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McNARY LOCK AND DAM TEMPORARY SPILLWAY WEIR (TSW) II

VALUE ENGINEERING REPORT



August 2007

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7 September 2007

MEMORANDU FOR RECORD

SUBJECT: Value Engineering (VE) Study – McNary Temporary Spillway Weir (TSW) II

1. This memorandum documents the VE study and findings for the subject project. A VE study for the McNary TSW was conducted and a final report completed in August 2007. The study has led to acceptance of VE-1 - REHABILITATE AND MODIFY EXISTING UPPER LEAF GATES, and was incorporated into the design plans and specifications. The VE study recommendation resulted in a potential savings of \$1,850,857.
2. After the VE study was completed and the solicitation package was ready for advertisement, regional review of draft biological test data resulted in a decision to stop the design and solicitation process. The decision was not related to the VE study recommendations. The potential savings may not be realized or may be significantly reduced pending the outcome of regional scope discussions.


KEVIN E. CRUM, R.A.
NWW Value Engineering Officer

CF:

John Skarbek, NWD-VE
Donna Street, Chief, Engineering and Construction Division
Dave Opbroek, Chief, Construction Branch

**U.S. Army Corps of Engineers, Walla Walla District
MCNARY LOCK AND DAM
TEMPORARY SPILLWAY WEIR**

**VALUE ENGINEERING STUDY
August 2007**

SPONSOR: The U.S. Army Engineering District, Walla Walla

VALUE ENGINEERING TEAM: U.S. Army Corps of Engineers (Corps), multi-District Team

ADDRESS: 201 N Third Avenue, Walla Walla, Washington

VALUE ENGINEERING OFFICER: Kevin Crum, Walla Walla District (NWW)

PROJECT MANAGER: Cary Rahn, NWW; 509-527-7564

PRODUCTION TEAM: RYAN BLISS, DOUG NEWTON, DAVID SALGADO, LORI CORBETT, MARK JONES, JAMES HAUGEN, CARL BENDER KURT FRIEDERICH, RICHARD ROBINSON

**U.S. Army Corps of Engineers, Walla Walla District
MCNARY LOCK AND DAM
TEMPORARY SPILLWAY WEIR**

**VALUE ENGINEERING STUDY
August 2007**

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Executive Summary

The Value Engineering (VE) analysis was conducted in August 2007. The TSWII contract was under BCOE review at the time of the study. The McNary project staff reviewed requirement to install new upper leaf sections of the operating gates, with the potential to rehabilitate existing gates to perform the same function. It was determined feasible and cost effective. Team meetings were held, the new scope was verified with the team and the design changes were implemented by the project delivery team. Impacts to dam safety have been discussed and are considered easier to resolve with the recommended action described herein than under the original design.

The original design of this project was developed using a regional expert review process with the concept to utilize minimal components for the weir structures. The intent of the testing was to install low-cost and short-term weirs meant for "temporary" use to gather performance information on the surface bypass flow they provide. The cost to redevelop a TSW design was anticipated to cost more in redesign than could be recovered in reduced initial costs. The intent of the prototype work was also to gather biological performance data as quickly as possible. Any conceivable design changes would result in additional regional consultation, physical modeling and demonstrations, adding substantial time and defeating the purpose of the project.

Therefore, this study focused on the most costly element of the project, the fabrication of two new upper leaf gate sections. This function was to "close flow" over the TSW, and it was determined this function could still be accomplished using existing gates, rehabilitated to maintain functional reliability, and modified to shift the seals to fit to the new TSW crest.

The report was drafted and finalized in August 2007.

Recommendation

The product delivery team met on 9 August, 2007 and committed to change the contract requirements to rehabilitate existing gates versus fabrication of new gates. There are several advantages to this approach as discussed herein. However, this direction increases the risk of unanticipated problems with the existing 50-year old gates. It is believed those risks will be overcome by the potential benefits. It is recommended to proceed with the proposed methods and utilize, rehabilitate, and modify the existing upper leaf gates.

