

SECTION 3.0 RECOMMENDED PLAN

A trench filled revetment is the recommended plan (Figure 3.0). It was determined that it would provide the greatest net benefits with annual benefits in excess of annual costs. It would consist of a trench filled revetment excavated into the embankment and filled with riprap to prevent erosion from reaching the bridge abutment.

The additional land required for project construction, operation, and maintenance is privately owned. The Kansas Department of Transportation, who is the non-federal sponsor, operates and maintains the right-of-way for U.S. Highway 83. The area along the toe of the riverbank where construction would take place is within the ownership of the State of Kansas and no interest in real estate would need to be acquired. Approximately 1.7 acres of additional right-of-way would need to be acquired for the area occupied by the rock filled trench.

The section of bank receiving impinging flow would be reshaped to deflect the flow and armored with riprap. Compacted fill would replace the lost bank and the new surface would be armored with 24-inch riprap. The revetment would wrap around the bridge embankment and redirect flows away from the bridge embankment. It would have three different legs. An upstream leg would lie about 60 feet inside the right-of-way fence (Photo 3.0) and extend parallel to the fence approximately 275 feet to the existing channel and leg two. Leg two would then extend diagonally towards the bridge another 264 feet where it would join leg three which would extend under and perpendicular to the bridge for another 140 feet. The length of the revetment would prevent flanking by erosional flows. Excavation would be to the expected scour depth.

Leg one and leg three would consist of an excavated trench filled with riprap and covered with one foot of topsoil. The trench would be excavated to a depth of 12 feet with 1V:1.5H side slopes and a three foot bottom width as shown in figure 3. The trench would be filled with 24-inch graded riprap. Topsoil would be placed over the rock filled trench and replanted with native vegetation. A more detailed description of the restoration of the project area is provided in SECTION 6.0 (RESTORATION PLAN).

Two similar designs would be used for leg two as shown in figure 3. The river bank would be graded to a 1V:3H slope. Filter cloth would then be placed and covered with a 9-inch aggregate bedding. Compacted fill would be used where needed to bring the structure to grade. The base of this section would be a nine-foot wide trench over-excavated six feet below the existing river bed, covered with filter cloth, and filled with 24-inch graded riprap. Embedded filter cloth would be placed in a one-foot deep trench along the top of this section.

The recommended plan would have insignificant environmental impacts. Construction would have minimal temporary adverse impacts to the biological resources along the excavated area by removing and disturbing vegetation and by displacing local fauna. The channel is dry during most of the year so the project would not impact aquatic species.

This plan was selected because it would have a benefit/cost ratio of 7.0, is expected to provide net annual benefits of \$263,133, and meets the benefit/cost requirement for Federal interest. It would provide long-term protection for the bridge abutment and protect against loss of the bridge. The Kansas Department of Transportation supports this plan.

SECTION 4.0 AFFECTED ENVIRONMENT

4.1 Location

The project is located in Finney County in western Kansas on the U.S. Highway 83 bypass bridge over the Arkansas River at Garden City.

4.2 Climate

The climate of the upper Arkansas River in Kansas is semi-arid to subhumid. The mean annual temperature at Garden City is 53.6 °F, the mean January temperature is 28.3 °F, and the mean July temperature is 80.1 °F.



Photo 3.0 Leg one of revetment parallels right-of-way fence in foreground.

The mean annual precipitation recorded in the area between 1961 and 1990 varies from 17.9 inches at the KSU Experiment Station east of Garden City to 19.4 inches at the airport east-southeast of Garden City. The precipitation is generally lowest in the winter and highest in the months of May-July (0.35 inches in January to about 3.0 inches in May and June at Garden City). The precipitation does range substantially from year to year. The mean annual minimum precipitation during 1961-1990 was 11.4 inches at the KSU Experiment Station and 10.3 inches at the Garden City airport. The mean annual maximum precipitation during 1961-1990 was 27.7 inches at the Experiment Station and 30.8 inches at the airport. The average annual snowfall is about 19 inches.

The mean annual rate of potential evapotranspiration is high; mean annual values are approximately 28 to 30 inches. The mean potential evapotranspiration exceeds the mean precipitation by about 8 inches annually in the project area.

Garden City's elevation is about 2,900 feet above sea level. The prevailing wind is southerly. Summers are usually warm and moderated by steady wind and relatively low humidity. Winters are usually mild with short periods of very cold weather. Spring is the most varied season and is the period of heaviest rainfall due to severe thunderstorms and occasional tornadoes.

