PROJECT MANAGEMENT PLAN
APPENDIX

CACHE LA POUDRE RIVER
GENERAL INVESTIGATION STUDY
GREELEY, COLORADO

November 2005

U.S. Army
Corps of Engineers
Omaha District

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A. INTRODUCTION.

The scopes of work and cost estimates were prepared by specialists from each discipline and reflect their best projection of the services and cost that will be required to complete the project as currently defined. The costs were then adjusted upwards by 12.5% to account for contingency. Within some of the scopes, work items have been identified that could be completed by the Local Sponsor as "work in kind". Credited In-kind services may include labor hours, such as hourly salaries plus overhead, travel costs and the value of materials, supplies and technical products (such as GIS files). Values for the in-kind services have been estimated and are included in budget and cost estimate figures.

1.0 Project Cost Estimate

Table A-1 presents the current cost estimate for the entire feasibility. It is broken out according to the disciplines doing the study work and specific project tasks.

CACHE LA POUDRE AT GREELEY, COLORADO
FEASIBILITY STUDY COST ESTIMATE
Table A-1 (November 2005)

Work Item	Cost Estimates ($)		
	Corps	**In-Kind**	**Total**
Cultural Resources Assessment	$6,250	$0	$6,250
Environmental Studies	$163,266	$0	$163,266
Economic Studies	$104,772	$3,960	$108,732
Real Estate Studies	$91,614	$44,663	$136,277
Hydrologic Studies	$125,000	$37,400	$162,400
Flood Plain Management Studies	$28,342	$0	$28,342
Hydraulic Studies	$215,770	$8,900	$224,670
Geotechnical Studies	$61,626	$6,000	$67,626
HTRW Baseline Study	$10,000	$0	$10,000
Surveys and Mapping	$13,500	$14,000	$27,500
Structural Studies	$10,000	$0	$10,000
Project Cost Estimates	$27,874	$0	$27,874
Constructability Review	$4,000	$0	$4,000
Plan Form & Project Management	$185,377	$90,000	$275,377
Funds Management	$10,774	$0	$10,774
External ITR*	$29,476	$0	$29,476
Federal Audit	$10,774	$0	$10,774
Value Engineering*	$30,000	$0	$30,000
Required Washington Level Review*	$53,870	$0	$53,870
* Local sponsor portions of these tasks	counted under	PM	
SUBTOTAL	**$1,182,285**	**$204,923**	**$1,387,207**
Contingency (approx 12.5%)	**$147,786**	**$25,615**	**$173,401**
TOTAL STUDY COST	**$1,330,070**	**$230,538**	**$1,560,608**

2.0 Decision Point 1 Cost Estimate

Table A-2 outlines the current cost estimate for doing the first phase of the Feasibility Study. This first phase will cover problem identification, conceptual plan formulation and the delineation of solution alternatives. The focus of this portion of the study will be on identifying a flood control and ecosystem restoration project that has solid sponsor support and is in the "Federal Interest". This table also provides the estimated study costs, with and without the 12.5% contingency.

CACHE LA POUDRE AT GREELEY, COLORADO

COST ESTIMATE TO DECISION POINT 1

Table A-2 (November 2005)

Work Item	Cost Estimates ($)		
	Corps	In-Kind	Total
Cultural Resources Assessment	$1,688	$0	$1,688
Environmental Studies	$44,596	$0	$44,596
Economic Studies	$42,666	$3,600	$46,266
Real Estate Studies	$21,447	$22,413	$43,860
Hydrologic Studies	$42,090	$2,400	$44,490
Flood Plain Management Studies	$16,902	$0	$16,902
Hydraulic Studies	$80,380	$8,900	$89,280
Geotechnical Studies	$15,420	$2,400	$17,820
HTRW Baseline Study	$10,000	$0	$10,000
Surveys and Mapping	$8,550	$10,400	$18,950
Structural Studies	$0	$0	$0
Project Cost Estimates	$9,290	$0	$9,290
Constructability Review	$0	$0	$0
Plan Form & Project Management	$61,350	$12,300	$73,650
Funds Management	$3,544	$0	$3,544
External ITR	$0	$0	$0
Federal Audit	$0	$0	$0
Value Engineering	$0	$0	$0
Required Washington Level Review	$10,000	$0	$10,000
SUBTOTAL	**$367,923**	**$62,413**	**$430,335**
Contingency (approx 12.5%)	**$45,990**	**$7,802**	**$53,792**
PHASE 1 STUDY COST	**$413,913**	**$70,214**	**$484,127**

3.0 In-Kind Services Estimate

Each technical provider has updated their descriptions of In-kind Services (IKS) for this estimate. Through negotiation between Greeley and Corps, appropriate IKS tasks and costs were developed to replace the old rough estimates. Consistent computational summary tables, which are tied to Tables A1 & 2, are provided at the end of each study area section. Table A3, detailing the in-kind services, was updated to reflect those changes.

In-kind services were identified that could be done by the city of Greeley in place of cash payment. The in-kind services were initially estimated based upon previous studies done by the Omaha District and specific tasks that were noted in the individual cost estimates prepared by members of the study team. Reevaluation of those services was accomplished during conference calls between the City and the Corps of Engineers during August and September 2005. The reevaluated in-kind services are noted in Table A-3 and reflect estimates of work items where Corps and Greeley employees have discussed the likelihood of work in their discipline being performed by the City. The numbering in Table A-3 follows the order of the study disciplines listed in Tables A-1 and A-2. The notation “Phase 1” indicates that the task will be done prior to Decision Point 1. Some of the in-kind services reflect the estimated time that city employees will participate in study management tasks. These tasks include project management, meetings and Corps processes such as the Washington-Level Review. In the majority of the cases where in-kind services are noted, it is anticipated that the City has greater ability to perform the task more efficiently and that the study will be improved if part of the task is performed by the local sponsor. Hourly rates with burdened overhead are included as estimates only, noting that final values of both hours and rates need to be supplied by the Sponsor during the course of the feasibility study.

In-kind service work can have different impacts on the total project cost, depending upon how the work is distributed. If work, originally scheduled to be done by the Corps is shifted to the local sponsor, it will not increase the total study cost, and will reduce the cash payment by the sponsor. On the other hand, if additional work is to be done by the sponsor, above what is originally estimated to be done by Corps employees, this work will add to the total cost and the Federal dollars that will be used for the study, but will not change the cash payment from the Sponsor to the Corps.

Table A-3 Potential In-Kind Services

WORK IN KIND ESTIMATE

	Discipline	Category	Cost	Starting in
3	**Economics (Scope by Econ 9/1, Cost by agreement 9/15)**		$3,960	
3.1	Provide city comprehensive plan.	Hours		Phase 1
3.2	Includes performing site visit on sample of structures in flood plain.	Hours		Phase 1
3.3	Providing economic data for structures in the 500-yr zone @ '88 datum.	Hours		Phase 1
3.4	Coordinate w/locals regarding future socioecon, land use, transport.	Hours		Phase 1
3.5	Provide historic flood fight, damage and recovery $, including '99 event	Hours		Phase 1
3.6	Sponsor's prelim. Financing Plan & Statement of Financial Capability	Hours		

3.7	Public Involvement Coordination on Economic Issues	Hours		Phase 1
	ECONOMICS TOTAL		$3,960	
4	**Real Estate (Revised by RE 16 Sep 05)**			
4.2	**Problem Identification (To Decision Point 1)**			
4.21	Data Collection	Hours	$4,700	Phase 1
4.22	Prelim Surface Owners	Hours	$4,500	Phase 1
4.23	Obtain ROE	Hours	$4,500	Phase 1
4.24	Mapping	Hours	$5,913	Phase 1
4.25	Fact Gathering Appraisal	Hours	$2,000	Phase 1
4.26	Meetings and Coordination	Hours	$800	Phase 1
			$22,413	
4.3	**Real Estate Evaluation and Final Report**			
4.31	Determine Land and Estates	Hours	$1,200	
4.32	Mapping and Acreages	Hours	$8,450	
4.33	Est. Mineral Rights	Hours	$1,000	
4.34	Est. Water Rights	Hours	$1,000	
4.35	Mapping Mineral Rights Acreages	Hours	$2,150	
4.36	Mapping Water Rights Acreages	Hours	$3,225	
4.37	Mapping Utilities	Hours	$3,225	
4.38	Determine Land and Estates	Hours	$1,200	
4.38	Meetings and Coordination	Hours	$800	
	Real Estate Phase 2 subtotal		$22,250	
	REAL ESTATE SUBTOTAL		$44,663	
5	**Hydrology Studies (Furnished by HE 15 Sep 05)**			
5.1	Identify water rights for sand pits with limitations (priority, time of year)	Hours	$20,000	Phase 1
5.2	Hydrologic data collection and evaluation	Hours	$2,400	Phase 1
5.3	Underwater Gravel Pit Survey	Hours	$15,000	
5.4	Basin Wide Hydro Study Initial Work (Not currently included)		$10,000	
	HYDROLOGY SUBTOTAL (without Item 5.4)		$37,400	
7	**Hydraulic Studies (Scope by hydraulics)**		$8,900	
7.1	Provide existing contours for initial feasibility modeling			Phase 1
7.2	Provide 2' TIN or DTM data for RAS model & plotting flood boundaries.	Hours		
7.3	Provide data on bridges that have changed since the '03 FIS Study.	Hours		Phase 1
7.4	Provide high water marks and other historical flood documentation.	Hours		Phase 1
7.5	Provide bridge inventory forms and dimension data	Hours		Phase 1
7.6	Provide storm water inventory of interior drainage structures	Hours		Phase 1
7.7				
7.8	Provide photos and newspaper accounts for past 30 yrs ('83, '99)	Hours		Phase 1
	HYDRAULICS SUBTOTAL		$8,900	
8	**Geotechnical Studies (Scope from Conf. Call)**		$6,000	
8.1	Provide soils and design information on all existing levees.	Hours		Phase 1
8.2	Provide available subsurface soil & bedrock data in project area.	Hours		
	GEOTECHNICAL SUBTOTAL		$6,000	
10	**Surveys and Mapping & GIS Support (Scope from Conf. Call)**		$14,000	

10.1	Gather Assessor Information. Provide by parcel for study area	Hours		Phase 1
10.2	Review elevation data for new buildings not in data base.	Hours		Phase 1
10.3	Provide recent aerial photography for flood plain	Hours		Phase 1
10.4	Convert existing map points to '88 datum, section by section	Hours		Phase 1
10.5	Create DEMs and TINs for flood plain (to > 500 yr flood plain)	Hours		Phase 1
10.6	Compare current gravel pit distribution to 2' contour data of mid-'90s	Hours		
10.7	Provide wetland delineation map	Hours		Phase 1
10.8	Provide recreation and bike trails map	Hours		Phase 1
10.9	Provide utilities map	Hours		Phase 1
10.10	Provide public involvement maps & website maps			Phase 1
10.11	Provide zoning maps for future development			
	GIS AND SURVEYS SUBTOTAL		$14,000	
14	**Plan Formulation & Project Management (Est. by PM)**			
14.1	**Phase 1**		$90,000	
14.11	Provide public meeting locations and support material.	Rental		Phase 1
14.12	Participate in all project related meetings.	Hours		Phase 1
14.13	Development of the Public Involvement Plan.	Hours		Phase 1
14.14	Plan Formulation.	Hours		Phase 1
14.15	Study correspondence and documentation.	Hours		Phase 1
14.16	Travel	Task		Phase 1
(pt15)	Value Engineering meetings	Hours		Phase 1
	Phase 1 Subtotal		$0	
14.2	**Phase 2**			
14.21	Provide public meeting locations and support material.	Rental		
14.22	Participate in all project related meetings.	Hours		
14.23	Development of the Public Involvement Plan.	Hours		
14.24	Plan Formulation.	Hours		
14.25	Review and editing of the Feasibility Report.	Hours		
14.26	Study correspondence and documentation.	Hours		
14.27	FCSA Signing	Hours		
(pt17)	Participate in Independent Technical Review meetings	Hours		
(pt18)	Participate in Washington Level Review meetings	Hours		
	Travel	Task		
	Phase 2 Subtotal		$0	
	PLAN FORMULATION TOTAL		$90,000	
	PHASE 1 SUBTOTAL FOR IN-KIND SERVICES		$44,813	
	PROJECT TOTAL FOR IN-KIND SERVICES		$204,923	
	Contingency of 12.5%		$25,615	
	TOTAL ESTIMATED IN-KIND SERVICES		$230,538	

4.0 Anticipated Study Products Through Decision Point 1

4.1 GENERAL STUDY SCOPE

The Feasibility Study effort will build upon what was learned in the Reconnaissance Study (905(b) Report). The primary study objective is to determine the most beneficial plan to reduce the flood threat to Greeley and improve the riparian ecosystem of the Cache la Poudre River. Based upon the results of the Reconnaissance Study, is anticipated that flood damages can be reduced by increasing stream channel conveyance, lowering flood peaks by storing part of the excess flow in designated areas of the flood plain and removing some property from the floodway. It is likely that the final flood damage reduction plan will include many or all of those methods.

Channel conveyance can be improved by buying and removing some property from critical reaches of the floodway and moving existing sand berms further from the center of the river. Widening the floodway will build upon the City's on-going effort to improve the channel capacity of bridge crossings in Greeley. Where the floodway can be widened, efforts will be made to improve both the environment in the reach and provide a public access corridor.

Gravel pits and old oxbows offer potential as storage areas for flood flows. In addition unoccupied flood plain property, such as the old sugar plant reservoir site east of 6th Avenue near the mouth of Eaton Draw, could also be used for flood storage. The flood storage areas will also be evaluated for their potential to improve riparian habitat along the Cache la Poudre River in Greeley, wetland habitat for migratory bird species and for public access via the regional trail system.

4.2 STUDY OBJECTIVES TO DECISION POINT 1

The initial focus of the study will be to identify flood reduction alternatives that are likely to have the highest favorable benefit / cost ratios. Additionally, ecosystem restoration efforts that are the most productive will be identified at the end of this phase of study. For both the flood damage reduction and ecosystem improvement efforts, typical tasks will include defining the problem and opportunities, forecasting the future conditions without a project and formulating alternative plans. This initial focus is referred to as "Decision Point 1", or "Phase 1" and an incremental cost estimate has been prepared for that part of the study.

Affordable flood damage reduction alternatives will be actively pursued during this phase. Particular focus will be producing a solution that will greatly reduce, or possibly eliminate the 100-year flood plain designation in urban areas of Greeley. Efforts will be made to determine whether storage, flood channel widening, land use changes, or some combination of those options will produce the greatest reduction in flood damages for the money spent. Hydrologic and hydraulic models will be prepared that will permit a detailed evaluation of the flood flows in the lower Cache la Poudre River around Greeley. This evaluation will include modeling of flood peaks and flood volumes to determine whether sufficient storage can be realized in detention basins and oxbow storage areas to produce significant flood stage reduction. Specific channel features

and flood plain structures will be evaluated to determine where the majority of flood conveyance improvements or flood damage reduction should be focused.

Within the context of the channel and flood plain changes proposed for the Cache la Poudre River, opportunities for ecosystem restoration and enhancement will be examined. Widening the channel to permit overflows to course through old oxbows and flood plain storage areas provide opportunities to recreate riparian habitat similar to what once existed in the lower Cache la Poudre River, prior to channelization and the dissection of the flood plain with spoil-bank levees. The potential for new habitat will be evaluated in terms of state or regional ecological goals, and where possible, designed to support efforts to encourage the survival of threatened and endangered species.

Opportunities for greater river access and use by local citizens will be explored as flood reduction and ecosystem restoration features are examined. Alternatives evaluated during this effort will be examined for integration with the existing recreational system of parks and trails, with the goal to improve the river corridor as an asset to the well being of the citizens of Greeley.

4.3 SPECIFIC TASKS RELATED TO REACHING DECISION POINT 1

Specific tasks that will be addressed before reaching Decision Point 1 include defining of stage-frequency-damage curves along key river reaches, determining the shape of major historical flood hydrographs, trends in flooding with time and identifying specific channel reaches and storage areas for ecosystem restoration. An economic analysis will be conducted, including the existing conditions expected annual damages for floods of all frequencies. The existing ecosystem will be documented, and a dominant cover-type map developed for the project reach.

If desirable flood damage reduction and ecosystem restoration measures are identified for Decision Point 1, then the study will continue to its conclusion through the process of evaluating the alternatives against the “without project” alternative, comparing the alternatives and selecting a plan. When Decision Point 1 is reached, the scope of the study can be enlarged if desired, to include tributary flood issues, channel stability and other issues that surface during the first part of the feasibility study effort.

More details on the proposed study effort, and the specific tasks to be performed by each member of the team, are provided in the Project Management Plan Appendix A. The following is a summary of specific tasks by each study team member of work to be done to reach the first decision point.

a. **Cultural Resources** – Review of background literature & coordination with State Historic Preservation Office (SHPO).

b. **Biology** –

1. Literature, GIS data & prior studies review.
2. Define baseline ecosystem conditions & develop cover-type maps for specific reaches or areas.
3. Define baseline water quality and fishery conditions.

4. Formulate ecosystem restoration plans from among:
a) Restoration of river meanders, side channels and oxbows.
b) Improvement of riparian and flood plain wetland habitat.
c) Limiting impact of construction on fish and wildlife.

c. **Socioeconomic Studies** -
1. Compile cost information on damages from historical floods.
2. Compile land use & property value data within the 500-year flood plain.
3. Define stage-damage reaches for use with HEC-FDA model.
4. Compute Expected Annual Damages.

d. Real Estate –
1. Data collection & development of baseline maps.
2. Right of entry
3. Preliminary assessment of 200 parcels
4. Fact gathering appraisals

e. Hydrology –
1. Hydrologic data collection – Historical stream and canal discharge records & basin parameters.
2. Review & update flood frequency curves.
3. Evaluate trends in flow & their impact on future frequency curves.
4. Develop low flow volume probability relationships.

f. **Flood Plain** –
1. Configure existing land use data for nonstructural assessment.
2. Conduct nonstructural flood damage reduction assessment.
3. Configure existing water surface profiles for hazard areas.

g. **Hydraulics** –
1. Compile historic flood data including high water marks, gage information and levee & flood plain information.
2. Update bridge information for modeling.
3. Obtain baseline information on levees & spoil banks, including whether they were designed by an engineer.
4. Obtain most recent DTM or TIN files for channels.
5. Convert HEC-2 model to HEC-RAS & calibrate for greater analysis accuracy.
6. Delineate flood boundaries using HEC GeoRAS & ArcView.
7. Evaluate impact of storage areas on flood stage reduction using HEC-RAS.

h. Geotechnical –
1. Evaluate the integrity of the existing levee system.
2. Define geological conditions (surface and subsurface).
3. Develop preliminary plans for alternative levee alternatives for cost analysis.

i. GIS -
1. Definition of best data sources.
2. Organization of data into logical theme groups.

3. Dissemination of data to team members for use.

j. Cost Engineering –

1. Prepare cost estimates of key features of flood damage reduction and ecosystem restoration alternatives.

k. **Plan Formulation** –

1. Coordinate meetings
2. Corps internal reporting & budget process
3. Public involvement.
4. Formulate alternative plans
5. Begin the Advisory Committee / Independent Technical Review process

B. DESCRIPTION OF TASKS AND DETAILED COST ESTIMATES

The tasks and cost estimates are those prepared by the members of Corps team for the work in their areas of expertise. Those estimates and the scopes of work were used to prepare the overall cost estimate and to estimate the in-kind services, jointly with the sponsor.

1.0 CULTURAL RESOURCES

SCOPE OF WORK
CLASS I CULTURAL RESOURCES INVENTORY
FOR A FLOOD DAMAGE REDUCTION & ENVIRONMENTAL
RESTORATION STUDY ON THE CACHE LA POUDRE RIVER,
GREELEY, COLORADO

PURPOSE AND SCOPE

The purpose of this work is to meet the Department of the Army's federal preservation legislation and associated implementing regulations as they relate to cultural resources that may be affected by flood control measures, which may be proposed for a portion of the Cache la Poudre River at Greeley, Colorado. The most pertinent for this investigation are the following: Public Law 74-292, Historic Sites Act of 1935, as amended; Public Law 89-665, National Historic Preservation Act of 1966 as amended; Public Law 91-190, National Environmental Policy Act of 1969 as amended; Public Law 95-341, American Indian Religious Freedom Act; Public Law 101-601, and the Native American Graves Protection and Repatriation Act; implementing regulations 36 CFR Parts 60 and 61, Appendix A; and 36 CFR Part 800.

A. The major focus of this scope is the preparation of an inventory of all known cultural resources, including archeological sites and traditional cultural properties.

B. The work will consist of the following:

1. A review and summary of all cultural resources background literature covering the project area; and

2. Report preparation; and

3. Creation of a GIS shape file and index of the cultural sites enumerated within the report.

4. Coordination:

In accordance with the National Historic Preservation Act (NHPA) and implementing regulations, the SHPO and other interested parties will be consulted to determine if there are any concerns regarding the proposed action. Historic properties in the study area that may potentially be affected by the implementation of the proposed project will be identified. This information will be utilized in the assessment of any potential impacts to historic properties under NEPA, and the results incorporated into the EA. A determination of project effect under NHPA will be included within the document.

For the purposes of this study, cultural resources are defined as prehistoric and historic archeological sites and traditional cultural properties. Cultural resources are defined as any site, building, district, structure, object, data, or material significant in history, architecture, archeology, or culture. Traditional cultural properties can generally be defined as properties that are eligible for inclusion on the National Register of Historic Places because of an association with cultural or spiritual practices and beliefs of a living community that are important in maintaining the continuing cultural identity of the community.

C. Study Area. The study area consists of all lands immediately adjacent to the Cache la Poudre River near Greeley, Colorado, extending approximately from the confluence with the South Platte River and upstream through the town of Greeley and on to a portion of Weld County. The study reach extends approximately 17 miles, flowing south-southeast.

D. The Investigation:

1. Literature and Records Search. Information for the literature and records search shall be obtained from site forms published and unpublished reports, theses, dissertations, and manuscripts available for each site. Individuals known to have knowledge concerning archeological or TCP sites will be consulted to obtain information that may not be available in the written sources. Site location data is restricted distribution and the report should be so marked.

2. Investigation Report. The investigation report, shall detail the work performed and the investigation results. The report shall include:

a. Previous Work. This will contain an enumeration and description of all previous studies relating to archeological sites and TCPs conducted in the study area, name(s) of Principal Investigator(s), dates of the studies, study results, and an overview of the past work.

b. Results. The information provided in this section shall include, but shall not be limited to: site names, site numbers, site types, elevation, a verbal description of the topographic position of the site, site size, condition (discuss the known past, present, or projected impacts such as vandalization), and maps.

3. GIS shape file and index. A shape file and index of all sites identified during the course of the inventory.

All data that is collected on archeological sites and TCPs will be restricted. There will be a restriction on the release of the data to minimize the danger that culturally sensitive sites would be disturbed by looters or untrained curious people and their value as historical records in context diminished or destroyed.