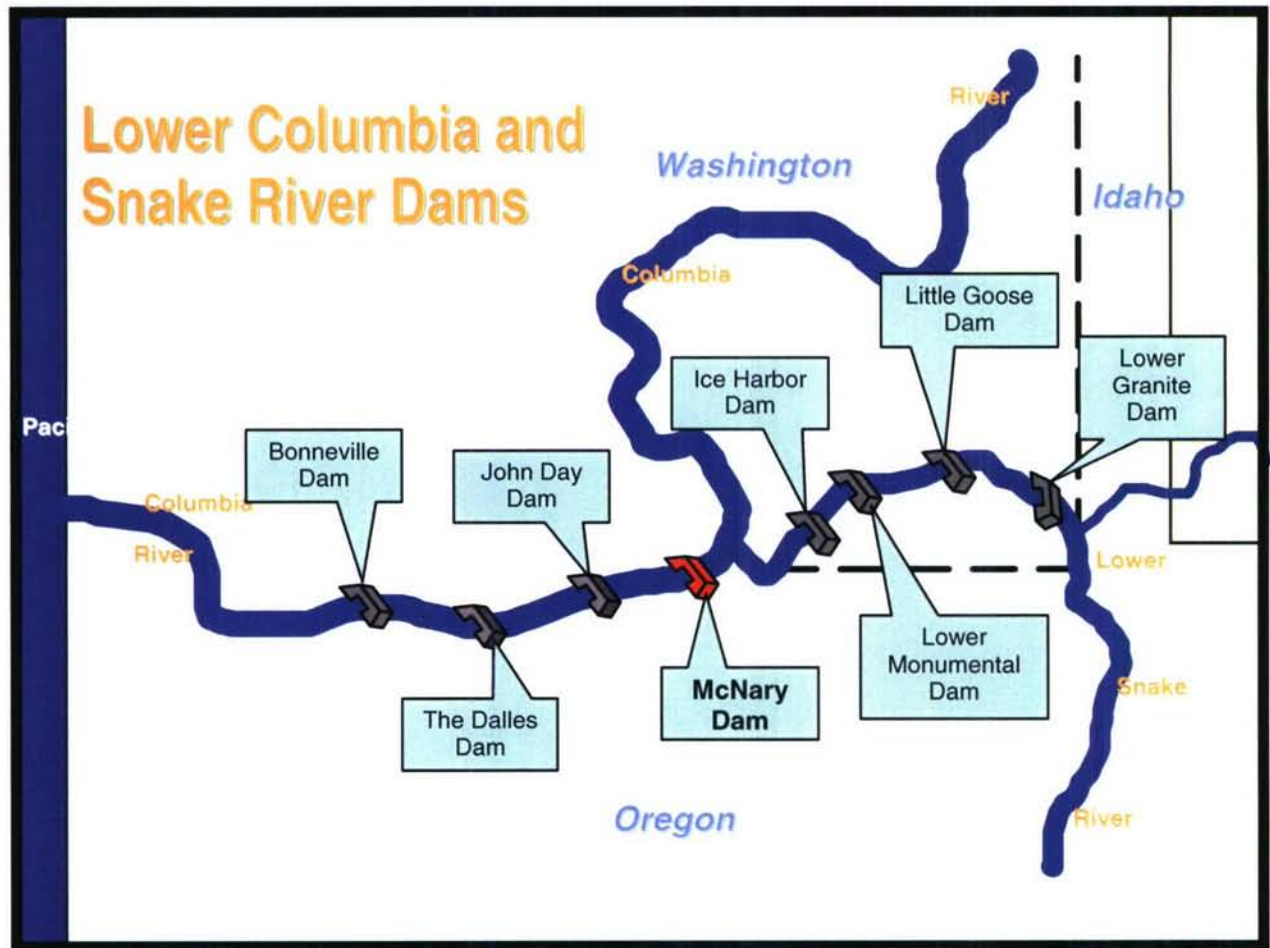
McNary Lock and Dam - Project Description

The McNary project is one of the four lower Columbia River lock and dams. It is the fourth project in upstream order located at river mile 292.0. The project includes a powerhouse with fourteen turbine units, twenty two vertical lift gate controlled spillway bays, a navigation lock, an earthen embankment, and two adult fish ladders (3 entrances). The following tables present pertinent information about the McNary project.