4.3 Social and Economic Conditions

The proposed project would have a direct impact on persons living and working in  City of Garden City. This area is considered the social area within which the primary impacts of the proposed project would occur.

The U.S. Census Bureau estimates that Garden City had a population of 28,451 in 2000, which is an 18% increase over the 1990 population of 24,097. Finney County had a population of 40,082 in the year 2000, a 22.5% increase above the 1990 Census count. The State of Kansas posted a population increase of 8.5% during the same period. According to the 2000 Census, the median resident age for Garden City was 28.6 years. Hispanic or Latino people comprised 43.9% of the total population with American Indian/Alaska Native making up 1.6%.

In 2000, there were 13,799 residents in the labor force in Garden City of which only 5.3 percent were unemployed. The State of Kansas unemployment rate was 4.2% during the same year. The majority of the area's employees worked in manufacturing, educational, health, and social services sectors. Manufacturing provided 23.9% of the employment for Garden City.

The 2000 per capita income (PCI) for residents in Garden City was \$15,200. This compared with \$20,506 PCI for the State of Kansas and \$21,587 for the entire United States.

The social area is primarily residential, with an additional mix of industrial, commercial and agricultural operations. Today Garden City serves as a center of manufacturing, educational and health services, and the service industry. Garden City also served as a social and economic center when the region's economy was more agriculturally oriented.

4.4 Natural Resources

4.4.1 Terrestrial

The study area lies within the High Plains region of the Great Plains physiographic province. North of the Arkansas River floodplain the upland surface is nearly level and is covered by loess. Sand dunes are the dominant topographic features south of the Arkansas River floodplain and the topography can be described as rolling, hummocky, or undulating depending on the thickness of the dune sand and the complexity of the dunes. The project lies within the floodplain of the Arkansas River and drains an area that has a flat lowland topography with very little relief.

The predominant land use in the project area is agricultural. Much of the land is in irrigated cropland. Other agricultural uses are dryland farming, rangeland, and feedlots. Two large areas of grassland remain in Finney County south of the Arkansas River. This land use is a result of restrictions for crops related to topography and sandy soils and use for non-crop purposes such as residences and a game refuge. The major agricultural crops are corn, grain sorghum, alfalfa, and wheat. Urban land use is primarily in Garden City. Roads and railroads comprise a substantial portion of the land not in cropland and rangeland. Industrial land uses in the project area corridor include companies processing agricultural products, sand, oil and gas wells and facilities associated with petroleum production and distribution, and electrical energy production.

The project area is located in the sand-sage prairie grassland type. Only a few tree and shrub species occur in the project area. Dominant species include sand sage (*Artemisia filifolia*), and other less common species of sage such as silky wormwood (*Artemisia dracunculus*), white sage (*Artemisia ludoviciana*), and Carruth sage (*Artemisia carruthyii*). Shortgrass species together with the inclusion of several tallgrass species make this area unique. Species in the area include sand bluestem (*Andropogon hallii*), buffalograss (*Buchloe dactyloides*), blue grama (*Bouteloua gracilis*), sand dropseed (*Sporobolus cryptandrus*), sideoats grama (*Bouteloua curtipendula*), western wheatgrass (*Agropyron smithii*), alkali sacaton (*Sporobolus airoides*), and little bluestem (*Schizachyrium scoparium*). The project area is nearly devoid of trees and shrubs with only a few scattered cottonwood (*Populus spp.*), willow (*Salix spp.*), and salt cedar (*Tamarix ramosissima*). Tumbleweed (*Amaranthus graecizans*) is widespread. (Photo 4.4.1)

4.4.2 Soils

Soils in the project area are of the Las-Las Animas Association. They consist of calcareous, sandy soils that have a weakly developed profile. They formed under native grasses in calcareous, sandy alluvium on the flood plains of the Arkansas River. They are soils in and adjacent to the channel of the river. Two soil types occur at the



Photo 4.4.1 Habitat at the project site.

proposed project. They include Las Animas-Lincoln loamy sands and Lincoln soils. Neither is classified as prime farmland.

Las Animas-Lincoln loamy sand (L1) occurs on 0 to 2 percent slopes, with a surface layer of loamy sand and a subsoil of brown sandy loam. Coarse sand and gravel underlie this soil at a depth of 18 to 60 inches. This soil is not suitable for cultivation, because of its low moisture-holding capacity and susceptibility to erosion. They are suitable for grazing where a proper stocking rate is strictly followed.