** - Note: No In-Kind Services were determined to be available for this discipline during feasibility by the Corps technical team member responsible for Cultural Resources.

Discussed in Corps - Sponsor conference calls held between August 24 & September 21, 2005.

Verified with Cultural 12 Apr 2005
CULTURAL RESOURCES
Class I Resources Inventory

Task I	Review of Background Literature	$1,500	P 1-3
Task II	Report Preparation	$1,500	P 4-6
Task III	GIS Shape File of CR sites	$2,000	P 4-6
	Subtotal	$5,000	
	S&A 15%	$750	
	ITR 10%	$500	
	TOTAL	$6,250	
	Phases 1-3	$1,688	
	Phases 4-6	$4,563	
	PROJECT TOTAL	**$6,250**	

Summary Cultural Resources Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE AT GREELEY, CO

CULTURAL RESOURCES ASSESSMENT
COST ESTIMATE
(September 2005)
TOTAL

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Review of Background Literature	1,500	
2	GIS Shape File of CR Sites	2,000	
3	Report Preparation	1,500	
	Subtotal	5,000	
4	S&A, QA/QC 15%	750	
5	ITR 10%	500	
	Subtotal Labor	**$6,250**	**$0**

OTHER COSTS

Task	Description	Corps Total Cost	In-Kind Total Cost

		($)	($)
All	Travel Expenses (i.e., vehicle usage fee)	0	
	Subtotal Other	**$0**	**$0**
	Subtotal	**$6,250**	**$0**
	TOTAL COST	**$6,250**	

Summary to Decision Point 1

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE AT GREELEY, CO

CULTURAL RESOURCES ASSESSMENT
COST ESTIMATE
Feasibility Steps 1-3

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Review of Background Literature	1,500	
2	1/4 th of S&A, QA/QC 15%	188	
	Subtotal Labor	**$1,688**	**$0**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
All	Travel Expenses (i.e., vehicle usage fee)	0	
	Subtotal Other	**$0**	**$0**
	Subtotal	**$1,688**	**$0**
	TOTAL COST	**$1,688**	

2.0 ENVIRONMENTAL STUDIES AND FISH & WILDLIFE COORDINATION

A Corps of Engineers senior and junior environmental resources specialist/biologist from Planning Branch, Environmental, Economic and Cultural Section (CENWO-PM-AE) will be assigned to the City of Greeley feasibility study. The biologist(s) will attend required study team meetings. The biologists will be responsible for the conduct of the study in a manner that is in accordance with Corps environmental planning policies and practices, and in a manner that adequately complies with environmental statutes. The

senior biologist will oversee the work of the junior biologist, who will do the majority of the work.

General Scope

It is national policy that fish and wildlife resources conservation be given consideration in the formulation and evaluation of alternative plans. Current planning guidance specifies that the Federal objective of water and related land resources planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, and applicable executive orders. Protecting the Nation's environment is to be provided by mitigation of the adverse effects attributed to alternative plans and through development of alternative plans that include Ecosystem Restoration Benefits. The specific scope below is formatted in such a way as to highlight the Corps' Six-Step Planning Process.

Specific Scope

1.0 Step 1 - Specify Problems and Opportunities

The Biologist will begin a review of existing literature, studies, and other material that identifies specific environmental problems and opportunities that exist in the study area to establish a necessary base of knowledge prior to proceeding with the study. The biologists will also attend initial public and agency scoping meetings to learn their priorities, preferences, and concerns. Significant resources will be preliminarily identified in order that the objectives of the study are properly focused. The biologist will assist the study team in clearly defining planning objectives and planning constraints. Specific, flexible, measurable, realistic, attainable, and acceptable objectives will be developed.

2.0 Step 2 - Inventory and Forecast Without Project Conditions

This task is a description of the without-project condition; the baseline from which alternative plans' benefits are measured and impacts are assessed. The impetus of this task is to establish the relationship of the problems that exist in the study area with significant resources currently being affected, and to forecast the most likely scenario that will occur in the future without a federal project. Appropriate coordination, literature review, site visits, and studies will be conducted throughout the planning process to determine this information.

If not already available, dominant vegetation will be sampled and a cover-type map developed for specific project reaches/areas. It was assumed that there would be six different specific project areas – three for flood damage reduction and three for ecosystem restoration. Dominant cover types would be delineated on a copy of an aerial photo of each project area and "ground-truthed". An assessment methodology that involves outputs in acres of stream habitat, riparian habitat, wetland habitat, and buffering upland habitat will likely be used. The method must also involve outputs in quality. The resulting assessment will likely result in acres of habitat type multiplied by

a quality index ranging from poor to excellent. A team of Corps/sponsor/agency/interest group biologists will be used to develop the quality index.

Also, special interviews may be necessary to determine how water quality issues are being addressed, or planned to be addressed. The existing and future water quality will be related to the existing and future expected fishery. Water quality will need to be looked at to a point where we are able to comfortably assume a fishery would be able to exist and use any restored aquatic habitat. Water quality is an important component of ecosystem structure and water quality improvement can be considered as an output of an ecosystem restoration project. However, projects or features that would result in treating or otherwise abating pollution problems caused by other parties where those parties have, or are likely to have a legal responsibility for remediation or other compliance responsibility shall not be recommended for implementation. It appears that there could be water quality improvement output for this project, but it will not be a major output; rather it will be more of an incidental output, incidental to wetland improvement and creation.

3.0 Step 3 - Formulate Alternative Plans

The focus of this task will be to identify alternative plans that will likely help alleviate anticipated problems with respect to the significant resources of the area. Alternative Plans will be formulated in a way to maximize benefits to both economic development and ecosystem restoration accounts.

The biologist will assist in the identification of ecosystem restoration measures that can be implemented at a specific geographic site to address one or more planning objectives, and then the formulation of alternatives from different mixes of the ecosystem restoration measures. Some iterative reformulation is also likely to better achieve a planning objective or stay within the limits of a constraint.

The biologist will also give fish and wildlife conservation consideration in the formulation of flood damage reduction alternatives.

The biologist will assist in a meeting with sponsor and interested agencies (FWS, CDOW, and EPA) during the development of alternatives.

4.0 Steps 4 thru 6 - Evaluate Effects Compare Alternative Plans, and Select Federal Plan

The biologist will forecast the most likely with-project environmental conditions expected under each alternative, and then compare each with-project conditions to the without-project conditions and document the differences between the two.

Environmental outputs of each ecosystem restoration alternative will be determined utilizing the assessment methodology used in determining the without project condition in step 2 above. The biologist will then assist in showing through cost effective analysis that an alternative restoration plan’s outputs cannot be produced more cost-effectively

by another alternative. The biologist will meet with the sponsor and interested agencies during the determination of outputs.

Statements of significance of ecosystem outputs will be prepared for alternative plans in order to provide qualitative information to help decision makers evaluate alternatives. The environmental impacts of each flood damage reduction alternative will also be determined.

5.0 NEPA / Environmental Documentation

In accordance with the National Environmental Policy Act and implementing regulations, preparation of an EA will be necessary. A detailed assessment will be written that identifies environmental impacts, beneficial and adverse, of the proposed action. Based on the identified impacts and concerns, reasonable alternatives to the proposed action would be developed. The EA will be integrated into the feasibility report. A Draft Feasibility Report/EA will be circulated for public review and comment before a Final Feasibility Report/EA is prepared.

In accordance with the Fish and Wildlife Coordination Act, the FWS and the Colorado Division of Wildlife will be requested to identify fish and wildlife concerns and available information and provide their views concerning the significance of fish and wildlife resources. Depending on the significance of issues at hand, a coordination act report may be necessary. It was assumed that our environmentally sensitive approach would result in the need for only a planning aid letter or a very simple coordination act report for the purpose of this estimate. The coordination act report would provide information that would allow consideration of the conservation of wildlife resources with the view of preventing loss of and damages to such resources as well as providing for development and improvement in connection with water resources development. Full consideration must be given to reports and recommendations furnished. The Corps is to provide funding to the FWS for their activities pursuant to this law. The funding that would be provided to the FWS by the Corps would be from the cost-shared project study funds.

In accordance with the Endangered Species Act, the FWS will be requested to provide information on any federally listed threatened or endangered species, in the project area, that may potentially be affected by the implementation of the proposed project. It is anticipated that the preparation of a biological assessment will be necessary as well. The biological assessment will evaluate the effects of the proposal on federally listed threatened or endangered species that may exist in the area. The biological assessment will for the most part be an extraction of text from the EA. Special studies may be needed to determine the actual presence or absence of listed species. In the preparation of the cost estimate, it was assumed that a single survey of each of the six specific project areas may be necessary to specifically look for a species or two. A week for surveys, a week to write up survey results, was assumed in that estimate.

In accordance with the Clean Water Act, preparation of a 404(b) (1) ecological evaluation is anticipated to be necessary. This evaluation will determine the potential effects of any proposed discharges of fill material of any alternatives on the physical, chemical, and biological components of the waters of the US, including wetlands.

Sufficient mitigation will be formulated to ensure that either the recommended plan or the NED plan will not have more than negligible adverse impacts on fish and wildlife resources. An incremental cost analysis will be performed to display variation in costs, and to identify and describe the least cost mitigation plan, excluding conservation measures that are formulated for conserving any impacted federally listed endangered and threatened species. An abbreviated HEP analysis or equivalent will be performed for mitigation measures, excluding conservation measures that are formulated for conserving any impacted federally listed endangered and threatened species. A mitigation monitoring program will also be developed.

A Draft EA/Feasibility Report will be completed, circulated to the public and agencies, and responses will be prepared for public comments received from circulation of the Draft Feasibility Report/EA. The biologists will attend the public meetings. Appropriate changes/revisions will be made in the text to address substantive comments. A FONSI will be prepared if it is determined that no significant impacts are anticipated.

6.0 Habitat / Species Surveys

Wildlife, fisheries, and habitat surveys may be needed to provide baseline data on existing project area conditions. In addition to the listed species survey identified above, it was also assumed that another two-week effort would be needed for wetland delineation or other special habitat delineation. This baseline data is necessary for subsequent impact assessments that will predict changes to existing conditions that could result from the various alternatives under future with-project conditions. These studies would be used, if necessary, to make determinations on how construction activities and habitat changes would affect endangered and threatened species are made. The exact composition and extent of environmental surveys is a function of the range of alternative plans and the availability of data that must be evaluated in detail as part of plan formulation. The estimated cost of environmental surveys presented in the PMP identifies the probable upper limit of costs. Individual studies would primarily include habitat surveys where species of concern may be found, and/or surveys for wetland delineation where project footprint impacts or habitat enhancement/restoration may occur.

The biologist will prepare the scope of work and government cost estimate for the surveys to be contracted, will negotiate the contract, and will oversee the completion of the work.

Modified Scope of Work to Define Phase 1
Greeley, Colorado
Updated April 2005

The following tasks listed below reflect the initial three steps of the planning process. In order to achieve project compliance with all applicable environmental laws and regulations, and completeness in the preparation of a draft and final integrated NEPA/feasibility report, all six steps of the planning process must be accomplished prior to report finalization, as well as any specific compliance requirements. Only general

wildlife, fisheries, and habitat surveys will be conducted with this modified scope of work. Special detailed surveys of affected wetlands and any affected species of concern will become necessary for subsequent impact assessment and compliance requirements.

1.0 Step 1 - Specify Problems and Opportunities

Staff Biologists will review existing literature, studies, and other material that will highlight specific problems and opportunities that exist in the study area to establish a necessary base of knowledge prior to proceeding with the study. Staff biologists will also attend initial public and agency scoping meetings to unearth constraints and opportunities to be pursued by the study. Significant resources will be identified in order that the objectives of the study are properly focused. Specific, flexible, measurable, realistic, attainable, and acceptable objectives will be developed and refined throughout the planning process.

2.0 Step 2 - Inventory and Forecast without Project Conditions

This task is a description of the without-project condition; the baseline from which alternative plans' benefits are measured and impacts are assessed. The function of this task is to establish a relationship between the problems that exist in the study area with significant resources currently being affected. Staff Biologists will work with City Staff to perform a comprehensive, qualitative analysis that will identify environmental opportunities within the study area including but not limited to orthophotography, GIS mapping, and ground surveys. Areas identified as having potential for varying levels of restoration success will be recorded and given a qualitative score based on hydrology, soils, current vegetative cover, urban impacts, and other environmental attributes. Areas having potential for impacts from flood control measures will also be recorded and given a qualitative baseline score.

A trends analysis and a forecast of the most likely scenario to occur in the future without a federal project will be made. Appropriate coordination, literature review, site visits, and studies will be conducted throughout the planning process to determine this information. The existing and future water quality will be related to the existing and expected future fishery.

3.0 Step 3 - Formulate Alternative Plans

The purpose of this task will be to identify alternative plans that will likely help alleviate the adverse conditions with respect to the significant resources of the area. Alternative Plans will focus on maximizing benefits to both economic development and ecosystem restoration features.

Ecosystem restoration alternatives will be formulated from different mixes of environmental restoration measures. Measures are expected to include restoration of river meanders, side channels, oxbows, wetlands, and riparian vegetation and habitat. Some iterative reformulation will also likely be performed to better achieve a planning objective or stay within the limits of a constraint.

Fish and wildlife impact avoidance and conservation will be given consideration in the formulation of flood damage reduction alternatives.
A meeting with the sponsor and interested agencies would be attended during the development of alternatives.

** - Note: No In-Kind Services were determined to be available for this discipline during feasibility by the Corps technical team responsible for Environmental Studies / Biology / Ecosystem Restoration. Discussed in Corps - Sponsor conference calls held between August 24 & September 21, 2005.

	Cost Estimate Furnished by Environmental 7 April 2005					
City of Greeley Draft Environmental Study Elements and Draft Cost Estimate (in house)						
	Task Items	**Hrs.**	**Jr. Bio x $68**	**Hrs.**	**Sr. Bio x $117**	**Non-Labor Items**
	1.0 Specify Problems and Opportunities	**61**	**$4,148**	**24**	**$2,808**	**$1,336**
	Preliminary Review of Existing Literature	10	$680	2	$234	
	Attend Public and Agency Scoping Meetings	16	$1,088	16	$1,872	
	Identify Sponsor/Agency/Public Concerns	10	$680	2	$234	
	Identify Significant Environmental Resources	5	$340	2	$234	
	Identify Objectives and Constraints to Address Significant Resources and Issues	20	$1,360	2	$234	
	Travel (2 biologists 2 days travel - $350 airfare/$159 per diem)					$1,336
	2.0 Inventory and Forecast Without Project Conditions	**260**	**$17,680**	**48**	**$5,616**	**$1,145**
	Evaluate Current and Future Without Environmental Conditions, including a habitat quality index	200	$13,600	40	$4,680	
	Develop Cover-Type Maps For Specific Reaches/Areas	40	$2,720	4	$468	
	Relate Existing/Future Water Quality to Fishery	20	$1,360	4	$468	
	Travel (1 biologists 5 days travel - $350 airfare/$159 per diem)					$1,145
	3.0 Formulate Alternative Plans	**136**	**$9,248**	**18**	**$2,106**	**$509**
	Assist in Formulation of Ecosystem Restoration Measures and Alternatives, and Iterative Reformulation	100	$6,800	10	$1,170	
	Give Fish and Wildlife Conservation Consideration in Formulation of Flood Damage Reduction Alternatives	36	$2,448	8	$936	
	Travel (1 biologists 1 days travel - $350 airfare/$159 per diem)	0	$0	0	$0	$509
	4.0 Evaluate Effects, Compare Alternative Plans, and Select Federal Plan	**200**	**$13,600**	**28**	**$3,276**	**$1,145**
	Forecast most likely with-project environmental conditions under each alternative	40	$2,720	5	$585	
	Compare with-project conditions to without-project conditions and document the differences	40	$2,720	5	$585	
	Determine environmental outputs of each ecosystem restoration alternative and assist in cost effectiveness / incremental cost analysis	40	$2,720	10	$1,170	

	Determine environmental impacts of each flood damage reduction alternative	80	$5,440	8	$936	
	Travel (1 biologists 5 days travel - $350 airfare/$159 per diem)					$1,145
5.0 NEPA/Environmental Documentation		**396**	**$26,928**	**73**	**$8,541**	**$18,336**
	Preparation of Draft Environmental Assessment, including statements of significance of ecosystem outputs for alternative plans	160	$10,880	24	$2,808	
	Obtain Fish and Wildlife Coordination Act Report from FWS ($7,000 transfer of funds to FWS).	8	$544	2	$234	$7,000
	Preparation of and Submittal of Biological Assessment to FWS	40	$2,720	6	$702	
	Prepare Clean Water Act 404(b)(1) Evaluation.	40	$2,720	6	$702	
	Consider and Evaluate FWS and CDOW recommendations.	40	$2,720	6	$702	
	Mitigation planning, including monitoring	60	$4,080	8	$936	
	Attend Public Meetings	16	$1,088	16	$1,872	
	Consider public comments and prepare final EA planning document	24	$1,632	4	$468	
	FONSI Preparation	8	$544	1	$117	
	Travel (2 biologists 2 days travel - $350 airfare/$159 per diem)					$1,336
	ITR (Independent Technical Review by other Corps District)					$10,000
6.0 Surveys		**80**	**$5,440**	**12**	**$1,404**	**$40,000**
	Preparation of Scope of Work, Government Cost Estimate, Contract Negotiation, and Contract Oversight	80	$5,440	12	$1,404	
	Contract Surveys for wetlands/species of concern		$0		$0	$40,000
Column Totals		**1133**	**$77,044**	**203**	**$23,751**	**$62,471**
Total Estimated Cost						**$163,266**

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE AT GREELEY, CO
ENVIRONMENTAL STUDIES
COST ESTIMATE
(November 2005)
TOTAL

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	**Specify Problems and Opportunities**	**6,956**	
1.1	Preliminary Review of Existing Literature		
1.2	Attend Public and Agency Scoping Meetings		
1.3	Identify Sponsor/Agency/Public Concerns		

1.4	Identify Significant Environmental Resources	
1.5	Identify Objectives and Constraints	
2	**Inventory and Forecast Without Project Conditions**	**23,296**
2.1	Evaluate Current and Future w/o Environmental Condit.	
2.2	Develop Cover-Type Maps for Specific Reaches / areas	
2.3	Relate Existing / Future Water Quality to Fishery	
3	**Formulate Alternative Plans**	**11,354**
3.1	Analyze Alternatives	
3.2	Integrate Fish & Wildlife Conservation in Flood Control	
4	**Evaluate Effects, Compare Alternative Plans & Select**	**16,876**
4.1	Forecast most likely w/o project environmental conditions.	
4.2	Compare with-project condit to w/o project cond.	
4.3	Determine Environmental Outputs of each alternative	
4.4	Determine environmental Impacts of each FD alternative	
5	**NEPA Environmental Documentations**	**35,469**
5.1	Preparation of Draft EA	
5.2	Obtain FWCA Report from FWS	
5.3	Preparation & submittal of Biological Assessment to FW	
5.4	Prepare Clean Water Act (404b)(1) Evaluation	
5.5	Consider & Evaluate FWS & CDOW Recommendations	
5.6	Mitigation Planning including monitoring	
5.7	Attend Public Meetings	
5.8	Consider Public Comments & prep final EA planning Doc FONSI	
5.9	Preparation	
6	**Surveys**	**6,844**
	Preparation of Scope of Work, Government Cost Estimate.	
7	**ITR (by other Corps District**	**10,000**
	Subtotal Labor	**$110,795**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
All	Travel Expenses (i.e., vehicle usage fee)	5,471	
6	Contract Surveys for wetlands / Species of Concern	40,000	
5	F&W Coordination Act Report From FWS	7,000	
	Subtotal Other	**$52,471**	**$0**
	Subtotal	**$163,266**	**$0**
	TOTAL COST	**$163,266**	

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE AT GREELEY, CO
ENVIRONMENTAL STUDIES
COST ESTIMATE
Feasibility Steps 1-3

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	**Specify Problems and Opportunities**	**6,956**	
1.1	Preliminary Review of Existing Literature		
1.2	Attend Public and Agency Scoping Meetings		
1.3	Identify Sponsor/Agency/Public Concerns		
1.4	Identify Significant Environmental Resources		
1.5	Identify Objectives and Constraints		
2	**Inventory and Forecast Without Project Conditions**	**23,296**	
2.1	Evaluate Current and Future w/o Environmental Condit.		
2.2	Develop Cover-Type Maps for Specific Reaches / areas		
2.3	Relate Existing / Future Water Quality to Fishery		
3	**Formulate Alternative Plans**	**11,354**	
3.1	Analyze Alternatives		
3.2	Integrate Fish & Wildlife Conservation in Flood Control		
	Subtotal Labor	**$41,606**	

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
8	Travel Expenses (i.e., vehicle usage fee)	2,990	
	Subtotal Other	**$2,990**	**$0**
	Subtotal	**$44,596**	**$0**
		TOTAL COST	**$44,596**

3.0 SOCIOECONOMIC STUDIES

SOCIOECONOMICS SCOPE OF WORK

An economic analyst from the Corps of Engineers, Omaha District's Environmental, Economics, and Cultural Resources Section will be assigned to the cost-shared portion of the feasibility study for the Greeley, Colorado GI project. The economic analysis will use the data previously developed during the initial assessment portion of the feasibility study to the extent possible. The economic analyst will attend required study team meetings and will conduct the study in a manner that is in accordance with Corps planning policies and practices.

Task 1: Data Collection and Evaluation

Collect and Evaluate Socioeconomic Data (Phase I). The economic analyst will compile socioeconomic data concerning historic, current, and projected population; income; employment; and unemployment rate from data available through the U.S. Census Bureau and the appropriate State and local agencies. Local officials will provide any existing comprehensive plans and other input regarding zoning and land use; and the location, timing, and nature of future development (including infill and redevelopment).

Collect Data on Public Damages and Emergency Costs (Phase I). The economic analyst will coordinate with the non-Federal sponsor(s) regarding data on previous flood damages to structures and contents; data on damages previously experienced for roads, bridges, sewers, and other public facilities; costs of emergency flood fighting, evacuation, temporary relocation, cleanup, and public administration costs of disaster relief; and information about emergency operations plans. To account for these public damages in the Corps analysis, the economic analyst will determine the percentage they constitute of the historic damages to structures and contents; or use the percentage of structure, content, and externality damage that was determined by the Corps in a previous flood damage survey in the Omaha District.