McNary Pertinent Data

Reservoir		Dam	
Maximum Elevation	365.5 msl	River Mile	292
Operating Range	335-340 msl	Overall Length	7,365 ft
Capacity within Operating Range	185,000 acre-ft	Powerhouse Length	1,422 ft
Spillway		Spillway Length	1,310 ft
Peak Design Discharge	2,200 kcfs	Number Powerhouse Units	14
Maximum Recorded Tailwater	278.96 msl	Number of Spillway Bays	22
Spillbay Clear Width	50 ft	Fish Facilities	
Spillbay Crest Elevation	291 msl	Fish Ladders	2
Spillbay Pier Width	10 ft	Fishway Entrances ^{1/}	3

Vicinity Diagram



TSW Background

Surface passage planning began in 2005 when the Walla Walla District, Federal, State, and Tribal fishery management agencies began discussions to consider new passage technologies at McNary Dam on the Columbia River. As a result, TSW's were designed and are being prototype tested at McNary Dam. The TSW is a surface bypass structure fitted into a spillway bay to create "spill" that originates at the surface of the forebay, versus traditional spill that originates deep in the forebay pool. The TSW crest is shaped to create an overflow trajectory that contacts the spillway at a relatively shallow angle.

TSW's were developed initially to gather passage information at McNary prior to implementing major retrofits such as RSW's or massive flume systems. There was limited knowledge as to what hydraulically makes a surface entrance "attractive" to juvenile fish. There are several theories and examples of these parameters are: threshold flow rate, velocity, hydraulic strain, acceleration, or flow type (*i.e.*, the rising streamlines of flow approaching a weir crest or flow patterns replicating a river bed).

The simplified weirs would be portable, so other spillway locations, flows, and configurations could be tested. Initial biological tests took place over the spring and summer of 2007. The preliminary passage and survival results are encouraging and the Corps and regional fisheries agencies and tribes plan to test multiple TSW locations at the McNary spillways in the near future. The TSW's components are being coated to increase the longevity of the devices to allow more data collection on the TSW system.

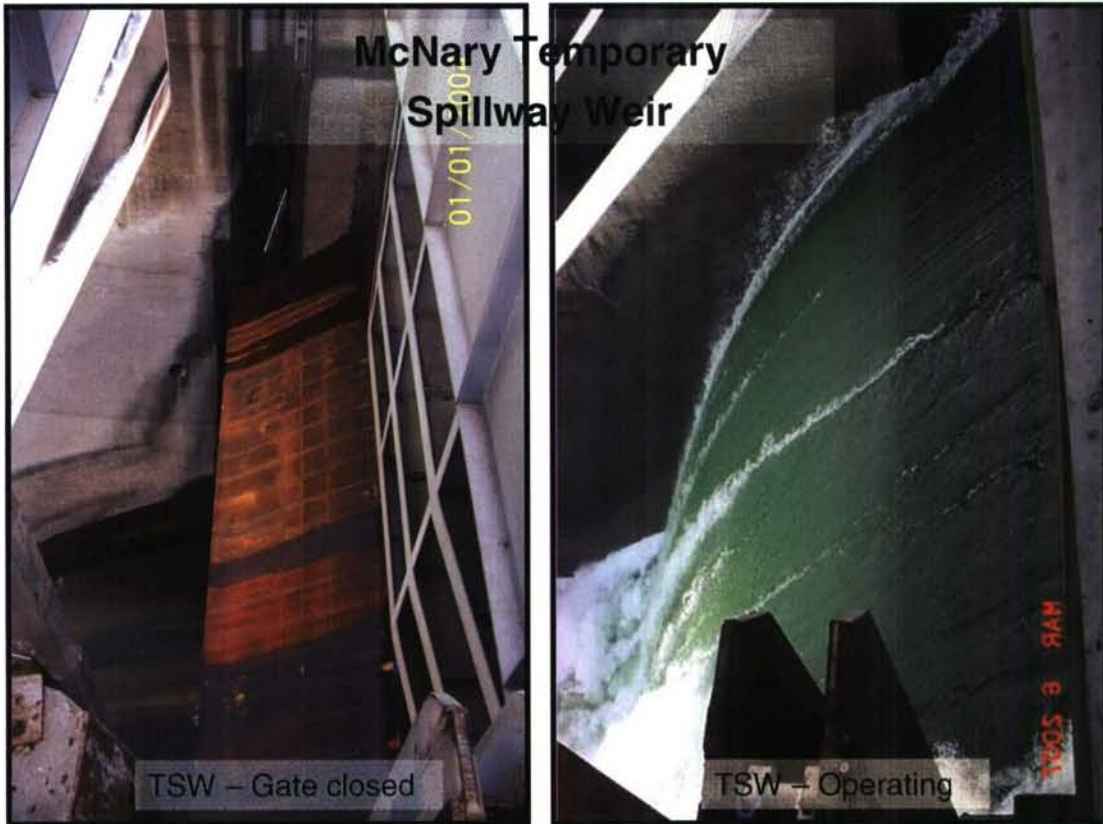
The TSW provides a raised spillway crest, but utilizes a separated water jet to pass juvenile fish to the tailrace. To simplify, the RSW is a "slide", and the TSW is a controlled "waterfall".

