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FINAL
SUPPLEMENT NO. 3
TO THE
ORIGINAL WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT
FOR
SPRING CREEK WATERSHED JOINT DISTRICT NO. 16 FLOODWATER RETARDING DAM R-1
IN
SECTION 12 T28S R4W SEDGWICK COUNTY, KANSAS

SEPTEMBER 2010

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FINAL
SUPPLEMENT NO. 3 TO THE ORIGINAL WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT FOR SPRING CREEK WATERSHED JOINT DISTRICT NO. 16 FLOODWATER RETARDING DAM R-1 IN SECTION 12 T28S R4W, SEDGWICK COUNTY, KANSAS 4TH CONGRESSIONAL DISTRICT

SEPTEMBER 2010

PREPARED BY: THE NATURAL RESOURCES CONSERVATION SERVICES AND KLA ENVIRONMENTAL SERVICES, INC.

ABSTRACT

Spring Creek Watershed Joint District No. 16 Floodwater Retarding Dam R-1 (the Dam) was designed as a Low Hazard Class (A) dam. Construction was completed August 7, 1972. County population growth and rural residential development increased traffic on MacArthur Road, located downstream from the Dam. The most recent traffic count measured more than 1,500 vehicles per day travelling on MacArthur Road in the area around 311th Street West and 327th Street West. K.A.R. 5-40-20 (c) states that a dam is classified as a High Hazard Class (C) dam if any road in the inundation area downstream from the dam has a traffic count of more than 1,500 vehicles per day. Consequently, the Dam is noncompliant with the current safety regulations. The Preferred Alternative is to (1) rehabilitate the dam to NRCS High Hazard Class (C) design criteria, and (2) extend the design life by 100 years. The project will result in (1) maintaining the axis of the dam approximately at its present location, (2) raising the top of the dam approximately 2.9 feet, (3) installing a new 30-inch diameter reinforced concrete pipe spillway with a standard open-top riser, (4) widening the auxiliary spillway to approximately 240 feet at its present location, (5) raising the auxiliary spillway crest 1.5 feet, and (6) retrofitting upgrades to the foundation, embankment, outlet channel, and drainage system.

AUTHORITY

The original work plan was prepared and the works of improvement were installed under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566), as amended. The rehabilitation of Floodwater Retarding Dam R-1 is authorized by the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566), as amended by Section 313 of Public Law 106-472, The Small Watershed Rehabilitation Amendments of 2000, and in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 USC 43221 et seq.)

SPONSORING LOCAL ORGANIZATION

Spring Creek Watershed Joint District No. 16
1572 N. Meridian
Wichita, Kansas 67203

COMMENTS

Submit comments and inquires on or before _____ to:

Eric Banks, State Conservationist
Natural Resources Conservation Service
760 S. Broadway
Salina, Kansas 67401

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FINAL
SUMMARY OF SUPPLEMENTAL WATERSHED PLAN NO. 3
FOR
SPRING CREEK WATERSHED JOINT DISTRICT NO. 16
FLOODWATER RETARDING DAM R-1
IN
SECTION 12 T28S R4W
SEDGWICK COUNTY, KANSAS
4TH CONGRESSIONAL DISTRICT

SPONSORING LOCAL ORGANIZATION (SLO)

Spring Creek Watershed Joint District No. 16
1572 N. Meridian
Wichita, Kansas 67203

ADDITIONAL SPONSORS

Sedgwick County Conservation District
2625 S Tyler Road, Suite 103
Wichita, KS 67215-8621
Reno County Conservation District
18 E 7th Avenue
South Hutchinson, KS 67505-1034

PROPOSED ACTION

The proposed action (Project) is the rehabilitation of Spring Creek Watershed Joint District No. 16 Floodwater Retarding Dam R-1 (the Dam) for the SLO under the Natural Resources Conservation Service (NRCS) Public Law 83-566 Statute 666 as amended (16 USC. Section 1001 et. Seq.) 1954, Watershed Rehabilitation Program. Figure S-1 shows the location of the Dam.

RESOURCE INFORMATION

Climate

- *Temperature*
  In winter, the average temperature is 32.5°F and the average daily minimum temperature is 21.2°F. In summer, the average temperature is 78.4°F and the average daily maximum temperature is 91.3°F.
- *Precipitation*
  The average annual precipitation is 29.11 inches. Seventy-one percent of this (20.7 inches) typically falls between April and September. This period also includes the growing season for most crops. The heaviest 1-day rainfall during the period of record was 6.35 inches on April 20, 1974. Thunderstorms occur on about 54 days each year with most occurring between May and September.
- *Snowfall*
  The average seasonal snowfall is 14.4 inches. The greatest snow depth at any one time during the period of record was 12 inches on March 20, 1984. During an average year, 20 days have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 12 inches recorded on March 16, 1970.

- *Humidity*
  The average relative humidity at dawn is 80%, and in mid-afternoon it is about 55%. Humidity is higher at night.
- *Sunshine*
  The sun shines about 74% of the time possible in summer and 60% in winter.
- *Wind*
  The prevailing wind is from the south. Average wind speed is highest in March and April at around 14 MPH.
- *Topography*
  The land surface of Northwest Sedgwick County and Southeast Reno County slopes downward from west to east in the direction of major drainage by the Ninnescah, Arkansas, and Little Arkansas Rivers. The topography is subdued, and most local variation in elevation is due to alluvial terrace surfaces and local incision by tributary streams.

Source: Soil Survey of Reno County, Kansas, United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with Kansas Agricultural Experiment Station

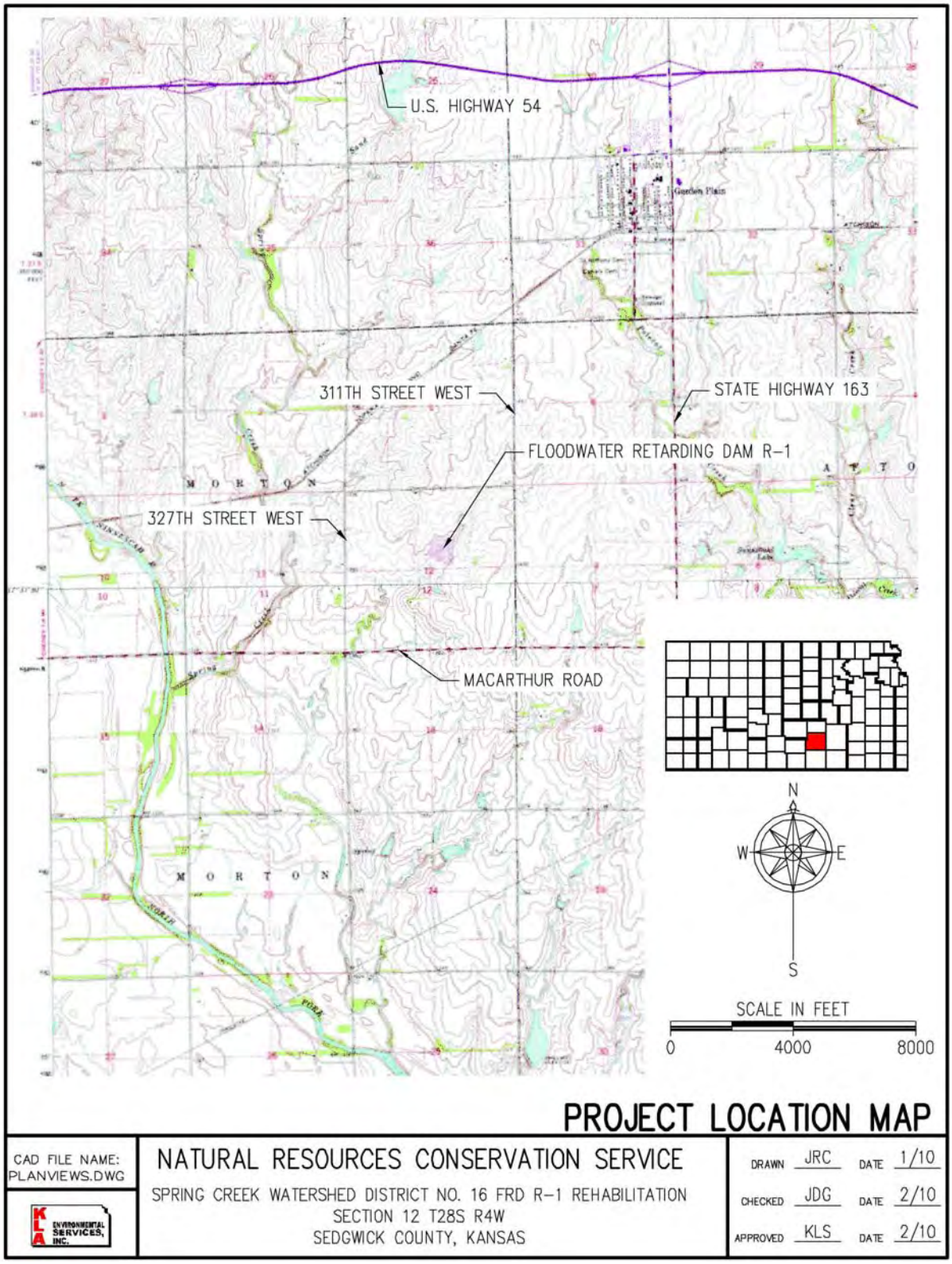
Table S-1 provides relevant resource information for the Project and Spring Creek Watershed Joint District No. 16 (the District).

Table S-1
Resource Information

Resource	Spring Creek Watershed [1]	Floodwater Retarding Dam R-1
Location		
Longitude	-	97° 42′ 25″ W
Latitude	-	37° 37′ 38″ N
Hydrologic Unit Code	-	11030014030070
Watershed Size	27,840 acres	646 acres
Land Use		
Cropland	21,993 acres	446 acres
Pasture/Range	5,011 acres	158 acres
Other	835 acres	42 acres
Land Ownership		
Private	27,283 acres	633 acres
State	0 acres	0 acres
County	557 acres	13 acres
Number of Farms	77	3
Prime Farmland	25,056 acres	646 acres
Minority Farmers	7	0
Limited Resource Farmers	0	0
Average Farm Size	360 acres	224 acres
Highly Erodible Cropland	6,960 acres	60 acres
Wetlands	1,397 acres	4.9 acres
Floodplains	962 acres	114 acres

[1] Source: Spring Creek Watershed Work Plan, November 1958

Figure S-1
Project Location Map



PROJECT BENEFICIARY PROFILE

Table S-2 provides relevant information regarding the project beneficiary profile.

Table S-2
Project Beneficiary Profile

Beneficiary	Garden Plain Township[1]	Sedgwick County[1]	Kansas[1]	U.S.[1]
Population	1,780	452,869	2,688,418	281,421,906
Median Age	33.4 years	33.6 years	35.2 years	35.3 years
Median per Capita Income	$21,322	$20,907	$20,506	$21,587
Median Household Income	$50,781	$42,485	$40,624	$41,994
Number of Households	577	176,444	1,037,891	105,539,122
Median Value of Housing Units	$97,800	$83,600	$83,500	$119,600
Families Living Below Poverty Level	16	8,309	47,299	6,620,945

[1] Source: U.S. Census Bureau, Census 2000

PROBLEM IDENTIFICATION

The Dam was originally designed as a Low Hazard Class (A) dam. Construction was completed on August 7, 1972; but over time, population growth and rural residential development in the county increased traffic on MacArthur Road, located downstream from the dam. The most recent traffic count measured more than 1,500 vehicles per day travelling on MacArthur Road in the area around 311th Street West and 327th Street West. K.A.R. 5-40-20 (c) states that if any road in the inundation area downstream from a dam has a traffic count of more than 1,500 vehicles per day, the dam shall be classified as a High Hazard Class (C) dam. Consequently, the Dam is noncompliant with the current safety regulations.

PROJECT PURPOSE AND NEED

The purpose of this Project (Project Purpose) is to continue to provide flood protection to agricultural land, rural transportation facilities, and rural residential structures in a manner that minimizes the risk of loss of human life.

There is a need for this Project (Project Need) because the existing floodwater retarding dam does not meet current dam safety criteria for a High Hazard Class (C) dam. The Project will address these public health and safety issues.

ALTERNATIVE PLANS CONSIDERED

Four alternatives were considered to address the Project Purpose and Need. The National Economic Development (NED) is the alternative that reasonably maximizes net economic benefits and protects the nation's resources.

Alternatives included structural and non-structural measures. All alternatives provided an additional 100 years to the design life so they could be consistently compared. Table S-3 summarizes the alternatives considered for the Project.

Table S-3
Alternative Plans Considered

Alternative	Summary of Alternative	Screening Method			Carried Forward for Detailed Study?
		Estimated Cost	Project Purpose Met	Project Need Met	
No Action/Future Without Federal Project	▪ Modify Dam to meet K.S.A. 82a-301a, Dam Rules and Regulations for High Hazard Class (C) dams. – Widen the auxiliary spillway. – Raise the embankment. – Replace concrete principal spillway. – Add an embankment and foundation drainage.	$726,900	✓	✓	Yes
Federal Decommissioning	▪ Remove constructed embankment and deposited sediment. – Breach the Dam. – Construct a concrete grade stabilization structure. – Size of the opening through the dam to safely pass the discharge from the 100-year, 24-hour storm runoff. – Place the embankment material removed from the in the auxiliary spillway and pool area, compacted for stabilization, and vegetated. – Remove and stabilize the accumulated sediment in the pool area. – Restore the stream channel through the project area. – Remove and dispose of the principal spillway system. – Replace the bridge at MacArthur Road to safely pass the runoff from the 100-year, 24-hour storm runoff.	$2,140,900	✓	✓	No
Rehabilitation to a High Hazard Class (C) Dam	▪ Rehabilitates dam to NRCS High Hazard Class (C) design criteria. Widening the auxiliary spillway. – Widen the auxiliary spillway.	$798,800	✓	✓	Yes

Alternative	Summary of Alternative	Screening Method			Carried Forward for Detailed Study?
		Estimated Cost	Project Purpose Met	Project Need Met	
	– Raise the embankment. – Replace the principal spillway with a 30-inch diameter reinforced concrete principal spillway. – Replace the anti-seep collars with a drainage diaphragm system. – Retrofit an extensive embankment and foundation drainage.				
Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area	▪ Rehabilitate dam to NRCS Low Hazard Class (A) design criteria. – Replace principal spillway. – Maintain the current auxiliary spillway configuration. – Replace the anti-seep collars with a drainage diaphragm system. – Retrofit an extensive embankment and foundation drainage system. – Replace the bridge with a larger structure and raise MacArthur Road. – Prevent development in breach inundation area.	$1,009,200	✓	✓	Yes
National Economic Development (NED) Alternative	▪ Combine any of the above alternatives that reasonably maximize net economic benefits and protect the nation's resources.	See **Rehabilitation to a High Hazard Class (C) Dam** alternative			Yes

PREFERRED ALTERNATIVE

The Preferred Alternative is the NED Alternative, which is to Rehabilitate the Dam to a High Hazard Class (C) Dam. This will:

- Rehabilitate the dam to NRCS High Hazard Class (C) design criteria.
- Extend the design life for an additional 100 years.
- Comply with state dam safety regulations.

The Preferred Alternative results in the following:

- Maintaining the axis of the dam at approximately its present location.
- Raising the top of dam approximately 2.9 feet.

- Installing a new 30-inch diameter reinforced concrete pipe spillway with a standard open-top riser.
- Widening the auxiliary spillway to approximately 240 feet at its present location.
- Elevating the auxiliary spillway crest elevation 1.5 feet.
- Retrofitting upgrades to the foundation, embankment, outlet channel, and drainage system.

PROJECT COSTS

Table S-4 summarizes the allocation of Project costs between the SLO and NRCS for the Preferred Alternative.

Table S-4
Estimated Project Costs[1]

Works of Improvement	PL 83-566 Funds [2]	SLO	Total Estimated Eligible Project Costs [3]	Total Estimated Non-eligible Project Costs
Rehabilitation of Spring Creek Watershed Floodwater Retarding Dam R-1	$400,300	$215,500	$615,800	$183,000

September 2010

[1] Price base 2009
[2] PL 83-566 cost share is 65 percent of the project cost, but not to exceed 100 percent of the total construction cost.
[3] Estimated eligible project costs are in addition to NRCS engineering and project administration costs.

PROJECT BENEFITS

The Preferred Alternative includes these benefits:

- Flood control.
- Minimized risk of loss of human life.
- Minimized risk of extensive damages.
- Sediment storage.
- Improved downstream water quality.
- Passive recreation.
- Maintained land values.
- Maintained fish and wildlife habitat.

ENVIRONMENTAL CONSIDERATIONS AND EFFECTS

Table S-5 describes the resource concerns identified during project scoping and summarizes the potential impacts related to the Preferred Alternative.

Table S-5
Summary of Resource Concerns and Impacts of Rehabilitation

Resource Concern	Summary of Concern	Summary of Effects of Preferred Alternative
Human Health and Safety	▪ Project Purpose is to provide flood protection in a manner that minimizes the risk of loss of human life.	▪ Breach inundation risk to existing and future downstream property is reduced. ▪ Breach inundation risk to transportation facilities is reduced. ▪ Flood control is improved due to more restrictive design criteria.
Erosion and Sedimentation	▪ The retention of sediment in the pool results in improved downstream water quality.	▪ Retain existing sediment storage and related downstream water quality benefits.
Water Quality	▪ Erosion and sediment accumulated in the existing pool can harm water quality.	▪ Downstream water quality is protected by capturing and retaining sediment and pollutants in pool area. ▪ Temporary impacts to water quality associated with construction activities will be addressed through implementation of a Stormwater Pollution Prevention Plan.
Flood Control	▪ Project Purpose is to provide flood control.	▪ Existing flood control benefits are retained and extended for an additional 100 years.
Land Use	▪ Land use has been planned in the benefit area under the premise that the dam would be retained.	▪ Current and planned land uses in the benefit area will be protected and enhanced. ▪ Land use in the reservoir area and auxiliary spillway will remain unchanged.
Recreation	▪ The dam provides incidental passive recreational opportunities.	▪ Current recreational opportunities are retained.
Transportation	▪ A breach of the existing structure and/or potential flood damage could have short-term impacts on local transportation facilities and systems.	▪ Breach inundation risk to facilities and systems is reduced.

In addition to the resource concerns noted in Table S-5, the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.) requires the evaluation of the resource concerns identified in Table S-6.

Table S-6
Summary of NRCS Planning Considerations

NRCS Planning Requirements	Summary of Planning Consideration	Summary of Effects of Preferred Alternative
Cultural Resources	▪ NRCS Cultural Resources Coordinator consulted Kansas State Historic Preservation Office (SHPO). ▪ NRCS Cultural Resources Coordinator reviewed each alternative's areas of potential impact.	▪ Project alternatives have no effect on cultural resources. ▪ Preferred Alternative will most likely not impact unknown cultural resources (determined in consultation with State Historic Preservation Office.)

NRCS Planning Requirements	Summary of Planning Consideration	Summary of Effects of Preferred Alternative
Endangered and Threatened Species	▪ U.S. Fish & Wildlife Service (USFWS) reviewed project. ▪ The Project Team informally consulted Kansas Department of Wildlife & Parks. ▪ Both agencies concluded project site contains no protected species or their critical habitats.	▪ Project has No Effect (NE) on federal- or state-listed threatened or endangered species. (This was confirmed in consultation with USFWS Kansas Ecological Services office in Manhattan, Kansas.)
Environmental Justice	▪ The Project Team evaluated each alternative's areas of potential impact with respect to demographic and socioeconomic composition of the Project area (complied with regulations of Title VI of the Civil Rights Act of 1964 [42 United States Code (USC) 2000d, et seq.] and Executive Order 12898, Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations [59 FR 7629]).	▪ Implementation of any alternatives will not affect minority or low-income populations.
Fish and Wildlife	▪ After identifying and evaluating each alternative's areas of potential impact with respect to fish and wildlife resources, Project Biologist concluded that: ▪ Preferred Alternative will cause temporary disturbances to local fish and wildlife populations. ▪ Short-term inundation will cause minor, temporary disturbances to aquatic and terrestrial wildlife. ▪ Spillway and embankment upgrades will cause minor, permanent disturbances to woodland, grassland, wetland, and stream channel.	▪ Short-term inundation will temporarily impact: – 375 feet of stream channel – 1.4 acres of woodland – 4.9 acres of wetland – 13.7 acres of grassland ▪ Changes to auxiliary spillway, dam embankment, and outlet channel will cause permanent loss of: – 0.5 acre of riparian woodland – 8.0 acres of grassland – 0.4 acres of wetlands – 60 feet of stream channel
Floodplain Management	▪ The Project Team did not evaluate floodwater retarding benefits in the Flood Insurance Study (FIS).	▪ Kansas Department of Agriculture, Division of Water Resources requires a Permit to Construct Dam.
Invasive Species	▪ The Project Team considered Executive Order 13112, 1999, which directs Federal agencies to prevent introducing invasive species and provide for their control and to minimize economic, ecological, and human health impacts that invasive species cause.	▪ Project has no effect on invasive species. ▪ Potential for introduction of invasive species with construction activities.

NRCS Planning Requirements	Summary of Planning Consideration	Summary of Effects of Preferred Alternative
Migratory Birds	▪ NRCS must consider the impacts of planned actions on migratory bird populations and habitats for all planning activities. ▪ The Bald and Golden Eagle Protection Act, 1962, provides additional protection to all Bald and Golden eagles.	▪ Migratory birds and their nesting activities will be temporarily disturbed if construction takes place between April 1 and July 15 (disturbance may be prevented by avoiding construction at that time).
Natural Areas	▪ The Project Team identified no natural areas present in or near study area.	▪ Project has no effect on natural areas.
Prime and Unique Farmlands	▪ The Project Team intended to minimize unnecessary and irreversible conversion by Federal programs of farmland to nonagricultural uses.	▪ Changes to dam embankment and auxiliary spillway will remove approximately 8.0 acres of prime farmland.
Riparian Area	▪ Planners working with riparian areas should consider: – Soils – Present plant community – Site potential – Geomorphology of stream and watershed – Stage of stream evolution – Fish and wildlife needs – Management of watershed upland areas – Producer's objectives	▪ Construction of Preferred Alternative will clear and fill approximately 0.5 acres or riparian area.
Waters of the US/Clean Water Act	▪ The Project Team considered Clean Water Act (CWA) (established several programs to regulate and reduce discharges of pollutants into "waters of the U.S."). ▪ 375 linear feet of stream channel will be infrequently inundated for short periods at the new top of dam elevation. ▪ Preferred Alternative will remove another 60 linear feet of stream channel.	▪ Inundation frequency is much less than a 1 in 100 chance and duration is estimated at 5 to 10 hours. ▪ Neither inundation frequency nor duration will change existing vegetation or physical structure of native habitats. ▪ Approximately 60 linear feet will be permanently filled.
Wetlands	▪ NRCS intends to protect and promote wetland functions and values in all NRCS planning and application assistance. ▪ Practical alternatives that enhance wetland functions and values or that avoid or minimize harm to wetlands shall be evaluated.	▪ Inundates approximately 4.9 acres of wetlands infrequently for short periods. ▪ Fills approximately 0.4 acres of wetlands downstream from the dam.

