Value Engineering

FINAL REPORT

PROJECT:

Chicago Ditch Dam Rehabilitation

211-1758-4707-001-00-0-0

DATE: December 23, 1996

Conducted for and in cooperation with:
US Fish and Wildlife

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Reclamation
Reclamation Service Center

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Chicago Ditch Diversion Dam on the Rio Grande River

EXECUTIVE SUMMARY

PROJECT: Chicago Ditch Dam Rehabilitation

General:

The purpose of this value study was to examine the subject project to identify alternatives that had the potential to enhance the value of the proposed project for the Fish and Wildlife Service and the customers they serve.

Through traditional Value Method procedures, the Value Study Team evaluated the activity. The team took the public issues, activities, funding authorization, and available resources (time, money, equipment, etc.) into consideration in its activities. The team generated **seven** concepts that would add value to the project. The value study also generated several **value added** features to the concept plans. (Value added features are defined as attributes that the team believes will improve the final product in non-monetary or hard to quantify ways, e.g., time, quality, and safety. Increased initial or Life-Cycle Costs (LCC), if any, are expected to be more than offset by the apparent added non-monetary value, and/or have undetermined cost savings that will exceed the projected increased proposal cost.)

Proposals 1A-1C are alternative methods to construct the diversion dam and there potential savings are, therefore, dependent upon each other. All other proposals are independent. At the December 6, 1996 oral presentation, the Value Study Team and Fish and Wildlife representatives performed an incremental cost versus worth analysis of all the diversion dam proposals. As a result, Proposal 1B was selected as the preferred alternative. A brief description and an estimate of the minimum potential value of the proposals are:

Proposal No. 1A. Construct the replacement dam using a sheet pile and riprap diversion structure. This approach produced several identified desired **value added** features (removal of seasonal restrictions, time, getting a solution in-place, etc.) and had the potential to reduce costs by about **$328,800.**

Proposal No. 1B. Use roller-compacted concrete to construct the replacement dam. Time and season requirements to construct using this approach were identified to be less advantageous as that identified in Proposal 1A. However, as compared to the Title I concept, this construction technique would produce similar desired **value added** features (time, getting a solution in-place, etc.) and had the potential to reduce costs by about **$493,100.** This was identified by the team and Service representatives to be the preferred value study alternative for construction of the diversion dam.

Proposal No. 1C. Construct the replacement dam using a diversion structure constructed of grouted riprap and make use of the existing sheet pile. Constructing the dam by this approach would produce similar desired **value added** features (minimal season restrictions, time, getting a solution in-place, etc.) and had the potential to reduce costs by about **$356,700.**

Proposal No. 1D. Construct the replacement dam as shown in the Title I design but add a low flow notch and move the gate to the west side of the structure. The Value Study Team determined that the use of this approach would produce **value added** features (reduced ice

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Proposal No. 2. Construct the replacement intake control structure at the same location as the original intake structure. Use of this approach is expected to produce desired **value added** features (avoiding flooding issues, potential risk of structure movement necessitating replacement, etcetera) and had the potential to reduce costs by about **$95,100.**

Proposal No. 3. Install automation equipment to control gates and measure flows. The Value Study Team estimated that this approach would produce several desired **value added** features (avoiding expertise, production losses, potential risk to staff, etcetera). However, it had the potential to increase costs by about **$13,700** over the life of the diversion facilities.

Proposal No. 4. Use precast units to construct gate floor, walls, and support blocks. It was estimated that this approach would produce several desired **value added** features (reducing lost water diversion time, construction time, and removing gate associated seasonal requirements) and had the potential to reduce costs by about **$5,800.**

Assuming the maximum cost savings for proposals that are independent of each other were selected, the maximum potential saving for the independent proposals resulting from the value study was about **$653,000** (pursuant to Part IV of the Interior Office of Management and Budget Fiscal Year report for FY97.) The cost to perform the value study was less than **$20,000.**

Additional Items for Further Study.

More than ten additional items for further study were also recommended. These are items that, due to time constraints, the lack of apparent large significant savings or value added during initial idea evaluations, complexity of idea, or scope of the idea (as compared to the study scope), make further investigation by the Value Study Team, within their limited time constraints, inadvisable. They are submitted for further consideration and development to add value for the project. The Value Study Team did not develop these concepts to the detail of the previous alternative proposals.

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GENERAL DISCUSSION OF THE VALUE METHOD PROCESS, ITS PURPOSE, AND THIS VALUE STUDY

The Value Method process is a series of procedures that were originally developed by Larry Miles in 1943. In general, it is a systematic and organized process to develop alternatives that secure essential functions at the greatest worth as opposed to their life-cycle cost (highest value). It has many applications but is most often used as a management and decision (problem-solving) tool.

A job plan is used throughout the value study activity. In brief, the component features from a program, project, or activity (PPA) are examined to determine pertinent functions, governing criteria, and associated costs. Then, through creativity techniques, resulting idea analysis, and development of the remaining best ideas, alternative methods that fully meet necessary requirements at a lower cost, or with an increase in the long-term values, are proposed for adoption by the parties responsible for the PPA.

This report is the result of a Value Study Team effort. A Value Study Team is comprised of people with the desired expertise and independence. They have an understanding of the needs of the organization they represent, and can take an open and independent view of the PPA being studied. Ideally, they have not been notably involved in the PPA prior to the value study. Using Value Method applied to the current collected data, the Value Study Team takes a "fresh look" at the PPA to create alternatives that fulfill the client needs at the greatest recognized attainable value.

The Value Method process has many common names. These mainly relate to the timing of its application or type of PPA studied. It is often referred to as: Value Analysis (VA), Value Management (VM), Value Engineering (VE), and Value Planning (VP).

The application of the process has been highly successful for more than 50 years for both private and Governmental entities. As a result, the Federal Government has mandated its use in all Federally funded operations. This value study report has the substance required to demonstrate that quality Value Methodology procedures were used throughout this value study, as stipulated under the mandated Governmental Value Program (as recommended by the Department of Interior and Bureau of Reclamation guidance) and the recommendations of the Value Method profession.

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VALUE STUDY TEAM ACKNOWLEDGMENT OF DESIGN TEAM AND CONSULTANTS

The Value Study Team wishes to express thanks and appreciation to the Lead Designer, Mr. William Kendal, and the other members of the design team, who fully and cordially provided all requested information and consultation on the conceptual design. The success of the value study effort could not have been possible without their full cooperation and assistance.

The Value Study Team wishes also to express thanks and appreciation to those listed on the Consultation Record of this report. The cooperation and helpfulness of those consulted contributed greatly to the technical foundation and support of the VST's deliberations and proposals.

The aim of using the Value Method is to achieve the best worth for the cost (value) for the project. It is only with the full team effort, as shown by all involved, that this goal can be achieved. This study represents the product of such an effort.

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VALUE STUDY
PROJECT:

Chicago Ditch Dam Rehabilitation

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VALUE STUDY
PROJECT:

Chicago Ditch Dam Rehabilitation

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TEAMLIST.MEM

GENERAL DESCRIPTION

PROJECT: Chicago Ditch Dam Rehabilitation

The Alamosa National Wildlife Refuge is operated and maintained for the benefits of migrating waterfowl and other environmental purposes by the Department of the Interior, Fish and Wildlife Service. To maintain and enhance existing wetlands, water flows are diverted from the Rio Grande River into the Chicago Ditch. The ditch carries the water to the refuge wetlands. The diversion canal is sized to meet the senior water right for a diverted flow capacity of 66 ft^3/sec. The location of the Refuge and diversion structures are shown in Figure 1.

A stable flow is maintained through the operation of a low profile diversion dam (Chicago Ditch Diversion Dam). This diversion dam raises the upstream water surface and generates a small pool within the river and in the ditch upstream of the Chicago Ditch intake control structure. The river flow is diverted into Chicago Ditch at the river and flow into the Ditch diversion system is regulated by a gated control structure. During floods or higher discharges, the river flow is allowed to pass over the diversion structure. Low flows and debris are periodically passed through a gated flume. The diversion and control structures were built in about 1967.

The existing structures are antiquated, difficult to control, and pose hazards to the operating personnel. The actual constructed structures appear to differ from the original design drawings. While designed and constructed adequately for the time period during which they were constructed, they lack the currently accepted safety and design features. The personnel operating the facility have had to learn a relatively adept method of changing its operational flow pattern. This means a high degree of expertise must be developed by the operators. Untrained staff cannot fully operate the controls. The existing facility is also eroding from overtopping of the dam when ice flows build up. The concept design, which is similar to the constructed site, is shown in Figure 2 and Figure 3.

The United States Congress has authorized expenditure of Federal funds to correct the operational and maintenance problems at these facilities. In 1994, the Fish and Wildlife Service determined that replacement of the existing diversion facilities would be the best option for meeting the needs of the Refuge.

A alternative evaluation report to examine various replacement schemes was completed in August 1994. Three alternatives were proposed: Ogee Weir Dam, Trapezoid Dam, and Handwheeled Sluice Gates with an overtopping weir to the side. All the alternatives included the same replacement option for the Ditch intake.

The Title I submittal for the Trapezoidal Dam and Ditch intake alternative was completed February 1995. Allocation of funds to proceed with construction in the 1997 construction season is planned.

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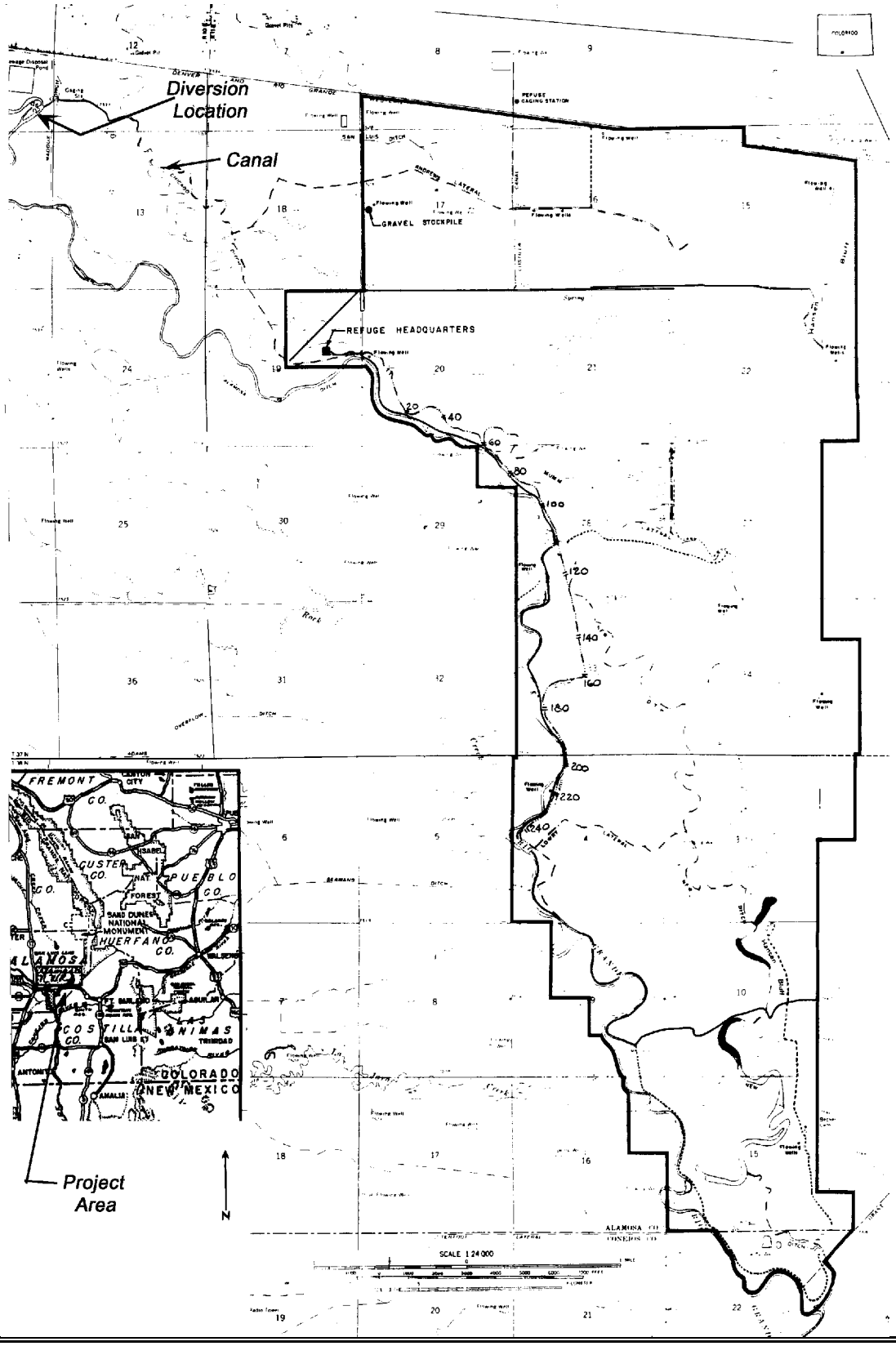
Figure 1. Location Map



