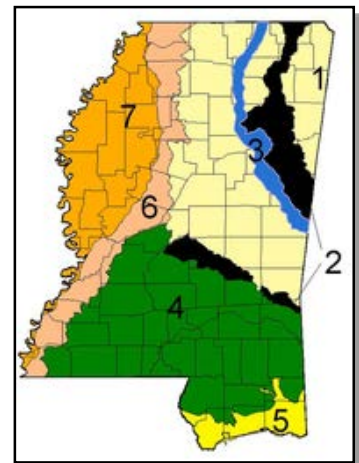
sections indicated by the respective suffixes, "A" and "B". The Mississippi Gulf Coast lies in the wet section of Zone 2: Only the limited areas located west of a line bisecting Texas fall in the section designated 2B.



In the Köppen Climate Classification System, all of Mississippi and most of the southern United States falls in a region designated Cfa characterized by *humid, subtropical* conditions (see figure at left). According to data provided by the National Oceanic and Atmospheric Administration (NOAA), the annual average daily high temperature recorded at Gulfport, during the five-year period from 2010 through 2014, was 77.8 degrees Fahrenheit; the average low was 59.1 degrees. The overall average temperature

during the same period was 68.4 degrees (see Table 4-1). August is the warmest month for the Mississippi Gulf Coast, with an average high temperature of approximately 91 degrees. The average low temperature in the midsummer months is around 75 degrees. January is the coldest month, with an average high temperature just above 60 degrees and an average low below 40. Average annual precipitation in the area between 2010 and 2014 was 60 inches (all rainfall). August is generally the wettest month, averaging close to nine inches of rain; October is the driest, averaging about one-and-a-half inches. Average rainfall amounts exceed five inches per month from February through September; during the relatively dry period from October through January, rainfall is generally one to three inches each month.

There are seven distinct physiographic regions in Mississippi, reflecting the varying topographic conditions in different parts of the state. Most of the southern part of the state is located in what has been denominated the Pine Hills Region (labeled 4 in the figure below right). The Coastal Flatwoods Region falls between the Pine Hills Region and the Gulf of Mexico, occupying an area that extends from 15 to 20 miles inland along most of its length. Geologically it is a relatively young area formed by deposits of clay, silt, sand and gravel. The topography is almost uniformly flat, rising gradually from the shoreline towards the interior. Soils are generally acidic with boggy soils having a high organic content. Low, sandy bluffs five-to-ten feet above sea level support live oak, southern magnolia and saw palmetto. Saline and brackish marshes along the shoreline feature black needlerush and cordgrasses. Slash pine and various grasses, sedges and carnivorous plants, such as pitcher plants and sundews, thrive on fire-dependent savannas in the region (*Stewart, R. A., 2003: Physiographic Regions of Mississippi Handout, Department of Biological Sciences, Delta State University, with addenda by S. P. Faulkner, 2005*). The Coastal Flatwoods Region is characterized by wet lowlands and depressions interspersed with higher, well-drained areas. Geologically the chief determinant of landform in the region is the impermanence of the coastline. The principal landform features are the coastline, estuaries, flatwoods and marshland.



**Table 4-1:
CLIMATOLOGICAL SUMMARY DATA FOR SELECTED MISSISSIPPI GULF COAST LOCATIONS (2010-2014)**

COUNTY	CITY (1)	MAXIMUM MEAN MONTHLY TEMP		MINIMUM MEAN MONTHLY TEMP		MEAN ANNUAL TEMP	MAXIMUM MEAN MONTHLY PRECIP		MINIMUM MEAN MONTHLY PRECIP		MEAN ANNUAL PRECIP
		MON	° (F)	MON	° (F)		MON	INCHES	MON	INCHES	
		Hancock	Waveland	Aug	89.1		Jan	40.9	67.3	Feb	
Harrison	Gulfport	Aug	91.9	Jan	39.7	68.4	Aug	7.92	Oct	1.74	59.27
Jackson	Pascagoula	Aug	91.1	Jan	37.6	66.7	Aug	9.43	Oct	1.43	58.31
	<i>Average</i>	--	90.7	--	39.4	67.5	--	8.93	--	1.58	60.01

(1) Location: Waveland - Latitude 30.295°N Longitude 89.383°W (Elevation 8 feet); Gulfport – Latitude 30.412°N Longitude 89.081°W (Elevation 42 feet); Pascagoula - Latitude 30.464°N Longitude 88.532°W (Elevation 18 feet).

Source: U. S. Department of Commerce, National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service (2015).

Hancock, Harrison and Jackson counties are located in a unique coastal environment that features extensive underground aquifers, diverse biological ecosystems and barrier islands strung along the coast between the Mississippi Sound and the Gulf of Mexico. Fresh water flowing into the sound has its source in three basins: the Lower Pearl River, the Coastal Streams Basin and the Pascagoula River. The Lower Pearl River Basin occupies 24 counties in all in Mississippi as well as several parishes in Louisiana. The Pearl River itself is almost 500 miles long and drains an area encompassing 8,760 square miles. At its southern end the Pearl forms the western boundary of Hancock County (as well as the State of Mississippi). However, only about one-quarter of the county is actually located within the Lower Pearl River Basin.

Most of Hancock County is located in the Coastal Streams Basin which also encompasses all of Harrison County and part of Jackson County. The basin drains an area measuring 1,545 square miles and differs from the other two basins in significant ways: It includes a number of offshore features—the Mississippi Sound and barrier islands (Cat, Ship Deer, Horn, Round and Petit Bois)—and several smaller watersheds. For example, the Wolf and Jourdan rivers, and Bayou la Croix, flow independently into the Bay of Saint Louis; other streams pursue separate paths to the Mississippi Sound or Bay of Biloxi. The last of the three basins, the Pascagoula River Basin, is exceeded in size among Mississippi drainage-ways only by the one associated with the Yazoo River. The Pascagoula River has the distinction of being the sole stream of sizable carrying capacity in the continental United States that remains in an essentially unaltered natural state. The Pascagoula Basin drains 22 counties in the southeastern quadrant of Mississippi and adjacent portions of Alabama, transporting water from an area encompassing 9,600 square miles to the Mississippi Sound, where it flows into the sea between the Jackson County municipalities of Gautier and Pascagoula (*Mississippi Gulf Coast Water Assessment, 2012*).

Agriculture, Forestry and Urban Development

Of the three Mississippi Gulf Coast counties, Hancock County is the least urbanized and has the lowest population density. There are three incorporated municipalities—Bay Saint Louis, Waveland and

Diamondhead—with a combined population of 25,987 (U. S. Census Bureau 2014 estimated). The estimated population of the county as a whole is 45,949. With total land area of 476.88 square miles, population density is approximately 96 persons per square mile for the county as a whole.