MITIGATION

Mitigation includes all measures anticipated to be undertaken to avoid, minimize, or compensate for potential adverse impacts. It is anticipated the Preferred Alternative will include on-site compensatory mitigation for the permanent loss of 60 linear feet of stream channel, 0.4 acres of wetlands and 0.5 acres of riparian woodland. A compensation plan shall be developed with cooperating agencies for the loss of streams, wetlands and riparian woodland.

Generally stream channel mitigation may include in-channel stream habitat restoration, stream bank and bed stabilization, and riparian establishment. In-channel measures, such as constructed riffles or similar structures, will be considered when the stream lacks natural channel features or its bed is unstable. Banks will be stabilized by sloping, planting with native vegetation, and creating a vegetated floodplain bench. Riparian mitigation will involve creating a new appropriate vegetation buffer, enhancing an existing riparian corridor, or preserving an existing high quality buffer to prevent its destruction, degradation, or alteration.

Wetland mitigation will be accomplished by constructing an artificial ecosystem with hydrophytic vegetation consistent with NRCS Conservation Practice Standard for Constructed Wetlands. The wetland design will include measures which are consistent with the purposes and intended life of the practice including safety, water management, cleanout of sediment, maintenance of structures, embankments, and vegetation, control measures for vectors and pests, and containment of potential pollutants during maintenance operations.

MAJOR CONCLUSIONS

The Preferred Alternative to rehabilitate the Dam is to upgrade the Dam to current NRCS High Hazard Class (C) design criteria and to extend the design life for an additional 100 years. The axis of the dam will remain approximately unchanged.

NET ECONOMIC BENEFITS

The estimated value of annual net economic benefits for the Preferred Alternative is $30,700.

BENEFIT TO COST RATIO

The Benefit to Cost Ratio for the Preferred Alternative is estimated to be 0.91:1.00.

PERIOD OF ANALYSIS AND PROJECT LIFE

The period of analysis and project life is 100 years.

AREAS OF CONTROVERSY

No areas of controversy were identified.

ISSUES TO BE RESOLVED

No issues to be resolved were identified.

EVIDENCE OF UNUSUAL CONGRESSIONAL OR LOCAL INTEREST

No evidence of unusual congressional or local interests was identified.

COMPLIANCE CERTIFICATION

Is this report in compliance with executive orders, public laws, and other statutes governing the formulation of water resource projects? Yes_X_ No___.

1.0 Purpose and Need for Action

1.1 Changes Requiring Preparation of a Supplement

Increased traffic on MacArthur Road in the area around 311th Street West and 327th Street West downstream from Floodwater Retarding Dam R-1 results in a change to the hazard classification of the dam. K.A.R. 5-40-20 (c) states that if any road in the inundation area downstream from a dam has a traffic count of more than 1,500 vehicles per day, the dam shall be classified as a High Hazard Class (C) dam. Consequently, the Dam is noncompliant with the current safety regulations.

1.2 Introduction

This Supplemental Watershed Plan and Environmental Assessment formulates, evaluates, and resolves alternatives for the rehabilitation of Spring Creek Watershed Joint District No. 16 Floodwater Retarding Dam R-1 (the Dam).

Spring Creek Watershed Joint District No. 16 (the District), which is the Sponsoring Local Organization (SLO), represents local landowners and residents within the watershed boundary. Spring Creek Watershed (the Watershed) has a total drainage area of approximately 43.5 square miles, which flows directly into the North Fork of the Ninnescah River. The Watershed is located in Northwest Sedgwick County and Southwest Reno County.

The District prepared and approved a watershed plan in 1960 that included land treatment and structural measures to aid protection of natural resources and to address flood-related issues of the Watershed. The original plan included the Dam as part of a system of structural measures, which provided a measurable degree of flood protection to the Watershed and Spring Creek floodplains. The watershed plan was supplemented in 1971 to provide relocation assistance and in 1972 to delete Floodwater Retarding Structure Nos. 1 and 2 and Floodwater Retarding Structure R-2.

Wilson & Company, Inc., Engineers and Architects completed a Rehabilitation Assessment of the Dam in September 2005 for NRCS at the request of the SLO. The assessment indicated that the Dam was near the end of its design life, and it recommended modifications and upgrades to the structure components. NRCS reviewed the breach inundation zone downstream from the Dam and determined that MacArthur Road was subject to flooding during a breach of the Dam.

The Dam is located approximately 2 miles south and 1.5 miles west of Garden Plain, Kansas. It was originally planned, designed, and constructed to be a Low Hazard Class (A) structure. Construction was completed August 7, 1972. Since then population growth and rural residential development in the county have increased daily traffic on MacArthur Road downstream from the Dam. The most recent traffic count indicates that more than 1,500 vehicles per day travel on MacArthur Road in the area around 311th Street West and 327th Street West. K.A.R. 5-40-20 (c) states that if any road in the inundation area downstream from a dam has a traffic count of more than 1,500 vehicles per day, the dam shall be classified as a High Hazard Class (C) dam. Consequently, the Dam is noncompliant with the current safety regulations.

The Project Team, as identified in Table 9-1, combined the Supplemental Watershed Plan and Environmental Assessment into a single document. NRCS and the Project Team collected all supporting data and documentation during research and investigation.

This document was prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended by Section 313 of Public Law 106-472, The Small Watershed Rehabilitation Amendments of 2000, and in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 USC 43221 et seq.). Responsibility for compliance with National Environmental Policy Act rests with the Natural Resources Conservation Service (NRCS).

1.3 PROJECT PURPOSE

The purpose of this Project (Project Purpose) is to continue to provide flood protection to agricultural land, rural transportation facilities, and rural residential structures in a manner that minimizes the risk of loss of human life.

1.4 PROJECT NEED

There is a need for this Project (Project Need) because the existing floodwater retarding dam does not meet current dam safety criteria for a High Hazard Class (C) dam. The Project will address these public health and safety issues

2.0 Scope of Environmental Assessment

2.1 Scoping Process

The scoping process of the Environmental Assessment for the Dam involved site investigations, public meetings, and consultations with jurisdictional agencies. This included meeting with (1) NRCS on August 20, 2009, (2) the SLO on September 16, 2009 and December 9, 2009, and (3) the public on October 7, 2009.

Scoping determined the (1) objectives, needs, and primary concerns for the SLO, (2) relevant issues, and (3) environmental concerns associated with the Project.

2.2 Identified Concerns

Table 2-1 identifies the primary resource concerns. Relevancy to the proposed action was determined when sufficient rationale was provided. Irrelevant concerns were eliminated from further consideration, while each relevant resource concern was reviewed in detail for the alternatives comparison.

Table 2-1
Summary of Scoping Identified During Public Meetings

Resource Concern	Relevant to Proposed Action?	Rationale
Human Health and Safety	Yes	▪ Project Purpose is to continue to provide flood protection to agricultural land, rural transportation facilities, and rural residential structures in a manner that minimizes the risk of loss of human life.
Erosion and Sedimentation	No	▪ Existing sediment storage addressed with downstream water quality benefits.
Water Quality	Yes	▪ Effects on water quality due to erosion and sedimentation are a potential long-term concern. ▪ Providing extended erosion and sedimentation control for agricultural land is a potential opportunity.
Flood Control	Yes	▪ Project Purpose is flood control. ▪ Each alternative must meet this purpose to be considered a viable alternative.
Land Use	Yes	▪ Land use has been planned in the benefit area under the premise that the dam would be retained. ▪ Loss of the Dam would significantly impact land use in the benefit area.
Recreation	No	▪ The recreational value of the existing structure is incidental and not quantifiable. ▪ Project Purpose does not include providing recreation benefits.
Transportation	Yes	▪ Dam failure would likely impair the use of MacArthur Road, which is a primary rural thoroughfare for the surrounding rural residential and agricultural communities.

In addition to the resource concerns noted in Table 2-1, the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.) requires the evaluation of the resource concerns identified in Table 2-2.

Table 2-2
Summary of Scoping for NRCS Planning Considerations

NRCS Planning Requirements[1]	Relevant to Proposed Action?	Rationale
Cultural Resources	No	▪ The Project Team contacted Kansas State Historic Preservation Office (SHPO) to identify the area of potential impact for each alternative. ▪ NRCS Cultural Resources Specialist reviewed these areas. ▪ The Project Team identified no known cultural resources. ▪ It is unlikely that unknown cultural resources are present that would be impacted by implementing Preferred Alternative.
Endangered and Threatened Species	No	▪ The Project Team informally consulted the U.S. Fish & Wildlife Service (USFWS) and the Kansas Department of Wildlife & Parks. ▪ Both agencies concluded that no protected species or their critical habitats reside at the project site. ▪ Project alternatives will have No Effect (NE) on federal- or state- listed threatened or endangered species.
Environmental Justice	No	▪ The Project Team studied each alternative's potential environmental impacts with respect to the demographic and socioeconomic composition of the Project area (in compliance with the regulations of Title VI of the Civil Rights Act of 1964 (42 United States Code (USC) 2000d, et seq.) and Executive Order 12898, Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629). ▪ No minority or low-income populations will be affected by implementing any of the alternatives. ▪ There are no people groups associated with E.O. 12898 in the Area of Potential Impact of the project.
Fish and Wildlife	Yes	▪ The U.S. Fish and Wildlife Service must be consulted on all P.L. 83-566 projects, and full considerations must be given to agency recommendations.
Floodplain Management	Yes	▪ A Permit to Construct Dam will be required from the Kansas Department of Agriculture, Division of Water Resources.
Invasive Species	Yes	▪ No invasive species were identified within or adjacent to the study area. ▪ Potential for introduction of invasive species with construction activities.

NRCS Planning Requirements[1]	Relevant to Proposed Action?	Rationale
Migratory Birds	Yes	▪ Migratory birds and their nesting activities will be temporarily disturbed if construction takes place between April 1 and July 15 (disturbance may be prevented by avoiding construction at that time).
Natural Areas	No	▪ No significant natural areas are present in or near the study area.
Prime and Unique Farmlands	Yes	▪ All soils in the Project area are considered Prime Farmland.
Riparian Area	Yes	▪ Riparian woodland and native habitat are present in the project area.
Waters of U.S./Clean Water Act	Yes	▪ Waters of the U.S. will be disturbed in the project area.
Wetland	Yes	▪ Wetlands will be disturbed (affected) in the project area.

[1] Based on KS-CPA-52, "Environmental Evaluation for Conservation Planning," Section J. Special Environmental Concerns.

2.3 Summary of Problems and Opportunities

Problem – Improper Classification and Noncompliance with Safety Regulations. Dam safety requirements have become more restrictive due to observed dam failures in the United States that have caused significant property damage and loss of life. The Dam was originally designed as a Low Hazard Class (A) dam; however, the current hazard classification for the Dam indicates that it is a High Hazard Class (C) dam. No other significant problems were noted.

Opportunities of the Preferred Alternative. The following opportunities will be recognized by implementing the Preferred Alternative. Quantification of these opportunities will be provided in other sections of this report as necessary.

- Comply with dam design and safety criteria established by NRCS and the Kansas Department of Agriculture – Division of Water Resources.
- Minimize the potential for loss of life associated with a failure of the Dam.
- Reduce SLO liability associated with operation of a noncompliant dam.
- Extend the existing level of flood protection for downstream agricultural land, houses, businesses, and infrastructure.
- Extend opportunity for higher-value land use in the benefit area (intensification).
- Protect real estate values.
- Maintain existing fish and wildlife habitats.
- Preserve existing recreation opportunities.
- Protect water quality.

3.0 AFFECTED ENVIRONMENT

3.1 PROJECT SETTING

Floodwater Retarding Dam R-1 is one of three structures built in Sedgwick County after authorization of the Spring Creek Watershed Joint District No. 3 in 1960. The construction of Floodwater Retarding Dam R-1 was completed in 1972.

The existing dam is located on an unnamed tributary of North Fork of Ninnescah River approximately 2 miles southwest of Garden Plain, Kansas. The intermittent stream channel downstream from the dam is generally a narrow-bottom channel (5 to 15 feet wide), moderately incised (4 to 8 feet deep), with wooded banks and stream slopes of approximately 25 feet of drop per mile.

The wildlife, plant, and animal species found near the dam are common for the region. Much of the land within the basin has been disturbed by agriculture. Wildlife species found in the vicinity include white-tailed deer, rabbits, mice, squirrels, striped skunks, raccoons, songbirds, hawks, pheasant, and quail. Fish species known to exist in the sediment pool include bluegill, bass, catfish, and bullhead.

3.2 BACKGROUND AND CURRENT STATUS

The Dam is an earth embankment constructed in the NE ¼ of Section 12, Township 28 South, Range 4 West, in Sedgwick County, Kansas. Table 3-1 describes its current design features.

The Dam is a rolled earthfill dam. Floodwater retention is the primary objective of the Dam. Other potential incidental benefits include grade stabilization, sediment retention, groundwater recharge, wildlife habitat enhancement, recreation, and water supply.

The auxiliary spillway is on the right abutment. The principal spillway consists of an 18-inch diameter, steel cylinder, reinforced concrete pipe barrel and a rectangular reinforced concrete riser and metal trash rack. The drawdown pipe is 10-inch diameter asbestos-cement with a 4-inch diameter eccentric plug valve.

The foundation of the Dam consists of shale overlain by poorly-graded sand, sandy clay, and low-plasticity clay. These permeable soils were removed by constructing a 10-foot wide cutoff trench that reached the shale. The Dam was constructed with two zones of soil materials. Zone 1 is made of impermeable plastic soils to resist cracking and seepage. This is the core of the Dam. Zone 2 is made of soils more permeable and less plastic than Zone 1 soils. This is the outer shell of the Dam.

Table 3-1
Floodwater Retarding Dam R-1 Current Design Features

Resource	Original Design Condition[1]	Existing Condition[2]
Watershed Size	670 acres	646 acres
Land Use		
Cropland	69 %	69 %
Pasture/Range	24 %	24 %
Other	7 %	7 %
Key Design Elevations		
Crest of Dam	1409.8	1409.8
Crest of Auxiliary Spillway	1404.8	1405.0
Sediment Pool	1399.4	1399.4
Drawdown	1389.9	1389.9
Principal Spillway Outlet	1388.0	1388.0
Outlet Channel	1384.2	1384.2
Structure Components		
Dam Height	21.8 feet	21.8 feet
Dam Length	1,700 feet	1,700 feet
Embankment Volume	86,300 cubic yards	N/A
Auxiliary Spillway		
Type	Vegetated Earth	Vegetated Earth
Bottom Width	40 feet	40 feet
Capacity	280 cfs	280 cfs
Principal Spillway		
Type	Reinforced Concrete Pipe	Reinforced Concrete Pipe
Diameter	18 inches	18 inches
Capacity	27.3 cfs	27.3 cfs
Structure Capacities		
Sediment Storage	67.51 acre-feet	92.1 acre-feet
Detention Storage	127.48 acre-feet	151.9 acre-feet
Surcharge	236.71 acre-feet	218.0 acre-feet
Surface Areas		
Sediment Pool	15.19 acres	19.38 acres
Detention Pool	33.96 acres	35.61 acres
Top of Dam	62.56 acres	57.04 acres

[1] Floodwater Retarding Dam R-1 As-Built Plans
[2] Study results

3.3 Dam Safety Inspection

The Project Team conducted a Dam Safety Inspection on October 14, 2009, as part of the rehabilitation planning study. The Dam was determined to be in fair to good condition. Items requiring ongoing action included tree and brush control throughout the structure, animal burrows and trails, and stilling basin bank erosion. Wet spots on the east back toe of the dam, which may indicate embankment or foundation seepage, needed further monitoring. A copy of the Physical Inspection for Dam Safety Evaluation is included in the administrative record for the Project.

3.4 Status of Operation and Maintenance (O&M)

The NRCS State Conservationist must verify that O&M is current prior to construction of the planned rehabilitation measures. The Sponsor is responsible for keeping the structure free of brush and trees, burrowing animals and recreational vehicle traffic.

Due to the age of the Dam, the trash rack, open-top riser, principal spillway conduit, and stilling basin will most likely require continued inspection, repair, and replacement to extend the life of the Dam beyond its intended design life.

3.5 Breach Analysis and Hazard Classification

The Project Team conducted the breach inundation analysis using Technical Release 60 (TR-60), Earth Dams and Reservoirs criteria and the methodology provided by Kansas Department of Agriculture, Division of Water Resources Regulation K.A.R. 5-40-24. The water surface elevation at the time of the breach was determined from flood-routing the design storm through the existing auxiliary spillway. The auxiliary spillway design was for the 100-year, 6-hour storm. The peak breach discharge and the breach discharge hydrograph were determined using the Natural Resources Conservation Service TR-66, third edition, “Simplified Dam-Breach Routing Procedure.” Discharge rating tables for each cross section were formulated using HEC-RAS. These calculations provided the peak discharge and maximum water surface elevation at each cross section below the dam. The results from HEC-RAS provided the top width at the maximum water surface elevation for each cross section below the dam.

The Project Team used data from TR-66 and HEC-RAS to plot the maximum water surface elevations on the U.S. Geological Survey topographic map and aerial photo at each cross section. This defined the portions of each cross section that would be inundated. Boundary lines were interpolated between cross sections by building a corridor using the maximum water surface profiles imported from HEC-RAS. The corridor surface provided a delineated area below the dam that would be inundated if the assumed breach were to occur.

The potential inundation area was extended downstream to a point where the width of the breach inundation area was less than or equal to width of the Federal Emergency Management Agency (FEMA) Zone A. Flood zones are geographic areas that the FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area. FEMA Zone A classifies areas with a 1% annual chance of flooding.

The breach inundation study indicates that a dam failure would result in inundation of MacArthur Road approximately 4,300 feet downstream from the Dam. The most recent traffic count measured more than 1,500 vehicles per day on MacArthur Road in the area around 311th Street West and 327th Street West. K.A.R. 5-40-20 (c) specifies that if any road in the inundation area downstream from a dam has a traffic count of more than 1,500 vehicles per day, the dam shall be classified as a High Hazard Class (C) dam. Consequently, the Dam is noncompliant with the current safety regulations.

3.6 Sediment Accumulation

The Project Team conducted a bathymetric survey to measure water depth at various locations and conducted sediment and storage analyses to estimate the accumulated sediment volume,

approximate the sedimentation rate, and predict the remaining design life for the existing sediment pool. The results of the survey and analyses indicate that sediment has accumulated at a significantly lesser rate than was originally predicted.

The original sediment capacity of available was approximately 67 acre-feet. Based on a design life of 50 years, this equates to predicted annual sediment accumulation rate of 1.34 acre-feet per year. The original storage capacity estimates did not include additional capacity resulting from the borrow excavation.

The sediment pool has accumulated 28.9 acre-feet of sediment during the 37-year life of the Dam, according to a comparison between the as-built storage (reservoir capacity table plus estimated borrow volume) to the existing storage (measured with the bathymetric survey). This equates to an annual sediment accumulation rate of 0.78 acre-feet per year. Based on this sediment delivery rate, the sediment pool has approximately 118 years of functional life remaining.

Sheet and rill erosion is the predominant erosion process in the structure drainage area. Gully and stream bank erosion may also contribute to the sediment delivery to the Dam. Sediment is delivered to the pool area by overland flow and channel flow.

3.7 Potential Dam Failure Modes

The Project Team examined five potential modes of dam failure during the planning study. These include failure due to sedimentation, insufficient hydrologic capacity, seepage, seismic activity, and material deterioration, which are described below.

Sedimentation – Low Risk. Sedimentation can fill the designed sediment pool and encroach on the available detention capacity of a reservoir. This increases frequency and rate of flow of the auxiliary spillway, which could pose a risk of dam failure resulting from the hydraulic failure of the auxiliary spillway. The Dam was designed with a 50-year sediment storage life, but the analysis of sediment accumulation indicates that 118 years of functional life remain for the sediment pool. Consequently sedimentation presents a low risk failure mode for the Dam.

Insufficient Hydrologic Capacity – Moderate Risk. An auxiliary spillway breach or overtopping of the Dam during a storm event can cause hydrologic failure. The integrity and stability of the auxiliary spillway is dependent upon depth, velocity, and duration of flow, the vegetative cover, and the embankment's resistance to erosion. The Dam was designed as a Low Hazard Class (A) dam; therefore, the auxiliary spillway has moderate resistance to erosion. Both the principal spillway and auxiliary spillway, which are based on Low Hazard Class (A) criteria, are considered inadequate according to High Hazard Class (C) design criteria. This deficiency, resulting from the upgraded design criteria, poses a moderate risk for hydrologic failure of the dam during extreme runoff events.

Seepage – Low to Moderate Risk. The Dam embankment is constructed from low plasticity clays that are significantly resistant to seepage and erosion, and the Dam design includes anti-seep collars on the principal spillway barrel. However, current design criteria propose using drainage diaphragms, which more effectively address potential embankment erosion than anti-seep collars. The Project Team also observed wet areas at the back toe of the embankment during the Dam Safety Inspection. The combination of these issues may present a low to moderate risk of dam failure due to seepage.

Seismic Activity – Very Low Risk. The integrity and stability of an earthen embankment during seismic activity are dependent on the magnitude of the activity and the presence of unstable embankment or foundation material. Foundation movement through consolidation, compression, or lateral movement can create weak zones within the embankment where voids can form. This can cause conduit joint failure or collapse of the embankment.

The Dam is located near a boundary between Seismic Zone 1 and Seismic Zone 2. Seismic Zones indicate the effects of an earthquake at a particular place based on geological

observations from the affected areas. Zone 1 represents areas with little to no historical seismic activity. Zone 2 is classified as a Low Damage Risk Zone. High Hazard Class (C) dams in Seismic Zone 2 require special investigations to determine the structural impacts of seismic activity. Because both Seismic Zones 1 and 2 are considered areas of low risk for seismic activity, seismic activity poses a very low risk for dam failure.

Material Deterioration – Low Risk. Wilson & Company, Inc., Engineers and Architects conducted a video inspection of the principal spillway barrel during the rehabilitation assessment in 2005. There was no indication of significant material deterioration, but it has been shown that anti-seep collars similar to those installed around the principal spillway conduit can cause reinforced concrete conduits to crack. This can cause internal embankment erosion and potential dam failure. However, because there is no reported observation of cracking or deterioration of the conduit, material deterioration poses a low risk of dam failure.

3.8 Consequences of Dam Failure

Inundation due to dam failure potentially has the following consequences.

Loss of Life. The breach inundation study indicates that a dam failure will result in inundation of agricultural land, public utilities, and county roads and bridges, specifically MacArthur Road approximately 4,300 feet downstream from the Dam. The most recent traffic count measured more than 1,500 vehicles per day travelling on MacArthur Road in the area around 311th Street West and 327th Street West. The population-at-risk includes the motoring public. A sudden dam failure could cause loss of life to motorists traveling on MacArthur Road.