Lincoln soil (Lm) occurs on 0 to 2 percent slopes and formed in alluvium. They are sandier than the Las Animas soils. Their fertility and moisture-holding capacity is very low. In general these soils consist of fine sand and loamy fine sand. Coarse sand is at a depth of less than 18 inches. These soils support a sparse stand of mid grasses, tamarisk, and cottonwoods. They have only limited value for grazing because they are unstable and vegetation is extremely variable.

4.4.3 Prime Farmland

Soil that is prime or unique farmland as defined in the Farmland Protection Policy Act is classified as prime farmland. According to the U.S. Department of Agriculture, it is soil that is best suited for producing food, feed, forage, fiber, and oilseed crops. Neither Las Animas-Lincoln loamy sand nor Lincoln soil is classified as prime farmland.

4.4.4 Wild and Scenic Rivers

There are no streams within the project area that are classified as wild and scenic pursuant to the Federal Wild and Scenic Rivers Act, Public Law 90-542.

4.4.5 Aquatic and Wetlands

Western Kansas is a region of low rainfall and high evapotranspiration (See Section 4.2 Climate). Essentially the Arkansas River at the project site is a dry riverbed throughout much of the year. There are no substantial tributaries to the Arkansas River from the Colorado-Kansas line to Garden City. During many years of the last three decades, the river has ceased to flow upstream of Finney County because of infiltration through the streambed, diversion from the river for irrigation, evaporation, and seepage into the underlying aquifers. During years with large snow melt from the Rocky Mountains and above average precipitation in eastern Colorado, high river flows can fill the channel.

The channel of the Arkansas River is higher than the channels of the Smoky Hill and Pawnee rivers to the north and the Cimarron River to the south. The Arkansas River enters the state at a much lower altitude than either the Smoky Hill or Cimarron but descends less rapidly eastward. The average gradient of the river as it crosses Finney County is about 7 feet to the mile. The width of the Arkansas River valley is about 3.5 miles near Garden City.

When there is water in the Arkansas River it is saline during both low and high flows. The salinity of the water derives from substantial concentrations of dissolved solids in the river water and by consumptive loss of water to evapotranspiration. The major dissolved constituents in Arkansas River water, in the order of decreasing concentrations, are sulfate, sodium, bicarbonate, calcium, magnesium, chloride, and silica.

There are no wetlands in the immediate project area.

The project falls within the scope of the Nationwide Permit for Bank Stabilization. A copy of the review pursuant to Section 404 of the Clean Water Act is in Appendix B.

4.4.6 Fish and Wildlife

Fish habitat at the project site is non-existent since the river is dry during a significant part of the year (Photo 4.4.6).

Amphibians that could occur in the project area include Great Plains toad (*Bufo cognatus*), plains spadefoot toad (*Spea bombifrons*), plains leopard frog (*Rana blairi*), western chorus frog (*Pseudacris triseriata*), Blanchard's cricket frog (*Acris crepitans*), and bullfrog (*Rana catesbeiana*). Common species of reptiles that could occur in the project area include the earless lizard (*Holbrookia maculata*), Texas horned lizard (*Phrynosoma cornutum*), six-lined racerunner (*Cnemidophorus sexlineatus*), Texas longnose snake (*Rhinocheilus lecontei tessellatus*), western hognosed snake (*Heterodon nasicus*), bull snake (*Pituophis melanoleucus*), ornate box turtle (*Terrapene ornata*), snapping turtle (*Chelydra serpentina*), and western painted turtle (*Chrysemys picta*).

Birds that are most likely to occur in the area include mourning dove, lesser prairie chicken, bobwhite quail, scaled quail, ring-necked pheasant, lark sparrow, Cassin's sparrow, western meadowlark, and Mississippi kites. In winter large flocks of migrating waterfowl utilize a 'duck pond' located on the Finney Game Refuge just southwest of the project site.

Mammals most likely to occur in the area include species typical of the sand-sage prairie such as mule deer (*Odocoileus hemionus*), whitetailed deer (*Odocoileus virginianus*), Ord's kangaroo rat (*Dipodomys ordii*), 13-lined ground squirrel (*Spermophilus tridecemlineatus*), spotted ground squirrel (*Spermophilus spilosoma*), coyote (*Canus latrans*), raccoon (*Procyon lotor*), opossum (*Didelphis marsupialis*), striped skunk (*Mephitis mephitis*), eastern spotted skunk (*Spilogale putorius interrupta*), black-tailed jackrabbit (*Lepus californicus*), and cottontail rabbit (*Sylvilagus floridanus*). The nearby Finney Game Refuge is home to the oldest publicly owned bison (*Bison bison*) herd in the state of Kansas and supports a small colony of black-tailed prairie dogs (*Cynomys ludovicianus*).



