The definition of the word "environment" varies depending upon the context, but in general, it is the aggregate of surrounding things, conditions, or influences, i.e. the surroundings. These surroundings may be natural or man-made, physical or perceived. The environment in which we live affects our quality of life. This Chapter discusses a variety of environmental factors including air quality, climate change, planning and environmental linkages, sustainability, and context sensitive solutions.

AIR QUALITY

KTMPO is bisected by IH 35, one of the nation's busiest interstate corridors. An average of 65,000 vehicles pass through this corridor daily. The Killeen and Temple urbanized areas have experienced considerable growth during the past 10 years and growth is projected to continue. KTMPO is also located between two major urbanized areas (UZA)—Austin UZA to the south and Waco UZA to the north. These factors may have an impact on the air quality of the KTMPO region. As a result, KTMPO has been actively researching and monitoring air quality information to incorporate into regional planning efforts.

Air Quality Standards

Ozone Monitoring Station: Temple Georgia C1045

The Clean Air Act, which was last amended in 1990, requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for pollutants considered harmful to public health and the environment. The Clean Air Act identifies two types of national ambient air quality standards. ***Primary standards*** provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. ***Secondary standards*** provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. These standards are implemented by the EPA to assign limits to the amount of pollution that can be present in the atmosphere. Based on monitoring data, the EPA will determine whether a region complies the NAAQS. An area may be considered in nonattainment if the thresholds are exceeded. EPA has set National Ambient Air Quality Standards for six principal pollutants, which are called "criteria" pollutants, as listed below:

- Carbon Monoxide

- Lead
- Nitrogen Dioxide
- Ground-Level Ozone
- Particulate Matter
- Sulfur Dioxide

Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu g/m^3$).

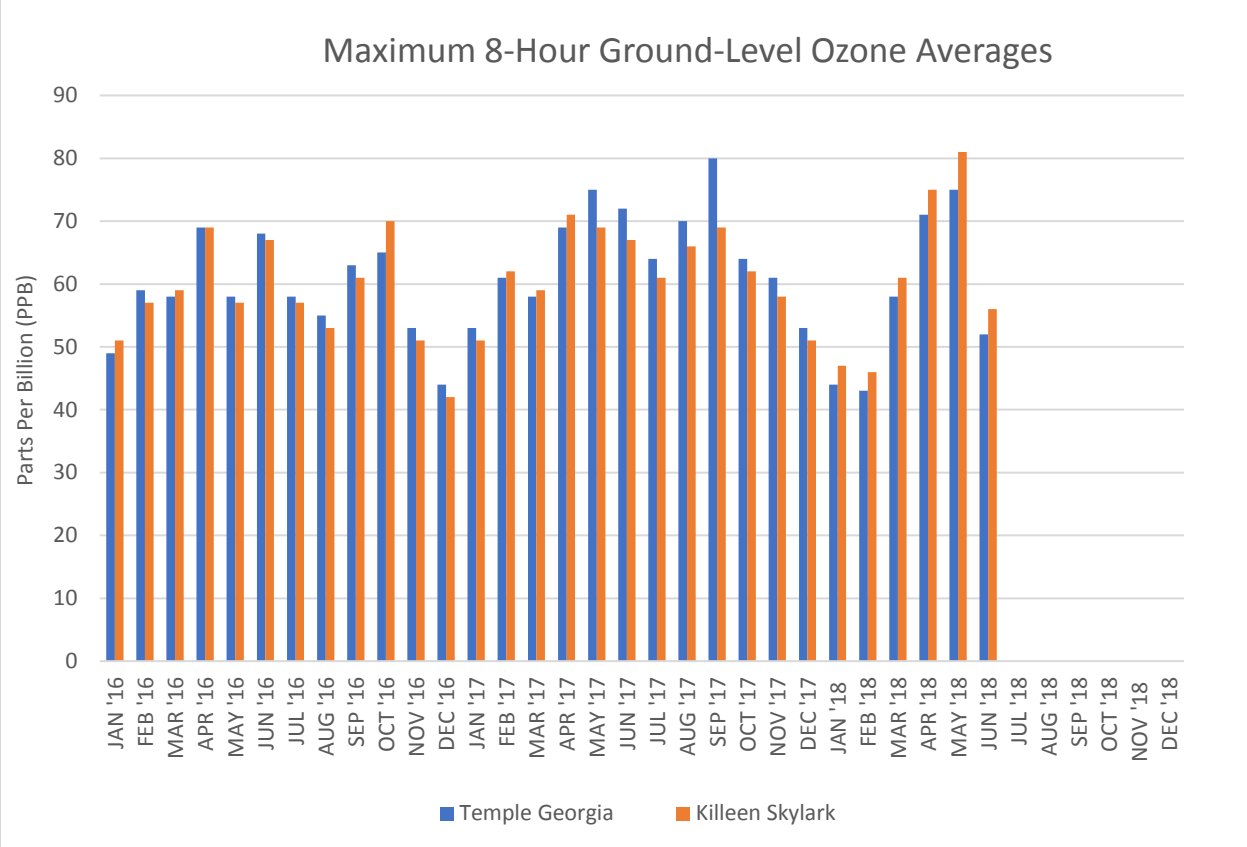
The EPA reviewed the NAAQS for ground-level ozone that were set in 2008. A reduction in the standards from 0.075 ppm to 0.060 - 0.070 ppm was under consideration. The proposed revised standards were available December 1, 2014, and the EPA finalized the revised standard of 0.070 ppm on October 1, 2015.