Release of Harmful Materials. Large volumes of sediment and eroded embankment material released to the stream would harm water quality, degrade aquatic habitat and reduce downstream channel capacity.

Agricultural Damage. Sedimentation may cause reduced productivity of agricultural land downstream from the structure. Livestock in the inundation area may be injured or killed.

Infrastructure Destruction. Fences, roads, bridges, public utilities, and farm equipment may be damaged or destroyed.

3.9 Social and Economic Conditions

Social Conditions. The Project site is located in a rural area of Garden Plain Township in Sedgwick County, Kansas. Although Sedgwick County has significant urban and suburban development, the agriculture industry is predominant in Garden Plain Township. Garden Plain is the nearest population center, which is approximately 1.5 miles east and 2 miles north of the Project site. The population of the area around the Project shows steady growth due to rural residential development in Sedgwick County. The land use in the Project drainage area is primarily cropland agriculture. Table 3-2 provides relevant information regarding the social and economic conditions in the study area.

Table 3-2
Social and Economic Profile

Subject	Garden Plain Township[1]	Sedgwick County[1]
Population	1,780	452,869
Median Age	33.4 years	33.6 years
Median Per Capita Income	$21,322	$20,907
Median Household Income	$50,781	$42,485
Number of Households	577	176,444
Median Value of Housing Units	97,800	83,600
Families Living Below Poverty Level	16	8,309

February 2010

[1] Source: U.S. Census Bureau, Census 2000

Economic Impacts. The Project Team used the P&G to account for flood control benefits associated with the alternatives. The original benefits for the project were indexed to current dollars using the land value index. The scope of the study did not include re-evaluation or reconsideration of the original benefits.
The original calculated annualized benefits, indexed for 2009 are shown in Table 3-3. NREH 611.0504 (a) recognizes that indirect benefits result from the recirculation of dollars in the local economy given the flood control gained through project implementation (flood reduction). The indirect benefits are approximately 10% of the sum of the Crop and Pasture, Other Agricultural, and Road and Bridge categories reported in Table 3-3.

Table 3-3
Total Annual Benefit Calculation[1]

Item	Crop & Pasture	Other Agricultural	Road & Bridge	Over Bank Deposition	Indirect	Changed Land Use	Total
1971 Benefits	$261	$278	$552	$935	$109	$228	$2,360
Index	385.7	385.7	541.7	385.7	N/A	385.7	N/A
2009 Benefits	$1,005	$1,072	$2,989	$3,607	$507	$878	$10,059[2]

[1] Original project benefits indexed from 1958 Work Plan and 1971 Supplement
[2] Rounded to $10,100

4.0 ALTERNATIVES

4.1 FORMULATION PROCESS

The NRCS National Watershed Manual (504.38 [c]) requires that the following alternatives be included in the development of a water resources plan:

- *No Action/Future Without Federal Project (FWOP)*
  The No Action/Future Without Federal Project (FWOP) alternative describes the most likely future condition that could be expected if NRCS takes no action. It describes what is most likely to happen in the absence of any developed Federal alternative or changes in law or public policy.
  The FWOP is used to compare other alternatives to determine the magnitude of benefits and adverse effects. Clearly describing the FWOP condition provides the reference necessary to evaluate changes caused by the alternatives. The FWOP alternative may contain flaws, violate a law, or fail to meet the project need or purpose; but it must still be developed as a comparison.
- *Decommissioning*
  The decommissioning alternative includes removal of the dam and stabilizing the site. If the decommissioning alternative is unreasonable, it can be eliminated from detailed study and included in the "Alternatives Considered but Eliminated from Detailed Study" section.
- *Rehabilitation*
  The rehabilitation alternative includes upgrading the existing dam to current applicable standards. Sediment storage life will be for the longest reasonable period practical (100 years maximum), but in no case will the evaluation life be less than 50 years.
- *National Economic Development (NED) Alternative*
  The National Economic Development (NED) alternative is not an independent option. It is the alternative, or combination of alternatives, that reduces the offsite or public problem and maximizes net national economic development benefits.

Structural and non-structural alternatives were initially considered to address the Purpose and Need for the Project. The Project Team solicited input on the Project Purpose, Project Need, and range of alternatives at the agency and public scoping meetings.

Alternative plans, including the NED plan, were formulated with consideration to completeness, effectiveness, efficiency, and acceptability (as required by the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, March 10, 1983.) These criteria are described below.

Completeness. Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to the realization of the contributions to the objective.

Effectiveness. Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.

Efficiency. Efficiency is the extent to which an alternative plan is the most cost-effective means of alleviating the specified problems and realizing the specified opportunities, consistent with protecting the Nation's environment.

Acceptability. Acceptability is the workability and viability of the alternative plan with respect to acceptance by State and local entities and public and to compatibility with existing laws, regulations, and public policies.

Table 4-1 summarizes the alternatives considered and the results of the screening process.

Table 4-1
Range of Alternatives and Determination for Detailed Study

Alternative	Screening Criteria [1]				Carried Forward for Detailed Study
	Completeness	Effectiveness	Efficiency	Acceptability	
No Action/Future Without Federal Project	▪ Alternative selected must be a Federal alternative so NED not accounted for with FWOP. (390-NWPM, Part 502, Subpart A, Section 502.2)	▪ Meets Project Purpose by providing flood protection to agricultural land, rural transportation facilities, and rural residential structures. ▪ Addresses current risk of loss of human life resulting from dam failure through compliance with State regulations.	▪ Benefit/Costs of the FWOP were evaluated only for comparison of Federal alternatives. ▪ SLO financial resources may limit timely implementation of FWOP alternative.	▪ Consistent with state and local laws, regulations, and policies.	Yes
Federal Decommissioning	▪ Does not provide for all investments because removing the dam eliminates benefits of flood control. ▪ Does not account for all EQ effects due to reduced water quality from loss of existing sedimentation trapping and storage capacity. ▪ NED Account was not evaluated because it did not meet Project Purpose and Need.	▪ Does not meet Project Purpose of providing flood protection to agricultural land, rural transportation facilities, and rural residential structures. ▪ Results in increased flooding and sedimentation. ▪ Addresses current risk of loss of human life resulting from dam failure. ▪ Reconnects the stream. ▪ Reduces future operation and maintenance costs.	▪ Detailed planning was not conducted because it did not meet Project Purpose and Need. ▪ Most costly.	▪ Consistent with state and local laws, regulations, and policies.	No
Rehabilitation to a High Hazard Class (C) Dam/NED Alternative	▪ Technically reliable and provides for all investments. ▪ Accounts for planned effects including NED, EQ, and OSE.	▪ Meets Project Purpose by providing flood protection to agricultural land, rural transportation facilities, and rural residential structures. ▪ Minimizes risk of loss of human life resulting from dam failure.	▪ Most cost-effective Federal alternative.	▪ Consistent with state and local laws, regulations, and policies.	Yes
Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area	▪ Technically reliable and provides for all accounts. ▪ Accounts for planned effects including NED, EQ, and OSE.	▪ Meets Project Purpose by providing flood protection to agricultural land, rural transportation facilities, and rural residential structures. ▪ Minimizes risk of loss of human life resulting from dam failure.	▪ Least cost-effective Federal alternative.	▪ Consistent with local laws, regulations, and policies. ▪ State dam safety agency may require special restrictions on future development in breach inundation area.	Yes

[1] Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, Section V. — Alternative Plans - 1.6.1 (c)

4.2 Sponsor's Rationale for Conditions of Future Without Project

The FWOP assumes Federal assistance in not available for the Project. The Project Team predicts the state dam safety agency would order the SLO to resolve nonconformance regarding the Project. The SLO would determine that the most likely course of action is to seek other funding sources to modify the dam to meet the design requirements noted in K.S.A. 82a-301 to 305a, Dam Rules and Regulations as they apply to a High Hazard Class (C) dam and to extend the design life for an additional 100 years.

Although SLO resources are insufficient to independently finance the FWOP in a timely manner, the District is committed to providing flood protection to agricultural land, rural transportation facilities, and rural residential structures in a manner that minimizes the risk of loss of human life. If NRCS federal assistance is unavailable for rehabilitation, the SLO would likely seek other sources of public funding and implement the FWOP alternative.

4.3 Alternatives Considered but Eliminated from Detailed Study

Federal Decommissioning. T he Federal Decommissioning alternative was developed to meet the purpose and need by including "flood proofing", relocation and other nonstructural measures (NWPM Section 505.35 B). The Decommission alternative included measures to stabilize the sediment and reconnect the stream channels. The Dam is breached during decommissioning. A concrete grade stabilization structure is installed to provide stabilization for the 25-year, 24-hour storm runoff from the drainage area. The size of the opening through the dam is designed and constructed large enough to safely pass the discharge from the 100-year, 24-hour storm runoff. Embankment material removed from the dam is placed in the auxiliary spillway and pool area, compacted for stabilization, and vegetated. The accumulated sediment in the pool area is removed or stabilized and the stream channel is restored through the project area. There is no impounded water or sediment storage provided by the Dam. The principal spillway system is removed and disposed of in a suitable manner. If the Dam was decommissioned, it would cause the following impacts:

- *Periodic Flooding, Sedimentation, and Other Damage*
  The existing dam provides sediment storage capacity, flood protection and flood-damage reduction to landowners, residents, motorists, and others using the project benefit area. Without the dam, periodic flood events would result in flood damages sedimentation damage and other associated damages at pre-project levels.
- *Increased Flood Zone*
  The existing downstream structures are currently protected from damage resulting from the 100-year storm event because the presence of the dam regulates the release of the water. However, FEMA Zone A does not account for the flood protection provided by the Dam. Decommissioning induces flooding downstream. NRCS requires that induced damages be mitigated. Consequently, damages to the roads, bridges, and utilities in the FEMA Zone A must be mitigated.

The cost associated with Federal Decommissioning along with the necessary costs of fulfilling the Project Purpose and Need and addressing the subsequent impacts is estimated to be approximately $2,140,900 or nearly three times the cost of rehabilitating the Dam to meet the NRCS High Hazard Class (C) Dam standards. Consequently, Federal Decommissioning was considered and eliminated from detailed study.

4.4 Description of Alternative Plans

No Action - Future Without Project (FWOP) . In the absence of NRCS technical and financial assistance, the likely SLO response would be to modify the dam to meet K.S.A. 82a-301 to 305a, Dam Rules and Regulations as they apply to a High Hazard Class (C) dam. The FWOP alternative includes the following modifications:

- Widening the auxiliary spillway.
- Raising the embankment to provide adequate capacity and freeboard to pass the design storm.
- Replacing the 38-year-old concrete principal spillway to extend design life by 100 years.
- Adding an embankment and foundation drainage system to address the potential structural stability deficiency.
- Compensatory mitigation for loss of riparian habitat, streams and wetlands.

The FWOP alternative creates significant cost and liability issues for the SLO. Detailed information for the FWOP alternative is provided in Table 4-2.

Table 4-2
Future Without Project Parameters

Project Feature	Original As-Built Conditions	K.S.A. 82a-301 to 305a Modifications
Principal Spillway Crest Elevation	1399.4 feet	1399.4 feet
Principal Spillway Conduit	18-inch diameter RCP	18-inch diameter RCP
Auxiliary Spillway Crest Elevation	1404.8 feet	1404.8 feet
Auxiliary Spillway Bottom Width	40.0 feet	240.0 feet
Top of Dam Elevation	1409.8 feet	1410.6 feet
Estimated Installation Cost		$ 726,900

Rehabilitation to a High Hazard Class (C) Dam. The Dam is rehabilitated to NRCS High Hazard Class (C) design criteria, and the design life is extended an additional 100 years. This alternative includes the following modifications:

- Widening the auxiliary spillway.
- Raising the embankment to provide adequate capacity and freeboard to pass the design storm.
- Replacing the 18-inch diameter reinforced concrete principal spillway with a 30-inch diameter reinforced concrete principal spillway. This meets the NRCS High Hazard Class (C) Dam criteria and ensures that the design life is extended by 100 years.
- Replacing the existing anti-seep collars with a drainage diaphragm system.
- Retrofitting an extensive embankment and foundation drainage system to address the wetness on the downstream toe of the left abutment.
- Compensatory mitigation for loss of riparian habitat, streams and wetlands.

Rehabilitating the dam to meet the NRCS High Hazard Class (C) Dam standards fulfills the Project Purpose and Need, and this alternative is consistent with the Watershed Work Plan Agreement between the District and NRCS.

Implementation of the Preferred Alternative will likely include mitigation for the permanent loss of 60 linear feet of stream channel, 0.4 acres of wetlands and 0.5 acres of riparian woodland. Sixty linear feet of stream channel equates to 240 debits according to the debit/credit system by the Kansas Stream Mitigation Guidance (KSMG). Therefore, the SLO will need to develop a compensatory mitigation plan to generate 240 credits to offset the stream loss debits. Alternatively, the SLO may transfer mitigation responsibilities by purchasing 240 credits through an approved Kansas In-Lieu Fee (ILF) mitigation provider.

Once a mitigation site is identified, the SLO, or alternatively the ILF provider, will develop specific compensatory mitigation measures and prepare a mitigation plan. Generally mitigation will

include in-channel stream habitat restoration, stream bank and bed stabilization, and riparian establishment. In-channel measures, such as constructed riffles or similar structures, will be considered when the stream lacks natural channel features or its bed is unstable. Banks will be stabilized by sloping, planting with native vegetation, and creating a vegetated floodplain bench. Riparian mitigation may involve creating a new appropriate vegetation buffer, enhancing an existing riparian corridor, or preserving an existing high quality buffer to prevent its destruction, degradation, or alteration.

The approved compensatory mitigation plan will include measurable and quantifiable performance criteria for each mitigation measure, a monitoring protocol to evaluate performance criteria, a contingency plan to address sub-standard performance, and a management plan for long-term maintenance of the mitigation site. Federal guidelines require permanent protection of all mitigation sites through an appropriate legally binding real estate instrument.

Detailed information for the Rehabilitation to a High Hazard Class (C) Dam alternative is provided in Table 4-3.

Table 4-3
Rehabilitation to High Hazard Class (C) Dam Parameters

Project Feature	Original As-Built Conditions	Rehabilitation to a High Hazard Class (C) Dam
Principal Spillway Crest Elevation	1399.4 feet	1399.4 feet
Principal Spillway Conduit	18-inch diameter RCP	30-inch diameter RCP
Auxiliary Spillway Crest Elevation	1404.8 feet	1406.3 feet
Auxiliary Spillway Bottom Width	40.0 feet	240.0 feet
Top of Dam Elevation	1409.8 feet	1412.7 feet
Estimated Installation Cost		$ 798,800

Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area. The Dam is rehabilitated to NRCS Low Hazard Class (A) dam design criteria, and the design life is extended by 100 years. This alternative includes the following modifications:

- Replacing the 18-inch diameter reinforced concrete principal spillway to meet the Low Hazard Class (a) dam criteria and to ensure that the design life is extended by 100 years.
- Maintaining the current auxiliary spillway configuration.
- Replacing the existing anti-seep collars with a drainage diaphragm system.
- Retrofitting an extensive embankment and foundation drainage system to address the wetness on the downstream toe of the left abutment.
- Removing the bridge at the confluence of the stream channel and MacArthur Road downstream from the dam.
- Replacing the removed bridge with a larger structure and raising MacArthur Road to prevent breach discharge from overtopping the road
- Acquire easements for 186 acres downstream from the Dam to prohibit development in the breach inundation area.
- Compensatory mitigation for loss of riparian habitat, streams and wetlands.

This alternative removes the downstream hazard and allows the Dam to be reclassified as a Low Hazard Class (A) dam. Easements would be acquired to prevent future upgrades to a High Hazard Class (C) dam due to downstream development within the breach inundation area. Detailed information for rehabilitation to a Low Hazard Class (A) dam and breach proofing in the inundation area is provided in Table 4-4.

Table 4-4
Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing Parameters

Project Feature	Original As-Built Conditions	Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing Parameters
Principal Spillway Crest Elevation	1399.4 feet	1399.4 feet
Principal Spillway Conduit	18-inch diameter RCP	18-inch diameter RCP
Auxiliary Spillway Crest Elevation	1404.8 feet	1404.8 feet
Auxiliary Spillway Bottom Width	40.0 feet	40.0 feet
Top of Dam Elevation	1409.8 feet	1409.8 feet
Estimated Installation Cost		$ 1,009,200

Rehabilitating the dam to a Low Hazard Class (A) dam and breach proofing in the inundation area fulfills the Project Purpose and Need, and this alternative is consistent with the Watershed Work Plan Agreement between the District and NRCS. Easements required to prevent future development in the breach inundation area downstream from the dam will restrict future development.

4.5 Comparison of Alternative Plans

Table 2-1 and Table 2-2 identify the primary resource concerns based on the NRCS planning requirements for the Project. Table 4-5 compares the alternatives with respect to these relevant resource concerns and NRCS planning requirements. Additionally the table shows in parentheses the applicable P&G account for each resource concern. These P&G Accounts are the following:

- *Environmental Quality (EQ)*
  The EQ account measures the ecological, cultural, and aesthetic attributes of significant natural and cultural resources. Measurements may be in numeric units or nonnumeric terms.
- *Other Social Effects (OSE)*
  The OSE account communicates other relevant effects that are not reflected in other P&G accounts, including urban and community impacts and effects on life, health, and safety.
- *Regional Economic Development (RED)*
  The RED account communicates the effects on rural development, including employment, income, and economic activities. The RED account effects were not included in the Plan because they were not identified as issues during the scoping process.
- *National Economic Development (NED)*
  The NED account includes the estimates of project benefits and costs used to calculate net economic benefits. The NED account is not included in Table 4-5. Table 4-6 shows these effects on the national economy.

Table 4-5
Comparison of Alternative Plans

Resource Concern/ NRCS Planning Requirement	No Action/Future Without Project (Modify Dam to meet K.S.A. 82a-301 to 305a)	Preferred Alternative (Rehabilitation to a High Hazard Class (C) Dam)	Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area
Human Health and Safety (OSE) ▪ The Project Purpose is to continue to provide flood protection to agricultural land, rural transportation facilities, and rural residential structures in a manner that minimizes the risk of loss of human life.	▪ Reduces risk of the breach inundation to existing and future downstream property and transportation facilities.	▪ Provides reduced risk of loss of life due to Dam failure because of more restrictive design criteria. ▪ Reduces the breach inundation risk to existing and future downstream property and transportation facilities.	▪ Removes the downstream hazard at MacArthur Road by increasing the bridge capacity, raising the roadway, and preventing future development in the breach inundation area through easements.
Water Quality (EQ) ▪ Effects on water quality due to erosion and sedimentation are a potential long-term concern. ▪ A potential opportunity of the project is to provide extended erosion and sedimentation control for agriculture.	▪ Maintains current water quality benefits due to the Dam (which include reduced sediment, nutrients, pesticides, and organic loading in downstream waters.)	▪ Maintains current water quality benefits by providing additional flood protection through installation of larger principal spillway conduit (benefits include reduced sediment, nutrients, pesticides, and organic loading in downstream waters.)	▪ Maintains current water quality benefits (which include reduced sediment, nutrients, pesticides and organic loading, in downstream waters.)
Flood Control (OSE) ▪ The Project Purpose is to provide flood control. Each alternative must fulfill this to be considered viable.	▪ Maintains current level of flood protection.	▪ Maintains current level of flood protection.	▪ Maintains current level of flood protection.
Land Use (EQ) ▪ Present and future land use planning in the benefit area has occurred based on the assumption that the Dam would be retained. ▪ Loss of the Dam would significantly impact land use in the benefit area.	▪ Does not affect land use in the downstream benefit area. ▪ Does not change normal pool of the Dam. ▪ Requires additional land rights for enlarged auxiliary spillway. ▪ Requires additional land rights for flood pool. ▪ Results in a permanent land use change from agriculture.	▪ Does not affect land use in the downstream benefit area. ▪ Does not change normal pool of the Dam. ▪ Requires additional land rights for enlarged auxiliary spillway. ▪ Requires additional land rights for flood pool. ▪ Results in a permanent land use change from agriculture.	▪ Restricts future downstream development with easements in the breach inundation area to prevent a future upgrade to a High Hazard Class (C) dam. ▪ Requires additional land rights to enlarge the bridge and raise the road at the confluence of the downstream channel and MacArthur Road.

Resource Concern/ NRCS Planning Requirement	No Action/Future Without Project (Modify Dam to meet K.S.A. 82a-301 to 305a)	Preferred Alternative (Rehabilitation to a High Hazard Class (C) Dam)	Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area
Cultural Resources (EQ) ▪ The Kansas State Historical Preservation Office (SHPO) was contacted. ▪ The area of potential effect was identified and reviewed by the NRCS Cultural Resources Specialist. ▪ Phase II field survey investigations were conducted by SHPO.	▪ No significant archeological sites were found in the Project area. ▪ Tribal consultation was completed by NRCS. ▪ National Register of Historic Places does not list presence in the Project area.	▪ No significant archeological sites were found in the Project area ▪ Tribal consultation was completed by NRCS ▪ National Register of Historic Places does not list presence in the Project area.	▪ No significant archeological sites were found in the Project area ▪ Tribal consultation was completed by NRCS ▪ National Register of Historic Places does not list presence in the Project area.
Endangered and Threatened Species (EQ) ▪ The Project Team informally consulted the U.S. Fish & Wildlife Service (USFWS) and the Kansas Department of Wildlife & Parks.	▪ There is no known federal critical habitat at the Project site. ▪ The project will have No Effect on Endangered or Threatened species.	▪ There is no known federal critical habitat at the Project site. ▪ The project will have No Effect on Endangered or Threatened species.	▪ There is no known federal critical habitat at the Project site. ▪ The project will have No Effect on Endangered or Threatened species.
Transportation (EQ) ▪ Dam failure would likely impair the use of MacArthur Road, which is a primary rural thoroughfare for the surrounding rural residential and agricultural communities.	▪ Reduces the risk of impairment of the transportations facilities in the benefit area by maintaining flood control benefit and reducing the potential for dam failure.	▪ Reduces the risk of impairment of the transportations facilities in the benefit area by improving the flood control benefit and reducing the potential for dam failure.	▪ Reduces the risk of impairment of the transportations facilities in the benefit area by improving the discharge capacity of the bridge at MacArthur Road.