According to the 2007 Census of Agriculture, there were 286 farms with total acreage of 42,256 (148 acres per farm). The principal uses of agricultural land were for raising cattle, horses, sheep, goats and chickens and for cultivating crops necessary for forage. A 2010 assessment of forestry resources in Mississippi, undertaken by the Mississippi Forestry Commission, determined that there were 225,411 forested acres in Hancock County. That represented more than 70 percent of total land cover in the county. Much of that forested land is located in the 125,000-acre acoustical buffer zone surrounding the National Aeronautics and Space Administration (NASA) Mississippi Test Facility at the Stennis Space Center.

While the Gulfport Urban Area, as defined by the U. S. Census Bureau, includes portions of all three Mississippi Gulf Coast counties, most of the urban area lies within the middle county. Harrison County is the most urbanized of the three counties, having five incorporated municipalities—Pass Christian, Long Beach, Gulfport, Biloxi and D'Iberville—with a combined population of 150,466 (U. S. Census Bureau 2014 estimated), up 5.4 percent from the 2010 census figure of 142,748. That represents more than three-quarters of all persons living in Harrison County: An estimated 199,058 in 2014, up from 187,105 at the time of the 2010 census. However, more than half of the estimated growth during that four-year period occurred in the unincorporated portion of the county, suggesting that urbanization continues to spread northward from the cities along the coast. With land area of 573.99 square miles, the estimated population density of the county as a whole is 346.8 persons per square mile, up from 326.0 in 2010.

The unincorporated portion of Harrison County accounts for 82.8 percent of total land area, most of which is dedicated to agriculture or forestry. The 2007 Census of Agriculture enumerated 367 farms in the county, having total acreage of 21,458 for an average of 58 acres per farm. Nearly half of the farms were dedicated to raising cattle. The Mississippi Forestry Commission assessment of the state's forestry resources determined there were 269,290 forested acres in Harrison County, representing approximately 70 percent of land coverage in the county. Much of that forested land is located in the DeSoto National Forest which occupies a substantial portion of unincorporated Harrison County as well as portions of nine other counties in southeastern Mississippi. The national forest boundary encompasses some 802,944 acres in all, 518,587 of which are actually incorporated in the National Forest System (NFS). (Non-NFS acreage within the limits of the forest remains under other, i.e. non-Federal, ownership.)

The *2030 Harrison County Comprehensive Plan* noted that only four percent of land in the unincorporated county is occupied by residential uses and only one percent by commercial or industrial uses. The county's zoning ordinance classifies almost 75 percent of the unincorporated area as agricultural, just under 20 percent as residential and two percent as commercial or industrial. It is only since 2010 that population in Harrison County has regained and exceeded the level reached prior to Hurricane Katrina. In the decade since Katrina, there has been growing demand for developable property in the unincorporated area north of Interstate 10, well inland from the low-lying coastal areas inundated by tidal surge in 2005.

Jackson County has the greatest concentration of industrial activities among the Mississippi Gulf Coast counties, but its population falls between those of the other two jurisdictions. There are four incorporated municipalities in the county—Ocean Springs, Gautier, Pascagoula and Moss Point—with combined population of 74,203 (U. S. Census Bureau 2014 estimated), almost unchanged from the 2010 Census

count of 74,022. That represents about 52.5 percent of all persons living in the county, 141,137 according to the most recent Census Bureau estimate. With total land area of 722.75 square miles, population density is approximately 195 persons per square mile for the county as a whole.

According to the 2007 Census of Agriculture, there were 454 farms in Jackson County, but that number was down by more than a hundred from the previous agricultural census in 2002. The 20 percent decline was due primarily to consolidation, since total acreage in farming fell by only three percent to 42, 890. Average farm size increased from 76 to 91 acres during the five-year intercensal period, and sales of crops and livestock increased by 25 percent. Gross revenue per farm went up 56 percent. The principal uses of agricultural land were for raising cattle, goats and horses and for cultivating the crops required to feed them. The 2010 assessment of forestry resources in Mississippi, undertaken by the Mississippi Forestry Commission, determined that there were 330,011 forested acres in Jackson County, more than in either of the other two counties on the coast. As with the other two counties, that represented approximately 70 percent of total land cover in the county.

A significant portion of Jackson County has been preserved in its natural condition: The Pascagoula River watershed contains the largest unimpeded water course in the 48 contiguous states of the Union. Forty years ago, The Nature Conservancy and other conservation groups and individual conservationists made common cause in bringing 35,000 acres of the watershed under public protection. The river corridor, traversing Jackson County from the George County line on the north to the Mississippi Sound on the south, is now buffered by almost 70,000 acres of public and private lands whose owners are committed to preserving them in a state of nature.