KTMPO Air Quality

KTMPO is currently in attainment for all criteria air pollutants. In June 2009, an air quality monitoring station was established at Skylark Field in Killeen. A second monitoring station was established in October 2013, in Temple, at West Temple Park near Georgia Avenue. These are the only monitoring stations in the KTMPO boundary and ground-level ozone is the only pollutant that is measured. Ground-level ozone forms when two types of pollutants, volatile organic compounds (VOC) and oxides of nitrogen, combine with sunlight and high temperatures. These pollutants are found in emissions from vehicles, construction equipment, lawn and garden equipment, sources that combust fuel such as industries and utilities, small industries such as gas stations and print shops, and consumer products including some paints and cleaners.

Data collected from the monitoring stations is posted on the Texas Commission on Environmental Quality (TCEQ) website and is available for viewing by the public. These values are collected hourly and averaged over 8-hour blocks. At the end of the calendar year, the highest values are recorded and the 4th highest daily maximum 8-hour concentration is used for compliance calculations. Once three full years of data are available, the 4th highest values are averaged to determine compliance. Based on current standards, this average cannot exceed 0.070 ppm (70 ppb). If exceeded, the area is considered to be nonattainment for the ozone standard.

Exhibit 10.2: Regional Ozone Monitor Data



Implications of Nonattainment

Three full years of certified data is needed to decide whether an area is in attainment with the NAAQS. A nonattainment designation may include an entire county or part of a county. Nonattainment areas must develop a plan to return to compliance within a specified time period. This time varies from 3 to 20 years, depending upon the severity of the classification. Failure to comply may trigger sanctions, such as a loss of federal transportation dollars.

The Texas State Implementation Plan (SIP) is the state's comprehensive plan to clean the air and meet federal air quality standards. The SIP must be revised to include areas (counties) classified as nonattainment. Components of a SIP Revision Include:

- Monitoring Data
- Emissions Inventory
- Photochemical Modeling
- Control Measures

The SIP revision process typically takes 3 – 4 years and is initiated upon nonattainment designation. This is an intense period of data collection and modeling; control measures and strategies are proposed and tested, and the revision is drafted. TCEQ goes through a rule making process which involves public meetings, hearings, review of public comments, etc. TCEQ then adopts final rules and the SIP revisions. The State's SIP revision package is then submitted to the EPA for review and approval.

Metropolitan Planning Organizations (MPO's) in nonattainment areas must demonstrate that their Metropolitan Transportation Plan (MTP) and Transportation Improvement Program (TIP) conform to the purpose of the SIP, i.e. "transportation conformity". Transportation Conformity only addresses air pollution from on-road sources which includes emissions created by cars, trucks, buses, commuter rail, and motorcycles. Federal Projects receiving FHWA/FTA funding and/or approval are also subject to Transportation Conformity. Conformity to a SIP means:

- Activities will not cause or contribute to any new violations of the NAAQS
- Activities will not increase the frequency or severity of NAAQS violations
- Activities will not delay timely attainment of the NAAQS or any required interim milestone

A conformity determination demonstrates that implementation of the MTP, TIP or project will not cause any new violations of the air quality standard, increase the frequency or severity of violations of the standard, or delay timely attainment of the standard or any interim milestone. Total projected emissions for the MTP or TIP must be within the "emissions budgets" established by the SIP. Transportation Control Measures (TCM) must be implemented in a timely fashion and State and local agencies consulted on data, modeling, and other issues. Development and implementation of TCMs are the responsibility of the MPO's participating local governments and includes both regulatory and non-regulatory measures.

Examples of TCMs include the following:

- Programs for improving public transit
- Developing high occupancy vehicle (HOV) lanes
- Employing ordinances to promote non-motor vehicle travel

MTP/TIP transportation conformity determination occurs within 12 months of a nonattainment designation. This determination is based upon the SIP; however, if SIP revisions have not been

developed, conformity is determined by "Build/No Build" evaluation and comparison to determine impact of the proposed projects on air quality.

Future Steps

It is in the best interest of the KTMPO region to remain in compliance with the NAAQS and avoid a nonattainment designation. Steps/measures that will be undertaken by KTMPO are discussed below.

CMP Development and Implementation: KTMPO will continue developing and implementing the Congestion Management Process (CMP) which involves collecting data to identify congested corridors and developing strategies to alleviate congestion. Reducing vehicle emissions will help provide cleaner air for our region. Objectives may include the following:

- Promote policies and projects to reduce travel delay
- Promote awareness of alternative transportation modes
- Promote policies and projects to reduce number of crashes and crash severity
- Promote policies and programs to increase transit ridership on existing services
- Promote awareness of multi-modal facilities
- Promote carpool/shared-ride opportunities
- Consider participation in air quality improvement programs
- Encourage community land development plans that balance access to all modes of transportation

Ozone Advance Participation:
One tool that may be available to KTMPO is the Ozone Advance program. This voluntary program has the following goals:

1. Help attainment areas take action to keep ozone levels below the level of the standard to ensure continued health protection
2. Better position areas to remain in attainment
3. Efficiently direct available resources toward actions to address ozone problems quickly

The Ozone Advance program offers participating entities the opportunity to work in partnership with EPA and each other within a framework that focuses on efforts to keep their air clean. Participation in the program is not a guarantee that an area will avoid a future nonattainment designation or other Clean Air Act requirements; however, it can better position the area to comply with the requirements associated with such a designation.

Staff is working to obtain more information to educate and inform the public about air quality issues such as ozone and will work with the Policy Board to consider participation in this program. Program participation will include collaboration and support of the KTMPO member entities to identify measures for consideration to lower ozone concentrations. These measures may include transportation demand management programs such as ridesharing, carpooling, telecommuting, transit, and bike/pedestrian travel. This endeavor works together with the Congestion Management Process (CMP) that KTMPO is implementing. When congestion is alleviated, ozone-contributing pollutants from vehicle emissions are reduced. However, an in-depth study to determine primary sources of the pollutants has not been conducted for the KTMPO area. This is needed to identify airsheds and predominant wind patterns to help determine sources of the pollutants. Once the sources are identified, more specific measures may be considered and undertaken to reduce the pollutants.