Resource Concern/ NRCS Planning Requirement	No Action/Future Without Project (Modify Dam to meet K.S.A. 82a-301 to 305a)	Preferred Alternative (Rehabilitation to a High Hazard Class (C) Dam)	Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area
Fish and Wildlife Coordination (EQ) ▪ Alternatives including stream modifications will require consultation with the U.S. Fish and Wildlife Service, and full considerations must be given to agency recommendations.	▪ Causes temporary disturbances of local fish and wildlife populations during construction. ▪ Causes minor short-term disturbances of aquatic and terrestrial wildlife from inundation. ▪ Causes minor, permanent disturbance of woodland, grassland, wetland, and stream channel from spillway and embankment upgrade. ▪ Temporarily impacts 250 feet of stream channel, 0.5 acre of woodland, 2.0 acres of wetland, and 3.2 acres of grassland due to short-term inundation. ▪ Causes permanent loss of 0.5 acre of riparian woodland and 7.3 acres of grassland from changes to the auxiliary spillway.	▪ Causes temporary disturbance of local fish and wildlife populations during construction. ▪ Causes minor short-term disturbance of aquatic and terrestrial wildlife from inundation. ▪ Causes minor permanent disturbance of woodland, grassland, wetland, and stream channel from spillway and embankment upgrade. ▪ Temporarily impacts 375 feet of stream channel, 1.4 acres of woodland, 4.9 acres of wetlands, and 13.7 acres of grassland due to short-term inundation. ▪ Causes permanent loss of 0.5 acre of riparian woodland, 8.0 acres of grassland, and 60 linear feet of stream channel due to changes to the auxiliary spillway, dam embankment, and outlet channel.	▪ Causes temporary disturbance of local fish and wildlife populations during construction. ▪ Impacts approximately 40 feet of stream channel near MacArthur Road. ▪ Constructs 10 feet of channel straightening and 10 feet of box culvert on each side of the new bridge. ▪ Disturbs approximately 0.2 acre of riparian woodland by the construction activities.

Resource Concern/ NRCS Planning Requirement	No Action/Future Without Project (Modify Dam to meet K.S.A. 82a-301 to 305a)	Preferred Alternative (Rehabilitation to a High Hazard Class (C) Dam)	Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area
Floodplain Management (EQ) ▪ See NECH 610.90), NRCS policy on Floodplains is found in the GM 190, Part 410.25, and reflects Executive Order (EO) 11988, May 24 1977. ▪ Floodplains are lowlands or relatively flat areas adjoining inland or coastal waters, including at a minimum, areas subject to a 1% or greater chance of flooding in any given year. ▪ The EO requires that decisions by Federal agencies must recognize that floodplains have unique and significant public values. ▪ Federal agencies are instructed to consider the natural and beneficial values of floodplains and the public benefits to be derived from floodplain restoration or preservation.	▪ Requires a Permit to Construct Dam from Kansas Department of Agriculture, Division of Water Resources.	▪ Requires a Permit to Construct Dam from Kansas Department of Agriculture, Division of Water Resources.	▪ Requires a Permit to Construct Dam and a Stream Obstruction Permit from Kansas Department of Agriculture, Division of Water Resources.
Invasive Species (EQ) ▪ Potential for introduction of invasive species with construction activities.	▪ Vegetative establishment associated with the planned activities shall be conducted consistent with The Kansas Seed Law.	▪ Vegetative establishment associated with the planned activities shall be conducted consistent with The Kansas Seed Law.	▪ Vegetative establishment associated with the planned activities shall be conducted consistent with The Kansas Seed Law.

Resource Concern/ NRCS Planning Requirement	No Action/Future Without Project (Modify Dam to meet K.S.A. 82a-301 to 305a)	Preferred Alternative (Rehabilitation to a High Hazard Class (C) Dam)	Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area
Migratory Bird (EQ) ▪ See NECH 610.92: Migratory Bird Treaty Act, 1918 as amended, ▪ It is unlawful for anyone to kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird, including feathers, parts, nests, or eggs. ▪ Executive Order 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds" requires NRCS to consider the impacts of planned actions on migratory bird populations and habitats for all planning activities.	▪ Migratory birds and their nesting activities will be temporarily disturbed if construction takes place between April 1 and July 15 (disturbance may be prevented by avoiding construction at that time). ▪ If construction begins prior to and continues through nesting season, migratory birds will likely nest in other locations thereby minimize adverse effects.	▪ Migratory birds and their nesting activities will be temporarily disturbed if construction takes place between April 1 and July 15 (disturbance may be prevented by avoiding construction at that time). ▪ If construction begins prior to and continues through nesting season, migratory birds will likely nest in other locations thereby minimize adverse effects.	▪ Migratory birds and their nesting activities will be temporarily disturbed if construction takes place between April 1 and July 15 (disturbance may be prevented by avoiding construction at that time). ▪ If construction begins prior to and continues through nesting season, migratory birds will likely nest in other locations thereby minimize adverse effects.
Prime and Unique Farmland (OSE) ▪ See NECH 610.94, Farmland Protection Act and 7 CFR Part 658 ▪ Federal programs must minimize the extent they contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses. ▪ Federal programs must be administered in a manner that, to the extent practicable, will be compatible with State, unit of local government, and private programs and policies to protect farmland.	▪ Inundates approximately 5.7 acres of prime farmland infrequently for short periods. ▪ Removes 7.3 acres of prime farmland for construction. ▪ All soils present in the project area considered Prime farmland.	▪ Inundates approximately 20.0 acres of prime farmland infrequently for short periods. ▪ Removes 8.0 acres of prime farmland for construction. ▪ All soils present in the project area considered Prime farmland.	▪ Removes 0.1 acres of prime farmland for construction of the road and bridge improvement. ▪ All soils present in the project area considered Prime farmland.

Resource Concern/ NRCS Planning Requirement	No Action/Future Without Project (Modify Dam to meet K.S.A. 82a-301 to 305a)	Preferred Alternative (Rehabilitation to a High Hazard Class (C) Dam)	Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area
Riparian Area (EQ) ▪ Riparian areas are woodland, grassland, and other terrestrial and aquatic habitat adjacent to the stream channel. ▪ Federal law does not specifically regulate riparian areas. ▪ However, portions of riparian areas, such as wetlands and other waters of the U.S., may be subject to federal regulation under provisions of The Food Security Act, The Clean Water Act, The National Environmental Policy Act, and state and local legislation.	▪ Inundates approximately 0.5 acres of riparian woodlands and 3.2 acres of riparian grassland infrequently for short periods. (Frequency of inundation is less than a 1% chance and the duration of inundation is estimated at 5 to 10 hours. Neither the frequency nor duration of this impact will change the existing vegetation or physical structure of these native habitats.) ▪ Removes 0.5 acres of riparian woodlands for construction.	▪ Inundates approximately 1.4 acres of riparian woodlands and 13.7 acres of riparian grassland infrequently for short periods by the Preferred Alternative. (Frequency of inundation is less than a 1% chance and the duration of inundation is estimated at 5 to 10 hours. Neither the frequency nor duration of this impact will change the existing vegetation or physical structure of these native habitats.) ▪ Removes 0.5 acres of riparian woodlands for construction of the Preferred Alternative.	▪ Removes 0.2 acres of riparian woodlands for construction of the road and bridge improvements.
Waters of U.S./Clean Water Act (EQ) ▪ Section 404 of the Clean Water Act sets the basic structure for regulating discharges of pollutants to waters of the United States and establishes a program to regulate the discharge of dredge and fill material into waters of the United States. ▪ Waters of the U.S. are all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce and their tributaries. ▪ Section 404 of the CWA established a permit program to regulate the discharge of dredged and fill material into waters of the U.S.	▪ Inundates 250 linear feet of stream channel infrequently for short periods at the new top of Dam elevation. (Frequency of inundation is less than 1% chance and the duration of inundation is estimated at 5 to 10 hours. Neither the frequency nor duration of this impact will change the existing vegetation or physical structure of these native habitats.)	▪ Inundates 375 linear feet of stream channel infrequently for short periods at the new top of Dam elevation. (Frequency of inundation is less than 1% chance and the duration of inundation is estimated at 5 to 10 hours. Neither the frequency nor duration of this impact will change the existing vegetation or physical structure of these native habitats.) ▪ Removes 60 linear feet of stream channel for construction.	▪ Impacts 40 linear feet of stream channel for construction of the bridge and road improvements.

Resource Concern/ NRCS Planning Requirement	No Action/Future Without Project (Modify Dam to meet K.S.A. 82a-301 to 305a)	Preferred Alternative (Rehabilitation to a High Hazard Class (C) Dam)	Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area
Wetland (EQ) ▪ See NECH 610.97, NRCS activities must comply with Executive Order (EO) 11990, "Protection of Wetlands," Food Security Act of 1985, GM 190 Part 410.26, and with Revised NRCS Wetland Technical Assistance Policy at 7 CFR Part 650, dated November 17, 1997. ▪ Wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions. ▪ It is the policy of the NRCS to protect and promote wetland functions and values in all NRCS planning and application assistance. ▪ If wetlands will be impacted by a proposed activity, the NRCS will identify whether practicable alternatives exist that either enhance wetland functions and values, or avoid or minimize harm to wetlands.	▪ Inundates approximately 2.0 acres of wetlands infrequently for short period. ▪ Frequency of inundation is less than 1% chance and the duration of inundation is estimated at 5 to 10 hours. Neither the frequency nor duration of this impact will change the existing vegetation or physical structure of these native habitats.	▪ Inundates approximately 4.9 acres of wetlands infrequently for short periods. ▪ Frequency of inundation is less than 1% chance and the duration of inundation is estimated at 5 to 10 hours. Neither the frequency nor duration of this impact will change the existing vegetation or physical structure of these native habitats. ▪ Fills approximately 0.4 acres of wetlands downstream from the dam.	▪ Does not disturb wetlands.

Benefit/Cost Comparison. The Project Team completed a comparative cost analysis for the alternative plans carried forward for detailed study, which is shown in Table 4-6. Cost items include:

- Land rights to enlarge the auxiliary spillway, raise the dam, mitigate the loss of habitat, and enlarge the bridge at MacArthur Road.
- Construction-related activities such as mobilization, clearing and grubbing, erosion and sediment control, demolition and removal of existing structures, site work, earthwork, fencing, seeding, habitat mitigation, road surfacing, sediment removal, and installation of the bridge, drainfill, and conduits.
- Engineering activities such as completing design, surveys, geotechnical investigations, construction observations, and project administration. (Engineering costs were estimated to be 35% of the total construction costs.)

Table 4-6
NED Account Comparison of Alternative Plans[1]

Item	Alternative		
	No Action/Future Without Project (Modify Dam to meet K.S.A. 82a-301 to 305a)	**Preferred Alternative (Rehabilitation to a High Hazard Class (C) Dam)**	**Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing in the Inundation Area**
Estimated Installation Cost	$726,900	$798,800	$1,009,200
Adverse Annual Costs[2]			
Amortized Installation Costs	$32,200	$35,400	$44,800
O&M and Replacement Costs	$1,600	$1,800	$1,700
Total Adverse Annual Costs	$33,800	$37,200	$46,500
Annual Benefits[3]			
Annual Benefits[4]	-	-	-
Costs Avoided	-	$33,800	$33,800
Total Annual Benefits	-	$33,800	$33,800
Annual Net Benefits	**($33,800)**	**($3,400)**	**($12,700)**

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[1] Price base 2009.
[2] Amortized over 100 years at 4.375 percent interest rate.
[3] Average Annual Benefits based on 100 year operational life.
[4] Benefits with the preferred alternative are the same as the benefits for the existing dam and FWOP.

4.6 NATIONAL ECONOMIC DEVELOPMENT (NED) ALTERNATIVE

The NED Alternative is the federally-assisted alternative with the greatest net benefits to an existing dam that (a) does not meet the current safety and performance standards, and (b) would put human life at risk if it catastrophically failed.

Rehabilitation to a High Hazard Class (C) dam is the Preferred Alternative and also the NED alternative, based on the following reasons:

- It fulfills the Project Purpose and Need, which were defined by the SLO and public.
- It has overall positive impacts on human resources and minimal impacts on natural environmental resources.
- It has the highest benefit-cost ratio of the federally assisted alternatives.

5.0 Environmental Consequences

5.1 Comparative Environmental Effects of Alternatives

The following is a comparative description of the effects that each alternative will have on the natural and human environment, focusing on the resource concerns identified during the scoping process determined to be relevant to the proposed alternatives. Resource concerns that were identified as not relevant to the proposed action are not included in this section. For each resource concern, the present conditions are summarized to provide a better understanding of the effects.

Human Health and Safety

- *Present Conditions*
  The dam is structurally safe; however, there is a threat of failure from overtopping of the dam or erosion of the auxiliary spillway during large storms. There is a significant threat from dam failure to human life and safety for residents, motorists, and other people using downstream facilities. County population growth and rural residential development increased traffic on MacArthur Road, located downstream from the Dam. The most recent traffic count measured more than 1,500 vehicles per day travelling on MacArthur Road in the area around 311th Street West and 327th Street West. K.A.R. 5-40-20 (c) states that a dam is classified as a High Hazard Class (C) dam if any road in the inundation area downstream from the dam has a traffic count of more than 1,500 vehicles per day. Consequently, the Dam is noncompliant with the current safety regulations.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  The threat of loss of life or unsafe conditions from the dam failing would be reduced through modifications designed to bring the dam into compliance with Kansas dam safety criteria. Flood protection would continue for residents, motorists, and other persons using downstream facilities.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Widening the auxiliary spillway would reduce flood pool elevation during freeboard storm events, prevent overtopping of the dam, and prevent erosion of the spillway. Rehabilitation would bring the dam into compliance with federal and state criteria, and the threat of the dam failing during large storms would be reduced. The threat of loss of life or unsafe conditions from the dam failing would be reduced through rehabilitation designed to bring the dam into compliance with NRCS High Hazard Class (C) Dam safety criteria. Flood protection would continue for residents, motorists, and other persons using downstream facilities.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  The threat of loss of life or unsafe conditions from the dam failing would be reduced through rehabilitation designed to bring the dam into compliance with NRCS High Hazard Class (A) Dam safety criteria. Flood protection would continue for residents, motorists, and other persons using downstream facilities.

Water Quality

- *Present Conditions*
  The existing sediment pool for the dam shows no evidence of significant water quality concerns. The effect of the existing pool on downstream water quality is likely positive, but not quantifiable.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  During implementation of the FWOP, there would be minor, temporary impacts to water quality due to an increase in turbidity in the pool and the stream during construction. A Stormwater Pollution Prevention Plan (SWPPP) and an NPDES general permit for construction will be required for construction. The SWPPP will include the preparation of an erosion and sediment control plan and installation of temporary best management practices

to minimize sediment discharge to the pool and the stream during and subsequent to disturbances associated with construction activities.

- *Rehabilitation to a High Hazard Class (C) Dam*
  Same as Future Without Project.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Same as Future Without Project.

Flood Control

- *Present Conditions*
  The primary purpose of the existing dam is flood control. The existing dam provides flood protection for the 145-acre benefit area from the 100-year flood. The dam provides average annual benefits totaling approximately $10,100 based on a 2009 price base. Failure of the dam poses a significant threat of flood damages to private property, roads, and utilities in the breach inundation area.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  The FWOP extends flood protection for the 145-acre benefit area for the 100-year flood for an additional 100 years. The threat of property damage from the dam failure would be reduced through modifications designed to bring the dam into compliance with Kansas dam safety criteria. Flood protection would continue for private property, roads, and utilities in the breach inundation area.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Same as Future Without Project.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Same as Future Without Project.

Land Use

- *Present Conditions*
  Intensification of land use has occurred in the benefit area of the dam due to reduced flooding.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  The FWOP requires additional land rights for the enlarged auxiliary spillway, extended dam footprint, and expanded flood pool upstream from the dam. The land use in the benefit area will not be further affected by the FWOP.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Same as Future Without Project.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Rehabilitation to a Low Hazard Class (A) Dam requires additional land rights for the enlarged auxiliary spillway, extended dam footprint and expanded flood pool upstream from the dam. Breach proofing in the 114-acre inundation area will result in land use restrictions prohibiting development.

Cultural Resources

- *Present Conditions*
  No significant archeological sites were found in the Project area.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  If the Project disturbs an unmarked burial site or human skeletal remains, Permits for excavation, study, display, and reinterment will be required.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Same as Future Without Project.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Same as Future Without Project.

Endangered and Threatened Species

- *Present Conditions*
  No known federal critical habitat in the Project area.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  The FWOP will have No Effect on Federal endangered or threatened species. Additionally, the Project does not impact Kansas State-listed species and, therefore, does not require a KDWP Action Permit.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Same as Future Without Project.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Same as Future Without Project.

Transportation

- *Present Conditions*
  The existing dam provides flood protection to the downstream transportation facilities for the 100 year flood. Traffic interruptions due to flooding are minimal due to the existing dam. A breach of the existing structure and/or potential flood damage could have short-term impacts on local transportation facilities and systems.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  The FWOP extends the current level of flood protection to the downstream transportation facilities from the 100-year flood for an additional 100 years. Traffic interruptions due to flooding are minimal due to the existing dam. Reduced potential of a breach of the existing structure and/or potential flood damage reduces short-term impacts on local transportation facilities and systems.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Same as Future Without Project.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Same as Future Without Project. Additionally, breach proofing at MacArthur road, including increased flow capacity at the bridge and elevation of the existing roadway provides reduced flooding and improved traffic flow.

Fish and Wildlife

- *Present Conditions*
  The pool provides habitat for fish, waterfowl, and other birds, and it provides storage for low-flow augmentation of fish habitat downstream of the dam. The area at the dam is mowed and provides low-value habitat.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  The fish and wildlife habitat provided by the pool will be temporary lost during construction. Except for possible temporary, minor increases in turbidity near the construction area, which would be minimized by best management practices for control of erosion and sediment runoff, downstream fish habitat would not be affected. By protecting the dam against failure, rehabilitation would ensure the continued, long-term presence of the fish and wildlife habitat in the pool and the availability of water for low-flow augmentation to support fish habitat downstream of the dam. Implementation of the FWOP causes permanent loss of 0.5 acre of riparian woodland and 7.3 acres of grassland due to enlargement of the auxiliary spillway. There could also be minor, temporary disturbances to wildlife due to noise from construction.
- *Rehabilitation to a High Hazard Class (C) Dam*
  The wildlife habitat provided by the pool will be temporary lost during construction. Except for possible temporary, minor increases in turbidity near the construction area, which would be minimized by best management practices for control of erosion and sediment runoff, fish habitat would not be affected. By protecting the dam against failure, rehabilitation would ensure the continued, long-term presence of the fish and wildlife habitat in the pool and the availability of water for low-flow augmentation to support fish habitat downstream of the dam.

Implementation of this alternative causes permanent loss of 0.5 acre of riparian woodland and 8.0 acres of grassland due to enlargement of the auxiliary spillway and 60 linear feet of stream channel. There could also be minor, temporary disturbances to wildlife due to noise from construction.

- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  The wildlife habitat provided by the pool will be temporary lost during construction. Except for possible temporary, minor increases in turbidity near the construction area, which would be minimized by best management practices for control of erosion and sediment runoff, fish habitat would not be affected. By protecting the dam against failure, rehabilitation would ensure the continued, long-term presence of the fish and wildlife habitat in the pool and the availability of water for low-flow augmentation to support fish habitat downstream of the dam. Implementation of this alternative causes permanent loss of 0.2 acre of riparian woodland and 10 linear feet of stream channel. There could also be minor, temporary disturbances to wildlife due to noise from construction.

Floodplain Management

- *Present Conditions*
  The floodplain downstream from the dam is shown in Appendix C. The Dam results a smaller influence on the floodplain of the Ninnescah River.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  The floodplain would not be affected by the FWOP.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Same as Future Without Project.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Same as Future Without Project.

Invasive Species

- *Present Conditions*
  The existing dam has no known effect on invasive species.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  Seeding activities associated with construction could potentially introduce invasive species. Vegetative establishment associated with the planned activities shall be conducted consistent with The Kansas Seed Law.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Same as Future Without Project.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Same as Future Without Project.

Migratory Birds

- *Present Conditions*
  The existing dam pool upstream from the dam provides nesting, feeding and resting habitat for migratory birds.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  The pool upstream from the dam with the FWOP will provide nesting, feeding and resting habitat for migratory birds. Migratory birds and their nesting activities will be temporarily disturbed if construction takes place between April 1 and July 15 (disturbance may be prevented by avoiding construction at that time). If construction begins prior to and continues through nesting season, migratory birds will likely nest in other locations thereby minimize adverse effects.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Same as Future Without Project.

- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Same as Future Without Project.

Prime and Unique Farmland

- *Present Conditions*
  The soils at existing dam and flood pool are classified as Prime Farmland.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  All soils present in the project area considered Prime farmland. The FWOP will inundate approximately 5.7 acres of prime farmland infrequently for short periods, remove 7.3 acres of prime farmland for construction.
- *Rehabilitation to a High Hazard Class (C) Dam*
  All soils present in the project area considered Prime farmland. This alternative will inundate approximately 20 acres of prime farmland infrequently for short periods and remove 8 acres of prime farmland for construction.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  All soils present in the project area considered Prime farmland. This alternative will remove 0.1 acres of prime farmland for construction.

Riparian Areas

- *Present Conditions*
  The existing structure is located in grassland. Riparian woodland exists downstream from the dam. The existing riparian woodland species are described in Appendix D.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  Implementation of the FWOP causes permanent loss of 0.5 acre of riparian woodland.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Implementation of this alternative causes permanent loss of 0.5 acre of riparian woodland.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Implementation of this alternative causes permanent loss of 0.2 acre of riparian woodland.

Waters of U.S./ Clean Water Act

- *Present Conditions*
  The existing structure is located on an intermittent stream considered to be Water of the U.S.
- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  Implementation of the FWOP will inundate an additional 250 linear feet of stream channel infrequently for short periods at the new top of Dam elevation. (Frequency of inundation is less than 1% chance and the duration of inundation is estimated at 5 to 10 hours. Neither the frequency nor duration of this impact will change the existing vegetation or physical structure of these native habitats.)
- *Rehabilitation to a High Hazard Class (C) Dam*
  Implementation of this alternative will remove 60 linear feet of stream channel for construction and inundate an additional 375 linear feet of stream channel infrequently for short periods at the new top of Dam elevation. (Frequency of inundation is less than 1% chance and the duration of inundation is estimated at 5 to 10 hours. Neither the frequency nor duration of this impact will change the existing vegetation or physical structure of these native habitats.)
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Implementation of this alternative will temporarily affect 40 linear feet of stream channel for construction of the bridge and road improvements.

Wetlands

- *Present Conditions*
  Wetland resources identified at the site designated as Wetland/Other Waters (W/OW) include 45.96 acres upstream from the dam and 3.42 acres downstream from the dam.

- *Future Without Project (Modify dam to meet K.S.A. 82a-301 to 305a)*
  Implementation of the FWOP would inundate approximately 2.0 acres of wetlands infrequently for short periods during extreme storm events. The frequency of inundation would be less than 1% chance and the duration of inundation would be from 5 to 10 hours. Neither the frequency nor duration of this impact will change the existing vegetation or physical structure of these native habitats.
- *Rehabilitation to a High Hazard Class (C) Dam*
  Implementation of this alternative would fill approximately 0.4 acres of wetlands downstream from the dam. Additionally this alternative would inundate approximately 4.9 acres of wetlands infrequently for short periods during extreme storm events. The frequency of inundation would be less than 1% chance and the duration of inundation would be from 5 to 10 hours. Neither the frequency nor duration of this impact will change the existing vegetation or physical structure of these native habitats.
- *Rehabilitation to a Low Hazard Class (A) Dam and Breach Proofing*
  Implementation of this alternative does not affect the wetland resources at the project site.