LOCMAP.PCX

Figure 2. Existing Diversion Dam

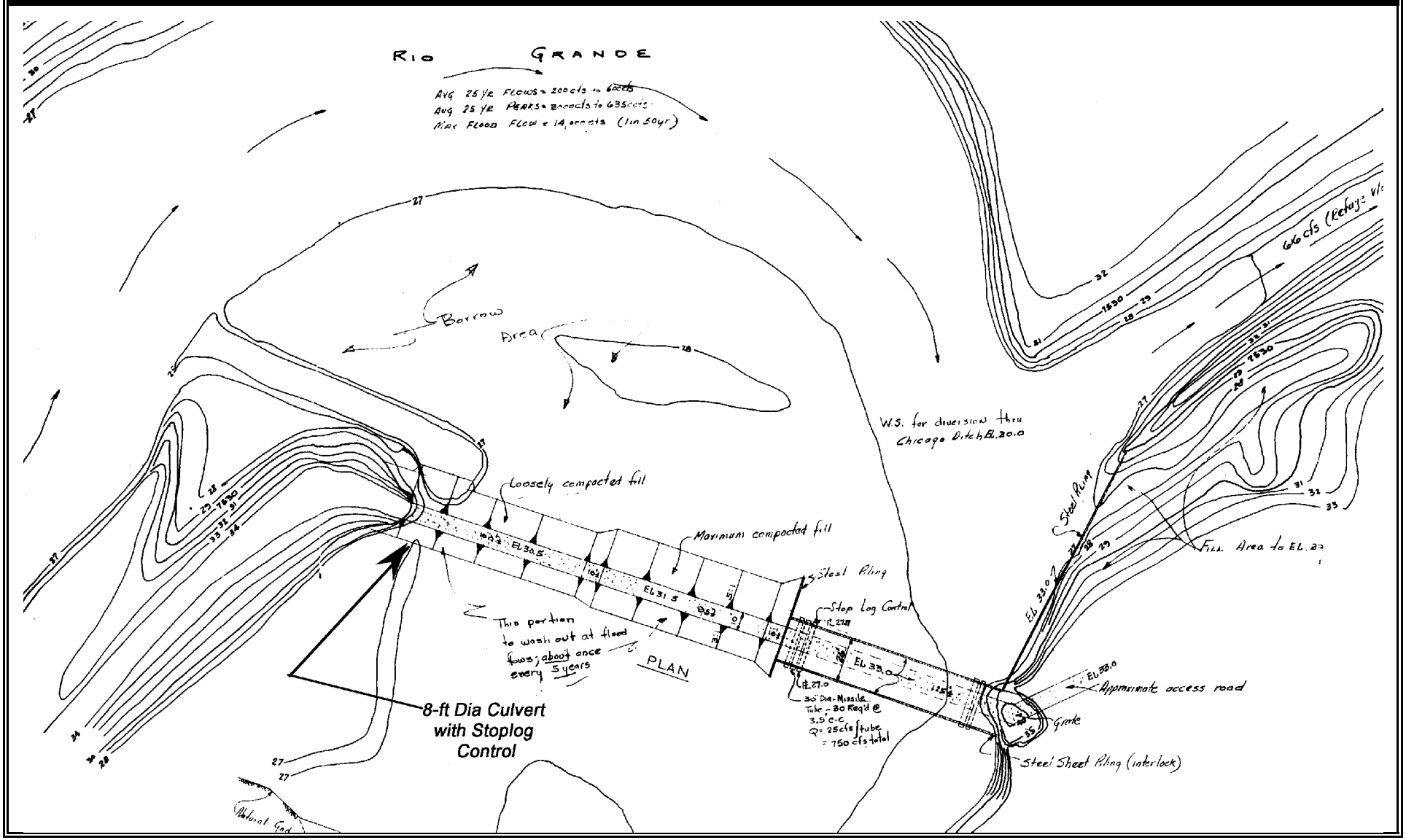


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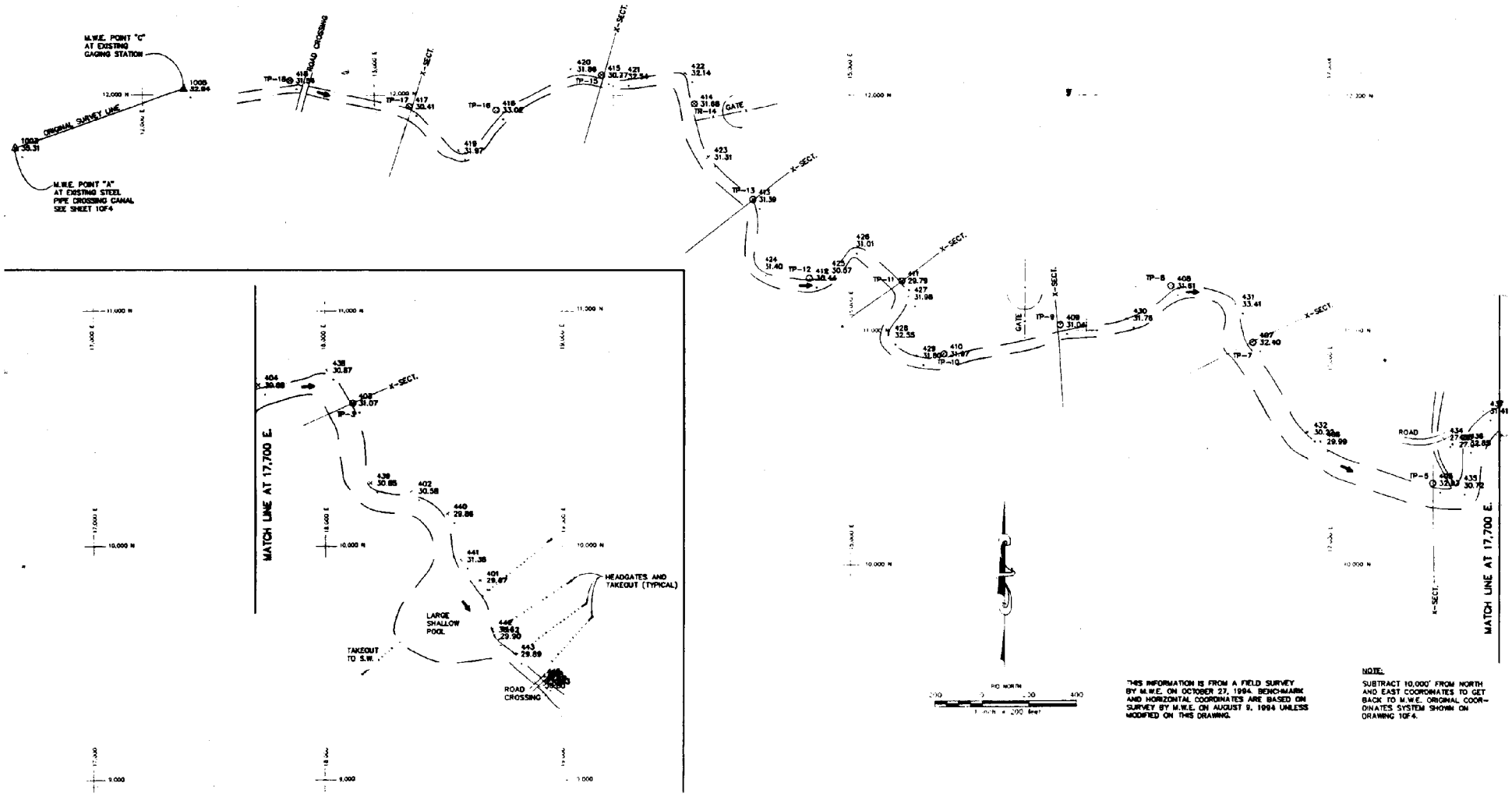
Figure 3. Existing Intake Control Structure



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OWNERS, USERS, STAKEHOLDERS ANALYSIS

Groups and Their Criteria/Limits

Project: Chicago Ditch Dam Rehabilitation

Owners (Groups that own or will own item)

Source-Criteria/Limits	Hard	Soft	Monetary Value	Time Value	Comments
Fish and Wildlife Service	X				Nesting season in June and July cannot be adversely affected. Operation to wet the Refuge must be possible by April 1.
Fish and Wildlife Service		X			The optimum construction period that affects the Refuge the least is about November through March.
Fish and Wildlife Service		X			Construction during diversion periods should be avoided. However, if necessary for construction, the August and September months are the preferred plausible time.

Users (Groups that will use item)

Source-Criteria/Limits	Hard	Soft	Monetary Value	Time Value	Comments
Fish and Wildlife Service- Wildlife using wetlands and environmental features		X			Waterfowl need to have the wetlands present during migration and nesting periods. Plant life is adversely affected by lack of water for extended periods. Water availability is limited.
Recreational Users- Hunters (mainly duck and geese), fisherpeople, and other Refuge visitors (birdwatchers, etc.)		X			These people make use of the water and its use in the Refuge environment to enjoy their recreations. The Service augments their use through pumping options when water is not sufficiently available.
Grazing Lessors- Local ranches have grazing options on some Service lands that indirectly obtain their vegetation from diverted water		X			Contracts and responsibilities with these groups need to be maintained, or alternatively, may require compensation if adversely affected. Income is produced from these sources.

OWNERS, USERS, STAKEHOLDERS ANALYSIS

Groups and Their Criteria/Limits

Project: Chicago Ditch Dam Rehabilitation

Stakeholders (Groups that will have a stake in the item)

Source- Criteria/Limits	Hard	Soft	Monetary Value	Time Value	Comments
City of Alamosa- The city has a new sewage treatment plant near the diversion dam		X			If the river surface elevation during floods were changed it may adversely affect that plant.
Upstream People- Several people have businesses and residences upstream of the dam		X			If the river surface elevation during floods were changed it could adversely affect their business or other activities.
Corp of Engineers- Congress has charged the Corps with administering and issuing of the required Section 404 permit	X				It is expected that the solutions proposed would be termed a "Finding Of No Significant Impact" (FONSI) for the purposes of the 404 permit. However, public meetings may be required. Estimated approval time is three to six months.
State of Colorado- Colorado State Engineer and Colorado Department of Natural Resources		X			The State notifies the Service of the water right available during any period and monitors compliance. The State also issues and controls the allowed hunting and fishing practices.
Grazing issues		X			People involved with those that have grazing contracts with the Service may be concerned if the contract agreements are adversely affected.
Environmental Groups- The practice of good environmental policies		X			People concerned with Federal policies as they pertain to the mission of the Service.
Recreational Support Groups- Hunting, fishing, and wildlife watching		X			The practice of policies that serve the interests of their recreational group.

OUSLIMIT.TAB

DESCRIPTION OF PRESENT ACTIVITY PLAN

PROJECT: Chicago Ditch Dam Rehabilitation

The preferred option as presented to the value study team was a trapezoidal structure with a radial gate and a Ditch intake control structure at the edge of the average (non-flood) river channel. The Title I designers sized the radial gate so as to draw debris to it and to allow debris to be cleared through the gate by the river flow as much as possible. A radial gate was selected due to its ease of operation and reduced potential for being adversely affected by sediment and debris. The purpose of the gate and overflow structure design was to avoid the current operational difficulties for the people charged handling those activities. The concept for the diversion dam is shown in Figure 4 and Figure 5.

The proposed relocated Chicago Ditch intake structure included a radial gate across the entire width of the structure. The location was selected to allow more debris to be drawn away from its intakes and reduce the amount of sediment deposited in the Ditch before the actual intake control structure. A debris boom was to be placed upstream of the intake to block surface debris. Again, the control is by a radial gate and it was selected due to its ease of operation and dependability. The concept for the diversion intake structure and Ditch is shown in Figure 5 and Figure 6.

The estimated construction cost for the accepted Title I project is $939,200 in 1995 dollars. Including design and other activities the total estimate for the work in 1995 dollars was $1,221,800. The estimate for 1997 construction is about $1,035,500. Therefore, the actual 1997 total cost is estimated to be about $1,347,000. The total cost allocated for the project is $1,200,000.

No change in the operating water surface is contemplated and the flow diversion behavior. Therefore, the work is designated as rehabilitation. Since the no change to existing feature is present, it is assumed that the Environmental Assessment (EA) for rehabilitation work should require the generation of an Environmental Impact Statement (EIS). An Environmental Assessment with a Finding of No Significant Impact (FONSI) is expected.

PRESDESC.DES

COST MODEL AND ESTIMATE INFORMATION

The Value Study Team cost model was based on the Title 1 design estimates presented to the Value Study Team by the designers at the initiation of the study. The cost model was developed by the Value Study Team. It was used to focus on features with the greatest potential for savings, and to highlight potential instances of value mismatch. (Areas that have low worth in comparison to their projected cost.)

To ensure reliability and applicability, all unit prices were reviewed by both estimators and the Value Study Team. Estimator(s) were independent from both the Value Study Team or design and process team. Value Study proposal and original concept estimates are of the same general level of development. It should be recognized that unit costs and estimates may vary as final designs are pursued and refined.

1COSTPAG.PG

Figure 4. Title I Design Diversion Dam

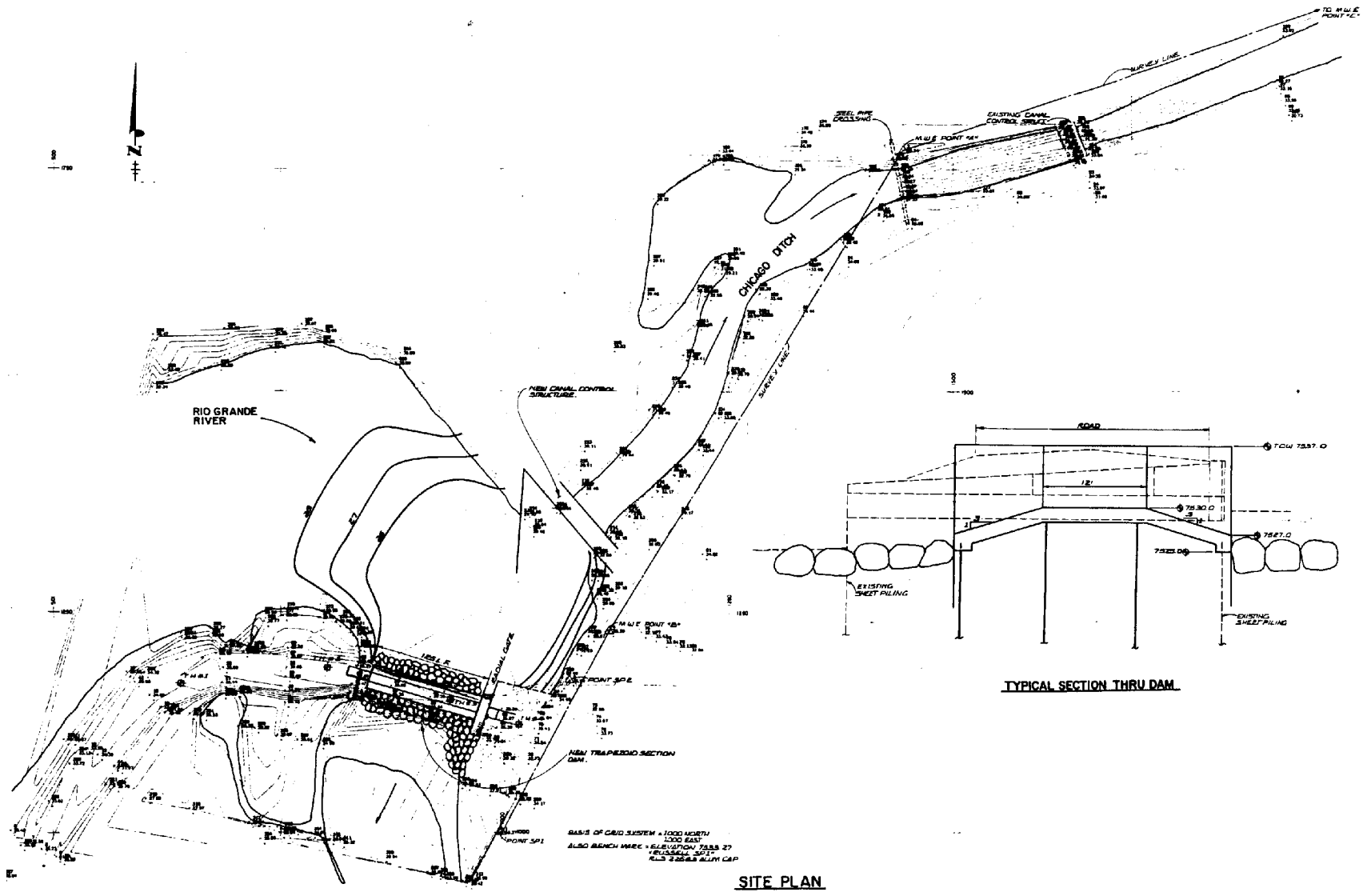

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Figure 5. Title I Design Diversion Dam – Plan and Sections

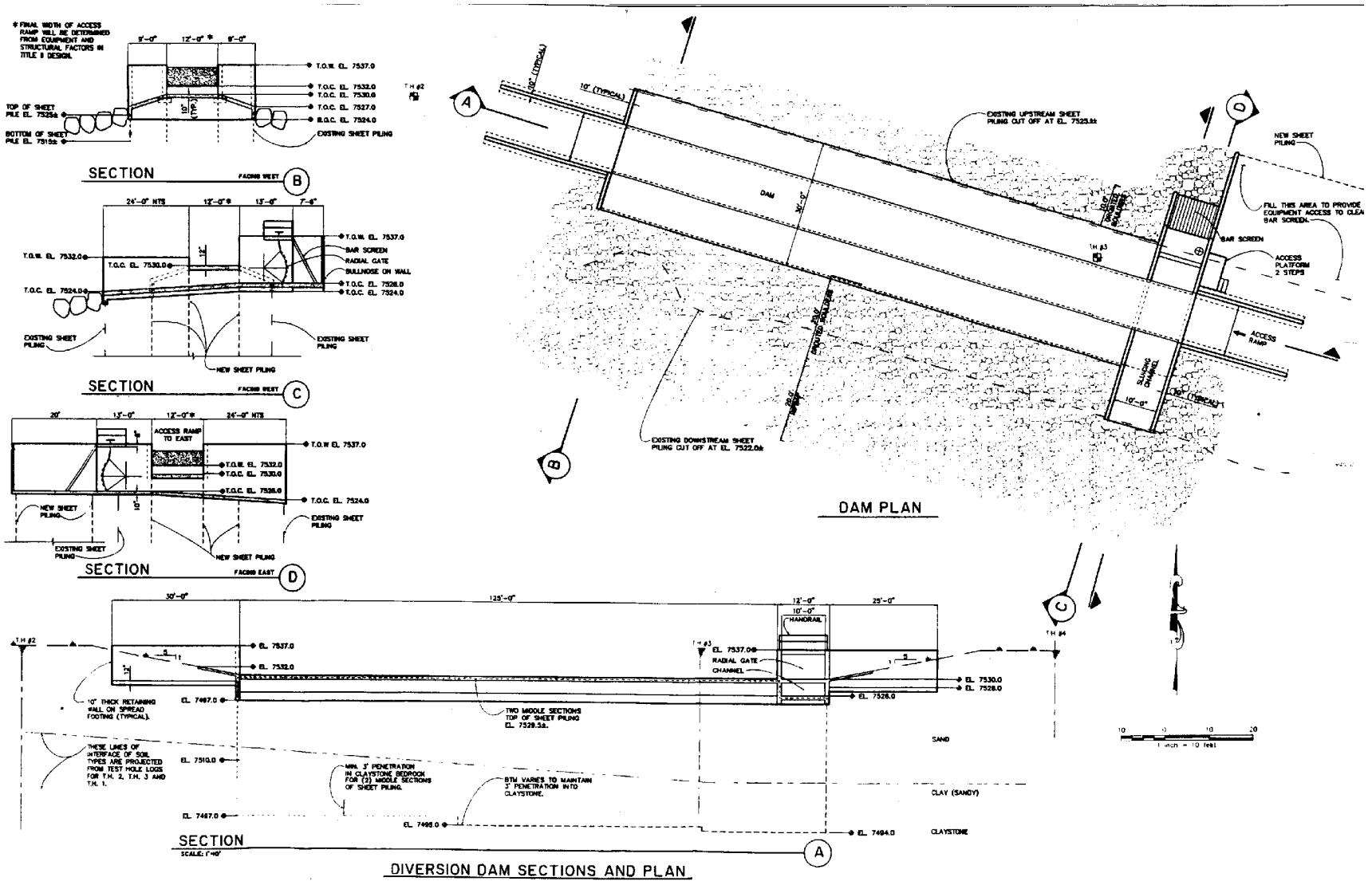

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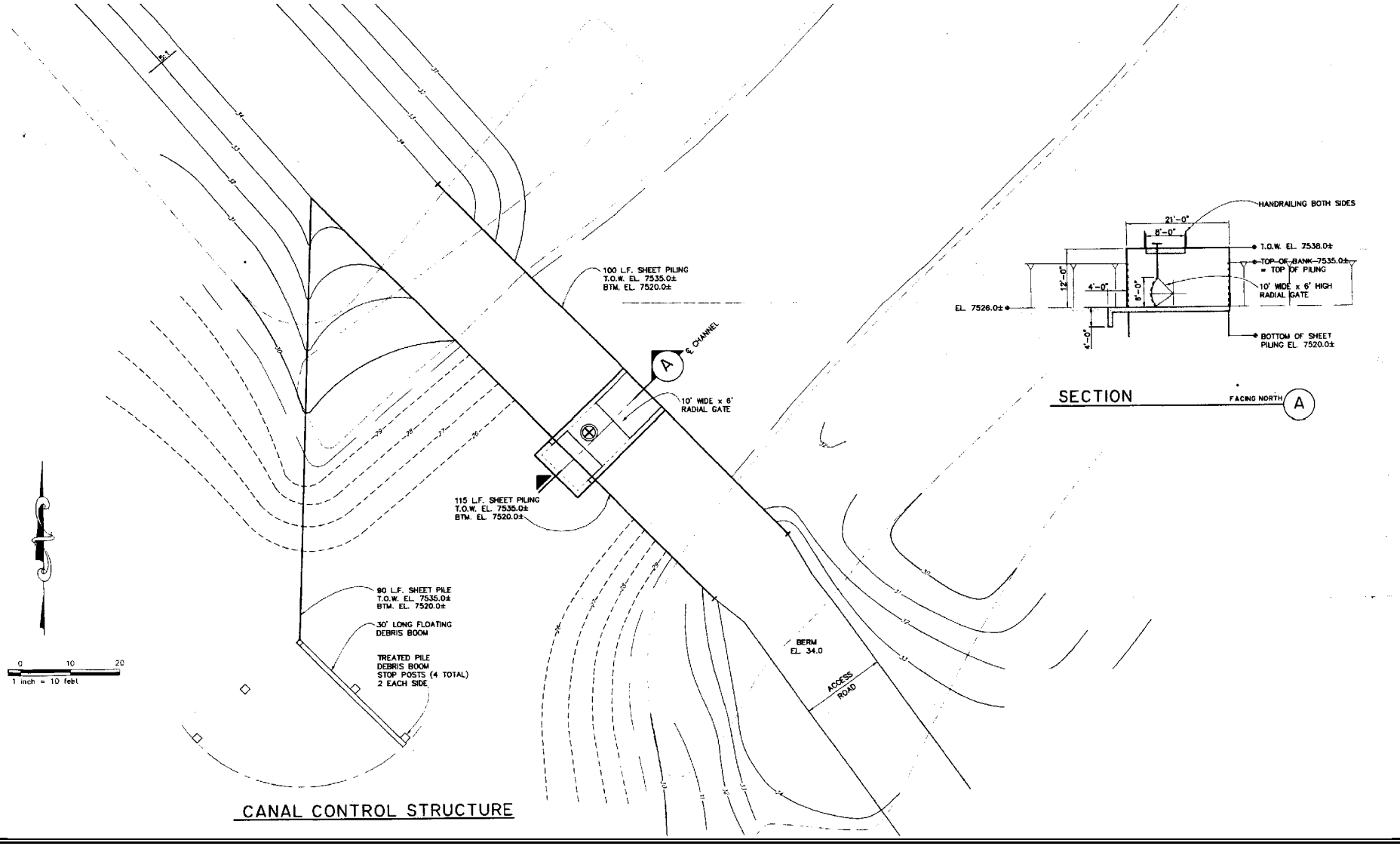
Figure 6. Title I Design Intake Structure – Plan and Sections



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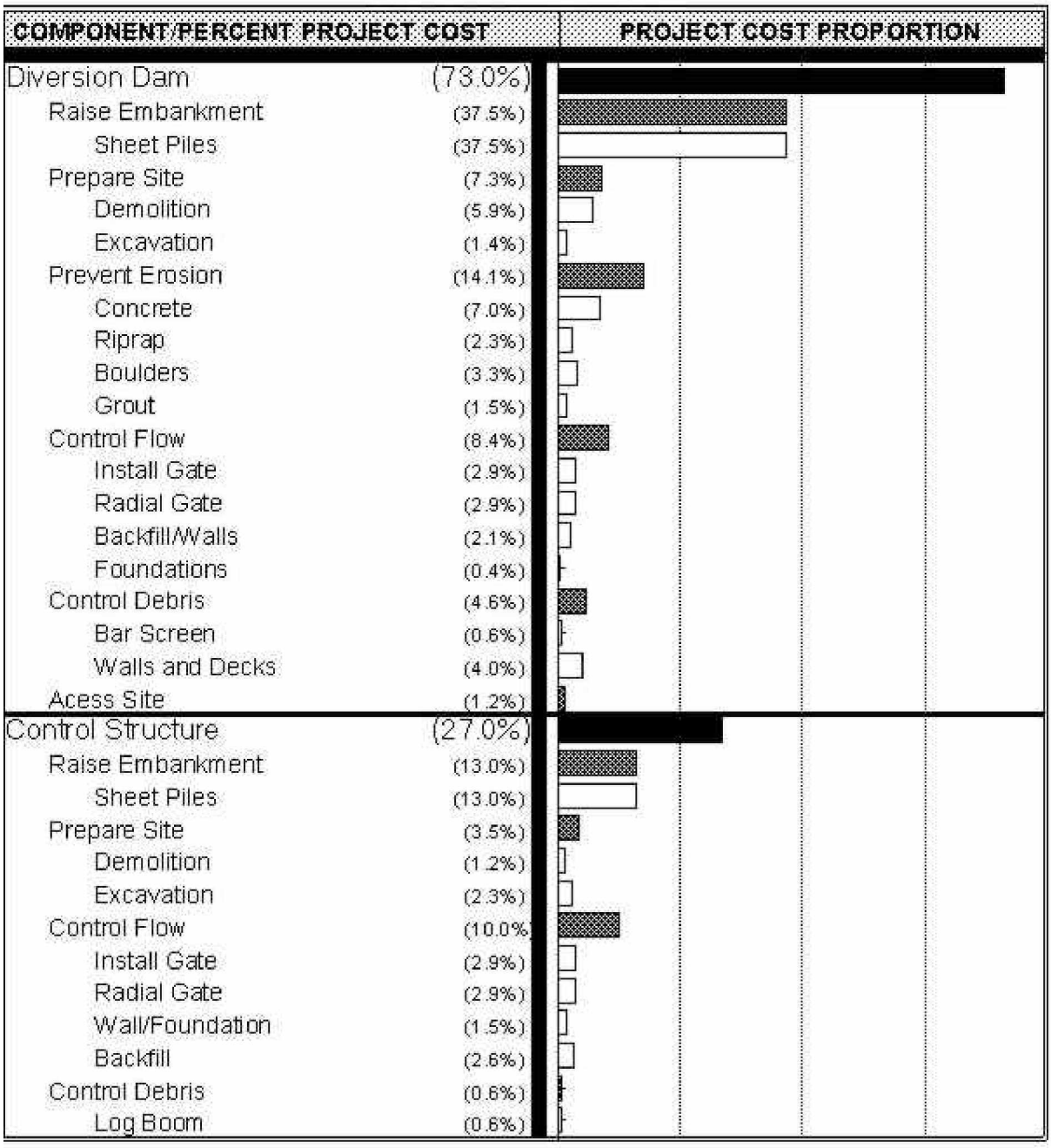
COST MODEL

Chicago Ditch Diversion Dam Rehabilitation

VALUE STUDY

COST MODEL



FUNCTION ANALYSIS

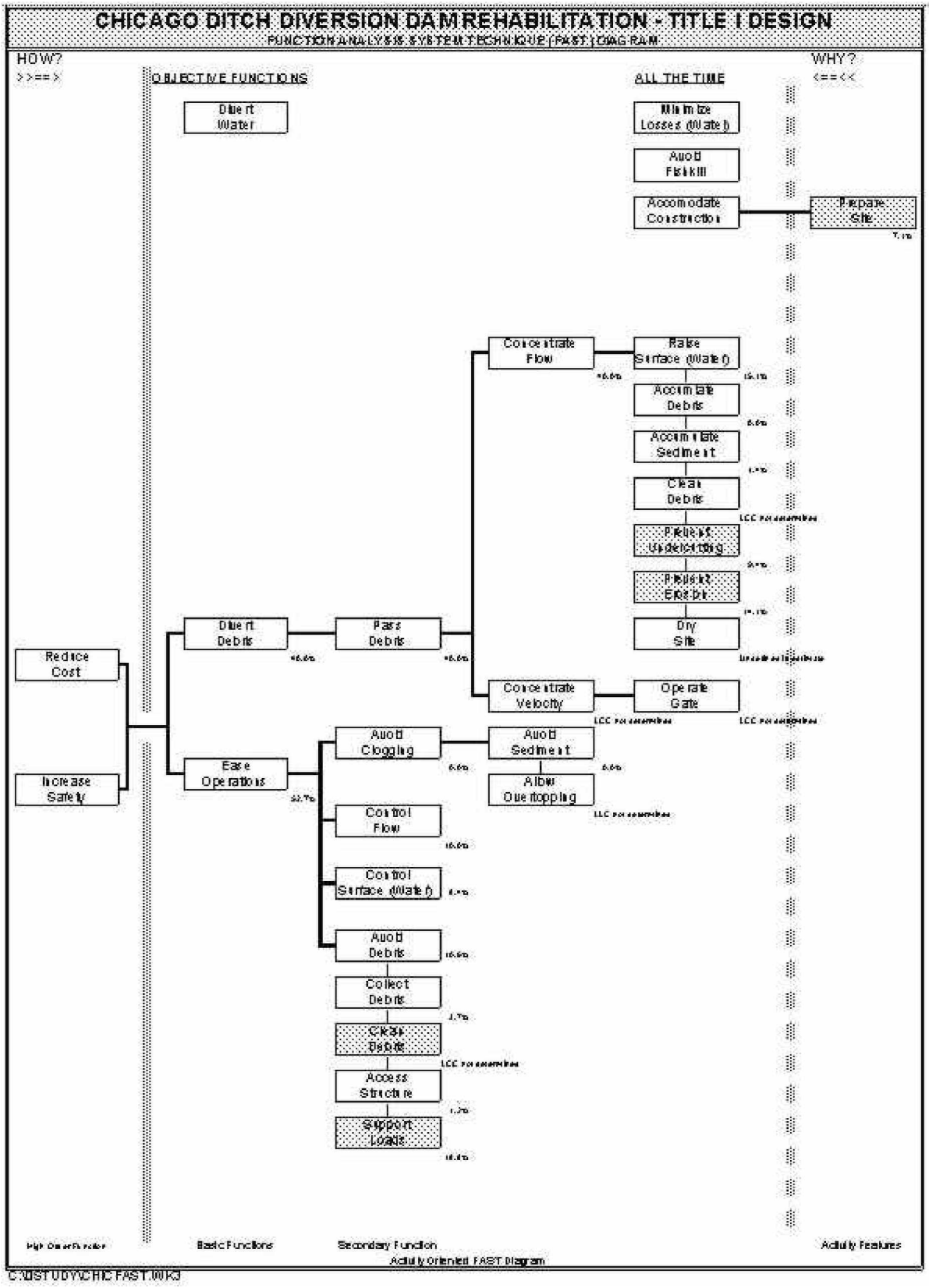
PROJECT: **Chicago Ditch Dam Rehabilitation**

STUDY ITEM: **DIVERSION DAM CONSTRUCTION AND INTAKE CONTROL STRUCTURE**

COMPONENT	VERB (ACTIVE)	NOUN (MEASURABLE)
DIVERSION DAM CONSTRUCTION		
Diversion Dam	Raise Divert Dry Avoid Pass Pass	Surface Water Site Fishkill Debris Floods
Sheetpile	Reduce Support Prevent Support Minimize Remove Improve	Leakage Loads Undercutting Stability Wastewater Piping Efficiency
Riprap	Prevent Increase	Erosion Mass
Concrete/Weir	Support Prevent Control Control	Wood Erosion Elevation Watersystem
Embankment	Fill Reduce	Void Cost
Gate	Control Remove Concentrate Concentrate	Flow Sediment Flow Velocity
Bar Structure	Avoid Access Remove	Clogging Structure Debris
INTAKE CONTROL STRUCTURE		
Concrete	Support Contain	Load Water
Gate	Control Avoid Avoid	Flow Debris Sediment
Access	Clean Operate	Debris Gate
Boom	Divert Collect Clean	Debris Debris Debris
Approach Earthwork	Accommodate	Construction

FUNCANAL.TAB

FUNCTIONAL ANALYSIS SYSTEM TECHNIQUE (FAST) DIAGRAM



Function Analysis System Technique (FAST)

The Value Study Team used the function-analysis process to generate a function-logic diagram. It is often referred to as a Function Analysis System Technique (FAST) diagram. A FAST diagram shows the "why" and "how", and "supporting" functions being performed. Items for potential concentration of study team effort were identified through the FAST. These functional tools aided the Value Study Team in identifying crucial features that are pivotal to meeting requirements that support critical issues (basic function and critical-path functions). It also highlights those functions that meet the activities less critical objectives (supporting or secondary functions). The development of the FAST assists the team in identifying any potential value mismatches and expedites the Value Study Team efforts in generating a common-understanding of the activity's purposes and applicable governing criteria.

FASTDIA.PG

VALUE STUDY – DISPOSITION OF IDEAS

PROJECT: Chicago Ditch Dam Rehabilitation

VALUE STUDY ELEMENTS CONSIDERED AS POTENTIAL PROPOSALS AND THEIR DISPOSITION	
IDEA	**DISPOSITION**
Avoid and limit debris entry into conveyance system by:	Most of the proposed concepts were consolidated, evaluated, and incorporated as shown in Alternative Proposal Nos. 1A-1D.
1. Place a debris boom in beginning of channel and move intake structure to other location further within Ditch, or use at present location.	1. This concept was determined to be extra cost with minimal value added. It was not used further.
2. Place a debris boom in beginning of channel and keep intake structure at design location.	2. Concept was used in the above proposal.
3. Use a chain for the debris boom and sweep it through the area as required to clean debris out.	3. Concept was used in the above proposal.
4. Build a basin to accumulated debris. Channel flow to "encourage" debris to enter the entrapment basin. Clean basin as required.	4. The concept recommended as an "Additional Idea for Further Consideration."
5. Build a "natural" barrier of sand or other material to accumulate debris in a easy to clean location.	5. Concept was recommended as an "Additional Idea for Further Consideration."
6. Avoid debris accumulation by use of a flap gate. Lower gate as needed to allow flow to clear debris.	6. This was determined to be inappropriate for this situation.
7. Use a knife gate as described in the previous discussion.	7. This was determined to be inappropriate for this situation.
8. Avoid the need to construct an expensive load support system for the dam crest by using a dozer to clean basin in place of a backhoe.	8. Dozer use was determined to be unnecessary due to discovery that the involved loads were less than envisioned during Title I work.
9. Use a drag line and sweep it through the area as required to clean debris from the ponded area.	9. It was determined that the cost of this idea outweighed the value added.
10. Concentrate the debris away from intake by concentrating flow away from it. Options discussed included: move the gate to the other side of the dam; use a notch, slide, or other gate instead of radial gate; use a low flow (flow related to aquatic minimum flow requirements) notch and debris boom combination	10. Through incremental worth versus cost procedures, the team decided a radial gate, moved to the west side of the dam, and addition of a notch on the east side would have the highest potential for added value. Concept was incorporated into the above proposal.

VALUE STUDY – DISPOSITION OF IDEAS

PROJECT: Chicago Ditch Dam Rehabilitation

VALUE STUDY ELEMENTS CONSIDERED AS POTENTIAL PROPOSALS AND THEIR DISPOSITION	
IDEA	**DISPOSITION**
In place of the cast-in-place concrete, use precast material around radial gate flume so as to reduce the required construction time.	This idea was incorporated into Alternative Proposal No. 4.
Ease operations through use of automation techniques such as: 1. Install a slide gate and control motor on the upstream 8-foot-diameter culvert. 2. Electrically operate the gate(s). 3. Tie in automated gate operating system with input from automated readings from the measurement flume. 4. Place a remote camera in a vandal hardened box so Refuge people can monitor remote controlled activities at intake. 5. Power facility through windmill or solar, or obtain power from the powerline that is less than one-half mile distant. 6. Mechanically remove debris from bars through use of a traveling water screen wipe or other method.	The concepts were consolidated, evaluated, and incorporated as shown in Alternative Proposal No. 3. 1. It was discovered that the culvert is near the end of its expected life. Therefore, the team recommended removing and replacing its operation as discussed in Proposal No. 1. 2. Used concept in the above proposal. 3. Used concept in the above proposal. 4. Abandoned due to determination that the ideas was extra cost with minimal value added. It would be a likely candidate for vandalism. 5. Powerline concept was used in above proposal. Alternative power sources are not expected to be sufficient to power gates. 6. Idea was considered to be extra cost with minimal value added.
Rechannel the upstream section of the Rio Grande River to remove the losses and improve flow distribution.	Ability to implement this option considered to be improbable and costly. Thus, the concept was not investigated further.
Stop the problem debris from entering river.	The debris has no point source. Thus, this idea was not considered to be practical.
Provide Refuge water by pumping it into the Ditch. This would allow a high degree of control.	Pumping of the water would be a high operation and maintenance expense for the Service. The added expertise to keep the pumping plant operational and the potential for breakdown at crucial periods more than negate any potential benefits.

VALUE STUDY – DISPOSITION OF IDEAS

PROJECT: Chicago Ditch Dam Rehabilitation

VALUE STUDY ELEMENTS CONSIDERED AS POTENTIAL PROPOSALS AND THEIR DISPOSITION	
IDEA	**DISPOSITION**
Provide Refuge water by diverting the water upstream of present location. This would allow a higher head to be available.	The combination of potential water rights effects, cooperation with another entity, potential environmental aspects, and other complications appear to negate the potential benefits that would be derived.
Develop a boy and/or girl scout "pick up program" with an interpretive program by a Service person to foster their activities, reduce potential costs, and further the information part of the Service mission.	Recommended as an "Additional Idea for Further Consideration."
Develop an "Adopt the River" program with the local public to foster public involvement and reduce cleanup costs.	Recommended as an "Additional Idea for Further Consideration."
Develop a program to sell the wood debris for firewood.	Recommended as an "Additional Idea for Further Consideration."
Diversion dam construction: 1. Design to use only riprap and existing steel and avoid the use of new sheetpile. 2. Design the crest to consist of only riprap and grout. 3. Use a sheetpile wall and riprap for the dam materials. 4. Use the riprap only for the spill over sections of the dam. 5. Create a gravity dam by using roller-compacted concrete or simple low-grade concrete. 6. If high loads transport across dam is found to be needed, distribute loads through use of driven piles and avoid use sheet pile wall for the support strength.	Concepts were consolidated, evaluated, and incorporated as shown in Alternative Proposal Nos. 1A-1D. 1. Used concept in the above proposal. 2. Used concept in the above proposal. 3. Used concept in the above proposal. 4. Used concept in the above proposal. 5. Used concept in the above proposal. 6. After analysis, this idea was determined to be extra cost with minimal value added. Did not use.
Move intake to another location within the channel.	Incorporated in Alternative Proposal No. 2.

VALUE STUDY – DISPOSITION OF IDEAS

PROJECT: Chicago Ditch Dam Rehabilitation

VALUE STUDY ELEMENTS CONSIDERED AS POTENTIAL PROPOSALS AND THEIR DISPOSITION	
IDEA	**DISPOSITION**
Lengthen the dam crest and raise its elevation to check river stage higher while reducing the potential for affecting upstream flood elevations.	Recommended as an "Additional Idea for Further Consideration."
Move the intake to another location upstream in the River Channel. Look into the possibility of tying into the upstream dam structure.	Recommended as an "Additional Idea for Further Consideration."
Develop an operations manual -Allow for lower level staff to operate some portion of facility (For example, Cooperative and stay-in-school students)	Recommended as an "Additional Idea for Further Consideration."
Research the possibility of acquiring the Alamosa treatment plant discharges and sending them directly to the Ditch.	The Value Study Team did not have the necessary time to properly research this option. While the idea was outside the direct scope of the study, it was considered valuable enough to include a recommendation to research it in an "Additional Idea for Further Consideration."
Install a Rubber Dam in place of a more extensive structural solution. If costs allowed, buy a replacement and store at the Refuge to allow quick replacement in the event of damage.	This idea was discarded by the Value Study Team. Rubber dams are highly susceptible to damage by vandals. Because of the remote site and potential vandalism, the Value Study Team determined that the potential risk was too great.
Line the Ditch to reduce water losses and increase the amount of water reaching the Refuge.	This was considered too costly at this stage but is still considered a viable option for further research. While the idea is outside the scope of the study, it was considered valuable enough to include the identified features as an "Additional Idea for Further Consideration."
Pond more water within the Refuge as much as possible.	This idea was outside the scope of study and no data was present to evaluate further. However, the Service may wish to consider it further.
Install check structures in the Ditch.	Recommended as an "Additional Idea for Further Consideration."

VALUE STUDY – DISPOSITION OF IDEAS

PROJECT: Chicago Ditch Dam Rehabilitation

VALUE STUDY ELEMENTS CONSIDERED AS POTENTIAL PROPOSALS AND THEIR DISPOSITION	
IDEA	**DISPOSITION**
Examine in detail the optimum sequencing for construction season.	This was researched by the team. Refuge managers recommended that the construction be done from November through March. If absolutely necessary to avoid cold weather, an alternative of August/September would be acceptable. Recommend the designer obtain more information.
Cut the upstream bank to divert flow so as to avoid the more expensive options to dewater at the site.	Recommended as an "Additional Idea for Further Consideration."
Clarify sources for the riprap using Reclamation and local contractor sources.	This was researched and the results were used in proposals.
Clarify the 404 permit requirements and Environmental Assessment activities required.	According to the Fish and Wildlife Service, this had not been considered in the time allotted for the project. Permits may add a three to six months time to project schedules.
Improve the site-specific hydraulic and hydrology knowledge the site.	Recommended as an "Additional Idea for Further Consideration."
Coordinate with the "HYDROSPHERE" study	Concept was researched by the study team and is addressed in the various proposals.
Use a prisoner work programs to clean debris from areas affected.	This was not considered a practical solution to clean the debris. Also, it may be costly.
Take out water at a low level intake area so as to reduce the amount of debris drawn to the structure.	It was determined that there was not enough water depth at this site to make this a useful option.
Realign intake channel to reduce sediment and debris attraction.	The worth of this idea was outweighed by the cost.
Rechannel the Rio Grande to achieve a higher head at the intake area.	The worth of this idea was outweighed by the cost.
Use weir or slide gates in place of radial gates.	The various gates were assessed by the team in evaluation of the proposals. The added worth of the radial gate was determined to justify its added cost through an incremental worth versus incremental cost analysis.
Use concrete debris in place of riprap to prevent erosion around the dam structure.	In this environment, concrete is not as durable as riprap. The idea was dropped from further consideration.

VALUE STUDY – DISPOSITION OF IDEAS

PROJECT: Chicago Ditch Dam Rehabilitation

VALUE STUDY ELEMENTS CONSIDERED AS POTENTIAL PROPOSALS AND THEIR DISPOSITION	
IDEA	**DISPOSITION**
Avoid the debris by diverting the water into the Ditch by use of a siphon.	The worth of this idea was outweighed by the cost. The water has suspended sediment, the depth of entry is small, danger to public too great, etcetera.
Use the water from the closed basin exclusively to meet mission objectives.	This was considered outside the scope of the project review. Further, the amount of water, the cost of obtaining additional rights, the long recovery period, and other features made examination of this idea unattractive.
Move the intake to another location upstream in the River Channel. Look into the possibility of tying into the existing nearby upstream dam structure.	Recommended as an "Additional Idea for Further Consideration."
Obtain additional geotechnical and geologic subsurface data.	Recommended as an "Additional Idea for Further Consideration."
Remove upstream culverts and avoid their operation.	The culverts are nearing the end of their service life. For the large culvert, this idea was incorporated into the proposals. However, the team recommended delaying decisions on the other culverts until after construction and experience has been acquired with the rehabilitated facilities.

IDEASDIS.TAB

ALTERNATIVE EVALUATION FOR PROPOSAL NO. 1A

PROJECT: Chicago Ditch Dam Rehabilitation

COMPONENT: Diversion Dam

FUNCTION: Divert Water

ALTERNATIVE DESCRIPTION

Construct a single row of sheet pile with riprap protection to serve as the diversion dam. The primary features of this alternative proposal are:

1) A single row of sheet pile would extend across the river to form the sill of the trapezoidal section. The top elevation of the sheet pile would be Elevation 7530 (same as the crest of the Title I concept). This elevation is about 5 feet above the stream bed. The sheet piles would extend about 25 feet into the foundation to about Elevation 7500.

2) Ungrouted riprap would be placed at a 6 to 1 slope on the downstream side of the sheet pile. A 12-foot wide riprap berm would be located on the upstream side of the sheet pile to provide access for maintenance. The upper part of the berm would be grouted to create a surface that is smoother than ungrouted riprap. This would allow access by maintenance vehicles. The upstream slope of the berm would be ungrouted riprap with a 3 to 1 slope.

BENEFITS	**DISADVANTAGES**
Since construction should proceed faster, it should reduce the water diversion downtime for the Refuge.	The crest will not be as smooth as concrete and will make walking and driving a little more difficult.
Construction can occur during winter months.	The roughness of the upstream face will make it more difficult to remove smaller sized debris.
The amount of dewatering effort required would be less extensive.	Additional investigation into condition of existing sheet pile would be necessary.

IDENTIFIED RISKS:

If removal of smaller debris is required, it may become lodged in rough surface and necessitate more effort.

This option will tie into existing sheetpile in a method similar to the Title I design. If the investigation determines that the present condition of the existing sheetpile is unsuitable for the proposed use, a new sheetpile wall costing about $120,000 would be necessary.

VEALTEVL.ALT

COST COMPARISON FOR PROPOSAL NO. 1A

PROJECT: Chicago Ditch Dam Rehabilitation	
COMPONENT: Diversion Dam	**FUNCTION:** Divert Water

ORIGINAL CONCEPT	VALUE STUDY CONCEPT
Construct a trapezoidal dam section with a reinforced concrete crest. Install three new rows of sheet piles and tie into concrete.	Construct a trapezoidal section with riprap. Install one new row of sheet pile at crest. Grout the crest of the dam to facilitate movement of maintenance equipment and staff over the crest.

COST ITEMS	NONRECURRING	LIFE CYCLE
ORIGINAL CONCEPT	$ 1,221,800	
VALUE CONCEPT (-)	$ 893,000	
SAVINGS	$ 328,800	
NUMBER OF UNITS (X)	1	
TOTAL SAVINGS	$ 328,800	
VALUE STUDY COSTS (-)	$ 20,000	
IMPLEMENTATION COSTS(-)	$ 0	
NET SAVINGS	**$ 308,800**	

Note: No change in life-cycle costs were identified.

VEALTMON.TAB

Figure 7. Original Design Diversion Dam

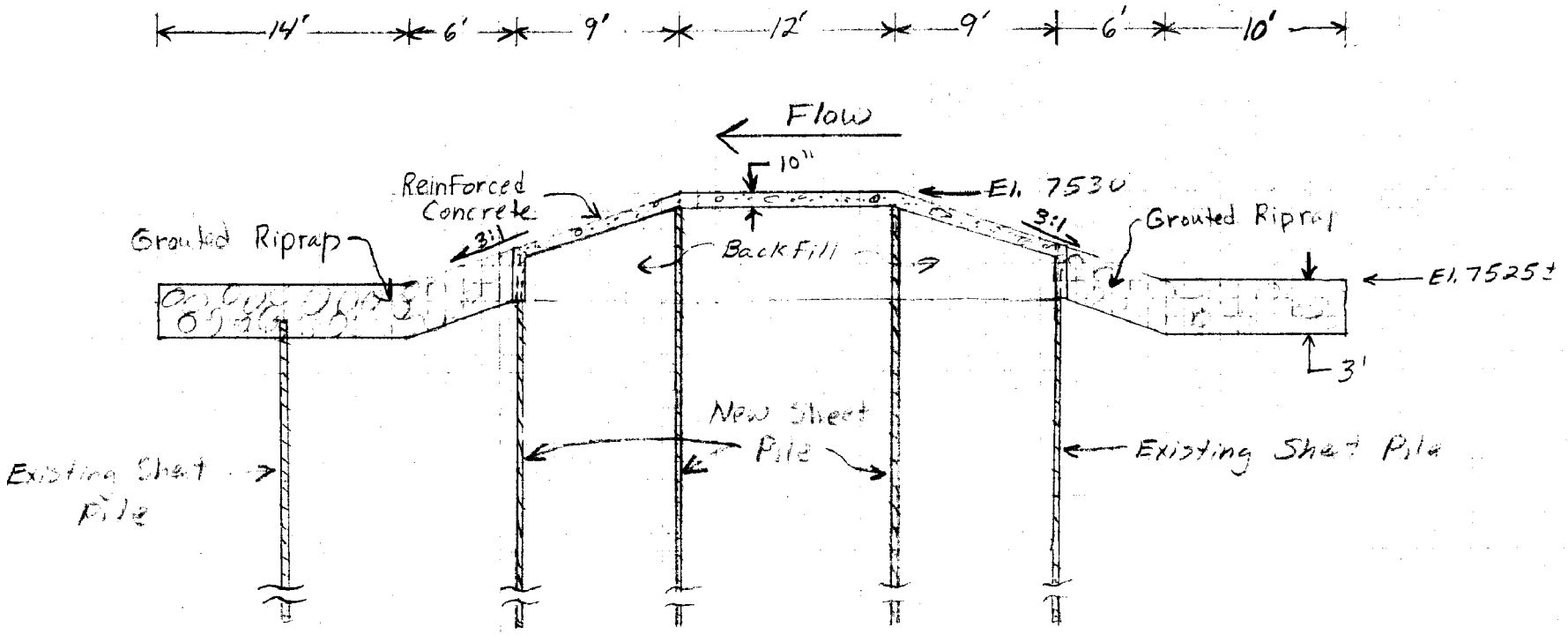


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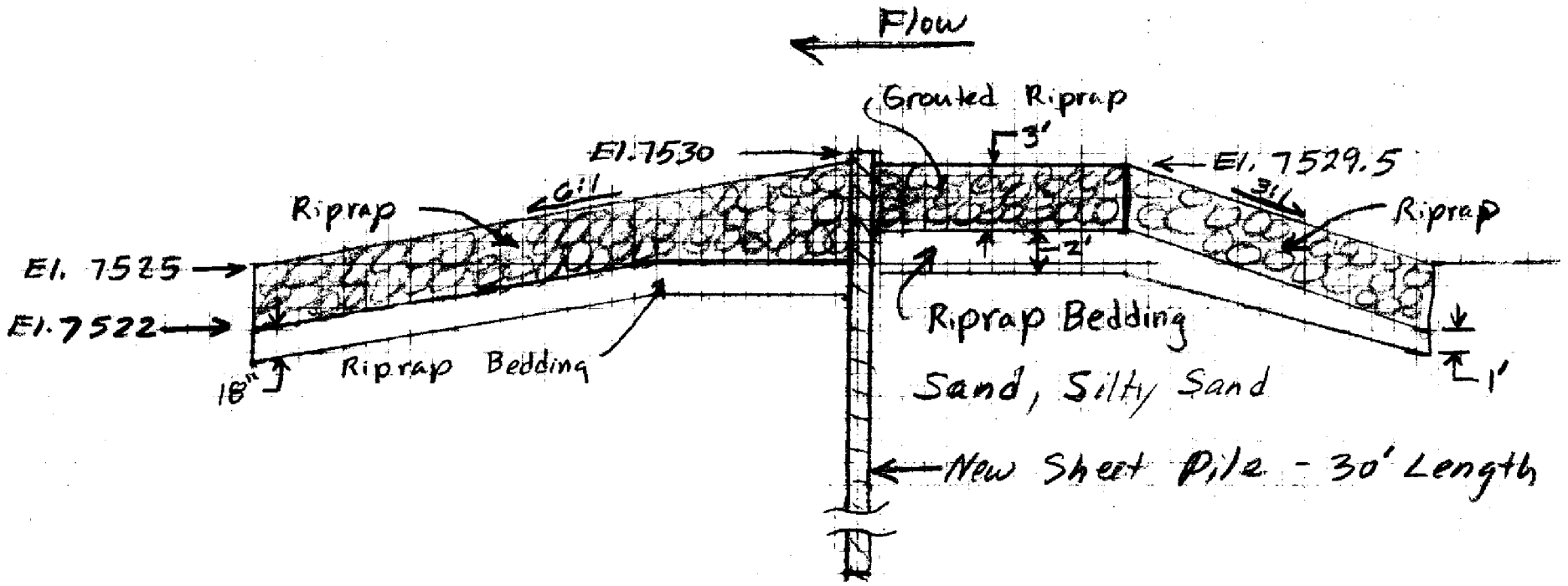
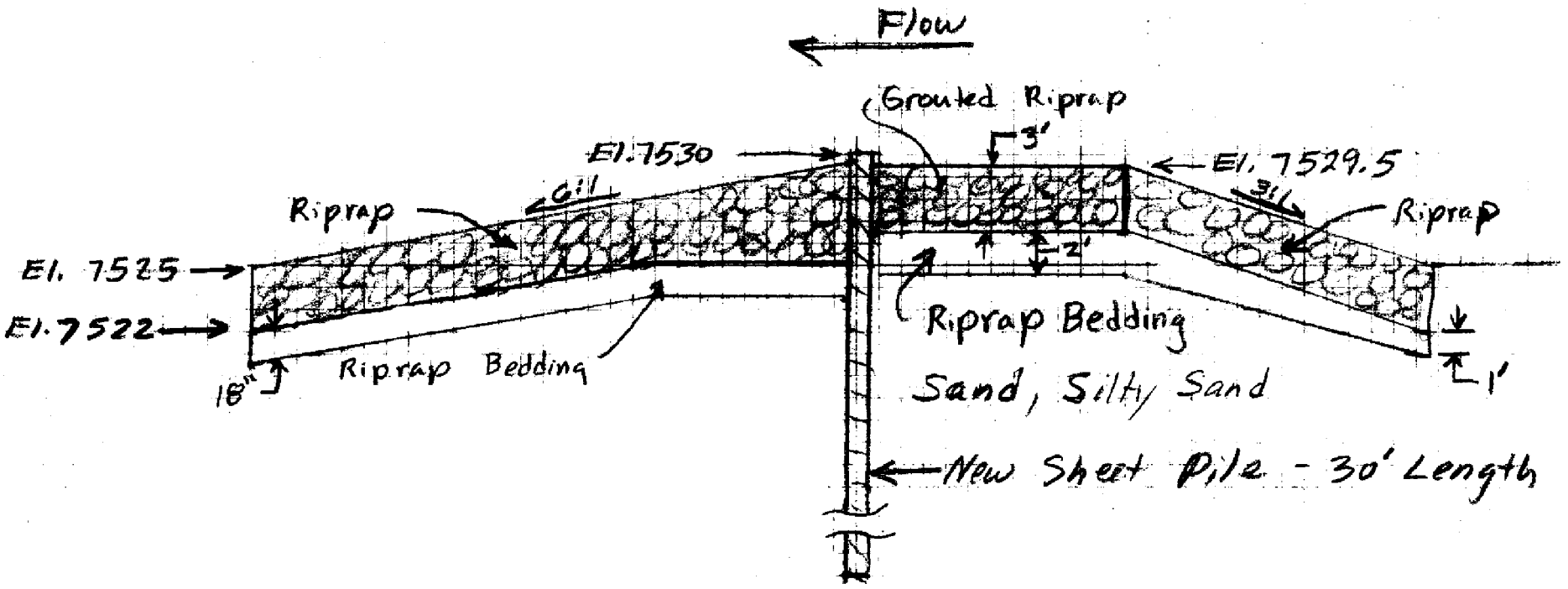
Figure 8. Sheet Pile and Riprap Diversion Dam



VEP1A.PCX

Figure 9. Photo of Similar Sheet Pile and Riprap Structure



VEP1APH.PCX

ALTERNATIVE EVALUATION FOR PROPOSAL NO. 1B

PROJECT: Chicago Ditch Dam Rehabilitation	
COMPONENT: Diversion Dam	**FUNCTION:** Divert Water

ALTERNATIVE DESCRIPTION

Construct the crest and slopes of the diversion dam with roller compacted concrete. The sheet piles and reinforced concrete would be eliminated. The primary features of this alternative are:

1) A 3-foot layer of roller compacted concrete would form the crest and slopes of the diversion dam. The dimensions of the structure would be the same as that described in the Title I concept. A 12-foot crest width and 3 to 1 slopes. The roller compacted concrete would tie into the existing two rows of sheet piles. At an additional cost (not included in proposal estimate), the lifts could be formed to allow a relatively smooth series of lift faces.

2) The geotextile would be placed under the crest and downstream portion of the roller compacted concrete to provide filter protection in the event that cracks form in the concrete.

BENEFITS	DISADVANTAGES
Construction (although not as simple as Alternative 1A) will be faster than the original proposal. Therefore, some operational time would be saved.	Roller compacted lifts may ravel which leaves an less attractive appearance, as compared to a reinforced concrete surface. If lifts are not formed, small debris may accumulate on lift faces.

IDENTIFIED RISKS:

None noted.

VEALTEVL.ALT

COST COMPARISON FOR PROPOSAL NO. 1B

PROJECT: Chicago Ditch Dam Rehabilitation	
COMPONENT: Diversion Dam	**FUNCTION:** Divert Water

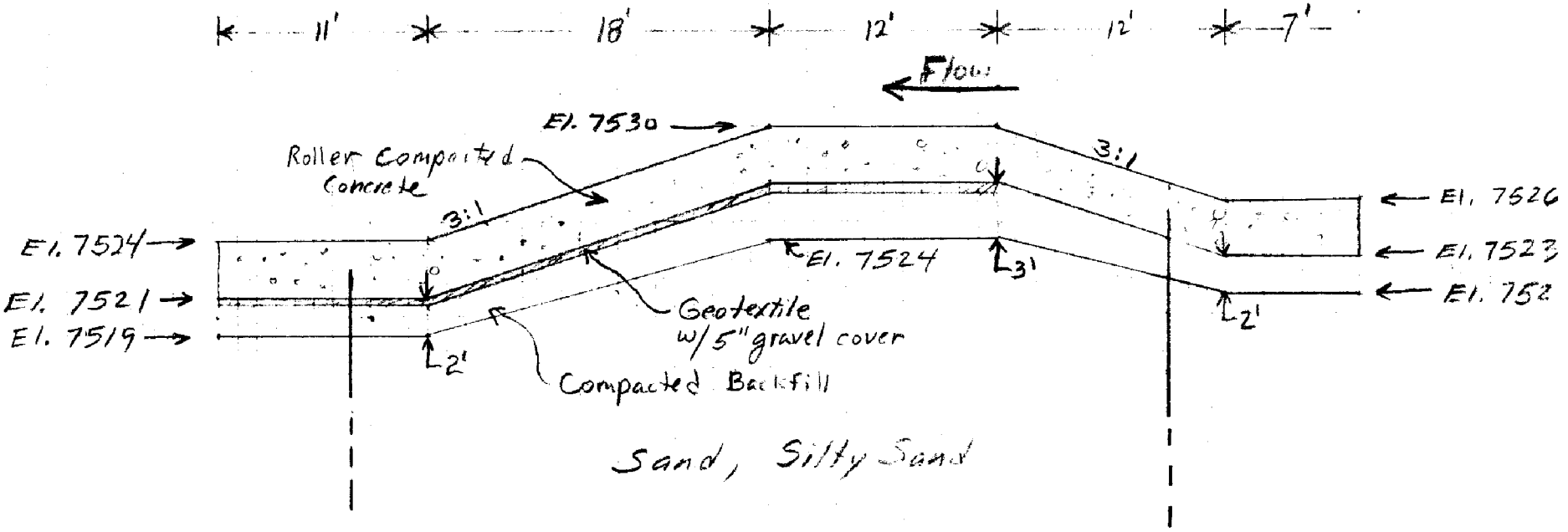
ORIGINAL CONCEPT	VALUE STUDY CONCEPT
Construct a trapezoidal dam section with a reinforced concrete crest. Install three new rows of sheet piles and tie into concrete.	Construct a trapezoidal section with a roller compacted concrete crest. Tie in concrete slopes to existing sheet piles.

COST ITEMS	NONRECURRING	LIFE CYCLE
ORIGINAL CONCEPT	$1,221,800	
VALUE CONCEPT (-)	$ 708,700	
SAVINGS	$ 513,100	
NUMBER OF UNITS (X)	1	
TOTAL SAVINGS	$ 513,100	
VALUE STUDY COSTS (-)	$ 20,000	
IMPLEMENTATION COSTS(-)	$ 0	
NET SAVINGS	**$ 493,100**	

Note: No change in life-cycle costs were identified.

VEALTMON.TAB

Figure 10. Roller Compacted Concrete Diversion Dam



VEP1B.PCX

ALTERNATIVE EVALUATION FOR PROPOSAL NO. 1C

PROJECT: Chicago Ditch Dam Rehabilitation

COMPONENT: Diversion Dam | **FUNCTION:** Divert Water

ALTERNATIVE DESCRIPTION

Construct the diversion dam crest and slopes using grouted riprap and eliminate the new sheet piles and reinforced concrete. The primary features of this alternative are:

1) A 3-foot layer of grouted riprap would form the crest and slopes of the diversion dam. The crest would have a 12-foot width and the upstream slope would be 3 to 1. The downstream slope would be 6 to 1. The grouted riprap would tie into the existing two rows of sheet piles.

2) A geotextile would be placed under the crest and downstream portion of the grouted riprap to provide filter protection in the event cracks form in the grouted riprap.

BENEFITS	DISADVANTAGES
Construction (although not as simple as Alternative 1A) will be faster than the original proposal. Therefore, some operational time would be saved.	The crest would not be as smooth as the Title I proposal but will still be accessible to foot traffic and maintenance vehicles. The upstream face will have a rough surface. This may make removal of small debris more difficult. Additional investigation into condition of existing sheet pile would be necessary.

IDENTIFIED RISKS:

If removal of smaller debris is required, it may become lodged in rough surface and necessitate more effort.

This option will tie into existing sheetpile in a method similar to the Title I design. If the investigation determines that the present condition of the existing sheetpile is unsuitable for the proposed use, a new sheetpile wall costing about $120,000 would be necessary.

VEALTEVL.ALT

COST COMPARISON FOR PROPOSAL NO. 1C

PROJECT: Chicago Ditch Dam Rehabilitation	
COMPONENT: Diversion Dam	**FUNCTION:** Divert Water

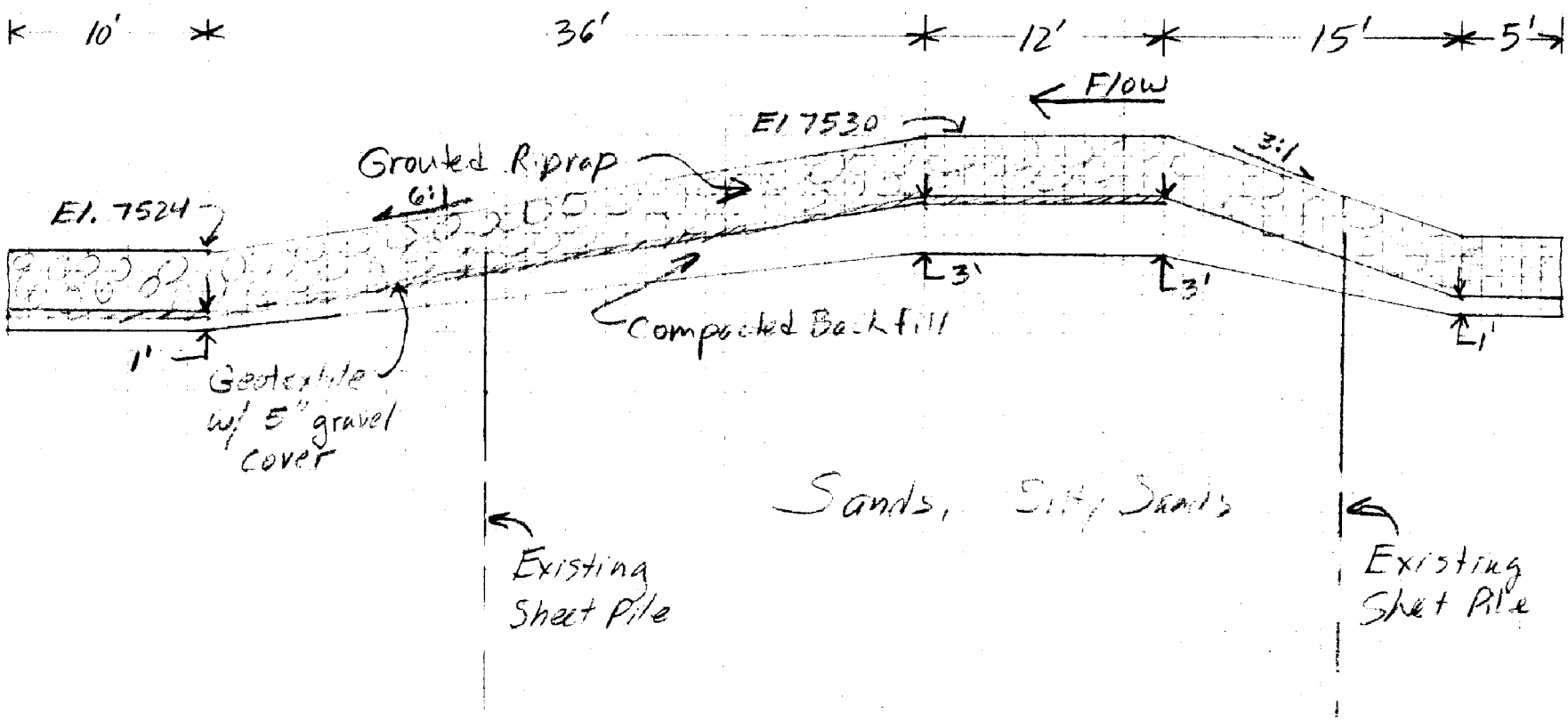
ORIGINAL CONCEPT	VALUE STUDY CONCEPT
Construct a trapezoidal dam section with a reinforced concrete crest. Install three new rows of sheet piles and tie into concrete.	Construct a trapezoidal section with a grouted riprap crest Tie in the slopes into the existing sheet piles.

COST ITEMS	NONRECURRING	LIFE CYCLE
ORIGINAL CONCEPT	$1,221,800	
VALUE CONCEPT (-)	$ 845,100	
SAVINGS	$ 376,700	
NUMBER OF UNITS (X)	1	
TOTAL SAVINGS	$ 376,700	
VALUE STUDY COSTS (-)	$ 20,000	
IMPLEMENTATION COSTS(-)	$ 0	
NET SAVINGS	**$ 356,700**	

Note: No change in life-cycle costs were identified.

VEALTMON.TAB

Figure 11. Grouted Riprap Diversion Dam



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VALUE STUDY PROPOSAL DESCRIPTION

PROJECT:	Chicago Ditch Dam Rehabilitation
PROPOSAL NO. 1D.	CONSTRUCT THE TITLE I CONCEPT BUT MOVE THE RADIAL GATE AND PROVIDE A LOW FLOW NOTCH.

VALUE STUDY PROPOSAL DESCRIPTION

PROJECT: Chicago Ditch Dam Rehabilitation

Background:
One of the primary functions identified during the value study was the need to alleviate the present identified problems with debris. This debris comes in the two forms of floating and sediment debris. The floating debris consists mostly of trees and limbs. Trash also comes in the form of debris but is much less a problem. Sediment debris consists mostly of gravel, sand, and silt.

Designers usually determine flow patters by performing model studies. Model studies are often complex and subject to error. Since the prototype already exists, using it to identify the actual flow patterns would be much more accurate and its data should be available at a substantially lower cost than a model study. The past information is there for the asking as the designer needs only to query project personnel. In this manner, the team gained much of the data used to develop this proposal.

According to project staff, the floating debris enters the river upstream by washing into the river or by the river stage rising and allowing debris on the banks to float downstream. This occurs with heavy precipitation or snow melt. Sediment enters the river at the same time. A crucial design item is that the maximum debris loading and flow occur about the same time. Low flow periods have very little debris movement into the area.

Another major factor determined to affect debris movement on Chicago Ditch is the percentage of river flow entering the Ditch. The Ditch diverts nearly all of the flow during an average of nine months of the year. From the March or April period through June, the percentage of river flow diverted into the Ditch drastically decreases. Because the river has much more discharge than the Service has water right, the amount of diverted flow into the Ditch can be as little as about 5-percent during June.

The debris load is the highest at the same time the water flow passing the ditch is the greatest. To minimize debris problems during these times, it is advantageous to get the debris past the diversion structure and allow it to continue to move downstream. During times of low flow the debris load will be low. However, because all of the water flowing down the river enters the ditch, all of the debris that was deposited in the general area will tend to accumulate near the intake and dam. The river flow distribution also places floating debris in this general area (on the outside of the river bend). This is the debris that produces operational problems which is currently being handled by staff physically removing the debris.

Therefore, as long as floating debris accumulating during time of high flows is allowed to continue down-river and not accumulated, it is expected that the amount of debris accumulating during low flows will be small enough that it should not be a problem. Using this information, it was apparent that all designs should try to pass the debris during periods of high flow and allow the debris to accumulated during periods of low flow. This accumulated debris will need collect in an area that allows it to be flushed clear of the intake when the high flows return.

After review, project staff believe the Title I designs will reduce the existing accumulation and placement of the debris.

VALUE STUDY PROPOSAL DESCRIPTION

PROJECT: Chicago Ditch Dam Rehabilitation

The sediment debris tends to collect on the inside of the bend in a different area than the floating debris and is deposited as the river stage falls. Depending on the specific hydrograph, the amount of sediment deposited in the intake region may vary significantly. Currently, operation staff control much of the sediment debris by allowing to move downstream as much as operationally practical. They flush the sediment using an 8-foot diameter Corrugated Metal Pipe (CMP) located near the east end of existing structure. (Actual dimension of the CMP is not clear, the pipe may be 6-foot in diameter.) The outlet is controlled by stoplogs that must be moved by a backhoe. The stoplog control operation presents significant staff safety hazards. The CMP is near the end of its useful life and will need to be repaired or replace in a few years.

Proposal:
Allow more of the floating debris to pass over the diversion structure during periods of high flow. This would be accomplished by allowing it to pass over the structure at the location where it now accumulates on the east side of the diversion dam (on the outside of the river bend). By installing a notch or lowering a part of the crest on the east side of the structure, the flow velocity and depth for the river flows would increase. This would encourage the floating debris to go over the structure rather than accumulate near it.

Allow and encourage sediment debris to pass through a radial gate on the west side of the dam structure. (The Title I design locates the gate on the east side of the diversion dam.) The west (inside river bend) is the location where the sediment is now accumulating. The existing large diameter CMP would be completely removed during dam construction. The other smaller diameter CMP's would not be addressed at this time. However, they could be removed or replace upon their failure as required by maintenance personnel.

This proposal can be used on all the value study diversion dam alternatives. It will further reduce the accumulation and placement of the debris beyond that generated by the Title I design concept.

Costs:
For proposal and estimating purposes, the assumed installed implementation of this proposal was performed using the Title I design with the recommended modifications. Irrespective of the diversion dam design selected (Title I or Proposal Nos. 1A-1D), the estimated cost of those structures would not be changed by this proposal.

VEALTDES.TAB

ALTERNATIVE EVALUATION FOR PROPOSAL NO. 1D

PROJECT: Chicago Ditch Dam Rehabilitation

COMPONENT: Diversion Structure

FUNCTION: Raise surface (water)

ALTERNATIVE DESCRIPTION

Allow floating debris to flow out of the intake area and sediment debris to be passed through the diversion dam. Modify the design of the diversion structure by:

1) Move the radial gate on the diversion structure from the east side (left side looking downstream) of the structure to the west side (right side looking downstream) of the structure.

2) Install a low flow notch in the east side of the structure to ensure that floating debris will pass over the structure.

BENEFITS	DISADVANTAGES
Easily eliminates much of the sediment debris from accumulating behind the diversion structure. Greatly increases the tendency to pass floating debris over the crest. Notch can be incorporated into any form of diversion structure discussed in this value study. Can be incorporated into future modifications of the crest if determined to be needed as river changes its flow versus stage relationship. The potential affect of winter ice buildup should be reduced.	Moving the gate to the east side would make the gate less effective for removing floating debris. Using a low flow notch would increase the depth of water in the notch compared to the remaining length of structure. This would require the operator to navigate deeper depths in the event they had to remove debris on the west side of the structure.

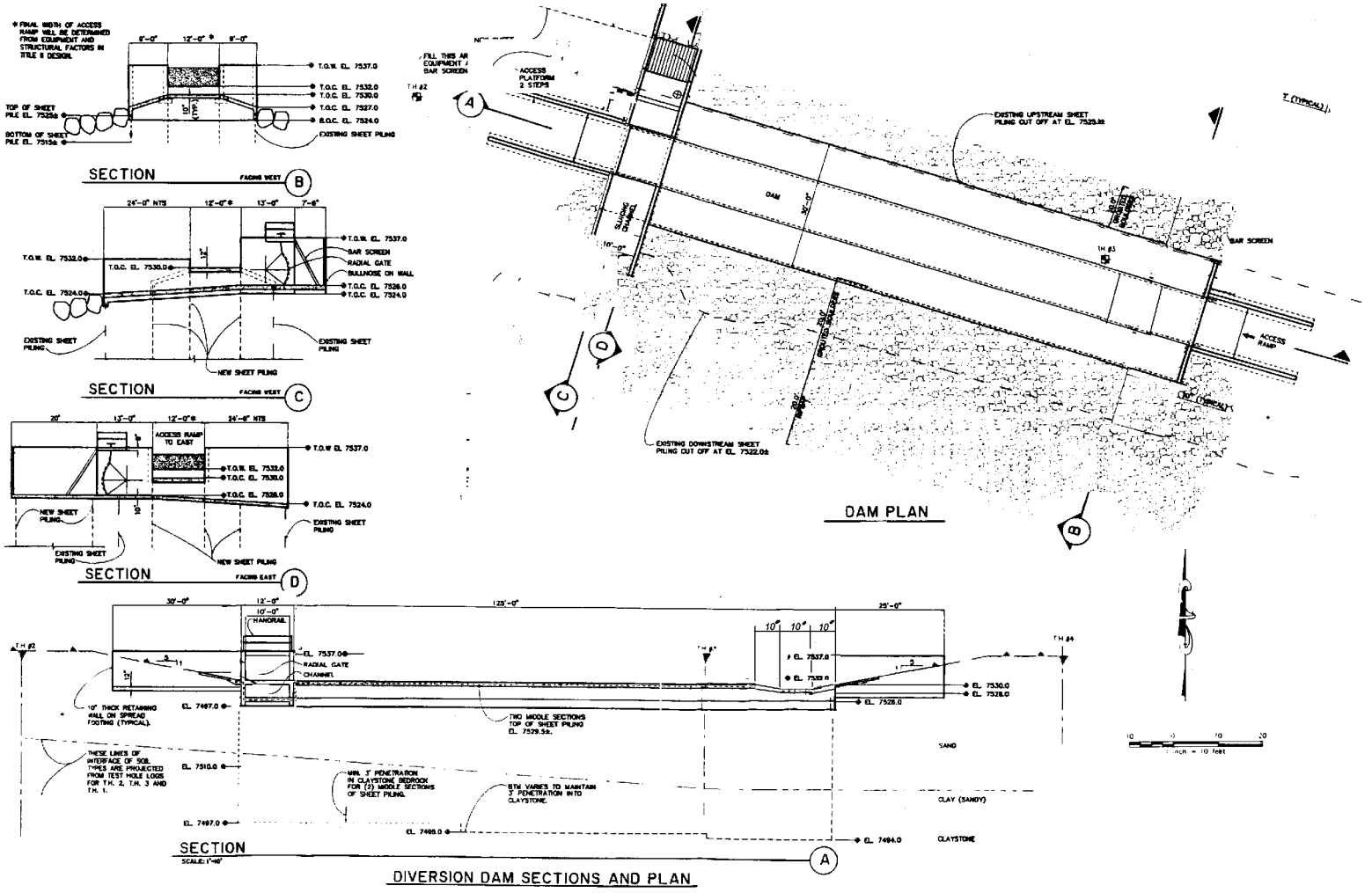
IDENTIFIED RISKS:

Using a low flow notch may create high flood stages upstream. This should not be a problem if designed properly.

There is a concern of the impact of beaver dams built or broken dam debris washed around the bottom of the radial gates. Since the gate would operate less frequently, the potential that the remains of a beaver dam would clog the gate region may be increased.

VEALTEVL.ALT

Figure 12. Notched Trapezoidal Dam with Radial Gate on West Edge



VEP1D.PCX

VALUE STUDY PROPOSAL NOS. 1C–1D INCREMENTAL WORTH VERSUS COST ANALYSIS

PROJECT: Chicago Ditch Dam Rehabilitation

Case	No added sheet pile required in 1B			Added sheet pile required in 1B	
Proposal	Cost	Incremental cost involved	Incremental worth equal to or greater than incremental cost?	Incremental cost involved	Incremental worth equal to or greater than incremental cost?
Title I Concept	$1,221,800	$513,100 (1B versus Original)	No	$393,100 (1B versus Original)	No
Proposal No. 1A. Sheet pile wall with riprap	$893,000	$184,300 (1B versus 1A)	No	$64,300 (1B versus 1A)	No
Proposal No. 1C. Riprap and grouted riprap crest	$845,100	$136,400 (1B versus 1C)	No	$16,400 (1B versus 1C)	No
Proposal No. 1B. Roller-compacted concrete	$708,700	N/A	Baseline	N/A	Baseline

Results: The incremental worth (benefits) of Proposal No. 1B (roller-compacted concrete) appear to outweigh the incremental costs (disadvantages, risk, and money) for all other alternatives. The added component of risk that could require the addition of a sheet pile wall in Proposal No. 1B did not affect the assessment.

Preferred Proposal: The Value Study Team, in conjunction with the Fish and Wildlife representatives present in the oral presentation meeting, select Proposal No. 1B as the preferred proposal.

Note: Notch and gate modifications considered to be added value items unrelated to analysis.

VALUE STUDY PROPOSAL DESCRIPTION

PROJECT: Chicago Ditch Dam Rehabilitation

PROPOSAL NO. 2. CONSTRUCT THE CHICAGO DITCH FLOW INTAKE CONTROL STRUCTURE AT ITS PRESENT LOCATION.

Background:
The Title I design would construct a new ditch flow control structure on the banks of the river. The location of the proposed new structure is approximately 750 feet upstream of the existing control structure and the existing structure would be demolished. The objective of relocating the structure was to reduce the distance between the Ditch intake structure and the diversion dam. The result was expected to be more efficient operations between the diversion dam and Ditch intake structure. Title I design also provides for a debris boom at the ditch intake.

Title I designers did not have much hydrologic data available to them. Further, due to the amount of time and funds allocated for the Title I activity, little hydrologic data gathering was possible. The team discussed past high flow river stages with Fish and Wildlife Service representatives and believes the Title I design location is within the floodplain. The team also believes the old location may be on the edge of the floodplain.

Flood waters overtopping the structure may cause it to wash out and could cause the release of uncontrolled flows down Chicago Ditch. This could be very detrimental to Refuge Ditch facilities. It is plausible that, if relocated to the specified location, the intake structure could be damaged by a significant flood event. This could create significant future repair costs at the intake structure and generate operational downtime for Refuge diversions.

Proposal:
Designers should identify the location of the hydrologic floodplain, and if appropriate, place the intake structure outside the floodplain. The debris boom should be constructed at the ditch intake, at the same general location as proposed in the Title I design.

Costs:
The estimate initial construction costs at these two sites are equivalent. However, a potential life-cycle cost savings does exist over the life of the project. When flood waters overtop the structure and recede, the structure will experience some damage. The degree of damage is difficult to estimate. It will probably range from minor erosion around the structure to movement or washout of the structure. Minor erosion will cost little to repair, while slight movements in the structure may require a complete reconstruction. This repair would most likely have to be done under emergency conditions. The study team estimates the damage to be 50-percent of the structure cost.

VEALTDES.TAB

ALTERNATIVE EVALUATION FOR PROPOSAL NO. 2

PROJECT: Chicago Ditch Dam Rehabilitation	
COMPONENT: Intake Control Structure	**FUNCTION:** Control Flow (ditch)

ALTERNATIVE DESCRIPTION

Use a debris boom to assist in keeping the Ditch channel clear.

Place the replacement intake control ditch structure at or near the present location.

BENEFITS	DISADVANTAGES
Avoids the probable need to replace the intake structure after a major flood event. Avoids potential damage to the intake structure during moderate floods. Placing a debris boom in the river blocks most floating debris from entering the Ditch. Debris washed into the Ditch during flood stages could be blocked by the gate from entry into the downstream Ditch channel. May reduce the required width of the structure due to the reduced Ditch dimension near the existing location. The present location allows sediment that does enter the channel to be encouraged to move downstream through gate operations during some flow periods.	The Ditch reach upstream of the intake structure will continue to receive sediment on occasion. The travel distance for maintenance personnel, between the operation gates, will be greater, as compared to the Title I design. This disadvantage would be mitigated with the automated control system described in Proposal No. 4. If constructed at the same exact location, construction of the new gate facility cannot occur until removal of the existing facility. Therefore, a small amount of additional construction time could be required at that location.

IDENTIFIED RISKS:

Subsurface foundations conditions are not known at either site. This could result in significant construction change orders or claims. The team recommends that additional soil investigation be done irrespective of the site selected.

VEALTEVL.ALT

COST COMPARISON FOR PROPOSAL NO. 2

PROJECT: Chicago Ditch Dam Rehabilitation	
COMPONENT: Intake Control Structure	**FUNCTION:** Control flow (Ditch)

ORIGINAL CONCEPT	**VALUE STUDY CONCEPT**
Rebuild an intake control structure at edge of river. Repair structure as required when it is damaged by flood events.	Rebuild the intake control structure out of the floodplain at or near its present location.

COST ITEMS	**NONRECURRING**	**LIFE CYCLE**
ORIGINAL CONCEPT		$ 345,300
VALUE CONCEPT (-)		$ 230,200
SAVINGS		$ 115,100
NUMBER OF UNITS (X)		1
TOTAL SAVINGS		$ 115,100
VALUE STUDY COSTS (-)		$ 20,000
IMPLEMENTATION COSTS(-)		$ 0
NET SAVINGS		**$ 95,100**

VEALTMON.TAB

ALTERNATIVE EVALUATION FOR PROPOSAL NO. 3

PROJECT: Chicago Ditch Dam Rehabilitation	
COMPONENT: Automated Operation System	**FUNCTION:** Ease Operations

ALTERNATIVE DESCRIPTION

An automated system would allow automatic measurement of water flow and operation of gates from the refuge headquarters. A plan view of the proposed system is attached. Key components of the system would include:

1. Radio-linked PC base station at the refuge headquarters. The base station would include software and a radio unit that would be linked to three measurement and control units (MCU)s. Functions at each MCU station are described in other items below.

2. Radio-linked MCU No. 1 at the Diversion Dam. MCU would measure/control the following:

   a. Measure river flow at the diversion dam
   b. Measure and control radial gate openings

3. Radio-linked MCU No. 2 at the Ditch Flow Intake Control Structure. MCU would measure/control the following:

   a. Measure and control radial gate openings at the Ditch Flow Intake Control Structure.

4. Radio-linked MCU No. 3 at the gage station downstream of the Ditch Control Intake Control Structure.

   a. Measure flows at the gaging station

5. Provide power to the diversion dam and ditch flow intake control structure for operation of electrical gate controls. Power is available at a local residence about 1/2 mile from the diversion dam.

BENEFITS	DISADVANTAGES
Less labor time required for gate operations Allows constant monitoring and adjustment of flows Allows more efficient use of water because the system will automatically adjust to fluctuating river levels	Annual operation and maintenance of the automated system will be required throughout the life of the project Routine training of refuge personnel will be required.

IDENTIFIED RISKS:

ALTERNATIVE EVALUATION FOR PROPOSAL NO. 3

PROJECT: Chicago Ditch Dam Rehabilitation	
COMPONENT: Automated Operation System	**FUNCTION:** Ease Operations

Automated system is susceptible to failure causing unexpected downstream releases or unexpected diversions into the Chicago Ditch. This risk could be mitigated by incorporating high water surface level warnings and other alarms into the automated system.

VEALTEVL.ALT

COST COMPARISON FOR PROPOSAL NO. 3

PROJECT: Chicago Ditch Dam Rehabilitation	
COMPONENT: Automated Operation System	**FUNCTION:** Ease Operations

ORIGINAL CONCEPT	VALUE STUDY CONCEPT
Manually operate gates. Manually measure and monitor flow rates and adjust gates as necessary. Maintain transportation and other support equipment to facilitate operations. Train Refuge staff in gate operations and the detailed intracity related to gate operation and river flow.	Install an automated measurement and control system for routine gate operation and measurement and monitoring of river flows. Bring power to site from nearby powerlines. Train Refuge staff in its use and maintenance requirements. Contract with and experienced consultant to service and maintain equipment. Replace equipment during various stages of the service life to update and maintain efficient operations.

COST ITEMS	NONRECURRING	LIFE CYCLE
ORIGINAL CONCEPT		$ 141,900
VALUE CONCEPT (-)		$ 145,600
SAVINGS		($ 3,700)
NUMBER OF UNITS (X)		1
TOTAL SAVINGS		($ 3,700)
VALUE STUDY COSTS (-)		$ 20,000
IMPLEMENTATION COSTS(-)		$ 10,000
NET SAVINGS		**($ 33,700)**

Note:
Cost estimates for the proposed system were based on a conversation with Rod Johansen, Electronics Engineer, Electrical Systems Group, U.S. Bureau of Reclamation, Reclamation Service Center.

VEALTMON.TAB

LIFE CYCLE COST ANALYSIS FOR PROPOSAL NO. 3

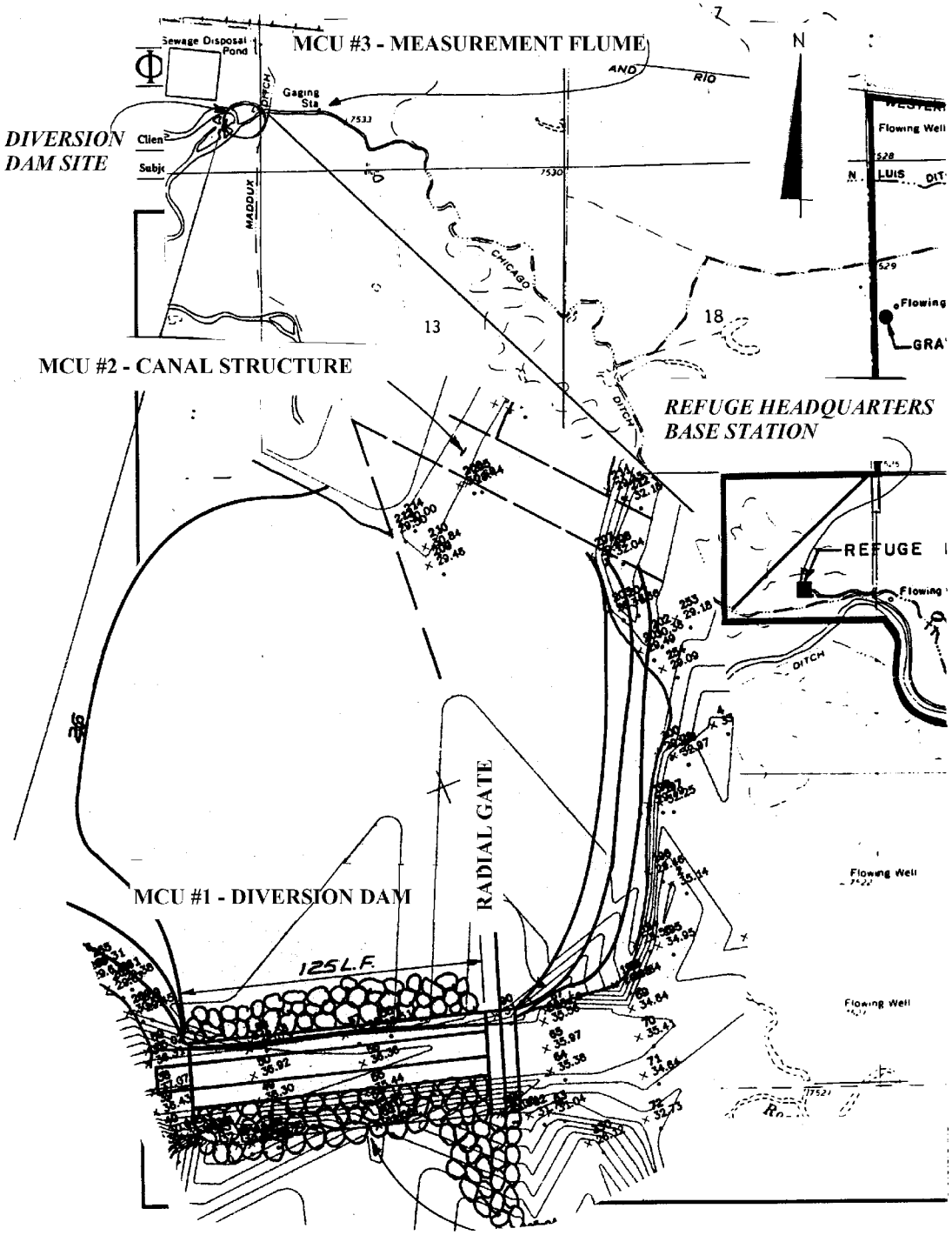
VALUE STUDY - LIFE CYCLE COST ANALYSIS
USING PRESENT WORTH (PW) COSTS

PROJECT: Chicago Ditch Dam Rehabilitation COMPONENT: Automated Control System Discount Rate: 6.0% Economic Life: 50			ORIG-NO AUTO SYS/ Estimated Costs	ORIG-NO AUTO SYS/ Present Worth	/ALT 4-AUTO SYSTEM Estimated Costs	/ALT 4-AUTO SYSTEM Present Worth
INITIAL/COLLATERAL COSTS						
A. Automated Operation System					$60,000	$60,000
B. Avoided first year opration cost					($9,000)	($9,000)
C. First year maintenance contract					$2,500	$2,500
D.						
E.						
F.						
G.						
Total initial/Collateral Costs						$53,500
REPLACEMENT/SALVAGE	Year	PW Factor				
(Single Expenditures)						
A. Replacement of 50% hardware assumed	15.0	0.4173			$20,000	$8,345
B. Replacement of 50% hardware assumed	30.0	0.1741			$20,000	$3,482
C. Replacement of 50% hardware assumed	45.0	0.0727			$20,000	$1,453
D.						
E.						
F.						
G.						
H.						
I.						
J.						
K.						
Total Replacement/Salvage Costs						$13,280
ANNUAL COSTS	Escal. Rate	PWA Factor w/Escal.				
A. Maintenance		15.762			$2,500	$39,405
B. Operations		15.762	$9,000	$141,857		
C. Training		15.762			$2,500	$39,405
D.						
E.						
F.						
Total Annual Costs				$141,857		$78,810
TOTAL PRESENT WORTH COSTS				$141,857		$145,590
LIFE CYCLE (PW) SAVINGS						($3,733)

LIFE CYCLE COST ANALYSIS GRAPH FOR PROPOSAL NO. 3

Graphic lost

Figure 13. Locations of Automation Control Units



VEP3.PCX

VALUE STUDY PROPOSAL DESCRIPTION

PROJECT: Chicago Ditch Dam Rehabilitation

PROPOSAL NO. 4. USE PRECAST CONCRETE TO CONSTRUCT RADIAL GATE STRUCTURES.

Background:
One of the operational concerns identified by Refuge staff was the amount of time that the Chicago Ditch could be out of service during construction of the rehabilitated dam.

The proposed Title I radial gate sluice-way is about 55 feet long, 12 feet wide, by 12 feet high. The original cast-in-place concept would require the following steps and associated time requirements:

1. Form the foundation (2 days)
2. Place the foundation (1 day)
3. Allow the foundation to cure (4 days)
4. Form the walls (3 days - concurrent with foundation cure)
5. Place the walls (1 day)
6. Allow the walls to cure (7 to 28 days)

Therefore, the cast-in-place method would require a minimum about 15-days of construction within the river channel and as much as 36-days of construction time overall.

Proposal:
Use precast concrete units to construct radial gate structures. Precast concrete construction of the radial gate structures would allow substantial reductions in the required construction time within the river. This time savings would reduce the time that the Refuge would be unable to divert water through the Chicago Ditch during construction.

Using precast construction techniques, the structures could be precast and delivered to the site in five, 11-foot-long sections. The study team believes that a precast structure could be installed and welded together in about two days. The pre-cast method would require about 2-days instead of 15-days in the river. Further, it would result in a savings of about 19-days of construction in the river or Ditch channel. (The comparative construction time estimates only reflect tasks which differ between cast-in-place and precast concrete.)

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ALTERNATIVE EVALUATION FOR PROPOSAL NO. 4

PROJECT: Chicago Ditch Dam Rehabilitation	
COMPONENT: Radial Gate Structures	**FUNCTION:** Ease Operations

ALTERNATIVE DESCRIPTION

Use precast in place of cast-in-place concrete to construct radial gate structures.

BENEFITS	DISADVANTAGES
Reduces required construction time within the river and Ditch channel. Reduces the amount of time that the Refuge is unable to divert water during construction. Reduce the time Chicago Ditch must be closed. Allows more strict control of sections to be done in casting yard. (If yard control was preferred, larger more complete sections could be cast. However, transportation to the site of large precast units would require added handling costs.)	Necessitates tight control during construction to make sure that the floor is level and the walls are plumb. Requires use of a large crane during construction.

IDENTIFIED RISKS:

It is important that radial gate structures are constructed with a level floor and plumb walls. There may be a higher risk that the floor may not be level and the walls may not be plumb if the pre-cast approach is used. This can be mitigated with tight construction specifications and diligent inspection during construction.

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COST COMPARISON FOR PROPOSAL NO. 4

PROJECT: Chicago Ditch Dam Proposal	
COMPONENT: Radial Gate Structures	**FUNCTION:** Ease Operations

ORIGINAL CONCEPT	VALUE STUDY CONCEPT
Construct the radial gate sluiceway with cast-in-place reinforced concrete.	Construct the radial gate sluiceway with pre-cast concrete.

COST ITEMS	NONRECURRING	LIFE CYCLE
ORIGINAL CONCEPT	$ 1,221,800	
VALUE CONCEPT (-)	$ 1,216,000	
SAVINGS	$ 5,800	
NUMBER OF UNITS (X)	1	
TOTAL SAVINGS	$ 5,800	
VALUE STUDY COSTS (-)	$ 20,000	
IMPLEMENTATION COSTS(-)	$	
NET SAVINGS	**($ 14,200)**	

Notes:
1. No change in life-cycle costs were identified.
2. If intake gate is moved out of the flood plain to the original or equivalent position, about $110,000 additional funds would be saved.

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ADDITIONAL ITEMS FOR FURTHER STUDY

(A LISTING OF ITEMS WITH POTENTIAL FOR COST OR OTHER VALUE IMPROVEMENT)

PROJECT: Chicago Ditch Dam Rehabilitation

DESCRIPTION	ESTIMATE OF DOLLARS INVOLVED	REMARKS
Develop an operations manual	$10,000-$15,000	At present the level of expertise and experience in operating the facilities is high. The new concepts will greatly reduce that requirement. Development of a draft operations manual by the designer and its finalization by the site staff will allow for a less experienced staff to operate some portion of facility (trainees, cooperative students, etcetera).
Lengthen the dam crest.	Undetermined	A higher dam crest would check river stage higher and allow easier operations at the intake structure. A longer dam crest would reduce the potential for affecting upstream flood elevations.
Acquire treatment plant discharges and directly send them to the Ditch.	Undetermined	The flows from the treatment plant would allow high nutrient water to be carried directly to the Refuge. This would add the Refuge mission. The city may be able to reduce their cost of treatment accordingly.
Line Chicago Ditch.	Undetermined	At times, the Refuge has difficulty obtaining enough water to fully perform its mission. Lining the Ditch would be costly but would remove much of the current water losses in the unlined channel section. The additional water reaching the Refuge may be worth the added cost of lining the Ditch.
Install check structures in the Ditch.	As much as $100,000 per check structure	Check structures may allow more head to be delivered at the Refuge and allow more flexibility. The ponded water could be used a "reservoirs" during periods of water surplus. Expansion of wider areas could also be done to increase storage capacity.

ADDITIONAL ITEMS FOR FURTHER STUDY

(A LISTING OF ITEMS WITH POTENTIAL FOR COST OR OTHER VALUE IMPROVEMENT)

PROJECT: Chicago Ditch Dam Rehabilitation

DESCRIPTION	ESTIMATE OF DOLLARS INVOLVED	REMARKS
Cut the upstream bank to divert flow.	$1,000-$2,000 versus $10,000-$20,000	The existing design did not address the dewatering issue. Conventional techniques could add significant costs to the construction. Refuge managers noted that it may be possible to do a temporary cut through the upstream bank area. This area was recently cut by the river and rebuilt, thus the affect of doing it again would be negligible.
Improve the site-specific hydraulic and hydrology knowledge of design and other personnel.	Added design cost	The site hydraulics and hydrology will directly influence Refuge satisfaction with any solution. Therefore, irrespective of the final construction decision, the Value Study Team recommends this be done as an necessary implementation procedure.
Develop a Boy/Girl Scout "pick up program."	Incorporate into program activities	The Service often has interpretive programs by a Service person to inform people of their mission activities. The addition of such a program would foster the activities of the Boy Scouts and Girls Scouts. Service staff time to collect debris would be reduced as would their potential costs.
Develop a "Adopt the River" program with the local public.		The Service often has interpretive programs by a Service person to inform people of their mission activities. The addition of such a program would foster public involvement. Service staff time to collect debris would be reduced as would their potential costs.
Examine the potential of improving Ditch hydraulics by placing a gate at a downstream road crossing.	$100,000	The Title I design group mentioned in Section 9 of their report a location where placement of a gate may improve hydraulic performance. Placing a slide gate at the intake and a radial gate at that location may add performance benefits.

ADDITIONAL ITEMS FOR FURTHER STUDY

(A LISTING OF ITEMS WITH POTENTIAL FOR COST OR OTHER VALUE IMPROVEMENT)

PROJECT: Chicago Ditch Dam Rehabilitation

DESCRIPTION	ESTIMATE OF DOLLARS INVOLVED	REMARKS
Ensure design effort funds are sufficient to fully realize goals and obtain optimum construction cost.	Recommend estimate by Service representatives be made	While amount of work is small, its potential affects are significant. Due to the hydraulic complexity of a relatively significant river and its record of meandering with its affect on subsurface conditions, additional work beyond typical design percentages of construction total may be warranted. Specifically, the Value Study Team suggests the following evaluations be made before the design begins: 1. obtain low and high flow hydrology for several years of record, 2. develop a water surface profile based upon peak flow hydrology and survey cross sections, and 3. obtain additional subsurface at specific structure locations. Further, small construction work such as this project contain features that should be investigated. To obtain the goals and achieve the highest construction return, it is recommended the Service evaluate the services needed and costs with regard to the potential worth of added design information and evaluation.
Move the intake to another location upstream in the River Channel. Look into the possibility of tieing into the existing nearby upstream dam structure.	Undetermined	Reduced maintenance and other benefits could be derived from such a cooperative agreement. However, several issues would need to be resolved such as affect on water right, whether cooperative cost would be acceptable, and the cost to generate the added necessary Ditch length.

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CONSULTATION RECORD

CONSULTANT/CONTACT INFO (Name,Title,Company,Address,Phone)	MAIN TOPIC DISCUSSED AND INFORMATION RECEIVED
Mike Blendon, Manager Alamosa National Wildlife Refuge 9383 El Rancho Lane Alamosa CO 81101 Phone (719) 589-4021	Hydro Sphere Study Cheryl Willis, regarding cause of study.
Rick Snyderbeck, Assistant Manager Alamosa National Wildlife Refuge 9383 El Rancho Lane Alamosa CO 81101 Phone (719) 589-4021	Power source to Chicago Dam cost estimate.
Mike Blendon Alamosa National Wildlife Refuge 9383 El Rancho Lane Alamosa CO 81101 Phone (719) 589-4021	All proposals (during prebriefing) and general site activities.
Mike Blendon Alamosa National Wildlife Refuge 9383 El Rancho Lane Alamosa CO 81101 Phone (719) 589-4021	Prebriefing meeting on Chicago Dam Diversion Proposals.
Richard Demlo U.S. Bureau of Reclamation Alamosa CO 81101 Phone: (719) 589-5855	Availability of riprap. A source of riprap is present about 30 miles east of the construction site.
Mark Steers, Civil Engineer, D-8130, U.S.Bureau of Reclamation, Phone (303) 236-9129, Extension 290	Hydraulics of the diversion dam overtopping (velocities, etcetera).
William Kendall, Title I Designer, McLaughlin Water Engineers Ltd., 2420 Alcott Street, Denver CO 80211 (303) 458-5550	Feasibility and Title I designs, site visit results, general project information, and additional ideas for inclusion into proposals.
Rod Johansen, Electronics Engineer, Electrical Systems Group, Reclamation, Reclamation Service Center, (303) 236-8440 ext 316	Component and cost information for the automated instrumentation system.

CONSULT.REC

INFORMATION/DATA DOCUMENTS CONSULTED

DOCUMENT (Name, Author, Dates, etc.)	INFORMATION RECEIVED/USED
Alternative Evaluation Report, Chicago Ditch Dam Rehabilitation, Alamosa National Wildlife Refuge, McLauglin Water Engineers, August 1994.	Historical information, design data, and background data.
Title I Report, Chicago Ditch Dam Rehabilitation, Alamosa National Wildlife Refuge, McLauglin Water Engineers, February 1995.	Title I design information, cost estimates, and additional information, design data, and background data.

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CHICAGO DITCH DAM REHABILITATION

CONCEPT VALUE STUDY

DESIGN TEAM BRIEFING ATTENDANCE LIST

2:00 p.m., December 2, 1996

BUILDING 67-1015

NAME	CODE/OFFICE	PHONE
Sam Martin	D-8170, Value Study Team Leader, CVS	(303) 236-9120, Extension 234
Sandy Clayton	Assistant Value Study Team Leader Department of Energy, Rocky Flats	(303) 966-3479
Al Bevilacqua	Regional Engineer, U.S. Fish and Wildlife Service, Lakewood CO	(303) 236-5320 Extension 229
Keith Copeland	D-8170, Cost Estimator, Value Study Team Member	(303) 236-9120 Extension 225
David Lucero	U.S. Fish and Wildlife Service, Alamosa National Wildlife Refuge, Mountain-Parried Region, Alamosa, Colorado, Maintenance, Value Study Team Member	(719) 589-4021 Extension 106
Steve Jamieson, PE	GEI Consultants, Value Study Team Member	(303) 779-5565 Extension 204
William Kendall	Title I Designer, McLaughlin Water Engineers Ltd., 2420 Alcott Street, Denver CO 80211	(303) 458-5550
Bill Thompson	D-8140, Water Conveyance, Value Study Team Member	(303) 236-3999 Extension 556
Steve Young	D-8311, Geotechnical Engineering Group, Value Study Team Member	(303) 236-3900 Extension 377

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CHICAGO DITCH DAM REHABILITATION

CONCEPT VALUE STUDY

ORAL PRESENTATION ATTENDANCE LIST

10:00 a.m., December 6, 1996

BUILDING 67-1015

NAME	CODE/OFFICE	PHONE
Sam Martin	D-8170, Value Study Team Leader, CVS	(303) 236-9120, Extension 234
Sandy Clayton	Assistant Value Study Team Leader Department of Energy, Rocky Flats	(303) 966-3479
Al Bevilacqua	Regional Engineer, U.S. Fish and Wildlife Service, Lakewood CO	(303) 236-5320 Extension 229
Keith Copeland	D-8170, Cost Estimator, Value Study Team Member	(303) 236-9120 Extension 225
Steve Jamieson, PE	GEI Consultants, Value Study Team Member	(303) 779-5565 Extension 204
David Lucero	U.S. Fish and Wildlife Service, Alamosa National Wildlife Refuge, Mountain-Parried Region, Alamosa, Colorado, Maintenance, Value Study Team Member	(719) 589-4021 Extension 106
Jack Miyake	Regional Dam Safety Officer U.S. Fish & Wildlife Service	303-236-5319 ext 222
Bill Thompson	D-8140, Water Conveyance, Value Study Team Member	(303) 236-3999 Extension 556
Steve Young	D-8311, Geotechnical Engineering Group, Value Study Team Member	(303) 236-3900 Extension 377

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Supporting Documentation

(Appendix A)

Cost estimate sheets, telephone report records, and computations of note.