Steps involved in enrolling and participating in the Ozone Advance program include the following:

1. Signup letter to EPA
2. Identify available information regarding area's ozone issue
3. Secure stakeholder participation
4. Coordinate control strategy development
5. Submit path forward letter to EPA
6. Implement control strategy per schedule and provide annual status updates
7. Apply for federal grants if desired/available

Before the KTMPO region signs up for the Ozone Advance program, preliminary steps are needed. KTMPO plans to proceed as follows:

1) collect existing information and data to help determine pollution sources;
2) identify stakeholders and form an air quality coalition/advisory group;
3) focus on public education and awareness programs highlighting information about ozone and associated pollutants.

These preliminary measures will prepare the KTMPO region for participation in the program and will lead to the Signup Letter and subsequent steps. KTMPO may enroll in the Ozone Advance program until the effective date of nonattainment designation.

TWG Participation: The Technical Working Group for Mobile Source Emissions (TWG) was formed by the Texas Department of Transportation (TxDOT) in the early 1990's. It was originally designed for a small group of technical staff to work out problems or strategies for modeling on-road mobile source emission inventories. Since then, topics have grown to include policy discussions and membership has grown considerably.

TxDOT Transportation Planning and Programming (TPP) Division has overall management responsibility for the TWG. The Texas Transportation Institute (TTI) facilitates the meetings and provides other staff support for the TWG as part of a contract with TxDOT. KTMPO has been participating in TWG meetings and will continue to do so. TWG meetings are currently held twice a year or as often as needed. Topics have included Ozone Advance Program, State Implementation Plan (SIP), NAAQS, MOVES (Motor Vehicle Emissions Simulator) Model, CMAQ (Congestion Mitigation and Air Quality Improvement) Program, Transportation Conformity reviews, etc.

Other Data Sources: KTMPO is coordinating with TCEQ and EPA to identify sources of air quality data relevant to the KTMPO region. TCEQ's Point Source Emissions webpage provides a list of entities throughout the state who are reporting their emissions to TCEQ. Nine have been identified in Bell County and 16 from the adjacent counties to the north, east, and south. Nitrogen Oxides and Volatile Organic Compounds are among the pollutants that are reported. KTMPO is reviewing this information and will encourage these entities to participate as stakeholders as air quality issues for the region are examined. Other sources of information that will be reviewed include TCEQ's Air Modeling webpage and Air Quality Research webpage, along with data from

Public Education: Educating the public regarding air quality issues and obtaining public support is a key factor for any program to be successful. KTMPO will continue to review data from the ozone monitors at Skylark field in Killeen and West Temple Park (Georgia Avenue) in Temple. Information will be provided on the KTMPO website to educate the public regarding ozone and other pollutants and inform the public of ways to reduce pollutant levels and improve air quality.

CLIMATE CHANGE

Extreme weather events can damage transportation networks and affect air quality. Extreme heat contributes to high Ozone levels which can be harmful to our health and affect our ability to breathe. Heat waves and flooding can be particularly taxing on the road infrastructure. Higher

temperatures can cause road pavement to soften and expand resulting in potholes, buckling of roads, and stress on bridge joints. Heavy rains and flooding can disrupt traffic, delay construction activities, and weaken or wash out the soil and culverts that support roads and bridges. These extremes in weather can shorten the life expectancy of the roadway, resulting in a need for more frequent maintenance and repairs.

High temperatures can also affect railways causing rail tracks to expand and buckle. Heavy rains can cause delays and disrupt service, and flooding can damage the rail lines resulting in repairs and/or replacement of the line and possible relocation to avoid future flooding events.

Weather extremes can also impact air travel. Extreme heat may result in cargo restrictions, flight delays, and cancellations. Heavy rains and flooding can cause disruptions by delaying service and forcing airports to close. Air related infrastructure, including runways, may also be damaged by flooding and higher temperatures.

According to FHWA, "Many state DOTs and MPOs are recognizing the role that transportation policies and investments play in contributing to the emissions of GHGs and conversely, the potential impact of climate change on transportation systems." Promoting the reduction of CO2 gases and other pollutants that make up "greenhouse gases" (GHG) is in the best interest of our region to extend the life of the infrastructure and ensure a healthy air supply for our population.

KTMPO is researching this issue to collect information that will promote awareness of the damaging effects of GHG and encourage practices to reduce these gases. These efforts will include publishing educational material on the KTMPO website and discussions with the Transportation Planning Policy Board to enlist support of future programs to promote a healthy environment and lengthen the lifespan of the transportation infrastructure.

In addition, through CTCOG, KTMPO is coordinating with the Homeland Security Advisory Council to assimilate information from Emergency Management Plans for counties within and adjacent to the MPO boundary. This information includes evacuation routes which may be needed during

extreme weather events such as flooding, hurricanes, etc. These routes should be given top priority with regard to maintenance.

Information Resources

Federal Highways Administration (FHWA) is a resource KTMPO may use in assimilating information on climate change. FHWA supports transportation and climate change research and dissemination of information, technical assistance to stakeholders, and coordination within US DOT and other Federal agencies. FHWA is also involved in climate change initiatives with the US DOT Center for Climate Change and Environmental Forecasting and other partners. The FHWA website provides information on FHWA research, publications, and resources related to climate change science, policies, and actions along with current state and local practices in adapting to climate change and reducing GHG emissions. The following areas of focus have been identified by FHWA and are discussed in detail on the following page:

Mitigation: Identifying strategies that reduce GHG emissions from transportation sources;
Adaptation: Preparing for the impacts of global climate change on the nation's transportation infrastructure and systems;
Sustainability: Ensuring that balanced choices are made among environmental, economic, and social values that will benefit current and future road users;
Energy: Promoting the use of alternative and renewable fuels, and vehicle technologies to reduce oil dependence, vehicle pollution and energy use.