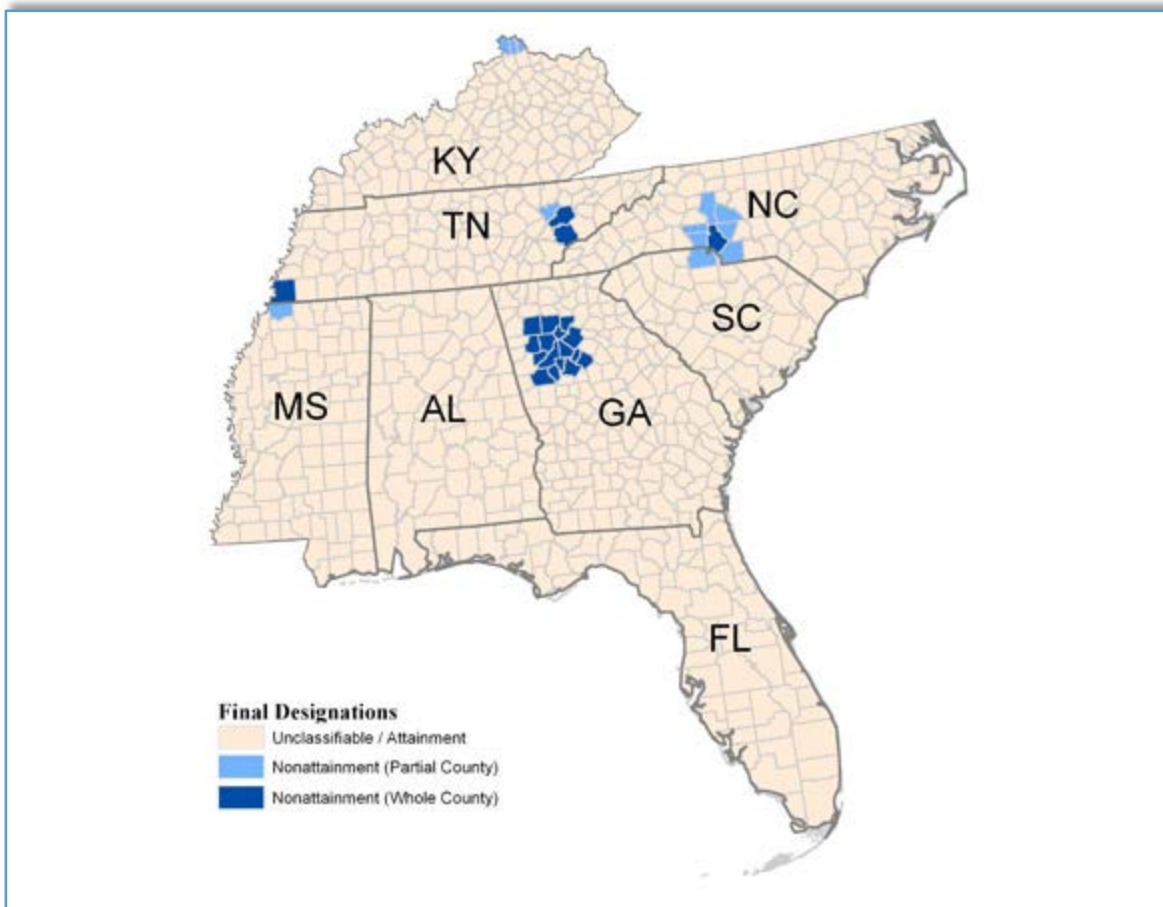
4.3 AIR QUALITY AND CLIMATE CHANGE

Air Quality and Mobile-Source Emissions

The *Clean Air Act Extension* (Public law 91-604, 84 Stat. 1676), signed into law by President Richard M. Nixon in 1970, directed the newly established U. S. Environmental Protection Agency (USEPA) to develop and enforce regulations for the purpose of improving and maintaining air quality throughout the United States. Pursuant to the act, USEPA promulgated National Ambient Air Quality Standards (NAAQS) for airborne pollutants considered harmful to public health and/or the environment. There are two sets of standards: Primary standards address the need to protect the public – especially children, the elderly and individuals who suffer from respiratory diseases and conditions – against harmful pollutants. Secondary standards address the broader need to secure human welfare by protecting animals, plants and other components of the natural environment, including the aesthetic quality and visibility of the landscape, as well as man-made features such as buildings and monuments.

The NAAQS apply to six common contaminants: Ozone, particulate matter, carbon monoxide, sulfur dioxide, nitrogen oxides and lead. Each state with designated nonattainment areas within its borders is required to develop a state implementation plan (SIP) for controlling these contaminants and meeting national air quality standards within its area of jurisdiction. Continuous monitoring at designated locations is used to determine compliance with the NAAQS on an annual county-by-county basis. Areas in which air quality is found to meet all applicable standards are identified as *attainment* areas. Those which fail to meet one or more of the standards are designated *nonattainment* areas (see Figure 4-1).

Figure 4-1: EPA Region 4 Ground-Level Ozone Nonattainment Areas (2008 Standard)



Source: U. S. Environmental Protection Agency (2015)

A nonattainment area which succeeds in improving its air quality to meet the applicable standards becomes a *maintenance* area.

The classification of an area as either a nonattainment or maintenance area has ramifications for transportation planning in the region. Transportation projects have the potential to affect air quality by changing the number of vehicles at a given location or on a particular route. In particular *mobile-source emissions* discharged by vehicles may increase ambient concentrations of ozone or carbon monoxide in the vicinity of a project. Ozone (O₃) is found both at ground level and in the upper atmosphere. Both have the same chemical composition, but while upper atmospheric ozone protects the earth from harmful solar radiation, ground-level ozone is the main component of smog.

Ground-level ozone is not emitted directly into the air but is created by chemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOC). Ozone is likely to reach unhealthy levels on hot sunny days in urban environments. Ozone can also be transported long distances by wind. For this reason, even rural areas can experience high ozone levels. Even relatively low levels of ozone can affect

human health. People with lung disease, children, older adults, and individuals who are active outdoors may be particularly vulnerable to the effects of ozone inhalation. The current standard for ozone promulgated by the USEPA is .075 parts per million (ppm). That standard is applied to the annual fourth highest daily maximum eight-hour concentration averaged over three years (see Table 4-2). Carbon monoxide (CO) is a colorless, odorless gas that interferes with the delivery of oxygen to a person's organs and tissues. The health effects of CO exposure depend on the duration and intensity of exposure as well as a person's health. Concentrations are typically higher during the winter months because internal combustion engines emit more CO at lower temperatures. The standard for CO concentration over a one-hour period is 35 ppm; the eight-hour standard is 9 ppm.

Metropolitan transportation planning regulations require that the long-range transportation plan for a nonattainment or maintenance area demonstrate conformity with the SIP. The MPO must show that proposed programs and projects included in the plan are consistent with the goals, objectives and strategies established for the purpose of achieving acceptable air quality. This process of documenting *transportation conformity* with air quality objectives includes modeling future emissions in order to quantify the probable effects of new or improved facilities.

None of the Mississippi Gulf Coast counties have been designated to be in a status of nonattainment with regard to the NAAQS. However, the EPA is currently proposing to update both the primary and secondary ozone standards, citing public health and welfare concerns. According to agency data for 2014, highway vehicles accounted for 36.2 percent of NO_x emissions and 12.6 percent of VOC emissions, the pollutants that combine to form ozone. Those shares have been reduced from 47.0 and 48.8 percent respectively since the adoption of the *Clean Air Act* in 1970. Moreover, the total amount of each pollutant emitted into the atmosphere by all sources has been reduced by more than half since 1970, due largely to dramatic decreases in mobile-source emissions. Cleaner fuels and cleaner burning automobile and truck engines have been largely responsible for lowering the actual amount of NO_x emitted by highway vehicles from 12,624,000 tons in 1970 to 4,489,000 tons in 2014, a reduction of 64.4 percent. Highway vehicle emissions of VOC have been lowered from 16,910,000 tons in 1970 to 2,159,000 tons in 2014, a reduction of 87.2 percent. Nevertheless, in a final rule published on October 1, 2015, EPA Administrator Gina McCarthy announced the promulgation of new standards:

Based on its review of the air quality criteria for ozone (O₃) and related photochemical oxidants and national ambient air quality standards (NAAQS) for O₃, the Environmental Protection Agency (EPA) is revising the primary and secondary NAAQS for O₃ to provide requisite protection of public health and welfare, respectively. The EPA is revising the levels of both standards to 0.070 parts per million (ppm), and retaining their indicators (O₃), forms (fourth-highest daily maximum, averaged across three consecutive years) and averaging times (eight hours).

