

FEASIBILITY STUDY
and
ENVIRONMENTAL ASSESSMENT

SECTION 205
SMALL FLOOD CONTROL PROJECT

LITTLE PUERCO WASH
GALLUP, NEW MEXICO

Prepared
by

U.S. ARMY CORPS OF ENGINEERS
ALBUQUERQUE DISTRICT
ALBUQUERQUE, NEW MEXICO

January 2000

FINDING OF NO SIGNIFICANT IMPACT

SECTION 205, SMALL FLOOD CONTROL PROJECT LITTLE PUERCO WASH, GALLUP, NEW MEXICO

The integrated Feasibility Study and Environmental Assessment for the proposed Small Flood Control Project on Little Puerco Wash in Gallup, New Mexico, was conducted under the authority contained in Section 205 of the Flood Control Act of 1948 (Public Law 80-858), as amended. Section 205 provides authority to the Secretary of the Army, acting through the Chief of Engineers, to plan and construct small local flood protection projects which have not already been specifically authorized by Congress.

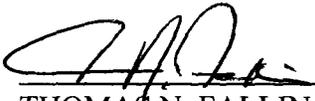
The objective of the proposed action is to provide flood protection for the City of Gallup from flood flows that occur in Little Puerco Wash. The recommended plan provides for the construction of a small earthen dam and reconstruction of a road crossing. The earthen dam would regulate flows in Little Puerco Wash to the capacity of the existing channel. The core of the dam would be compacted random fill with the spillway and embankment tiebacks of roller compacted concrete. Flood water storage capacity to the spillway crest would be 401 acre-feet. The road crossing reconstruction would remove existing undersized concrete box culverts and construct new concrete box culvert structures that are designed to channel capacity. The plan includes habitat mitigation that would construct 2.0 acres of wetland habitat. The total project would require 6.0 acres of land. The project design capacity is the one-percent chance event (100-year frequency event).

The recommended plan provides for the control and regulation of flood flows in the existing channel and therefore provides flood protection for the City of Gallup. Should the project not be constructed, flood flows would continue to overflow from the existing channel flooding the downtown area of Gallup, threatening structures and loss of life. The planned action would result in temporary or negligible impacts on vegetation, air quality, noise levels, and aesthetic values. The following elements have been analyzed and the planned action would have negligible or no effects on: natural resources, air quality, water quality, wetlands, wild and scenic rivers, wildlife, special status species or their habitat, wilderness values, prime and unique farmland, cultural resources, or the socio-economic environment. The recommended plan provides for the construction of 2.0 acres of wetland habitat to mitigate the loss of riparian habitat.

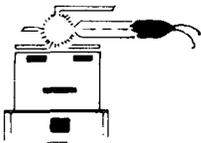
The proposed action requires Section 404 of the Clean Water Act (CWA) authorization. Water Quality Certification as required by Section 401 of the CWA would not apply to the proposed project because Little Puerco Wash is ephemeral; however, ephemeral watercourses are protected and the project is still subject to the State of New Mexico Standards for Interstate and Intrastate Streams that include isolated wetlands and ephemeral watercourses. A general permit under National Pollutant Discharge Elimination System guidance would be required because the total construction easement is more than five acres. Best management practices would also be utilized during project construction to prevent construction site erosion and storm water discharges.

The planned action has been coordinated with Federal, State, and local agencies with jurisdiction over the biological and cultural resources of the project area. Based upon these factors and others discussed in detail in the integrated Feasibility Study-Environmental Assessment, the planned action would have a negligible effect on the human environment. Therefore, an Environmental Impact Statement will not be prepared for the Little Puerco Wash Section 205 Small Flood Control Project.

23 Oct 99
DATE



THOMAS N. FALLIN
Lieutenant Colonel, EN
District Engineer



CITY OF GALLUP

MAYOR: JOHN PENA
COUNCILORS: LOUIS BONAGUIDI
PATRICK "PAT" BUTLER
CHARLIE R. CHAVEZ
ROSE MARIE SANDOVAL
CITY MANAGER: DAVID RUIZ

30 December 1999

LTC Thomas N. Fallon, USA
District Engineer
U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Plaza NE
Albuquerque, NM 87109-3435

RE: LITTLE PUERCO WASH FLOOD CONTROL PROJECT

LTC Fallin:

City Of Gallup has completed its review of the draft Feasibility Report, dated July 1999, for the Little Puerco Wash Section 205 Flood Control Project. Per our review, we see no problems with the draft report for constructing a flood control dam across the Little Puerco Wash.

Accordingly, this letter shall serve as notice of the City's continued support for the planning, engineering, design, and construction of the project as presented in the draft Feasibility Report. We are also familiar with the current project cost sharing provisions, and we are still committed to the eventual completion of construction.

Deeply appreciate your consideration and support of this project. If you have any questions or we can be of further assistance, please give us a call. My point of contact is Stanley Henderson, Public Works Director, at 505-863-1290.

David Ruiz
City Manager

Copy to:
Stanley Henderson, Public Works Director
Ellery Biathrow, City Engineer



SUMMARY

This Feasibility Study (FS) presents the results of investigations completed to determine if Federal participation is warranted on the Little Puerco Wash at Gallup, New Mexico. In addition to addressing the need to reduce flood damages in the area, this report also investigated opportunities for recreational improvements and for fish and wildlife habitat enhancement measures. This study was undertaken due to the extensive flood damages in the area and the rapid growth that is taking place in the Little Puerco Wash basin. The Environmental Assessment (EA) addresses the perceived effects of alternative plans developed to provide higher levels of flood protection to flood plain communities, development, and wildlife habitat from flood flows in the Little Puerco Wash in Gallup, New Mexico. Together, the integrated FS/EA presents a complete package addressing the planning and environmental objectives of the project.

The project area for the proposed earthfill dam lies immediately upstream from the Pepsi Bottling Plant in Gallup, McKinley County, New Mexico. The project area for the proposed reconstruction of existing box culverts is located near the Little Puerco Wash's confluence with the Puerco River. The project area for the proposed mitigation site is at the Gallup municipal golf course. The city lies at an elevation of approximately 6,600 feet. The Little Puerco Wash is a drainage that flows into the Puerco River from the south. The silt-laden drainage courses of these small side tributaries are typically shallow, broad, and meandering. The flood plain is predominately urban and includes the Central Business District of Gallup. The City of Gallup had a 1990 population of over 19,000 and is the county seat of McKinley County. The economy is based on manufacturing, wholesale and retail trade, and tourism. Gallup is the major

population center in the project area.

Recorded flood history in the study area goes back to the 1880's. No gage data exists for Little Puerco Wash. Notable floods on the Little Puerco Wash probably occurred in 1895, 1904, 1923, 1933, 1959, 1964, and 1990. The 1990 flood resulted in one death and over one million dollars in damages. Future floods would result in higher damages as a result of greater development of the basin and the continued deterioration of the covered portion of the channel. If a 100-year flood were to occur today, estimates indicate that it would result in over \$5 million in damages in the study area, whereas in 50 years, the damages would rise to greater than \$7 million. The current start of damages is estimated to be between an 8- and 10-year event. This equates to a 10 to 12 percent chance of flood damages in any given year. Thus, the study area not only is characterized by large economic losses during flood events, but also a frequent event with which damages will begin.

The purpose of this FS/EA is to determine the potential to provide flood protection measures, and to investigate possible environmental restoration, water quality improvements, wildlife habitat improvements, and recreation enhancements at Gallup, New Mexico. Therefore, this analysis initiated the plan formulation and evaluation process. Alternatives considered and eliminated from further study include flood-proofing, flood zoning, watershed land treatment measures, channelization, gabion dams, roller compacted concrete dams, and other possible locations for dams. The final analysis examined an earthfill dam with a roller compacted concrete (RCC) spillway, improvements to existing box culverts located downstream, and a mitigation site at the Gallup municipal golf course. Several differing heights and configurations of the proposed dam were optimized.

In summary, this report concludes that the recommended plan for Little Puerco Wash is the National Economic Development (NED) plan, which maximizes net economic benefits to the nation. The Feasibility Study falls under the approval authority of the Division Commander, CESP. In a letter dated 30 December, 1999 signed by the City Manager of Gallup, the City supports the recommended plan and intends to cost share the project. It is recommended that the District Engineer proceed in partnership with the City toward project implementation, which includes plans and specifications and construction of the earthfill dam, reconstruction of the downstream box culverts, and development of 2 acres of habitat at the Gallup municipal golf course.

**FEASIBILITY STUDY
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ENVIRONMENTAL ASSESSMENT
LITTLE PUERCO WASH
GALLUP, NEW MEXICO**

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CHAPTER I INTRODUCTION

I-1 Introduction

This Feasibility Study presents the results of investigations completed to determine if Federal participation in the construction of a flood control project is warranted at Gallup, New Mexico, on the Little Puerco Wash. In addition to addressing the need to reduce flood damages in the area, this report also investigated opportunities for recreational improvements, and fish and wildlife habitat enhancement measures. This study was undertaken due to the extensive flood damages and rapid growth, which are taking place within the Little Puerco Wash Basin. Additionally, the continued deterioration of the covered section of channel above Little Puerco Wash will exacerbate the situation in the future. The following sections of this report outline the study authority, the study participants, and prior studies performed for this study area.

I-2 Purpose and Need for Action

The flood hazard in the area is substantial. The city of Gallup has an extensive history of flooding, with accounts dating back to 1881. Notable floods on the Little Puerco Wash probably occurred in 1923, 1933, 1959, 1964, and 1990. The July, 1990, rain occurred between 3:30 p.m. and 4:30 p.m. Rainfall within the previous 10 days of the storm amounted to 1.14 inches. High soil moisture and flow restrictions caused by hail accumulation aggravated the flood damage. This flood resulted in the death of one man and over one million dollars in damages to streets, sidewalks, drainage facilities, homes, commercial and retail property. The value of property in the floodplain is \$19,271,000, of which over \$16,500,000 is commercial. The one hundred year flood event would cause an estimated \$5,110,000 damage of which approximately \$4,600,000 would be commercial. Damages could start at a less than 10 year event. Future growth in the basin will increase both the total damages and frequency of flooding. In addition, there is a covered section of the channel which needs continual maintenance. There are structures and

roadways lying over approximately 2,000 feet of covered channel. A significant flow and/or deterioration of the covered section could result in greater damages in the future, resulting either from blockage of the channel creating greater overbank flooding, or collapse of a section creating both greater overbank flooding and damages to the structures overlying the channel.

I-3 Study Authority

The U.S. Army Corps of Engineers (Corps) signed a cost sharing agreement with the City of Gallup on September 30, 1996, to conduct a Feasibility Study on the Little Puerco Wash. This study is conducted under the authority contained in Section 205 of the 1948 Flood Control Act (Public Law 80-858), as amended. Section 205 provides authority to the Chief of Engineers to plan and construct small local protection projects, which have not already been specifically authorized by Congress. Each project must not require additional Federal action before it can operate for flood control. The flood damage reduction benefits must be at least equal to the costs. Each project is limited to a Federal cost of not more than \$7,000,000. The Feasibility Study is cost shared 50 percent Federal and 50 percent City of Gallup. A previous Reconnaissance Study (1993) was 100 percent Federally funded. Upon the completion of the Feasibility Study report, the level of detail and extent of engineering work will be sufficient to proceed to the preparation of Plans and Specifications.

I-4 Prior Studies and Reports

Several studies were used as the references in the report:

Gordon Herkenhoff and Associates, 1962, Engineer's Report on Flood Control and Storm Drainage, for Gallup City Council.

Gordon Herkenhoff and Associates, 1966, Storm Drainage - Indian Hills Subdivision, for City of Gallup Planning and Zoning Board

U.S. Army Corps of Engineers, Los Angeles District, 1974, Flood Plain Information, Puerco River, Vicinity of Gallup, NM

U.S. Army Corps of Engineers, 1986, Puerco River Levees, Gallup, New Mexico, General Design Memorandum.

U.S. Department of Agriculture, Soil Conservation Service, 1992, Little Puerco Wash and Catalpa Canyon Floodplain Management Study.

U.S. Army Corps of Engineers, Albuquerque District, 1993, Reconnaissance Report, Little Puerco Wash, Section 205.

Bohannon Huston, Inc and Mussetter Engineering, 1998, Little Puerco Wash Sediment Transport Appendix.

The Natural Resources Conservation Service, (NRCS; formerly Soil Conservation Service, SCS) completed a Reconnaissance Study in 1992 on the Little Puerco Wash. The study concluded that the primary damages were urban in nature and therefore, further participation on their part did not meet their authorities. The Corps began a Reconnaissance Study immediately afterward using many of the materials developed by the NRCS.

The Corps' Reconnaissance Study (1993) identified a dam as the preferred alternative, located immediately south (upstream) of the Pepsi Bottling Plant. The 10-year flow was estimated to be under the 800 cubic-foot-second (cfs) requirement, and a waiver was obtained since the 100-year flow did meet the 1,800 cfs flow requirement. The preferred alternative was a roller compacted concrete dam, approximately 20 feet in height.

I-5. Regulatory Compliance & History

A. Regulatory Compliance

This Environmental Assessment was prepared by the U.S. Army Corps of Engineers, Albuquerque District, in compliance with all applicable Federal

statutes, regulations, and Executive Orders, including the following:

American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)
Archaeological Resources Protection Act of 1979 (16 U.S.C. 470)
Clean Air Act of 1972, as amended (42 U.S.C. 7401 *et seq.*)
Clean Water Act of 1972, as amended (33 U.S.C. 1251 *et seq.*)
Endangered Species Act of 1973, as amended (16 U.S.C. 1531)
Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*)
Flood Plain Management (Executive Order 11988)
Protection of Wetlands (Executive Order 11990)
National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq.*)
National Historic Preservation Act of 1966, as amended (16 U.S.C. 470)
Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 *et seq.*)

This document also reflects compliance with all applicable State of New Mexico and local regulations, statutes, policies, and standards for conserving the environment, such as water and air quality, endangered plants and animals, and cultural resources.

B. History of Fish and Wildlife Coordination Act and Endangered Species Act Consultation and Compliance

During the Corps Reconnaissance Study (1993), informal consultation was conducted with the U.S. Fish and Wildlife Service (USFWS), the New Mexico Energy, Minerals, and Natural Resources Department, and the New Mexico Department of Game and Fish. On September 8, 1997, the Corps, working under a nationwide Memorandum of Agreement with the USFWS for Fish and Wildlife Coordination Act (FWCA) activities, sent a Scope-of-Work to the USFWS New Mexico Ecological Services State Office. The Scope-of-Work requested that the USFWS review the proposed project and prepare a draft and final Fish and

Wildlife Coordination Act Report (CAR) that discussed existing fish and wildlife conditions; any institutionally designated fish and wildlife areas or resources under State, local, or Federal purview; problems, needs, and opportunities relating to fish and wildlife resources; and potential major biological effects of alternative plans. The Corps responded to USFWS with comments to the draft CAR on June 25, 1998, and the Corps received the Final CAR on January 8, 1999.