Mitigation Strategies

- Improve system and operational efficiencies by optimizing the design, construction, operation, and use of transportation networks. The strategies range from anti-idling ordinances to traffic management to congestion pricing. The objective of this group of strategies is to reduce the energy use and GHG emissions associated with a given unit of passenger or freight travel (e.g., person-miles, vehicle-miles, or ton-miles of travel).
- Reduce travel activity by reducing growth in vehicle-miles traveled. The objective of this group of strategies is to influence travelers' activity patterns, thereby reducing total travel, shifting travel to more efficient modes, increasing vehicle occupancy, or otherwise taking actions that reduce energy use and GHG emissions associated with personal travel.

- Introduce low-carbon fuels. The objective of this group of strategies is to develop and introduce alternative fuels that have lower carbon content and generate fewer transportation GHG emissions. These alternative fuels include ethanol, biodiesel, natural gas, liquefied petroleum gas, synthetic fuels, hydrogen, and electricity.
- Increase fuel efficiency by advancing and bringing to market advanced engine and transmission designs, lighter-weight materials, improved aerodynamics, and reduced rolling resistance. The objective of this group of strategies is to use less fuel and generate fewer GHG emissions.

Adaptation

Planning, designing, constructing, operating, or maintaining transportation infrastructure while incorporating consideration of climate changes. The impacts of climate change should be taken into account as transportation systems are planned and as transportation projects are developed. Highways are an integral part of the broader context of sustainable development.

Sustainability

A sustainable highway should satisfy the functional requirements of societal development and economic growth while striving to enhance the natural environment and reduce consumption of natural resources. Significant advances are being made to improve the overall efficiency of the energy sector, particularly with regards to fuel economy. However, further fuel savings is needed. The traveling public is increasingly investing in alternative fuels, plug-in hybrid and other electric vehicle (EV) technologies. States and localities in the U.S. are beginning to build the necessary infrastructure to support the use of these fuels and vehicle technologies.

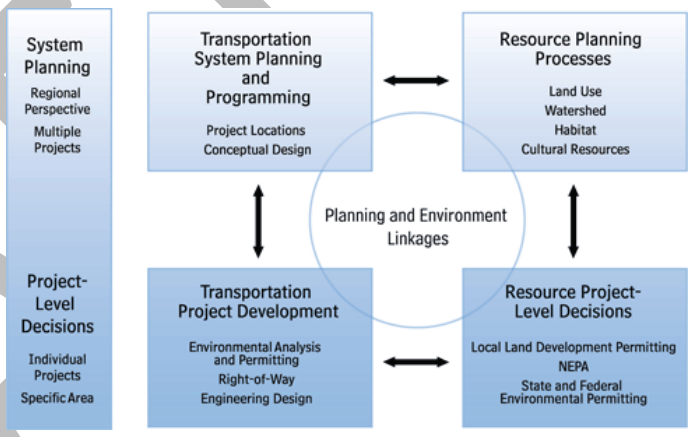
Energy

KTMPO will use these resources and others to promote awareness of climate change and the impact it may have on the transportation network, as well as methods and strategies to mitigate these impacts.

PLANNING AND ENVIRONMENTAL LINKAGES (PEL)

When planning transportation projects, it is important to consider the effect a project may have on the environment. Environmental issues should be considered early in the transportation planning process and should focus on the following principles: 1) avoid; 2) minimize; and 3) mitigate. When possible, projects should avoid environmentally sensitive areas and natural resources. If avoidance is not possible then efforts should be made to minimize adverse effects on the environment. When environmental impacts are known, mitigation efforts may be necessary and involve implementing projects or programs to offset the known impacts.

By including environmental analysis early in the project planning stage, environmental, regulatory, and resource agencies are actively involved from the beginning which will help to streamline environmental reviews that occur later in the process.



Potential problems may be identified in the early stages which may result in cost savings and more efficient project delivery times.

When considering environmental impacts of transportation planning, it is important to include the following:

Define and Identify Environmentally Sensitive Areas and Natural Resources

It is important to define "environmentally sensitive areas" and "natural resources" within a region. Once defined, these areas can then be identified and mapped. Defining and identifying these areas will involve coordination with various agencies and groups and review of local conservation plans and programs.

Evaluate Impact

When projects are proposed it is important to determine what impact, if any, the project may have on the environment. By obtaining geospatial data of the sensitive areas and overlaying potential infrastructure projects over them in GIS, potential impacts can be easily assessed from a geographic perspective.

Coordinate with Agencies

As previously stated, it is important to communicate with environmental agencies and groups, as well as TxDOT Environmental Coordinators, early in the planning process to identify potential conflicts and evaluate possible action

Environmentally Sensitive Areas

KTMPO actively researches the geographic location of environmentally sensitive areas and natural resources in the region, as depicted in Exhibit 10.5. The identification of these areas began with the established statewide datasets from state agencies and has been augmented with local data from member entities. The southwestern portion of the KTMPO region has the most concentration of sensitive areas, largely due to the watersheds and recharge zones for two major aquifers. Detailed information on the identified sensitive areas is discussed below.

Natural or Recreational Areas: A database is maintained of natural or recreational areas in the region, consisting of data from a variety of sources, including Texas Parks and Wildlife, TxDOT, and local entities.

Archaeological Sites: The Gault archaeological site is in the KTMPO region, west of Salado and south of Stillhouse Hollow Lake. Considered one of the major excavation sites in Texas, it is receiving international attention because of the wealth of new information on Clovis culture that is being discovered.