The primary goal for surface passage is to create hydraulic conditions that attract juvenile fish, allows opportunity for discovery of the entrance, and provides a safe passage over the weir and into the tailrace of the dam. The overall goal is to improve passage conditions and increase survival of downstream migrating juvenile salmonids.

RSW/TSW Pertinent Data

	RSW	TSW
Height	120 feet	35 feet
Width	78 feet	50 feet
Depth	70 feet	7 feet
Weight	2,000,000 lbs	250,000 lbs
Construction Time	12 months	4 months
Cost	\$15-19M	\$700K TSW1

TSW Operation



Value Engineering Proposal

VE-1 REHABILITATE AND MODIFY EXISTING UPPER LEAF GATES

ORIGINAL DESIGN:

The original design specified fabrication, delivery and installation of two new upper leaf gates. These gates would have some removable features that would seal to the TSW crest, but could also be removed to seal the bulkheads as originally intended.

PROPOSED DESIGN:

The proposed design is to use existing (original) operating gates, rehabilitate and modify them with the same features and functions as described above. Because of the presumed temporary nature of TSW's, it is also appropriate to consider this path since the long term fish passage solution is not known or predictable.

COSTS:

Costs are based on data provided by NWW Cost Engineering Branch. The difference between the original design and the proposed design is estimated to be \$1,850,857. See appendix A for back-up cost data and correspondence.

ADVANTAGES:

- Original function is maintained.
- Costs are significantly decreased.
- The construction effort and schedule will be decreased.
- Alleviates gate storage complications (extra gates are avoided)
- Reduces concern that handling of extra gates prior to a flood would increase dam safety risks due to the time and motion the extra gates may create.
- Reduces concern of providing permanent features for a potentially temporary fish testing system.

DISADVANTAGES:

- Design schedule and rework will be increased to reconfigure the contract.
- Increases cost risk - unknown condition of existing gates and components may require change order if unknown problems are encountered. Cost and schedule may be impacted

JUSTIFICATION:

This proposal maintains the function of the system at a reduced cost.

COST ESTIMATE WORKSHEET

Proposal: Rehab and Modify (2) existing upper leafs

Cost Comparision

[illegible]

MCNARY LOCK AND DAM
TEMPORARY SPILLWAY WEIR
VALUE ENGINEERING STUDY

APPENDIX A

SUPPORTING DOCUMENTATION

Correspondence

-----Original Message-----

From: Bliss, Ryan M NWW

Sent: Monday, August 13, 2007 10:00 AM

To: Salgado, David J NWW; Crum, Kevin E NWW; Palmer, Chuck R NWW; Corbett, Lori K NWW; Newton, Doug P NWW; Jones, Mark T NWW; Chong, Randy R NWW; Hollenbeck, Robert E NWW; Miller, Brian D NWW; Clarno, Bill R NWW; Berglin, John D NWW; Rahn, Cary L NWW

Subject: RE: TSW Phase II - Modified Upper Leafs

All,

There's presently only one upper leaf with a seal modification on it (makes it unusable to latch to a lower leaf). That upper leaf with the seal modification is an upper leaf that has been rehabbed, therefore is good to go. This makes the total number of upper leafs that need to be rehabbed 3.

Ryan

-----Original Message-----

From: Salgado, David J NWW

Sent: Sunday, August 12, 2007 5:08 PM

To: Crum, Kevin E NWW; Bliss, Ryan M NWW; Palmer, Chuck R NWW; Corbett, Lori K NWW; Newton, Doug P NWW; Jones, Mark T NWW; Chong, Randy R NWW; Hollenbeck, Robert E NWW; Miller, Brian D NWW; Clarno, Bill R NWW; Berglin, John D NWW; Rahn, Cary L NWW

Subject: RE: TSW Phase II - Modified Upper Leafs

All,

To maintain uniformity it would be a good idea to also rehab the existing modified (seal assembly modification) upper leaf. That would make the total number of gates to be rehabbed 4 instead of 3. As of right now, the only work on this upper leaf is some painting on the previously modified areas.

David S.

