DRAFT
ENVIRONMENTAL ASSESSMENT
US HIGHWAY 83 BY-PASS BRIDGE
EMERGENCY STREAMBANK PROTECTION PROJECT
GARDEN CITY, KANSAS

SECTION 1.0 PURPOSE, NEED, AND SCOPE

This study is being conducted under authority of Section 14 of the 1946 Flood Control Act, as amended, by Section 915 of Public Law 99-662. The purpose of the project is to protect the integrity of the US Highway 83 By-pass Bridge southeast of Garden City in Finney County, western Kansas (Figure 1.0). The river has intermittent flows but during flood events the river can carry high velocity, bankfull flows.

The erosion is caused by the lateral migration of the river. Photo 1.0 depicts how the river has migrated south and how it approaches the bridge abutment at a right angle before making a 90 degree turn to the north and continues parallel to the bridge until it makes a 90 degree turn east and passes under the bridge. Erosion has already impacted the base of the abutment (Photo 1.1). From the photo it also appears that the lateral migration of the river may have been accelerated by the operation of a sand plant just upstream of the bridge on the left bank of the river. The soils are sandy and easily erodable during high flow events. A large flow event could destroy the south bridge approach and bridge abutment in one occurrence. The project would protect the bridge from erosion by stabilizing the right bank of the Arkansas River upstream of the bridge abutment.

Without protection, the bridge would become unsafe and have to be closed. US Highway 83 is a major north-south traffic route in western Kansas. Since the by-pass serves as a major traffic route around the city, its closure would place a severe economic and logistical hardship on the city and the users. The forced rerouting of traffic would be through downtown Garden City. Twenty-five percent of the 3500 vehicles that use the bridge daily are tractor-trailers and the city streets of Garden City will not support that amount of tractor-trailer traffic.

The National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190) requires all Federal agencies to address the environmental impacts of any major Federal action on the natural and human environment. Guidance for complying with the NEPA is contained in Title 40 of the Code of Federal Regulations (CFR), Parts 1500 through 1508, and in Engineering Regulation (ER) 200-2-2, *Procedures for Implementing NEPA.* The primary intent of NEPA is to ensure that environmental information is made available to public officials and citizens regarding major actions taken by Federal agencies. This environmental assessment was developed to assure that construction of the proposed project complies with the intent of NEPA.

SECTION 2.0 ALTERNATIVES

Alternatives to the Proposed Action included a no action plan, and several river training, bank armoring, and abutment protection methods.

2.1 No Action Alternative

The Council on Environmental Quality (CEQ) regulations implementing the provisions of the National Environmental Policy Act of 1969 (NEPA) require Federal agencies to consider a "no action" alternative. These regulations define the "no action" alternative as the continuation of existing conditions and their effects on the environment, without implementation of, or in lieu of, a proposed action. This alternative represents the existing condition and serves as the baseline against which to compare the effects of the other alternatives. This is an emergency streambank protection project and under existing conditions, without Federal assistance, it is highly probable that the erosion will destroy the approach and damage the bridge. It is possible that the next high flow