Collect Sample of Land Use Data for Structures, Contents, and Externalities (Phase I). Considerable land use information has already been provided from a previous study and from the Sponsor; however, some additional work is required. A “windshield” land-use survey will be conducted for a stratified sample of structures within the 0.002 percent chance exceedance flood plain. A “windshield” land-use survey will be conducted on a stratified sample of structures within the 0.002 percent chance exceedance flood plain. A stratified sample of the land use is necessary to ensure that the data collected from the windshield survey is consistent with land use data collected from the assessor records. It is possible that the land use data collection could be performed by Greeley’s GIS department and other local officials as in-kind credit, however, coordination between the Corps economist and local officials will first be necessary to determine the requirements of this task. In addition, it will be necessary to collect any additional land use data not collected during the May 2002 Floodplain Land Use Data Collection Study, including land uses for which damages would be expected to be induced by any project alternatives. The non-Federal Sponsor may also be eligible to receive in-kind credit for the additional land use collection. Each structure will be located and keyed to the stationing along the Platte River. Ground elevations for all structures in the 500-year flood plain will be obtained using the GIS-based ground elevations displayed on aerial

photography. First floor elevations will be obtained using a hand level and the data collected during the land use survey will be coded for input into HEC-FDA. Uncertainties associated with first floor and ground elevations, structure and content values, and damage curves will be quantified and inserted in the model. In addition, modifications of the existing conditions land use data will be prepared. These will include additions, deletions, and modifications of land uses reasonably expected to occur in the future under with- and without-project conditions, and under a nonstructural alternative, based on input from local officials regarding future land use zoning and projected location, timing, and nature of future development and redevelopment. The land uses will be divided into reaches based on expected alignments of various identified alternatives to identify areas which may be protected, or receive induced damages, under various structural or nonstructural alternatives. The economic data in combination with hydrologic and hydraulic data inputted into the HEC-FDA model will be used to conduct Monte Carlo simulations to obtain expected annual damages under existing without-project conditions and equivalent annual damages under future-with and -without project conditions.

Each structure will be located and keyed to the stationing along the Cache la Poudre River. Structure type and use will be categorized and keyed to the depth-damage relationships. The depreciated replacement value of each sampled structure will be updated to current price levels based on its estimated size, structural elements, use, depreciation, and square foot cost (keyed to RS Means for residences and Marshall and Swift for nonresidential structures). The content value of the residential structures will be 50 percent of the structure value. The percent to be used for the content value of nonresidential structures will be based on the type of structure usage. The value of features of the property external to the main structure, such as materials or equipment stored or displayed outside, parked vehicles, detached garages or storage sheds and their contents, and landscaping (which are referred to collectively as externalities) will also be determined. In addition, the economist will collect any additional land use data necessary not collected during the reconnaissance phase, including land use for which damages would be expected to be induced by any project alternatives.

Update all Land Use Collected From Reconnaissance Phase (Phase I). The depreciated replacement value for the structures within the 0.002 percent chance exceedance floodplain will be calculated based on the most current assessed value of the structures. First floor elevations and ground elevations will be updated based on 1988 datum. The Floodplain Land Use Data Collection Study Report was completed by Icon Engineering, Inc. in May 2002. The study utilized existing topographic mapping provided by the City of Greeley from their Geographic Information System (GIS) data base. All planimetric data was digitized from aerial photographs dated 1987, 1992, 1995 and 2000. In addition to the topography, the mapping also included floodplain data information that was developed by the Corps in July of 2001. After a telephone conference with Greeley officials on August 26, 2005, this data is believed to be in 1929 NGVD and will need to be converted to 1988 datum for the cost-shared portion of the Feasibility Study. The City of Greeley may also receive in-kind credit for gathering the most current assessor and economic data required for all structures in the 500-year flood plain. This includes gathering parcel data, land use type, external construction type, ground elevation (converting ground elevation data for all structures from 1929 NGVD to 1988 datum), first floor elevation, size of structure, number of buildings in parcel, condition of structure, and content and externality data

for all structures in the 500-year flood plain. A further detailed explanation of the required data can be communicated between the Corps economist and the local officials who will be performing the in-kind services. Structure stationing will be assigned to each structure based on cross-section data along the Cache la Poudre River.

Task 2: Flood Damage Model

Modify HEC-FDA with R&U Model (Phase I). The Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) model with risk and uncertainty (R&U) will be used to assess flood damages to the City of Greeley. The economist will modify the HEC-FDA model to develop a study configuration specific for the Greeley study.

Setup and Input Data into HEC-FDA model (Phase I). The economist will input the land use data collected in Task 1 into the HEC-FDA program. Uncertainties associated with first floor and ground elevations, structure and content values, and damage curves will also be identified and quantified within the HEC-FDA model for each alternative.

Task 3: Flood Damage Reduction Alternatives

Compute EADs under with-, without-, and future-without project conditions (Phase I). A plan will be developed for each alternative considered in the analysis. Each plan may require adjustments to the water surface profiles and the structures included in the floodplain to reflect proper conditions under each alternative. The HEC-FDA model will then be used to compute the expected annual damages (EAD) to structures, contents, and externalities for with-, without-, and future-without project conditions.

Task 4: Compute National Economic Development (NED) Benefits

Determine flood benefits for structures/contents for each alternative (Phase I). The economist will determine the flood benefits for structures/contents/externalities for each alternative based on the output provided by the HEC-FDA model.

Determine NFIP Administrative Cost Avoidance Benefits of Alternative Plans (Phase I). From the model output, the number of homes in the 100-year flood plain under without-project conditions will be determined. The number of homes in the 100-year flood plain will then be determined for each alternative plan. This number of homes will be multiplied by the current National Flood Insurance Program (NFIP) annual per-policy administrative costs cited in the Economic Guidance Memorandum (EGM) for the current Fiscal Year to determine annual NFIP administrative costs under without-project conditions. This number of homes will be the difference between the number of homes in the 100-year flood plain under without-project conditions and each alternative plan will be multiplied by the current NFIP per-policy administrative costs cited in the EGM for the current Fiscal Year to determine annual NFIP administrative costs reduced under each plan. The difference in the annual NFIP administrative cost under without-project and each alternative plan is considered a cost avoidance benefit.

Determine Benefits of Public Damage/Emergency Cost Reduction (Phase I). The public facility damages and emergency, evacuation, and cleanup costs will be calculated as a percentage of the EAD.

Evaluate Possible Recreation Benefits (Post-Phase I). If in agreement with the non-federal sponsors and consistent with Federal interest, the Corps NED analysis will consider any opportunities, which, the project affords for outdoor recreation. The economist will perform a recreation analysis, using the most appropriate method for considering recreational benefits.

Benefit-Cost Analysis (Phase I). The economic analyst will calculate the flood damages and annual benefits, categorized by type, for each alternative that was not eliminated during plan formulation. Based on the Micro-Computer Assisted Cost Estimating System (M-CACES) project costs and schedule of expenditures provided by the cost estimator and project manager, using current interest rates and a project life consistent with ER1105-2-100, the economic analyst will calculate the Interest during Construction (IDC) for these alternatives. Using annual benefits and costs based on price levels for the same month and year, the net annual benefits and the benefit-cost ratio will be computed for these alternatives.

Task 5: Evaluate National Ecosystem Restoration (NER) Plans.

Coordinate with the environmental team (All Phases). The economic analyst will coordinate with the environmental team tasked to this study in order to determine possible ecosystem restoration plans.

Setup/input data of ecosystem restoration alternatives into IWR-Plan or selected environmental model (Phase I). The economic analyst will setup and input data for the preliminary ecosystem restoration alternatives into the IWR-Plan model or another selected environmental model. The model will be used to perform an incremental cost analysis to assist in identifying the NER plan.

Screening of preliminary alternative plans (Phase I). The economist, in coordination with the environmental team, will screen the preliminary ecosystem restoration plans to determine the most cost effective plans.

Evaluation and comparison of alternative plans for determination of National Ecosystem Restoration Plan(s) (Post-Phase I). Of the most cost effective plans, the economist along with the environmental team will evaluate and compare alternative plans to determine the alternatives that are the most efficient in production of outputs (best NER plans).

Task 6: Formulate and Evaluate Combined Flood Damage Reduction and Ecosystem Restoration Plans.

Formulation of preliminary combined alternative plans (Phase I). The economist, in coordination with the Project Development Team, will formulate an array of combined alternative plans that address the primary purpose of the study.

Screening of preliminary combined alternative plans (Phase I). The economist, in coordination with the PDT, will screen the preliminary combined alternative plans against four planning criteria, completeness, effectiveness, efficiency and acceptability.

Analysis of combined alternative plans (Post-Phase I). The economist, in coordination with the PDT, will perform an analysis of each combined plan including a description of its features, accomplishments, uncertainties, effects, operation, maintenance, repair, replacement and rehabilitation (OMRR&R) requirements, and costs.

Evaluation and comparison of combined alternative plans (Post-Phase I). The economist, in coordination with the PDT, will perform a trade-off analysis to be used to help identify the best Combined Plan to be further considered. This includes developing a method, which can be used to provide a comparison between the cost-effective plans. This includes performing an incremental cost analysis to identify the plans that provide the greatest increase in outputs for the least increase in cost and have the lowest incremental cost per unit of output relative to the other cost effective plans. This also includes, where applicable, a separable cost-benefit analysis in accordance with ER1105-2-100.

Task 7: Cost Allocations

Allocate Costs (Post-Phase I). The economist will allocate costs to the Project if the Project is a multipurpose project.

Task 8: Cost Apportionment

Apportion Costs (Post-Phase I). The economist will assign the Project costs to the appropriate parties in accordance with current cost-sharing policy.

Task 9: Financial Analysis of Sponsor

Prepare financial analysis (Post-Phase I). The potential non-Federal sponsors will provide a Statement of Financial Capability (information regarding their tax base and structure that demonstrates their capability of providing the non-Federal share of project costs, and a Financing Plan that includes the potential funding mechanisms available to meet their cost-sharing obligations on schedule. The economic analyst will work with the non-Federal sponsors in the development of the Financing Plan, providing the appropriate and latest guidance on how to prepare the Plan, the necessary project cost estimates, and the construction schedule. The economic analyst will use the Statement of Financial Capability and the Financing Plan to prepare a Financial Analysis assessing the non-Federal sponsor's ability to provide its share of project funding.

Task 10: Feasibility Report Preparation

Prepare narrative, tables for draft preliminary report & socioeconomic appendix (Post-Phase I). The economic analyst will prepare narratives and tables for the draft report and draft socioeconomics appendix. The report narrative will include identification and significance assessment of potential socioeconomic impacts of the recommended project.

Prepare revisions for final report & appendix (Post-Phase I). The economic analyst will respond in writing to individual comments if deemed appropriate by the project manager. The draft report and appendix will be revised to a final report and appendix based on supervisory review and on public, agency, and in-house QA/QC comments.

Task 11: Coordination

Coordinate with others and Attend In-House Meetings (All Phases – cost estimate allocates cost by phase). The economist will meet with others on related task activities as well as attend in-house team meetings.

Task 12: Public Involvement

Attend meeting with sponsor (Post-Phase I). The economist will attend any necessary meetings with the sponsor.

Prepare for and attend public meeting (Post-Phase I). The economist will attend any scheduled public meetings.

Review and address socioeconomic comments from meeting with sponsor/public (Post-Phase I). The economic analyst will respond in writing to comments made at meetings by the sponsor or public if deemed appropriate by the project manager.

Task 13: Quality Assurance/Quality Control

Supervisory review and comments for QA/QC report process (Post-Phase I). It is assumed that QA/QC would be done in-house. Supervisory review and comments will be performed for quality assurance and quality control.

Respond to review comments from internal review (Post-Phase I). The economist will respond to comments suggested during the internal review.

Task 14: Independent Technical Review (ITR)

ITR outside district (Post-Phase I). An Independent Technical Review will be performed on the socioeconomic analysis outside of the Omaha district.

Respond to review comments from ITR (Post-Phase I). The economist will respond to comments from the ITR.

Economics Cost Estimate

	Task Name, Description, and Scope	Phase	Effort (Hrs)	Cost /hr ($)	Task Cost ($)	Data/Info Needed, or Completion of Tasks Required by Others
1	**Data Collection & Evaluation**		**96**		**$ 6,336**	
	Collect & evaluate city/county socioeconomic data	Phase I	16	66	$ 1,056	Need city comprehensive plan
	Collect data on public damages % emergency costs	Phase I	16	66	$ 1,056	
	Collect a stratified sample of land use for structure/content/externalities	Phase I	24	66	$ 1,584	

	Update all land use collected from reconnaissance phase	Phase I	40	66	$	2,640	
2	**Flood Damage Model**		**96**		**$**	**6,336**	
	Modify HEC-FDA Model	Phase I	40	66	$	2,640	
	Setup and input data into HEC-FDA model	Phase I	56	66	$	3,696	
3	**Flood Damage Reduction Alternatives**		**120**		**$**	**7,920**	
	Without Project Conditions						
	Compute Expected Annual Dmgs (EAD) wout-project	Phase I	24	66	$	1,584	
	Future Without Project Conditions						
	Compute Expected Annual Dmgs (EAD) with project	Phase I	16	66	$	1,056	
	Levee Set Backs/Bridge Replacements/ Channel Improvements/ Off Channel Storage/Relocations						Includes developing a new plan for each alternative, adjusting WSP and structures included in floodplain.
	Compute EAD for each with-project alternative.	Phase I	80	66	$	5,280	
4	**Compute NED Benefits**		**188**		**$**	**13,344**	
	Determine flood benefits for structures/contents for each alternative	Phase I	40	66	$	2,640	
	Determine NFIP admin cost avoidance benefits of alternative plans	Phase I	8	66	$	528	Need # of structures removed from 100-yr floodplain
	Determine benefits of public damage/emergency cost reduction	Phase I	8	66	$	528	Use CENWO standard 11%+5.5%=16.5% if historic data "na"
	Evaluate possible recreation benefits	Post-Ph I	60	66	$	3,960	
		Post-Ph I	24	105	$	2,520	
	Benefit-Cost Analysis, net benefits of alternative plans	Phase I	48	66	$	3,168	Cost includes calc. IDC and OMRR&R
5	**Evaluate National Ecosystem Restoration (NER) Plans**		**160**		**$**	**10,560**	
	Coordination with environmental team	Phase I	20	66	$	1,320	
		Post-Ph I	20	66	$	1,320	
	Setup/input data of ecosystem rest. alternatives into IWR-Plan or selected environmental model	Phase I	80	66	$	5,280	
	Screening of preliminary alternative plans	Phase I	8	66	$	528	
	Evaluation and comparison of alternative plans	Post-Ph I	32	66	$	2,112	
6	**Formulate and Evaluate Combined Flood Damage Reduction & Ecosystem Restoration Plans**		**290**		**$**	**19,140**	May require HQ staff to make visit to Omaha to assist in trade-off analysis if combined plan is pursued.
	Formulation of preliminary combined alternative plans	Phase I	40	66	$	2,640	
	Screening of preliminary combined alternative plans	Phase I	40	66	$	2,640	
	Analysis of combined alternative plans	Post-Ph I	110	66	$	7,260	
	Evaluate & compare of combined alternative plans	Post-Ph I	100	66	$	6,600	
7	**Cost Allocations**		**80**		**$**	**5,280**	
	Allocate costs if multipurpose project	Post-Ph I	80	66	$	5,280	
8	**Cost Apportionment**		**40**		**$**	**2,640**	

	Apportion cost to appropriate parties	Post-Ph I	40	66	$ 2,640	Assume coordination meeting with PM and/or sponsor
9	**Financial Analysis of Sponsor**		**16**		**$ 1,056**	
	Prepare financial analysis	Post-Ph I	16	66	$ 1,056	Shared task with PM
10	**Feasibility Report Preparation**		**160**		**$ 10,560**	
	Prepare narrative, tables for draft preliminary report & socioeconomic appendix	Post-Ph I	80	66	$5,280	
	Prepare revisions for final prelim. report & appendix	Post-Ph I	80	66	$5,280	
11	**Coordination**		**64**		**$ 4,224**	
	Coordinate with others (ED-H re outputs, & results of HEC-FDA)	Phase I	16	66	$ 1,056	Coordinate with H&H on HEC-FDA input & output data, NED/NER analysis, separable costs
		Post-Ph I	16	66	$ 1,056	
	Attend in-house meetings	Phase I	16	66	$ 1,056	
		Post-Ph I	16	66	$ 1,056	
12	**Public Involvement**		**48**		**$ 3,168**	
	Attend meeting with sponsor	Post-Ph I	16	66	$ 1,056	
	Prepare for and attend public meeting	Post-Ph I	16	66	$ 1,056	
	Review & address socioeconomic comments from meeting w/sponsor	Post-Ph I	16	66	$ 1,056	
13	**Quality Assurance/Quality Control**		**76**		**$ 7,356**	
	Supervisory review & comments for QA/QC report process	Post-Ph I	60	105	$ 6,300	
	Respond to review comments from internal review	Post-Ph I	16	66	$ 1,056	
14	**Independent Technical Review**		**64**		**$ 5,472**	
	ITR outside district	Post-Ph I	32	105	$ 3,360	
	Respond to review comments from ITR	Post-Ph I	32	66	$ 2,112	
	Additional: Travel Cost				**$ 1,380**	
	Travel includes 1 trip - site visit for land use surveying Air Fare (1 Roundtrip flight Omaha to Denver)	Phase I			390	
	Per Diem	Phase I			150	
	Auto Rental	Phase I			150	
	Travel, 1 trip - one sponsor meeting/public meeting Air Fare (1 Roundtrip flight Omaha to Denver)	Post-Ph I			390	
	Per Diem	Post-Ph I			150	
	Auto Rental	Post-Ph I			150	
			(hours)			
	Subtotal Phase I		**636**		**$ 42,666**	
	Subtotal Post-Phase I		**862**		**$ 62,106**	
	Total		**1,498**		**$ 104,772**	

Kara M. Reeves Date
Economist

Candace M. Gorton Date
Chief, Environmental, Economics,
and Cultural Resources Section
Planning Branch

Note that Total In-Kind Services were negotiated to be $3960 on 26 August 2005 for Economics due to a lower in-kind services hourly rate, thus the tabulated values were proportionately reduced for tasks included in the summary table that follows.

Summary Economics Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE AT GREELEY, CO
Updated September 2005
ECONOMIC STUDIES
COST ESTIMATE
(September 2005)
TOTAL

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Data Collection & Evaluation	6,336	3,169
2	Flood Damage Model	6,336	0
3	Flood Damage Reduction Alternatives	7,920	0
4	Compute NED Benefits	13,344	453
5	Evaluate National Ecosystem Restoration Plans	10,560	
6	Formulate & Evaluate Combined NED & NER plans	19,140	
7	Cost Allocations	5,280	0
8	Cost Apportionment	2,640	
9	Financial Analysis of Sponsor	1,056	226
10	Feasibility Report Preparation	10,560	
11	Coordination	4,224	
12	Public Involvement	3,168	112
13	S&A, QA/QC	7,356	
14	ITR	5,472	
	Subtotal Labor	**$103,392**	**$3,960**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
All	Travel Expenses (i.e., vehicle usage fee)	1380	

	Subtotal Other	**$1,380**	**$0**
	Subtotal	**$104,772**	**$3,960**
		TOTAL COST	**$108,732**

Summary Through Decision Point 1

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE AT GREELEY, CO

ECONOMIC STUDIES
COST ESTIMATE
Feasibility Steps 1-3

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Data Collection & Evaluation	6,336	3,169
2	Flood Damage Model	6,336	0
3	Flood Damage Reduction Alternatives	7,920	0
4	Compute NED Benefits	6,864	453
5	Evaluate National Ecosystem Restoration Plans	7,128	
6	Formulate & Evaluate Combined NED & NER plans	5,280	
11	Coordination	2,112	
	Subtotal Labor	**$41,976**	**$3,622**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
All	Travel Expenses (i.e., vehicle usage fee)	690	
	Subtotal Other	**$690**	**$0**
	Subtotal	**$42,666**	**$3,622**
		TOTAL COST	**$46,288**

4.0 REAL ESTATE

4.0 Real Estate

Real estate costs are usually a significant portion of the total project cost, and the cost of real estate (including utilities and easements) for each plan must be considered when comparing potentially feasible plans.

4.1 General Scope of Work for Feasibility Study

Problem identification:

This phase of the study forms the foundation of the Real Estate mapping by gathering and analyzing all available Real Estate data which pertains to the project area. This data will consist of survey plats, subdivision plats, tax plats, flood plan maps, zoning maps, utility maps, city, county, state plats, deeds and any other existing ownership information that may be available. Appraisal data obtained at this time is to support all three (3) appraisal approaches, to be used to develop the land cost estimate to be used during the plan formulation phase as will the gross appraisal in the project design phase of this Project. The real estate appraiser and real estate planner will require a site visit during this phase. A real estate base map will be created and utilized throughout the entire study process based on the real estate data.

Plan formulation:

This phase involves mapping each alternative being evaluated on the real estate base map. Upon completing analysis of the real estate maps, other real estate data, project, construction, and operation requirements the following results and determinations will be put into a narrative report by the real estate planner.

1) The minimum real estate interest to be acquired.

2) The number of landowners that will be impacted by the project.

3) The amount of land that will need to be acquired.

4) Land types involved in the study area (residential, industrial, commercial, etc.

5) Estimated acreages.

6) Potential Public Law 91-646 relocations and they’re costs.

7) Any other real estate requirements appropriate for the Project at this phase of the study.

All of the above will be required in order to develop a real Estate Baseline Cost Estimate. The Baseline Cost Estimate will also include all administration activities and contingencies, these Costs will be sufficient enough to be used in the screening Process required for this phase of the project.

Project baseline cost estimate:

When the selected plan has been identified, and all project construction, operation and maintenance requirements have been obtained. Real Estate will concentrate its efforts on finalizing the real estate requirements and develop a gross appraisal to finalize the real estate Baseline Cost Estimate. The final real estate requirements and the Baseline Cost Estimate will be the subject of the Real Estate Plan (REP). The rep will include information from the gross appraisal, costs associated with Public law 91-646 relocation benefits, lands and associated costs for facility relocations, title work, and administration costs, and an acquisition timeline. Also to be developed and included in the REP is an attorney's opinion of compensability for all the utilities/facilities, if any, that may be impacted by the project, and an assessment of our local sponsor's land acquisition experience and ability.

4.2 Delineation of duties within the Real Estate Team

Real Estate Planner:

A Corps of Engineers real estate planner from the Real Estate Division, Civil Branch, (CENWO-RE-M) will be assigned to the Feasibility Study and is responsible for the development of the Real Estate Plan (REP) and the Real Estate Baseline Cost Estimate. The real estate planner in consultation with the Project Manager, the Sponsor and other Corps personnel will establish the minimum land and real estate interest to be acquired to support the construction, operation, and maintenance of the Project.

The following is a list of the primary responsibilities of the Real estate planner:

1) Obtains, analyzes and assembles all real estate data required for the project study. (owner deeds, surveys, plats, utility/facility easements, etc.).

2) Determines real estate requirements to match the construction, operation, and maintenance for the project and insures that the lands to be acquired will cause the least disruption to the landowners.

3) Estimates real estate acquisition costs including relocation costs under Public Law 91-646, administration costs of title work, acquisition appraisal, and etc.

4) Documents the real estate analysis in a technical format, entitled Real Estate Plan (REP), to be included as an appendix in the Feasibility Report. A REP is necessary for defining the minimum real estate requirements, the total estimated real estate costs for the proposed Project, as will as a guide as to how the property will be acquired.

5) Comply with the regulations defined in ER 405-112 (Chapter 12) and the requirements under Public Law 91-646 are followed.