Scoping letters were also sent to the New Mexico Energy, Minerals, and Natural Resources Department, and the New Mexico Department of Game and Fish as well as other entities, including the nearby Navajo Nation and Pueblo of Zuni Reservations, to afford opportunity for their comment concerning species regarded as having special status to their agency(s) or peoples (see Chapter X, Public Involvement).

CHAPTER II

PLAN FORMULATION

This section of the report will discuss the process of formulating alternative plans, which address the water resource problems and needs for the Little Puerco Wash Study area, as defined in the previous section of this report.

II-1 Planning Objectives/Opportunities & Constraints

A. Planning Objectives

Planning objectives are an expression of public and professional concerns about the use of water and related land resources resulting from the analysis of future conditions in the study area. These planning objectives were considered in the development of alternative plans for evaluation in the Little Puerco Wash Study area.

The primary purpose of the 1993 Corps' Reconnaissance Study was to develop a viable flood control plan, which would substantially alleviate the flooding problems of the study area. Additional flood control alternatives, as well as the associated environmental, water quality, and recreational developments for these alternatives, were investigated in the feasibility phase. Based on the flood control problems and needs discussed in Chapters III and IV of this report, the following specific planning objectives and opportunities were considered during this evaluation.

(1) Reduce the flood hazard and flood damage potential to existing properties within the flood plains of the study area to a level that would protect against hazards to health and safety and is acceptable to the majority of the study area's population, thus, helping to constitute an acceptable plan for the non-Federal sponsor.

(2) Contribute to the conservation and enhancement of fish and wildlife

resources of the existing environment, including the preservation of wetlands in conjunction with a project in the study area, and a maximization of opportunities for aesthetic appreciation of the environmental quality of the area.

(3) Preserve, conserve, or enhance the environmental and cultural resources of the study area, and mitigate any adverse impacts to the existing natural environment and identified cultural resources caused by any economically feasible flood control plan.

(4) Enhance water quality conditions within the study area and prevent degradation of water quality, which may be created by the construction of any flood control alternative within the study area.

(5) Maintain existing open spaces within the study area, and control public access in order to improve the aesthetic and recreational features of the area.

B. Planning Constraints

In the development of flood damage reduction plans, the following constraints or limitations were considered important during the formulation of plans and the maximization of beneficial impacts and the minimization of adverse impacts.

(1) The project should be limited to the Little Puerco Wash study area as outlined in Chapter III of this report.

(2) Flood control features that solve problems in one area, but compound them in other areas should be avoided.

(3) Total benefits must equal or exceed total costs for any plan to be implemented by the Federal government or the U.S. Army Corps of Engineers.

(4) There must be compliance with National Environmental Policy Act of 1969 (NEPA), the Endangered Species Act (ESA), and all other Federal, state, and local environmental laws and regulations.

(5) Any recommended project must be developed in close coordination with the non-Federal sponsor, who is willing to undertake the responsibilities of supporting the project through construction, and operating and maintaining it through its useful life.

C. Federal Interest

The Federal objective of water and related land resources planning is to contribute to NED, while protecting the Nation's environment, pursuant to Federal environmental laws, statutes, and policy, applicable executive orders, and other Federal planning requirements.

Contributions to NED are an increase in the net value of the national output of goods and services expressed in monetary units; are the direct net benefits that accrue in the planning area and the rest of the nation; and are increases in the net value of those goods and services that are marketed, and also of those that may not be marketed.

The Federal objective for the relevant planning setting is also stated in terms of an expressed desire to alleviate problems and realize opportunities related to the output of goods and services, or to increased economic efficiency.

D. Rationale for Plan Evaluation

The rationale used for the evaluation of the authorized plan consists of the evaluation of technical, economic, NED, regional economic development, environmental, and social impacts. The following paragraphs discuss the technical, economic, environmental, and social criteria used to evaluate the authorized plan and its success in meeting the stated objectives of the study.

E. Technical Criteria

Technical criteria are based on Corps' design standards for flood damage reduction. Applicable criteria are summarized as follows:

(1) The plan must be effective and efficient with regard to alleviating the specified flood problems and achieving the specified goals and opportunities.

(2) The plan must be technically feasible, using established engineering methods and procedures applicable and appropriate within the region.

(3) The plan must be adequate to provide a project life of at least 50 years.

(4) Existing project facilities should be used to the maximum extent possible.

(5) The plan is to be complete within itself and not require additional future improvements other than normal operation, maintenance, rehabilitation, replacement, and repair.

(6) The plan must be designed, using engineering criteria contained in the appropriate Corps' engineering and design manuals and regulations relating to flood control alternatives.

F. Economic Criteria

The economic criteria which were applied are contained in the "Planning Principles and Guidelines," approved by the President of the United States in 1983, and the Water Resources Development Act of 1986. Also adopted for planning studies is the Water Resource Council's (WRC) "Economic and Environmental Principles for Water and Related Land Resources Implementation Studies," Chapter II - National Economic Development (NED) Benefit Evaluation Procedures (March 10, 1983). These are included in the December 28, 1990, "Planning Guidance Handbook" (Corps of Engineers Regulation 1105-2-100). Alternatives typically developed under these constraints include: a NED plan which would reasonably maximize net benefits; plans which are compatible with

existing water and related land resources in the area; and plans which would minimize adverse effects on or would enhance the environmental, social, and economic settings of the study area. Economic criteria used in evaluating plans include:

(1) The identification and comparison of benefits and costs for each alternative. Generally, tangible economic benefits of a selected plan must exceed costs, unless the deficiency is the direct result of cost incurred to obtain positive environmental quality contributions. Annual costs and benefits are calculated at the current interest rate (6-7/8 percent) and price levels (April 1999). Annualized costs must include the cost of operation, maintenance, repair, replacements, and rehabilitation. A 50-year amortization period was used for the period of analysis.

(2) Plans, or incremental plans, will not be recommended for Federal development that, although they have beneficial effects on the objectives, would physically or economically preclude alternative non-Federal plans, which would likely be undertaken in the absence of the Federal plan and which would more effectively contribute to the objectives when comparably evaluated according to these principles.

(3) The plan must fit integrally into an overall plan for water and related land resources management and development within the study area.

(4) The alternative plan with the greatest net economic benefits (the NED plan), consistent with protecting the nation's environment, is required to be the plan recommended for Federal action, unless an exception is granted by the Assistant Secretary of the Army for Civil Works (ASA-CW). In presenting the NED plan, all reports must include appropriate information and data on a sufficient number of alternatives to define both the lower and upper portion of the net NED benefit curve. If there are believed to be overriding and compelling reasons favoring the selection of a larger or smaller plan other than the NED plan, a clear and complete rationale must be presented in the report for a decision maker to evaluate the appropriateness of such a deviation. Such an exception may be

granted for a locally preferred plan when economically justified and at the additional expense of the non-Federal sponsor.

G. National Economic Development Criteria

The NED procedures are for Federal administrative purposes and do not create any substantive or procedural rights in private parties. Criteria for evaluating NED effects of alternative plans include the following:

(1) When an alternative procedure provides a more accurate estimate of a benefit, the alternative estimate may also be shown if the procedure is documented.

(2) Steps in a procedure may be abbreviated by reducing the extent of the analysis and amount of data collected where greater accuracy or detail is clearly not justified by the cost of the plan components being analyzed. The steps abbreviated and the reason for abbreviation should be documented.

(3) The following must be presented in support of the NED analysis:

(a) Installation Period - The number of years required for installation (design and construction) of the plan. If staged installation is proposed over an extended period of time, the installation period is the time needed to install the first phase.

(b) Installation Expenditures - The dollar expenses expected to be incurred during each year of the installation period.

(c) Period of Analysis - The time horizon for project benefits deferred installation costs, and operation, maintenance, repair, rehabilitation and replacement (OMRR&R) costs must be the same for all alternative plans. The period of analysis is the time required for implementation plus the lesser of (1) the period of time over which any alternative plan would have significant beneficial or adverse effects; or (2) a period not to exceed 100 years. Appropriate consideration should be given to environmental factors that may extend beyond the period of analysis.

(d) Benefit Stream - The pattern of expected benefits over the period of analysis.

(e) OMRR&R Costs - The expected costs over the period of analysis for operation, maintenance, repair, rehabilitation and replacement, necessary to maintain the benefit stream and agreed upon levels of mitigation of losses to fish and wildlife habitats.

(f) Discount Rate - The discount rate established annually for use in evaluating Federal water projects.

Net NED benefits of the plan are calculated in average annual equivalent terms. In performing this calculation, the benefit stream, deferred installation costs, and OMRR&R costs are discounted to the beginning of the period of analysis, using the applicable project discount rate. Installation expenditures are brought forward to the end of the period of installation by charging compound interest at the project discount rate from the date the costs are incurred. The project discount rate is used to convert the present worth values to average annual equivalent terms.

H. Regional Economic Development Considerations

Factors affecting regional economic development are considered, including most of the factors described in the national economic development account, as well as the following:

(1) The effect on the area tax base of taking private lands and placing them in public ownership. In this regard, lost taxes are not included in the benefit cost ratio. In any flood control project where private property must be acquired, there would be a loss of taxes. However, the protection provided by a flood control project offsets the loss of taxes as well as preventing various emergency costs to a community during times of severe flooding.

(2) Employment changes in the area as a result of the project.

(3) Expenditures of non-area residents in the study area.

(4) Disruption of desirable community and regional growth.

I. Environmental Criteria

Plans evaluated must be consistent with enhancing the existing environment by the management, conservation, preservation, creation, restoration, or improvement of the quality of certain natural and cultural resources and ecological systems in the proposed project area. Structural and non-structural measures must be evaluated in accordance with guidelines established by the National Environmental Policy Act of 1969 (Public Law 91-190), as amended, and the Principles and Guidelines. Environmental criteria considered in the evaluation of the authorized plan include:

(1) Management, protection, acceptability, or creation of areas of natural beauty and human enjoyment.

(2) Management, protection, and enhancement of valuable or outstanding archaeological, historical, biological, and geological resources and ecological systems.

(3) Enhancement in quality of water, land, and air, while recognizing the need to harmonize land-use objectives in terms of economic use and development with conservation of the resource.

(4) Determination of the relationship between local short-term uses and the maintenance and enhancement of long-term productivity.

(5) Determination of any irreversible and irretrievable commitment of natural resources and biological systems which could be used in any proposed action.

(6) All environmental mitigation and losses should be included for the final array of alternatives before the NED plan is selected.

(7) Compliance with all Federal, State, and local laws and regulations pertaining to physical and biological resources.

J. Social Criteria

Social well-being factors considered during the study include:

- (1) Hazards to public health and safety, including loss of life potential.
- (2) Affect on local community patterns and local development.
- (3) Preservation and enhancement of social, cultural, educational, and historic values of the area.
- (4) Preservation of aesthetic values of the area.
- (5) Provision of adequate water and related land-based recreation opportunities.

II-2 Alternatives Including the Recommended Plan

A. Alternatives Evaluated

A range of flood control measures have been considered for the Little Puerco Wash Study area to address the planning objectives defined above. The addition of any alternative plans to be investigated and the final design revisions for any recommended plan reflect the normal revisions inherent in the planning process. The primary focus of this Feasibility Study is to determine the most cost effective, viable, flood control plan that is acceptable to the officials and citizens of Gallup. Other allied purposes such as the preservation of open space, preserving local environmental qualities, including fish and wildlife resources, and other related planning objectives were also investigated. The recommended plan reflects concerns that have been expressed during interagency and public consultation and coordination.

The major flood problem identified in this report is attributed to high flows originating in the Little Puerco Wash Basin. In general, there are two approaches to reduce flood damages: either (1) the damageable property is protected from the flood at the present location of the property; or (2) flood flows are prevented from reaching the property. Either of the above-mentioned means of flood protection can be accomplished using non-structural or structural

alternatives. Non-structural alternatives are flood control measures that do not employ traditional features such as dams, levees, or channels. Non-structural alternatives can involve construction; although, they are usually limited to the property being protected (i.e. flood proofing) or can be accomplished through an institutional change. Another non-structural method of protection is to remove flood-prone structures from the flood plain.

For this Feasibility Study, the term "alternative" refers to the project area and/or plan investigated to relieve flooding, which was defined by the Corps and the city of Gallup. Structural alternatives were initially investigated since they would provide an immediate and substantial flood control improvement within the area. Non-structural alternatives were then also evaluated.

(1) Structural measures consist of structures designed to control, divert, or exclude the flow of water from flood-prone areas to reduce damages to property, hazard to life or public health, and general economic losses. Alternatives are limited due to the large portion of the channel that is covered. This area forms the current capacity restraint on the Wash. The cost of opening the channel is extremely prohibitive, involving approximately 7 large structures and 6 road crossings. Extensive work within the covered section or attempting to deepen the channel as it passes through the area are economically infeasible, given its current condition. Portions of the covered section should be rehabilitated over time in order to maintain the current flow capacity through that section. The following structural alternatives were considered and eliminated from detailed consideration:

(a) Channel capacity increases were eliminated due to the constraint imposed by the covered section.

(b) Levees were eliminated due to the constraint imposed by the covered section.

(c) During reconnaissance, a plan to include a new covered concrete channel below First Street was examined. This channel would carry the

excess flood water. The plan consisted of a covered, rectangular diversion channel of reinforced concrete construction beneath Second Street and draining to the Puerco River with a capacity of approximately 1,890 cfs. The channel would be approximately 3000 feet long with a slope of approximately 0.017. The required dimensions would be 8 feet wide by 7 feet deep. A trash rack and settling basin at the entrance would be necessary to alleviate sediment deposition and plugging due to accumulation of debris.

The relocation and replacement of existing utilities and pavement in downtown Gallup would entail considerable disruption of local traffic and require very close coordination with local utilities in relocating water, sewer, gas, and phone lines. A floodgate on the Puerco River would also be necessary to prevent additional flooding from the diversion channel caused by backwater flooding.

The estimated construction cost exclusive of real estate is \$3,942,600. Since this alternative costs significantly higher than other alternatives, the added cost of obtaining the real estate requirements (which would be extensive) were not analyzed.

(d) A Roller Compacted Concrete Dam with Integral Spillway was analyzed during the reconnaissance phase and identified as the recommended plan at that time (1993). Subsequent drilling showed that the distance to bedrock at the proposed dam site is 80 feet. Costs for a roller compacted concrete dam were completely unfeasible based on that depth. Another site was investigated, but the results were similar.

(e) A gabion dam was analyzed at the beginning of the feasibility phase, when it was determined that the roller compacted concrete dam was no longer feasible. Initially, this appeared to be the least-cost alternative. However, changes in hydrology, based on the watershed being larger than estimated during reconnaissance, resulted in a dam height that precluded the safe use of gabions.

(2) Non-structural measures considered include flood proofing/raising structures; permanent evacuation within the flood plain; flood plain management; and flood forecasting/temporary evacuation.

(a) The feasibility of flood proofing is based on the relative height of the anticipated water level at the structure. Flood proofing includes such measures as installing valves on sewer lines, providing watertight coverings for door and window openings, sump pumps to drain seepage, sealing of cracks, steel bulkheads on brick walls to close off entrances, constructing levees and floodwalls around individual buildings or groups of buildings, and coating walls of structures with a waterproof membrane. Flood proofing is more easily applied at the time of new construction. The flood plain in Gallup is characterized by older commercial structures as well as structures of adobe or with basements. Therefore, frequently the type of structure is not amenable to flood proofing. Additionally, floods on the Little Puerco Wash are expected to occur with little warning, such that commercial structures may not be occupied at the time of a flood event and temporary flood proofing measures could not be implemented. Therefore, flood proofing was rejected as a solution.

(b) The feasibility of raising structures in-place is rejected as a solution. Many of the structures contain basements, are constructed of adobe, or are large commercial buildings. The costs to elevate such structures will be significantly more than a structural solution.

(c) Permanent evacuation of the flood plain is rejected since this is one of the primary commercial areas in Gallup. The frequency and severity of flooding is not such that an action of this magnitude could be economically justified.

(d) Flood plain management was examined, of which there are several components. These include zoning regulations, subdivision regulations, and building codes. Zoning regulations would permit prudent use and development of the flood plain. However, most of the flood plain is fully

developed and commercial, such that this method would not be effective. Subdivision regulations could require adequate drainage facilities, protect the floodway, and require new structures to be elevated one foot above the 100-year flood plain. These are important to future growth in the undeveloped areas. However, the Little Puerco Wash flood plain is primarily developed. The city of Gallup has developed and enforced flood plain regulations to insure that structures are built either out of or above the 100-year flood plain. The implementation of subdivision regulations restricting drainage in the watershed could lessen the impact of future flooding. The city currently has requirements for new developments to impound the increased runoff they generate up to the .04 frequency event. The total impact is limited due to large quantity of individual lot development, and the regulations inapplicability to streets and roads. Building codes could specify building design and materials for both new buildings and repair of flood-damaged structures. Their applicability is limited since the flood plain is almost fully developed.

(e) Flood forecasting/temporary evacuation involve the determination of imminent flooding, implementation of a plan to warn the public, and organization of assistance in the evacuation of persons and property. This alternative is considered in conjunction with a structural alternative. Since the warning time will be short (15 minutes or less), there may be a savings in human life; however, there is not expected to be significant savings in personal property.

B. No Action Plan

Based on the technical studies for this Feasibility Study, the flood risk to life and property for the Little Puerco Wash is substantial if no action is taken to reduce the potential for flooding. Average annual damages for this area are currently estimated at \$432,000. Table II-1 shows the expected without project equivalent average annual damages by category. Damages could be greater if there is a failure of the covered section of the channel (see economic technical appendix). Potential future damages exceed present damages due to growth in the basin.

Table II-1
EQUIVALENT AVERAGE ANNUAL DAMAGES
LITTLE PUERCO WASH
(x \$1,000 April, 1999 price level)

| Land Use Category | Present Annual Damages | Average Annual Damages | Future Annual Damages | Average Annual Damages | Average Equivalent Damages | Annual Damages |
|-------------------|---------------------------|---------------------------|--------------------------|---------------------------|-------------------------------|-------------------|
| Commercial | | 67 | | 145 | | 108.8 |
| Com. Contents | | 166 | | 354 | | 267.3 |
| Residential | | 9 | | 20 | | 14.7 |
| Res. Contents | | 6 | | 11 | | 8.7 |
| Public | | 11 | | 19 | | 15 |
| Public Contents | | 11 | | 23 | | 17.5 |
| | | | | | | |
| TOTAL | | 270 | | 572 | | 432 |

C. Comparison of Alternative Plans

(1) Description of Plans

Detailed comparison of the alternative plans consisted of analyzing several dam and spillway heights. The proposed dam location is 200 feet south (upstream) of the Pepsi Bottling Plant (See Plate 11) to capture most of the drainage prior to the flow entering the covered channel. Initially, another site was

identified upstream, but it did not capture tributary flow, required a higher dam, and had potential complications from the location of a utility substation. The type of dam was optimized at the recommended site based primarily on spillway height. All earthen dams analyzed had a semi-impervious core with random fill outer shell. Each dam embankment would have an inspection trench. The overflow spillway would be approximately 200 feet in length and constructed of reinforced concrete with reinforced concrete training walls. A wire-wrapped rip-rap stilling basin would be placed at the downstream toe. The upstream edge of the spillway would be protected by the wire-wrapped rip-rap. An outlet for the dam would be provided by a cast in place concrete conduit. It would have an inside diameter of 36-inches with a one square foot removable flow reducer. The intake tower would be reinforced concrete with vertical metal trash racks. It would be uncontrolled or un-gated. Random borrow material would be used varying between 16,434 cubic yards and 7,100 cubic yards depending on the height. The volume of concrete calculated for the construction of structures varies from 3,100 cubic yards to 3,220 cubic yards. Each structure would require approximately 600 cubic yards of wire-wrapped rip-rap. Semi-impervious material is available on site. Subsurface investigations, sampling from the upstream area, classified the material as having a high plastic index, suitable for use as a semi-impervious material. Construction right-of-way for the project would vary between 5.5 acres to 3.0 acres. Four embankment heights for the proposed earthen dam were compared. Additionally, existing downstream box culverts will be enlarged. These box culverts are located at a point where the Little Puerco Wash exits the covered section of the channel. To prevent the channel from being overtopped at this location as well as backing up flows into the covered section, these culverts are replaced under all the alternatives. Also, a mitigation site was recommended on the public golf course, consisting of approximately two acres of ponds and plantings. These costs were not determined during the alternative phase. Costs are the same regardless of the selected

alternative.

(2) Level of Protection/Identification of the NED Plan

An NED analysis was conducted during the Feasibility Study in order to determine which level of protection would provide the maximum net economic benefits and thus be the NED plan. In this effort, four differing dams were analyzed to determine the optimum benefit/cost relationship. The primary indicators were outflows per event and the resultant benefits and costs. Upon selection of the NED plan, costs were further optimized. Costs, outflows, and benefits were optimized based on several features. The differing dam/spillway elevations are defined in Table II-2. Elevations are from the channel invert.

TABLE II-2

ALTERNATIVE DAM HEIGHTS EVALUATED

| <u>Alternative</u> | <u>Spillway</u> | <u>Description</u> |
|--------------------|-----------------|--------------------|
| Dam - 1 | 24 feet | 36 feet |
| Dam - 2 | 27 feet | 39 feet |
| Dam - 3 | 31 feet | 42.6 feet |
| Dam - 4 | 35 feet | 47.4 feet |

The alternative dams were designed to reduce flows to channel capacity for mean current events ranging from the 27 to greater than 1,000 year; whereas in fifty years the reduction would be from less than a 15 year event to a 500 year event. The reduction in protection results from the filling in of the sediment pool and the increased runoff from the basin.

Cost estimates were computed for each of the dam/spillway heights described in Table II-2. The method of computing project costs is outlined in the

economic appendix attached to this report. Benefits were derived for each of the alternatives. The resulting benefit and cost estimates for the four dam alternatives are outlined in Table II-100. The last column indicates the recommended alternative, which corresponds to alternative 2, after additional design work was performed.

TABLE II-3: BENEFIT-COST ANALYSIS (\$000)

| | Dam 1 | Dam 2 | Dam 3 | Dam 4 | Recommended Plan* |
|--------------------------------|---------|---------|---------|-----------|-------------------|
| Construction Cost | \$1,429 | \$1,478 | \$1,789 | \$2,203 | \$1,832 |
| Plans and Specifications | \$116 | \$120 | \$145 | \$179 | \$360 |
| Total First Cost | \$1,545 | \$1,598 | \$1,934 | \$2,382 | \$2,192 |
| IDC, Construction | \$53 | \$55 | \$66 | \$82 | \$64 |
| IDC, Plans and Specifications | \$13 | \$14 | \$16 | \$20 | \$26 |
| Total, Interest During Constr | \$66 | \$69 | \$82 | \$102 | \$90 |
| Total Investment | \$1,611 | \$1,667 | \$2,016 | \$2,484 | \$2,282 |
| Average Annual Cost | \$114.9 | \$118.9 | \$143.8 | \$177.2 | \$162.8 |
| OMRR&R | \$7 | \$7 | \$7 | \$7 | \$7 |
| Total Average Annual Cost | \$121.9 | \$125.9 | \$150.8 | \$184.2 | \$169.8 |
| Equiv. Average Annual Benefits | \$374.7 | \$405.0 | \$414.8 | \$432.0** | \$405.0 |
| Benefit/Cost Ratio | 3.1:1 | 3.2:1 | 2.8:1 | 2.3:1 | 2.4:1 |
| Net Benefits | \$252.8 | \$279.1 | \$264 | \$247.8 | \$235.2 |

*The Recommended plan is the same as Alternative 2. Changes were made during the Feasibility design phase which impacted the shape of the spillway and some of the materials. These feature changes lowered the construction cost of the dam portion. However, two features were added which were required for all plans. These are the mitigation which would take place at the golf course, and the enlargement of an existing culvert. Both of these features are required for all alternatives such that the increase in cost would not impact plan selection. The recommended plan was done in April 1999 prices, previous alternatives were done in March 1998 prices.

**Benefits were not computed. Total equivalent average annual damages are used which show that given this optimistic assumption this alternative could not be the NED plan.

From the information in Table II-3, it can be concluded that the NED plan is Dam 2. This plan has a total first cost of \$1,598,000 and net economic benefits of \$279,100. These totals do not include the cost of real estate, culvert replacement or mitigation. These costs are the same regardless of alternative; therefore, the costs did not impact NED selection and were detailed during the design of the recommended plan. Their inclusion resulted in a final cost estimate of \$2,192,000. Implementation costs for this option have been computed using the MCACES format (the Corps' cost estimating system) and are included with this report in the Technical Appendix. This plan meets the established planning objectives for the study area, and further Federal involvement is warranted. Please refer to the Economic Investigations Appendix for further details on how the NED analysis was conducted.

(3) Recommended Plan

The recommended plan is the NED plan. The recommended plan for Little Puerco Wash is essentially the same as the alternative identified as preferred, with some important changes. These changes were formulated during the design as ways to reduce costs and provide the same level of benefits, and are presented in the design appendix. The most important changes are sixfold. First, the spillway will be roller compacted concrete. Second, the tiebacks to the embankments will include roller compacted concrete. Third, random fill will be used for the dam core, an impervious core is not necessary. Fourth, the spillway will be trapezoidal, 150 feet long. The result is a different size for the dam and spillway, increasing the spillway height by less than 1 foot. Fifth, culverts downstream of the covered section will be replaced with culverts that pass the same flow as the channel in the covered section to prevent flooding and backing into the covered section. Sixth, the plan includes mitigation which involves constructing approximately 2.0 acres of wildlife habitat at Gallup's Municipal

Golf Course. This will consist of ponds and plantings.

Table II-4 presents a summary of the project features.

TABLE II-4: SUMMARY OF PROJECT FEATURES

Dam:

| | |
|---|-----------------------|
| Pool capacity at crest | 84 acre feet |
| Spillway cross-section | Trapezoidal |
| Construction | Compacted Random Fill |
| Length | 437 feet |
| Height to embankment | 42 feet |
| Height to spillway crest | 28 feet |
| Random fill volume | 20,500 cu. yds. |
| Spillway base width | 150 feet |
| Spillway top width | 235 feet |
| Side slopes-embankments slope | 2.5H:1V |
| Debris pool elevation | 6621.0 |
| Crest elevation | 6629.7 |
| Probable maximum flood surcharge level | 6640.5 |
| Top of dam | 6643.5 |
| Debris pool area | 308 acre feet |
| Spillway crest area | 401 acre feet |
| Capacity of debris pool | 35 acre feet |
| Capacity at spillway crest | 84 acre feet |
| Capacity of maximum flood surcharge level | 149 acre feet |
| Spillway probable maximum flood surcharge | 16.8 acre feet |
| Design discharge spillway | 16,900 cfs |
| Outlet size diameter | 1.1' |
| Entrance invert elevation | 6602.9 |
| Conduit length | 200' |
| Maximum capacity at spillway crest | 27 cfs |
| 1% Chance flood total volume | 102 acre feet |
| 1% Inflow peak | 1,262 cfs |
| Probable maximum flood volume | 758 acre feet |
| Probable maximum flood inflow peak | 17,000 cfs |

TABLE II-4 (continued)

Concrete Structures:

| | |
|--------------------|----------------|
| Floodwalls | 350 feet |
| Concrete volume | 1,400 cu. yds. |
| Soil cement volume | 5,500 cu. yds. |

Sediment Control Features:

| | |
|-------------------|--------------|
| Sediment capacity | 35 acre feet |
|-------------------|--------------|

Relocations:

| | |
|----------|----------------------------------|
| Sewer | manholes (plate 2) |
| Culverts | 4 X 200' Roundhouse Road (5'x6') |

Mitigation Features:

| | |
|--------------------------------------|-----------|
| 1 Wildlife habitat area w/vegetation | 2.0 acres |
|--------------------------------------|-----------|

Real Estate Requirements:

| | |
|---------------------|-----------|
| Sponsor owned lands | 2.0 acres |
| Private ownership | 4.0 acres |

Borrow Areas:

| | |
|-----------------------------|-----------------|
| Average depth of excavation | 6 feet |
| Required volume | 20,500 cu. yds. |

Table II-5 presents the with-project peak discharges. For more detail on pre- and post- hydrologic conditions refer to Section II in the technical appendix. The project restricts flows to less than channel capacity from the current mean 100 year event, and a future mean event of greater than the 50 year.

Table II-5
With Project Peak Discharges.
Values are in cfs, present-condition-with-project/future-with-project-condition.

| LOCATION | DRAINAGE AREA (sq mi) | PER CENT CHANCE FLOOD (RECURRENCE INTERVAL IN YEARS) | | | | | | |
|-------------------------------------|-----------------------------|---|-------------|------------|------------|-------------|---------------|-----------------|
| | | 50% (2) | 10% (10) | 4% (25) | 2% (50) | 1% (100) | 0.2% (500) | 0.08% (1250) |
| LITTLE PUERCO AT DAM SITE | 1.69 | 18 | 23 | 25 | 26 | 27 | 360 | 790 |
| | | 22 | 27 | 310 | 610 | 1080 | 2020 | 2650 |
| LITTLE PUERCO AT GREEN STREET | 2.00 | 150 | 370 | 520 | 600 | 730 | 940 | 1070 |
| | | 190 | 430 | 590 | 680 | 1020 | 1920 | 2530 |
| COVERED SECTION BREAKOUT | N/A | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| | | 0 | 0 | 0 | 0 | 150 | 480 | 1710 |
| ROUNDHOUSE ROAD BREAKOUT | N/A | 0 | 0 | 0 | 0 | 0 | 70 | 130 |
| | | 0 | 0 | 0 | 0 | 40 | 320 | 400 |
| LITTLE PUERCO AT PUERCO GATES | 2.12 | 210 | 510 | 710 | 810 | 970 | 1050 | 1100 |
| | | 250 | 570 | 780 | 890 | 1030 | 1060 | 1180 |

The Equivalent average annual benefits and residuals resulting from the selected plan are displayed on Table II-6. The equivalent average annual benefits are approximately \$405,000.

**TABLE II-6: EQUIVALENT AVERAGE ANNUAL RESIDUALS/BENEFITS OF
THE RECOMMENDED ALTERNATIVE**
(x \$1,000 April, 1999 price level)

| Land Use Category | Residuals | Benefits |
|----------------------|-----------|------------|
| Commercial | 6.8 | 102 |
| Commercial Contents | 15.4 | 251.9 |
| Residential | .9 | 13.8 |
| Residential Contents | .5 | 8.2 |
| Public | .9 | 14.1 |
| Public Contents | 2.5 | 15 |
| | | |
| TOTAL | 27 | 405 |

(4) Mitigation

The proposed project would result in limited direct environmental impacts that require mitigation. Direct impacts of the proposed project include the displacement of riparian vegetation along the channel. A total of 2.5 acres would be permanently removed for construction of the earthen dam. The recommended plan calls for habitat mitigation that results in the construction/creation of 2.0 acres of riparian habitat at the Gallup Municipal Golf Course, a local public facility where sufficient water is available to sustain the habitat and on land already owned by the project Sponsor. Mitigation at the dam construction site would also include revegetation measures such as mulching, reseeding with approved native plant species, and monitoring for reestablishment of vegetation and would be provided for all disturbed areas. The proposed habitat mitigation at the golf course would construct three open-water ponds averaging about 50 feet wide and from 40, 100, and 200 feet in length with depths varying from 0 to 9 feet, and a cobble-mulch, wetland meadow area about 50 feet by 100 feet. Riparian vegetation to be planted at this mitigation site would include about 100 cottonwood poles planted on 20-foot centers, 50 willows, 120 shrubs, and 6,000 plants. The Corps would also provide for the installation of approximately 800

lineal feet of 8-inch PVC pipe for water inflow to the ponds and gated irrigation boxes to control flows between the ponds. No mitigation is required for the reconstruction of the downstream box culverts.

(5) Real Estate Requirements & Relocations

Federal interest in nearly all the land required for the dam or culverts has not been secured. Project real estate requirements for a permanent easement for the dam and flood pool are 7 1/2 acres. Culvert easements, including work area, are approximately 1 acre.

The approximately two acres of land to be used for the wildlife habitat mitigation at the Gallup Municipal Golf Course is owned by the city of Gallup, the project Sponsor .

(6) Fill, Borrow & Disposal Requirements

The design of the dam and its associated structures require fill, borrow and disposal materials for construction as summarized in Table II-7.

TABLE II-7
FILL, BORROW & DISPOSAL REQUIREMENTS

| | |
|----------------|---------------------------|
| a. Random fill | 20,500 cubic yards (c.y.) |
| b. Excavation | 24,557 c.y. |
| c. Waste | 4,057 c.y. |
| d. Borrow | 20,500 c.y. |

The random fill necessary for the construction of the dam would come from excavation in the proposed detention pool area. Waste generated from the construction of the embankment would become property of the contractor and

would be disposed of at approved off-site locations according to Federal, State, and local laws and regulations governing this activity. Local borrow sites have been identified as sources of fill material for the embankment.

(7) Construction Methods & Schedule

Construction methods for the proposed plan are summarized in the following paragraphs.

(a) Dam Construction. Material for the dam embankment will be obtained from the upstream borrow area. The volume needed will require an area approximately 5 acres and would be excavated an average of 6' in depth.

(b) Hydraulic Structures and Appurtenant Features. The embankment will have the following features: an RCC emergency spillway- 150' length; concrete intake tower, fitted with steel trash racks; a 3' diameter cast-in-place concrete conduit 190' in length and an uncontrolled inlet with a removable 1 square foot flow reducer; and, an RCC energy dissipating stilling basin with concrete guide walk.

(c) Haul Roads, Access Roads & Turn-arounds. Access to the site will be an existing utility access road approximately 15' wide. It enters the construction site from the south, where it meets the construction easement. All construction activities will be conducted in the construction easement.

(d) Stockpiling. All stockpiling for this project will be minimal since the borrow area is less than 500 feet (Reference Section V- Geology, soils, and construction materials).

(e) Construction Schedule. Feature design memorandums (FDMs) are not anticipated to be required for refining the dam design and its appurtenant structures. Therefore, the project's Plans and Specifications phase would be initiated in November 1999 and would be completed by October 2000. Construction is anticipated to begin in November 2001.

(8) Permit Requirements & Agreements

(a) Section 404 and Section 401 of the Clean Water Act. The proposed action would involve activities within the Little Puerco Wash. Therefore, the proposed project would require Section 404 authorization before construction activities commence. Section 401 water quality certification from the State of New Mexico is not required. The 404 (b)(1) evaluation for the proposed project is also included in the Appendix.

(b) National Pollution Discharge Elimination System. Section 402 of the Clean Water Act regulates point source discharges of pollutants into waters of the United States and specifies that storm water discharges associated with construction activity be conducted under the general permit guidance of the National Pollution Discharge Elimination System (NPDES). Storm water discharge associated with “construction activity” includes discharges from clearing, grading, and excavation that result in disturbance of five or more acres of land. Prior to the start of construction, a Storm Water Pollution Prevention Plan (SWPPP) would be prepared by the Government or the construction contractor and a Notice of Intent would be filed with the Environmental Protection Agency. The Government Contracting Officer would monitor the contractor’s compliance with the specifications regarding Section 402 best management practices for the proposed project, including sediment, erosion, and storm water management control measures.

(c) U.S. Fish and Wildlife Service. Informal consultation and coordination regarding the Endangered Species Act (ESA) and the Fish and Wildlife Coordination Act (FWCA) has been conducted with the U.S. Fish and Wildlife Service (USFWS), New Mexico Ecological Services Field Office, Albuquerque. The Corps provided a Scope-of-Work to the USFWS in September 1997, to conduct FWCA activities. The USFWS submitted a draft Fish and Wildlife Coordination Act Report for the project and the Corps provided comments on June 25, 1998. The final **Fish and Wildlife Coordination Act**

Report, Little Puerco Wash Flood Control Project (1998) was received by the Corps on January 8, 1999. The report discusses wildlife and vegetation in the project area, the potential for special status species, as well as project impacts. The USFWS also provided several recommendations and mitigation alternatives. The USFWS, Corps, and the city of Gallup agreed upon mitigation for the removal of riparian habitat at the proposed earthen dam construction site. Mitigation would provide for the creation of approximately 2.0 acres of wildlife habitat to be constructed at the Gallup Municipal Golf Course where sufficient water is available to maintain the habitat.

(9) Operation & Maintenance Considerations

Upon completion of the Dam, culvert replacement, and mitigation at the city golf course, the project would be turned over to the Sponsor for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R), as defined in paragraph 10 “Division of Plan Responsibilities” below. These tasks may include management of the mitigation and conservation areas. Five years of monitoring of the wildlife habitat at the golf course, including evaluating and assessing the survivability of planted vegetation; and replacing any significant losses of vegetation would also be required, these costs would be paid for by project construction funds. The Albuquerque District would provide the Sponsor with a manual summarizing the duties necessary for proper operation of the project. The Sponsor has undertaken responsibility to operate and maintain other Corps’ projects on the Rio Puerco. They have demonstrated their capability to perform the necessary operation and maintenance for flood control projects.

(10) Local Sponsorship

Cost sharing requirements for the Little Puerco Wash authorized by legislation in the Water Resources Development Act of 1996. A Project Cooperation Agreement (PCA) would be negotiated with the city of Gallup. The PCA includes a detailed breakdown of the cost-sharing responsibilities of the Federal government and the Sponsor. The cost of the non-Federal portion of the

Little Puerco Wash dam is \$767,445, which is 35% of the total project cost estimate of \$2,192,700. Of the Sponsor's share, \$553,545 would be required as a cash payment. The remainder of their share, equal to \$213,900, is equal to the Lands, Easements, Rights-of-ways, Relocations, and Disposal areas (LERRDs) required for the project, which are the responsibility of the Sponsor. A more detailed summary of Federal and non-Federal costs is illustrated in Table II-8.

TABLE II-8
PROJECT IMPLEMENTATION COSTS
Federal vs. Non-Federal
(April 1999 price level)

| <u>Item</u> | <u>Responsibility</u> | |
|--|-----------------------|--------------------|
| | <u>Federal</u> | <u>Non-Federal</u> |
| Lands and Damages | \$0 | \$213,900 |
| Dam & Flood Control | \$1,485,000 | \$0 |
| Plans & Specifications | \$ 360,000 | 0 |
| Construction Management | <u>\$ 133,800</u> | <u>0</u> |
| Total Project Cost | \$1,978,800 | \$ 213,900 |
| 5 Percent Cash | - \$ <u>109,635</u> | <u>+\$109,635</u> |
| Subtotal | \$1,869,165 | \$323,535 |
| Percentage | 85.0 | 15.0 |
| Additional Cash | <u>-\$ 443,910</u> | <u>+\$443,910</u> |
| Adjusted Project Cost | \$1,425,255 | \$767,445 |
| Adjusted Percentage | 65.0 | 35.0 |
| Federal & Non-Federal Project Implementation Cost | | \$2,192,700 |

(11) Division of Plan Responsibilities

Prior to construction of this project, the Sponsor and the Corps would execute a Project Cooperation Agreement (PCA). This agreement would serve as the contract between the local sponsor and the government to delineate the responsibilities of the parties for funding, construction, and operation and maintenance of the project.

The division of financial responsibilities are discussed in the previous paragraphs. The Corps would act as the design and construction agent for this project. The current strategy is to complete construction in three phases. One phase at the dam site, one phase at the culvert site, and a final phase for the mitigation features at the golf course. The Corps shall be responsible for preparation, award, and administration of the contract documents.

The city of Gallup, as local sponsor, would be responsible for providing all lands, easements, rights-of-way, and relocations for construction.

In addition, the Sponsor would accept responsibility for operation and maintenance of the project upon completion and transfer to the local sponsor.

CHAPTER III
EXISTING ENVIRONMENTAL CONDITIONS

III-1 General Environmental Setting

The proposed project is located within the city of Gallup, New Mexico, on the Little Puerco Wash. Gallup, the largest city of McKinley County, is located in northwestern New Mexico approximately 20 miles east of the Arizona-New Mexico state-line and about 140 miles west of Albuquerque, the largest city in New Mexico.

Gallup is situated west of the Continental Divide in the southern portion of the Colorado Plateau Physiographic Province. The Little Puerco Wash is a left bank (south) tributary to the Puerco River (of the West). The Puerco River flows from east to west through the city of Gallup and to the Little Colorado River of the Colorado River Basin. Uplift of the Colorado Plateau and down cutting by the Puerco River has created a broad, shallow alluvial valley surrounded by sandstone cuestas and eroding tablelands. The Little Puerco Wash drains an area of approximately 2.1 square miles. Numerous arroyos and small drainages, including Little Puerco Wash, flow into the Puerco River from the north and south. The silt-laden, alluvial drainage courses of these small side tributaries are typically shallow, broad, and meandering.

The project area for the proposed earthen dam is located in a small canyon about one mile south of U.S. Highway 66 and on the east side of State Highway 32 (See Plate 11,12). The construction easement and detention pool is immediately south of the Pepsi Bottling Plant. The study area contains outcrops of Gallup Sandstone of the Mesa Verde formation that is characterized

by massive beds of sandstone and numerous inter-tonguing layers of shale, siltstone, and coal. Some jointing has been noted in the sandstone beds. The city lies at an elevation of approximately 6,600 feet.

The project area lies within the Great Basin Desert Scrub biotic community. Vegetation is thin and sparse in upland areas due to poorly developed soils; however, riparian areas may produce significant micro-environments. Wildlife in the area is typical for New Mexico and the Desert Scrub community. Several species utilize the area and a variety of migratory birds occur seasonally.

The study area has an arid to semi-arid continental climate characterized by light precipitation, abundant sunshine, low relative humidity, and a wide diurnal and annual range of temperature. Precipitation in Gallup averages approximately 11 inches per year, with almost 35 percent falling in the form of snow from December through March. Local, high-intensity thunderstorms of short duration are responsible for most of the rainfall in the area, and contribute to the local flooding problems.

III-2 **Physical Resources**

A. Physiography, Geology and Soils

The project area lies within the Navajo Section (southeastern portion) of the Colorado Plateau Physiographic Province (Hawley 1986:23-25; Fenneman 1931:317-319). The city of Gallup is located on the small structural feature known as the Gallup Sag. The area is bounded on the north by the Chuska Mountains and the San Juan Basin, on the east by The Hogback, the Puerco River (of the west) valley, and Mt. Taylor, on the

south by the Zuni Mountains, and on the west by Manuelito Plateau. Local elevations range from about 5,000 feet to 7,500 feet in the area. Near the project area, elevations reach 7,425 feet (2,263 meters) along portions of The Hogback about 5 miles northeast of the project area and to about 6,490 feet (1,978 meters) at the Puerco River in Gallup.

The numerous physical and topographic features of this plateau region include broad mesas, numerous canyons and steep escarpments of rough and broken basalt and sedimentary rock, sloping plains, dry arroyos and incised flood plains. Area geology includes Triassic, Jurassic, and Cretaceous sedimentary rock formations. The local Gallup Sandstone of the Mesaverde Group is Upper Cretaceous in age and is found throughout the study area. The Gallup Sandstone consists of light gray, buff, and pale-red very fine to fine very coarse grained sandstone. Within the area, the Upper Cretaceous formations are characterized by numerous inter-layered beds of coal, silt-, mud-, and sandstone, and shale. Mesaverde Group members range up to 2,200 feet in thickness while the Gallup Sandstone averages about 350 feet (Cooley *et al.* 1969). Some jointing of the Gallup Sandstone has been noted; however, no drilling has been performed to date for petrographic analysis. The proposed dam site and sediment pool area are essentially located in a small canyon with steep slopes. There are Gallup Sandstone outcrops along the canyon rim and numerous eroding sandstone blocks creeping down the canyon slopes.

Locally, soils in this plateau region are arid to semi-arid types of the Torriorthents-Rock Land association. The mesic soils of the upland areas and steep

slopes are generally shallow, light-colored, and undeveloped. Upland soils in the project area are a light yellowish-brown calcareous silt loam or silty clay loam. On moderate slopes and in flood plains, soils are fine- to moderately fine textured and are deep, saline, and sodic. Runoff and erosion are major problems. In the Little Puerco Wash's flood plain, surface soils are light brownish-gray fine sandy loam and loamy sand while deeper deposits are a pale brown sandy loam (Maker *et al.* 1978).

B. Climate

The climate of the area, not including higher mountain regions, is semi-arid continental. The summers are warm and sunny; the winters are cold. The average annual precipitation is 11 inches of moisture. Snowfall is common and averages 15 to 40 inches per year; however, the majority of the annual precipitation comes from brief but intense afternoon thunderstorms, some of which can be severe. These storms usually occur during late summer and early fall. Humidity is generally low. Gallup is the location for the closest weather station in the area (Maker *et al.* 1978). The average annual temperature is 48.5 degrees Fahrenheit (°F) with maximum recorded temperatures of 99°F for a high and a low of 23°F. The average frost-free season is about 120 days.

C. Water Resources

(1) Surface Water: As described above, under current conditions Little Puerco Wash flows to the incised, degrading Puerco River (of the West). Both Little Puerco Wash and the Puerco River are considered to be ephemeral streams. Little Puerco Wash has a contributing, uncontrolled drainage area of approximately 2.1 square miles upstream from

the project area. Encroachment on the Wash's channel, downstream of the proposed dam site, is a problem. There are no existing water management structures in the basin. Current estimates indicate that flow volumes greater than about 750 cubic foot per second (cfs) cause flooding in downtown Gallup. The upstream drainage area above the proposed project is rapidly being developed from an open, rural area into an urban setting that greatly compounds the flooding problem.

The Little Puerco Wash channel is generally 10 feet wide and is characterized by upstream meandering until it reaches the developed area. The Wash flows downstream to a point where the channel is confined and a section of the channel, approximately 2,000 lineal feet, is covered. The covered section of the wash is located between Logan Avenue and U.S. Highway 66. As the city developed during the early part of the century, commercial and residential buildings, roads, sidewalks, and parking lots were constructed over the Little Puerco Wash watercourse. Through this reach the conduit varies from an earthen channel covered by building floors to a rock masonry channel with concrete cover. Downstream from Highway 66, the Wash emerges from the fully covered conduit and travels through an assortment of concrete culverts and corrugated metal pipes prior to entering the south bank of the Puerco River. Table III-1 shows the current and future without project flows at various locations on the Little Puerco Wash.

Table III-1

**Without Project Peak Discharges.
Values are in cfs, present condition/future-without-project-condition.**

| LOCATION | DRAINAGE AREA (sq. mi.) | PER CENT CHANCE FLOOD (RECURRENCE INTERVAL IN YEARS) | | | | | | |
|--------------------------------------|-------------------------------|---|-------------|------------|------------|-------------|---------------|-----------------|
| | | 50% (2) | 10% (10) | 4% (25) | 2% (50) | 1% (100) | 0.2% (500) | 0.08% (1250) |
| LITTLE PUERCO WASH AT DAM SITE | 1.69 | 220 | 790 | 1260 | 1520 | 1940 | 2700 | 3190 |
| | | 430 | 1240 | 1820 | 2130 | 2630 | 3500 | 4050 |
| AT ENTRANCE TO COVERED SECTION | 2.00 | 220 | 830 | 1310 | 1580 | 2050 | 2870 | 3410 |
| | | 420 | 1270 | 1900 | 2230 | 2760 | 3720 | 4300 |
| ALLEY CHANNEL BREAKOUT | N/A | 0 | 430 | 850 | 1120 | 1590 | 1850 | 2240 |
| | | 0 | 710 | 1250 | 1540 | 2030 | 2380 | 2940 |
| ROUNDHOUSE ROAD BREAKOUT | N/A | 0 | 350 | 420 | 430 | 450 | 470 | 1100 |
| | | 0 | 380 | 500 | 520 | 530 | 550 | 1200 |
| LITTLE PUERCO AT PUERCO GATES | 2.12 | 230 | 620 | 660 | 700 | 760 | 990 | 1300 |
| | | 430 | 630 | 780 | 852 | 950 | 1230 | 1410 |

Section 404 of the Clean Water Act of 1972 (CWA; 33 U.S.C. 1251 *et seq.*), as amended, provides for the protection of waters of the United States from impacts associated with irresponsible or unregulated discharge of dredged or fill material in aquatic habitats, including wetlands. There are no perennial surface water bodies, springs, seeps, or jurisdictional wetlands, as defined under Section 404(b)(1), within the project area. This project would require Section 404 authorization (see Technical Appendix X). Work on the new culverts would be

permitted by a Nationwide 14, Road Crossing permit. Work on the new earthen dam may be permitted by either of two ways, by an Individual Permit or by a proposed, new Nationwide Permit C, Stormwater Management Facilities. Currently, the new Nationwide Permit C is being reviewed for authorization with implementation scheduled for December 1999. Application for the Section 404 permit will be made in the spring of 2000.

Section 401 of the CWA, as amended, requires that an applicant for a Section 404 permit also obtain water quality certification for the proposed action prior to initiating the proposed construction. For projects located in New Mexico, the New Mexico Environment Department administers the water quality certification process for U.S. EPA. Since the Little Puerco Wash is ephemeral, this project is not subject to Section 401 water quality certification; however, ephemeral watercourses are protected and the project is still subject to the State of New Mexico Standards for Interstate and Intrastate Streams that include isolated wetlands and ephemeral watercourses. The project would follow safeguards and best management practices for the protection of water resources and prevention of effects to water quality, if stream flows occur during construction.

The New Mexico Water Quality Control Commission (1995) has established water quality standards for surface waters within the state. Watercourses of the Puerco River drainage are subject to the general standards (20 NMAC 6.1 Section 1102) and applicable use-specific numeric standards (20 MNAC 6.1 Section

3101). The use defined as applicable in the project area is:

Wildlife habitat - a water of the State used by plants and animals, not considered pathogenic to humans or domesticated livestock and plants.

The referenced statutes provide general standards for water quality parameters such as turbidity, temperature, salinity, radioactivity, nutrients, and pathogens (NMWQCC 1995).

Section 402 of the CWA, as amended, regulates point source discharges of pollutants into waters of the United States and specifies that storm-water discharges associated with construction activity be conducted under National Pollutant Discharge Elimination System guidance (NPDES). Storm-water discharge associated with "construction activity" includes discharges from construction activities (clearing, grading, and excavation) that result in disturbance to five or more acres of land. The NPDES general permit guidance would apply to this project because the total construction easement is more than five acres.

(2) Ground Water: Recharge to aquifers is directly related to the permeability of surface soil deposits and the underlying sedimentary rock, the amount of sedimentary fracturing, as well as the duration, type, and amount of precipitation. Ground water in this marginal and extreme southwestern portion of the San Juan Basin are relatively near the surface. Ground water and area recharge is generally derived from higher elevations at the southern portions of the Chuska

Mountains and Defiance Plateau to the north and from the Zuni Mountains on the east and south with movement toward the southwest (Cooley *et al.* 1969). The small Little Puerco Wash drainage area would have insignificant effects on local ground water supplies.

D. Flood Plains and Wetlands

Executive Order 11988 (Flood Plain Management) provides Federal guidance for activities within the flood plains of inland and coastal waters. The goal of the proposed project is to limit the existing potential for excessive flooding in the city of Gallup, especially in downtown areas. Historically, development in and encroachment on the Wash's floodplain has restricted the floodplain and the channel thereby enhancing the flooding problem which this project attempts to solve. The encroachment has included commercial and residential buildings, roads, sidewalks, parking lots, features constructed to channel the Wash, and by the dumping of wasted earthen fill materials, old pavement and concrete, and debris and trash.

Executive Order 11990 (Protection of Wetlands) requires the avoidance, to the extent possible, of long- and short-term impacts associated with the destruction, modification, or other disturbance of wetland habitats. There are no perennial surface water bodies, springs, seeps, or jurisdictional wetlands within the project area.

E. Air, Sound, and Visual Quality

The Gallup area is in the New Mexico intrastate Region No. 8 for air quality monitoring. Region 8 is “in attainment” (does not exceed State or Federal Environmental Protection Agency air quality standards) for all criteria pollutants (carbon monoxide, sulfur oxides, nitrogen dioxide, lead, ozone, and particulate matter), as determined by National Ambient Air Quality Standards as established by the U.S. EPA (NMEDAQB 1997). Region 8 is considered a Class II area under the Prevention of Significant Deterioration Program as required by the Clean Air Act of 1972 (42 U.S.C. 7401 *et seq*), as amended. PSD Class II areas allow moderate development and the resulting air quality impacts. Air quality in the project area is good. Suspended particulate matter, primarily dust, and other pollutants in the local area arise from vehicular traffic on local dirt roads, from traffic on Interstate Highway 40 and the railroad system, and from regional open-pit mining and quarrying operations. Dust also arises from winds that scour the unprotected, over-grazed rangeland in the region. PSD Class I areas have pristine air and almost no increase in air contaminant levels are allowed (NMHEDAQB 1988). The closest Class I areas include the San Pedro Parks Wilderness, approximately 110 miles to the northeast; The Gila Wilderness, approximately 140 miles to the south; the Petrified Forest National Park in Arizona, approximately 65 miles to the southwest; and Mesa Verde National Park in Colorado, approximately 120 miles north of the project area.

Background noise levels in the proposed project areas are low to moderate and result primarily from vehicular and railroad traffic. Existing noise levels in the Gallup area are typical for small communities in New Mexico.

Terrain of the Gallup area is characterized by grasslands and pinyon pine/juniper covered mesas and cuevas broken by numerous breaks and canyons with cliffs and small arroyos. Although the proposed dam site is not necessarily unique from a scenic standpoint, it is none-the-less beautiful although it would receive minimal recreation use with the intent of viewing scenery. There are however, many scenic areas within a short distance from Gallup such as the Red Mesa valley east and west of Gallup and views from locally higher elevations can be impressive. Dirt roads in the area, used by vehicular traffic, add to the visually distracting suspended dust particles.

III-3 **Hazardous, Toxic and Radioactive Waste Environment**

A hazardous, toxic, and radioactive waste (HTRW) assessment of the proposed dam site and detention pool area was performed by Albuquerque District's HTRW Section. The survey of the proposed project sites was conducted on foot and reviewed the areas for visible signs of underground storage tanks, HTRW, or any signs of contamination such as stressed vegetation. There was no visible evidence of fuel storage tanks or HTRW anywhere within the project boundaries; however, there were many areas contaminated by garbage and litter. A review of the leaking underground storage tank sites in Gallup showed that there were none identified in the project areas.

III-4 **Biological Resources**

A. Surveys

Surveys of biological resources including plants, animals, and special status species were conducted by biologists from the Corps and the U.S. Fish and Wildlife Service (USFWS, New Mexico Ecological Services Field Office, Albuquerque) on January 14 and April 18 and 19, 1998. The intensive, pedestrian surveys were conducted in suitable seasons to identify any elements of concern in the project areas. Additional information on biological resources in the study area and common and scientific names of all plants and animals mentioned in this report are contained in the Fish and Wildlife Coordination Act Report (USFWS 1998; see Technical Appendix IX).

B. Plant Communities

The project area lies within the Great Basin Desert Scrub biotic community. Desert Scrub vegetation is cold adapted and is characterized by juniper and pinyon pine. Due to the aridity of the region, these evergreens generally do not exceed large heights (40 feet, 12 meters) and are relatively open spaced. The trend for lack of moisture, extreme daily and seasonal temperature ranges, and weak soil conditions tend to limit the productiveness of grasses and shrubs of the understory. Within the dam site project area there are three plant communities (USFWS 1998). Along the arroyo grows a mature stand of narrow-leaf cottonwood with an occasional Russian olive and an understory of western

wheatgrass. In the floodplain above the arroyo, the vegetation consists of four-wing saltbush, rabbit brush, and one-seed juniper. The canyon walls and upland area provide a more arid area with vegetation that includes big sagebrush, rabbit brush, one-seed juniper, pinyon pine, and prickly pear. The riparian corridor and its' associated vegetation in the small canyon provides unique habitat in a region that is primarily an arid, upland desert environment.

C. Animal Communities

Within the study area, wildlife use is limited by the arid conditions and residential growth and associated human activity. The area to the south and west of the city is still largely undeveloped and would support animal species typical of desert scrub plant communities; however, it does not provide the vegetation found in the Wash's alluvial corridor. Wildlife in the area are typical for New Mexico and species observed during surveys included Cooper's hawk, mourning dove, American crow, yellow-headed blackbird, rock squirrel, red fox, and various sparrows. Little Puerco Wash is ephemeral and there are no perennial waters near the project area, therefore there are no fish in the local area. Typical reptiles and amphibians are also likely to occur; however, none were observed.

D. Special Status Species

While all Federal agencies and numerous other State and Tribal agencies have responsibility for the protection and conservation of animal and plant species in the project area, three agencies have this task as their primary responsibility.