The MPO coordinates with TxDOT on issues related to identifying Native American tribal lands and potential artifact locations. Maps are available depicting historic tribal territories in Texas and KTMPO has access to a tribal representative database to obtain more information on tribal lands within the KTMPO region. The available maps indicate the KTMPO region is within historic tribal territories for two tribes—the Comanche Nation of Oklahoma and the Tonkawa Tribe of Oklahoma. KTMPO will continue coordination efforts to determine whether the MPO region lies within historic tribal territories of other Indian tribal groups with interests in Central Texas and will contact these groups as needed.

Historical Structures or Areas: Data for the National Register of Historic Places was obtained from

National Park Service for structures and districts, and additional local historic data has been received. These historic places are listed below in Exhibit 10.4.

Environmental Justice Communities of Concern (EJCOC): EJCOC areas were discussed in Chapter 2, Demographics, and are areas containing a higher percentage of low income or minority groups. The purpose of an environmental justice review is to ensure that federally-funded transportation projects do not adversely impact minority populations and low-income populations.

Landfills: The identification of closed landfills and waste disposal sites is important for new transportation projects, as soil testing may indicate poor load-bearing qualities, unsupportive of the weight of the roadway and heavy vehicle traffic. In this case, a costly and time-consuming process of removing the buried waste may be necessary. Hazards of excavating a previously closed landfill include contaminated water and the release of disease-causing pathogens to the surrounding area.

Watersheds: Of the Brazos River Basin, the watersheds present in the planning area include the Lampasas, Leon, Little, Lower Brazos-Little Brazos, Cowhouse, and San Gabriel watersheds. Though not depicted on the map, KTMPO has geospatial data detailing the location of the watersheds for use in analysis. Particularly sensitive, the Nolan Creek watershed, a part of the Leon River watershed, covers a large portion of the Killeen urbanized area and Little Nolan Creek from confluence with Nolan Creek/South Nolan Creek upstream has been determined by TCEQ to have elevated bacteria concentrations. These segments are classified as 5b, indicating that a review of the water quality standards for this water body will be conducted before a total maximum daily load (TMDL) will be scheduled.

Aquifers: The Trinity Aquifer underlies all of the planning area, while the Edwards Aquifer underlies the south-central portion. In an aquifer recharge zone, or outcrop, water from precipitation and/or storm water runoff may easily enter the aquifer system. If the runoff carries pollutants, these pollutants will also enter the aquifer system. Structural damage to the aquifer is also a concern as this could affect the ability of an aquifer to recharge.

The Edwards Aquifer is a karst limestone aquifer consisting of porous, honeycombed, rock in

which water easily moves through. In the recharge zone where the aquifer is exposed at the surface, the Edwards is highly faulted and fractured allowing large quantities of water to flow into the aquifer with little if any filtration. As a result, the Edwards aquifer recharge zone is considered particularly sensitive. In the downdip area of an aquifer, the water-bearing layers underlie other layers and are under artesian pressure. Construction projects in these areas should be carefully planned and monitored to ensure there is no loss of artesian pressure which can result in declining spring flows.

It should be noted that both the Trinity and Edwards BFZ aquifers are considered major aquifers by the Texas Water Development Board. Within the KTMPO planning boundary, there are several other groundwater resources that are smaller in extent and capacity and are not classified as major or minor aquifers. These other groundwater resources supply the majority of water wells in the eastern half of the KTMPO area and are relatively close to the surface, i.e. generally less than 100 feet below the surface.

Endangered species: While the KTMPO region is the home to several endangered species, the U.S. Fish and Wildlife Service has not identified any critical habitats in the region; therefore, there are currently no specific areas designated as essential for the conservation of an endangered species. Both U.S. Fish and Wildlife Service (USFWS) and Texas Parks and Wildlife maintain a county level inventory of species of special concern in Texas.

Exhibit 10.3 depicts the rare, threatened, or endangered species that are present in Bell County, the largest portion of the KTMPO planning area. The most well-known endangered species present include the black-capped vireo, the golden-cheeked warbler, and the whooping crane. Recently, there has been much discussion regarding the Salado Springs salamander. On February 24, 2014, the USFWS officially listed the Salado Springs salamander as threatened; critical habitat has not been designated at this time.