6) Work with the Project Sponsor, the Project Manager, and the Project Team to develop an estimated schedule for the land acquisition. The land acquisition schedule is to insure that the real estate will be available for Project construction.

6) Attends all team meetings as necessary to monitor progress and/or problems. Coordinates information back to areas within real estate that may be impacted.

7) Obtains or coordinates rights-of-entries for the Project.

8) The Real Estate Division's Technical Manager is the Real Estate Planner. The Real Estate Technical Manager is responsible for coordinating all real estate information.

Real Estate Cartographic Technician:

A Corps of Engineers Real Estate cartographic technician from the real estate division, Technical Branch, (CENWO-RE-S) will be assigned to the Feasibility Study. The cartographic technician is responsible for developing the Real Estate base map; develop a map of each alternative being studied and the final real estate map for the selected plan. The following is a list of the primary responsibilities of the Real Estate cartographic technician:

1) Develops real estate base map showing existing Ownerships, project area, property lines, utilities and Facilities and all other real estate information that pertain to the study area.

2) Develops a real estate map of each alternative being Studied in the plan formulation phase of the project.

3) Calculates the number of acres to be acquired by each Estate for each alternative and for the selected plan.

4) Develops the final real estate map to be used in the real Estate plan.

5) Develops other exhibits that may be used in the Real Estate Plan, the attorney's opinion, and the gross appraisal.

6) Attends study team meetings to discuss study progress and/or problems as needed.

Real Estate Appraiser:

A Corps of Engineers real estate appraiser from Real Estate Division, Technical Branch (CENWO-RE-S) will be assigned to the Feasibility Study. The appraiser is responsible for preparing the land cost estimates for each alternative being studied in the plan formulation phase of the Project and the gross appraisal of the Project lands for the selected plan in the Project Design Phase of the study.

1) Gathers information on the market values of the study areas.

2) Develops land cost estimates for all alternatives.

3) Develops a gross appraisal for the selected plan.

4) Attends study team meetings to discuss study progress and/or problems as needed.

Real Estate Attorney:

A real estate attorney from the Omaha District Office of Council (CENWO-OC) will be assigned to the feasibility study. The attorney is responsible for determining legal responsibilities for utility/facility relocations and an assessment of the sponsor's land acquisition experience and ability to acquire real estate.

The following is a list of the primary responsibilities of the real estate attorney:

1) Reviews information on legal agreements concerning the utilities/facilities in a study area.

2) Prepares an attorney's opinion of compensability, stating who will be responsible for costs to relocate or alternate utilities/facilities for project purposes.

3) Assesses the potential local sponsor's land acquisition experience and ability to acquire (e.g., "quick take" authority, manpower, resources, etc.)

4) Develops a physical taking analysis if required.

5) Develops non-standard estates if required.

6) When needed, attends study team meetings to discuss progress and/or problems.

4.3 DEVELOPMENT OF THE REAL ESTATE PLAN

The Omaha Real Estate and the Local Sponsor together will develop the Real Estate Plan (REP) during the feasibility study. The Omaha Corps will determine the sites, construction limits, utility/facility relocations, and the disposal areas needed for the construction and operation, including access for construction and future O & M for the project. These will be mapped, quantified, and submitted to the Corps and the Local Sponsor for determination of the needed blocked-out areas, estates, and acreage's for each surface owner, mineral owner, and water rights needed to support the construction, operation, and maintenance of the project.

The gathering of all real estate data, such as subdivision plats, flood plain maps, zoning maps, city maps, county maps, landownership data, mineral ownerships, water rights, as well as comparable sales type information, needs to be completed in the Existing Condition phase of the study. At this time it is estimated that there are 200 separate surface owners, 90 mineral owners, and 30 separate water right owners to be mapped. These ownerships are just estimates and have not been verified. When all the information has been gathered, a base map for the surface owner, the mineral owners and water right owners will be developed from the information. The base maps will be used to evaluate the different alternatives during the Plan Formulation Phase. These base maps will also be used throughout the entire study process. The comparable sales data will be used by a Corps Appraiser in developing land cost estimates during the plan formulation phase and for analysis and development of the gross appraisal when the preferred plan has been determined and used in the Real Estate Plan (REP) being developed in the Final Report Phase.

These efforts and products will be in conformances with the Gross Appraisal Scope, the Corps regulation ER 405-1-12, Public Law 91-646, and the Uniform Standard of Professional Appraisal Practice.

Ownership Data: The Local Sponsor shall coordinate with the Corps Real Estate Technical Manager in the Civil Branch to determine the appropriate estates for each parcel and use. For these, the Local Sponsor shall acquire title information, existing right-of way, easements and pertinent encumbrances. To obtain landownership data, a search of the County Courthouse records will be made to obtain the names, legal descriptions and addresses of the necessary landowners in the study area. A copy of the recorded real estate instrument covering the ownership, including each owner's contiguous lands which may extend outside the study area or is a part of the whole operation, will be obtained during that search; or preferably preliminary title evidence may be obtained from a private title company. In order to accurately plot the owner's recorded real estate interest. It will be necessary to obtain from the County Courthouse all available recorded surveys, subdivision plats, tax plats, all underlying fee owners of easement lands in and adjoining the study area, as well as any and all maps or plats relating to that parcel of land.

A listing of the landowners' names, addresses and the number of acres of the ownership required for the project will be developed from the ownership data obtained from the County Courthouse. The name of the landowner, as it appears on the Courthouse real estate instrument covering that portion of land, will be listed under the appropriate columnar heading on the base map's tract register. The landowner's mailing is not necessary on the base map, but should be supplied to the Corps.

Base Map: The real estate base map and all maps discussed hereafter shall be developed using ESRI or AutoCAD software. The real estate base map will contain all pertinent subdivision lines, section, township, range lines, subdivision lots and blocks, and any and all information required to show an accurate plot of the landowners' entire contiguous ownership. The following features will also be shown on the base map: all culture features, existing buildings, roads, railroads, fence lines, woodlands, transmission lines, telephone/telegraph lines, gas lines electric lines, cable television lines, and any and all utility lines that may exist in the study area. All culture features will be shown in accordance with standard topographic mapping practices. The Local Sponsor will produce the base map using the City's and Weld County's Geographic Information Systems (GIS) data. Utility companies in the study area will be contacted and asked to provide, verify, and update location information of their utilities. This may be general in nature. The scale of the base map will be shown graphically, and will be such that the map is legible and sufficiently large to permit ready interpretation of pertinent real estate features when reduced to report size. The scale of the map will be one-inch equaling multiples of 10 feet or 100 feet, depending on what scale is required. The smallest scale acceptable will be 1:24,000. A tract register, in columnar form, will also be displayed on the base map. The heading on the tract register will be TRACT NUMBER, NAME OF LANDOWNER, ACRES, and ESTATE. A tract number will be assigned to each landowner within the study area. Segment 1 maps will have tract numbers beginning with 1, Segment 2 maps will have tract numbers beginning with 2, etc. A hard copy and a diskette of the real estate base map will be furnished by the Local Sponsor to the Corps for review and approval.

Acreages and Costs: The Corps of Engineers will provide to the Local Sponsor a brief real estate write-up, which will include maps and estates for each

alternative being studied. Upon receipt by the Local Sponsor, the Sponsor will review the number of acres required for each estate for each alternative. The number of acres required and copies of the estates language to be used will then be furnished to the Corps Appraiser for preparation of a preliminary land value cost estimate for each alternative. The Corps Appraiser will prepare the land cost estimates for review and approval. The land cost estimates value will be included in the Real Estate Baseline Cost Estimate, which will be prepared by the Corps.

Preferred Alternative Final Map, Acreage's, and Real Estate Plan. When the preferred alternative is selected, the Sponsor will revise the base map to show the preferred alternative. The preferred alternative drawings will be provided by the Corps. The drawings should show all project construction, operation and maintenance requirements for the selected plan. The Corps will provide a brief write-up stating the duration the land will be required (i.e., one or two years for a temporary work area, staging areas, life of the project). A description of what the land will be used for (i.e., channel excavation, borrow area, spillway, etc.), and a statement as to what lands would be subject to induced damages.

The Sponsor will also revise the preferred alternative as plotted on the Real Estate Base Map, showing all lands required for all project features identified on the preferred alternative drawings. The features will be drawn on the real estate base map in the same manner as on the design drawings, with the exception of the contours that do not apply.

The Sponsor will furnish the Corps a hard copy and diskette of the Preferred Alternative drawings on the real estate base map for the Corps and the Sponsor to make the final determination of lands and estates to be acquired. The Corps will provide a copy of the required estates to the Local Sponsor.

The acreage's required for each real estate interest to be acquired from each Land owner will be determined by the Local sponsor and listed under the appropriate columnar heading on the tract register. Upon completion of the above identified mapping tasks, the Local Sponsor will deliver to the Corps a hard copy and diskette of the map for review and approval. After the Corps approval, the map then becomes the official real estate project map, and will be provide to the Appraiser along with the proposed estates for the development of the Gross appraisal. At this time it is estimated that there could be 120 surface owners, 40 mineral owners, and up to 60 different water rights to be mapped.

The Corps will furnish the Local Sponsor a copy of Chapter 3, Mapping Regulation ER 405-1-12.

Gross Appraisal and Baseline Cost Estimate. The Corps will be responsible for development and review of the gross appraisal for all the Lands, easements, and/or licenses required for the project. The Gross Appraisal shall be in conformance with the details in the Gross Appraisal Scope and in conformance with Chapter 12 of ER 405-112 of 1992 and with Public Law 91-646.

The Appraiser will use the final acreage numbers, estate language provided by the Corps, and the final Corps approved real estate project map in developing the gross appraisal. Upon completion and Corps approval of the Gross Appraisal, the Corps and Local Sponsor will develop a Baseline Cost Estimate and Acquisition Schedule.

Relocations: In cost shared project, real estate acquisition and performance of any facility and utility relocations are major responsibilities of the non-Federal sponsor. The Corps of Engineers Office of Council will a preliminary and a final Attorney's Opinion of compensability (according to Chapter 12 ER 405-1-12) to determine the extent of the Government's or non-Federal Sponsor's legal obligation to relocate a utility or public facility that will be impacted by the construction or operation of a project. The preferred alternative project map will show the location of all highways, roads, utilities, that will be relocated or altered by the construction or operation of the project. A brief write up describing how the utility line is going to be affected will be provided to the Corps. The Local Sponsor will provide the Corps the name, title, address and telephone number of a point-of-contact at each utility company, and a copy of the real estate instrument granting each utility company its right to be locate its utility/facility where it is located. Any relocation of a railroad bridge and/or approaches to the railroad bridge is the responsibility of the Corps.

Attorney's Opinion of Sponsor's eligibility: The Corps will develop an Attorney's opinion of the sponsor's land acquisition experience and ability to acquire (e.g. quick take authority, manpower, resources, etc.), per Chapter 12 ER 405-1-12 to be incorporated into the Real Estate Plan.

4.4 COST ESTIMATE

CACHE LA POUDRE RIVER AT
GREELEY, COLORADO
FEASIBILITY STUDY
4-Nov-05

EXISTING CONDITIONS SUBTASKS	UNIT TYPE	# UNITS	COST/ UNIT	TOTAL UNIT COST	# UNITS	IN-KIND COST/ UNIT	TOTAL UNIT COST
DATA COLLECTION	WORK HRS	40	$88	$3,520	140	$34	$4,700
PRELIM SURFACE OWNERS	WORK HRS	0	$88	$0	90	$50	$4,500
OBTAIN R-O-E	WORK HRS	80	$88	$7,040	90	$50	$4,500
MAPPING	WORK HRS	40	$56	$2,221	110	$54	$5,913
FACT GATHERING APPR.	WORK HRS	40	$115	$4,600	40	$50	$2,000
PRO. I.D. REPORT	WORK HRS	16	$88	$1,408			$0
MEETING & COORDINATION	WORK HRS	16	$88	$1,408	16	$50	$800
TRAVEL COSTS	AIR FARE	2	$400	$800			$0
	PER DIEM	8	$115	$920			$0
	CAR	8	$35	$280			$0
MAPS PLATS,	PURCHASE	1	$100	$100			
TOTAL				$22,297			$22,412
PLAN FORMULATION (3 ALTERNATIVES)							
		#	COST/	TOTAL	#	COST/	TOTAL

SUBTASKS	UNIT TYPE	UNITS	UNIT	UNIT COST	UNITS	UNIT	UNIT COST
DETER. LAND & ESTATES	WORK HRS	24	$88	$2,112	24	$50	$1,200
MAPPING & ACREAGES	WORK HRS	60	$56	$3,332	40	$50	$2,000
EST. MINERAL OWNERS	WORK HRS	12	$88	$1,056	20	$50	$1,000
EST. WATER RIGHTS	WORK HRS	12	$88	$1,056	20	$50	$1,000
COST ESTIMATE	WORK HRS	40	$88	$3,520	0	$72	$0
COST ESTIMATE REVIEW	WORK HRS	8	$115	$920	0	$0	$0
CLERICAL	WORK HRS	4	$46	$183	0	$0	$0
ALTERNATIVE REPORT	WORK HRS	24	$88	$2,112	0	$0	$0
MEETING & COORDINATION	WORK HRS	16	$88	$1,408	16	$50	$800
TOTAL				**$15,699**			**$6,000**

SELECTED PLAN		#	COST/	TOTAL UNIT	#	COST/	TOTAL UNIT
SUBTASKS	**UNIT TYPE**	**UNITS**	**UNIT**	**COST**	UNITS	**UNIT**	**COST**
MAPPING & ACREAGES	WORK HRS	24	$56	$1,333	120	$54	$6,450
MAPPING/ACREAGES MIN.	WORK HRS	16	$56	$888	40	$54	$2,150
MAPPING WATER RIGHTS	WORK HRS	16	$56	$888	60	$54	$3,225
MAPPING UTILITIES	WORK HRS	24	$56	$1,333	60	$54	$3,225
DETER. LAND & ESTATES	WORK HRS	24	$88	$2,112	24	$50	$1,200
LEGAL OPINIONS	WORK HRS	150	$70	$10,505	0	$0	$0
CLERICAL	WORK HRS	6	$36	$214	0	$0	$0
GROSS APPRAISAL	WORK HRS	120	$115	$13,800	0	$72	$0
APPRAISAL REVIEW	WORK HRS	40	$115	$4,600	0	$0	$0
CLERICAL	WORK HRS	12	$46	$549	0	$0	$0
PL91-646	WORK HRS	12	$88	$1,056	0	$0	$0
REAL ESTATE PLAN	WORK HRS	80	$88	$7,040	0	$0	$0
CLERICAL	WORK HRS	8	$35	$280	0	$0	$0
TRAVEL COSTS	AIR FARE	2	$400	$800			
	PER DIEM	10	$115	$1,150			
	CAR	10	$35	$350			
MEETING & COORDINATION	WORK HRS	40	$88	$3,520	0	$0	$0
ADMINISTRATION	WORK HRS	40	$80	$3,200			
TOTAL				**$53,618**			**$16,250**
REAL ESTATE COSTS				**$91,614**			**$44,662**
SPONSOR'S INKIND				**$44,662**			
TOTAL REAL ESTATE FEASIBILITY COSTS				**$136,276**			

17 MILES IN LENGTH FOR ORIGINAL ESTIMATE

THIS ESTIMATE IS ASSUMING 7 MILES WITH APPROXIMATELY 8 OWNERS FOR ENVIROMENTAL SITES

Summary Real Estate Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
Revised November 2005
REAL ESTATE STUDIES

COST ESTIMATE
(November 2005)
Total

LABOR COSTS

Task	Description		Corps Total Cost ($)	In-Kind Total Cost ($)
1	**Problem Identification - Existing Conditions**		**20,197**	**22,413**
a	Basic data collection		3,520	4,700
b	Preliminary surface owners @ 200 parcels		0	4,500
c	Obtain ROE		7,040	4,500
d	Mapping (15% @$75 & 85% @ $50)		2,221	5,913
e	Fact Gathering Appraisal		4,600	2,000
f	Pro. ID Report		1,408	0
g	Meeting & coordination		1,408	800
	Problem ID Sub. - Labor	**$ 42,609.70**		
2	**Plan Formulation 3 Alternatives**		**15,699**	**6,000**
a	Deter. Land & Estates		2,112	1,200
b	Mapping & Acreages		3,332	2,000
c	Est. Mineral Owners		1,056	1,000
d	Est. Water Rights		1,056	1,000
e	Cost Estimate		3,520	0
f	Cost Estimate Review		920	0
g	Clerical		183	0
h	Alternative Report		2,112	0
i	Meeting & Coordination		1,408	800
	Plan Form. Sub. - Labor	**$ 21,698.80**		
3	**Final Plan & Report**		**51,318**	**16,250**
a	Mapping & Acreages (15% @$75 & 85% @ $50)		1,333	6,450
b	Mapping/Acreages min.		888	2,150
c	Mapping Water Rights		888	3,225
d	Mapping Utilities		1,333	3,225
e	Deter. Land & Estates		2,112	1,200
f	Legal Opinions - All		10,505	
g	Clerical		214	
h	Gross Appraisal (Sponsor contract to Title Co.)		13,800	
i	Appraisal Review		4,600	0
j	Clerical		549	
k	PL 91-649		1,056	
l	Real Estate Plan		7,040	
m	Clerical		280	
n	Meetings & Coordination		3,520	
o	Administration		3,200	
	Final Plan - Labor	**$ 67,568.18**		
		Subtotal Labor	**$87,214**	**$44,663**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
	Travel Expenses (Air Fare, Vehicle, PD)	**4300**	0
1	Problem Identification - Existing Conditions	2000	
2	Plan Formulation 3 Alternatives	0	
3	Final Plan and Report	2300	
	Map purchases	**100**	
1	Problem Identification - Existing Conditions	100	
2	Plan Formulation 3 Alternatives		
3	Final Plan and Report		
	Subtotal Other	**$4,400**	**$0**
	COST SHARED TOTALS	**$91,614**	**$44,663**
		TOTAL COST	**$136,277**

Summary Through Decision Point 1

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
Revised November 2005
REAL ESTATE STUDIES
COST ESTIMATE
Feasibility Steps 1-3

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	**Problem Identification - Existing Conditions**	**20,197**	**22,413**
a	Basic data collection	3,520	4,700
b	Preliminary surface owners @ 200 parcels	0	4,500
c	Obtain ROE	7,040	4,500
d	Mapping (15% @$75 & 85% @ $50)	2,221	5,913
	Fact Gathering		
e	Appraisal	4,600	2,000
f	Pro. ID Report	1,408	0
g	Meeting & coordination	1,408	800
	Subtotal Labor	**$20,197**	**$22,413**

OTHER COSTS

Task	Description	Corps Total Cost	In-Kind Total Cost

			($)	**($)**
1	Travel Expenses (Air Fare, Vehicle, PD)		1150	
1	Map purchases		100	
		Subtotal Other	**$1,250**	**$0**
		Subtotal	**$21,447**	**$22,413**
		TOTAL COST	**$43,860**	

5.0 HYDROLOGY

Greeley, Colorado
Hydrology Scope of Work

Purpose

The purpose of this study is to develop the hydrologic data necessary to evaluate the water related problems on the Cache La Poudre River in and around Greeley, Colorado. Results of the hydrology study will serve as the foundational basis for understanding the Cache La Poudre River system through Greeley and for making decisions on flood reduction and environmental restoration alternatives. This scope of work was developed to aid the Project Development Team (PDT) in the development of a General Investigation Report/Environmental Impact Statement (GI/EIS) for the Cache La Poudre River through Greeley. A detailed scope of work has been developed for each work task.

Quality Assurance/Quality Control (QA/QC)

The Project QA/QC Plan describes quality control and assurance activities. A Quality Control Plan (QCP) will be developed to outline review procedures for study products/deliverables. The QCP should include a description of the QC process, outline of interim review milestones, names and qualifications of reviewers, and an example of comment/issue resolution. The QCP will be submitted for approval by the Corps and local sponsor prior to initiation of the technical study. At the end of the study, a QC Report will be completed that documents the interim peer reviews (i.e. comments and responses). A QA review will be performed to ensure that the objectives of the scope have followed the approved QCP. The QC Report will be reviewed to insure that all comments have been addressed. The Corps and the local sponsor will conduct this QA review. Specific items requiring quality review are:

Hydrologic Appendix
Risk and Uncertainty Appendix

Design Criteria

USACE design criteria will be used and includes the following references:

EM 1110-2-1415 Hydrologic Frequency Analysis
EM 1110-2-1419 Hydrologic Engineering Requirements for Flood Damage Reduction Studies
EM 1110-2-1601 Hydraulic Design of Flood Control Channels
EM 1110-2-1619 Risk-Based Analysis for Flood Damage Reduction Studies

Task 1 - Data Collection and Evaluation

Review and evaluate existing Corps files, past studies, and other available data for the Cache la Poudre in and around Greeley, CO that pertain to hydrology. Some of the major studies include:

1988 Update, Hydrologic Analysis of the Cache La Poudre River Basin, by USACE
USGS stream gage records
Flood Plain Information – Cache La Poudre River, Greeley, Weld County by USACE
Various hydrologic models – e.g. SWMM
905(b) (WRDA 86) Preliminary Analysis – Cache La Poudre River – Greeley, Colorado. Flood Damage Reduction and Environmental Restoration Study

Task 2 - Site Reconnaissance

Conduct a site reconnaissance of the features in the Greeley area. Specific areas to be observed include the Cache La Poudre River Watershed, the existing gravel pits, proposed, tributaries of the Cache La Poudre River in and around Greeley, waterfowl preserves or production areas, and USFWS properties or easements. A field reconnaissance report will be prepared summarizing the findings.

The field investigation will be taken by the engineer working on the project to become familiar with site-specific flow and drainage conditions. Given the time that has passed since the work for the 905(b) Report, it is possible that a different employee will work on the feasibility study, and a site visit would be extremely helpful to pursuing accurate engineering analysis and design. The site reconnaissance will likely be made in conjunction with a meeting to minimize travel expenses.

Task 3 - Statistical Analysis

3.1 Review and Update Frequency Curves. Discharge-frequency curves will be derived for use in the HEC-RAS steady flow model that will be developed by the Hydraulics Section. Flows for the 10-, 50-, 100-, and 500-year events will be derived for the Cache La Poudre River at the near Greeley gage based on the methodology that was used for the 1988 Corps study. Additional annual peak discharges from 1986 through 2004 will be included in the update of the 1988 study. Streamflow data will be obtained through the USGS or the Colorado Department of Natural Resources where necessary. Results will be reviewed and compared to the original study and final curves adopted. Peak Discharge Frequency relationships are required for use in the steady flow hydraulic model and also are used in development of the balanced flood hydrographs.