-----Original Message-----

From: Crum, Kevin E NWW

Sent: Friday, August 10, 2007 9:28 AM

To: Bliss, Ryan M NWW; Palmer, Chuck R NWW; Corbett, Lori K NWW; Salgado, David J NWW; Newton, Doug P NWW; Jones, Mark T NWW; Chong, Randy R NWW; Hollenbeck, Robert E NWW; Miller, Brian D NWW; Clarno, Bill R NWW; Berglin, John D NWW; Rahn, Cary L NWW

Cc: Crum, Kevin E NWW

Subject: RE: TSW Phase II - Modified Upper Leafs

Team,

I've included some edits in this revision 2. Clarified funding stream for follow-on work (CFRMP) and clarified scope (I hope) for TSW2 crest component, and remaining TSW2 components plan.

thanks,

Kevin

527-7557

-----Original Message-----

From: Crum, Kevin E NWW

Sent: Thursday, August 09, 2007 5:03 PM

To: Bliss, Ryan M NWW; Palmer, Chuck R NWW; Corbett, Lori K NWW; Salgado, David J NWW; Newton, Doug P NWW; Hartman, Steven A NWW; Jones, Mark T NWW; Berger, Robert M NWW; Chong, Randy R NWW; Hollenbeck, Robert E NWW; Miller, Brian D NWW; Clarno, Bill R NWW; Berglin, John D NWW
Cc: Rahn, Cary L NWW; Ryan, Randall B NWW; Opbroek, David A NWW; Street, Donna L NWW; Matlock, Glenn R NWW; Williams, Robert D NWW; Hansen, Ken E NWW; Alexander, David C NWW; Setter, Ann L NWW; Hurson, Dave F NWW; Heitstuman, John J NWW
Subject: RE: TSW Phase II - Modified Upper Leaf

All,

A design PDT meeting was pulled together today to discuss revised scope for the TSW II contract. The "TO" list attended the meeting and discussed scope. While we need more time to determine the impact to the P&S and solicitation schedule, the scope items were worked out. The attached is my attempt to capture the items discussed today. Please let me know ASAP if I missed something or have an incorrect understanding.

We will also need to ensure we review and revise (if justified) the TSW removal timing/criteria related to this project. That will be a separate meeting.

I apologize I missed inviting some key players but hopefully this brings you up-to-speed. Thanks for your efforts and thoughts on this today.

thanks,

Kevin
527-7557

-----Original Message-----

From: Bliss, Ryan M NWW

Sent: Wednesday, August 08, 2007 5:57 PM

To: Crum, Kevin E NWW; Palmer, Chuck R NWW; Hansen, Ken E NWW; Corbett, Lori K NWW; Salgado, David J NWW; Newton, Doug P NWW; Hartman, Steven A NWW; Jones, Mark T NWW; Williams, Robert D NWW; Matlock, Glenn R NWW
Cc: Rahn, Cary L NWW; Ryan, Randall B NWW; Berger, Robert M NWW; Chong, Randy R NWW; Opbroek, David A NWW; Street, Donna L NWW; Alexander, David C NWW
Subject: RE: TSW Phase II - Modified Upper Leaf

Kevin,

Last year the contract was to modify two upper leafs, but there was a contract mod so that only one upper leaf received the seal modifications. The leaf that was modified last year was taken from a gate that was modified in the past year or so. The contract should at a minimum rehab the three that will be modified and look very seriously at rehabbing the two bulkheads as they will be seeing more than usual use with the TSWs and their current condition is not great.

Thanks,
Ryan

-----Original Message-----

From: Crum, Kevin E NWW

Sent: Wednesday, August 08, 2007 4:38 PM

To: Bliss, Ryan M NWW; Palmer, Chuck R NWW; Hansen, Ken E NWW; Corbett, Lori K NWW; Salgado, David J NWW; Newton, Doug P NWW; Hartman, Steven A NWW; Jones, Mark T NWW

Cc: Rahn, Cary L NWW; Ryan, Randall B NWW; Berger, Robert M NWW; Chong, Randy R NWW; Opbroek, David A NWW; Street, Donna L NWW
Subject: RE: TSW Phase II - Modified Upper Leafs

Ryan,

Thanks for your coordination of this. Talking with the program manager it appears to be good for the project to include rehab of the upper leafs to ensure reliability of the TSW1. We will get together with the designers as soon as possible to look at the schedule impacts of reconfiguring this contract. I think we have two more upper leafs that go with TSW2 and TSW1 that were modified but not rehabbed last year. We should nail down if those should be included too, especially if we think TSW1 will be in operation for extended seasons.