5.2 Cumulative Impacts

Construction of Floodwater Retarding Dam R-1 in 1972 had long-term direct effects on the environment through the excavation of the site, filling of the structure, and development of a permanent impoundment behind the dam that now provides flood control, incidental recreational opportunities, fish and wildlife habitat, and other incidental benefits.

Since construction, the dam has indirectly affected the natural environment by permanent flooding of the 19.37-acre area of the normal pool, by temporary inundation of the floodplain upstream of the dam during rain events, and by trapping sediment that would otherwise move downstream during rain events. The dam has also altered the hydrology of downstream channel by reducing downstream peak flows during storm events, and consequently protecting property and people in otherwise flood prone areas.

Rehabilitation of the dam under the alternatives considered would not change the hydrology downstream except for protecting the downstream area from catastrophic flooding that could occur if the dam were to fail. Consequently, there would be no long-term, cumulative effects from the rehabilitation project.

Future actions in the watershed not related to this project include continued changes to upstream and downstream land use as a result of residential, industrial, and commercial development. Rehabilitation of the Dam would not affect future development, but it would allow the dam to safely pass storm flows under extreme rainfall conditions.

5.3 Controversy

There are no known areas of controversy.

5.4 Risk and Uncertainty

Project risk and uncertainty primarily exist in the engineering and economics analyses of the Project alternatives. The Project Team based all preliminary designs and cost estimates on an additional 100 years of functional life using LIDAR data provided by Sedgwick County, recent topographic surveys, and bathymetry. Geotechnical explorations were not conducted, and the designs relied on minimal soil mechanics data from the original dam design, as-built plans, field observations and experience. Slope stability analyses were not performed. Hydrologic data was measured using aerial photos, United States Geological Survey 7.5 minute quadrangle maps, and field observations. Accuracy of the data impacts uncertainty of the reservoir operation levels, discharge capacities, breach inundation areas, flood damage area, design life, and structure function. Failure of the dam would most likely occur as a result of (1) breach of the embankment due to extreme storm events, or (2) deterioration and failure of the principal spillway conduit.

The Project Team used the Economics and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G) to account for flood control benefits associated with the alternatives. Predicting economic benefits naturally involves a moderate degree of uncertainty. The economic analysis used an indexing approach to predict benefits. Uncertainty in the price of inputs, outputs, and the demand for agronomic crops produced will vary in the future. Consequently, the change in land value is the index that is most likely to reflect the value of preventing flood damage because changes in land value relates to the change in the land's use for various crops, which subsequently reflects the changes in price and productivity.

The original benefits for the project were indexed to current dollars using the land value index. The scope of the study did not include re-evaluation or reconsideration of the original benefits. Consequently, the estimated average annual flood damage reduction benefits and intensification benefits may vary from those in displayed.

Uncertainties with the analysis of environmental impacts lie with the identification of wetland areas, riparian habitat, and streams. Trained specialists identified environmentally significant areas using standard, well-accepted protocols.

Within the context of this study, all alternatives were considered on a comparable basis. There does not appear to be any area that would have resulted in a different decision by using different procedures or conducting more intensive studies.

6.0 CONSULTATION AND PUBLIC PARTICIPATION

6.1 PUBLIC PARTICIPATION

The SLO submitted a formal request for assistance to NRCS in 2005. The request listed concerns about a potential change in hazard classification, the condition of the principal spillway, the condition of the drain outlets, and sedimentation as justifications for an assessment.

NRCS contracted with Wilson & Company, Inc., Engineers and Architects to complete a Rehabilitation Assessment for the Dam. The Rehabilitation Assessment determined that the Dam did not meet NRCS and State Dam Safety requirements with respect to the current hazard classification and recommended modifications to meet current design criteria.

The SLO, Project Team and NRCS held multiple public meetings to receive input, discuss problems and opportunities, and issue updates on progress. The following are summaries and general comments received during and after the meetings.

August 20, 2009 –Project Team/NRCS. The Project Team and NRCS held a meeting. This provided instruction and guidance on the Project scope and the extent of activities required for developing the Supplemental Watershed Plan.

September 16, 2009 – Project Team/NRCS/SLO. The Project Team and NRCS met with the SLO to receive input on plan development and the schedule of activities. The SLO provided preliminary guidance on the Project Purpose and Need.

October 7, 2009 – Public Forum. A public scoping open forum was held at Garden Plain, Kansas to discuss the rehabilitation of the Dam. A public notice was published in the Wichita Eagle (a daily newspaper published in Wichita, Kansas), and postcard meeting notices were sent to public, local and state officials. Thirteen people attended. The following topics were discussed:

- Purpose of the public meeting
- Information on the PL-566 Small Watershed Program
- History of the Dam
- Project location
- Structure design details
- Results of the Rehabilitation Assessment
- Proposed Project Purpose
- Proposed Project Need
- Project scope of work
- Project team
- Alternatives to consider
- Project schedule
- Questions and comments

December 9, 2009 – Project Team/NRCS/SLO. The Project Team and NRCS met with the SLO to receive input on plan development and the schedule of activities. The SLO provided final guidance on the Project Purpose and Need.

January 27, 2010 – Public Forum. A public scoping open forum was held at Garden Plain, Kansas to discuss the rehabilitation of the Dam. A public notice was published in the Wichita Eagle (a daily newspaper published in Wichita, Kansas), and postcard meeting notices were sent to public local and state officials. Approximately 25 people attended; 14 signed the register. The following topics were discussed:

- Purpose of the public meeting
- Information on the PL-566 Small Watershed Program
- History of the Dam
- Project location
- Structure design details
- Results of the Rehabilitation Assessment
- Proposed Project Purpose
- Proposed Project Need
- Project scope of work
- Project team
- Alternatives to consider
- Project schedule
- Questions and comments

The SLO allowed public input at all District Board Meetings prior to and during the planning process. A draft of the Supplemental Watershed Plan and Environmental Assessment was sent to all interested parties from the public scoping meetings and also made available to the general public upon individual request. A public comment period was provided.

6.2 Agency Consultation

The following is a list of federal, state, and local agencies and organizations consulted for the Project:

- Osage Nation of Oklahoma
- Wichita and Affiliated Tribes [in Oklahoma]
- U.S. Environmental Protection Agency
- Natural Resources Conservation Service
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- Kansas Department of Agriculture, Division of Water Resources
- Kansas Department of Wildlife and Parks
- Kansas State Historic Preservation Office
- State Association of Kansas Watersheds
- Sedgwick County Conservation District
- Sedgwick County Code Enforcement Department
- Sedgwick County Public Works Department

A draft of the Supplemental Watershed Plan and Environmental Assessment was made available for review and comment. Comments received after the comment period were considered and are included in the administrative record.

7.0 PREFERRED ALTERNATIVE: REHABILITATE TO HIGH HAZARD CLASS (C) DAM

7.1 SUMMARY AND PURPOSE

Based on review of the Project Purpose and Project Need, the overall impacts on human and natural environmental resources, and consideration of the NED Alternative, the Preferred Alternative is to rehabilitate the dam to NRCS High Hazard Class (C) design criteria. The Preferred Alternative will improve the present level of flood protection and reduce the threat to public health and safety. The Preferred Alternative includes the following modifications to the Dam:

- Extending the design life by 100 years.
- Widening the auxiliary spillway.
- Raising the embankment to provide adequate capacity and freeboard to pass the design storm.
- Replacing the 18-inch diameter reinforced concrete principal spillway with a 30-inch diameter reinforced concrete principal spillway.
- Replacing the existing anti-seep collars with a drainage diaphragm system.
- Retrofitting an extensive embankment and foundation drainage system to address the wetness on the downstream toe of the left abutment.

After implementation of the Preferred Alternative, the Dam will meet all current NRCS and State of Kansas dam safety and performance standards. USDA policy requires 50 percent of the land above the reservoir be adequately protected prior to construction. Based on field reconnaissance of the project drainage area, all agricultural land above the reservoir has been treated with soil conservation measures.

Detailed information for Preferred Alternative is provided in Table 3.

7.2 COMPLIANCE WITH FEDERAL, STATE AND LOCAL LAWS

The following permits and compliance actions may be required for construction of the project:

Federal Permits and Compliance Actions

- *Section 404 of the Clean Water Act Permit*
  The Project will impact a stream classified as “waters of the U.S.” Section 404 requires a permit for the discharge of dredged or fill material into waters of the U.S. The Project is subject to the Corps Section 404 regulatory authority.
- *50 C.F.R. §§ 17.2(b), 402.01(b), Endangered Species Act (ESA) of 1973*
  Section 7 of the ESA applies to NRCS, and it imposes an affirmative duty on NRCS to ensure that the Project is not likely to jeopardize the continued existence of a listed species or result in the destruction or modification of critical habitat. The ESA is enforced by the U.S. Fish and Wildlife Service (FWS).
- *36 CFR Part 800 - National Historic Preservation Act*
  Section 106 requires NRCS to identify and assess the effects of the Project on historic properties. NRCS must consult the appropriate state and local officials, the SLO, and members of the public and consider their views and concerns about historic preservation issues when making final Project decisions. If cultural resources (excluding human remains) are discovered during installation, NRCS will cause work to stop in that area and conduct an investigation and evaluation by a qualified cultural resources specialist. If human remains are

discovered, work will cease in that area and protocol as described in the "Kansas Unmarked Burial Sites Preservation Act" (K.S.A 75-2741 through 75-2754) will be implemented.

- *16 U.S.C. 668-668d, 54 Stat. 250, Bald and Golden Eagle Protection Act*
  This law provides protection of the bald eagle (the national emblem) and the golden eagle by prohibiting, except under certain specified conditions, the taking, possession, and commerce of such birds. NRCS must ensure that the Project is not likely to jeopardize the continued existence of bald eagles or golden eagles.
- *50 CFR Parts 10, 14, 20 and 21, Migratory Bird Treaty Act*
  Legislation (16 USC § 703 et seq.) makes it unlawful to pursue, hunt, take, capture, kill, offer for sale, purchase, or offer for shipment any bird, egg, or nest protected under several migratory bird treaties, except as permitted under regulation. NRCS must ensure that the Project is not likely to kill migratory birds.
- *16 USC 661 et seq., Fish and Wildlife Coordination Act*
  The Fish and Wildlife Coordination Act (FWCA) provides basic authority for the involvement of the U.S. Fish and Wildlife Service in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. NRCS must consult with the U.S. Fish and Wildlife Service and Kansas Department of Wildlife and Parks regarding the impacts on fish and wildlife resources and measures to mitigate these impacts.

State Permits and Compliance Actions

- *K.S.A. 82a-301 to 305a, Dam Rules and Regulations*
  It is unlawful to modify the Dam without prior permitting by the Kansas Department of Agriculture, Division of Water Resources, Chief Engineer. The regulations list requirements for plans and specifications. Certain minimum design standards such as spillway design criteria, geotechnical investigation requirements, and structural requirements are detailed in the regulations.
- *K.A.R. 28-16-56 et seq., Construction Stormwater Permit*
  Since the Project will disturb one or more acres, it must have authorization to discharge stormwater runoff under the construction stormwater general permit S-MCST-0701-1. Application for the construction stormwater permit is made by completing a Notice of Intent (NOI) form at least 60 days before starting construction. The permit fee for this general permit for stormwater runoff from construction activity is $60 per year. The Project must include a Stormwater Pollution Prevention Plan.
- *K.S.A 82a-327, Water Projects Environmental Coordination Act*
  Prior to approval or issuance of a permit for a proposed water development project, the permitting agency shall obtain a review of the proposed project for environmental effects by the appropriate state environmental review agencies, and shall consider their comments in determining whether to approve or issue a permit for such project. The permitting agency may condition the approval of or permit for the project in a manner to address the environmental concerns of the environmental review agencies.
- *K.S.A. 32-957 through 32-963, 32-1009 through 32-1012, 32-1033 and K.S.A. 32-960a and 32-960b, and amendments, Nongame and Endangered Species Conservation Act*
  The Project may require a special permit from the Kansas Department of Wildlife and Parks regarding the Kansas Nongame and Endangered Species Conservation Act. The secretary of Wildlife & Parks may issue special permits to provide protection for listed species and their critical habitats that will be affected by proposed actions such as road and bridge construction, flood control structures, pipeline installation, etc.

- *KSA 75-2741 through 75-2754, Unmarked Burial Sites Preservation Act*
  If the Project disturbs an unmarked burial site or human skeletal remains, Permits for excavation, study, display, and reinterment will be required. Each permit request shall include the following information:
  - The name, address, and telephone number of the applicant and, if the applicant is an organization, the name of the contact person.
  - A statement detailing the reason for the permit request.
  - A detailed work plan.

Local Permits and Compliance Actions

- The Project may be subject to local permits and compliance actions. Sedgwick County Code Enforcement regulates development and construction activities in Sedgwick County, Kansas. The Sedgwick County Clerk's Office, located on the 2nd floor of the Sedgwick County Courthouse, 525 N. Main, Wichita, Kansas can provide additional information regard local planning and zoning requirements related to the project.

7.3 INSTALLATION

Project installation should be completed in one construction season. During construction, equipment will not be allowed to operate when conditions are such that soil erosion and water, air, and noise pollution cannot be satisfactorily controlled. NRCS will provide assistance to the SLO. The SLO has the needed authorities to carry out the plan and has agreed to use them.

Installation Costs. Estimated installation costs for the Preferred Alternative are shown in Table 1 and Table 2.

- *Construction*
  Major components of construction costs consist of mobilization, clearing, grubbing, earthfill, excavation, demolition of existing structures, drainfill, conduits, concrete, rock riprap, fencing, seeding, dewatering and pollution control.
  NRCS will pay up to 65 percent of the eligible project costs but not to exceed 100 percent of the total construction cost. The cost share rate for FRD 2-1 is 65 percent NRCS P.L. 83-566 funds and 35 percent other funds. Table 1 and Table 2 reflect the division of the total estimated installation cost between Federal and other funds. NRCS technical and financial assistance for carrying out the project is contingent on the appropriation of funds for this purpose. Key cost accounts are separated and shown in
- *Engineering*
  Major components of engineering costs consist of design, survey, geotechnical investigation, and construction observation. Engineering costs were estimated to be 30 percent of the total construction costs. NRCS would provide 100 percent of funding for the costs of engineering. Table 2 displays a summary of engineering costs and cost share.
- *Administration*
  Project administration costs include contract administration, maintenance of records, and other overhead costs of installing structural measures and are included in Table 2
- *Land Rights*
  The Land rights costs include the estimated value of easements and rights-of-way needed for installation of the structural measures, mitigation, modifications to improvements such as roads, utility lines, etc., and legal fees and surveys needed in acquiring land rights. The cost of land rights is borne by others. K.A.R. 5-40-77 provides regulations related to easements for dams in Kansas and requires land rights upstream from the dam to the top of dam elevation. Additional land rights will be required in the areas occupied by the structural measures. Approximately 29.8 acres of additional land rights will be required for installation of the Preferred Alternative.

NRCS Responsibilities. NRCS is responsible for the following implementation components of the Preferred Alternative:

- Execute a project agreement with the SLO before either party initiates work. This agreement sets forth detailed financial and working arrangements and other applicable conditions.
- Execute a Memorandum of Understanding with the SLO that allocates cost-share funding.
- Execute an updated O&M Agreement for the Dam. This agreement is based on the NRCS National Operation and Maintenance Manual.
- Assuring that an Emergency Action Plan is prepared before construction is initiated.
- Provide engineering support, technical assistance, and approval during the design and construction of the project.
- Certify completion of all installed measures.

SLO Responsibilities. The SLO is responsible for the following implementation components of the Preferred Alternative:

- Secure all needed environmental permits, easements, and rights for installation, operation, and maintenance of the rehabilitated structure.
- Execute a project agreement with NRCS before either party initiates work. This agreement sets forth detailed financial and working arrangements and other applicable conditions.
- Execute a Memorandum of Understanding with NRCS that allocates cost-share funding.
- Execute an updated O&M Agreement with NRCS for the Dam based on the NRCS National Operation and Maintenance Manual.
- Provide local administrative and contract services necessary for installation of the project.
- Enforce all associated project easements and right-of-ways.

The SLO has taxing authority for Project funding along with $88,000 reserved from the Kansas State Conservation Commission for rehabilitation of FRD R-1. The SLO has the power of eminent domain and may exercise their authority as need to acquire any necessary land rights. The SLO has analyzed their financial needs in consideration of the scheduled installation of the works of improvement and is able to make funds available when needed.

7.4 MITIGATION

The U.S. Army Corps of Engineers (USACE) will determine final mitigation requirements through the Section 404 Permit process. The Preferred Alternative will likely include mitigation for the permanent loss of 60 linear feet of stream channel and 0.5 acres of riparian woodland. Using the debit/credit system established through the Kansas Stream Mitigation Guidance (KSMG), the loss of 60 linear feet of channel equates to 240 debits. It is anticipated that mitigation will occur onsite. The SLO will need to develop a compensatory mitigation plan that generates 240 credits to offset the stream loss. Alternatively, the SLO may choose to purchase 240 credits through an approved Kansas In-Lieu Fee (ILF) mitigation provider. If credits are purchased, all legal mitigation responsibilities transfer to the ILF provider.

Depending on the USACE-determined course of action, either the SLO or ILF provider will develop specific compensatory mitigation measures—and prepare a mitigation plan for USACE approval—once a mitigation site is identified. For efficiency, the required 0.5 acre riparian woodland mitigation will be incorporated into the compensatory mitigation plan. In general, mitigation may include in-channel stream habitat restoration, stream bank and bed stabilization, and riparian establishment. In-channel measures—such as constructed riffles or similar structures—will be considered when natural channel features are lacking or bed instability is evident. Bank stability may be addressed through sloping and planting with native vegetation and creating a vegetated floodplain bench. Depending upon mitigation site conditions, riparian mitigation may involve the creation of an appropriate vegetation buffer where one did not

previously exist, enhancement of an existing riparian corridor, or preserving an existing high quality buffer to prevent its destruction, degradation, or alteration.

The approved compensatory mitigation plan will include measurable and quantifiable performance criteria for each mitigation measure, a monitoring protocol to evaluate performance criteria, a contingency plan to address sub-standard performance, and a management plan for long-term maintenance of the mitigation site. Federal guidelines require permanent protection of all mitigation sites through an appropriate legally binding real estate instrument.

7.5 Operation, Maintenance, and Replacement

The SLO will operate and maintain all modifications and previously installed measures with technical assistance from federal, state, and local agencies in accordance with their delegated authority.

NRCS will develop a new O&M agreement for the Dam, and it will be executed prior to signing a Project agreement. The term of the new O&M agreement will be for the projected life of the rehabilitated structure plus two years of project design and installation, which totals 102 years. The agreement will specify responsibilities of the SLO and include detailed provisions for retention, use, and disposal of property that is acquired or improved. Provisions will be made for the free access of district, state, and federal representatives to inspect all structural measures and their appurtenances.

The SLO will be required to inspect the structure at these times:

- Annually on a regularly scheduled basis
- During or immediately after initially filling the reservoir
- During or immediately after major storms, earthquakes, or other adverse events

Table 1
Total Estimated Project Installation Cost[1]

Spring Creek Watershed Joint District No. 16
Sedgwick County, Kansas

Preferred Alternative	Source		Total Estimated Installation Costs [2]
	PL 83-566 Funds	Other Funds	
Rehabilitate dam to NRCS high hazard class (c) design criteria	$583,000	$215,800	$798,800

September-2010

[1] Price base 2009
[2] Estimated total project installation costs include NRCS engineering and project administration costs.

Table 2
Estimated Cost Distribution[1]
Spring Creek Watershed Joint District No. 16
Sedgwick County, Kansas

Works of Improvement	Installation Cost - Public Law 83-566 [2]				Installation Cost - Other Funds							Total Installation Costs
	Construction	Engineering	Project Administration	P.L. 83-566 Funds	Land Rights	Land Rights Admin-istration	Construction	Engineering[3]	Permits	Admin-istration [3]	Total Other	
Rehabilitate Dam to NRCS High Hazard Class (C) Design Criteria	$400,300	$156,600	$26,100	$583,000	$38,700	$3,000	$121,600	$0	$300	$52,200	$215,800	$798,800
Total	$400,300	$156,600	$26,100	$583,000	$38,700	$3,000	$121,600	$0	$300	$52,200	$215,800	$798,800

September-2010

[1] Price base 2009.
[2] PL 83-566 cost share is 65 percent of the project cost, but not to exceed 100 percent of the total construction cost.
[3] NRCS technical assistance for installation is not cost shared by the SLO.
[4] Includes $2,600 for land rights administration cost for mitigation.
[5] Includes $100 for land rights cost for mitigation.

Table 3
Structure Data[1]

Spring Creek Watershed Joint District No. 16
Sedgwick County, Kansas

Item	Unit	Structure No. R-1	Total
Class of Structure		C	
Seismic zone		2	
Uncontrolled drainage area	Square mile	1.05	1.05
Controlled drainage area	Square mile	0	0
Total drainage area	Square mile	1.05	1.05
Runoff curve number (1-day) (AMC II)		73	
Time of concentration (Tc)	Hours	0.85	
Elevation Top of Dam	Feet		
Elevation crest auxiliary spillway	Feet	1412.7	
Elevation crest high stage inlet	Feet	1399.4	
Elevation crest low stage inlet	Feet	NA	
Auxiliary spillway type		Earth	
Auxiliary spillway bottom width	Feet	240	
Auxiliary spillway exit slope	Percent	2.34	
Maximum height of dam	Feet	24.7	
Volume of fill	Cubic yard	100700	
Total capacity			
Sediment submerged	Acre feet	92.1	92.1
Sediment aerated	Acre feet	0	0
Beneficial use (identify use)	Acre feet	0	0
Floodwater retarding	Acre feet	200.6	200.6
Between high and low stage	Acre feet	0	0
Surface area			
Sediment pool	Acres	19.37	19.37
Beneficial use pool (identify use)	Acres	0	0
Floodwater retarding pool	Acres	40.53	40.53
Principal spillway design			
Rainfall volume (1-day)	Inches	7.8	
Rainfall volume (10-day)	Inches	12.32	
Runoff volume (10-day)	Inches	6.2	
Capacity of low stage (max.)	cfs	NA	
Capacity of high stage (max.)	cfs	91	
Dimensions of conduit	Inches	30	
Type of conduit		RCP	
Frequency operation-auxiliary spillway	percent chance	< 1	
Auxiliary spillway hydrograph			
Rainfall volume	Inches	14.98	14.98
Runoff volume	Inches	11.3	11.3
Storm duration	Hours	24	
Velocity of flow (Ve)	Feet/second	5.88	
Maximum reservoir water surface elevation	Feet	1408.9	
Freeboard hydrograph			
Rainfall volume	Inches	35.43	35.43
Runoff volume	Inches	31.25	31.25
Storm duration	Hours	24	
Maximum reservoir water surface elevation	Feet	1412.7	
Capacity equivalents			
Sediment volume	Inches	1.64	
Floodwater retarding volume	Inches	3.58	
Beneficial volume (identify use)	Inches	0	

September-2010

[1] Information in this table is based on the results of the planning study and may vary from the General Work Plan and As-Built Drawings for structures.