The flood frequency distribution for the 1988 study is listed as follows. This information was obtained from Table 7 from the Hydro Analysis for Cache La Poudre Basin (Dated April 1988). The values for the Cache near Greeley gage would be listed as 'Above Eaton Draw'.

table 7

Discharge Frequency Relationships

Cache la Poudre River

(Discharge values in cubic feet per second)

Location	10 year	25 year	50 year	100 year	500 year
Bluff line gage	6490	9210	11800	15100	26300
Abv. Dry Creek	5370	7820	10200	13300	24100
Bel. Dry Creek	6700	9760	12700	16600	30100
Abv. Boxelder Cr.	5820	8610	11400	15000	27900
Bel. Boxelder Cr.	6750	9990	13200	17400	32400
Abv. Law Ditch	4590	7090	9640	13100	26100
Bel. Law Ditch	4620	7140	9720	13200	26300
Abv. Coalbank Cr.	3870	6120	8470	11700	24200
Bel. Coalbank Cr.	3900	6170	8540	11800	24400
Abv. Eaton Draw	3400	5470	7660	10700	22700
Bel. Eaton Draw	3400	5470	7660	10700	22700
Mouth	3310	5360	7550	10600	22800

3.2 Trend Analysis. A trend analysis and other statistical tests will be completed to identify if peak flows and/or low flows have changed over the historic streamflow period or record. This analysis will also determine if the historical record of peak flows are stationary, homogeneous, random and independent. These criteria must be met to ensure that the historical streamflows can be used to fit a probability distribution to the data. For this analysis, the historical precipitation and streamflow data will be plotted several different ways to identify possible climatic cycles and the effects of water development within the basin on the Hydrology of the Cache La Poudre River at Greeley. Data developed for the Cache La Poudre River near Greeley gage for the seasonal flow duration analysis and volume probability relationships will also be used in this analysis. Available daily precipitation data will be obtained from the

National Climate Data Center using records from the National Weather Service gages in the vicinity of Greeley.

3.3 Hydrology Checkpoint Meeting #1. Following completion of Task 3.1 and the trend analysis of historical peak flows in Task 3.2, a checkpoint meeting will be held with the PDT and the Sponsors to discuss the results and determine the best approach to establishing the existing conditions peak discharge frequency relationship. Depending on the results of Tasks 3.1 and 3.2, it may be necessary to proceed to task 4 and develop the Hydrologic model to synthesis a period of record Regulated flows and Unregulated flows to be used in establishing the Existing Conditions Peak Flow Frequency relationship at Greeley. If it is determined that the Simulated flows should be used for the existing conditions, Tasks 3.4 through 3.7 will be put on hold and the simulated flows will be used for those analyses when completed. Also to be discussed at this meeting will be any differences in the flow frequency relationship from the 1988 study resulting from the longer streamflow record and the possible relationship to existing floodplain mapping and bridge design.

3.4 Develop Volume Probability Relationships. Volume probability relationships in conjunction with balanced flood hydrographs will be used in the HEC-RAS unsteady flow model for routing through the modeled Cache La Poudre River reach. Durations of 1-, 3-, 7-, 15-, 30-, 60-, 90-, 180-, and 365-days will be analyzed. The volume probability relationships will be developed for the Cache La Poudre River at the near Greeley gage for the period of record from 1924 to 2003. HEC's statistical analysis program STATS will be used for the analysis. The standard deviation and skew will be smoothed based on the Corps guidance, EM 1110-2-1415. Smoothing of statistics is necessary to prevent the extrapolated curves from crossing.

3.5 Develop Balanced Design Flood Hydrographs. Balanced flood hydrographs will be used for modeling flood control and environmental restoration alternatives. Utilizing the updated discharge-frequency and the volume probability relationships, balanced design flood hydrographs will be generated for the Cache La Poudre River at the near Greeley gage for use in the unsteady HEC-RAS model to be developed by the Hydraulics section. Hydrograph shapes will be patterned based on historical flood events. Final hydrographs will be furnished in the HEC-DSS format.

3.6 Seasonal Flow Duration Analysis. Flow duration relationships are used to define the percent of time that a given inflow is equaled or exceeded. A duration curve is not the same as the probability curves that are defined in tasks 3.1 and 3.4. A Flow Duration curve cannot be interpreted on an annual event basis because it provides only the fraction of time that a given event was exceeded and not the annual probability of an event occurring. It can be used to determine the average number of days per year that a particular magnitude is equaled or exceeded if it is annual duration curve or the number of days during a particular month or season if it is a seasonal duration curve. Seasonal duration curves can be defined to represent particular months or seasons, which will help in assessing the viability of environmental restoration alternatives that have flow requirements. Flow duration curves are also used for evaluating instream flow requirements, riparian recreation, water quality, and sedimentation. Daily flows for the Cache La Poudre River at the near Greeley gage will be used for the analysis for

the period of record 1924 through 2003. Flow duration relationships will be developed for each month, each season (i.e. winter, spring, summer, and fall), and on an annual basis. HEC's statistical analysis program STATS will be used for the analysis.

3.7 Develop Low Flow Volume Probability Relationships. Low flow volume probability relationships will be used to help in the assessment of environmental restoration alternatives where it is important to know the annual percent chance of exceedance for different durations of low streamflows. Low Flow Volume probability relationships are also used to evaluate water quality and instream flow needs. Discharges of 1 through 30 days will be developed for the Cache La Poudre River at the near Greeley gage for the period of record 1924 through 2003. HEC's statistical analysis program STATS will be used for the analysis along with a graphical analysis.

3.8 Coincident Flow Analysis (if needed). A coincident flow analysis is used to determine if flood events on the Cache La Poudre River are coincident with the flood events on either the tributaries to the Cache La Poudre River or the South Platte River. Results from this analysis are used in helping to determine the starting water surface elevation for the HEC-RAS models being developed by the Hydraulics Section. For the Cache La Poudre River, the analysis will include developing a stage duration curve for the South Platte River at the confluence using the near Kersey gage on the South Platte River. Next, stage discharge curves for the Cache La Poudre River will be developed for different stages on the South Platte River. These curves will then be combined with the adopted discharge frequency curve for the Cache La Poudre River to obtain a composite stage frequency curve that takes into account any backwater effects from the South Platte River. A similar analysis will be performed on the major tributaries that are modeled in the HEC-RAS model being developed by the Hydraulics Section.

3.9 Hydrology Checkpoint Meeting. This meeting will be either Checkpoint meeting #2, or #3 depending on the outcome of meeting #1, and include the decision of whether or not to proceed to the Basin Wide Hydrologic Model. A checkpoint meeting will be held with the PDT and the Sponsors to discuss the results of the existing conditions statistical analyses. Once the Existing conditions are completed, modeling and statistical analyses will be performed to evaluate with project conditions.

Task 4 – Basin Wide Hydrologic Model (if desired by Greeley)

4.1 Model Configuration. The statistical analyses to be performed under Task 3 are all based on using the existing streamflow records for the Cache La Poudre River near Greeley gage. Because of extensive development of water resources in the Cache la Poudre River basin for irrigation, water supply, and other uses, the stream flow regime has changed over time. A basin wide hydrologic model will be configured and utilized to develop a homogeneous flow record for both regulated and unregulated flow conditions. The "Regulated" flows will represent the flows that would have occurred historically if the existing (today's) water resources development had been in place. The "Unregulated" flows are those that would have occurred if no water resources development had occurred in the basin. This task will also include researching and reviewing the historical estimates of diversions, storage and depletions in the Cache la Poudre River basin. Historical records of diversions and storage will be gathered and

provided by the sponsor as an in-kind service. This in-kind services task would consist of contacting the State of Colorado to determine the owners of all reservoirs and diversions in the Cache la Poudre basin and the documentation of available data. This documentation would include the period of record for all reservoirs and diversions, and the availability of inflow, outflow, diversion flow, and/or reservoir stage. Also included in this documentation will be the format that the data is currently available in such as an electronic format or in hard copy, like analog recorder charts. Based on this initial assessment on what data is available and format it is in, a cost to convert all the data to a usable format (such as an Excel spreadsheet) will be determined and negotiated in the next phase.

An HEC-HMS model will be configured for the entire Cache la Poudre River basin. HEC-HMS is a hydrologic precipitation runoff and routing model developed by the Corps Hydrologic Engineering Center. Digital maps in the form of Digital Elevation Models (DEM) will be downloaded from the USGS web site and used with the HEC-GeoHMS Arc View 3.2 extension to configure the HEC-HMS model. Recorded daily stream flow data will be downloaded from the USGS web site and stored in an HEC-DSS database. The period of record to be used for analysis is 1924 through 2003, an 80-year record length. Some stream gages have records available as early as the late 1800's but the records are sparse. Some of the stream gages do not have records extending to 1924 and will require filling in the records by interpolation or synthesis. Meteorological data including precipitation, temperature, snow water equivalent, and evaporation will be downloaded from the NOAA and NRCS archives and stored in an HEC-DSS database. Soils information will also be obtained from the NRCS. The HEC-HMS model will also be configured to simulate the operation of major tributary reservoirs. This task is currently not included in the cost estimate at this time.

4.2 Model Calibration. The model will be calibrated to reproduce historic flows. Calibration will involve adjusting channel routing coefficients, synthesizing missing streamflow records, and adjusting diversions and depletions to reflect incomplete or inaccurate records to match historical streamflows. Once the model is calibrated it will be used to develop a period of record of Regulated and Unregulated flows and then used for the statistical analysis performed in Task 3. Future use of the model could also include flood forecasting and evaluation of future project alternatives including additional basin storage, change in existing reservoir operation, and changes in irrigation demands throughout the basin.

4.3 Hydrology Checkpoint Meeting. This meeting will be held after completion of Tasks 4.1 and 4.2 to review and discuss the results of the Basin Wide Modeling. Simulated regulated and unregulated flows will be compared to historic recorded streamflows and possible impacts on the statistical analyses in Task 3 will be discussed. Decisions to be made at this meeting will include whether or not to use the simulated regulated flows in Task 3 to establish the existing conditions or proceed with using the historical streamflow data. Also use of the model to evaluate future projects will be discussed.

Task 5 - HEC-HMS Modeling

5.1 Tributary HEC-HMS Models (if desired by Greeley). A HEC-HMS rainfall and runoff model will be developed of the major tributaries of the Cache La Poudre River to model potential flood reduction or environmental alternatives that may impact the tributaries. The tributary basins modeled will include Sheep Draw as the upper reach downstream through Greeley to the confluence at the South Platte River. Digital maps in the form of Digital Elevation Models (DEM) will be downloaded from the USGS web site and used with the HEC-GeoHMS Arc View 3.2 extension to delineate basin parameters for the HEC-HMS model. Hypothetical precipitation events will be used to develop the 2- through 500-year floods. The HMS model will be calibrated utilizing past studies, existing SWMM models, and the Colorado Regional Equations developed by the USGS.

5.2 Reservoir Modeling of Sand Pit Lakes. The sand pits lakes located in the overbank of the Cache La Poudre River will be assessed to determine their ability to act as detention ponds for flood reduction and/or low flow augmentation for environmental restoration. If it is decided not to pursue development of the Unsteady Flow Hydraulic Routing Model (Refer to Hydraulics Scope of Work), An HEC-HMS model will be used to model the sand pit lakes as reservoirs. If an unsteady flow model is available, it will be used to evaluate the effectiveness of flood storage in the sand pit lakes. The balanced flood hydrographs for the Cache La Poudre River developed under Task 3 will be used, as inflows and the model will include a rating curve diversion of flows into the sand pits. As part of this task, the Sponsor will provide surveys of the Sand Pit lakes as an in-kind service.

Task 6 – Sand Pit Water Budget Model (if desired by Greeley)

As a potential environmental restoration project, the sand pit lakes will be evaluated using a water budget model to determine the viability of those lakes to support fisheries and recreation within the lake area and provide low flow augmentation to improve water quality, habitat, and recreation downstream in the Cache la Poudre. A water budget model such as the wetland hydrologic analysis model (WHAM) will be used to simulate the daily water budget of the lakes. The WHAM computes the hydrologic budget of the wetland for each day of the period of record used in the simulation. The hydrologic budget for a wetland can be simply described as the outflow from the wetland plus the change in storage within the wetland equal to the inflow to the wetland. For a single wetland basin, the inflow would consist of surface runoff onto the wetland, precipitation on the wetland surface, and groundwater inflow. Outflow consists of evapotranspiration, seepage to groundwater; spills over the drainage divide, and flow through man-made drainage structures or pumps. Storage change is the amount of water stored in the wetland at a specific time relative to the amount in storage at a previous time. The WHAM was designed to simulate the hydrologic budget on a daily basis accounting for all the parameters included. Meteorological data including precipitation and evaporation will be downloaded from the NOAA and NRCS archives and stored in an HEC-DSS database. Soils information will also be obtained from the NRCS. As part of this task, the Sponsor will provide surveys of the Sand Pit lakes and any water rights analysis as an in-kind service. Water Rights analysis may include determining rule curves that specify what time of year and how much water can be taken from the river for the sand pits. An alternative would be to determine daily (or monthly) flows available

for the sand pits over the period of record for the Cache la Poudre near Greeley gage. If the sandpits are to be drained and used for flood storage, the survey will need to provide data for developing elevation-area-capacity curves for each of the sand pits to be so employed. This will require surveying the sand pit below the water down to the invert.

Task 7 - Interior Drainage

An interior drainage analysis will be conducted when required for proposed alternatives. Drainage structures and/or ponding areas will be sized to minimize potential interior flooding due to proposed alternatives. Evaluation of the ponding areas may include use of the ponding areas as wetland habitat restoration areas. The HEC-HMS models setup in the Task 5.1 will be used where possible. Small basins that were not modeled in Task 5.1 will be developed using the same methodology and models. Any supplemental surveys that will be needed to evaluate interior drainage facilities will be provided by the sponsor as an in-kind service. It is estimated that the supplemental surveys for evaluation of interior drainage structures for proposed alternatives would take a total of approximately 3 man-days. Work may consist of surveying the interior drainage sites to obtain channel invert data, left and right overbank elevations, and slopes. Work also includes converting field notes and inputting into an Excel Spreadsheet.

Task 8 - Risk and Uncertainty Analysis

A Risk and uncertainty analysis will be conducted on the existing conditions and the proposed alternatives using the HEC-FDA model.
This task includes an evaluation of the effects of uncertainty associated with factors affecting the discharge-probability and volume-probability relationships, including number of year of available streamflow records. This information will be required for the setup and use of the flood damage assessment (HEC-FDA) model. As part of this task, assistance will be provided to the Economics section by helping to determine the National Economic Development (NED) plan using HEC-FDA results for the different alternatives. The Hydrology Section will also assist in preparing a detailed technical report to document the data, assumptions, methodology and results for the risk and uncertainty analysis. Provide internal review on the documents and revise to address review comments.

Task 9 - Hydrologic Report

Prepare, Review and Revise Hydrologic Report. Prepare a detailed technical report to document the data, assumptions, methodology and results for the hydrologic analysis. Charts and tables will be prepared to summarize and compare the results for the flood reduction and environmental restoration alternatives. Sources of data used in the analysis shall be referenced in the report. Provide internal review on the documents and revise to address review comments. Once the internal review is completed the report will be furnished to the PDT and Sponsor for review.

Task 10 - Conduct Quality Control Reviews

Quality control reviews will be conducted by senior staff and in accordance with a Quality Control Plan.

Task 11 - Independent Technical Review

An independent technical review of the hydrologic analysis will be conducted in accordance with the Quality Control Plan.

Task 12 – Meetings and Coordination

Multiple meetings and coordination with the product development team (PDT) as well as with the local sponsor will be required throughout the course of this study.

Hydrology Study Costs

The cost estimate to perform the hydrology studies will range from $162,400 to $368,400 depending on the level of detail performed and alternatives evaluated. The higher end of the range in cost would depend upon whether the basin-wide model and the advanced hydrologic wetland analysis are selected after Decision Point 1. The in-kind services have been negotiated and are defined in the new table. Check point meetings will be used after each major task is completed to determine which phases of study to pursue next and whether or not they are needed based on the results. Re-scoping may be necessary during each checkpoint meeting to determine which studies are needed to develop the hydrologic data necessary to evaluate selected alternatives.

26-Sep-05 Hydrology Formatted for 6 Planning Steps

	Plan Form Estimate of Work by Phases	% of task in Phase	Total cost of Task	Line Item Cost	PMP Sec. Reference
1	**Spec. Problems and Opportunities**				
1.1	Data Collection and Evaluation	1.00	3000	$3,000	**1**
1.2	Site Recon.	1.00	3000	$3,000	**2**
1.3	Sponsor Data Collection and Evaluation			$2,400	
2	**Future Without Project & Forecasted Conditions**				
2.1	Review and Update Frequency Curves	1.00	11000	$11,000	**3.1**
2.2	Trend Analysis	1.00	8000	$8,000	**3.2**
2.3	Meetings and Coordination (apart from those listed)	0.50	7500	$3,750	**12**
3	**Formulate Alternative Plans**				
3.1	Hydrology Checkpoint Meeting #1	1.00	1900	$1,900	**3.3**
3.2	Hydrologic Report (Interim)	0.33	9000	$2,970	**9**
3.3	Quality Control Reviews	0.33	3500	$1,155	**10**
3.4	Independent Technical Review	0.33	5500	$1,815	**11**
3.5	Develop Low Flow Volume Probability Relationships	1.00	5500	$5,500	**3.7**
	Subtotal Phase 1 (Planning Steps 1-3)				***Steps 1-3 $44,490***
4	**Evaluate Alternative Plans**				

4.1	Develop Volume Probability Relationships	1.00	5500	$5,500	**3.3**
4.2	Develop Balanced Design Flood Hydrographs	1.00	2200	$2,200	**3.5**
4.3	Seasonal Flow Duration Analysis	1.00	5500	$5,500	**3.6**
4.4	Hydrology Checkpoint Meeting #2	1.00	1900	$1,900	**3.9**
4.5	HEC-HMS Model of Sand Pit Lakes d	0.50	76000	$38,000	**5.2**
4.6	Sponsor Tasks for Sand Pit Modeling			$15,000	
4.7	Sponsor Water Rights Analysis			$20,000	
5	**Compare Alternative Plans**				
5.1	Interior Drainage	0.50	14000	$7,000	
6	**Select Recommended Plan**				
6.1	Risk and Uncertainty Analysis	0.50	14000	$7,000	**8**
6.2	Hydrologic Report (final)	0.67	9000	$6,030	**9**
6.3	Quality Control Reviews	0.67	3500	$2,345	**10**
6.4	Independent Technical Review	0.67	5500	$3,685	**11**
6.5	Meetings and Coordination (apart from those listed)	0.50	7500	$3,750	**12**
					Steps 4-6
					$117,910

SUMMARY

Subtotal Likely for Planning Steps 1-3	$44,490
Subtotal Likely for Planning Steps 4-6	$117,910
TOTAL Likely for Planning Steps 1-6	**$162,400**
Potential In-Kind Services (included in TOTAL above)	*$37,400*

Additional Features that could be added if considered to be desirable by Greeley after Phase I.

Tasks 3.7 and 3.8 can be further discussed among the PDT for potential inclusion if preliminary study results indicate a need for the work				*****	**3.7& 8**
Coincident Flow Analysis	1.00	15000	$15,000		**3.8**
Basin Wide Hydrologic Model * If the PDT determines that the Basin Wide Model is needed and can be funded, it would provide better definition of both flood control and ecosystem restoration plans.			$115,000	**a**	**4**
Since the analysis of the tributaries were downplayed by the sponsor in recent meetings, they will be considered an option to add back in after Phase 1.			$38,000	**b**	**5.1**
* If the PDT determines that the Sand Pit Water Budget WHAM Model is needed , it would provide a better understanding of the types of wetland ecosystem species that may thrive in restored sand pits.	0.5	76000	$38,000	**c**	**5.2, 6**

Potential Additional Hydrologic Analysis for Basin-Wide and Advanced Wetlands Modeling **$206,000**

(revised after discussion with Doug 28-Apr-05

TOTAL HYDROLOGY ESTIMATE **POSSIBLE** **$368,400**

The in-kind service total for hydrology will range up to $37,400, depending upon choices made following the completion of the work for Decision Point 1. The work by Greeley in support of the hydrologic analysis that was discussed during the conference calls in August and September includes:

$20,000 Water Rights Analysis
$15,000 Underwater Gravel Pit Survey
$ 2,400 Initial Streamflow, Canal & Pump Data Collection and Evaluation

And in the event that a Basin-Wide Model is desired following Decision Point 1;
$10,000 Initial assessment of the data collection and analysis in preparation for a basin-wide model. Presently, this cost is not included in the total for hydrology in-kind services.

If it is determined that water rights have minimal impact on the plan formulation process, then considerably less than $20,000 worth of effort may be needed following the Decision Point. Similarly, if gravel pits are not to be drawn down below the ground water level to provide flood storage, the $15,000 underwater gravel pit survey will not be needed.

Summary Hydrology Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
Updated September 2005
HYDROLOGIC STUDIES
COST ESTIMATE
(September 2005)
TOTAL

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	**Specify Problems and Opportunities**		
1.1	Data Collection and Evaluation	3,000	2,400
1.2	Site Recon	3,000	
2	**Future w/o Project & Forecasted Conditions**		
2.1	Review and Update Frequency Curves	11,000	
2.2	Trend Analysis	8,000	
2.3	Meetings & Coordination (apart from those listed)	3,750	
3	**Formulate Alternative Plans**		
3.1	Hydrology Report (Interim)	1,900	

3.2	Hydrology Checkpoint Meeting #1	2,970	
3.3	Quality Control Reviews	1,155	
3.4	Independent Technical Review	1,815	
3.5	Develop Low Flow Volume Probability Relationships	5,500	
4	**Evaluate Alternative Plans**		
4.1	Develop Volume Probability Relationships	5,500	
4.2	Develop Balanced Flood Hydrographs	2,200	
4.3	Seasonal Flow Duration Analysis	5,500	
4.4	Water Rights Analysis	0	20,000
4.5	HEC-HMS Model of Sand Pit Lakes	38,000	15,000
4.6	Hydrology Checkpoint Meeting #2	1,900	
4.7	Basin Wide Hydrology Study (not currently funded)		
5	**Compare Alternative Plans**		
5.1	Interior Drainage (data provided under Hydraulics)	7,000	
6	**Select Recommended Plan**		
6.1	Risk and Uncertainty Analysis	7,000	
6.2	Hydrologic Report (final)	6,030	
6.3	Quality Control Reviews	2,345	
6.4	Independent Technical Review	3,685	
6.5	Meetings & Coordination (apart from those listed)	3,750	
	Subtotal Labor	**$125,000**	**$37,400**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
Incl	Travel Expenses (i.e., vehicle usage fee)	0	
Incl	GIS Usage Fee	0	
	Subtotal Other	**$0**	**$0**
	Subtotal	**$125,000**	**$37,400**
		TOTAL COST	**$162,400**

Summary Through Decision Point 1

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO

HYDROLOGIC STUDIES
COST ESTIMATE
Feasibility Steps 1-3

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	**Specify Problems and Opportunities**		
1.1	Data Collection and Evaluation	3,000	2,400
1.2	Site Recon	3,000	
2	**Future w/o Project & Forecasted Conditions**		
2.1	Review and Update Frequency Curves	11,000	
2.2	Trend Analysis	8,000	
2.3	Meetings & Coordination (apart from those listed)	3,750	
3	**Formulate Alternative Plans**		
3.1	Hydrology Report (Interim)	1,900	
3.2	Hydrology Checkpoint Meeting #1	2,970	
3.3	Quality Control Reviews	1,155	
3.4	Independent Technical Review	1,815	
3.5	Develop Low Flow Volume Probability Relationships	5,500	
	Subtotal Labor	**$42,090**	**$2,400**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
Incl	Travel Expenses (i.e., vehicle usage fee)	0	
Incl	GIS Usage Fee	0	
	Subtotal Other	**$0**	**$0**
	Subtotal	**$42,090**	**$2,400**
		TOTAL COST	**$44,490**

6.0 FLOOD PLAIN

The Greeley, Colorado feasibility study cost estimate for the nonstructural analyses, the flood plain management plan, and conditional letter of map revision (CLOMR) is presented below. The nonstructural analysis will focus on determining the feasibility of flood proofing commercial and/or residential structures, elevating, or relocation out of the flood hazard area along the Cache la Poudre River. The nonstructural analyses will include the investigation of a total of 12 structures located within the two highest damage areas (six structures per damage area) as determined by the economic land use and damage analysis. Depending upon the results of this nonstructural analysis, the project sponsor may request additional analyses be performed. The cost of this analysis ($16,902) is currently contained within the PMP for Decision Point 1. Current Corps of Engineers guidance requires a minimum of two structures to be found feasible through a nonstructural analysis before Federal interest can be ascertained. The number of structures was selected based on the size and number of economic damage areas. This analysis will indicate whether it is feasible to pursue a nonstructural project either alone, or in conjunction with a structural project.