The more stringent standards will likely result in a significant increase in the number of designated nonattainment areas. Annual reports published by the Mississippi Department of Environmental Quality, Air Quality Division, show that ozone monitoring stations in both Harrison and Jackson counties recorded

Table 4–2: National Ambient Air Quality Standards (U. S. Environmental Protection Agency)

Pollutant [final rule cite]	Primary/ Secondary	Averaging Time	Level	Form	
Carbon Monoxide [76 FR 54294, Aug 31, 2011]	Primary	8-hour	9 ppm	Not to be exceeded more than once per year	
		1-hour	35 ppm		
Lead [73 FR 66964, Nov 12, 2008]	primary and secondary	Rolling 3 month average	0.15 µg/m ³ ⁽¹⁾	Not to be exceeded	
Nitrogen Dioxide [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]	primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years	
	primary and secondary	Annual	53 ppb ⁽²⁾	Annual Mean	
Ozone [73 FR 16436, Mar 27, 2008]	primary and secondary	8-hour	0.075 ppm ⁽³⁾	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years	
Particle Pollution Dec 14, 2012	PM _{2.5}	Primary	Annual	12 µg/m ³	annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m ³	annual mean, averaged over 3 years
		primary and secondary	24-hour	35 µg/m ³	98th percentile, averaged over 3 years
	PM ₁₀	primary and secondary	24-hour	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sept 14, 1973]	Primary	1-hour	75 ppb ⁽⁴⁾	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years	
	Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year	

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m³ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(2) The official level of the annual NO₂ standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard (“anti-backsliding”). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

(4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO₂ standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

levels resulting in design values exceeding 70 ppb from 2010 through 2012. The highest value—76 ppb--was registered for the Gulfport station in 2010 when the ozone standard was still 84ppb. However, the Harrison County count has since come down to 69 ppb. If it can be maintained at or below that level, the county may avoid designation as a nonattainment area. On the other hand, while ozone measurements at Pascagoula have come down since 2010, the 2014 design value of 71ppb puts Jackson County in jeopardy of being designated a nonattainment area under the new standards.

Transportation conformity is a process required of MPOs pursuant to the *Clean Air Act Amendments of 1990* (Public Law 101-549, 104 Stat. 2468) to ensure that Federal funding only goes to those transportation activities that are consistent with air quality goals. The legislation requires that transportation plans, programs and projects funded or approved by the Federal Highway Administration (FHWA) in nonattainment or maintenance areas be in conformity with the SIP. The SIP outlines a state's program for achieving or maintaining compliance with the NAAQS for a particular pollutant.

Should any of the Mississippi Gulf Coast counties be designated a nonattainment area, the MTP will be subject to transportation-air quality conformity analysis. Under such circumstances, the travel demand forecasting model, which currently provides input to the transportation planning process, could provide quantitative data required for the requisite regional air quality modeling effort.

Climate Change

It is the position of the Federal Highway Administration (FHWA), as expressed in *Integrating Climate Change into the Transportation Planning Process*, “. . . that the earth is experiencing a long-term warming trend and that human-induced increases in atmospheric greenhouse gases (GHGs) are the predominant cause.” Greenhouse gases are primarily produced by the combustion of fossil fuels, and the biggest producers are (1) electric power generation and (2) transportation. A majority of transportation-related emissions are generated by cars and trucks.

The FHWA report notes that greenhouse gas (GHG) emissions related to transportation might be reduced by “. . . switching to alternative fuels, using more fuel efficient vehicles, and reducing the total number of miles driven.” Each of these would require a combination of governmental and non-governmental effort supported by properly oriented transportation planning activities.

While making a substantial contribution to the long-term trend in global warming, the report also notes that “. . . transportation will likely also be affected by climate change. Transportation infrastructure is vulnerable to predicted changes in sea levels and increases in severe weather and extreme high temperatures. Long-term transportation planning will need to respond to these threats.”

The 2009 U.S. Global Change Research Program (USGCRP) report, *Global Climate Change Impacts in the United States*, predicts the following effects of climate change the southeastern region:

- Average annual temperatures in the region are projected to increase by four to nine degrees Fahrenheit by the year 2080.

- Climate models suggest that rainfall will arrive in heavier downpours with increased dry periods between storms, changes that would increase the risk of both flooding and drought.
- Because higher temperatures increase evaporation and water loss from plants. Rising temperatures will likely increase the frequency, duration and intensity of droughts in the area.
- If the region increases groundwater pumping to offset water shortfalls, aquifers will be further depleted, placing additional strain on surface water resources.
- Growing demand due to population increase will also likely strain water resources, although decreased water availability will challenge future growth and the quality of life of residents in the region.

The report further states that climate change is expected to affect public health and biological ecosystems in the following ways:

- Higher temperatures and more frequent heat waves will likely increase heat stress, respiratory illnesses, and heat-related deaths in the Southeast. High temperatures also correlate with poor air quality and pose a risk to people with respiratory problems. While the number of cold-related deaths is projected to decrease, net climate-related mortality will likely increase.
- The spread of some types of bacteria has been linked to warmer temperatures. For example, food poisoning from eating shellfish infected with *Vibrio parahaemolyticus* bacteria has increased by 41% from 1996 to 2006 in the United States. As temperatures increase, the frequency of these types of shellfish-borne disease outbreaks in coastal waters is likely to increase.
- Warmer temperatures could increase the number of wildfires and outbreaks of pests such as the southern pine beetle.
- Declining soil moisture, water scarcity and increasing temperatures will likely stress agricultural crops.
- Sustained temperatures between 90 and 100°F can significantly affect cattle. Severe droughts, such as the water shortage that affected Texas in 2011, may lead to the premature slaughtering of cattle.
- Sea level rise and increased storms will likely raise the salinity level in estuaries, coastal wetlands and tidal rivers. Rapid sea level rise could even eliminate some barrier islands that currently protect inland habitats.

The EPA further notes that increased flooding and hurricanes could present extreme public health and emergency management challenges.

4.4 PUBLIC HEALTH

A growing number of local and state governments are performing health impact assessments for transportation projects and programs in order to address the foreseeable public health outcomes. Transportation can affect public health in many ways, but the most commonly discussed include the following:

- **Safety:** Roadway design can affect the risk of traffic-related injuries and fatalities. Between 2011 and 2013, there were 154 fatal accidents in the Mississippi Gulf Coast counties. That corresponds to very nearly one per week. There were also 8,475 crashes involving injuries, representing more than 50 per week.
- **Air Quality:** Air pollution from vehicle emissions exacerbates the symptoms of chronic respiratory diseases such as asthma.
- **Noise Pollution:** Noise pollution can lead to hearing loss, stress-related illness, high blood pressure, speech interference and sleep disruption.
- **Physical Activity:** A lack of sufficient bicycle and pedestrian infrastructure can limit opportunities for physical activity.
- **Accessibility:** Lack of transportation can limit access to healthy food, recreational opportunities, and healthcare facilities.

While transportation planning has typically addressed safety, air quality, noise pollution and accessibility in the past, only recently has the planning process begun to consider the impact of transportation on physical activity. Of particular interest is the impact of the built environment on walking and biking. Walking and biking are important physical activities because they provide regular light-to-moderate physical activities which can significantly decrease a person's risk for cardiovascular disease, colon cancer, Type 2 diabetes, obesity, osteoporosis and depression. Walking and biking can also improve psychological well-being and quality of life. Therefore, providing convenient and attractive pedestrian and bicycle infrastructure, and encouraging walking and biking, can improve public health outcomes for a community.