Exhibit 10.3: Rare, Threatened, or Endangered Species in KTMPO region

Rare, Threatened or Endangered Species in KTMPO Region				
Taxon	**Common Name**	**Scientific Name**	**Federal Status**	**State Status**
Amphibians	Salado Salamander	*Eurycea chisholmensis*	T	
Birds	Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	
Birds	American Peregrine Falcon	*Falco peregrinus anatum*	DL	T
Birds	Bald Eagle	*Haliaeetus leucocephalus*	DL	T
Birds	Black-Capped Vireo	*Vireo atricapilla*	LE	E
Birds	Golden Cheeked Warbler	*Setophoga chrysoparia*	LE	E
Birds	Henslow's Sparrow	*Ammodramus henslowii*		
Birds	Interior Least Tern	*Sterna antillarum athalassos*	LE	E
Birds	Mountain Plover	*Charadrius montanus*		
Birds	Peregrine Falcon	*Falco peregrinus*	DL	T
Birds	Red Knot	*Calidris canutus*	T	
Birds	Sprague's Pipit	*Anthus spragueii*		
Birds	Western Burrowing Owl	*Athene cunicularia hypugaea*		
Birds	Whooping Crane	*Grus americana*	LE	E
Fish	Guadalupe Bass	*Micropterus treculii*		
Fish	Smalleye Shiner	*Notropis buccula*	LE	
Insects	Leon River Winter Stonefly	*Taeniopteryx starki*		
Mammals	Cave Myotis Bat	*Myotis velifer*		
Mammals	Gray Wolf	*Canis lupus*	LE	E
Mammals	Llano Pocket Gopher	*Geomys texensis*		
Mammals	Red Wolf	*Canis rufus*	LE	E
Mammals	Plains Spotted Skunk	*Spilogale putorius interrupta*		
Mollusk	Smooth Pimpleback	*Quadruia houstonensis*	C	T
Mollusk	Texas Fawnsfoot	*Truncilla macrodon*	C	T
Mollusk	Texas Pimpleback	*Quadrula petrina*	C	T
Plants	Hall's Prairie Clover	*Dalea hallii*		
Plants	Hill County Wild-Mercury	*Argythamnia aphoroides*		
Plants	Glass Mountains Coral Root	*Hexalectris nitida*		
Plants	Reverchon's Curfpea	*Pediomelum reverchonii*		
Plants	Osage Plains False Foxglove	*Agalinis densiflora*		
Plants	Plateau Loosestrife	*Lythrum ovalifolium*		
Plants	Plateau Milkvine	*Matelea edwardsensis*		
Plants	Scarlet Leatherflower	*Clematis texensis*		
Plants	Sycamore Leaf Snowbell	*Styrax platanifolius*		
Plants	Tree Dodder	*Cuscuta exaltata*		
Plants	Texabama Croton	*Croton alabamensis var. texensis*		
Plants	Texas Almond	*Prunus minutiflora*		
Plants	Texas Fescue	*Festuca versuta*		
Plants	Texas Milk Vetch	*Astragalus reflexus*		
Reptile	Concho Water Snake	*Nerodia paucimaculata*	DL	
Reptile	Texas Garter Snake	*Thamnophis sirtalis annectens*		
Reptile	Texas Horned Lizard	*Phrynosoma cornutum*		T
Reptile	Timber Rattlesnake	*Crotalus horridus*		T

Federal Status Legend
LE: Listed Endangered
T: Threatened
C: Candidate
DL: Delisted

State Status Legend
E: Endangered
T: Threatened

Source: Texas Parks & Wildlife

Exhibit 10.4: National Register of Historical Places in the KTMPO Region

National Register of Historical Places				
County	City	Name	Facility	Address
Bell	Salado	Anderson House and Store	Historic House	35 S. Main St.
Bell	Salado	Armstong-Adams House	Historic House	Main St. and Thomas Arnold Rd
Bell	Belton	Austin, F.K. and Mary, House	Historic House	702 N. Penelope St.
Bell	Belton	Baggett, Ele, House	Historic House	1019 N. Main St.
Bell	Belton	Baggett, Silar and Ellen House	Historic House	1018 N. Main St.
Bell	Salado	Baines, George Washington, House	Historic House	316 Royal St.
Bell	Salado	Barbee-Berry Mercantile Building		Main and Royal St.
Bell	Temple	Barclay-Bryan House	Historic House	S. 25 St and W Ave. H
Bell	Bartlett	Bartlett Commercial Historic District	Historic District	Clark St bounded by SH 95 (East), E. Bell St. (North), E Pietzsch St. (South), Railroad Tracks (West)
Bell	Salado	Barton House	Historic House	101 N. Main St.
Bell	Belton	Baylor Female College Historic District	Historic District	Bounded by King, College and W. Ninth St.
Bell	Belton	Beamer, William, House	Historic House	1202 S. Beal St.
Bell	Belton	Bell County Courthouse	Courthouse	101 W. Central Ave.
Bell	Belton	Belton Academy	School	404 E. Ninth St.
Bell	Belton	Belton Commercial Historic District	Historic District	FM 93, Penolope St. and Nolan Creek
Bell	Belton	Belton Farmers' Gin Coop	Cultural Monument	219 S. East Ave., Building 4
Bell	Belton	Belton Standpipe	Cultural Monument	W Aveune J and Hughes St
Bell	Belton	Belton Yarn Mill	Cultural Monument	805 E. 4th Ave.
Bell	Belton	Birdwell, T. Hamp and Beulah, House	Historic House	503 N. Wall
Bell	Belton	Burford, R. F. and Lena House	Historic House	920 N. Penelope St.
Bell	Belton	Carnegie Public Library	Historic Library	201 N. Main St.
Bell	Belton	Cornelison House	Historic House	1102 N. Pearl St.
Bell	Salado	Davis House	Historic House	Main St.
Bell	Belton	Elliott, Joel, House	Historic House	716 N. College St.
Bell	Belton	Ferguson House	Historic House	518 N. 7th St.
Bell	Belton	Ferguson, James A., House	Historic House	1123 N. Beal St.
Bell	Belton	Ferguson, James E. and Miriam House	Historic House	604 N. Penelope St.
Bell	Belton	First Christian Church Parsonage	Historic Church	608 N. Penelope St.
Bell	Salado	Fowler House	Historic House	N. Main St.
Bell	Belton	Frazier, Dr. Jacob Moore House	Historic House	618 N. Wall St.
Bell	Belton	Gray Rental Houses	Historic House	702-708 N. Pearl St.
Bell	Salado	Halley, Capt. Robert, House	Historic House	Main St.
Bell	Belton	Hammersmith, John P. House	Historic House	520 S. Main St.
Bell	Belton	Harris, Capt. Andrew Jackson House	Historic House	1001 W. 10 St.
Bell	Salado	Hendrickson-Caskey House	Historic House	Center Circle
Bell	Belton	House at 402 N. East St.	Historic House	402 N. East St.
Bell	Belton	House at 730 N. Beal St.	Historic House	730 N. Beal St.
Bell	Belton	Hudson, Dr. Taylor, House	Historic House	324 N. Main St.
Bell	Belton	James House	Historic House	805 N. Beal St.
Bell	Killeen	Killeen Downtown Historic District	Historic District	Roughly Bounded by Ave. A (North), Santa Fe Plaza (South), N. 4th St (West), and N. 8th St. (East)
Bell	Belton	Kinchion, L.B., House	Historic House	702 S. Pearl St.
Bell	Temple	Kyle Hotel	Historic Inn	111 N. Main St.
Bell	Belton	Lee, Walter J., House	Historic House	804 N. College St
Bell	Belton	McWhirter, George and Martha, House	Historic House	400 N. Pearl St.
Bell	Belton	Means, V.R., House	Historic House	E. 14th St
Bell	Belton	Miller, J.Z., House	Historic House	804 N. Penelope St.
Bell	Belton	Miller-Curtis House	Historic House	1004 N. Main St.
Bell	Belton/Temple	Missouri, Kansas & Texas Railroad Bridge at the Leon River	Historic Bridge	Across the Leon River at Taylor's Valley Rd.
Bell	Belton	Morey House	Historic House	328 N. Main St.
Bell	Belton	Mount Zion United Methodist Church	Historic Church	218 Alexander St.
Bell	Belton	Naismith, Robert, House	Historic House	440 N. Penelope St.
Bell	Belton	Norton-Orgain House	Historic House	Main St.
Bell	Belton	Old St. Luke's Episcopal Church	Historic Church	401 N. Wall St.
Bell	Belton	Potts, Arthur, House	Historic House	445 N. Wall St.
Bell	Salado	Robertson, Col. Elijah Sterling Clack, Plantation	Historic Plantation	I-35 approximetely 0.25 miles southwest of Main St.
Bell	Salado	Rose, Maj. A.J., House	Historic House	Rose Way and Royal St.
Bell	Salado	Salado College Archeological Site	Archeological Site	Main St. & College Hill
Bell	Salado	Salado United Methodist Church	Historic Church	650 Royal St.
Bell	Salado	Stagecoach Inn	Historic Inn	416 S. Main St.
Bell	Belton/Temple	State Highway 53 Bridge at the Leon River (Waco Rd, Belton)	Historic Bridge	Waco Rd (FM 817) at Leon River
Bell	Temple	Temple Commercial Historic District	Historic District	Roughly bounded by French Av., 3rd St., Av. D & 6th St.
Bell	Salado	Tenney, Levi, House	Historic House	Pace Park Dr
Bell	Salado	Twelve Oaks	Historic House	Center Circle
Bell	Salado	Tyler House	Historic House	Main St.
Bell	Belton	Venable, W.J., House	Historic House	426 N. Wall St.
Bell	Salado	Vickery House	Historic House	Main St.
Bell	Belton	Ware, H. A. and Helena, House	Historic House	401 Pearl St.
Bell	Salado	White-Aiken House	Historic House	I-35
Bell	Temple	Wilson, Ralph, Sr., and Sunny House	Historic House	1714 S. 61st St.
Coryell	Copperas Cove	Copperas Cove Stagestop and Post Office	Historical Post Office	Ogletree Gap Park, Post Office Road