If a structural flood damage reduction measure is found to be feasible and is selected as the feasibility study plan, a Conditional Letter of Map Revision (CLOMR) will be developed. The CLOMR will be submitted to the Federal Emergency Management Agency (FEMA) of the Department of Homeland Security to coincide with the completion of the feasibility study to expedite the process of having the flood insurance rate maps modified to reflect the federal project. The final map modifications will occur during the PED phase to ensure all project changes have been captured in the as-built drawings of the completed project. These modifications will be accomplished through the Letter of Map Revision (LOMR) submittal for the project.

Section 202; Flood Control Policy, subsection (c) of WRDA 1996, requires the development of a Floodplain Management Plan (FPMP). This plan is to be developed and in-place within one year after signing the project cooperation agreement (PCA). In essence, the FPMP is a document developed by the non-Federal sponsor, with input and guidance from the Federal sponsor. The FPMP assures that the integrity of the Federal project will not be diminished during the life of the project and that impacts of future flood events in the project area have been reduced. The FPMP will address potential measures, practices, and policies to reduce loss of life, injuries, damages to property and facilities, public expenditures, and other adverse impacts associated with flooding and to preserve and enhance natural floodplain values. The FPMP is required for either a structural or nonstructural project.

The total estimate to conduct the nonstructural assessment, obtain flood plain permits, develop and submit the CLOMR, and to develop the FPMP is estimated to be $ 59,062. If a structural plan is identified and constructed, the LOMR submittal will be conducted during the PED.

** - Note: No In-Kind Services were determined to be available for this discipline during feasibility by the Corps technical team member responsible for Flood Plain. Lack of Flood Plain in-kind service tasks was noted in Corps -Sponsor conference calls held between August 24 & September 21, 2005.

Flood Plain Cost Estimate interpreted by PM 21-Sep 05

Greeley, Colorado

Flood Plain Management Services Section Cost Estimate

FPMS Feasibility Study Estimate	**Hours**	**Cost ($)**	Phase
Nonstructural Measures			
Site reconnaissance (2-person)	40	4,100	P 1-3
Site recon (MRD plane), rental and per diem (2-person)	N/A	350	P 1-3
Configure existing land use data for nonstructural assess	8	760	P 1-3
Configure existing water profiles for hazard areas	6	570	P 1-3
Configure w/project water profiles for hazard areas	6	570	P 1-3
Conduct nonstructural assessment of project area	56	5,320	P 1-3
Develop nonstructural report write-up and review	24	2,280	P 1-3
Coordination activities (meetings, conference calls, etc)	16	1,520	P 1-3
QA/QC review	12	1,320	P 1-3
Computer usage fees	56	112	P 1-3
Sub-total		$16,902	
(25% of Work to be done late in the Cost-Shared Feasibility Study)			P 4-6
Conditional Letter of Map Revision Development			1/4 amt.
Develop CLOMR Technical Book and MT-2 forms	100	11,000	$2,750
Develop FEMA Mapping (100-, 500-yr, and floodway)	48	5,280	$1,320
Coordinate CLOMR package with NSP	40	4,400	$1,100
Coordinate CLOMR package with City and FEMA	24	2,640	$660
QA/QC CLOMR package	24	2,640	$660
Sub-total		$25,960	$6,490
Flood Plain Management Plan (FPMP) Development			1/4 amt.
Obtain and review existing flood plain ordinances	12	1,140	$285
Develop draft FPMP for project sponsor comment	56	5,320	$1,330
Site visit (air fare, rental and per diem)	N/A	1,200	$1,200
Coordinate draft FPMP with City officials (guidance)	24	2,280	$570
Develop final FPMP Plan and submit to City	40	3,800	$950
PDT coordination activities	12	1,140	$285
QA/QC FPMP plan	12	1,320	$330

	Sub-total	$16,200	$4,950

Subtotal to Decision Point 1	**$16,902**
Subtotal Phases 4-6	**$11,440**
Proposed Feasibility Study Cost, Phases 1-6	**$28,342**

The total dollar amount consists of three analyses (Nonstructural Assessment, CLOMR, FPMP). The total cost of the nonstructural assessment ($16,902) should be included within the PMP, and conducted prior to reaching decision point 1. The Conditional Letter of Map Revision (CLOMR) ($25,960) is required to be conducted if a project is pursued which alters the effective flood plain mapping. This item should occur after a feasible project has been identified. If the CLOMR is pursued by interests outside of the Corps, FEMA requires an additional fee of $4,500 for processing. This fee is waived when a government agency conducts the CLOMR. The Flood Plain Management Plan (FPMP) ($16,200) is required when Federal dollars are used to construct a project, no matter the level of protection provided by the project. The FPMP can have costs as high as $50,000, but we consider implications of such high costs and try to scope for the minimal requirements.

The FPMP should be conducted after a feasible project has been identified. For the purposes of this cost estimate, it will be assumed that work on both the CLOMR and the FPMP will start late in the Feasibility Study (25%), in order to expedite the process of FEMA certification of the new smaller flood plain, with the majority of that work (75%) to be done during the PED (Plans and Specifications) phase. The objective of this initial work in the Feasibility phase would be to potentially shorten the time it would take Greeley residents removed from the Cache la Poudre flood plain to see a reduction in Flood Insurance costs. This was discussed and agreed upon between during the talks between the Sponsor and the Corps in September 2005.

Summary Flood Plain Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
Revised September 2005
FLOODPLAIN MANAGEMENT STUDIES
COST ESTIMATE
(May 2005)
TOTAL

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
A	**Problems, Opps, Forecasts & Formulation**		
	Site		
1	Reconnaissance	4,100	
2	Configure existing land use data for non-structural	760	

3	Configure existing water profiles for hazard areas	570	
4	Configure w/project water profiles for haz. areas	570	
5	Conduct nonstructural assessment of project area	5,320	
6	Develop non-structural report write-up and review	2,280	
7	Coordination activities (meetings, Conf. Calls)	1,520	
8	QA/QC Review	1,320	
	Labor Subtotal to Decision Point 1	**16,440**	
B	**25% of Conditional Letter of Map Revision Work**		
1	Develop CLOMR Technical Book and MT-2 Forms	11,000	
2	Develop FEMA Mapping (100, 500-yr & floodway	5,280	
3	Coordinate CLOMR Package with NSP	4,400	
4	Coordinate CLOMR Package with City and FEMA	2,640	
5	QA / QC CLOMR Package	2,640	
	Subtotal All Work in CLOMR	25,960	
	Proposed Work in Feasibility @ 25% of Subtotal	**6,490**	
C	**25% of Flood Plain Management Plan Development**		
1	Obtain and review existing flood plain ordinances	1,140	
2	Develop draft FPMP for project sponsor comment	5,320	
3	Coordinate draft FPMP with City Officials (guidance)	2,280	
4	Develop final FPMP Plan and submit to City	3,800	
5	PDT Coordination Activities	1,140	
6	QA / QC FPMP Package	1,320	
	Subtotal All Work in FPMP	15,000	
	Proposed Work in Feasibility @ 25% of Subtotal	**3,750**	
	Subtotal Labor	**$26,680**	**$0**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
A,C	Travel Expenses (i.e., vehicle usage fee) To Decision Point 1	350	
	CLOMR & FPMP Travel @ 100%	1200	
A	Computer usage fees	112	
	Subtotal Other	**$1,662**	**$0**
	Subtotal	**$28,342**	**$0**

TOTAL COST	**$28,342**

Summary Through Decision Point 1

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
Revised September 2005
FLOODPLAIN MANAGEMENT STUDIES
COST ESTIMATE
Feasibility Steps 1-3

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Site Reconnaissance	4,100	0
2	Configure existing land use data for non-structural	760	
3	Configure existing water profiles for hazard areas	570	
4	Configure w/project water profiles for haz. areas	570	
5	Conduct nonstructural assessment of project area	5,320	
6	Develop nonstructural report write-up and review	2,280	
7	Coordination activities (meetings, Conf. Calls)	1,520	
8	QA/QC Review	1,320	
	Subtotal Labor	**$16,440**	**$0**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Travel Expenses (i.e., vehicle usage fee)	350	
2	Computer usage fees	112	
	Subtotal Other	**$462**	**$0**
	Subtotal	**$16,902**	**$0**

TOTAL COST	**$16,902**

7.0 HYDRAULICS

DRAFT
Greeley, Colorado GI Study
Scope of Work for Feasibility Study
Hydraulics Analysis
April 2005

PURPOSE

The primary goal of the Greeley, CO G.I. Study is to evaluate possible projects for a combination of flood control and environmental restoration.

The purposes of the hydraulic analysis are to provide hydraulic data to evaluate the impacts of various proposed alternatives for the Cache la Poudre River in and around Greeley, CO. These purposes will be accomplished by setting up a steady flow model for the study area. The steady-state hydraulic model calculates water surface elevations at a maximum flow condition (peak discharge) for the entire river.

ASSUMPTIONS AND LIMITATIONS

The proposed hydraulic analysis described herein is based on the sponsor's desire for a minimum effort, least cost study that would result in potential projects with federal interest. The use of existing data has been maximized throughout the scope. Two phases have been considered so that the sponsor will have logical decision points to continue or stop the study process.

In order to maximize the use of existing data, several assumptions must be clearly set forth. Table 1 summarizes assumptions made and the limitations imposed by them.

Based on the desire for a minimum effort, least cost study, the existing HEC-2 model, created for the 2003 FIS update study, will serve as the base model for existing conditions. The HEC-2 model will be converted to HEC-RAS to facilitate automated flood boundary plotting through HEC-GeoRAS. It is assumed the existing model is updated to reflect existing conditions and will require minimal effort to convert to a working HEC-RAS model.

Channel stability issues will not be addressed in Phase I of the feasibility study. Tasks related to channel stability and sediment were removed from consideration during feasibility when the study scope was decreased at the request of the sponsor. However, at the completion of Phase I, if a feasible project with federal interest has been decided upon, further investigation will be required. The scope and cost of this effort will be determined prior to Phase 2 initiation. As noted in Table 1, sediment deposition issues may be addressed by requiring regular maintenance by the city. Plan formulation and the evaluation of alternatives must correctly identify project sediment impacts and any associated annual operation and maintenance costs.

TABLE 1.

	Assumptions	Limitations
1	The hydraulic analysis will be based entirely on existing data.	A potential exists for projects to be either underdesigned or overdesigned. Because base data may have a compromised level of accuracy, the level of uncertainty is increased resulting in a project with additional safety factors. For example, a levee design must include a higher safety factor when the level of uncertainty for the water surface profiles is high.
2	The City of Greeley will provide all survey data. Contour mapping with 2-ft (or finer) contour interval will be provided. Additionaly, a digital terrain model (DTM) or a triangulated irregular network (TIN) of 2-ft (or finer) contour interval accuracy will be delivered in National Geodetic Vertical Datum of 1929 (NGVD29). The terrain model must include both overbank and hydrographic surveys and should be able to replicate the contour mapping.	Assuming the City of Greeley will provide existing survey data, all modeled cross sections will be subject to the location of existing data. It will not be possible for the modeler to lay out cross sections convenient for particular study alternatives. Keeping other variables unchanged, the minimum standard deviation of error in the computed stage decreases from 0.6 ft for 2-ft contours to 0.3 ft for 1-ft contours (USACE EM 1110-2-1619). Obtaining 1-ft contour interval accuracy, while more costly, would provide a higher degree of accuracy when computing water surface profiles (and subsequent flood boundaries) and should be taken into consideration.
3	A stable channel analysis will NOT be performed.	Information from the City of Greeley has indicated that sediment deposition is an issue. However, because no stable channel analysis is included in the scope, it must be assumed that the City of Greeley will maintain the channel as needed. Depending on the outcome of this study and the selected project, channel maintenance could range from none to regularly scheduled dredging/cleanup.
4	An unsteady-state HEC-RAS model will NOT be created.	Evaluation of off-channel storage will be performed by Hydrology section using an HEC-HMS model with rating curves supplied by Hydraulics section. Although tasks for the unsteady HEC-RAS model will be omitted, tasks for generating rating curves at locations of most likely storage sites will be included.
5	The existing HEC-2 model reflects existing conditions throughout the study reach. (Exception-new bridge at 8th Ave)	The savings obtained by converting the existing model rather than creating a new model rely on the assumption that the HEC-2 model reflects existing conditions.
6	The existing HEC-2 model will be converted to HEC-RAS to support automated flood boundary plotting.	
7	Evaluation of levee and channel improvement alternatives will be limited to the river reach between Birch Ave. and N. 47th Ave, a reach length of approximately 6-7 miles	Because of the potential to generate a large number of study alternatives, the river reach to be evaluated for levee setbacks and channel improvements has been reduced to the location of highest expected damages (based on very coarse assumptions)
8	Evaluation of tributaries will NOT be performed.	Based on the desire for a minimum effort, least cost study, no tributary evaluation will be performed.

Existing survey information will be used to create a Triangulated Irregular Network (TIN)

or a Digital Terrain Model (DTM). The TIN or DTM will be created by the City of Greeley as an in-kind service. The TIN or DTM will be used to expedite the process of plotting flood boundaries. See Section 1.d of Phase I for more information.

The contour interval accuracy of the surveys used in the HEC-RAS model and the amount of calibration data available both have an effect on the uncertainty of the stage computations as shown in Table 2 (adapted from USACE EM 1110-2-1619) and the accuracy of identifying potential flooding areas.

Table 2

Minimum Standard Deviation of Error in Stage

	Standard Deviation (in feet)	
Manning's n Value Reliability[1]	Cross Section Based on Field Survey or Aerial Spot Elevation	Cross Section Based on Topographic Map with 2-5' Contours
Good	0.3	0.6
Fair	0.7	0.9
Poor	1.3	1.5

[1] Where good reliability of Manning's *n* value equates to excellent to very good model adjustment/validation to a stream gage, a set of high water marks in the project effective size range, and other data. Fair reliability relates to good model adjustment/validation for which some, but limited, high-water mark data are available. Poor reliability equates to poor model adjustment/validation or essentially no data for model adjustment/validation.

The minimum standard deviation of error in computed stages described in Table 1, assumption 2 (0.3 ft for 1-ft contours and 0.6 ft for 2-ft contours) assumes the model has excellent to very good model adjustment/validation to a stream gage, a set of high water marks in the project effective size range, and other data. The importance of data collection (high water marks, flood data, etc.) by the City of Greeley is evident when looking at Table 2. With essentially no data for model adjustment/validation, the standard deviation of error for cross sections based on 2-ft contours increases from 0.6 ft to 1.5 ft.

Obtaining 1-ft contour interval accuracy, while more costly, would provide a higher degree of accuracy when plotting flood boundaries for existing conditions and flood alternatives but is not included as part of a minimal estimate.

Note: The current scope assumes the existing HEC-2 model will be converted to HEC-RAS. If the City of Greeley decides to obtain mapping with 1-ft contour interval accuracy and would prefer that a new HEC-RAS model be created, a change in scope would be required to indicate a HEC-RAS model setup rather than the currently planned conversion from HEC-2 to HEC-RAS.

The mapping provided by the City will primarily be used to determine flood boundaries. The TIN provided by the city will be used in ArcView along with the HEC-GeoRAS extension to determine flood boundaries. Flood boundaries will be provided as-is from the HEC-GeoRAS extension in ArcView. Depending on the topography of the area, the flood boundaries determined using the automated surface intersection routine in the HEC-GeoRAS extension may be coarse. Steep slopes and an irregular bank configuration, common to the City of Greeley, often cause boundaries to either cross contours or locate “islands” or “potholes” throughout the TIN. Considerable time can be spent refining flood boundaries to ensure a clean, smooth delineation and is not scoped

for this study. The flood boundaries will primarily be used for the economic analysis to estimate damages. See Section 3 of Phase 1 for more information.

PROPOSED STUDY TASKS

PHASE 1

1) **Data Collection**. A review of Corps of Engineers (COE) files, past studies, and other available literature pertaining to hydrologic and flood plain studies for the Cache la Poudre River in and around Greeley, CO will be performed by USACE personnel. The search will specifically look for high water marks, gage information, levee information, and flood plain information and has been estimated as a minimal effort.

   a) **Bridge Data**. Data for bridges that have changed since the 2003 Flood Insurance Model will be collected to allow the HEC-RAS model to be updated to reflect existing conditions. This will be an in-kind service that will be performed by the City of Greeley.

   b) **High water marks**. Includes the collection of high water marks, gage data, flood pictures, flood articles, and other past flood data to allow verification of the existing conditions HEC-RAS model. This will be an in-kind service that will be performed by the City of Greeley.

   c) **Levee Information**. Existing levee information along the Cache la Poudre will be collected to determine the adequacy of existing levees. Levees with soils information and engineering drawings will be collected so a determination of the level of protection by Geotechnical Section can be made. Levees without this information may be considered as non-engineered and may not be considered as providing any level of protection. This will be an in-kind service that will be performed by the City of Greeley.

   d) **Survey TIN (DTM).** The hydraulic analysis assumes a digital terrain model (DTM) or a GIS triangulated irregular network (TIN) of best available contour interval accuracy would be delivered in National Geodetic Vertical Datum of 1929 (NGVD29). It is the understanding of USACE that there are several sources for existing mapping that will be combined to create this TIN (DTM). It is assumed the existing mapping generally has 2-ft contour interval accuracy. It is assumed the terrain model will provide an all-inclusive contour map of available data for the channel and overbank areas. This mapping will be provided as an in-kind service by the City of Greeley.

   COE efforts for data collection have been minimally estimated. An allotment for in-kind services has been assumed to assist in collecting and providing copies of the

   high water mark data, gage data, and bridge data in the study reach. The actual cost figure was not listed in the previous cost estimate. An amount of $8,900 for

was determined for in-kind services following conference calls in late August 26, 2005. As described under “Assumptions and Limitations” and listed in Table 2, the uncertainty of the model decreases with more calibration/verification data.

2) **Convert HEC-2 to HEC-RAS.** HEC-RAS assumes steady, gradually varied flow in natural or man-made channels. The effects of various obstructions such as roads, bridges, culverts, weirs, and structures in the flood plain are considered in the computations. The computational procedure is based on the solution of the one-dimensional energy equation (assumes the water surface is equal across the cross section) with energy loss from friction evaluated with Manning's equation. The computational procedure is generally known as the standard step method.

   The existing HEC-2 model and the two split flow HEC-2 models will be imported into HEC-RAS to facilitate automated flood boundary plotting. Tributaries to the Cache la Poudre will not be modeled.

   First, the HEC-RAS model will be calibrated to water surface profiles computed in the 2003 FIS update study. Then, using high water mark data and gage information collected in step 1, the HEC-RAS model will be verified with historic flood events. For scoping purposes, two flood events will be used for verification.

   Using the calibrated HEC-RAS model, water surface elevations for the 5-, 10-, 50-, 100-, and 500-year flood events will be calculated and plotted. The computed results will then be compared to gage data.

   Flood Boundaries. Flood boundaries will be delineated for the 100- and 500-year flood events for the study reach using HEC-GeoRAS and ArcView. The new flood boundaries will be compared to the existing flood boundaries. The evaluation will look for any major discrepancies between the two. *The final product will show flood boundaries as computed from HEC-GeoRAS.* The boundaries will not be refined or smoothed out for the feasibility study. A potential exists for the flood boundaries to cross contours, especially in areas of highly irregular topography and steep slopes. The flood boundaries computed during the feasibility study will be used primarily for the economics analysis to determine damages. If a feasible project is found, additional work would be required to produce flood boundaries to support changes in flood plain zoning. In keeping with the focus on determining project feasibility, floodway calculations will not be performed. The existing floodway will be used when analyzing alternatives.

   Sensitivity analyses will be performed for the roughness values, expansion/contraction coefficients, and starting water surface elevations used in the HEC-RAS model.

   Prepare Flood Routing Data. To determine impacts from off-channel storage, flood routing will be performed by the Hydrology Section using the HEC-HMS model. For scoping purposes, it is assumed that two sites will be analyzed. Hydraulics Section will provide the following information in support of this task: volumes for the Cache la Poudre channel for a range of discharges and rating curves at two off channel

3) **Storage Areas.** Following the flood routing analysis performed by the Hydrology Section, resultant peak discharges will be run in HEC-RAS by the Hydraulics Section to determine the impact to flood stages.

4) **Analyze Flood Control Alternatives-Steady State Only (Cursory).** Alternatives for possible flood control would be laid out by the study team. Based on the desire for a minimum effort, least cost study, the alternatives analysis will focus on the reach of the Cache la Poudre between Birch Ave. and N. 47th Ave (a reach length of approximately 6-7 miles). Levees, channel enlargements or bridge modifications would be individually coded into the steady state HEC-RAS model. Results from this analysis would give an indication of the more promising alternatives to be evaluated in further detail. The cursory analysis will not evaluate combinations of levees, channel enlargements, and bridge modifications. A combination of the components may be evaluated during Phase 2.

5) **Analyze Environmental Restoration Alternatives (Cursory)**. For this study, the scope includes examining the hydraulic features of several potential environmental restoration projects. This may include modeling conceptual meander paths (assume 1 site), adding vegetation (roughness) to the model, and the sizing of one or two structures or channel connections to increase connectivity between the stream and the flood plain. For the cursory analysis, vegetation (roughness) will be added to relatively long reaches (>1/2 mile) and will include 1 or 2 variations. A more detailed evaluation of environmental restoration alternatives is included in Phase 2.