Photo 4.4.6 Dry riverbed at project site.

4.5 Threatened and Endangered Species

The Federal Register (Vol. 66, No. 65 / Wednesday, April 4, 2001; Final Designation of Critical Habitat for the Arkansas River Basin Population of the Arkansas River Shiner; Final Rule) lists the mainstem of the Arkansas River in Kansas from the Kansas State Highway 27 bridge in Hamilton County, Kansas, downstream to the Oklahoma state line as designated critical habitat for the Arkansas River Shiner. The Rule further states that the River ceases to flow between Syracuse and Garden City, Kansas, due to surface and groundwater withdrawals; that surface flow then resumes near Great Bend, Kansas; and that the lack of sufficient streamflow and ongoing water quality degradation renders much of the Arkansas River west of Great Bend at least seasonally unsuitable for Arkansas River shiner. The Rule designates 'Lateral Extent of Critical Habitat' as a 300-foot lateral corridor of riparian (ie, wetlands) habitat measured from bankfull; and lists 'Primary Constituent Elements' that identify physical and biological features that are essential to conservation of the species. The project site is less than 10 acres in size, with the footprint of the rock-filled trench being within 150 feet of the existing bridge approach; does not contain any riparian (wetland) habitat; and does not provide most of the primary constituent elements. The river in this area is dry during a significant part of the year.

State-listed threatened and endangered species known or likely to occur in Finney County includes the bald eagle, flathead chub (*Platygobio gracilis*), least tern, peregrine falcon, piping plover, snowy plover, Texas longnose snake, white-faced ibis, whooping crane, and eastern spotted skunk. Only two of those species, the Texas longnose snake and the eastern spotted skunk realistically could occur in the immediate project area.

The Texas longnose snake inhabits rocky canyons and open prairies with sandy soils in southwestern Kansas. They are almost exclusively nocturnal and are most active in the early evening. They burrow readily in loose soil but will enter crevices if available rather than by burrowing. They will utilize riparian habitat but not aquatic habitat. Food consists of snakes, lizards, lizard eggs, small mammals and large insects such as grasshoppers.

The Kansas Department of Wildlife and Parks has designated all suitable habitats within a riparian corridor along the main stem Arkansas River in Finney County as critical habitat for the eastern spotted skunk. The corridor's outermost boundary is along a line 0.5 mile landward from the ordinary high water mark on each bank.

Spotted skunks are smaller and more weasel-like in body shape than the more familiar striped skunk. The spotted skunks' strips are broken in pattern, giving it a 'spotted' appearance. Spotted skunks may occur in suitable habitat anywhere in the state. They seem to prefer forest edges and upland prairie grasslands, especially where rock outcrops and shrub clumps are present. In western counties, it relies heavily on riparian corridors where woody shrubs and woodland edges are present. Woody fencerows, odd areas, and abandoned farm buildings are also important habitat for spotted skunks.

4.6 Cultural Resources

In accordance with Section 106 of the National Historic Preservation Act of 1966 (as amended), in 2004 consultation was initiated with the Kansas State Historic Preservation Office (SHPO). Earlier in 2003, consultation for the general Garden City area, specifically relating to the Arkansas River ecosystem restoration from west of Garden City through the current Highway 83 bridge on the east side of town, was initiated with appropriate Native American tribes. These tribes included the Apache Tribe of Oklahoma, Cheyenne-Arapaho Tribes of Oklahoma, Comanche Tribe of Oklahoma, Kiowa Tribe of Oklahoma, and Wichita and Affiliated Tribes of Oklahoma.

In a letter dated April 5, 2004 the Kansas SHPO indicated that the project would have no effect on historic properties (Appendix D), thereby completing Section 106 coordination with the SHPO for the proposed project. Prior to correspondence with the SHPO, in the summer of 2003, the Comanche Tribe of Oklahoma contacted the Corps of Engineers, requesting further consultation. This consultation was conducted via telephone in early July 2003, when the Comanche tribal cultural resources representative requested further clarification of the proposed project effects, and the project area footprint for the ecosystem restoration project. Consultation revealed that the Comanche had historically utilized the Arkansas River for spiritual cleansing ceremonies, and that it was possible that during the course of project construction, certain associated materials used in these ceremonies might be identified. If such materials are encountered, the Comanche wish to be contacted. There were otherwise no objections to the progression of the project.