4.5 PROJECT DEVELOPMENT CONSIDERATIONS

While detailed analysis of potential environmental impacts is beyond the scope of a long-range transportation plan, it was necessary to give due consideration to the possible effects of projects that might present a significant barrier to their implementation. The project evaluation and prioritization process employed for MTP development gave special attention to the following: Wetlands, waterways and flood zones; protected plant and animal species; historical and archaeological resources; hazardous materials; neighborhoods and community facilities; and environmental justice.

Wetlands, Waterways and Floodplains

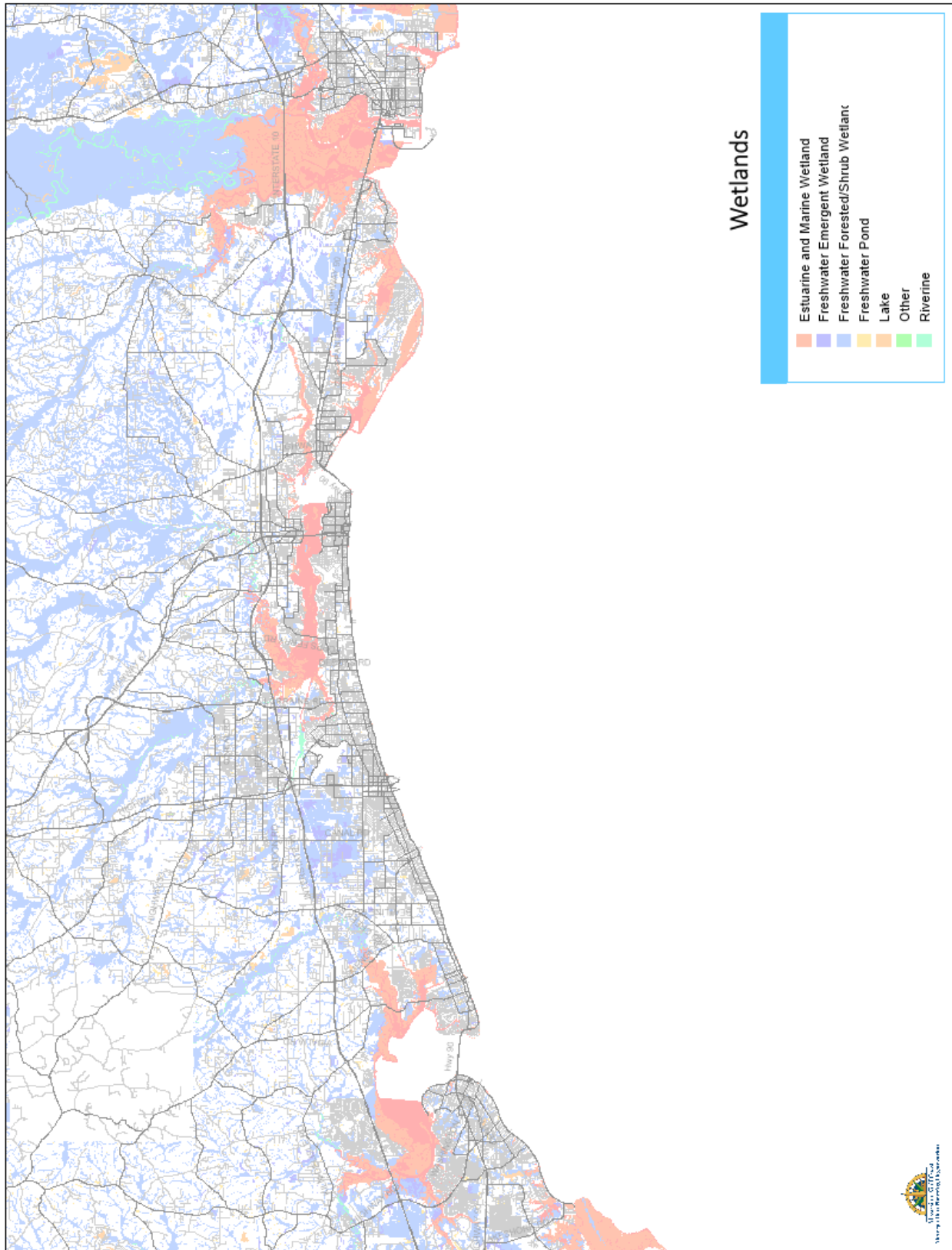
Wetlands have many environmental benefits, most notably water purification, flood protection, shoreline stabilization, groundwater recharge and streamflow maintenance, and fish and wildlife habitat. Wetlands are afforded special protection under the terms of the *Clean Water Act* (33 USC Sections 1311, 1362, 1344). Due to their prevalence in the Mississippi Gulf Coast area, it is virtually impossible to undertake construction of a new road without encroaching on designated wetland areas (see Figure 4-2). Even the widening or realignment of an existing roadway involves a significant likelihood of encroachment. In most cases, the assumption is that it will be necessary to mitigate the loss of wetlands resulting from a project by establishing compensatory wetlands off-site in accordance with state and Federal policy. However, there is a cost associated with mitigation; and if it cannot be avoided it can at least be minimized. In evaluating proposed projects, a determination was made as to whether a proposed improvement would be likely to have no impact on wetlands, some impact or a substantial impact. Preference was assigned to those which would have more limited impacts.

Encroaching on or changing the natural floodplain of a water course can result in disastrous flooding of developed areas. The Mississippi Gulf Coast is bounded on the south by the Mississippi Sound and Gulf of Mexico and is subject to potentially catastrophic tidal inundation associated with tropical storm activity. This was demonstrated in 2005 when waters driven inland by Hurricane Katrina destroyed thousands of homes and businesses and caused devastating damage to roadways and other infrastructure. The bridges over the Bay of Saint Louis and Bay of Biloxi were demolished by the surging waters and had to be replaced. The total cost for those two new bridges alone was well over half a billion dollars. In the wake of the 2005 calamity, the emphasis has been on rebuilding for resiliency: Planning systems and facilities that will be more likely to withstand the ravages of a potentially cataclysmic natural event. In evaluating projects for inclusion in the long-range plan, preference was given to those that were less likely to traverse low-lying areas subject to flooding (see Figure 4-3). Roadways located in floodways are both more likely to suffer the damaging effects of inundation and more likely to affect the natural flow of water in times of flooding.