6) **Senior Engineer Oversight.** Supervisory oversight throughout the study progress is estimated at 10% of USACE study costs (not including in-kind services, quality control reviews, or independent technical reviews).

7) **Contingencies.** A value of 15% of USACE study costs (not including in-kind services, quality control reviews, or independent technical reviews) has been added to account for contingencies for unforeseen circumstances.

8) **Meetings and Coordination.** The task includes two to three trips for coordination in Greeley, CO, as well as for internal coordination within the Omaha team. One site visit for modeling is also included. The site visit will include two team members (a junior and senior engineer) to view the study area and collect needed data on bridges, dams, and other structures for the hydraulic and flood plain analyses. The site visit to collect data on bridges and structures consists of taking photographs and allowing the engineer to become familiar with the study area. No detailed information would be obtained during this visit, and the in-kind data collection would still be needed. The visit will also be used to record information on vegetation cover for verifying hydraulic roughness coefficients for the HEC-RAS model.

9) **Quality Control Reviews.** To ensure a quality product is delivered meeting this scope, interim peer reviews will be performed to verify the work is meeting Hydrologic Engineering Branch's quality standards. The reviews will be done

periodically during the study as set forth in a quality control plan that will be developed by the branch.

10) **Independent Technical Review-Steady State HEC-RAS Model.** The estimate includes the cost of 1 independent technical review. The review would be conducted as the study progresses on the steady flow model.

11) **General Expenses (GIS, CADD).** General expenses include fees for the use of ArcView, the GIS network, and CADD. In the Omaha District, the general expenses are tracked and billed according to the hours spent using the software/hardware. Corps offices are billed for both GIS and CADD, which must be paid from the projects that use them. These tools will be used while the product is being developed. For scoping purposes, the amount was estimated based upon a percentage of the total study costs. In-kind services may include similar expenses. It will need to be documented for crediting.

PHASE 2

1) Analyze Flood Control Alternatives-Steady State Only (Detailed). The steady flow model will be used to model and evaluate alternatives such as channel improvements, levees, etc. Impacts of using sand pits as off-channel storage will be evaluated by providing rating curves at the most likely locations to Hydrology Section. Hydrology will then use the rating curves to route flood flows and determine decreases in peak discharge using HEC-HMS.

a) **Existing Storage Facilities.** The impact on water surface profiles and flood discharges from the existing storage facilities will be analyzed by altering the discharges based on the results of the hydrology modeling for with and without these structures.
b) **Proposed Storage Facilities.** The impact on water surface profiles and flood discharges from proposed storage facilities will be analyzed by altering the discharges based on the results of the hydrology modeling when adding these structures. The results of this analysis will be compared to the existing conditions water surface profiles.
c) **Bridges, Levees, Channel Enlargement.** The analysis here will primarily concentrate on how the replacement of bridges, addition of levees, and channel enlargement impacts flood flow discharges and stages.

2) **Analyze Environmental Restoration Alternatives (Detailed).** Similar to Phase 1, task 5. The analysis will include a more detailed analysis of selected potential environmental restoration alternatives determined in the cursory analysis.

3) **Evaluate Selected Alternatives.** Several alternatives will be chosen based on a number of factors, including: computed water surface elevations and flood boundaries, potential induced stages from the alternative, real estate availability, environmental considerations, and overall project feasibility. The selected alternatives will be evaluated to determine the appropriate alternative with

components supporting the National Economic Development (NED) and the National Ecosystem Restoration (NER) plans.

4) **Perform Detailed Analysis of Preferred Alternative**. Based on the alternatives analysis, environmental restoration analysis, and real estate considerations, a

preferred alternative will be selected (the NED plan). A more detailed evaluation of the preferred alternative will be conducted to refine assumptions used in the selection process. The detailed evaluation will include examining the potential for uniform protection through the study reach. Also, levee superiority, FEMA guidance, and the effect of added meanders and/or vegetation will be evaluated with more detail. A floodway will be computed. The selected plan will be evaluated using the HEC-RAS model.

5) **Perform Risk and Uncertainty Analysis on Selected Plan.** It is assumed an uncertainty analysis will be conducted on the selected plan only to determine its appropriate level of protection. Sensitivity analyses will be conducted on the model roughness values, starting water surface elevations, and debris on bridges. USGS gage data will be compared with the computed results. Rating curves will be generated at index stations to aid in the economics evaluation. For scoping purposes, it is assumed that index stations will be established approximately every 4 miles for a total of 5-6 index stations through the 22-25 mile stream reach (depending on upstream and downstream model extents). Coordination with economics and hydrology will be necessary to evaluate the results of the risk assessment.

6) **Prepare Report.** A hydraulic analysis appendix will be prepared describing the HEC-RAS model development and assumptions made while developing the steady flow and unsteady flow models. The hydraulic appendix will include bridge modeling approaches, stream roughness value selection, and any assumptions required in modeling conceptual alternatives. The report will also describe some of the limitations of the study and its results. The report will also include copies of the flood boundaries (for the specified study areas) and water surface profiles developed during the study.

7) **Senior Engineer Oversight**. Similar to Phase 1, task 7.

8) **Contingencies.** Similar to Phase 1, task 8.

9) **Meetings and Coordination.** Similar to Phase 1, task 9. Site visit will be used to confirm assumptions used in modeling and/or view areas that were not foreseen as critical until the detailed evaluation. The site visit will be attended by the project engineer and supervisor.

10) **Quality Control Reviews.** Similar to Phase 1, task 10.

11) **Independent Technical Review-Alternatives Analysis.** The estimate includes the cost of an independent technical review of the alternatives analysis.

12) **General Expenses (GIS, CADD).** Similar to Phase 1, task 12.

The in-Kind Services were jointly eliminated by the City of Greeley and the Hydraulic Engineering Section on August 26, 2005. It was estimated that the in-kind services work would consist of providing data on culverts, bridges, changes in gravel pit configurations, high water marks and historic flood information (photos, newspaper accounts, etc.). The cost of the work was estimated to be $8,900. This amount is noted under the Data Collection effort listed under Phase 1:

DELIVERABLES

The sponsor will receive the following as a final product of the above-described study:

HEC-RAS	-Updated and verified existing conditions model -Selected alternatives models -NED Plan project model
Report	A hydraulic analysis appendix describing model development and description of alternatives analysis. The report will include study limitations and uncertainties as well as plates showing model layout and computed water surface profiles.
Flood Boundaries	-Existing conditions 10-yr, 50-yr, 100-yr and 500-yr flood boundaries from ArcView and HEC-GeoRAS -NED Plan 100-yr and 500-yr flood boundaries and floodway

Summary Hydraulics Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
Updated September 2005
HYDRAULIC STUDIES
COST ESTIMATE
(September 2005)
Phase 1 incl. Tasks 1-3 & Phase 2 incl. Tasks 4-6

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
	Phase 1		
1	Data Collection	2,073	8,900
2	Convert HEC-2 to HEC-RAS	18,656	
3	Flood Boundaries	8,982	
4	Prepare Flood Routing Data	3,455	
5	Initial anal. Flood Control Alts -Steady State	8,982	
6	Initial anal. Environmental Restoration	2,073	
7	Senior Engineer Oversight (10% Phase 1 tasks 1-6)	4,422	

8	Contingencies (15% Phase 1 tasks 1-6)*		6,633	
9	Meetings and Coordination		10,023	
10	S&A, QA/QC		3,464	
11	ITR Steady State HEC-RAS Model		5,000	
		Subtotal Labor	$73,763	**$8,900**
			67,130	wo contingency
	Phase 2			
1	Analyze Flood Control Alts - Steady State (detailed)		24,184	
2	Analyze Environmental Restoration Alts -(detailed)		3,455	
3	Evaluate Selected Alts (top 2 or 3)		6,219	
4	Perform Detailed Analysis of Preferred Alternative		30,402	
5	Perform Risk and Uncertainty Anal. On Selected Pl.		11,055	
6	Prepare Report		17,274	
7	Senior Engineer Oversight (10% of Ph 2 tasks 1-6)		9,259	
8	Contingencies (15% of Phase 2 tasks 1-6)		13,888	
9	Meetings and Coordination		7,347	
10	S&A, QA/QC		5,195	
11	ITR Alternatives Analysis		6,000	
		Subtotal Labor	$134,278	**$0**
			120,389.9	wo contingency

OTHER COSTS

Task	**Description**	**Corps Total Cost ($)**	**In-Kind Total Cost ($)**
Ph1	Travel Expenses (i.e., vehicle usage fee)	5,750	
Ph1	General Expenses (GIS, CADD)	7,500	
All	Travel Expenses (i.e., vehicle usage fee)	13,250	
All	General Expenses (GIS, CADD)	15,000	
	Subtotal Other	**$28,250**	**$0**
		$ 80,380	phase I wo cont
	Subtotal	**$236,292**	**$8,900**
		TOTAL COST	**$245,192**

8.0 GEOTECHNICAL

PROJECT MANAGEMENT PLAN

Greeley, Colorado
General Investigation Study

Scope-of-Work
For Feasibility Study

Geotechnical Engineering &
Sciences Branch

Revised: April 2005

GREELEY, COLORADO FEASIBILITY STUDY
GEOTECHNICAL SCOPE-OF-WORK

General. Develop, describe, and present sufficient geotechnical information to verify, as necessary, the project plan, including the evaluation of the existing levee system and evaluation of three proposed alternatives. The completeness of the work shall be sufficient enough to develop a preliminary construction cost estimate.

Site Characterization. The proposed project location in Greeley, Colorado, and vicinity will be characterized by providing the General Regional Geology, Physiography, Hydrogeology, Climatology, Site Geology, Site Ground Water, and Seismicity. Geology Section of Geotechnical Engineering & Sciences Branch will complete this effort by literature research.

Soils Section B (An office within the Omaha District specializing in Geotechnical Engineering) will research the availability of completed subsurface exploration at the project location and, if necessary, request literature describing upper soils of the area. The local sponsor will also complete research and collection of available subsurface exploratory data for the project area as an in-kind work item.

Soils Section B shall identify potential borrow sites and disposal sites. If applicable, Soils Section B shall also describe evaluations completed for the selection of design parameters, including parameters used as the basis for structural design.

Evaluation of Existing Levee System. The existing levee system will be evaluated based on a site inspection and analysis of available construction drawings, surveys, borings, etc, to determine the level of protection that the current system provides. This evaluation is required as part of the economic benefits analysis of the project as it currently exists and to determine if modifications or replacement of the current levee system will potentially be required.

Site Selection and Project Alignments. Soils Section B shall discuss the selection of the project site and the evaluation of alternative layouts, alignments, and components in relationship to available subsurface data and anticipated construction materials. The site layout information shall be sufficiently detailed to support the development of project real estate requirements and the preparation of a preliminary construction cost estimate.

Project Drawings. Soils Section B shall complete preliminary project drawings depicting engineering requirements and real estate requirements. Drawings showing engineering requirements shall include, but not be limited to, plan views of project alignments, profiles of project alignments, typical cross sections, details of specific components, and subsurface exploratory boring information if available. Drawings showing real estate requirements shall include the limits of lands, easements, right-of-ways, and proposed borrow and disposal sites necessary for the construction, operation, and maintenance of the project.

Further Studies and Completion of Design Documentation Report (DDR). Soils Section B shall help identify plans for further studies, tests, and analyses for completion after the feasibility study phase. This shall include identification of any significant unresolved design issues, an evaluation of how these issues affect current cost contingencies, and how they may impact design costs. To help limit the cost of the feasibility phase, exploratory borings and laboratory testing will be completed after the completion of the feasibility phase (during Preconstruction Engineering and Design (PED)) and documented in the DDR. Following a conference call in August 2005, it was decided to leave the $4140 in for Geotech to do their PED cost estimate at the very end of the Feasibility Study as it will save money as the study proceeds through Plans and Specifications (PED) and Construction.

Submitted by Geotech 12 April 2005

GREELEY, COLORADO
GENERAL INVESTIGATION STUDY
Feasibility Study ED-GB Man-hour Cost Estimate*

FEASIBILITY STUDY - PRE-STUDY WORK

Item	Man-hours		Cost
1. PDT Meetings	8	$107	$856
2. Geological Site Characterization	40	$107	$4,280
3. Subsurface Soils/Bedrock Data Gathering (Coord. & Literature Search)	24	$107	$2,568
	78		

		SUBTOTAL	$7,704

FEASIBILITY STUDY

Item	Man-hours	Rate	Cost
1. PDT Meetings	16	$107	$1,712
2. Evaluation of Existing Levee, incl. report write-up	48	$107	$5,136
3. Evaluation of Three Alternatives, incl. report write-up	72	$107	$7,704
4. Report Plates/Drawings	150	$107	$16,050
5. Quantities Calculations (3 Alt's)	60	$107	$6,420
6. Supv/QC/QA	16	$128	$2,048
		SUBTOTAL	$39,070

MISCELLANEOUS EXPENSES

Item	Cost
CADD fee	$3,000
SUBTOTAL	$3,000

GREELEY, COLORADO
GENERAL INVESTIGATION STUDY

Feasibility Study ED-GB Man-hour Cost Estimate*

POST-FEASIBILITY STUDY

Item	Man-hours		Cost
1. Independent Technical Review	40	$115	$4,600

(ITR)

2. Preconstruction Engineering and Design (PED) Man-hour Cost Estimate	36	$115	$4,140
			$8,740

IN-KIND WORK (CITY OF GREELEY, CO)
(Local sponsor cost not included in this cost estimate.)

Item		Cost
Collection of Subsurface Soil & Bedrock Data (Literature/File Search, Provide Documents)	(to be determined by local sponsor)	(TBD)
	SUBTOTAL	(TBD)

SITE VISITS/
MEETINGS IN GREELEY, CO (Incl. Prep. & Post Work for Trip)

Work Phase	Man-hours	Labor Cost	Per Diem/ Air Fare	Total Cost
Pre-Feasibility Study Work	0	$0	$0	$0
Feasibility Study	16	$1,712	$600	$2,312
Feasibility Study Review (Sponsor Review Stage)	16	$1,712	$600	$2,312
			SUBTOTAL	$4,624

*** Work completed during Preconstruction Engineering and Design Phase:**

1. 1-ft. contour mapping will be provided for all urban areas of the project. Mapping provided will be compatible with MicroStation and InRoads CADD Software.

2. If the local sponsor does not provide an adequate amount of subsurface exploratory boring data for locations of proposed grading for the project, then exploratory borings, sampling, and laboratory testing will need to be completed during the PED phase of the project.

FEASIBILITY STUDY - PRE-STUDY WORK	$7,704
FEASIBILITY STUDY	$39,070
MISCELLANEOUS EXPENSES	$3,000
POST-FEASIBILITY STUDY	$8,740
SITE VISITS	$4,624
TOTAL	$63,138

The In-Kind Services were jointly estimated by the City of Greeley and the Geotechnical Engineering Section on August 24, 2005. It was estimated that the In-Kind Services work would consist of providing subsurface exploratory boring data on bedrock & soils and the existing levee system. The cost of the work was estimated to be $6,000.

Summary Geotechnical Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
Updated September 2005
GEOTECHNICAL STUDIES
COST ESTIMATE
(September 2005)
TOTAL

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	**Data Collection and Review**		
1.1	Initial PDT Meetings	856	
1.2	Geological Site Characterization	4280	
1.3	Subsurface Soils / Bedrock Data Gathering	856	3,600
2,3	**Inventory , Forecast and Formulate**		
a	Evaluate Existing Levee	5,136	2,400
b	Meetings and Coordination 1/2	856	
c	Supv/QC/QA 1/2	1,024	
4,5	**Evaluate & Compare Alternative Plans**		
a	PDT Meetings	1,712	
b	Evaluation of 3 Alternatives, Write-up	7,704	
c	Quantities Calculations (3Alts)	6,420	
6	**Select Recommended Plan**		
6.1	Reports Plates & Drawings	16,050	

6.2	Supv/QC/QA 1/2	1,024	
6.3	Meetings and Coordination 1/2	856	
6.4	Feasibility Study Review with Sponsor	1,712	
6.5	Independent Technical Review	4,600	
6.6	Estimate of work for PED	4,140	
	Subtotal Labor	**$57,226**	**$6,000**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
	Travel & PD @ $700 each	1,400	
	CADD Fee	3,000	
	Subtotal Other	**$4,400**	**$0**
	Subtotal	**$61,626**	**$6,000**
	TOTAL COST	**$67,626**	

Summary Through Decision Point 1

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
Updated September 2005
GEOTECHNICAL STUDIES
COST ESTIMATE
Feasibility Study Steps 1-3

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	**Data Collection and Review**		
	Initial PDT		
1.1	Meetings	856	
1.2	Geological Site Characterization	4280	
1.3	Subsurface Soils / Bedrock Data Gathering	2568	
2,3	**Inventory , Forecast and Formulate**		
	Evaluate Existing		
a	Levee	5,136	2,400
b	Meetings and Coordination 1/2	856	
c	Supv/QC/QA 1/2	1,024	
	Subtotal Labor	**$14,720**	**$2,400**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)

	Travel & PD		700	
		Subtotal Other	**$700**	**$0**
		Subtotal	**$15,420**	**$2,400**
			TOTAL COST	**$17,820**

9.0 HTRW Environmental Baseline Study

The presence of Hazardous and Toxic or Radiological Waste (HTRW) on property included in a project can result in major cost overruns, changes in the project design or on occasion, cause a project to become infeasible. Depending upon the history of lands included in the project footprint, it may be necessary to do an Environmental Baseline Survey to determine the impact that HTRW remediation could have on the project. Since there was no evidence of HTRW issues that surfaced in the 905 (b) report, it is assumed that significant waste dumps are unlikely and relatively small study effort will be required to determine if there is any threat to project viability during this feasibility study. Based upon other projects, $10,000 may be needed to perform the baseline survey.

Summary HTRW Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO

ENVIRONMENTAL BASELINE STUDY
COST ESTIMATE (Assume all in Phase 1)
(September 2005)

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Review Existing Information	2,900	0
2	Coordination and Site Visit	3,600	
3	Report Preparation	2,100	
4	S&A, QA/QC	800	
	Subtotal Labor	**$9,400**	**$0**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
All	Travel Expenses (i.e., vehicle usage fee)	600	

	Subtotal Other	**$600**	**$0**
	Subtotal	**$10,000**	**$0**
		TOTAL COST	**$10,000**

10.0 Surveys and Mapping (Geographic Information Systems)

SCOPE OF WORK
Precision Topographic Mapping and Field Surveying
Cache La Poudre River, Greeley, Colorado
Greeley, CO GI Study
Surveys, Mapping and GIS Section
Budgetary Estimate for Spatial Data Support

May 2, 2005

My effort will involve reviewing in-house data supplied by Greeley GIS personnel; assuring that data is most current available; organizing data into appropriate themes; and producing hard copy maps to show team members what we have.

Elevation data is of immediate concern. Mr. Sullivan informed me that the current 2' contour data is from 1992 and may have been from multiple efforts. Thirteen year old topographic data for a growing city is considered "ancient", not to mention inherent problems of multiple contracting efforts for data gathering and processing. With current budgetary considerations new data gathering seems to be out of the question. Mr. Sullivan also stated that the Water Works department is flying the area for photography only, no topographic considerations. At most a comparison of new photography to existing topography will show land use changes, providing little supplemental information for hydrologic modeling efforts.

TASKS	DESCRIPTION	TIME days	COST
1	**Obtaining & Organizing Data**		
1.1	Familiarization of data & assurance of best data	3	$2,250
1.2	Organization of data into logical theme groups	3	$2,250
2	**Dissemination of Data**		
2.1	Production of hard copy examples for team review	3	$2,250
2.2	File transfer and GIS assistance to team members	2	$1,500
3	**Communication and Team Meetings**		
3.1	Ongoing communication with Greeley Personnel	3	$2,250
3.2	Team meetings	1	$750
	Subtotal		$11,250
4	**Additional Expenses**		
4.1	S&A @ 10%		$1,125
4.2	ITR @ 10%		$1,125

	TOTAL PROJECT COST	$13,500

STUDY TASKS 1-3 Only

TASKS	DESCRIPTION	TIME days	COST
1	**Obtaining & Organizing Data**		
1.1	Familiarization of data & assurance of best data	2.5	$1,875
1.2	Organization of data into logical theme groups	2.5	$1,875
2	**Dissemination of Data**		
2.1	Production of hard copy examples for team review	1.5	$1,125
2.2	File transfer and GIS assistance to team members	1	$750
3	**Communication and Team Meetings**		
3.1	Ongoing communication with Greeley Personnel	1.5	$1,125
3.2	Team meetings	0.5	$375
	Subtotal		$7,125
4	**Additional Expenses**		
4.1	S&A @ 10%		$713
4.2	ITR @ 10%		$713
	FIRST PHASE PROJECT COST		$8,550

Summary Surveys and Mapping / GIS Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
September 2005 Update
SURVEYING & MAPPING
COST ESTIMATE
(September 2005)
TOTAL

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	**Obtaining and Manipulating Data**	4,500	12,000
a	Gather Assessor Data by parcel for study area.		
b	Review elevations- new bldgs & assign to database		
c	Extract culvert invert data from Stormwater Inventory		
d	Existing map points to 1988 datum, section level.		
e	Create DEMs & TINs for beyond 500yr flood plain		
f	Compare current sand pit distribution vs. old.		
2	**Dissemination of Data**	3,750	1,000
a	Provide aerial photos of Cache la Poudre River		
b	Furnish Bridge Inventory Coverage		
c	Furnish available wetland delineation map.		
d	Furnish available recreation and trails maps		
e	Provide available utilities maps		

f	Provide Zoning Maps for future development		
3	**Communication & Team Meetings**	3,000	1,000
a	Provide map for web site.		
b	Provide maps for public meetings.		
4	**S&A (Corps)**	1,125	
5	**ITR (District Office)**	1,125	0
	Subtotal Labor	**$13,500**	**$14,000**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Contractor	0	0
2	Contractor	0	0
	Subtotal Other	**$0**	**$0**
	Subtotal	**$13,500**	**$14,000**
	TOTAL COST	**$27,500**	

Summary Through Decision Point 1

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
September 2005 Update
SURVEYING & MAPPING
COST ESTIMATE
FEASIBILITY PHASE 1

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	**Obtaining and Organizing Data**	3,750	9,000
a	Gather Assessor Data by parcel for study area.		
b	Review elevations- new bldgs & assign to database		
d	Existing map points to 1988 datum, section level.		
e	Create DEMs & TINs for beyond 500yr flood plain		
2	**Dissemination of Data**	1,875	900
a	Provide aerial photos of Cache la Poudre River		
b	Furnish Bridge Inventory Coverage		
c	Furnish available wetland delineation map.		
d	Furnish available recreation and trails maps		

e	Provide available utilities maps			
3	**Communication & Team Meetings**		1,500	500
a	Provide map for web site.			
b	Provide maps for public meetings.			
4	**S&A (Corps)**		713	
5	**ITR (District Office)**		713	0
		Subtotal Labor	**$8,550**	**$10,400**

OTHER COSTS

Task	**Description**		**Corps Total Cost ($)**	**In-Kind Total Cost ($)**
1	Contractor		0	0
2	Contractor		0	0
		Subtotal Other	**$0**	**$0**
		Subtotal	**$8,550**	**$10,400**
			TOTAL COST	**$18,950**

11.0 STRUCTURAL ENGINEERING

It is not certain at this time if work will be needed from Design Branch. If any of the flood detention storage methods selected involve gates or pumps, design branch will become involved. These structural measures may be used to divert water in and out of sand pits and other off-channel storage facilities. The most likely type of structures that could be designed in Design Branch would be gated diversion structures for wetlands and the sandpits. For the feasibility study, the designs would not be detailed or final, and would be used for cost estimating purposes. A representative of this organization is not yet on the PDT. At this time, it is believed that the work from this Branch will be limited to standard pumps and gates. An estimate of $10,000 was included for this service.