Evaluate Impacts

The evaluation of potential impacts of new transportation projects on sensitive areas helps prevent damage to the natural or historical environment of the region. Proposed transportation projects that intersect with any of the identified environmentally sensitive areas are shown on Exhibit 10.6. The appearance of projects in Exhibit 10.7 indicates that some part of the project lies in the same geographic location as one of the identified sensitive areas and should be addressed in the initial stages of planning. The awareness of the potential effects on these sensitive areas early in the planning process ensures that efforts and resources are not spent towards a project only to fail during the National Environmental Policy Act (NEPA) process, costing more resources as the project is changed or refined. It should be noted that the entire KTMPO region lies within one watershed or another, so this factor in itself was not considered in listing a project.

Exhibit 10.5: Environmental Sensitive Areas

Insert Updated Map

Exhibit 10.6: Proposed Projects in Environmental Sensitive Areas

Insert Updated Map

Exhibit 10.7: Proposed Project Listing with ENV Sensitive Areas

Insert Updated Map

Coordination with Agencies

KTMPO initially coordinated with statewide agencies in the identification of areas of environmental sensitivity, followed by outreach to local entities. These agencies and entities are shown below. An inventory of groups and agencies with interests in the KTMPO region will be maintained and augmented for use in coordination efforts as more groups are discovered and participate.

- **Environmental Protection Agency**
- **Texas Commission on Environmental Quality**
- **Texas Historical Commission**
- **U.S. Fish & Wildlife Service**
- **Texas Parks & Wildlife**
- **Texas Water Development Board**
- **Clearwater Underground Water Conservation District**
- **City of Belton**
- **City of Temple**
- **City of Killeen**
- **City of Harker Heights**
- **City of Copperas Cove**

Environmental Mitigation Activities

KTMPO will continue coordination with appropriate entities to identify environmentally sensitive areas and develop mitigation activities. To the extent possible, transportation projects should minimize off-site disturbance in sensitive areas and develop strategies to preserve air and water quality, limit tree removal, minimize grading and other earth disturbance, provide erosion and sediment control, and limit noise and vibration. Where feasible, alternative designs or alignments may be developed that would lessen the project's impact on environmentally sensitive areas. Federal Regulation 40 CFR 1508.20 suggests that typical steps for mitigation include the following:

- 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.

Effective mitigation starts at the beginning of the environmental process and should be included as an integral part of the alternatives development and analysis process. There are a variety of possible mitigation activities and measures that can be considered when dealing with environmental impacts, most of which should be considered during the project development process. The environmental mitigation strategies and activities shown on the following page are intended to be regional in scope, and may not necessarily address potential project-level impacts. As the location and magnitude of the proposed projects are determined, appropriate project level mitigation measures will be developed in consultation with appropriate entities.