The U.S. Fish and Wildlife Service (USFWS), under authority of the Endangered Species Act of 1973 (16 U.S.C. 1531), as amended, has responsibility for Federally listed species. The New Mexico Department of Game and Fish (NMDGF) and the New Mexico Department of Energy, Minerals, and Natural Resources (NMEMNRD) have responsibility for wildlife and plant species, respectively, within the State. While not affected by this project, the nearby Navajo Nation is also concerned with and provides protection and conservation for listed species on Navajo Nation lands. Each agency maintains a list of animal and/or plant species which have been classified, or are candidates for classification as protected, based on present status and potential threat to future survival or recruitment. Informal coordination with these agencies has been conducted, and prior to conducting fieldwork, the above mentioned lists of animal and plant species were reviewed along with information on available habitat, habitat preferences, and known ranges. These agencies provided a broad list of listed species that potentially occur in McKinley County and may occur near the proposed project area. These species are discussed below and species which could occur near the project area are listed in Table III-2.

U.S. Army Corps of Engineers and USFWS biologists conducted surveys for biological resources on January 14, and April 18 and 19, 1998. No Federal or State listed, proposed, or candidate plant or animal species or evidence thereof were observed within the proposed construction areas.

The USFWS lists six special status plant species with the potential to occur in McKinley County. These plants are Acoma fleabane, Arizona leatherflower, Goodding's onion, Parish's alkali grass, Sivinski's fleabane, and Zuni (rhizome) fleabane. These plant species are found at elevations or in specific habitats or soil types that do not occur in the proposed construction areas. During surveys, no listed plant species or suitable habitat for these species was found in or adjacent to the proposed construction areas.

The USFWS identified 6 bat species that are all listed as Federal Species of Concern. These species include: fringed myotis (*Myotis thysanodes*); long-eared myotis (*Myotis evotis*); long-legged myotis (*Myotis volans*); occult little brown bat (*Myotis lucifugus occultus*); small-footed myotis (*Myotis ciliolabrum*); and spotted bat (*Euderma maculatum*). Potential habitat areas for these taxa include steep hillsides and cliffs that provide rock crevices and shelters such as caves for roosting. In many instances these rocky locations have nearby streams, rivers, or other perennial water bodies. These bat species tend to occur in remote areas; however, some may also utilize hollow trees, tree bark or trees with dense foliage, or human buildings and structures such as barns as other roosting sites, especially during migration. A few of these species may hibernate locally through the winter, but most migrate to areas further south. Most New Mexican bats eat insects and small invertebrates (Findley 1987). All of these bat species potentially occur in McKinley County and may occur in the project areas.

There are a number of other species listed by USFWS and NMDGF for McKinley County that would most likely not occur in or near the project area (species accounts in NMDGF 1988 *et seq.*). In New Mexico, the Bald Eagle is normally found near major waterways and larger lakes where adequate food supplies may be found (Clark and Wheeler 1987). The Southwestern Willow Flycatcher usually inhabits dense shrub stands near perennial streams or other water sources. There is no potential habitat or designated Critical Habitat for Southwestern Willow Flycatcher in the vicinity of the project area. The Black Tern is usually found near large bodies of water and riverine areas that have sand bars or beaches. The White-faced Ibis is a rare to uncommon statewide migrant and are only known to breed in the New Mexican eastern plains. White-faced Ibis are generally found in shoreline and marsh habitats near open water, but may also frequent flooded fields for feeding. The Mexican Spotted Owl inhabits mature montane forest and woodlands with high closure, multilayered canopy, high tree density, in association with wooded, steep canyons and cliffs. The preferred forest vegetation tends to be mixed conifer, although pinyon-juniper woodlands may be utilized. There is no Mexican Spotted Owl preferred habitat in the vicinity of the project area. There are no perennial water resources in the proposed construction area to support fish species. The Mountain Plover is a lowland, grasslands species that breeds in dry, open shortgrass prairie. The Gray Vireo prefers open woodlands in Great Basin Shrub/steppe habitat up to about

7,000 feet, but occurs in New Mexico only in warmer months. The Northern Goshawk utilize moderate to highly canopied, mature coniferous forests, nesting in areas with a high density of large trees. The project areas lack the potential, suitable, or preferred habitats of the above species.

The black-footed ferret (*Mustella nigripes*), a Federally Endangered species, is considered to be extirpated in New Mexico by the New Mexico Department of Game and Fish. This species is known primarily to inhabit prairie dog towns. There are only a few past records for New Mexico that indicate prior habitation areas were found in the lowlands of the central part of the state. There were no prairie dog towns identified during the field surveys.

The American Peregrine Falcon (*Falco peregrinus anatum*) is a Federally Endangered species. The Peregrine's preferred breeding habitat is isolated wooded areas with cliffs that create "gulfs" of air in which the Peregrine may forage. There are no cliffs in the project area or the preferred wooded/forested habitat.

The Arctic Peregrine Falcon (*Falco peregrinus tundrius*) is a Federally Endangered species due to its similarity in appearance to the American Peregrine Falcon. This subspecies is a rare migrant in New Mexico.

The Ferruginous Hawk (*Buteo regalis*), a Federal Species of Concern species, may be seen seasonally throughout a large portion of the western United States. This hawk is fairly common and is a permanent resident of the High

Plains and Basin and Range provinces. The species migrates and winters in most of New Mexico. It is shy and retiring, preferring undisturbed areas for breeding and nesting.

The Loggerhead Shrike (*Lanius ludovicianus*), a Federal Species of Concern, is a year-round resident of New Mexico. They prefer semi-open areas with lookout posts from which they prey on insects and small lizards.

The Western Burrowing Owl (*Athene cunicularia hypugea*), a Federal Species of Concern, prefers open grasslands and is known to utilize prairie dog burrows for nesting. Habitat also includes bank walls of incised streams and arroyos. During field surveys, no prairie dog towns and no Western Burrowing Owl or evidence thereof was observed.

Table III-2 indicates the Special Status Species with the potential to occur in the vicinity of the proposed project areas.

**Table III-2. Special Status Species with the Potential to Occur in the Vicinity of the
Proposed Project Areas.**

| Common Name | Scientific Name | Federal (USFWS) status ^a | State of New Mexico status ^b |
|---------------------------|-----------------------------------|---|---|
| Animals | | | |
| Black-footed ferret | <i>Mustela nigripes</i> | E | --- |
| Fringed myotis | <i>Myotis thysanodes</i> | SC | --- |
| Long-eared myotis | <i>Myotis evotis</i> | SC | --- |
| Long-legged myotis | <i>Myotis volans</i> | SC | --- |
| Occult little brown bat | <i>Myotis lucifugus occultus</i> | SC | --- |
| Small-footed myotis | <i>Myotis ciliolabrum</i> | SC | --- |
| Spotted bat | <i>Euderma maculatum</i> | SC | T |
| American peregrine falcon | <i>Falco peregrinus anatum</i> | E | E |
| Arctic peregrine falcon | <i>Falco peregrinus tundrius</i> | E (S/A) | E |
| Ferruginous hawk | <i>Buteo regalis</i> | SC | --- |
| Loggerhead shrike | <i>Lanius ludovicianus</i> | SC | --- |
| Western burrowing owl | <i>Athene cunicularia hypugea</i> | SC | --- |

^a **Endangered Species Act (ESA)** (as prepared by U.S. Fish and Wildlife Service) **status:**

Only Endangered and Threatened species are protected by the ESA.

E = Endangered: any species that is in danger of extinction throughout all or a significant portion of its range.

T = Threatened: any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

C = Candidate: taxa for which the Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species.

SC = Species of Concern: taxa for which information now in the possession of the Service indicates that proposing to list as endangered or threatened is possibly appropriate, but for which sufficient data on biological vulnerability and threat are not currently available to support proposed rules.

CH = Critical Habitat, as established by the agency.

P = Proposed for listing in the identified category listed above.

S/A = Similarity of Appearance.

^b **State of New Mexico status:**

NM Fauna

E = Endangered Animal species whose prospects of survival or recruitment within the state are in jeopardy.

T = Threatened Animal species whose prospects of survival or recruitment within the state are likely to become jeopardized in the foreseeable future.

III-5 Cultural Resources:

During the spring and summer of 1997, U.S. Army Corps of Engineers (Corps) archaeologists conducted two intensive cultural resources inventories totaling approximately 14.7 hectares (36.5 acres) along portions of Little Puerco Wash within the city of Gallup, McKinley County, New Mexico. On March 20 and 21, 1997, Corps archaeologists conducted an intensive (Class III) cultural resources inventory (13.7 hectares, 34.0 acres) of the proposed dam site construction area and on July 21, 1997, a Corps archaeologist conducted a pedestrian survey of approximately 1.0 hectare (2.5 acres) at the box culverts construction area. The Corps found several ceramic artifacts located outside of the construction easement at the dam site; however, no artifacts or cultural resource manifestations were observed within the construction easements at either location.

A search of the New Mexico Archaeological Resources Management Section database found that three archaeological sites have been reported in the vicinity of the proposed construction areas; LA 20198 (Bishop House/C.N. Cotton House), LA 89842 (Garden Site), and LA 89843 (Park Site). All of these sites are located away from the project areas and would not be disturbed by the proposed construction. The famous U.S. Highway Route 66, still in use in this area and portions of which have been listed on the State Register and National Register of Historic Places, is located in downtown Gallup. The box culverts project area is located approximately one city block north of U.S. Highway Route 66 and would not affect the highway. The project's cultural resource survey report is part of the project permanent record (Corps 1998). Consultation with the New Mexico State Historic Preservation Officer has been

performed (see Technical Appendix 11).

There have been several extensive archaeological surveys conducted in the general area and regional summaries prepared that cover the northwest and west-central New Mexico regions. These include Schutt and Chapman (1997), Allen and Nelson (1982), Simmons *et al.* (1989), Stuart and Gauthier (1984), and Tainter and Gillio (1980).

The brief discussion of the area cultural history is based on archaeological and cultural resources preservation work conducted in the Southwest. The culture history of the Southwest and the project area has been chronologically generalized into several classification schemes that utilize noticeable changes in the cultural record, as seen in temporal and spatial similarities and differences, to assist in the explanation and interpretation of the cultural record. The primary Periods and their approximate dates are as follows:

| | |
|-------------|--------------------------|
| PaleoIndian | ~9,500 B.C.- ~5,500 B.C. |
| Archaic | ~5,500 B.C.- ~A.D. 1 |
| Puebloan | ~A.D. 1 - A.D. 1540 |
| Historic | A.D. 1540 - Present. |

These Periods are further subdivided to describe specific regional and local variations in the archaeological record (Cordell 1984: 106-107, 1979: 131-151; Schutt, Daniel and Chapman 1997:13-25; Simmons *et al.* 1989:23-26, 32-35; Stuart and Gauthier 1984: 44-46).

In New Mexico, PaleoIndian sites are known primarily from the eastern plains and the Rio Grande valley, and very few are known in the western part of the state (Stuart and Gauthier 1984; Simmons *et al.* 1989:33-34). There are however, numerous, scattered isolated artifacts that have

been reported in portions of the northwestern and west-central parts of the State. The PaleoIndian peoples were thought to be primarily mobile hunter-gatherers who probably also scavenged and subsisted primarily on megafauna.

The chronology defined by Cynthia Irwin-Williams (1973) for the Arroyo Cuervo region in northwestern New Mexico is the most widely utilized for the Archaic Period (Simmons *et al.* 1989:43; Biella and Chapman 1979:62-64). The Archaic Period for the region is fairly well defined (Simmons *et al.* 1989:66-68; Schutt, Daniel and Chapman 1997:16), however, sites across the state remain difficult to distinguish. Many lithic scatters in the Southwest may date to the Archaic, but positive dating and association to the Archaic Period eludes archaeologists at this time. Archaic peoples were thought to be still very mobile, had an increased reliance on collecting and gathering plant foods, and likely utilized a seasonal migratory pattern in their subsistence strategies (Schutt, Daniel and Chapman 1997:16).

In the project area, the Puebloan/Anasazi Period generally follows the Pecos classification developed in the late 1920s and 1930s and utilizes major changes in populations and cultural interaction, ceramics, architecture, and settlement patterns to establish a chronology. Schutt, Daniel and Chapman (1997:17) provide an excellent table of classificatory schemes developed for the western part of the State. The Red Mesa Valley (Puerco River valley) and the Chaco Canyon core area, approximately 50 miles northeast of the project area, are locations where primary developments in Puebloan/Anasazi culture have been identified. The Anasazi Period is characterized by the development and increasing dependence on agriculture and farming, ceramic technologies and food storage, increasing population sizes, more sedentism, migrations and areas of

abandonment, aggregation into larger villages, increasing spirituality and ceremonialism, and more intense and efficient use of the environment (Simmons *et al.* 1989:102-108; Schutt, Daniel and Chapman 1997:16-20). There is an increasing use of water control features and conservation methods over time and local and long distance trade is important.

The Historic Period begins in the region with Coronado's entrada and Spanish contact with the Zuni pueblos, located south of the project area, in 1540 A.D. Like much of New Mexico, endemic conflict between Native Americans and Europeans prevented substantial settlement in the Gallup area prior to the mid and late 1800's. Following the subjugation of the Navajo and the coming of the railroad in 1881, mining developed as an important industry in the region. Gallup has remained primarily a rural center over the past century. Its position relative to the large Native American Reservations, the Navajo Nation to the north and the Pueblo of Zuni to the south, reinforces Gallup's position as a center for tourism to the great Southwest.

III-6 **Socio-Economic Environment**

A. Demography

The City of Gallup is the population center in the study area. Table III-3 depicts the growth of the city and county over the last three census periods and predicts the growth rate until 2015 based on projections by the Bureau of Business and Economic Research at the University of New Mexico.

TABLE III-3

POPULATION GROWTH IN THE CITY OF GALLUP AND MCKINLEY COUNTY

| YEAR | MCKINLEY COUNTY | CITY OF GALLUP | % OF COUNTY |
|------|--------------------|----------------|-------------|
| 1970 | 43,208 | 14,596 | 33.78 |
| 1980 | 56,536 | 18,167 | 32.13 |
| 1990 | 60,686 | 19,157 | 31.57 |
| 1995 | 67,572 | 20,516 | 30.36 |
| 2000 | 72,172 | 21,861 | 30.29 |
| 2005 | 76,864 | 23,196 | 30.18 |
| 2010 | 81,675 | 24,543 | 30.05 |
| 2015 | 86,687 | 25,951 | 29.94 |

Gallup's economy has been fueled by the arts and crafts trade, mining operations, government programs, and a robust retail trade, with annual retail gross receipts ranking in the top five in the State of New Mexico. Retail trade, services, government and wholesale trade comprise the majority of new jobs created since 1970. In contrast, the mining industry and public utilities have the greatest number of jobs lost. The loss of the traditional blue collar jobs in the County has been filled by retail trade jobs which tend to be lower paying.