Table 4
Estimated Average Annual NED Costs[1]

Spring Creek Watershed Joint District No. 16
Sedgwick County, Kansas

Item	Rehabilitation of R-1 to a High Hazard Class (C) Dam
Annual Costs [2]	
Amortized Installation & Landrights Costs	$ 35,400
O&M and Replacement Costs	$ 1,800
Total Adverse Annual Costs	$ 37,200

September-2010

[1] Price base 2009

[2] Amortized over 100 years at 4.375% interest rate.

Table 5
Estimated Average Annual Flood Damage Reduction Benefits[1]
Spring Creek Watershed Joint District No. 16
Sedgwick County, Kansas

Item	Estimated Average Annual Damage				Average Annual Damage Reduction Benefits [2]	
	Without Project (FWOP)		With Project			
	Agriculture Related	Nonagriculture Related	Agriculture Related	Nonagriculture Related	Agriculture Related	Nonagriculture Related
Floodwater Damage						
Crop and Pasture	$ 300	-	$ 300	-	-	-
Other Agriculture	$ 100	-	$ 100	-	-	-
Road and Bridge	$ 700	-	$ 700	-	-	-
Subtotal Floodwater Damage	$ 1,100	-	$ 1,100	-	-	-
Sediment						
Over Bank Deposition	$ 1,400	-	$ 1,400	-	-	-
Indirect Damage	$ 100	-	$ 100	-	-	-
Total	$ 2,600	-	$ 2,600	-	-	-

September-2010

[1] Price base 2009

[2] Average Annual Benefits based on 100 year project life.

Table 6
Comparison of NED Benefits and Costs[1]

Spring Creek Watershed Joint District No. 16
Sedgwick County, Kansas

Works of Improvement	Agriculture Related Benefits [5]		Costs Avoided with Project [4]	Average Annual Benefits [2]	Average Annual Costs [3]	Benefit/Cost Ratio
	Damage Reduction	Intensification				
Floodwater Retarding Dam R-1 [6]	-	-	$ 33,800	$ 33,800	$ 37,200	
Total	-	-	$ 33,800	$ 33,800	$ 37,200	0.91:1.00

September-2010

[1] Price base 2009

[2] Average Annual Benefits based on 100 year project life.

[3] Amortized over 100 years at 4.375% interest rate.

[4] Amortized cost of FWOP over 100 years at 4.375% interest rate.

[5] Agriculture related benefits with the preferred alternative are the same as the agriculture related benefits for the FWOP (See Table 5).

[6] See Table 3-3 for the calculated annualized benefits indexed from 1958 Work Plan and 1971 Supplement.

8.0 REFERENCES

Department of the Army, Corps of Engineers, Institute for Water Resources, Hydrologic Engineering Center, River Analysis System Computer Model (HEC-RAS), Davis, CA.

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U.S. Census Bureau, Census 2000.

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United States Department of Agriculture, Natural Resources Conservation Service, National Planning Procedures Handbook.

United States Department of Agriculture, Natural Resources Conservation Service, Soil Survey of Sedgwick County, Kansas.

United States Department of Agriculture, Natural Resources Conservation Service, Technical Release 60 – Earth Dams and Reservoirs.

United States Department of Agriculture, Natural Resources Conservation Service, Technical Release 66 – Simplified Dam-Breach Routing Procedure.

United States Department of Agriculture, Natural Resources Conservation Service, Water Resources Site Analysis Computer Program, SITES Integrated Development Environment.

United States Department of Agriculture, Natural Resources Conservation Service, National Watershed Manual, December 2009.

United States Department of Agriculture, Natural Resources Conservation Service, National Watershed Program Handbook, January 2010.

Wilson & Company, Inc., Engineers & Architects, Rehabilitation Assessment Report, Spring Creek Watershed Site No. R-1, September 2005.

9.0 LIST OF PREPARERS

Table 9-1
List of Preparers

Name	Current Position	Years of Experience in Current Position	Education	Experience	Total Years of Experience
NATURAL RESOURCES CONSERVATION SERVICE					
Jeffrey L. Gross	Natural Resources Manager	7	B.S. Agriculture	Water Resources	30
Paul J. Gallagher	Agricultural Economist	8	B.A., Economics	Economist	17
Dean R. Krehbiel	Resource Conservationist (Cultural Resources Coordinator)	1.5	B.S. Biology	Natural Resources	14
Kenneth A. Kuiper	Biologist	19	B.S./M.P.A	Biologist	31
Edwin W. Radatz, P.E.	Hydraulic Engineer	10	B.S. Agricultural Engineering	Hydraulic Engineer	32
Robert K. Stutzman	Soil Conservationist	17	BS Agriculture	District Conservationist	23
Arvil G. Bass, P.E.	Civil Engineer	1.5	B.S. Agricultural Engineer	Design Engineer	17
KLA ENVIRONMENTAL SERVICES, INC.					
Kevin L. Shamburg, P.E.	Project Manager	13	B.S. Civil Engineering	Project Engineer	30
Jarred D. Green, P.E.	Project Engineer	5	B.S. Civil Engineering	Project Engineer	5
Kirk Miles	Project Economist	10	B.S. Agricultural Economics	Project Economist	10
Billy B. Golden	Consulting Economist	9	B.S. Agricultural Engineering Ph.D. Agricultural Economics	Ag. Economist	38
Christopher S. Mammoliti	Project Biologist	7	B.S. Fisheries and Wildlife Biology M.S. Environmental Studies	Fisheries Biologist	31
Eldon R. Colson, Jr.	Project Technician	8	A.S. Natural Resources	Engineering Technician	17
Derek E. Belton	Project Technician	2	B.S. Agricultural Technology Management	Engineering Technician	2

10.0 DISTRIBUTION LIST

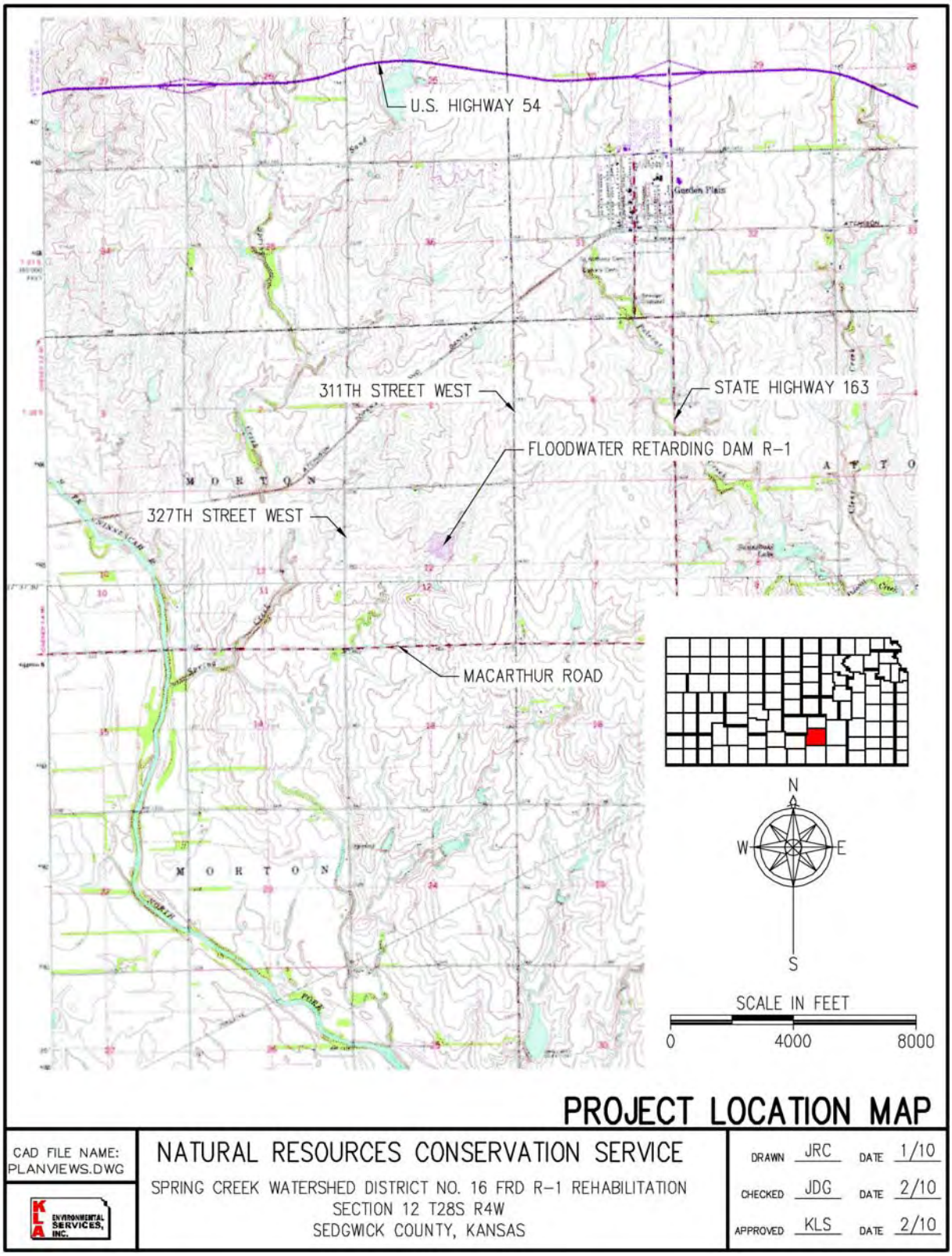
The following is a list of individuals and federal, state, and local agencies and organizations receiving copies of the Supplemental Watershed Plan and Environmental Assessment for the Project:

- Federally Recognized Tribal Councils
- U.S. Environmental Protection Agency
- Natural Resources Conservation Service
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- Kansas Department of Agriculture, Division of Water Resources
- Kansas Department of Wildlife and Parks
- Kansas State Historic Preservation Office
- State Association of Kansas Watersheds
- Sedgwick County Conservation District
- Sedgwick County Code Enforcement Department
- Sedgwick County Public Works Department

Appendix A
COMMENTS AND RESPONSES

Appendix B
PROJECT MAP

Figure B-1
Project Location Map



Appendix C
MAPS AND DRAWINGS

Figure C-1
Preferred Alternative Site Map

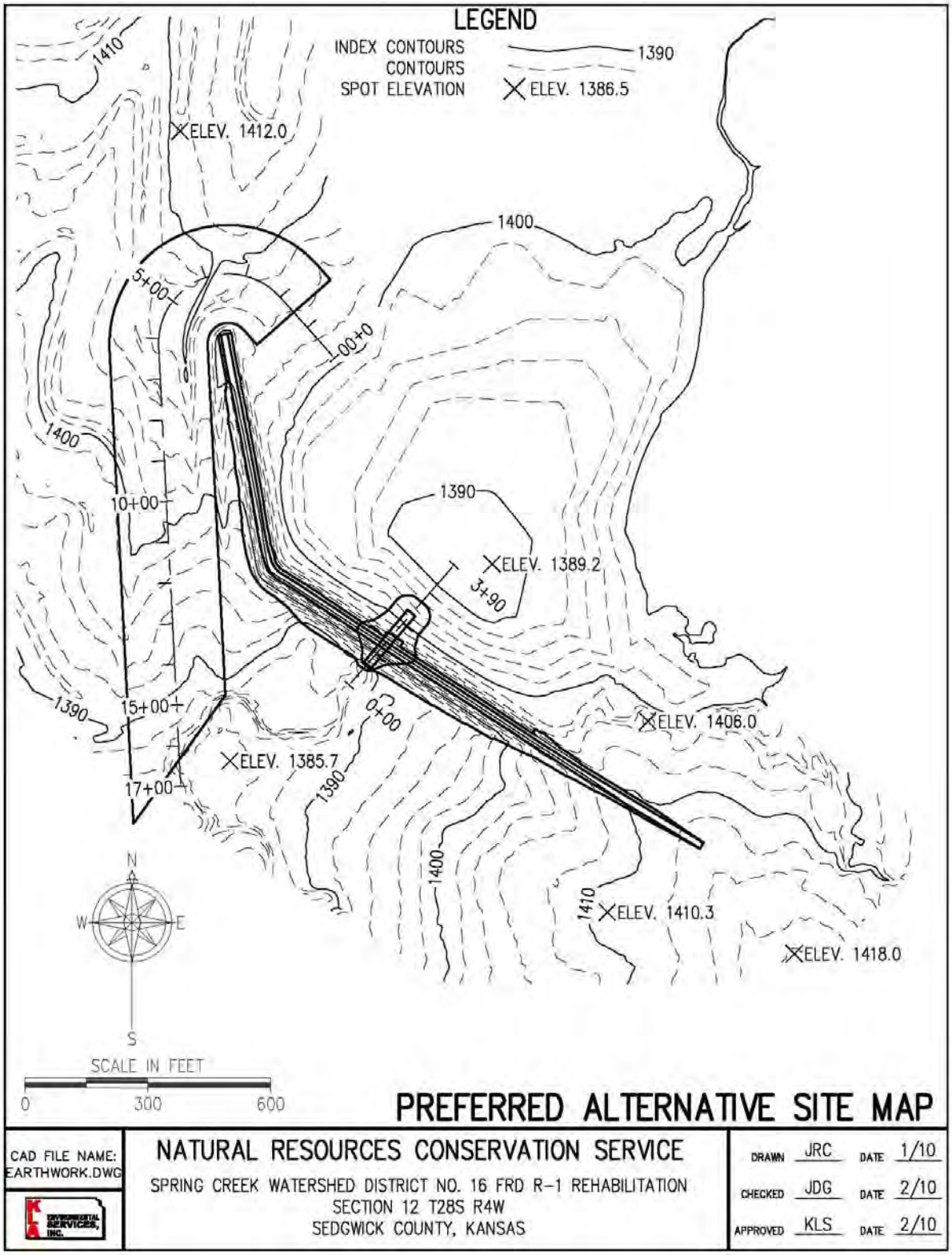


Figure C-2
Preferred Alternative Impacted Area Map

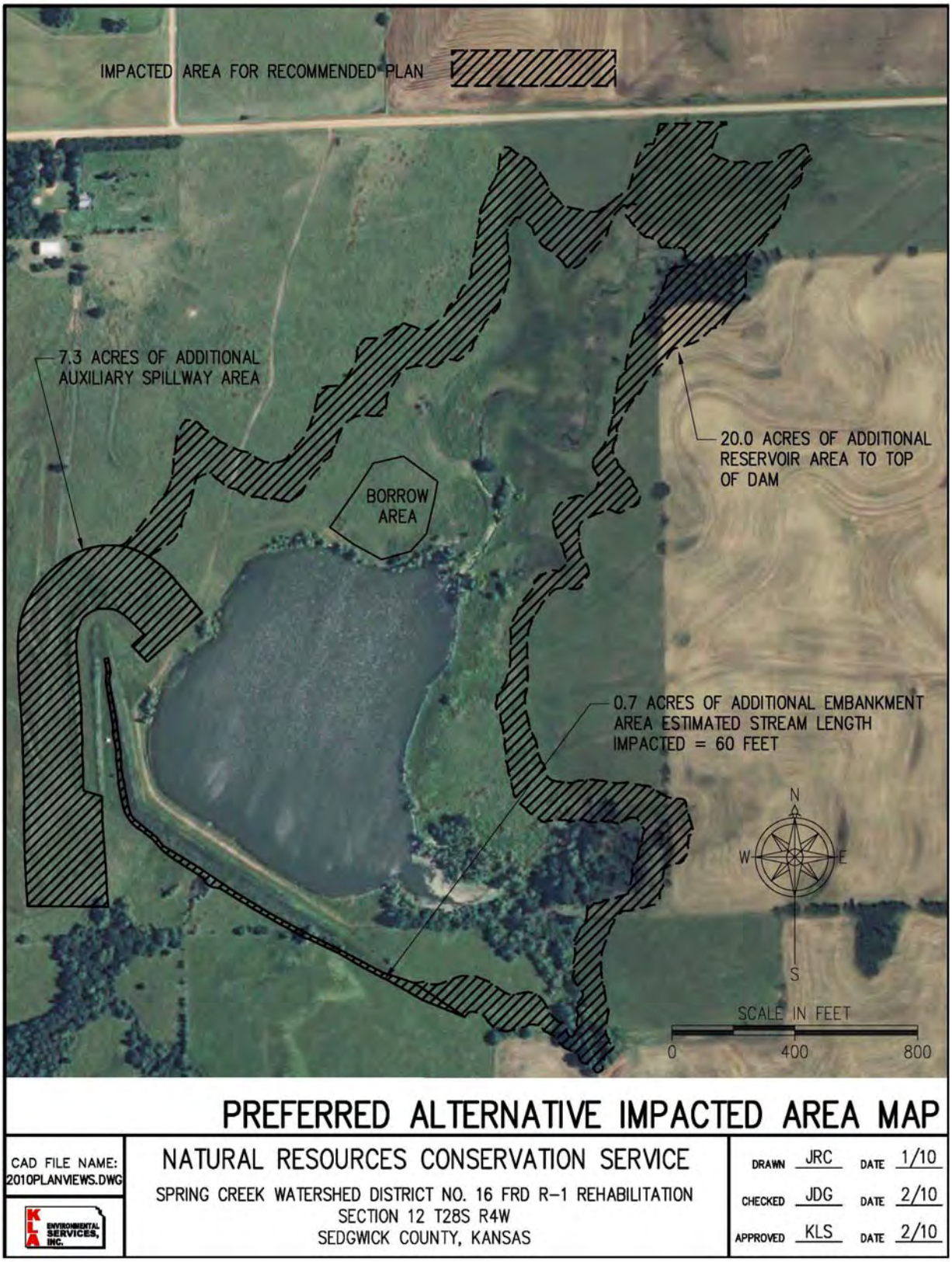


Figure C-3
Preferred Alternative Profile Views of Auxiliary Spillway and Embankment

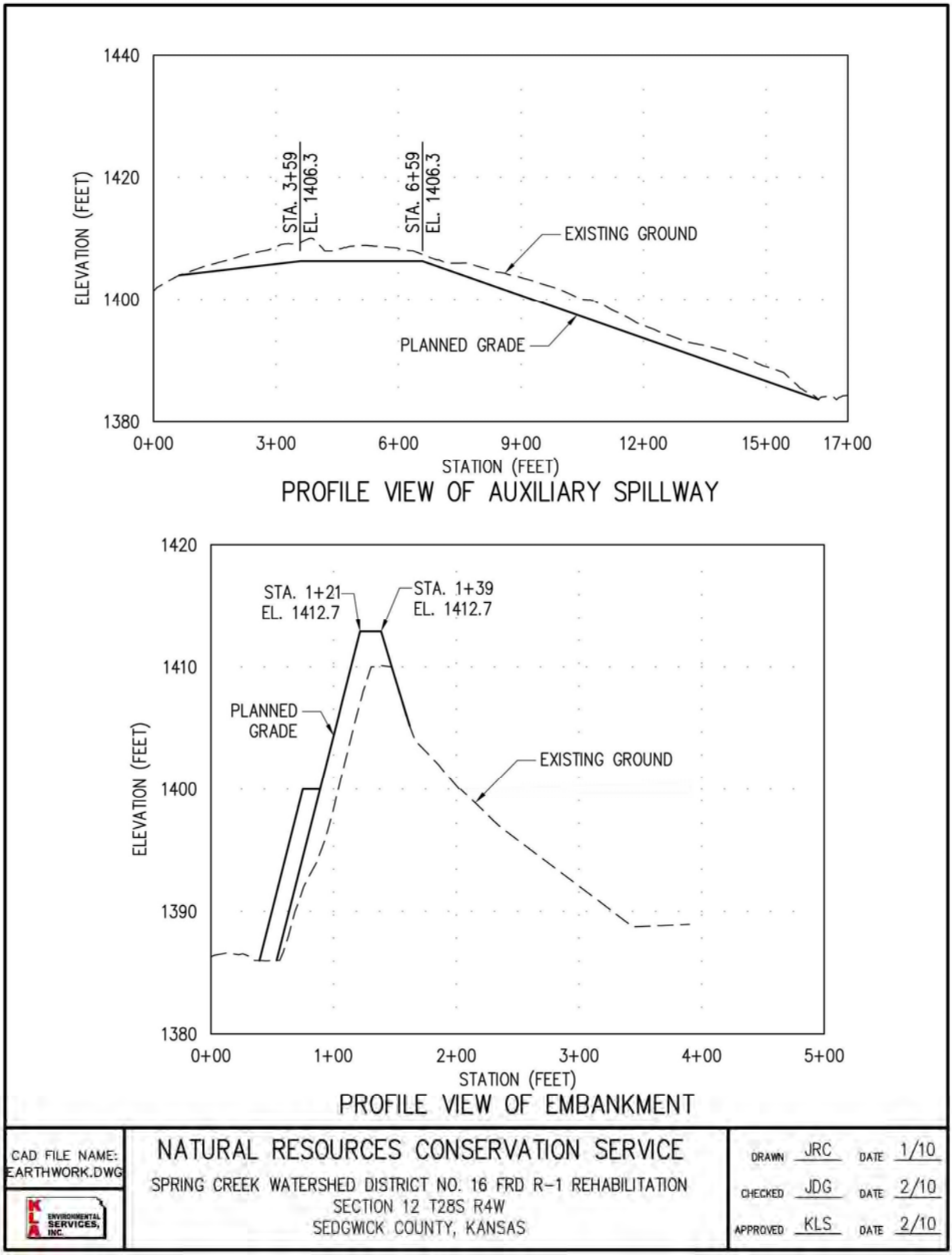
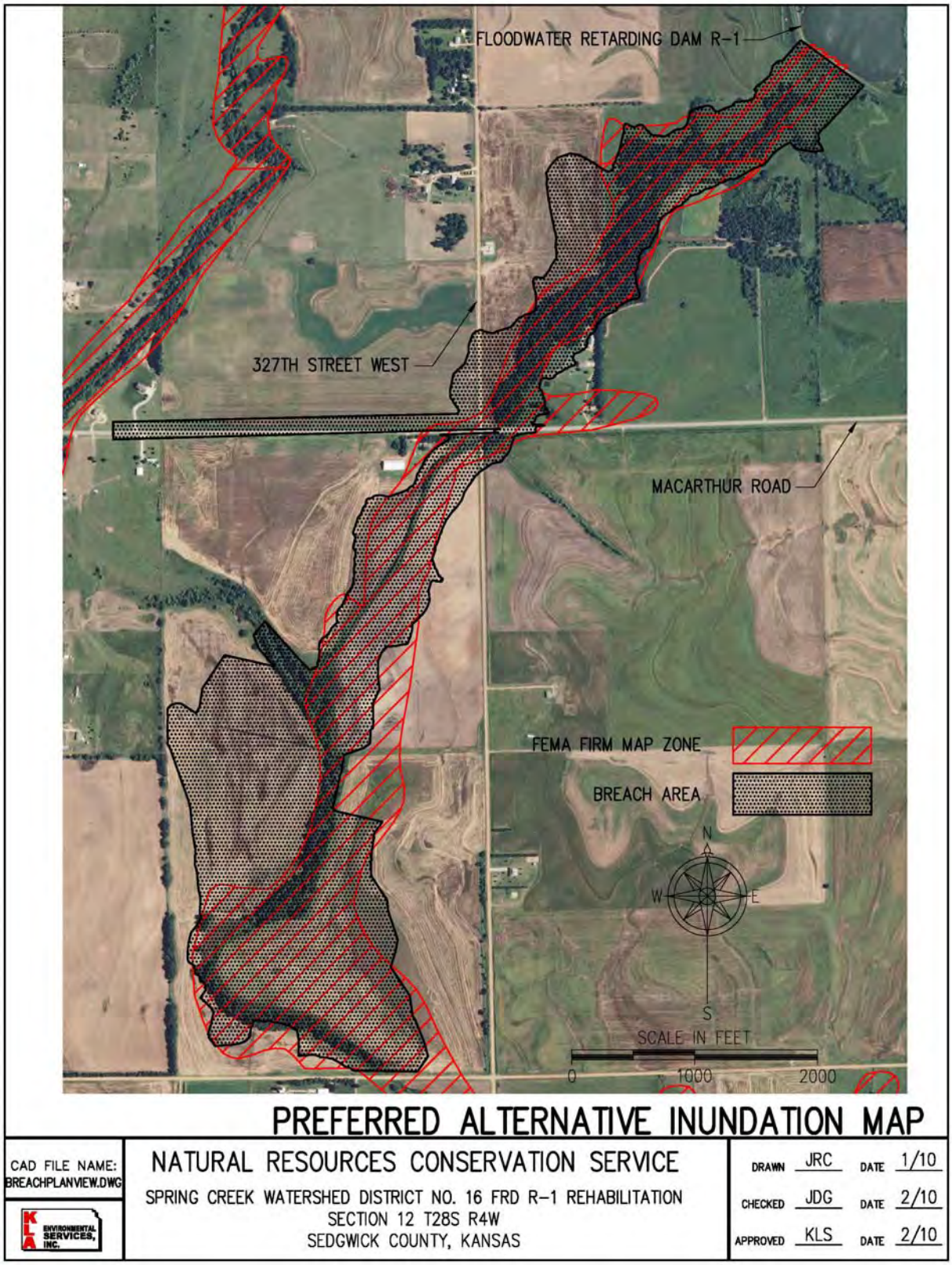


Figure C-4
Preferred Alternative Inundation Map



Appendix D

INVESTIGATIONS AND ANALYSES

D.1 INTRODUCTION

This appendix provides supplementary information regarding the investigations and analyses conducted for the Project. The administrative record contains additional information relevant to each of the sections in this appendix.