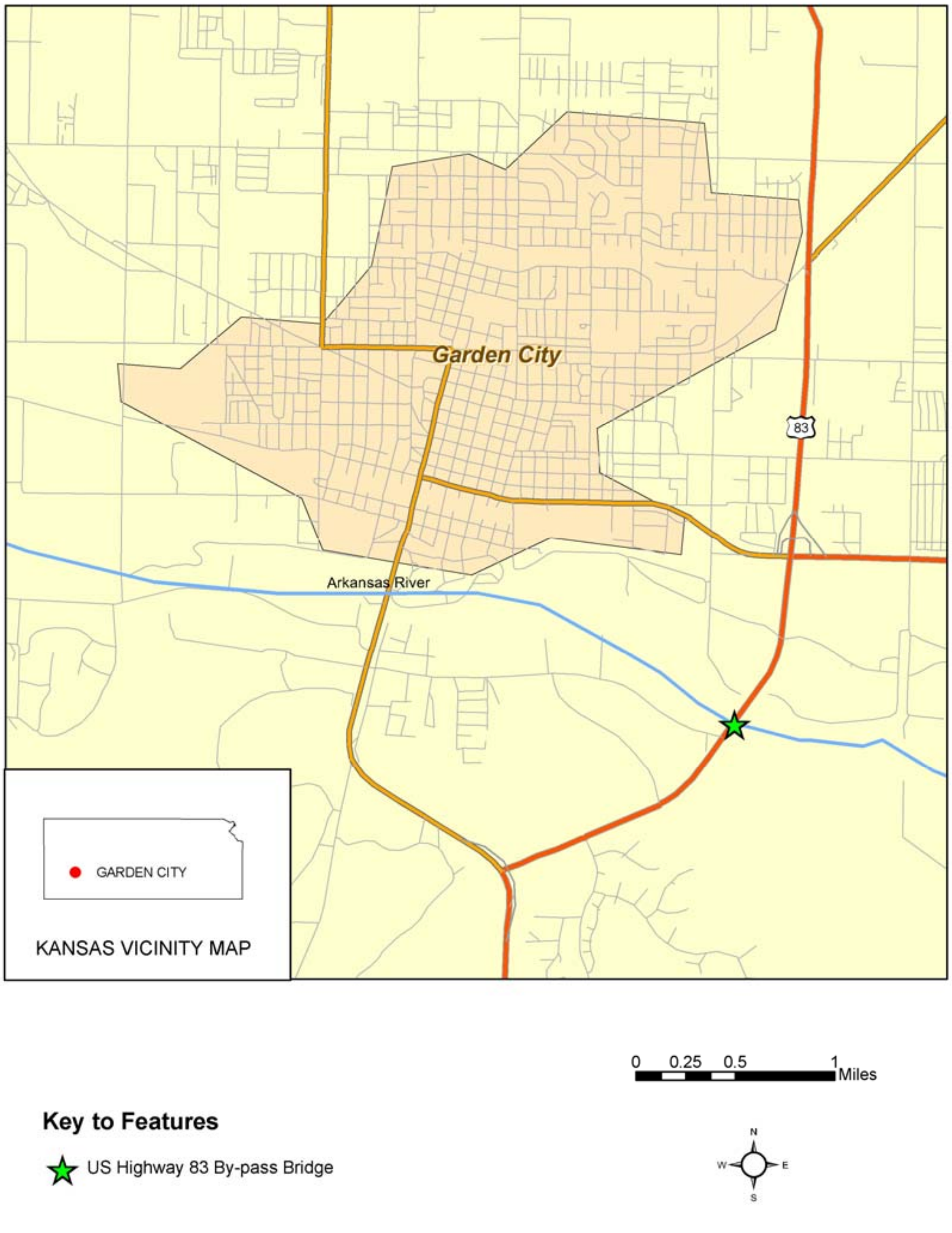

Figure 1.0 Vicinity Map, US Highway 83 Emergency Protection Project, Garden City, Kansas

Photo 1.0 Arkansas River approaching US Highway 83 By-pass Bridge


Photo 1.1. Erosion damage to the base of the abutment.

event could damage the bridge abutment or cut around the bridge. The no action alternative would retain the existing condition and would not result in any project-related environmental impacts or losses of fish and wildlife habitat.

2.2 Action Alternatives

The development of alternatives to the no action condition considered a number of factors. Alternatives were developed to minimize impact to the channel bed because of the critical habitat designation of the stream reach for the endangered Arkansas River shiner. The alternatives considered included river training, bank armoring, and abutment protection methods.

A non-structural solution using only vegetation and/or slope grading was considered, but discounted. The lack of available land to cut back the slope and the sandy nature of the soil eliminated this type of erosion protection project from further consideration. The most effective and efficient protection was determined to be a structural approach. Vegetation was determined to be necessary where feasible to stabilize soils just above the structural features, to reduce soil loss from wind erosion and to increase acceptance of the project by other Federal and state agencies. Vegetation will be discussed in the Restoration Plan in Section 6.0.

2.2.1 River Training

Channelization; construction of bendway weirs; and construction of jetties, dikes, or rock vanes were considered and dropped from further study.

Channelization to direct flows to a better approach to the bridge would not be a long-term solution. Due to the sandy nature of the bed material the river would likely change course again after one or two high flow events. This reach of the river is designated critical habitat for the Arkansas River shiner and work in the channel was avoided as far as possible.

Bendway weirs are not feasible due to the channel geometry at the site. The radius of the bend is too small.

Jetties, dikes or rock vanes used in conjunction with stone toe protection would be feasible. However, the cost would be high due to the lack of acceptable stone in the area. The structures would have to be very large due to the channel geometry and hydraulic characteristics of the river.

2.2.2 Bank Armoring

A-jacks were considered but are not commonly used in rivers this large. Small A-jacks used for toe protection would need to be used in conjunction with other methods.

Bank armoring with graded riprap is commonly used. The bank slope would be too steep at the bridge abutment due to the lack of space between the riverbank and the bridge abutment. The length of bank armored would need to be too long to prevent flanking.

The use of gabions is technically feasible but would be more expensive than riprap.

2.2.3 Abutment Protection

Sheet pilings were considered. Sheet pilings driven below scour depth in the embankment around the abutment and used with toe protection would protect the bridge and highway approach but would be expensive.

A trench filled revetment excavated into the embankment and filled with riprap, then covered with soil would prevent erosion from reaching the bridge abutment. The section of the embankment taking the main impact of the existing flow of the river would be reshaped to deflect the flow. Compacted fill would replace the lost bank and the new surface would be armored with 24-inch riprap. The trench would wrap around the bridge embankment.

2.3 Final Alternatives

The alternatives listed above were screened through engineering design and analysis to determine structural stability. Screening level costs were then developed for four plans determined to be structurally stable. The highest cost plan was dropped and the following three alternatives were evaluated during the final cost comparison.

1. Bank Armoring with Riprap. The existing bank would be shaped to a 3H:1V slope and covered with gravel bedding and riprap. Cut and fill would be about even. The new toe would extend into the channel about 21 feet when completed. This would push the channel back near the pre-1995 location. Total implementation cost: $716,100. Annual benefits: $311,700. Annual cost: $51,286. Benefit-Cost Ratio: 6.1.

2. Trench Filled Revetment. A trench would be excavated into the embankment and filled with riprap. The trench would be located to deflect flows away from the bridge embankment and prevent flanking by erosion flows. The trench would be excavated to expected scour depth. The section of bank receiving impinging flow would be reshaped and armored with riprap. Total implementation cost: $634,700. Annual benefits: $311,700. Annual cost: $44,567. Benefit-Cost Ratio: 7.0.

3. Sheet Pilings. Sheet pilings would be placed to protect just the bridge and bridge embankment. The sheet pilings would extend about 700 linear feet. Total implementation cost: $1,299,100. Annual benefits: $311,700. Annual cost: $86,986. Benefit-Cost Ratio: 3.6.

The construction of the trench filled revetment was determined to be the alternative with the greatest net annual benefits and selected as the recommended plan.