In McKinley County and Gallup, the distribution of age groups has been stable since 1980, with the exception of 20-24 year olds, which has been decreasing steadily. This indicates that more and more young people are leaving once they finish high school to find better opportunities. The median income (in

constant dollars) has declined and the number of persons and families below the poverty level has increased.

B. Land Use

Land use in the watershed is a mixture of commercial and residential, with land adjacent to the Little Puerco Wash being commercial. The watershed is expected to be fully developed within 20 years. The development along the main thoroughfares will continue to be commercial, whereas plans are currently underway for both commercial and residential developments within the rest of the basin. The dominant land use in the flood plain is commercial as indicated on Table III-4. Currently, structures and contents susceptible to damages during a 100 year storm are valued at approximately \$19,271,000 of which \$16,500,000 are commercial.

**TABLE III-4: VALUE OF DAMAGEABLE PROPERTY
PRESENT PREPROJECT CONDITIONS
LITTLE PUERCO WASH
(x \$1,000 April, 1999 price level)**

| LAND USE CATEGORY | MEAN EVENT, PRESENT CONDITION | | | |
|----------------------|-------------------------------|---------------|---------------|---------------|
| | .1 | .02 | .01 | .002 |
| Commercial | 3,770 | 7,345 | 7,345 | 11,916 |
| Com. Contents | 5,390 | 8,916 | 9,268 | 11,292 |
| Residential | 552 | 854 | 926 | 1,024 |
| Res. Contents | 276 | 427 | 463 | 512 |
| Public | 154 | 733 | 733 | 1,371 |
| Public Contents | 56 | 536 | 536 | 2,736 |
| | | | | |
| TOTAL | 10,198 | 18,811 | 19,271 | 28,851 |

C. Flood Hazard

The flood hazard in the area is substantial. The city of Gallup has an extensive history of flooding, with accounts dating back to 1881. Precipitation and stream gage records, however, are either too recent or nonexistent. No gage data exists for Little Puerco Wash. Precipitation data at the airport do not always reflect the local thunderstorm precipitation amounts or intensities. Newspaper accounts are helpful, but do not give enough detail. Notable floods on the Little Puerco Wash probably occurred in 1923, 1933, 1959, 1964, and 1990. The July 13, 1990, rain occurred between 3:30 p.m. and 4:30 p.m. Rainfall within the previous 10 days of the storm amounted to 1.14 inches. High soil moisture and flow restrictions caused by hail accumulation aggravated the flood damage. This flood resulted in the death of one man and over one million dollars in damages to streets, sidewalks, drainage facilities, homes, commercial and retail property. Rainfall reports varied from .79 inches at the official rain gage at the airport to 2.5 inches at Gallup Sand and Gravel (bucket measurement). Gallup Sand and Gravel is near the confluence of the west end of the study area. Since most of the precipitation fell within a 20- to 30- minute period, this storm is estimated to be a 25 year frequency event. It occurred during the day such that many of the commercial establishment were able to take some preventative steps such as sandbagging (or similar materials) the entrance to the business or moving sensitive goods to higher locations.

Currently, damages start at less than a 10-year event. Equivalent average annual damages are estimated at \$432,000 of which 86% are commercial (see Table II-1). Flood depths range up to 4 feet during the 100-year event. Expected current single occurrence damages are portrayed in the following table:

**TABLE III-5
SINGLE OCCURRENCE DAMAGES
PRESENT PREPROJECT CONDITIONS
LITTLE PUERCO WASH
(x \$1,000 April, 1999 price level)**

| LAND USE CATEGORY | MEAN EVENT, PRESENT CONDITION | | | |
|----------------------|-------------------------------|--------------|--------------|--------------|
| | .1 | .02 | .01 | .002 |
| Commercial | 401 | 945 | 1,091 | 2,220 |
| Com. Contents | 652 | 2,456 | 3,536 | 4,750 |
| Residential | 74 | 128 | 153 | 195 |
| Res. Contents | 45 | 83 | 102 | 129 |
| Public | 26 | 95 | 108 | 177 |
| Public Contents | 30 | 96 | 120 | 395 |
| | | | | |
| TOTAL | 1,228 | 3,803 | 5,110 | 7,866 |

The flood hazard will become greater as development occurs in the upper watershed. This will create an impermeable area and increase flows such that the start of damages will become less than a 5 year event within 20 years.

An additional hazard to the area under current conditions is the covered section of the channel previously described. The covered section overlies the channel for approximately 2,000 feet. As the city developed during the early part

of the century, commercial and residential buildings, roads, sidewalks, and parking lots were constructed over the Little Puerco Wash. Through this reach the conduit varies from an earthen channel covered by building floors to a rock masonry channel with concrete cover. Downstream from Highway 66 the Wash emerges from the fully covered conduit and travels through an assortment of undersized concrete culverts and corrugated metal pipes prior to entering the Puerco River. During the last flood the home at the entrance to the covered section was damaged and condemned. Maintenance within the covered section is critical under with or without project conditions, since it will deteriorate over time and jeopardize the integrity of the channels ability to pass flows. A covered section collapse not only would lead to all the water in the channel flowing into the flood plain increasing damages, but would cause significant damage to the overlying structures and roads. This would impact traffic and commerce in the heart of Gallup for several weeks as repairs are made. Should a gasoline or other utility rupture the damages could be severe, including loss of life.

CHAPTER IV FUTURE WITHOUT PROJECT CONDITIONS

(No Action Alternative)

As part of the analyses conducted during the preparation of this study, the conditions of the study area at a select point in the future were defined, assuming that none of the alternatives considered during this report would be implemented. Because these projections become more unpredictable the farther into the future they are made, the *future without project conditions* (or no action alternative) were defined to a point 50-years into the future (project-year-50 conditions). Beyond that time, most predictions become very unreliable.

IV-1 **Physical Resources**

A. Physiography, Geology and Soils

The future without project or no action alternative would have no effect on existing conditions at the site; in other words, the arroyo would continue to erode and incise deeper into the narrow channel's flood plain and would slowly continue to meander in an ever widening path downstream. There would be no significant effect to the physiography or geology of the area; however, soils would continue to erode.

B. Climate

The no action alternative would have no effect on the area's climatic conditions.

C. Water Resources

(1) Surface Water

With the no action alternative, impacts would include continued channel incision/degradation and erosion within the meandering, ever-widening arroyo channel. When flows occur, large amounts of sediment would be transported downstream. Sediments would have the potential to be partially deposited in the covered portion of the downstream channel, which would increase the likelihood of overflow flooding in that portion of the downtown channel. Eroding soils also degrade surface water quality. Future urban development in the upstream drainage area will increase the volume of stream flows in the existing narrow channel and enhance the likelihood of flooding.

Encroachment on the Wash's channel can be a serious problem. It is caused by small earth moving activities in years past as well as dumping of trash and debris that limit the available surface water flood plain. This problem is beyond the scope of this small project's proposed alternatives noted in Section V; however, encroachment should be addressed, monitored, and prevented by the city of Gallup. By narrowing the available flood plain, the chance for overbank flows increases.

(2) Ground Water

The no action alternative would be no effect on ground water resources of the area.

D. Flood Plains and Wetlands

With the no action alternative, erosion could continue within the flood plain. Development in the flood plain could occur under existing conditions. Also as noted above, continuing encroachment on the flood plain should be monitored and prevented by the city of Gallup. There are no perennial surface water bodies, springs, seeps, or jurisdictional wetlands within the proposed project's construction areas; therefore, the no action alternative would have no effect on wetlands.

E. Air, Sound, and Visual Quality

The no action alternative would have no effect on existing or future air, sound, and visual qualities in the Gallup area. Air quality would remain in attainment. The no action alternative would also have no effect on PSD Class I areas which are greater than 65 miles from Gallup. Sound/noise will probably slowly increase with urban growth and increased vehicular traffic, however, would not be affected by the no action alternative. The no action alternative may have a small effect on visual quality from an unsightly and increasingly degrading channel.

IV-2 **Hazardous, Toxic and Radioactive Waste Environment**

There are no known significant hazardous, toxic or radioactive wastes located in the area. Existing contamination in the area is limited to garbage and litter. The no action alternative would have no effect on existing or future conditions; however, there is

always the potential for unscrupulous dumping of these wastes.

IV-3 **Biological Resources**

A. Plant Communities

The no action alternative may affect existing plant communities in the flood plain. Existing and potentially increasing stream flows in the future would continue channel degradation threatening vegetation. Channel incision may lower existing ground moisture available to the root zone.

B. Animal Communities

The no action alternative may affect existing animal communities in the small canyon area. The potential for increased stream flows from urbanization may threaten the existing vegetation, thereby threatening existing wildlife. Continuing urbanization and proximity to humans may force some existing species to move from the area.

C. Special Status Species

No special status species or their preferred habitats were observed in the project areas, therefore, the future without project - no action alternative would most likely have no effect on these species.

IV-4 **Cultural Resources**

No cultural resources were identified within the project's proposed construction easement areas. The no action alternative would most likely have no effect on the cultural resources of the

region; however, with continuing erosion and incision of the channel, buried cultural resources may be exposed in the future. Buried cultural resources in the area have been exposed from either stream bank erosion or by excavation in flood plain areas. Cultural resource sites known to occur in the area would not be affected by the no action alternative. However, the future without project would not provide protection from potential flood flows. The potential for flood flows and increased volumes of flows may cause severe flooding in portions of downtown Gallup. Historic buildings in the downtown area may be affected by flood flows and severe flood flows may damage portions of the historic U.S. Highway Route 66 and its relationship to the historic buildings.

IV-5 **Socio-Economic Environment**

A. Demography

Gallup is expected to grow approximately 26% from 1995 to 2015 according to the Bureau of Business and Economic Research. Population in 1995 is estimated at 20,516 and would rise to 25,951 by 2015. The Little Puerco Wash watershed would account for some of this development.

B. Land use

Land use within the flood plain is not expected to change significantly from current conditions. There may be some commercial infill, but the area is almost fully developed with structures or parking lots at the current time. Land within the basin is expected to change with the addition of more commercial establishments near the main thoroughfares and residential development in other areas.

C. Flood Hazards

Flood hazards are expected to change for two reasons. First, watershed development will increase the hazard to structures within the flood plain. Second, the covered section will continue to age, which without maintenance, will create a situation where partial or complete collapse could create greater flooding.

Single occurrence future damages are portrayed in Table IV-1. Damages in the future condition 100- year event are expected to be approximately \$7,165,000, of which approximately \$6,271,000 would be commercial.

**TABLE IV-1: SINGLE OCCURRENCE DAMAGES
FUTURE PREPROJECT CONDITIONS
LITTLE PUERCO WASH
(x \$1,000 April, 1999 price level)**

| LAND USE CATEGORY | MEAN EVENT, FUTURE CONDITION | | | |
|----------------------|------------------------------|--------------|--------------|--------------|
| | .1 | .02 | .01 | .002 |
| Commercial | 516 | 1,150 | 1,783 | 2,313 |
| Com. Contents | 1,324 | 3,792 | 4,488 | 5,013 |
| Residential | 74 | 128 | 153 | 210 |
| Res. Contents | 62 | 109 | 128 | 140 |
| Public | 36 | 120 | 185 | 206 |
| Public Contents | 32 | 128 | 389 | 646 |
| | | | | |
| TOTAL | 2,071 | 5,466 | 7,165 | 8,528 |

Value of damageable property in the 1% chance flood plain, future conditions is estimated at \$28,883,000, of which \$22,000,000 is commercial, as portrayed on Table IV-2.

**TABLE IV-2: VALUE OF DAMAGEABLE PROPERTY
FUTURE PREPROJECT CONDITIONS
LITTLE PUERCO WASH
(x \$1,000 April, 1999 price level)**

| LAND USE CATEGORY | MEAN EVENT, FUTURE CONDITION | | | |
|----------------------|------------------------------|---------------|---------------|---------------|
| | .1 | .02 | .01 | .002 |
| Commercial | 3,770 | 7,345 | 11,938 | 11,978 |
| Com. Contents | 5,390 | 9,268 | 11,302 | 11,332 |
| Residential | 634 | 926 | 1,024 | 1,090 |
| Res. Contents | 317 | 463 | 512 | 550 |
| Public | 154 | 733 | 1,371 | 1,371 |
| Public Contents | 56 | 536 | 2,736 | 2,736 |
| | | | | |
| TOTAL | 10,321 | 19,271 | 28,883 | 29,057 |

CHAPTER V
EVALUATION OF EFFECTS OF THE ALTERNATIVES
INCLUDING THE RECOMMENDED PLAN

V-1 Physical Resources

The effects of the recommended plan on the physical environment of the study area can be characterized as minimal. The proposed dam includes a footprint of 2.5 acres. The dam height is estimated at 42 feet from the channel invert. The detention pool would temporarily store flood waters with a maximum storage capacity of 84 acre-feet. Dam construction and reconstruction of the downstream box culverts would provide protection from flood flows by regulating those flood flows to a volume that the existing downstream channel can carry. Project construction would not change the Little Puerco Wash's channel capacity, sinuosity, velocities or small flow volumes. It would only regulate flood flows to the existing channel carrying capacity.

The impact to the riparian vegetation from dam construction would be mitigated by the construction/creation of about 2.0 acres of wetland habitat at the Gallup Municipal Golf Course, a local public facility where sufficient water is available to sustain the habitat and on land already owned by the project Sponsor. Mitigation at the dam construction site and disturbed areas would also include revegetation measures such as mulching, reseeding with approved native plant species, and monitoring for reestablishment of vegetation. No mitigation is required for the reconstruction of the downstream box culverts.

A. Physiography, Geology and Soils

Implementation of any of the considered alternatives would have no effect on the physiography or geology of the region over a 50-year project life. Impacts to the soils

within the proposed project area include disturbance that would result from dam construction. Dam construction would result in 5 acres of temporary disturbance and 2.5 acres of permanent disturbance. Some soils from the existing flood plain in the small canyon would be excavated for the construction of the earthen dam. Total required borrow for the proposed project is 20,500 cubic yards. Construction and excavation specifications, and a Storm Water Pollution Prevention Plan required by New Mexico's general NPDES permit would be developed to protect water quality from deteriorating as a result of erosion-causing construction activities at both construction sites.

B. Climate

There would be no effect on the area's climatic conditions from any of the project's proposed construction alternatives.