D.2 EXISTING DATA

NRCS provided the following existing data from its archived files to the Project Team:

- As-Built plans
- Detailed Report of Geology Investigations
- Soil Mechanics Reports
- Design documentation
- General Work Plan & Supplements
- Watershed Work Plan

D.3 ENVIRONMENTAL EVALUATIONS

The environmental evaluation identifies and analyzes the environmental concerns related to the planning alternatives and the recommended plan. The evaluation is an NRCS planning process that is described in the National Planning Procedures Handbook.

The Project Team used the NRCS-CPA-52 Environmental Evaluation Worksheet for scoping and documenting environmental impacts. This Worksheet documents the planning process and Environmental Assessment. The Project Team conducted studies and evaluations regarding the following resource concerns.

Wetland Determinations. NRCS completed wetland determinations on October 21, 2009, using the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region. NRCS identified 45.96 acres upstream and 3.42 acres downstream from the dam as Wetland/Other Waters (W/OW). Consequently, any activities that would disturb these areas may require a Clean Water Act, Section 404 Construction Permit. Implementation of the Preferred Alternative will inundate approximately 4.9 acres of wetlands infrequently for short periods and will fill approximately 0.4 acres of wetlands downstream from the dam. The administrative record for the Project includes a map of the wetland determinations and the data forms.

Federal Threatened and Endangered Species. Through informal consultation with the U.S. Fish and Wildlife Service (USFWS), NRCS concluded that the Project does not impact listed Federal Threatened and Endangered Species. There is no critical habitat at the Project site. The Project will have No Effect (NE) on the following Sedgwick County, Kansas, Federal Threatened or Endangered Species: Arkansas River Shiner, *Notropis girardi T*; Interior Least Tern, *Sterna antillarium E;* and Whooping Crane, *Grus Americana E*.

Kansas State Threatened and Endangered Species. NRCS consulted with Mr. James Larson, Environmental Specialist Kansas Department of Wildlife and Parks (KDWP), on October 27, 2009. The Project does not impact state-listed species and, therefore, does not require a KDWP Action Permit.

Migratory Bird Treaty Act (MBTA) . NRCS reviewed the Project site for impacts to nesting birds. If construction is initiated before April 1, construction can occur after April 1. The MBTA impact should be reassessed when the Project design is finalized.

Fish and Wildlife Habitat Assessment. The Project team conducted fish and wildlife habitat assessments, including woodland evaluations and stream assessments. The Project Biologist used the KDWP Woodland Key to assess the woodland composition and distribution at the Project site. The Project Biologist concluded a Woodland Quality Rating of 5.00. The Project Team identified the following woodland species at the Project Site:

- Hackberry
- Mulberry
- Cottonwood
- Silver Maple
- Siberian Elm
- Black Willow
- Eastern Red Cedar
- Rough-leaf Dogwood
- Coralberry
- Poison Ivy
- Greenbrier

The Project Biologist used the KDWP Stream Habitat Evaluation Worksheet to assess the tributary adjacent to the reservoir, the stream upstream from the dam, and the stream downstream from the dam near MacArthur Road. Table D-1 describes the Total Stream Habitat Scores:

Table D-1
Stream Habitat Evaluation

Stream Location	Total Stream Habitat Score (R-Value)
Tributary	4.12
Upstream from Dam	4.71
MacArthur Road	4.85

D.4 Archaeological and Historical Resources

Agency Consultation. NRCS consulted with Mr. John Tomasic, Archeologist, and Mr. Patrick Zollner, Deputy State Historical Preservation Officer, Kansas Historical Society and found no significant archeological sites or historical properties in the vicinity of the project site. Additionally, the Project Team contacted all affected Federally Recognized Tribal Councils, and responded to their comments and concerns.

Field Reviews. Kansas Historical Society staff conducted a Phase II field survey investigation of the project site. Society staff archeologist John Tomasic and technicians Matt Dreher and Jerry Elmore conducted the fieldwork and found no indications of archaeological or historical sites.

If buried cultural deposits are encountered during the course of the Project, the remains must be left in place, and the State Archeologist must be contacted immediately to conduct appropriate investigation to assess potential mitigation measures.

D.5 Economic and Social Effects

Social Effects. Section 3.9 Social and Economic Conditions includes data from the U.S. Census Bureau - 2000 Census and from interviews with local contacts.
Economic Impacts. The Project Team used the P&G to account for flood control benefits associated with the alternatives. The original benefits for the project were indexed to current dollars using the land value index. The scope of the study did not include re-evaluation or reconsideration of the original benefits.
Reconnaissance downstream from the Project site confirmed that the land use in the benefit area remains the same as described in the original plan. Section 3.9 Social and Economic Conditions includes details about the economic analysis.

Economic Analysis Summary. The Project Team observed the dam site, the contributing area above the dam, and the flood impact zone below the dam. The predominant crop rotation in the benefit area changed from soybeans and corn to grain sorghum and wheat. This minimally

impacted the economic analysis, which allowed indexing to be an acceptable method of updating benefits. Indexing used land values consistent with National Watershed Manual 604.1 (B)

The Project Team received input from the SLO and the public. The Project Economists discussed the future plans for area roads and bridges with county officials and ascertained from local school districts the bus routes using MacArthur Road at West 327th. Benefits include avoided costs of stopgap measures where the recommended plan precludes their expenditure.

Economic References. The economic analysis references the National Watershed Manual (NWM) and the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G), U.S. Water Resources Council, March, 1983.

The objective of P&G is to determine whether benefits from proposed actions exceed project costs. P&G defines consistent instructions for project formulation and evaluation for federal agencies implementing water and related land resource studies. P&G requires that the NED Alternative is implemented unless federal, state, local, or international concerns regarding social and environmental accounts supersede. Overriding concerns allow for project considerations or benefits whose ecological system and social effects cannot be quantified and monetized.

Economic Benefits. P&G section 1.7.2(a)(4)(ii) and 2.1.1(b)(2) allows abbreviated procedures to evaluate project benefits. Consequently, indexing was used instead of hydrologic and economic evaluation. The original 1958 economic analysis was indexed to 2009 dollars. Indexing did not change the evaluation of alternatives or the NED alternative.

The Project provides significant flood protection to agricultural land in rural Sedgwick County. Flood reduction benefit categories are crop and pasture, other agriculture, road and bridge, sediment, and indirect benefits. Flood protection allows changed land use from low quality trees or brushy, weedy pasture to cropland. Land use changes in the benefit area occurring in the last 50 years impacted all alternatives equally. County roads and bridges, considered beneficiaries of the original project, still exist and have had no fundamental improvements. According to the U.S. Census (2000), Wichita's population increased to 452,869. No significant development in the benefit area has occurred despite this population increase. Over the past 50 years, the number of farms in the Project drainage area remained constant at seven.

Total average annual benefits of the recommended plan are approximately $10,100 (2009 dollars). The benefits categories remain the same as in the 1971 supplement.

Economic Index. The Project Team calculated flood control benefits and costs for planning alternatives consistent with P&G and NREH Part 611. Benefits represent costs or damages that would occur in the absence of the Project. Indexing methods are described in P&G 2.1.1 (b)(2). The Project Team updated the 1971 benefit-cost analysis provided by NRCS. This base year is set equal to one to conceptualize a growth trend.

Indexing land values is an acceptable method for updating agricultural benefits. Land value growth trends can be used as a proxy for agriculture productivity growth trends. This is because farmland value reflects the impact to producer net income as cropping patterns, crop yields, prices and costs, and technology change over time. A single time series of 1971-2009 land prices that reflect only non-irrigated crop production in Sedgwick County is the basis of the preferred index. Because this series is unavailable, the following indexing methods were considered:

- *Method 1: Land Sales*

  Project Team analyzed land sales data for Sedgwick County from the Property Valuation Division of the Kansas Department of Agriculture. The Project Team, in consultation with the Sedgwick County Tax Appraisal office, deemed the land sales data unsuitable for constructing an appropriate index.

- *Method 2: Land Value*

  The Project Team used two historical data sets for the price of farmland from the National Agricultural Statistic Service (NASS). These are multi-county aggregations for the South-Central NASS Crop Reporting District and are available at http://www.nass.usda.gov. The first set represents farmland from 1962 to 2009, but it includes irrigated land values. The second set includes only non-irrigated cropland values but only represents 1976 to 2009. To compensate, the first set was used to statistically predict the missing values for the second set. This estimated the 2009 index value as 399.9, assuming a 1971 index value of 100.

- *Method 3: Land Value*

  The Project Team used two historical data sets for the price of farmland from http://www.economics.nrcs.usda.gov the National Agricultural Statistic Service (NASS) available at http://www.nass.usda.gov.

  The first set is an aggregation of Sedgwick County farmland from 1850 to 1992, but it includes irrigated land values. The second set is a multi-county aggregation for the South-Central NASS Crop Reporting District. It includes only non-irrigated cropland values but only represents 1976 to 2009. To compensate, the first set was used to statistically predict the missing values for the second set. This estimated the 2009 index value as 372.3, assuming a 1971 index value of 100.

- *Method 4: Rental Value*

  Land rent is often used to index agricultural productivity growth. This is because land sales and land value indices may overstate agricultural productivity growth if the data was positively impacted by non-agriculture values. The agriculture value is production income, which is impacted by cropping patterns, crop yields, prices and costs, and technology. The non-agriculture value is largely based on recreational potential.

  The Project team used a historical data set for the rental rate of non-irrigated farmland from NASS available at http://www.nass.usda.gov. This data set is a multi-county aggregation for the South-Central NASS Crop Reporting District. It represents 1972 to 2009. The rental value for 1971 was estimated based on the linear trend observed from 1972 to 1975. The estimated 2009 index value was 385.0, assuming a 1971 index value of 100.

The average index value of Methods 2, 3, and 4 is 385.7. The calculated annualized agriculture benefits for 2009, based on this averaged index of 385.7, are shown in Table 3-3.

The National Watershed Manual 604.1 (B) suggests that the use of the Engineering News Record (ENR) Index is appropriate for indexing structural (road and bridge) values. This index is 541.7, assuming a 1971 index value of 100. The calculated annualized structural values for 2009, based on this index of 541.7, are shown in Table 3-3.

NREH 611.0504 (a) recognizes that indirect benefits result from the recirculation of dollars in the local economy given the flood control gained through project implementation (flood reduction). The Project Team determined the indirect benefits to be 10% of the sum of the Crop and Pasture, Other Agricultural, and Road and Bridge categories reported in Table 3-3.

D.6 ENGINEERING

Surveys. The Project Team used RTK-GPS survey technology and equipment to complete a topographic survey of the embankment, auxiliary spillway, and reservoir on October 14, 2009. The survey team collected adequate data to make an accurate topographic map of existing ground surfaces. Topographic surveys were referenced to horizontal control surveys, and vertical control surveys were referenced with mean sea level as the approximate datum. All survey elevations were based on the existing benchmarks at the dam location.
The field surveys were supplemented using Light Detection and Ranging (LIDAR) data acquired from the Sedgwick County Geographic Information Services (GIS) department. A shape file with two foot contours based on LIDAR data was acquired from Sedgwick County GIS department. The shape file data was imported into AutoDesk to generate the topographic model. The shape file was provided with NAD83, Kansas State Plane South, U.S. Feet coordinate projection.

The survey team created contours via a triangulated interlocking network (TIN) based on the surveyed points. The contour intervals are two feet and represent even integer elevations. Index contours, which are defined as every fifth contour, are represented by dark solid lines on the topographic map and are identified with the integer elevations. All other contours are represented by with lighter dashed lines on the topographic map and are also identified with an elevation.

A bathymetric survey was completed to determine the remaining capacity of the sediment pool upstream from the dam.

Dam Safety Inspection. The Dam Safety Inspection was conducted on October 14, 2009, to assess the existing condition of the dam. The inspection consisted of three parts: (a) a visual observation of the exposed features of the dam and associated structures, (b) a collection of photo documentation, and (c) a survey of the dam, auxiliary spillway, and reservoir.

The physical inspection was a visual review of the exposed areas of the dam and associated structures and what could be observed of the conduit from both ends. It was an overcast day with temperatures around 44 degrees Fahrenheit. The entire site was walked by Kevin Shamburg, P.E. and Jarred Green, P.E.

The crest of the dam appeared relatively uniform. Vehicle tracks were observed on the top of the embankment, but they had not damage the embankment. There were no visible signs of misalignment, visual settlement, or longitudinal or transverse cracking of the embankment. The top surface was straight and reasonably level.

The front slope, back slope, and top have desirable grass cover with a minor amount of trees and brush. The upstream embankment side slope was in fair condition. Recent clearing of trees and brush was observed on the west end of the embankment. The upstream embankment contained some brush above the waterline. The downstream embankment side slopes were relatively steep. Animal burrows were observed on both upstream and downstream slopes of the embankment.

The back slope of the dam is mostly dry and vegetated. The vegetation is typical for upland floodplains. The foundation near the downstream toe at the intersection of the east abutment indicated physical signs of seepage or saturation.

The principal spillway is a reinforced concrete riser with a metal trash rack and a reinforced concrete pipe barrel.

The auxiliary spillway was in good condition. Trees and brush have been cleared from the inlet and outlet of the auxiliary spillway. A few trees and brush still remain in the auxiliary spillway. There was no major erosion damage observed in the auxiliary spillway.

At the time of the dam safety inspection, the dam and associated structures were found to be in fair to good condition. The inspection team observed no deficiencies or threats to structural integrity or public safety that require immediate action.

Geology. No detailed geologic investigation was conducted. The geology of the site is based on the investigations and analyses conducted during the design of the dam on August 25, 1971.

Design. The Project team used the following references to design the Project alternatives:

- Detailed Report of Geologic Investigations
- Soil Mechanics Laboratory Report and Supplements
- NRCS Technical Release 60
- NRCS National Engineering Handbook, Part 628, Chapters 50 and 51
- NRCS National Engineering Handbook, Part 728.5, SITES, Version 2005
- USDA Agriculture Handbook 667
- Kansas Department of Agriculture – Division of Water Resources Regulations pertaining to dam design (K.A.R. 5-40-1 through K.A.R. 5-40-70)

- Department of the Army, Corps of Engineers, Institute for Water Resources, Hydrologic Engineering Center, River Analysis System Computer Model (HEC-RAS), Davis, CA.

The drainage area, time of concentration, curve number, and structure capacity table were compared to the data in the As-Built Plans. The drainage area and land uses were field-checked to confirm that there had been no development or other land use changes that would alter the hydrology associated with the dam and reservoir.

The required design storms were flood routed using the NRCS Water Resource Site Analysis Computer Program (SITES, with User Manual dated March 2005). This program was developed by NRCS for hydrologic and hydraulic analyses of water control structure sites. SITES routes the inflow hydrographs through the structure and predicts the flow depth, velocity, and discharge capacity of the auxiliary spillway. SITES also predicts the extent of erosion in the auxiliary spillway.

SITES develops water surface profiles based upon a full trapezoidal cross section using a combination of the direct step and standard step methods. Flow resistance is calculated using the vegetal retardance curves in Agriculture Handbook 667. Backwater computations begin with critical depth at the upstream end of the first supercritical reach. Ratings are based on the energy head at the reservoir end of the inlet channel.

SITES also incorporates the auxiliary spillway erosion model is based on NRCS National Engineering Handbook Part 628, Chapter 51 – Earth Spillway Erosion Model. It uses basic physical principles and data gathered from the actual performance of auxiliary spillways. This model considers only downward and upstream migration of erosion—lateral erosion is not addressed.

The detention storage rainfall event was routed through the reservoir to determine the maximum water surface elevation attained during the storm. Routing began at the principal spillway crest elevation.

The Design Storm and Stability Design Event were routed through the reservoir to determine the maximum water surface elevations attained during the storms. The routings began at the principal spillway crest elevation.

Details on the engineering analyses can be found in Chapter 7 of the Supplemental Watershed Plan and Environmental Assessment and in the administrative record for the project.

Detailed information describing the changes in the structure data for the Preferred Alternative is provided in Table D-2.

Table D-2
Preferred Alternative Design Criteria

Resource	Original As-Built Conditions	Rehabilitation FRD R-1 to a NRCS High Hazard Class (C) Dam
Watershed size	646 acres	646 acres
Land use		
Cropland	69%	69%
Pasture/range	24%	24%
Other	7%	7%
Key design elevations		
Crest of dam	1409.8	1412.7
Crest of auxiliary spillway	1405.0	1406.3
Sediment pool	1399.4	1399.4
Drawdown	1389.9	1389.9
Principal spillway outlet	1388.0	1388.0
Outlet channel	1384.2	1384.2
Structure components		
Dam height	21.8 feet	24.7 feet
Dam length	1,700 feet	1,850 feet
Embankment volume	86,300 cubic yards	100,700 cubic yards
Auxiliary spillway		
Type	Vegetated earth	Vegetated earth
Bottom width	40 feet	240 feet
Capacity	280 cfs	4,643 cfs
Principal spillway type		
Type	Reinforced Concrete Pipe	Reinforced Concrete Pipe
Diameter	18-inch	30-inch
Capacity	27.3 cfs	91.0 cfs
Structure capacities		
Sediment storage	92.1 acre-feet	92.1 acre-feet
Detention storage	151.9 acre-feet	200.56 acre-feet
Surcharge	241.5 acre-feet	364.61 acre-feet
Surface areas		
Sediment pool	19.37 acres	19.37 acres
Detention pool	35.61 acres	40.53 acres
Top of dam	59.33 acres	77.07 acres

September 2010

[1] Based on the results of the planning study and may vary from the General Work Plan and As-Built Drawings for FRD R-1.

Breach Inundation Studies. The Project Team conducted the breach inundation analysis using Technical Release 60 (TR-60), Earth Dams and Reservoirs criteria and the methodology provided by Kansas Department of Agriculture, Division of Water Resources Regulation K.A.R. 5-40-24.

The water surface elevation at the time of the breach was determined from flood-routing the design storm through the existing auxiliary spillway. The auxiliary spillway was designed for the

100-year, 6-hour storm. The peak breach discharge and the breach discharge hydrograph were determined using the Natural Resources Conservation Service TR-66, third edition, “Simplified Dam-Breach Routing Procedure.” Valley cross sections were created from the Sedgwick County LIDAR data. Discharge rating tables for each cross section were formulated using HEC-RAS. These calculations provided the peak discharge and maximum water surface elevation at each cross section below the dam. The results from HEC-RAS provided the top width at the maximum water surface elevation for each cross section below the dam.

The Project Team used data from TR-66 and HEC-RAS to plot the maximum water surface elevations on the U.S. Geological Survey topographic map and aerial photo at each cross section. This defined the portions of each cross section that would be inundated. Boundary lines were interpolated between cross sections by building a corridor using the maximum water surface profiles imported from HEC-RAS. The corridor surface provided a delineated area below the dam that would be inundated if the assumed breach were to occur.

The potential inundation area was extended downstream to a point where the width of the breach inundation area was less than or equal to the width of the Federal Emergency Management Agency (FEMA) Zone A. Flood zones are geographic areas that the FEMA has defined according to varying levels of flood risk. These zones are depicted on a community's Flood Insurance Rate Map (FIRM) or Flood Hazard Boundary Map. Each zone reflects the severity or type of flooding in the area. FEMA Zone A classifies areas with a 1% annual chance of flooding.

Sedimentation. The Project Team conducted a bathymetric survey to measure water depth at various locations. It conducted sediment and storage analyses to estimate the accumulated sediment volume, to approximate the sedimentation rate, and to predict the remaining design life for the existing sediment pool. The analysis considered (a) the amount of borrow material removed from the reservoir area during construction of the dam, and (b) the measured amount of sediment deposited in the reservoir since construction. The analysis was used to estimate the remaining years of sediment storage available at the principal spillway riser inlet elevation. The results of the survey and analyses are described in. The administrative record for the Project includes detailed information on the sedimentation analysis.

Cost Estimates. The Project Team prepared predictions of probable costs for all alternatives. The predictions of probable costs are intended for comparing the alternatives. Project cost estimates included the following:

- Construction
- Habitat mitigation
- Engineering design
- Construction inspection
- Project administration
- Easements
- Advisory services
- Road and bridge modifications
- Operation and maintenance

Cost estimates were based on the following:

- Component quantities were based on conceptual designs.
- Unit costs were based on recent project experience.
- All cost estimates are based on 2009 U.S. Dollars.
- Engineering design, construction inspection, and project administration costs were estimated to be 35% of the estimated construction costs.
- Land rights cost were included as a separate component and based on the USDA-NRCS Fiscal Year 2009, Kansas Wetlands Reserve Program Graphic Area Rate Caps.