Potential Environmental Mitigation Activities

Resource	Mitigation Measures
Natural/Recreational Areas	Avoidance; minimization; replacement property for open space easements to be of equal fair market value and of equivalent usefulness; design exceptions and variances; environmental compliance monitoring.
Archaeological Sites/Historic Structures and Areas	Avoidance; minimization; landscaping for historic properties; preservation in place of excavation for archeological sites; Memoranda of Agreement with the Department of Historic Resources; design exceptions and variances; environmental compliance monitoring.
EJCOC	Impact avoidance or minimization; context sensitive solutions for communities (appropriate functional and/or aesthetic design features).
Landfills	Avoidance; minimization; design exceptions and variances; environmental compliance monitoring.
Watersheds/Aquifers	Avoidance; minimization; design exceptions and variances; environmental compliance monitoring.
Endangered Species	Avoidance; minimization; time of year restrictions; construction sequencing; design exceptions and variances; species research; species fact sheets; Memoranda of Agreements for species management; environmental compliance monitoring.

SUSTAINABILITY

Sustainability is defined as the capacity to maintain, support, or endure. Since the 1980's, *sustainability* has been used more in the sense of human sustainability on planet Earth and this has resulted in a definition related to the concept of sustainable development as follows: sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations, 1987).

Incorporating Sustainability into the Planning Process

Sustainable transportation is the process of designing transportation systems in order to improve livability and mobility by simultaneously meeting social, environmental, and economic goals. It is not an end state, but it is an interlocking series of processes, guided by a collection of principles to meet the needs of present and future members of the community by conserving natural resources. KTMPO may choose any combination of accepted best practices to implement sustainability principles:

Triple Bottom Line – considering the Social, Environmental and Economic impacts equally.

Life Cycle Assessment – considering environmental impacts over the life of a project.

Project Scoring and Selection – placing higher value on projects or methods that combine a positive effect on quality of life with minimal impact on the natural environment.

Performance Measures – Collecting data from multiple sources related to the Triple Bottom Line. Public Surveys, Air Quality Monitoring, Cost Analysis, and other metrics may be used.

INVEST - Employing the web-based tools developed by FHWA: www.sustainablehighways.org.

Congestion Management – implementing a broad policy in order to improve mobility and reduce emissions, resulting in higher quality of life for our region.

Materials Selection – Seeking ways to use recycled materials during construction and maintenance, and eliminate use of non-renewable resources.

Energy Efficiency – Developing projects to maximize efficient travel in terms of time and fuel.

KTMPO will strive to inform and educate the public on sustainability through various media to include the KTMPO website, and incorporate the practices and principles discussed above into the transportation planning process.

KTMPO seeks to include as many of the principles of sustainable transportation as described by FHWA, American Association of State Highway and Transportation Officials (AASHTO), American Society of Civil Engineers (ASCE), TXDOT, and other organizations. These principles are in line with KTMPO goals and include but are not limited to:

Strategies for Implementing Sustainable Principles

Access	providing the same level of service to all members of the community
Movement	balancing the need to move people and goods, free from congestion
Choice	providing a range of options, including public transit, bicycles and walking, and alternate routes to alleviate bottlenecks
Environmental Justice	ensuring that low-income or minority communities do not suffer adverse effects of construction or design of transportation systems
Economic Impact	considering the local and regional financial effects
Environmental Impact	examining the impact during construction as well as the impact of obtaining, processing and transporting various road-building materials, and the long-term impact of the different components of the transportation system

KTMPO acknowledges that sustainable transportation planning is a complex and challenging undertaking. Sustainable principles may be applied to any of our planning focus areas, listed below:

- Long and Short-Range Planning
- Project Scoring and Prioritization
- Project Selection and Funding
- Traffic Modeling and Forecasting
- Congestion Management
- Intelligent Transportation Systems (ITS)
- Environmental Justice
- Air Quality
- Safety

- Public Involvement, Outreach, and Education

CONTEXT SENSITIVE SOLUTIONS

Overall, context sensitive solutions techniques provide a more enjoyable experience of the transportation system. Community participation is encouraged in developing the project design concept and considering community needs and concerns in project implementation. As a result:

- Local leader commitments to the project are enhanced
- Dialogue between local entities and the MPO is further supported
- Purpose of a given project is clearly defined
- Land use decisions in the area are coordinated
- Lines of communication regarding multi-modal transport are opened
- Environmental, aesthetic and scenic harmony is promoted
- Overall system user safety and security is improved
- Project expectations yield more positive results
- More stakeholders are integrated and efficiency of resources is increased
- Local issues are addressed while increasing long-term value for community

Context sensitive solutions (CSS) Is a collaborative, interdisciplinary approach that involves all stakeholders in providing a transportation facility that fits its setting. It is an approach that leads to preserving and enhancing scenic, aesthetic, historic, community, and environmental resources, while improving or maintaining safety, mobility, and infrastructure conditions.

Source: Results of Joint AASHTO/FHWA Context Sensitive Solutions
Strategic Planning Process, Summary Report, March 2007


Plaza Dr

Currently, TxDOT Waco and Brownwood Districts have taken the lead on Context Sensitive Solutions for a variety of projects in the KTMPO area, most notably the I-35 expansion. With this aspect being shifted towards the MPO, KTMPO is researching methodologies to integrate CSS into the public participation process through TxDOT's experience. Of note, the City of Harker Heights recently adopted "Designing Walkable Urban Thoroughfares: A Context Sensitive Approach" as the design manual for use in the Development Overlay District 1—The Knights Way Corridor (FM 2410 Overlay). TxDOT has also adopted this publication as an appropriate design manual and city officials have encouraged TxDOT to implement the recommendations for

projects in Harker Heights.