C. Water Resources

(1) Surface Water

Currently, there are no water control or management features on the Little Puerco Wash. There are local flood protection levees that have been constructed on the Puerco River immediately downstream of the proposed construction areas. As stated above, project construction would not change the Little Puerco Wash's channel capacity or sinuosity or change small flow volumes, velocities, sediment carrying capacity, or water quality. It would manage flood flows by regulating flood flow volumes to the existing channel carrying capacity. The recommended plan is designed for construction at an estimated 100-year flood event. The earthen dam includes an emergency overflow spillway in the event that flood flows exceed storage capacity. Therefore, it is also very

important that the city prevent further encroachment on the downstream channel. Temporary storage of flood flows in the detention pool area would not have significant effects on the Wash's transportation of sediments.

(2) Ground Water

The construction alternatives, including the recommended plan, would have no effect on ground water resources of the area.

D. Flood Plains and Wetlands

The proposed project would provide regulated stream flows downstream of the proposed earthen dam structure for flood events that result in flows greater than about 750 cfs. No additional development of the flood plain would result from the proposed project and there are no wetlands in the area of the proposed construction easements. Through mitigation efforts, the recommended plan would benefit the Gallup area by constructing approximately 2.0 acres of wetland habitat. The proposed location for habitat mitigation is at the Gallup Municipal Golf Course, a local public facility where sufficient water is available to sustain the habitat and is on land already owned by the project Sponsor.

E. Air, Sound, and Visual Quality

Increases in suspended dust particles and construction equipment emissions would be minimal and would not result in permanent or significant long- or short-term detrimental effects on air quality. During construction, noise levels would increase locally; however, the increase would be minor and temporary, ending when construction is complete. Small increases in suspended dust particles would have minor

effects on visual quality. Equipment with water sprinklers would be used during construction to minimize dust. Therefore, construction alternatives, including the recommended plan, would result in temporary but negligible effects on local air, sound, and visual quality.

V-2 **Hazardous, Toxic and Radioactive Waste Environment**

Based on site visits to the project areas, there is no evidence for HTRW contamination. Therefore, the proposed project would have no effect on the HTRW environment. A small amount of trash and debris would require removal to an approved facility prior to the start of major construction efforts.

V-3 **Biological Resources**

A. **Plant and Animal Communities**

With mitigation, the foreseeable effects of the construction alternatives, including the recommended plan, on the biological resources of the region would be minor. Dam construction would significantly impact riparian vegetation at the dam construction site and the immediate adjacent borrow area, which includes the existing riparian corridor of the small canyon. Also, sediments deposited in the detention pool area upstream of the dam would impact the existing vegetation, but the time required for this to happen would be dependant upon the frequency of flood events and the associated sediment deposits. Although the project area is small and isolated within the city of Gallup, this area appears to provide important habitat for wildlife in the area (USFWS 1998). Following USFWS recommendations, the recommended plan, therefore, calls for habitat mitigation that would result in the construction/creation of about 2.0 acres of similar riparian habitat at

the Gallup Municipal Golf Course, a local public facility where sufficient water is available to sustain the habitat, and which is owned by the project Sponsor. While this mitigation would not replace lost riparian habitat on a one-to-one basis, it would provide for habitat considered to be of higher quality. Created habitat at the 2.0 acre mitigation site would include slow flowing water to supply 3 ponds that would have a water surface area of about 0.4 acres. The remaining 1.6 acres would be planted with emergent plants, transplant shrubs, 50 black willow pole cuttings, and 100 cottonwood pole cuttings planted on 20-foot centers. The proposed location for habitat creation at the public golf course is located about 1.2 miles east of the site of the proposed earthen dam. No mitigation is required for the reconstruction of the downstream box culverts.

B. Special Status Species

Project construction would have no effect on special status species. No Federal- or State-listed species (threatened, endangered, proposed threatened or endangered, or candidates for threatened or endangered status) are known to occur in the vicinity of the proposed project and are unlikely to occur there in the future, with or without the project.

Therefore, the project should have no effect on these species. No other special status species are known to occur in the vicinity of the proposed project and are unlikely to make significant use of the project area in the future, with or without project.

V-4 Cultural Resources

During surveys, no cultural resources were identified within the project's proposed construction easement areas. Two isolated occurrences (IO's), consisting of several ceramic artifacts each, are located near, but outside of the dam construction easement area. These

artifacts would not be disturbed by project construction. Three cultural resource sites are known to occur in the area; however, these sites would not be affected by project construction. Historic structures located in the downtown area of Gallup and portions of the historic U.S. Highway Route 66 would benefit from project construction which provides for controlling the volume of flood waters that flow through the downtown area in the restricted Little Puerco Wash channel, thereby lowering the probability of uncontrollable flood events. The project's cultural resource survey report is part of the project permanent record.

While no other sites are known to occur in or near the construction easement areas, buried cultural resources may be exposed during construction excavation. Buried artifacts and cultural resource sites are known to have been exposed in the area from either stream bank erosion or by excavation in flood plain areas. Should previously undiscovered artifacts or cultural resource manifestations be unearthed during construction, work would be stopped in the immediate vicinity of the find, a determination of significance made, and a mitigation plan formulated in coordination with the New Mexico State Historic Preservation Officer. The construction contract plans and specifications have provisions to ensure that all known and unknown cultural resources are adequately protected. Therefore, the proposed project would have no effect on the cultural resources of the area and the New Mexico State Historic Preservation Officer has concurred with our determination of no affect on cultural resources of the project area (see Technical Appendix 11).

V-5 **Socio-Economic Environment**

A. Demography

The proposed project will have no impact on the long term demographics or the

employment in Gallup. The watershed will continue to develop in either case. Population and employment impacts will be negligible during the next 50 years. During the construction period there will be minor impacts. There will be an estimated 4,200 hours of employment for McKinley County residents, resulting in approximately \$30,000 of local income. In addition, there will be \$80,000 in wages, which will impact the local economy based on payments to out-of-area laborers. The latter will spend an estimated 25% in town on temporary quarters, food, and entertainment, such that the direct payments to the community related to labor will be approximately \$50,000. Given a multiplier of approximately 2.5:1 (assumes that the money continues to turn over in purchases within the community), the net impact could be approximately \$125,000 during the construction period. In addition, purchases of local materials will approximate \$320,000 such that local gross receipts taxes will benefit as well as the businesses from whom the materials are purchased.

B. Land Use

There will be no anticipated change in land use with or without the project. The upper watershed will continue to develop, and there may be some infilling of the flood plain.

C. Flood Hazard

The project will result in a significant reduction in flood hazards as described previously, with equivalent average annual residual damages estimated at \$27,000. However, it is important to note that the covered section remains a flood hazard and needs continued maintenance or repair to insure that it does not become a greater hazard.

It remains a danger to the community since large flows could cause collapse of roads, structures and rupture of gas and utility lines.

V-6 **Cumulative Impacts**

Cumulative impacts are those which result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions. There is one completed, Federally-funded flood control project in the vicinity of the proposed Little Puerco Wash project. The Puerco River and Tributaries Flood Control Project was completed in 1991 and is documented in **The Final Supplemental Environmental Assessment to Supplement Final Environmental Statement of 1979, Puerco River and Tributaries Flood Control Project, McKinley County, New Mexico** (1988). The Little Puerco Wash is a left bank tributary to the Puerco River. There are no other planned, Federally-funded or non-Federal projects in the vicinity of the proposed project or elsewhere along the Puerco River or Little Puerco Wash. In consideration of the past, present, and future (foreseeable, reasonable actions), the cumulative impacts of the proposed project would be negligible on the resources of the construction area.

CHAPTER VI
SUMMARY OF IRREVERSIBLE AND IRRETRIEVABLE
COMMITMENTS OF RESOURCES

Irreversible and irretrievable commitment of resources that would be associated with the proposed action consists primarily of labor, fuel, and structural material, such as concrete steel, pipe, and ancillary equipment. The earth and rock that would be used to construct the project is considered to be reusable, and, therefore, would not be considered an irreversible or irretrievable commitment of resources. Further, vegetation and associated wildlife that would be displaced as a result of the dam would become reestablished through both artificially manipulated or natural processes or would be compensated for through the proposed habitat improvement features, and, therefore, would not be an irreversible or irretrievable commitment of resources.

The proposed action would not, and cannot, change these conditions. The proposed action would, however, save a significant amount of irreversible and irretrievable human, physical, and monetary resources that could be lost as a result of high magnitude flooding and associated repair.

Alternative Levels of Flood Protection. Irreversible and irretrievable resource effects would be similar to the proposed action for all evaluated alternative levels of flood protection.

CHAPTER VII

RECOMMENDATIONS

As District Engineer, Albuquerque District, Corps of Engineers, I have reviewed and evaluated, in light of overall public interest, the data, information, and alternatives for water resources development pertaining to the Little Puerco Wash. The principal elements of my review included: (a) environmental and cultural resource considerations, (b) economic factors of local, regional and national resource development, (c) engineering feasibility, (d) social well-being, and (e) institutional needs.

The purpose of this FS/EA is to determine the NED plan for the Little Puerco Wash and determine the best solution for the study area. These objectives have been met as discussed in this report. I have considered all of the alternatives available for meeting the flood control and environmental needs of the area and have concluded the recommended plan meets the economic and local support requirements, which warrant further Federal involvement. The recommended plan consists of a dam on the Little Puerco Wash, the replacement of two existing culverts, and two acres of mitigation. The recommended plan is the NED plan.

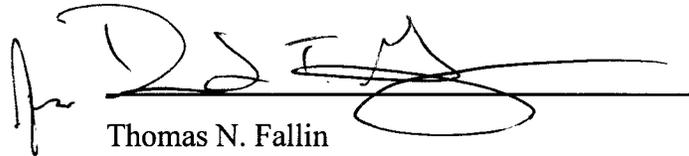
The City of Gallup, non-Federal Sponsor of this project, shall, prior to implementation, agree to perform the following required items of cooperation:

- (1) Provide, without cost to the United States, all lands, easements rights-of-way, and disposal areas, necessary for construction of the project;
- (2) Provide, without cost to the United States, all necessary relocations and alterations of buildings and utilities, roads and bridges, sewers and related or special features;
- (3) Hold and save the United States free from damages due to construction and the subsequent maintenance of the project, except for damages which are caused by the fault or negligence of the United States or its contractors, and, if applicable, adjust all claims concerning water rights;
- (4) Maintain and operate the project works after completion without cost to the United States in accordance with regulations prescribed by the Secretary of the Army; and,

(5) Provide a cash contribution of at least five percent (5%) of the project cost so that the total non-Federal requirement including the cash contribution, lands, easements, rights-of-way, relocations, and disposal areas (LERRD's), would not be less than thirty-five (35%) of the total project cost. Should the combination of the five percent (5%) minimum cash payment with the cost of the LERRD's exceed fifty percent (50%) of the total project cost, then the Sponsor would be required to provide the five percent (5%) cash contribution and only that portion of the LERRD's necessary to result in the total non-Federal contribution equalling fifty percent (50%) of the total project cost.

Upon completion of project construction, the Government would turn the project over to the local sponsor who would be responsible for operating, maintaining, repairing, rehabilitating and replacing the project features for the life of the project, in accordance with the Corps of Engineers' guidelines and regulations.

I also recommend that Plans and Specifications be initiated in February 2000 such that project construction can begin in 2001.

A handwritten signature in black ink, appearing to read 'T. Fallin', is written over a horizontal line. The signature is stylized and cursive.

Thomas N. Fallin

Lieutenant Colonel, EN

District Engineer

CHAPTER VIII

PUBLIC INVOLVEMENT, REVIEW, COORDINATION & CONSULTATION

This integrated Feasibility Study/Environmental Assessment was prepared by the U.S. Army Corps of Engineers, Albuquerque District, 4101 Jefferson Plaza, NE, Albuquerque, New Mexico 87109-3435. Scoping letters were mailed on September 11, 1999, to appropriate federal, state, and local government agencies, as well as private individuals and agencies who may have a potential interest in or who have expressed an interest in the proposed project. Public meetings were held in Gallup, New Mexico, on July 21, 1998 and August 25, 1999. Coordination and consultation communications have taken place between the Corps and the City of Gallup, the U.S. Fish and Wildlife Service, and members of the environmental community through meetings, field trips, and written and verbal correspondence.

Agencies and concerned entities consulted formally or informally in preparation of this Environmental Assessment include:

- U.S. Department of Interior
 - Bureau of Indian Affairs
 - Navajo Area Office
 - Environmental Quality Services Office
 - Fish and Wildlife Service
 - New Mexico Ecological Services State Office
 - National Park Service
 - Chaco Culture National Historical Park
- State of New Mexico
 - State Historic Preservation Bureau
 - Department of Energy, Minerals and Natural Resources
 - Forestry and Resources Conservation Division
 - Department of Game and Fish
 - Conservation Services Division
 - Environment Department
 - Water and Waste Management Division
 - Environmental Impact Review

Department of Highways and Transportation
Environmental Section
Navajo Nation
President Milton Bluehouse
Fish and Wildlife Department
Historic Preservation Department
Environmental Protection Administration
Chaco Protection Sites Program
Pueblo of Zuni
Governor Donald S. Eriacho
Heritage and Historic Preservation Office
Department of Fish and Wildlife
Cibola County
County Commission, Public Works
Burlington Northern and Santa Fe Railway
Environmental Operations
Field Engineering

Information on the proposed project including project background, purpose and need, project description, proposed alternatives, and project area map were mailed to all entities contacted in the above list.

Comments and concerns received from scoping letter inquiries concerning the proposed construction project included the following:

- Comments and concerns have been expressed by the USFWS as documented in their **Fish And Wildlife Coordination Act Report** (1998; see Section 9, Technical Appendix). Mitigation efforts as documented in this report address USFWS concerns.
- The Burlington Northern and Santa Fe Railway also provided comments concerning the replacement of the downstream box culverts and the potential for channel degradation. Corps engineering, and hydrology and hydraulics studies have addressed the Railway's concerns in the design.
- There were no comments submitted regarding the Draft Feasibility Report and the report was approved by South Pacific Division on September 16, 1999.

CHAPTER IX

LIST OF PREPARERS

The following team members contributed their expertise to this study:

| | |
|----------------------------|--|
| Fermin Chavez | Design Technical Leader |
| Gary Rutherford | Project Manager/Economist/ Plan Formulation |
| Bruce Beach | Hydrology/Hydraulics/Sediment |
| Alan R. C de Baca | Cost Estimates |
| John Schelberg | Cultural Resources |
| Gregory Everhart | Environmental Resources |
| Joseph A. Garcia | Real Estate |
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The following technical review team members were contributors to this report:

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| Ben Alanis | Civil Engineering Design |
| Tony Apodaca | Study Management/Formulation |
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CHAPTER X

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CHAPTER XI

DISCLAIMER

These recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the States, interested Federal agencies, and other parties would be advised of any modifications and would be afforded an opportunity to comment further.