4.7 Air Quality

The U.S. Environmental Protection Agency (EPA) published a Conformity Rule on November 30, 1993, requiring all Federal actions to conform to appropriate State Implementation Plans (SIP's) that were established to improve ambient air quality. At this time, the Conformity Rule only applies to Federal actions in non-attainment areas. A non-attainment area is an area that does not meet one or more of the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act (CAA).

Garden City is in a predominately rural area of western Kansas. There are no air quality monitoring stations in Garden City. The Kansas Department of Health and Environment has a Special Purpose Monitor (SPM) to monitor for particulates in Dodge City, which is approximately 55 miles east of the project site. The nearest State and Local Air Monitoring Station (SLAMS) is located in Wichita, which is over 200 miles east of the project site. The Wichita-Sedgwick County Health Department monitors air quality in Wichita and the surrounding area for both criteria pollutants and air toxins. National Ambient Air Quality Standards exist for six pollutants: carbon monoxide, ozone, particulate matter smaller than 10µm, sulfur dioxide, nitrogen oxides, and lead. These "criteria pollutants" are the only ones for which standards have been established. The EPA assigns designations, based on an area's meeting, or "attaining" these standards. The Wichita-Sedgwick County area is designated "In Attainment" for criteria pollutants and air toxins.

A conformity determination based on air emission analysis is required for each proposed Federal action within a non-attainment area. Since this geographical region is in attainment and meets the National Air Quality Standards for the criteria pollutants designated in the CAA, a conformity determination is not required.

4.8 Hazardous, Toxic, and Radiological Waste

Potential for discovery of hazardous material during construction of the Arkansas River Highway 83 Bridge, Streambank Protection Project, in Garden City, Kansas was evaluated through examination of historic and current land use, review of environmental databases, interviews with local regulatory personnel, and visual observations. Avoidance of HTRW during construction is desirable in order to minimize project delays, remediation costs, and environmental damage.

Lands in the project area are primarily composed of agricultural land. As such, these lands have not been subject to industrial development or other land use activities with associated potential for significant contamination. In addition, lands in close proximity to the project area share similar land uses and has a low potential for contaminant transport to the project. Accordingly, there is no reason to believe that environmental media in the project area have been significantly contaminated by past or current land practices or by releases from adjoining properties. No hazardous, toxic, or radiological waste was observed, and potential for encountering these materials does not appear likely.

A search of environmental databases revealed no documented areas of contamination near the project location. A search of the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database revealed the presence of two CERCLIS-listed sites in Finney County, Kansas. However, both are located over three miles from the proposed project. Similarly, 11 sites listed on the Enforcement and Compliance History Online (ECHO) database were noted in Finney County. Of these sites, none are located in Garden City, Kansas and all are removed from the construction area. Equipment used in the sand operations on the river were noted in the area but not believed to be hazardous or toxic. Based on this information from environmental databases and documents there is a low probability of HTRW related problems from documented areas of local contamination.

In addition to searches of environmental databases, local personnel from the Garden City area and Finney County, Kansas area were contacted, in conjunction with the ongoing Ark River 1135 Project, for information related to potential areas of contamination that could affect project construction or operation. The US Highway 83 Bridge project is within the project area of the Ark River 1135 Project. These personnel included personnel from the Garden City Zoological Center and residents in Garden City, Kansas. All contacted individuals were unaware of any HTRW related issues near the site.

Finally, a site visit was conducted on May 28, 2003, in conjunction with the ongoing Ark River 1135 Project, and included a search for visual evidence of potential HTRW-related problems. This involved walking the project area as well as visual reconnaissance of surrounding areas. Areas of soil staining, evidence of unusual vegetative distress, drums of containerized waste, unusual topography (mounds or depressions), or other visual evidence of potential contamination were not noted at any location within the proposed Highway 83 Bridge project.

SECTION 5.0 ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

A summary of environmental impacts is presented in Table 5.0, Impact Assessment Matrix.

5.1 Social and Economic Impacts

5.1.1 Future Without-Project Conditions

Under the without-project conditions, population trends of the past decade would likely continue. Job opportunities in Garden City and the demand for residential lands will be linked to future population dynamics in the area. US Highway 83 is a major north-south traffic route in western Kansas and carries a significant amount of large truck traffic. The Highway 83 Bypass routes most of this traffic around the City. In the absence of the bridge