The long-range planning process is concerned with needs analysis and project identification rather than development. It is not possible at this early stage to assess project-level impacts on wetlands, waterways or floodplains in any detail. Nevertheless, it is assumed that as projects proceed to environmental analysis and eventual development, sponsors will undertake the following to avoid, minimize or mitigate potential impacts:

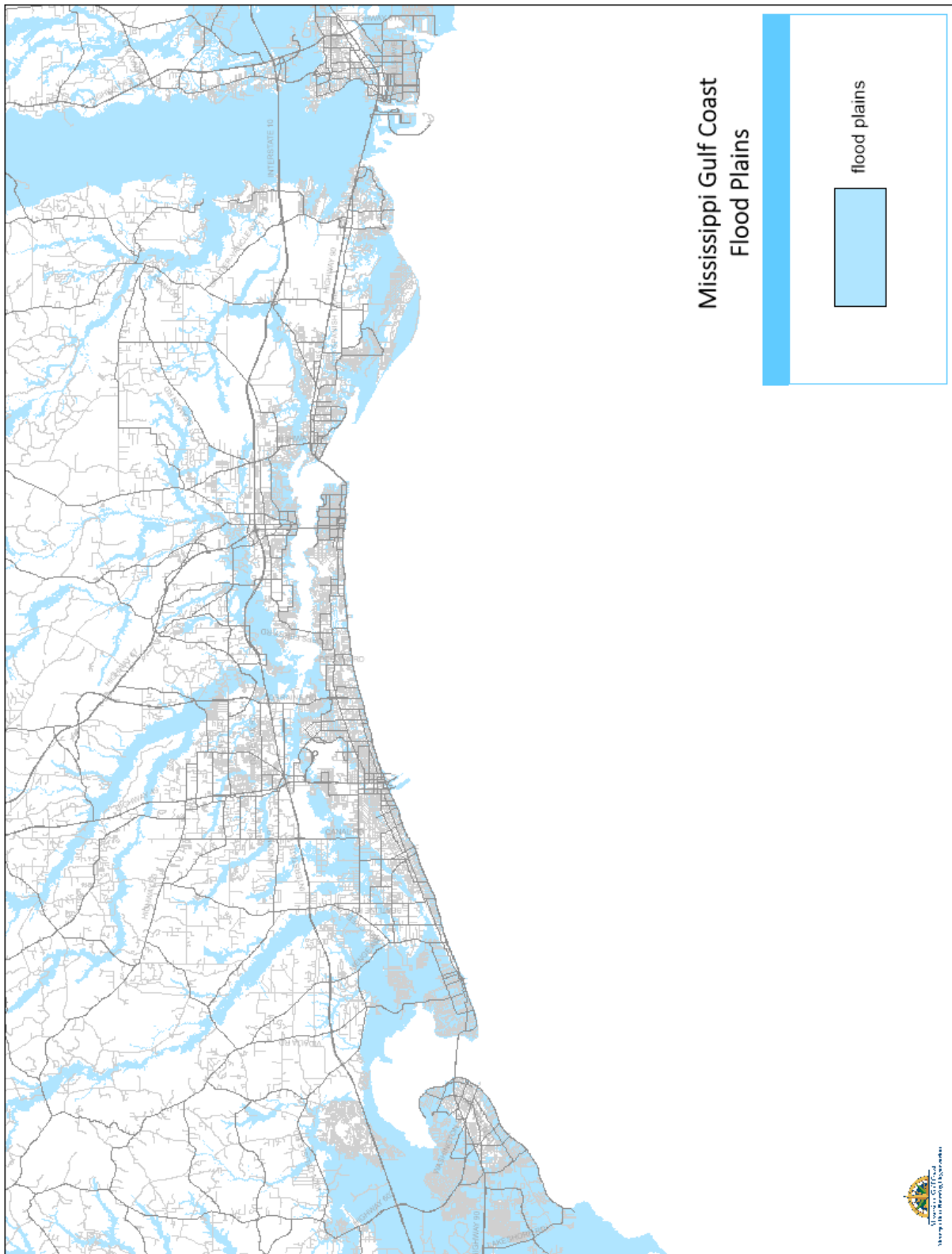
- Take steps to avoid wetland and flood zone impacts where practicable
- Ensure that transportation facilities constructed in floodways will not increase flood heights
- Consider strategies which minimize potential impacts to wetlands and flood zones
- Provide compensation for any remaining unavoidable impacts through activities to restore or create wetlands.

Figure 4.2 Mississippi Gulf Coast Wetlands



Source: Gulf Regional Planning Commission.

Figure 4-3: Mississippi Gulf Coast Floodplains



Source: Gulf Regional Planning Commission.

Protected Plant and Animal Species

There are 20 plant and animal species, known to occur within the three Mississippi Gulf Coast counties, which are listed by the U. S. Fish and Wildlife Service (USFWS) as being either threatened or endangered in accordance with the *Endangered Species Conservation Act* of 1973 (Public Law 93-205, 87 Stat. 884) (see Table 4-3). Twelve are listed as *threatened*, the other eight *endangered*. Of the 20 USFWS-listed species, nine occur in all three counties, four in Harrison and Jackson (but not Hancock), one in Hancock and Harrison (but not Jackson), two only in Hancock County, and four only in Jackson County. There also three species that have been identified as candidates for Federal listing, one of which is also on the state list maintained by the Mississippi Department of Wildlife, Fisheries and Parks (MDWFP) and the Mississippi Museum of Natural Science in accordance with the *Nongame and Endangered Species Act* adopted by the Mississippi Legislature in 1974.

The state list of threatened and endangered animals and plants includes 11 species occurring in the three coastal counties that are not listed by the USFWS. Six of these are known to exist in all three counties, one has been observed in Hancock and Jackson counties (but not Harrison), three are found only in Hancock County, and one is restricted to Jackson County.

While the bald eagle has been removed from the Federal list of threatened and endangered species, it is still afforded special protection under the *Bald and Golden Eagle Protection Act* (16 USC 668-668d) adopted to preserve the national symbol of the United States.

A number of the protected species are fish or sea turtles, such as the *gulf sturgeon* and *Kemp's ridley*, that live in the Mississippi Sound and other coastal waters of the state. Others, such as the piping plover, are shorebirds that live on the barrier islands and mainland beaches. There are several small species of fish listed by the state that have their habitat in either the Pearl River or Pascagoula River. Of more concern with regard to transportation projects are the inland species—such as the gopher tortoise, Mississippi gopher frog and Louisiana quillwort—that may pop up in or around proposed new right-of-way. Possible impacts must be evaluated on a case-by-case basis as proposed improvements are subjected to environmental assessment. At the level of long-range planning, it is only possible to evaluate projects in terms of their proximity to known habitat or areas considered more or less likely to be habitable by protected species.

Historical and Archaeological Resources

There are 130 sites within the Mississippi Gulf Coast area listed in the *National Register of Historic Places* (NRHP): 68 in Jackson County (35 in Pascagoula), 46 in Harrison County (32 in Biloxi) and 16 in Hancock County (eight in Bay Saint Louis). Because they are well-known, these are easily avoided in planning transportation improvements. Of greater concern are potentially historic sites and structures that must be evaluated in order to determine their eligibility for listing on the NRHP. Even more challenging are the as yet unidentified sites, having archaeological significance, that remain concealed within the earth. Due diligence during the environmental phase of project development will seek to find any artifacts that should be preserved before ground-breaking can disturb a site that merits further research. At the long-range planning level, it is only necessary to note the need to avoid locations where cultural resources of previously established historical or archaeological significance are known to exist.