KANSAS

Kansas Historical Society
Cultural Resources Division

MARK PARKINSON, GOVERNOR

December 29th, 2009

Eric B. Banks, State Conservationist
Natural Resources Conservation Service
760 South Broadway
Salina, Kansas 67401

ATTN: Dean Krehbiel, Cultural Resources Coordinator

RE: Spring Creek Watershed Site No. R-1
Sedgwick County

Dear Sir:

Staff review of the above referenced project has been completed. Pursuant to 36 CFR 800.4, we concur with the finding of no historic properties affected for the above referenced undertaking. We therefore have no objection to implementation of the project.

Sincerely yours,

Jennie Chinn
State Historic Preservation Officer

Patrick Zollner
Deputy State Historic Preservation Officer

jt

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MARK PARKINSON, GOVERNOR

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Natural Resources Conservation Service
760 South Broadway
Salina, Kansas 67401

December 29th, 2009

ATTN: Dean Krehbiel, Cultural Resources Coordinator

RE: Spring Creek Watershed Site No. R-1
Sedgwick County

Dear Sir:

In accordance with the goals and procedures of the Cooperative Agreement between the Kansas Historical Society (KSHS) and the Natural Resources Conservation Service (NRCS), the Society has completed a Phase II field survey investigation of the above referenced project. The fieldwork was conducted by Society staff archeologist John Tomasic and archeological technicians Matt Dreher and Jerry Elmore on December 15th, 2009. Enclosed, you will find a report of that investigation.

In brief, no significant archeological sites were found in or adjacent to the specified project area. We therefore recommend that the project proceed as planned with no further archeological investigations. A copy of the enclosed report, containing this recommendation, has been sent to the State Historic Preservation Officer for review.

Of course, due to the nature of archeological manifestations, it is always possible that buried cultural deposits could be encountered during the course of the project. If that occurs the remains should be left in place and the State Archeologist contacted immediately so that the appropriate mitigative measures can be carried out as soon as possible.

Thank you for your cooperation in helping to preserve the State's archeological resources. The costs incurred during the course of our investigation are detailed below. The actual invoice will be presented in our regular billing.

Sincerely,

For the State Archeologist:

John Tomasic, Archeologist

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ARCHEOLOGICAL SURVEY OF THE SPRING CREEK WATERSHED SITE R-1, AN NRCS PROJECT IN SEDGWICK COUNTY, KANSAS

Report submitted to the Natural Resources Conservation Service,
Salina, Kansas

by John Tomasic
Archeology Office, Cultural Resources Division
Kansas Historical Society
December 29th, 2009

ARCHEOLOGICAL SURVEY OF THE SPRING CREEK WATERSHED SITE R-1, AN NRCS PROJECT IN SEDGWICK COUNTY, KANSAS

by John Tomasic
Archeology Office, Cultural Resources Division
Kansas Historical Society
December 29th, 2009

INTRODUCTION

In accordance with the goals and procedures of the Cooperative Agreement between the Kansas Historical Society (KSHS) and the Natural Resources Conservation Service (NRCS), the Kansas Historical Society (KSHS, or "the Society") recently completed a Phase II archeological field survey investigation of an NRCS project known as the Spring Creek Watershed Site R-1 Project. The purpose of the investigation was to determine whether any significant archeological resources would be affected by the proposed project. More specifically, the investigation was conducted to ensure compliance with various laws governing the treatment of cultural resources, particularly Section 106 of the National Historic Preservation Act and its implementing regulation, 36 CFR 800.

As required by the terms of the Cooperative Agreement, a Phase II survey must result in a report submitted to NRCS and the State Historic Preservation Officer (SHPO) wherein the investigation is described and recommendations are made for clearance or for further work to be done. This report was prepared to comply with that requirement. In accordance with the SHPO's request that site locational data be left out of the text of reports such as these, and to enable the easy removal of such data from copies of reports so as to guarantee confidentiality, all of the maps and figures pertaining to this investigation are contained within Appendix I.

As currently planned, the project will involve borrow and waste activities associated with the renovation, replacement, or removal of a dam in Sedgwick County, Kansas (Figures 1 and 2).

The Phase II investigation was initiated by earlier correspondence between the Society and NRCS relating to the potential impact of the project on cultural resources. A Phase I investigation (archival research) was requested by NRCS on November 4th, 2009. After reviewing the available documentation and consulting with the SHPO, the Society concurred that a Phase II field survey investigation be performed. Based on comments by the SHPO, the primary purpose of the investigation was to determine if any cultural resources would be affected by the renovation, replacement, or removal of the existing dam. The recommended fieldwork was thereby carried out by Society staff archeologist John Tomasic and archeological technicians Matt Dreher and Jerry Elmore on December 22nd, 2009.

ENVIRONMENTAL SETTING

In physiographic terms, the project area lies within the McPherson Lowland division of the Arkansas River Lowlands section of the Central Lowland physiographic province (Schoewe 1949:280). Schoewe characterized the McPherson Lowland as a flat plain underlain by unconsolidated clays, silts, sand, and gravels from 10 to 250 feet thick, either of Tertiary or Quaternary age. In addition, he stated that

> Low sand dunes and undrained depressions constituting ponds and small lakes diversify the topographic expression of the area whose surface lies approximately 1,500 feet above sea level. The Little Arkansas River and its tributaries drain the area. Beneath the thick covering of the unconsolidated deposits are the impervious shales of Permian age (1949:297).

The natural vegetation of the region prior to the encroachment of modern civilization apparently consisted of tall grass prairie interpenetrated by narrow bands of riverine forest (Kuchler 1974). Warm season grasses dominated the prairie vegetation community, with big and little bluestem, switchgrass, and Indian grass being the most important elements of that community. Moderate rainfall, a relatively long growing season, and rich soils provided conditions suitable for many other grasses and numerous annual and perennial herbs. Within the stream valleys, periodically flooded shallow depressions hosted wetland communities dominated by prairie cordgrass, while mud flats served as preferred sites for smartweeds, docks, purslane, and chenopods. Gallery forests occurred in narrow bands along the major streams. The forest vegetation was dominated by medium tall to tall broadleaf deciduous trees like cottonwood, hackberry, willow, and elm. Hillsides and ravines along valley edges supported woodlands of bur oak with scattered individuals of bitternut hickory and shagbark hickory. Black walnut, green ash, and sycamore prevailed in the lower, more mesic areas. The understory was mostly buckbrush and Missouri gooseberry, with the herbaceous flora being similar to that found in oak-hickory forests to the east.

These vegetative conditions provided shelter and food for an abundant mammalian fauna, including such large game animals as bison, elk, deer, antelope, and bear along with smaller animals such as cougar, wildcat, coyote, fox, beaver, otter, muskrat, raccoon, opossum, badger, squirrel, rabbit. Wild turkey, prairie chicken, ruffed grouse, and quail were also present, and the larger streams yielded an abundance of edible fish and shellfish.

The natural ecology of the region has been greatly altered by modern land-use practices. Today, most of the lands within this part of the state are used for agricultural purposes, primarily the pasturing of cattle and the cultivation of crops such as wheat, corn, milo, and soybeans.

Ground conditions within the project area consisted of large expanses of grassland surrounding a dam and reservoir. At the time of the survey, large portions of the proposed project area were inundated by the waters of the reservoir (Figures 2, 3). Ground visibility within the grassy areas immediately surrounding the reservoir averaged less than 10%. However,

grassy areas on the hilltops and hillslopes of the project area and the areas below the dam were characterized by patchy vegetation with 40%-50% surface visibility. Furthermore, the entire survey area was characterized by an unusually large number of rodent burrows which, as described in the Research Methodology section, greatly aided the pedestrian survey of the project area.

CULTURAL-HISTORICAL SETTING

Archeologically, research in this region of Kansas has yielded evidence of prehistoric human occupation dating from around 11,000 years ago and extending up to the modern era, and certainly has the potential for yielding more such evidence. Sites in the region usually represent habitation areas or small workshops and more rarely occur as villages or burials. While the full extent of the area's archeological resources has yet to be determined, it is clear that the region contains materials deriving from all of the major cultural periods thus far identified in Kansas, i.e.,

Paleoindian	circa 9,000 B.C. to 7,000 B.C.
Archaic	circa 7,000 B.C. to A.D. 1
Early Ceramic	circa A.D. 1 to A.D. 1000
Middle Ceramic	circa A.D. 1000 to A.D. 1500
Late Ceramic	circa A.D. 1500 to A.D. 1800
Historic	A.D. 1541 to present

The list consists of broad and somewhat artificial categories, and there is some temporal overlap between periods. As might be expected, more is known about the most recent inhabitants than is known about the earliest (Lees 1989; Brown and Simmons 1987; Hoard and Banks 2006; Thies 1987; Wedel 1959).

With regard to the project that is the subject of this report, documentation consulted during the Phase I investigation indicated that no archeological sites had been reported in or near the project area. The topographic setting, however, suggested that there was some potential for prehistoric sites to be present. Since the project area had never been professionally inspected for archeological remains, a Phase II field survey was recommended.

RESEARCH METHODOLOGY

The Phase II investigation consisted of a field inspection of entire the project area, including an intensive pedestrian survey of that area and a brief reconnaissance survey of the surrounding area. Inundated portions of the proposed project area were excluded from the survey. The remaining portions of the project area were systematically surveyed by a series of pedestrian transects spaced 15 meters apart, radiating outward from the shores of the reservoir. Areas of high topographic potential for the finding of prehistoric archeological remains were criss-crossed to ensure that no archeological remains would be overlooked. Furthermore, all rodent burrows encountered during the pedestrian inspection were carefully examined for the presence of cultural materials. The amount of land covered in this survey amounted to approximately 80 acres (see Figure 2, Figure 3).

As described in the Environmental Setting section of this report, the ground visibility along the sparsely covered hilltops and hillslopes averaged between 40%-50%. Areas along the edge of the reservoir were covered in dense grasses, and surface visibility was less than 10%. In order to supplement the low surface visibility within the areas immediately surrounding the reservoir, and to search for potentially deeply buried archeological sites, the pedestrian inspection was supplemented with shovel testing. Shovel tests were placed within these low visibility areas along a series of transects spaced 15 meters apart. Shovel tests were excavated to a depth of 10 centimeters into sterile sub-soil (B-horizon) and all excavated material was screened through ¼ inch hardware cloth.

SURVEY FINDINGS AND CONCLUSIONS

Despite the intensity of the survey and the presumed potential of the area to contain cultural remains, no significant cultural resources were found within the project area. To use the language employed in 36 CFR 800.4, the investigation produced a finding of "no historic properties affected." We therefore recommend that the project proceed as planned, with no additional investigations unless archeological discoveries are made during the course of the project.

It is always possible, of course, due to the nature of archeological manifestations, that buried cultural deposits could be encountered. If that occurs, the remains should be left in place and the State Archeologist contacted immediately so that appropriate mitigative actions can be carried out as soon as possible.

John Tomasic
Archeology Office, Cultural Resources Division
Kansas Historical Society
December 29th, 2009

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APPENDIX I.

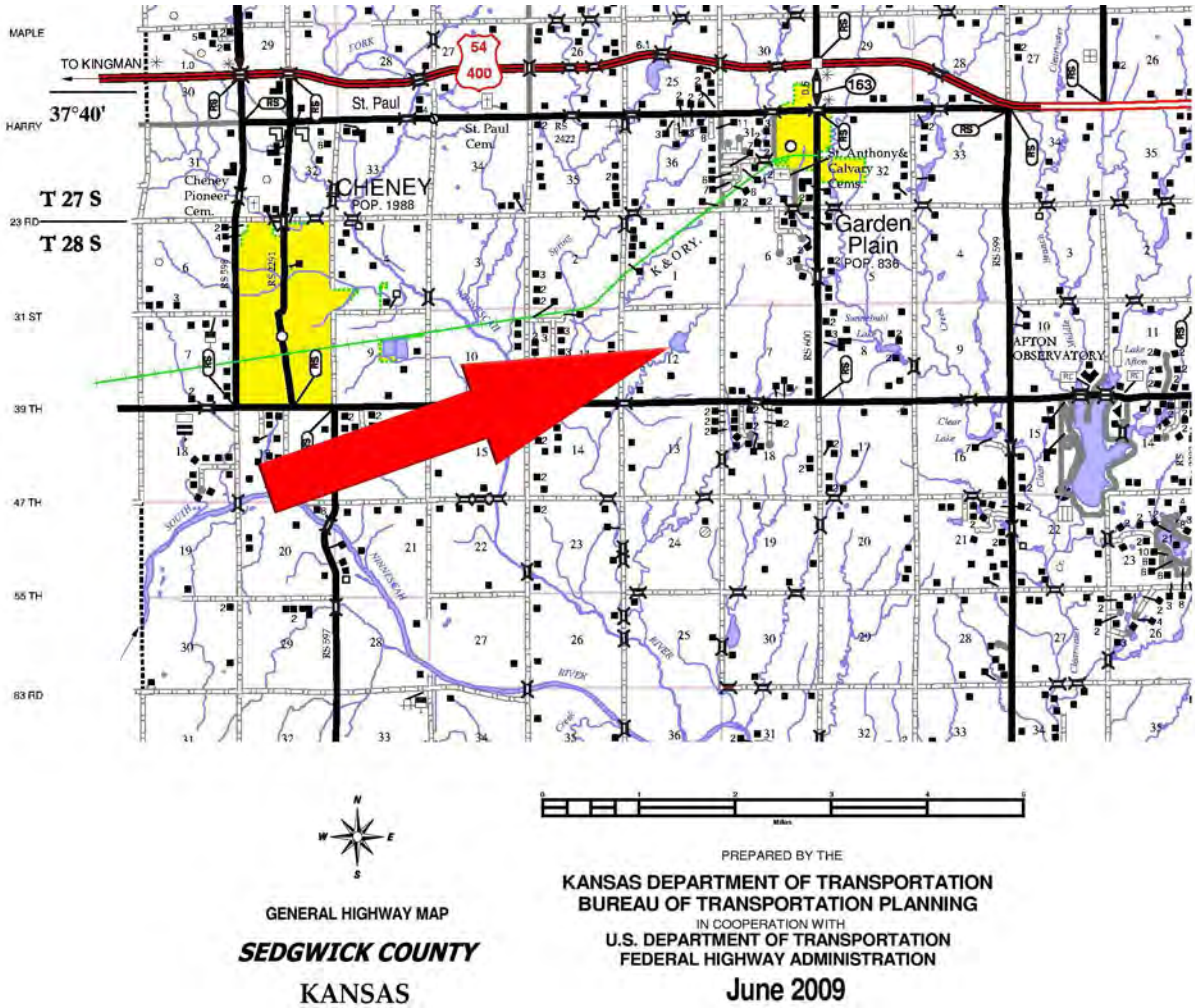

FIGURE 1. Section of Sedgwick County highway map, with a red arrow indicating the location of the Spring Creek Watershed Site R-1 Project.

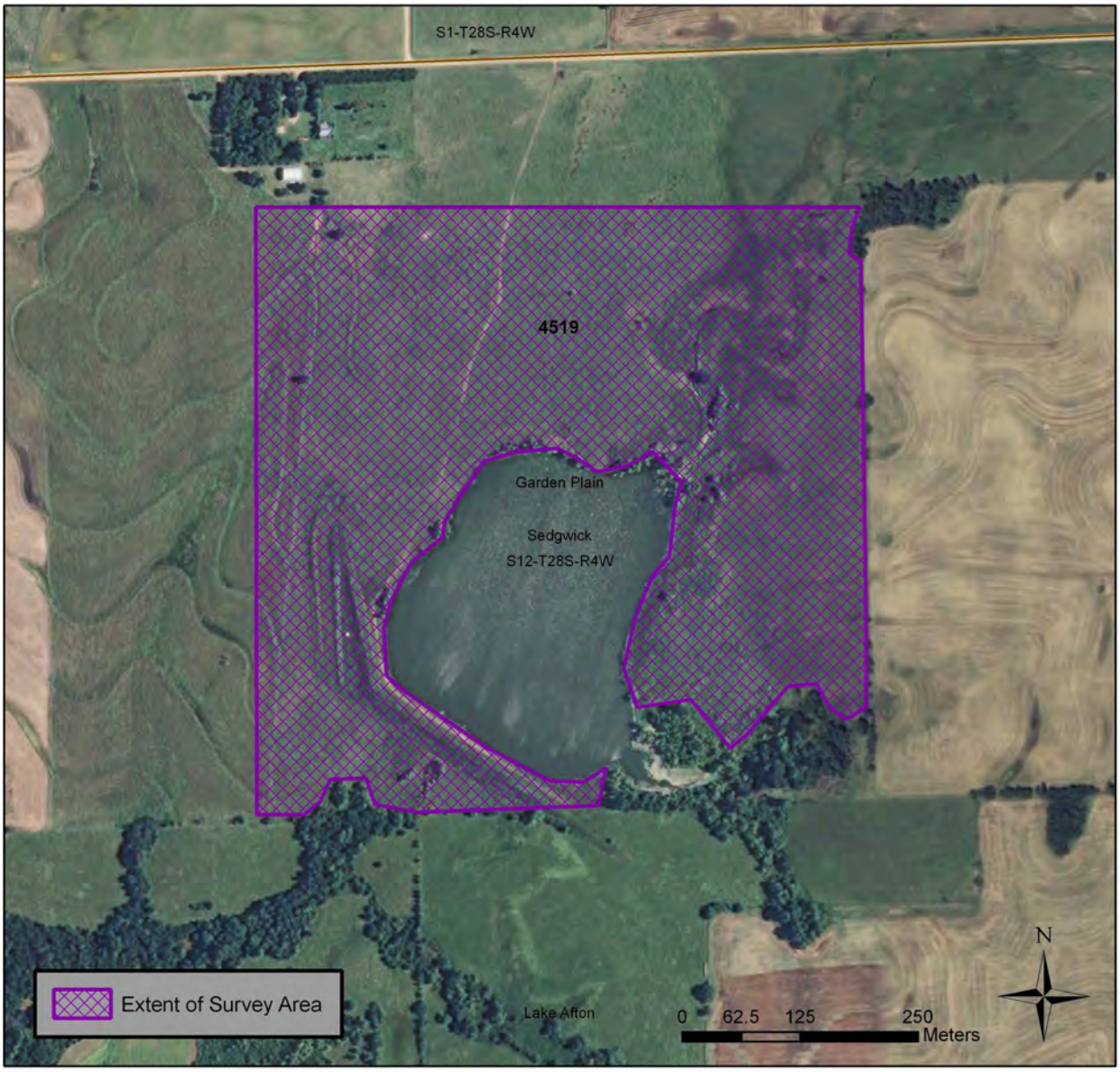

FIGURE 2. Aerial image of the project area showing the location and extent of the area surveyed. The area surveyed is labeled with a Kansas Historical Society bibliographic record number (4519).

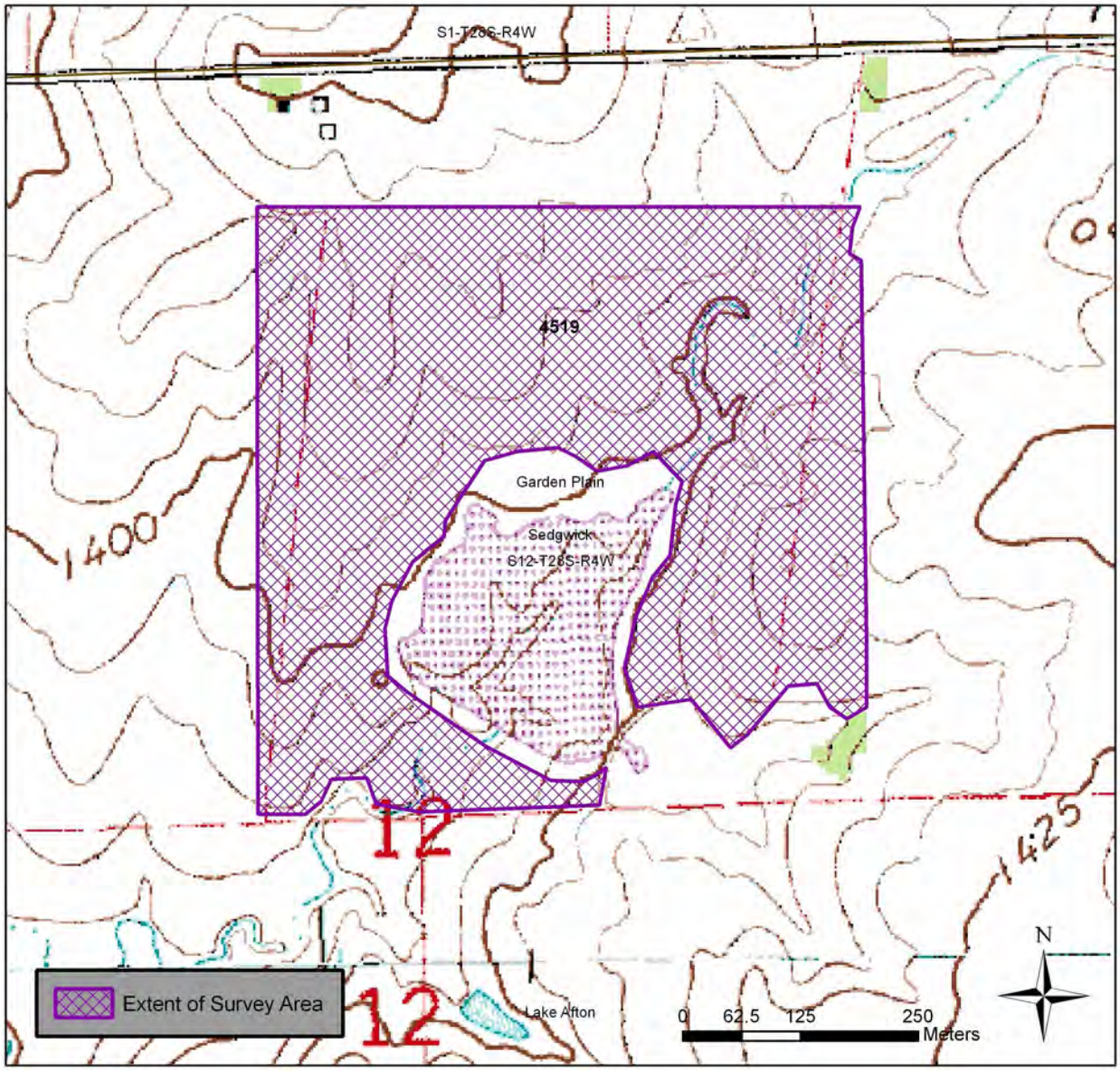

FIGURE 3. Section of U.S.G.S. topographic map (Garden Plain quadrangle Section 12, Township 28 South, Range 4 West), showing the location and extent of the area surveyed. The area surveyed is labeled with a Kansas Historical Society bibliographic record number (4519).

Appendix E

SUPPORTING INFORMATION

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