Summary Structures Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO

STRUCTURAL STUDIES
COST ESTIMATE
(September 2005)
All Work in Feasibility Steps 4-6

LABOR COSTS

Task	Description		Corps Total Cost ($)	In-Kind Total Cost ($)
1	Interior Drainage Structures		2,000	
2	Off-Channel Storage diversion gates		6,432	
3	Coordination Meetings		736	
4	S&A, QA/QC		832	
		Subtotal Labor	**$10,000**	**$0**

TOTAL COST	**$10,000**

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO

STRUCTURAL STUDIES
COST ESTIMATE
Project Cost Estimates
Feasibility Steps1-3

LABOR COSTS

Task	Description		Corps Total Cost ($)	In-Kind Total Cost ($)
1	Interior Drainage Structures		0	
2	Off-Channel Storage diversion gates		0	
3	Coordination Meetings		0	
4	S&A, QA/QC		0	
		Subtotal Labor	**$0**	**$0**

TOTAL COST	**$0**

12.0 COST ENGINEERING

During the Feasibility Study, estimates must be prepared for diverse tasks such as hydraulic structures, earth moving and utilities relocation. The evaluation of the cost of tasks and structures is an integral part of computing the cost of potentially feasible solution options and the determination of the selected plan.

** - Note: No In-Kind Services were determined to be available for this discipline during feasibility by the Corps Project Manager. The lack of Cost Engineering in-kind service tasks discussed in Corps - Sponsor conference call on 24 August 2005.

Revised by Cost Engineering (Phone Conv. With R. Stricker) 25-Apr-05

GI STUDY

(Man-Hour Estimate)

	Days		$/Day		
1. Earthwork:	6	X	$840	=	$5,040
2. Structures:	2	X	$840	=	$1,680
3. Drainage:	5	X	$840	=	$4,200
4. Utilities:	5	X	$840	=	$4,200
5. Real Est & Oth Engr.	3	X	$840	=	$2,520
6. Alternatives:	5	X	$840	=	$4,200
7. Site Visit:				=	$3,500
			Sub-Total:	=	$25,340
	Supervision		10%	=	$2,534.00
			TOTAL:	=	$27,874.00

Assume 2/3 Cost Engr is in steps 4-6

Steps 1-3 Subtotal = $9,290.40

Summary Cost Engineering Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO

PROJECT COST ESTIMATES - COST ENGINEERING
COST ESTIMATE
(September 2005)
Feasibility Steps 4-6

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Earthwork	5,040	0
2	Structures	1,680	
3	Drainage	4,200	
4	Utilities	4,200	
5	Real Estate & Other Engineering Estimates Estimate	2,520	
6	Alternatives	4,200	
7	Labor, Site Visit	2,500	
	Supervision & QA	2,534	
	Subtotal Labor	**$26,874**	**$0**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
All	Travel Expenses (i.e., vehicle usage fee)	1000	
	Subtotal Other	**$1,000**	**$0**
	Subtotal	**$27,874**	**$0**
		TOTAL COST	**$27,874**
Assume that Phase 1 = 1/3 of total cost		**9,290**	

13.0 CONSTRUCTABILITY REVIEW

The plan selected at the end of the Feasibility Study will be submitted to Construction Division for a general "Constructability" Review. This will be done to determine if there are any obvious construction problems inherent in the selected plan, which would impact plan formulation prior to Plans and Specifications. The listed cost of $4,000 was based upon the effort on other studies of this size.

Summary Construction Total

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO

CONSTRUCTABILITY REVIEW
COST ESTIMATE
(September 2005)

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Review Proposed Plans for Constructability Issues	4,000	0
	Subtotal Labor	**$4,000**	**$0**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
All	Travel Expenses (i.e., vehicle usage fee)		
	Subtotal Other	**$0**	**$0**
	Subtotal	**$4,000**	**$0**
	TOTAL COST	**$4,000**	

14.0 PLAN FORMULATION & PROJECT MANAGEMENT

Project management includes the work of both the Corps and the Local Sponsor to direct the progress of the feasibility effort. A primary Project Management task is defining the critical study path in order to lead the feasibility study forward in a timely fashion. Other Project Management tasks include the necessary upward reporting through the District, Division and USACE (i.e. PRC, PRB and data calls) and through the administration of the City of Greeley and the Colorado Water Conservation Board, working with budget documents and workload projections and preparation of the PCA. It is likely that a local advisory committee will be established, to review and evaluate the progress of the feasibility study.

Formulating a flood damage reduction and ecosystem restoration plan is the primary goal of the Feasibility Study and requires active involvement by the Planning Branch. A primary Plan formulation task includes guiding the team to iterate through the 6 steps Plan Formulation Process which are noted as follows:

1) Specify problems and opportunities.
2) Inventory and forecast conditions and define the without project future condition.
3) Formulate alternative plans.
4) Evaluate the effects of alternative plans.
5) Compare alternative plans.
6) Select the recommended plan and prepare for the PED phase.

Other Plan Formulation tasks include planning, conducting and documenting meetings; leading the public involvement process, ITR coordination and the Feasibility report preparation and publication. Considerable in-kind service work is expected in the area of public involvement. Cost estimates for Project Management functions are estimated based upon projected task efforts and the workload generated managing previous General Investigation Studies in the Branch. Following discussions between the Corps and the Sponsor, it was determined that there will be significant in-kind services provided in the areas of project management and plan formulation by the City of Greeley. Costs of those services include an estimated $78,000 for labor and an additional $12,000 in direct costs to support the project. Those estimated costs were distributed in the following tables by task.

Summary Plan Formulation / Project Management Total

GENERAL INVESTIGATION FEASIBILITY STUDY **CACHE LA POUDRE RIVER AT GREELEY, COLORADO** **Revised September 2005** **PROJECT MANAGEMENT** **COST ESTIMATE** **(September 2005)** TOTAL			
LABOR COSTS			
Task	**Description**	**Corps Total Cost ($)**	**In-Kind Total Cost ($)**

	Planning Phases 1-3		
1	Advisory Committees (PRC, etc)	5,544	1,000
2	Prepare & Update Budget Documents	5,544	1,000
3	Study Correspondence and Documentation	9,240	4,000
4	Scheduling and Progress Tracking	6,930	1,000
5	PDT Meetings (Attendance, Agendas, Minutes)	6,930	3,000
6	Public Involvement Plan & Coordination	9,240	3,000
7	Plan Formulation and Analysis	11,550	3,000
8	ITR Coordination	2,772	0
	Labor Subtotal	57,750	16,000
	Planning Phases 4-6		
1	Advisory Committees (PRC, etc)	5,544	2,000
2	Prepare & Update Budget Documents	6,468	1,500
3	Study Correspondence and Documentation	9,240	6,000
4	Scheduling and Progress Tracking	6,930	1,500
5	PDT Meetings (Attendance, Agendas, Minutes)	9,240	8,000
6	Public Involvement Plan & Coordination	9,240	9,000
7	Plan Formulation and Analysis	13,860	10,000
8	Prelim. Report Prep	9,240	5000
9	Draft Final Report Prep/Review	9,240	4000
10	Final Report Preparation	13,860	2,000
11	Project Division Level Coordination & Approval	10,395	500
12	ITR Plan Implementation & Coordination	6,930	500
13	Prepare & Sign PCA	9,240	500
14	Value Engineering*	0	1,500
15	Participate in External Independent Tech Review*	0	4,000
16	Participate in Washington Level Review*	0	6,000
	Labor Subtotal	119,427	62,000
*	Sponsor Plan Formulation Tasks Counted Here & not in Summary		
	Subtotal Labor	**$177,177**	**$78,000**

OTHER COSTS

Task	**Description**	**Corps Total Cost ($)**	**In-Kind Total Cost ($)**
	Provide meeting locations	0	3,000
All	Travel Expenses (i.e., vehicle usage fee)	7200	9,000
8,9,10	Misc. Report Prep (Binders, Repro, etc.)	1,000	
	Subtotal Other	**$8,200**	12,000
	TOTALS	**$185,377**	**$90,000**
		TOTAL	**$275,377**

COST

Summary Through Decision Point 1

GENERAL INVESTIGATION FEASIBILITY STUDY
CACHE LA POUDRE RIVER AT GREELEY, COLORADO
Revised September 2005
PROJECT MANAGEMENT
COST ESTIMATE
TOTAL STUDY COST
Feasibility Phases 1-3

LABOR COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
	Planning Phases 1-3		
1	Advisory Committees (PRC, etc)	5,544	0
2	Prepare & Update Budget Documents	5,544	0
3	Study Correspondence and Documentation	9,240	1,440
4	Scheduling and Progress Tracking	6,930	0
5	PDT Meetings (Attendance, Agendas, Minutes)	6,930	1,440
6	Public Involvement (Prep and Attendance)	9,240	2,400
7	Plan Formulation and Analysis	11,550	1,920
8	Misc. Coordination & Project and Study Support	2,772	0
	Subtotal Labor	**57,750**	**7,200**

OTHER COSTS

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
	Provide meeting location & support materials		1500
All	Travel Expenses (i.e., vehicle usage fee)	3600	3600
8,9,10	Misc. Report Prep (Binders, Repro, etc.)	0	0
	Subtotal Other	**$3,600**	**$5,100**
	Subtotal Other Costs	**$3,600**	**$5,100**
	TOTALS	**$61,350**	**$12,300**

TOTAL COST	$73,650

15.0 VALUE ENGINEERING

Value Management is a process to facilitate and encourage the understanding, consideration, and integration of the needs of all customers, PDT members, partners and stakeholders. Value management seeks the highest value for a project by balancing resources and quality and should be applied continuously throughout the life cycle of the project. Value Management is maintaining important functions in regard to efficiency, effectiveness and cost control during the study. At least one VE study shall be performed during the feasibility phase of the project, as part of the plan formulation process prior the selection of final alternatives.

The criteria for Value Engineering are spelled out in EC 11-1-114 “Army Programs Value Management / Value Engineering”, which covers current applications of the methodology under the Project Management Business Process. The basis for the current Value Engineering process is mandated by Public Law 104-106, Section 4306 (1996) and Public Law 99-662, Section 911 (1986).

For this General Investigation Study, this means that a Value Management Plan will be developed to make sure that Value Management / Value Engineering tasks are properly scheduled and staffed during the Feasibility Phase. During this phase, a Value Engineering Officer will become part of the PDT. The purpose of the VE Officer is to make sure that VE activities are accomplished and the appropriate documentation prepared. During the feasibility phase, at least one VE study will be conducted as part of the plan formulation process, prior to the selection of the final alternative. The cost estimate of $30,000 for this function was made based upon the cost of Value Engineering effort costs on similar GI studies.

16.0 PROGRAM MANAGEMENT & CLOSEOUT

Program management is a separate Project Management task that is concerned with accounting for the expenditure of the taxpayer’s money. On the Federal side, this covers congressionally appropriated funds and on the local side, this covers tax dollars raised through local assessments, including sales, property and income taxes.

The PM is responsible for closeout; however, the required actions may require participation of the PDT members, especially for closeout of financial cost accounts. The closeout would also apply in situations where the project might be terminated. All outstanding obligations and commitments will need to be cleared. The sponsor’s PDT member responsible for keeping financial records will assist the PM in carrying out an audit of feasibility study cost expenditures, including funds used for contracted services and those for in-kind services. The PM shall also insure that all contracted services products have been accepted prior to making any final payments.

Omaha District procedures for closeout shall follow standard operation procedures. The amounts of Federal and non-federal costs will be determined and a balancing of expenditures based on the approved study cost share ratio will be determined. The

outcome will determine the direction and amount of any funds to be transferred between the sponsor and the Federal government.

The cost of the closeout is to be included in the PMP scope per guidance in Article VI, Part B of the current model FCSA.

At the conclusion of the project a closeout accounting must be performed to balance the costs of the project to the proportions defined in the cost share agreement. The work involved in project funds management and closeout generally costs about 1% of the total cost of the feasibility study total and has been estimated at about $10,800.

17. FEDERAL AUDIT

Projects of this size are subject to a Federal Audit to ensure that the tax payer's money has been properly spent at all levels of government. An independent audit will be performed after closeout. This is anticipated to cost about 1% of the total cost of the feasibility study total and has been estimated at about $10,800.

18. REQUIRED WASHINGTON LEVEL REVIEW

General Investigation studies must be reviewed by a team in Headquarters USACE in Washington, DC. The review effort may include travel to Greeley by Washington level reviewers and from Omaha or Greeley to Washington to participate in the review the feasibility study. Local expenses associated with this process can be credited as In-Kind Services. This effort is generally about 5% of the federal study cost before contingency and has been estimated to be about $54,000. During Phase 1, Headquarters will be involved in a Feasibility Scoping Meeting before the Formulation of Alternative Plans effort is complete. The Feasibility Scoping meeting, including preparation, travel and documentation is estimated at around $10,000 during Phase 1.

19.0 OTHER PROJECT RELATED TASKS

In addition to the tasks defined in the preceding paragraphs, there are other tasks that are part of the Feasibility Study process.

19.1 SPONSOR INITIATED TASKS

This flood control and ecosystem recreation project is a joint venture between the City of Greeley and the Corps of Engineers. There may be additional tasks, which are not scoped in this document that should be proposed as part of the project by the local sponsor, which would add greatly to the final project. The local sponsor may propose additional tasks that pertain to solving specific problems within the bounds of the legally authorized project for cost sharing under this agreement. Examples of sponsor-initiated study items may include tasks such as stakeholder involvement coordination and

recreation impact analysis. Presently, there is no money for these tasks in the cost estimate.

19.2 PUBLIC INVOLVEMENT

Leading the public involvement effort is a scoped task within the Plan Formulation and Project Management cost estimate. Some of this effort will be a local in-kind services task, such as conducting public informational meetings, or the development of a local web page to provide detailed spatial information to the citizens of Greeley as the study progresses. Other members of the team will also participate in Public Involvement tasks as needed, and the cost of this effort is included in the overall cost estimates.

The City of Greeley is considering the establishment of a Poudre Study Advisory Committee. It would participate in the detailed feasibility study for the purpose of providing agency and public input to the formulation process. Representation on this committee would include city, county and state officials, land owners and officials from the water conservancy district. It is anticipated that regular meeting will be held with this advisory committee during the course of the Feasibility Study. The establishment of a Poudre Study Advisory Committee by the City of Greeley would be useful in encouraging widespread public involvement.

19.3 INDEPENDENT TECHNICAL REVIEW

Cost estimates for the preparation of a feasibility report and a within-Omaha District Independent Technical Review (ITR) are contained within the estimates and scopes prepared by each functional element and detailed in this Appendix. According to the latest Corps guidance (EC1105-2-408 dated May 31, 2005), all General Investigation Studies are now required to have an ITR conducted during the feasibility study. This Peer Review requirement has been applied to the Cache la Poudre at Greeley Feasibility Study, since the Feasibility Cost Share Agreement had not been signed when the new requirement went into effect. No exception to this directive has been granted for the Cache la Poudre study. The ITR will be managed by the Northwestern Division, and the ITR team will be drawn from experts outside of the Omaha District. The estimated cost of this requirement is approximately $40,000 to pay the cost of individuals from other Corps Districts to review the Feasibility Study. Part of this cost was included in the individual scope and cost estimates of some team members, thus the line item cost for this task is shown to be about $29,000 in the overall cost estimate. That cost will be shared between the Federal and Local Government.

One of the first tasks following the signing of the Feasibility Cost Share agreement will be to work with the Northwestern Division to assign members to the ITR team. The ITR team will involve two separate elements. One element of the review will be directed towards programs, policy, project management, economics and environmental issues. Another will focus on engineering issues. Since flood control is the dominant engineering discipline, it is anticipated that the ITR technical team will draw from senior Hydrology and Hydraulics experts within the Division.

FEASIBILITY STUDY
CACHE LA POUDRE RIVER
AT GREELEY, COLORADO
Peer Review Mandated by EC
1105-2-408 31May 05
External Independent Technical Review
Cost Estimate
Sep-05

After Decision Point 1

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
1	Policy, Planning, Economics & Ecosystem ITR	0	0
a.	Environmental Studies*	0	
b	Plan Formulation & Economics	$11,120	
2	Engineering Division		
a	Hydrology	$4,606	
b	Hydraulics	$13,750	
	Subtotal Labor	**$29,476**	**$0**

* Environmental Studies already included external ITR in their cost estimate in the amount of $10,000

Task	Description	Corps Total Cost ($)	In-Kind Total Cost ($)
	(included in labor estimates)		
	Subtotal Other	**$0**	**$0**
	Subtotal	**$29,476**	**$0**
	TOTAL COST*		**$29,476**

*$39,476 including Environmental Studies

APPENDIX B
ESTIMATED SCHEDULE

PROJECT	***Current***
MILESTONE	***Schedule***
Initiate RECON	March-03
Establish PDT	September-03
Draft 905(b)	December-03
District Commander approval	April-04
Initial LOI	June-04
FCSA Draft to Sponsor for Review	October-04
Sponsor Complete Review of FCSA	February-05
Draft Re-scoping	April-05
PMP (Preliminary)	May-05
Final 905(b)	June-05
Submit FCSA & 905b Report to NWD	July-05
Obtain new LOI	August-05
Complete Feasibility PMP	September-05
NWD Certification	September-05
Sign FCSA & Initiate Feasibility Study	November-05
Obtain CWCB Funding	December-05
Feasibility Scoping Meeting	March-06
Complete Decision Point I	December-06
Complete Draft Feasibility Report / EA	March-08
Final Feasibility Report	December-08

APPENDIX C
QUALITY CONTROL PLAN
OMAHA DISTRICT

A. PROJECT RISK SCORING FORM

Guidelines: The Project Delivery Team (PDT) will score each item in the QCP Score Guide (Table 1) to get a total score. Based on that score, the review components may be selected from the Review Component Matrix (Table 2). The Project Manager (PM) will document the team's evaluation by completing this form,

QCP Score Guide – Table 1								
Project Risk Item	**Degree**	**Assessment**					**Degree**	**Score**
Project Complexity	Low	1	2	3	4	5	High	4
Customer Expectations	Low	1	2	3	4	5	High	4
Product Schedule/Cost	Flexible/Low	1	2	3	4	5	Fixed/High	3
Engineer/Scientist Experience	High	1	2	3	4	5	Low	3
Failure Impact and Consequences	Low	1	2	3	4	5	High	4

Based on the score from above, the review components can be selected using Table 2. Table 2 serves as a guide only. Review components may be revised as appropriate to address specific project issues. The QCP will state the selected reviews.

Review Component Matrix – Table 2			
Total Score	Design Checks/Peer Review	Interference Check Component	**ITR Component**
5 – 9	None/Other Section Members	Product Development Team Members	Section Chief or Tech Specialist
10 – 19	Other Section Members	Product Development Team Members	Section Chief or Tech Specialist
20 – 25	Other Section Members/recognized experts	Product Development Team Members and recognized experts	Recognized expert (CX, Consultant, other District experts, etc.)

Project Score Total (Table 1): _____18_____

List the selected reviews for each project phase and each discipline:

Design Checks/__Other Section Members_____
Peer Review:__Other Section Members_____

Interference Checks: ____PDT Members_____

ITR: ____Section Chief of Tech Specialist_____

B. PROJECT MANAGEMENT PLAN APPROVAL

Location: Greeley, Colorado **Project Name:** GI Study

Product: Feasibility Report **IH / AE**(Circle one) **Completion date:**_____

PM: Mark Nelson **PE:** Mark Nelson
Development Team Leader: Mark Nelson **Review Team Leader:** _____
Omaha District GI FCSA Lead: David Brandon

CORPS OF ENGINEERS

Discipline	**Team Member**	**Signature**	**Date**
Cost Estimator	Richard Stricker	_____	_____
Geotechnical	Dennis Gaare	_____	_____
Surveys, GIS	Ty Sabin	_____	_____
Hydro,Hydrology	Joel Knofczynski	_____	_____
Hydraulics	Curtis Miller	_____	_____
Flood Plain	Randy Behm	_____	_____
Plan Formulation	Mark Nelson	_____	_____
Economics	Kara Reeves	_____	_____
Environmental	M. Katie Reed	_____	_____
Cultural Res.	Sandra Barnum	_____	_____
Real Estate	Victoria French	_____	_____

CITY OF GREELEY

Project Manager	Dave Wells	_____	_____

C. INDEPENDENT / TECHNICAL /DISTRICT PEER REVIEW

Location: Greeley, Colorado **Project Name:** GI Study

Product: Feasibility Report **IH/AE**(Circle one) **Date of QCR:** _____

PM: Mark Nelson **PE:** Mark Nelson
QA Review: Supervisor____Independent IH____ Independent AE_____
QC Review: Supervisor_____Independent IH____ Independent AE_____

Development Team Leader: Mark Nelson Review Team Leader: _____

Discipline	Reviewer	Signature	Date
Cost Estimator	James Dunn		
Geotechnical	John Bertino		
Hydro Branch	Larry Buss		
Plan Formulation_	David Brandon		
Economics	Gene Sturm		
Environmental	Candace Gorton		
Real Estate	Lon Larson		

D. SUPERVISORY / QUALITY CHECK / QA REVIEW

Location: Greeley, Colorado **Project Name:** GI Study
Product: Feasibility Report **IH/AE**(Circle one) **Date of QCR:** _____

PM: Mark Nelson **PE:** Mark Nelson
QA Review: Supervisor____Independent IH____ Independent AE_____
QC Review: Supervisor____Independent IH____ Independent AE_____
Development Team Leader: Mark Nelson Review Team Leader: _____

Discipline	Reviewer	Signature	Date

E. CLOSEOUT REPORT

Location: Greeley, Colorado **Project Name:** GI Study

Product: Feasibility Report **IH-AE-IH/AE** (Circle one) **Date of QCR:** _____

PM: Mark Nelson **PE:** Mark Nelson

QA Review: Supervisor____ Independent IH____ Independent AE____ NA____
QC Review: Supervisor _X_ Independent IH____ Independent AE____ NA____

Development Team Leader: Mark Nelson____Review Team Leader:_____

Lessons Learned:
Significance of Annotated Review Comments:
Open Issues: