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1 INTRODUCTION

The Dover Dam Safety Assurance (DSA) project is proposed to be implemented by the Huntington District. This report describes in detail fully-funded project costs and schedule execution for all appropriate feature accounts.

2 PROJECT DETAIL

The Dover DSA Project is located in the Muskingum watershed of Eastern Ohio. Using sound engineering analysis and standards, the Project Delivery Team (PDT) identified and developed various risk reducing alternatives associated with the dam. Viable alternatives were developed to the appropriate level of detail. With adequate scope of work and mapping, the Cost Engineering Section has developed detailed costs for the preferred plan. A detailed description of the project features can be found in the Engineering Appendix.

2.1 METHODOLOGY

2.1.1 General

The feasibility cost estimate for the preferred plan has been prepared to an equivalent price level of 1 October 2006. The preparation of the cost estimate is in accordance with guidelines and policies included in "ER 1110-1-1300 - Cost Engineering Policy and General Requirements, (26 March 1993)" and "ER 1110-2-1302 - Civil Works Cost Engineering, (31 March 1994)". The estimate was completed using the latest guidance from OCE concerning implementation of the Civil Works Breakdown Structure (CWBS) and Chart of Accounts.

2.1.2 Various Cost Methods Incorporated

Depending on the project feature being considered, the engineer would employ one of two distinctly different methods of estimating cost: 1) estimates developed from detail and prepared in MCACES 2nd Generation (MII) estimating software and 2) estimates based on the historical record of performing similar work. Table 1 summarizes the application of these various methods.

Table 1. *Summary of Cost Methods Applied*

Project Feature	*Method of Costing*
Relocations	MII Detailed Bottoms Up
Anchors	MII Detailed Bottoms Up
Parapet Wall	MII Detailed Bottoms Up
I-Wall/Gate	MII Detailed Bottoms Up/ Historically Based
Access Road	MII Detailed Bottoms Up
Drilled Shaft Cutoff	MII Detailed Bottoms Up
Miscellaneous, such as Mob/De-Mob, Development of Staging Area, Environmental Protection, etc.	Historically Based
Resident Engineer's Building	Historically Based

2.1.2.1 Detailed, Bottoms-up Cost Estimating

This method incorporated MII version 2.2.1 by applying unique crews to work items and obtaining material and supply quotes from prospective vendors/contractors where possible for significant cost items. By using this method, most (if not all) of the costs are detailed in the estimate. Following are descriptions of those detailed costs and how they were obtained.

2.1.2.1.1 *Direct Costs*

Direct costs are based on anticipated equipment, labor and materials necessary to construct this project. Direct costs have been calculated independent of the contractor assigned to perform the tasks. Following

formulation of the direct cost a determination is made as to whether the work would be performed by the prime contractor or a subcontractor.

2.1.2.1.1.1 Labor - Wage Determination

Current Tuscarawas County, OH Davis-Bacon wages (General Decision Number OH030029, 10/20/2006) were obtained from the Department of Labor, and applied for all craft labor. The total labor rate was developed using the base wage, fringe benefits, FICA, FUTA and Workers' Compensation rates for each craft. The base wage rate and taxable fringe were entered into MII and applied accordingly. Additional labor burdens are computed by MII based on the state, which in this case is OH.

2.1.2.1.1.2 Vendor Quotes

Vendor quotes have been acquired and documented for the material prices associated with significant features of work.

2.1.2.1.1.3 Crews

Project specific crews have been developed for use in estimating the direct costs of construction for those items not estimated using quotes or historical cost information. Crew members consist of selected complements of labor classifications and equipment pieces assembled to perform specific tasks. Productivity has been assigned to each crew reflective of the expected output per unit of measure for the specific activities listed in the cost estimate.

2.1.2.1.1.4 Quantities

The civil site and structural quantity takeoffs were developed and detailed in accordance with the major features of work for this project as well as the associated sub-quantities for each of these features.

2.1.2.1.2 Indirect Costs

2.1.2.1.2.1 Prime Contractor

It is assumed that a construction contract will be awarded for work to be performed on the dam while the RE building and relocation work will likely be performed by separate contractors. The work associated with each of these potential contracts has been assigned to an appropriate prime contractor within the MII cost estimate. The markups associated with the prime contractor identified in MII are described below.

2.1.2.1.2.2 Field Office Overhead

The indirect costs for field overhead are included as a percentage of the direct costs. Generally, 15% has been used for field overhead. This value represents the anticipated prime contractor field overhead costs for such items as project supervision, contractor quality control, contractor field office supplies, personal protective equipment, field engineering, and other incidental field overhead costs.

2.1.2.1.2.3 Home Office Overhead

For home office overhead expense, the cost estimate includes an allowance applied as percentage of direct cost plus field overhead. Home office overhead includes items such as office rental/ownership costs, utilities, office equipment ownership/maintenance, office staff (managers, accountants, clerical, etc.), insurance, and miscellaneous. In reality, the range of home office overhead can be quite broad and depends largely on the Contractor's annual volume of work and the type of work that is generally performed by the contractor. In this case, a value of 6% was assumed for the prime contractor.

2.1.2.1.2.4 Profit

Profit has been assumed to be 10%.

2.1.2.1.2.5 Bond

Bond has been assumed to be 1% applied as a running percentage to prime's own work and the prime's subcontracted work.

2.1.2.1.3 Subcontractors

2.1.2.1.3.1 Field Office Overhead

All subcontractor overhead costs are set to 20% of direct cost to account for such items as project supervision, contractor quality control, contractor field office supplies, personal protective equipment, field engineering, and other incidental field overhead costs.

2.1.2.1.3.2 Home Office Overhead

The cost estimate includes an allowance applied as percentage of direct cost plus field overhead for home office overhead expense. Home office overhead includes such items as office rental/ownership costs, utilities, office equipment ownership/maintenance, office staff (managers, accountants, clerical, etc.),

insurance, and miscellaneous. In reality, the range of home office overhead can be quite broad and depends largely on the Contractor's annual volume of work and the type of work that is generally performed by the contractor. In this case, a value of 10% was assumed for the subcontractor.

2.1.2.1.3.3 Profit

Profit has been assumed to be 10%.

2.1.2.2 Historically Based Estimates

When considering the use of historically based cost estimates, the estimator would consider a number of factors. Factors that were considered in determining which method to use include availability of historical record, availability of reliable parametric estimating tools, the potential impact the item might have on the bottom line, and the general complexity and uniqueness of the particular project feature being considered.

2.1.3 **Fully Funded Cost Estimate**

The Fully Funded Cost Estimate is presented in the attached Table 4. The fully funded table distributes the base level cost estimate across the appropriate years according to the schedule. The yearly totals are inflated by OMB cost factors which vary by feature account. These inflated yearly totals are summed to yield a total fully funded project cost.

2.1.4 **Project Feature Accounts**

The Dover DSA baseline cost estimate was prepared and organized according to the Civil Works Breakdown Structure (CWBS). As such, the estimate includes the following feature accounts:

2.1.4.1 (01) Lands and Damages

The land and damages feature account includes costs for both permanent and temporary acquisitions. Temporary easements will be required in order to allow for an adequate staging area for the various contractors that will be performing the work associated with this project. Appropriate administrative costs have been included in this account.

2.1.4.2 (02) Relocations

This account represents the estimated costs to perform the relocation of the public facilities, bridges, and utilities that will be required in order to provide flood protection throughout the project. This work includes the relocation of utilities due to the construction activities near the dam.

2.1.4.3 (04) Dams

This cost includes the construction of the Dover Dam Safety Assurances measures, which includes a concrete I-wall with a 25 ft vehicular gate, a concrete parapet wall, anchors through the dam, anchors through the stilling basin, and a drilled shaft cutoff at the toe of the stilling basin.

2.1.4.4 (19) Buildings, Grounds, and Utilities

This cost account includes the construction of the resident engineer's building that would be required as part of the implementation of this project. The RE building is to be constructed at the Muskingum Area office location approximately ½ mile away.

2.1.4.5 (22) Feasibility Studies

This cost account includes all costs expended for the purpose of preparing the feasibility report.

2.1.4.6 (30) Planning, Engineering, and Design

The work covered under this account includes project management, project planning, preliminary design, final design, geotechnical and HTRW investigations, hydraulic modeling, preparation of plans, preparation of specifications, engineering during construction, contract advertisement, opening of bids, and contract award. The cost for this account has been estimated by the PDT from detail and is included for each major project feature.

2.1.4.7 (31) Supervision and Administration

The work covered under this account includes contract supervision, contract administration, construction administration, technical management activities, and District office supervision and administration costs.

2.1.5 **Rationale for Contingency Values**

2.1.5.1 General

Contingencies were assigned by the cost engineer based on the risk and/or uncertainty of each individual bid item estimated. Higher contingencies were assigned to the items that had the least design development or a higher anticipated risk factor associated with construction. Where possible, contingency has been applied at the Bid Item Level of the cost estimate in order to more definitively address the level of risk associated with the determinate scope of the lower level cost item. This allows the engineer greater freedom to apply more liberal contingencies to high risk cost items while maintaining lower contingencies on lower risk cost items.

2.1.5.2 Project Specific Considerations

Table 2 shows a summary of the percent contingencies applied to each feature account. In most instances, the contingencies were applied at levels below the feature account levels in the estimate hierarchy. The values shown in Table 2, therefore, represent the *net* contingency applied to all the items contained within that feature account. Generally speaking, Dover DSA was formulated under extremely tight budget and schedule conditions. The cost engineer, therefore, tended to be somewhat conservative in the application of contingencies.

Table 2. *Summary of Contingencies Applied*

ALTERNATIVE	FEATURE_ACCOUNT	FEATURE_ACCNT_DESC	% CONT
RAISE DAM			
	01	Lands & Damages	25.00%
	02	Relocations	25.00%
	04	Dams	38.84%
	19	Buildings, Grounds, & Utilities	30.00%
	22	Feasibility Studies	0.00%
	30	Engineering & Design	39.95%
	31	Supervision & Administration	38.69%
RAISE DAM Total			**38.44%**

2.1.5.2.1 *(01) Lands and Damages*

The land and damages feature account was understood by the PDT to be fairly straightforward and requiring minimal effort during implementation. USACE already owns the majority of the real estate involved with Dover and therefore a typical contingency of 25% was used.

2.1.5.2.2 (02) Relocations

The relocations feature account was understood by the PDT to be fairly straightforward and requiring minimal effort during implementation. Only very minor relocations will be involved with Dover and therefore a typical contingency of 25% was used.

2.1.5.2.3 (04) Dams

The bulk of the estimated cost is in this feature account. Considering the schedule and budget constraints under which this project was formulated, the PDT was forced to abbreviate its approach in design and analysis. As such, the scope of this project was somewhat volatile throughout its formulation. Although the PDT feels that all significant items have been addressed, it was deemed appropriate by the PDT to assign higher than normal contingencies on these items of work. The cost engineer assigned 40% to the majority of the items within this account.

2.1.5.2.4 (19) Buildings, Grounds, and Utilities

This cost account includes the construction of the resident engineer's (RE) building that would be required as part of the implementation of this project. The PDT developed no design for this building. However, the cost was based on a typical RE building that has been used by LRH in the actual construction of several RE buildings. Still, with no current design, a contingency of 30% was assigned to this account.

2.1.5.2.5 (22) Feasibility Studies

Since this account is for funds that have already been expended, it is not appropriate to add contingencies here.

2.1.5.2.6 (30) Planning, Engineering, and Design

Several considerations contributed to the high contingency used for this feature account. First, similar to the contingency assignment for the 04 account, the PDT felt that the schedule and funding constraints were likely to contribute to missed items of work. Also, the abbreviated approach taken at this time pushes more design work into the future. In other words, the PDT won't have a typical feasibility level design to spring from once detail design and analysis begins. As a check against the historical record, the 30 account shown in this baseline is 25.5% of the estimated construction cost, with all contingencies applied. This certainly is within the expected rate for this type of a project.

2.1.5.2.7 (31) Supervision and Administration

The cost for this account has been estimated based on a historical factor of 7.5% of the total construction cost. Therefore, this account (and its contingencies) is commensurate with the construction accounts and their contingencies.

2.2 ESTIMATED COST

The baseline cost estimate has been prepared for each of the considered project features for the preferred plan – the raising of the dam with a drilled shaft cutoff. The PDT developed a project implementation schedule for the preferred alternative which has been used in developing the fully funded cost estimates. The baseline cost estimate at PL 1 October 2006 is $92.9 million as shown in Table 3.

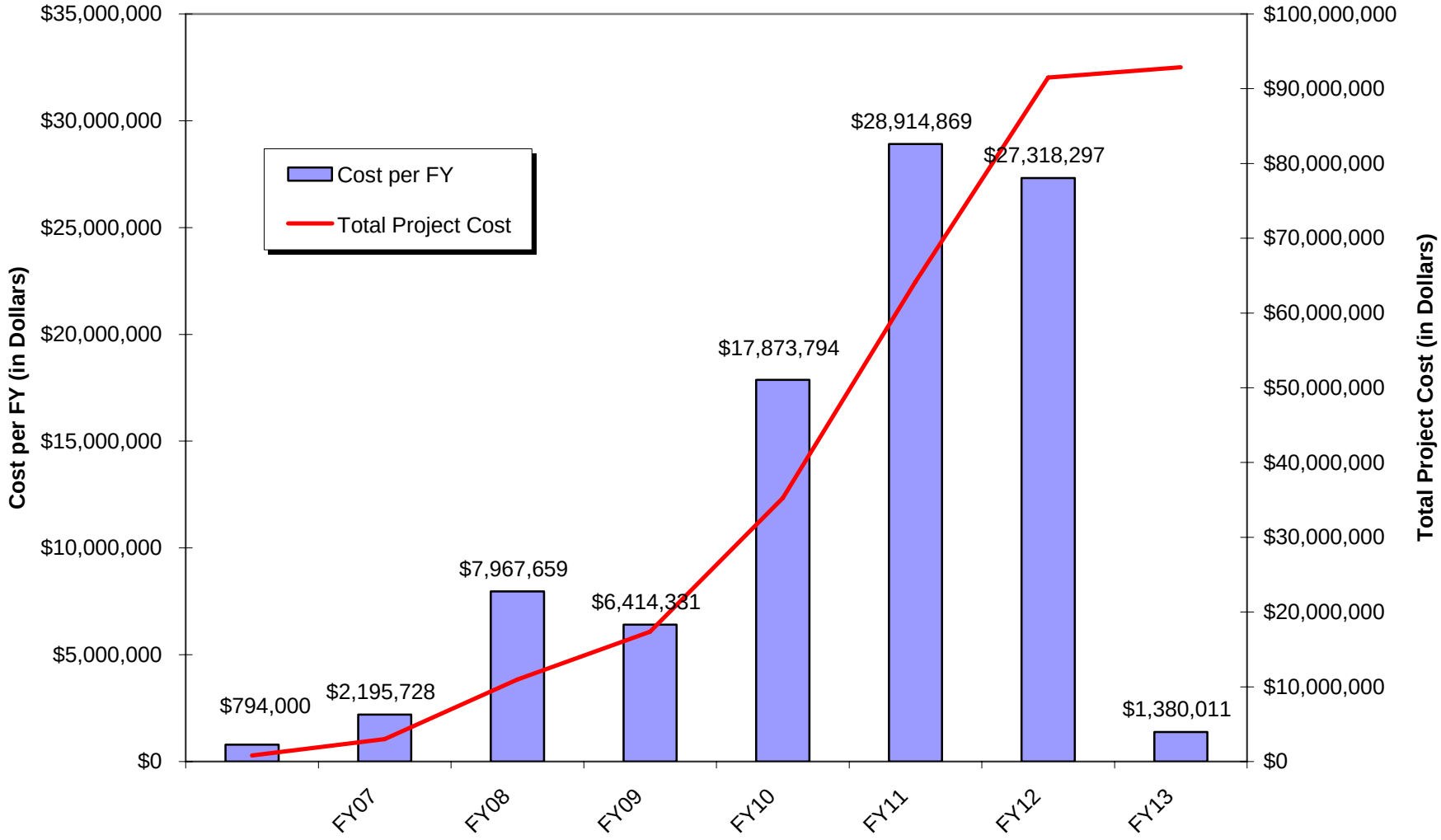
Table 3. *Total Project Cost for Preferred Plan, 1 Oct 2006 PL*

FEATURE_ACCOUNT	FEATURE_ACCNT_DESC	PROJECT COST
01	Lands & Damages	$193,750
02	Relocations	$85,225
04	Dams	$68,095,648
19	Buildings, Grounds, & Utilities	$910,000
22	Feasibility Studies	$794,000
30	Engineering & Design	$17,598,250
31	Supervision & Administration	$5,181,815
Grand Total		**$92,858,688**

The fully funded cost estimate including inflation over the scheduled years of implementation is $100.8 million.

Table 4 *Fully Funded Project Cost - Yearly Distribution*

Dover Dam Safety Assurance
Dover, Ohio



FEATURE ACCOUNT SUMMARY
PL 1 October 2006

FEATURE	(All)
Activity Name	(All)
RESOURCE	(Multiple Items)
ACTIVITY ID	(Multiple Items)
Cost Type	Non-Fully Funded
ALTERNATIVE	RAISE DAM

FEATURE ACCOUNT	FEATURE_ACCNT_DESC	BASE YEAR ESTIMATE	BASE YEAR CONTINGENCY	% CONT	BASE YEAR PROJECT COST
01	**Lands & Damages**	$155,000	$38,750	25.00%	$193,750
02	**Relocations**	$68,180	$17,045	25.00%	$85,225
04	**Dams**	$49,047,855	$19,047,793	38.84%	$68,095,648
19	**Buildings, Grounds, & Utilities**	$700,000	$210,000	30.00%	$910,000
22	**Feasibility Studies**	$794,000	$0	0.00%	$794,000
30	**Engineering & Design**	$12,575,000	$5,023,250	39.95%	$17,598,250
31	**Supervision & Administration**	$3,736,203	$1,445,613	38.69%	$5,181,815
Grand Total		**$67,076,237**	**$25,782,451**	**38.44%**	**$92,858,688**

ALTERNATIVE	RAISE DAM
FEATURE_ACCOUNT	(All)
RESOURCE	(All)
SECTION	(All)
Cost Type	Non-Fully Funded

PROJECT_PHASE	FEATURE	ACTIVITY ID	Activity Name	BASE YEAR ESTIMATE	BASE YEAR CONTINGENCY	BASE YEAR PROJECT COST
Feasibility						
	Evaluation Report			**794,000**		**794,000**
		NEW06	Produce Evaluation Report	794,000		794,000
Feasibility Total				**794,000**		**794,000**
Design Documentation Report						
	Engineering Analysis & Design			**6,069,000**	**2,400,600**	**8,469,600**
		A2530	ITR of DDR	225,000	90,000	315,000
		A2540	Resolve ITR of DDR comments	200,000	80,000	280,000
		DDR3940	Develop Interim Risk Reduction Measures	511,000	204,400	715,400
		A1880	DDR FY07	135,000	51,750	186,750
		DDR3910	Geotechnical	190,000	76,000	266,000
		A1950	Drilling FY07	440,000	176,000	616,000
		A2690	Materials DDR	170,000	68,000	238,000
		A1900	DDR FY08	380,000	134,000	514,000
		A1970	Geological Testing Rock FY08	80,000	32,000	112,000
		A1960	Geological Testing Soil FY08	35,000	14,000	49,000
		DDR3880	Site Development	160,000	64,000	224,000
		DDR3950	Civil Site Layout for RE Office	74,000	29,600	103,600
		DDR3900	Eng & Design Analysis	673,000	269,200	942,200
		A2720	Mapping for RE Office	27,000	10,800	37,800
		DDR3920	H&H Physical Model Studies	1,805,000	722,000	2,527,000
		DDR3890	Hydro & Hydraulics	230,000	92,000	322,000
		A2700	Real Estate Acquisition	50,000	20,000	70,000
		A2680	Real Estate ROE	0	0	0
		NEW07	Additional HTRW Investigations	73,000	29,200	102,200
			HTRW Input to DDR	17,000	6,800	23,800
		NEW08	Design of Instrumentation	155,000	62,000	217,000
			Certify Real Estate	0	0	0
			Drilling for Stilling Basin Mods	350,000	140,000	490,000
			Materials Testing	44,000	17,600	61,600
			Mussel Surveys	30,000	7,500	37,500
			Wetland Delineations	15,000	3,750	18,750
	Value Engineering/Management			**230,000**	**92,000**	**322,000**
		DDR4480	VE/VM Studies DDR	105,000	42,000	147,000
		DDR4490	VE/VM Redesign DDR	120,000	48,000	168,000
		DDR4500	DDR VE/VM Complete	5,000	2,000	7,000
	Cost Estimates			**85,000**	**34,000**	**119,000**
		DDR4350	Current Working Estimate	85,000	34,000	119,000
	Project Management			**325,000**	**130,000**	**455,000**
		A1920	Prog & Project Management FY07	100,000	40,000	140,000
		A1930	Prog & Project Management FY08	100,000	40,000	140,000
		A1940	Prog & Project Management FY09	100,000	40,000	140,000
		A1890	Execute PCA	25,000	10,000	35,000

ALTERNATIVE	RAISE DAM
FEATURE_ACCOUNT	(All)
RESOURCE	(All)
SECTION	(All)
Cost Type	Non-Fully Funded

PROJECT_PHASE	FEATURE	ACTIVITY ID	Activity Name	BASE YEAR ESTIMATE	BASE YEAR CONTINGENCY	BASE YEAR PROJECT COST
Design Documentation Report						
Design Documentation Report Total				**6,709,000**	**2,656,600**	**9,365,600**
Construction E&D						
	Plans & Specifications			**2,700,000**	**1,077,000**	**3,777,000**
		END5671	Plans and Specs FY09 (Resourced)	1,245,000	495,000	1,740,000
		END5680	ITR P&S	225,000	90,000	315,000
		END5720	BCOE Review	120,000	48,000	168,000
		END5721	Resolve BCOE Review Comments	120,000	48,000	168,000
		END5660	P&S RE Office	360,000	144,000	504,000
		END5681	Resolve ITR Comments	270,000	108,000	378,000
		END5710	Construction Permits	20,000	8,000	28,000
		END5705	IGE	85,000	34,000	119,000
		END5670	Plans and Specs FY09 (Schedule)	250,000	100,000	350,000
		END5655	Certify Real Estate for RE Office	5,000	2,000	7,000
	Relocations			**200,000**	**80,000**	**280,000**
		NEW08	AEP Relocation Contract - Admin	50,000	20,000	70,000
			Verizon Relocation Contract - Admin	50,000	20,000	70,000
			ODOT Relocation Contract - Admin	50,000	20,000	70,000
			Contract Admin	50,000	20,000	70,000
	Value Engineering/Management			**393,000**	**157,200**	**550,200**
		END6040	VE/VM Studies	90,000	36,000	126,000
		END6050	VE/VM Redesign	300,000	120,000	420,000
		END6060	Construction E&D VE/VM Complete	3,000	1,200	4,200
	Environmental Studies			**113,000**	**45,200**	**158,200**
		END5760	Coord Docs/Agencies	25,000	10,000	35,000
		END5870	All Other Environ Docs	43,000	17,200	60,200
		END5800	State Water Qual Cert	15,000	6,000	21,000
		END5810	Sec 404 (b)(1) Anal Rpt	15,000	6,000	21,000
		END5850	NPDES Permit	15,000	6,000	21,000
	Ecological Restoration Monitoring			**50,000**	**20,000**	**70,000**
		END6350	Eco Restoration Monitoring	50,000	20,000	70,000
	Project Management			**400,000**	**160,000**	**560,000**
		NEW10	Prog & Project Management FY10	100,000	40,000	140,000
		NEW11	Prog & Project Management FY11	100,000	40,000	140,000
		NEW12	Prog & Project Management FY12	100,000	40,000	140,000
		NEW13	Prog & Project Management FY13	100,000	40,000	140,000
Construction E&D Total				**3,856,000**	**1,539,400**	**5,395,400**
Construction						
	Construction - Contract A			**49,914,035**	**19,314,038**	**69,228,073**
		CON505	Construct RE Office	743,000	227,200	970,200

PROJECT PHASE COST
PL 1 October 2006

ALTERNATIVE	RAISE DAM
FEATURE_ACCOUNT	(All)
RESOURCE	(All)
SECTION	(All)
Cost Type	Non-Fully Funded

PROJECT_PHASE	FEATURE	ACTIVITY ID	Activity Name	BASE YEAR ESTIMATE	BASE YEAR CONTINGENCY	BASE YEAR PROJECT COST
Construction	**Construction**	CON510	Advertise/Open/Award Construction Contract	30,000	12,000	42,000
		CON590	Contract Award	25,000	10,000	35,000
		CON630	Construction Contract	49,116,035	19,064,838	68,180,873
	S&A During Construction			**3,736,203**	**1,445,613**	**5,181,815**
		NEW09	S&A During Construction	3,736,203	1,445,613	5,181,815
	E&D During Construction			**2,010,000**	**804,000**	**2,814,000**
		END6330	E&D During Construction FY10	670,000	268,000	938,000
		A2600	E&D During Construction FY11	670,000	268,000	938,000
		A2610	E&D During Construction FY12	670,000	268,000	938,000
	Project Closeout			**57,000**	**22,800**	**79,800**
		END6380	Final Inspectection	20,000	8,000	28,000
		END6390	Proj Dedication Ceremony	20,000	8,000	28,000
		END6500	OMRR&R Manual	17,000	6,800	23,800
Construction Total				**55,717,237**	**21,586,451**	**77,303,688**
Grand Total				**67,076,237**	**25,782,451**	**92,858,688**