Table 4-3:
MISSISSIPPI GULF COAST THREATENED AND ENDANGERED SPECIES BY COUNTY

PROTECTED SPECIES		COUNTY STATUS		
SPECIES NAME	COMMON NAME	HANCOCK	HARRISON	JACKSON
<i>Ursus americanus luteolus</i>	Louisiana black bear	T	T	T
<i>Alligator mississippiensis</i>	American alligator	T	T	T
<i>Gopherus polyphemus</i>	Gopher tortoise	T	T	T
<i>Chelonia mydas</i>	Green turtle	T	T	T
<i>Caretta caretta</i>	Loggerhead turtle	T	T	T
<i>Acipenser oxyrhynchus desotoi</i>	Gulf sturgeon	T	T	T
<i>Potamilus inflatus</i>	Inflated heelsplitter	T	N	N
<i>Charadrius melodus</i>	Piping plover	T	T	T
<i>Graptemys oculifera</i>	Ringed sawback	T	N	N
<i>Drymarchon corais couperi</i>	Eastern indigo snake	N	T	T
<i>Graptemys flavimaculata</i>	Yellow-blotched map turtle	N	N	T
<i>Trichechus manatus</i>	West Indian manatee	E	E	E
<i>Lepidochelys kempii</i>	Kemp's ridley	E	E	E
<i>Isoetes louisianensis</i>	Louisiana quillwort	E	E	N
<i>Schwalbea americana</i>	American chaffseed	N	N	E
<i>Picoides borealis</i>	Red-cockaded woodpecker	N	E	E
<i>Rana sevosus</i>	Mississippi (Dusky) gopher frog	N	E	E
<i>Pseudemys alabamensis</i>	Alabama red-bellied turtle	N	E	E
<i>Grus canadensis pulla</i>	Mississippi sandhill crane	N	N	E
<i>Pituophis melanoleucus lodingi</i>	Black pine snake	N	C/S	C/S
<i>Mycteria americana</i>	Wood stork	C	C	C
<i>Percina aurora</i>	Pearl darter	S	N	C/S
<i>Haliaeetus leucocephalus</i>	Bald eagle	*	*	*
<i>Notropis chalybaeus</i>	Ironcolor shiner	S	S	S
<i>Noturus munitus</i>	Frecklebelly madtom	S	N	N
<i>Crystallaria asprella</i>	Crystal darter	S	N	N
<i>Amphiuma pholeter</i>	One-toed amphiuma	N	N	S
<i>Farancia erythrogramma</i>	Rainbow snake	S	N	S
<i>Pelecanus occidentalis</i>	Brown pelican	S	S	S
<i>Elanoides forficatus</i>	Swallow-tailed kite	S	S	S
<i>Charadrius nivosus</i>	Snowy plover	S	S	S
<i>Falco peregrinus</i>	Peregrine falcon	S	S	S
<i>Thryomanes bewickii</i>	Bewick's wren	S	S	S

T - Federally listed Threatened E - Federally listed Endangered C - Candidate for Federal listing
*S - State-listed Endangered N - Non-occurring * No longer listed but protected under the Bald*
and Golden Eagle Protection Act

Source: Mississippi Department of Wildlife, Fisheries and Parks and Mississippi Museum of Natural Science (2015), Endangered Species of Mississippi.

Hazardous Materials

Potentially hazardous materials exist in great abundance in any urban setting. In planning new transportation facilities, it is easy to avoid the larger concentrations of such materials associated with industrial activity, waste disposal, the distribution of public utilities or other undertakings necessary to promote or ensure human welfare. More challenging is the need to avoid smaller contaminated sites that may not have been cleaned up well enough to permit human use. The EPA maintains a number of databases containing information about potentially hazardous material locations, toxic waste spills, clean-up and decontamination efforts, and related subjects with public health implications. These include the *Comprehensive Environmental Response, Compensations, and Liability Act* (Public Law 96-510, 94 Stat. 2767) (CERCLA or “Superfund”) database and the National Priorities List (NPL).

Enacted in 1980 CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites; provided for the liability of persons responsible for releases of hazardous waste at these sites; and established a trust fund to provide for clean-up efforts when no responsible party can be identified. CERCLA also authorized revision of the National Contingency Plan, which established the National Priorities List. The NPL prioritizes known or threatened releases of hazardous substances, pollutants and contaminants throughout the United States and its territories. The NPL is intended primarily to guide the EPA in determining which sites warrant further investigation and/or action.

Addressing the possible presence of hazardous materials early on in the project development process can reduce costs, delays and liabilities. However, the in-depth investigation of all available databases is only appropriate or feasible for a given project when it has advanced to the identification of alternatives for environmental study. At the long-range planning level, what is called for is the avoidance of known hazards or threats that render a particular location undesirable for development.

Neighborhoods and Community Facilities

The integrity of existing neighborhoods is an important consideration which must always be given its due weight in locating new transportation facilities. The bifurcation of established neighborhoods should be avoided whenever possible. Similarly, access to existing neighborhoods must not be impeded by the construction of new roads. If a road cannot be constructed without causing undue hardship for residents coming from or going to the neighborhood in which they live, then the road ought to be built elsewhere. In any event it must be designed so as to guarantee unimpeded access.

In the same regard, the location of transportation improvements should not damage or displace cemeteries, schools, churches, parks, playgrounds, other recreational facilities or significant community resources. In fact it is expressly forbidden by law to disturb such properties unless no “reasonable or prudent alternative” for implementation of a necessary public project can be found.

Community Impacts and Environmental Justice

The metropolitan planning regulations require MPO compliance with the *Civil Rights Act* of 1964 (Public Law 88-352, 78 Stat. 241) and other Federal legislation, executive orders and regulatory guidance enacted, issued or promulgated in furtherance of the objectives in the law. The requirements they impose apply to all MPO activities, programs and services, including the development of the long-range plan.

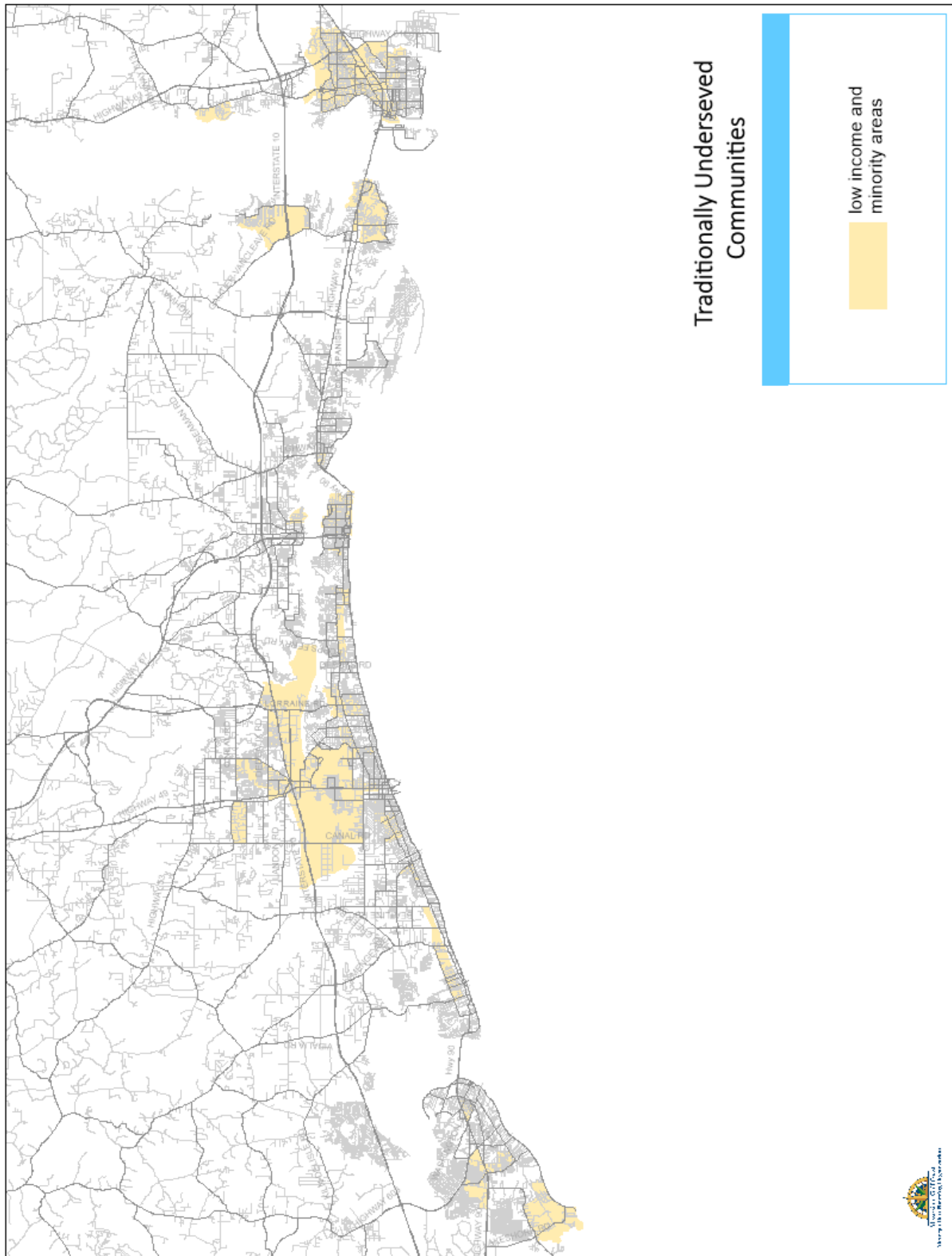
Traditionally underserved populations are those groups afforded special protection under the non-discrimination policies codified in law and regulation. They include racial and ethnic minorities, low-income individuals, the elderly and the young, those who are not proficient speakers of the English language and the disabled. It is GRPC policy to ensure equal access to the transportation planning process, to minimize or alleviate any foreseen burdens imposed by transportation projects, and to share the benefits realized from transportation investment equitably among all community members.

There are several terms used to describe negative impacts which may be incurred by protected populations: *Adverse effect*, *adverse impact*, *disparate impact* and *disproportionate burden* are the most common. With regard to the development of the Mississippi Gulf Coast Metropolitan Transportation Plan (MTP), there are two main areas that require evaluation for potential adverse impacts. The first obligation is to ensure that the plan development process is made available to all interested citizens. Efforts to meet this compliance goal (described in more detail in Section 2.2) included working in cooperation with MDOT and other Mississippi MPOs to mount a public involvement program that was consistent and convenient and offered various options for individuals and groups to participate in the planning process.

The second core element requiring particular consideration lay in the selection of improvement projects to meet long-range goals and objectives. The evaluation process was conducted on a project-by-project basis and gave special attention to proposed improvements that would be constructed in areas identified as meriting protection (see Figure 4-4). In each case a project impact worksheet was completed, identifying which population groups, if any, might be affected by the proposed improvement. If the worksheet review identified a protected group as being vulnerable to an impact, an appropriate strategy was suggested for conducting targeted outreach in the potentially affected community. The spreadsheet program lists the anticipated positive impacts of the project, any negative impacts likely to occur during the construction process, and any foreseeable adverse effects of project implementation. It also provides space for the analyst to enter comments regarding how unwanted impacts might be avoided altogether, minimized or mitigated if necessary.

Impact areas addressed through this process include topics such as air, noise and water pollution; toxic waste and other hazardous materials; aesthetic considerations; neighborhood integrity and community cohesion; economic vitality and employment effects; displacement of persons or businesses; farmland conversion; accessibility of transportation facilities and services for disabled individuals; traffic congestion; safety; and temporary impacts resulting from construction. In short, the MPO is required to assess the impact of proposed projects on protected populations within the metropolitan area. If a disproportionate burden will be borne by members of a traditionally underserved group or if they will not receive an equitable share of the project benefits, it is necessary either to forego the project or to identify appropriate mitigation measures. The goal for every MPO-funded project is the fair distribution of both the beneficial and adverse effects attributable to the improvement.

Figure 4.4: Mississippi Gulf Coast Traditionally Underserved Communities



Source: Gulf Regional Planning Commission

As previously noted, Executive Order 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*) sought to reaffirm the intent of Title VI of the *Civil Rights Act* of 1964 with regard to NEPA, by forbidding the inequitable distribution of either the environmental burdens or public benefits of a transportation project in a manner prejudicial to the interests of racial or ethnic minority groups or economically disadvantaged individuals. The MPO seeks to avoid such undesirable impacts of transportation improvement projects proposed for inclusion in the long-range plan by giving careful consideration to the question of how an action will likely affect residents of “environmental justice” areas defined on the basis of U. S. Census and other available data.

The executive order specifies actions to be taken on a range of issues that are intended to promote nondiscrimination in Federal actions; provide minority and low-income communities equal access to public information regarding a Federal action; and provide opportunities for public participation in the evaluation of a Federal action in matters relating to human health and the environment. In particular, the order stipulates the following:

To the greatest extent practicable and permitted by law . . . each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low income populations . . . (Order Section I-101).

Each Federal Agency shall conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons . . . from participation in, denying persons the benefits of, or subjecting persons . . . to discrimination under such programs, policies, and activities, because of their race, color, or national origin (Order Section 2-2).

In an attempt to prevent disproportionately high and adverse effects on minority or low-income populations early in the planning process, the MPO determined the relative likelihood of impacts for all transportation projects, using its previously adopted environmental justice map.