Question 1: Bob William's gate rehab job should allow availability of the gate repair/storage pits in early December. To rehab two upper leafs and bolt the modified seals on should take 30-45 days. If we do two more we would be pushing it, but seems possible. Are the pits going to be available say Dec/Jan/Feb/Mar?

Question 2: As you state, we will need to coordinate any adjustments to the plan (if needed) of timeframes and sequences to removal of gates in preparation for SPF/PMF. This would be a check of the present interim plan that already exists to handle the TSW1 starting around 400 kcfs. Who would need to be involved to discuss, and responsible to write the procedures?

Suggest the design (P&S) as it presently exists be saved as a post BOCE status before any revisions start. This is happening pretty quickly and we may uncover some unexpected problem with this logic and should keep the present design in the back pocket.

thanks,

Kevin
527-7557

-----Original Message-----

From: Bliss, Ryan M NWW

Sent: Wednesday, August 08, 2007 2:15 PM

To: Palmer, Chuck R NWW; Hansen, Ken E NWW; Corbett, Lori K NWW; Salgado, David J NWW; Newton, Doug P NWW; Hartman, Steven A NWW; Jones, Mark T NWW

Cc: Crum, Kevin E NWW; Rahn, Cary L NWW; Ryan, Randall B NWW; Berger, Robert M NWW; Chong, Randy R NWW

Subject: TSW Phase II - Modified Upper Leafs

All,

Cary and Kevin asked the question, Do we really need two new upper leafs, can we just modify two existing upper leafs?

We do not need to construct two more upper leafs, we can modify the existing leafs. We strongly recommend that the upper leafs that are used be rehabbed prior to TSW operation. We do not want to use any of the currently rehabbed gates.

It is very important to us to keep in mind passing a project flood, the addition of these TSWs require the installation of the bulkheads in the upstream slot to get access to the TSW crest and the lower leaf. We will need to establish a procedure for TSW removal in the event of a flood.

Thanks,
Ryan

Cost Data - CWE for Original Design

Print Date Wed 22 August 2007
Eff. Date 7/31/2007

U.S. Army Corps of Engineers
Project 001 TSW: TSW Phase II
COE Standard Report Selections

Time 09:53:09

Project Cost Summary Report Page 1

Description	Quantity	UOM	ContractCost	ProjectCost
Project Cost Summary Report			4,429,058	4,429,058
			4,429,058.32	4,429,058.32
06 Fish and Wildlife Facilities	1.00	EA	4,429,058	4,429,058
			4,429,058.32	4,429,058.32
0601 Fish Facilities at Dams	1.00	EA	4,429,058	4,429,058
			681,332.83	681,332.83
0601 0001 CLIN 0001 TEMPORARY SPILLWAY WEIR CREST	2.00	EA	1,362,666	1,362,666
			1,284,046.00	1,284,046.00
0601 0002 CLIN 0002 UPPER SPILLWAY GATE LEAF	2.00	EA	2,568,092	2,568,092
0601 0003 CLIN 0003 SAFETY RAILING	1.00	LS	11,078	11,078
			131,204.75	131,204.75
0601 0004 CLIN 0004 PAINT EXISTING TSW CRESTS	2.00	EA	262,410	262,410
			3,558.26	3,558.26
0601 0005AA CLIN 0005AA Inspect and repair guide plates and tread plates	3.00	EA	10,675	10,675
			221.30	221.30
0601 0005AB CLIN 0005AB Additional depth repair of guide plates	200.00	FT	44,260	44,260
			221.30	221.30
0601 0005AC CLIN 0005AC Additional depth repair of tread plates	200.00	LF	44,260	44,260
			62,808.88	62,808.88
0601 0006 CLIN 0006 MODIFY EXISTING SPILLWAY GATE UPPER LEAF	2.00	EA	125,618	125,618

Cost Data - CWE for Proposed Design Changes

Print Date Wed 22 August 2007
Eff. Date 8/22/2007

U.S. Army Corps of Engineers
Project 001 TSW: TSW222
COE Standard Report Selections

Time 10:03:26

Project Cost Summary Report Page 1

Description	Quantity	UOM	ContractCost	ProjectCost
Project Cost Summary Report			2,562,976	2,562,976
			2,562,976.17	2,562,976.17
06 Fish and Wildlife Facilities	1.00	EA	2,562,976	2,562,976
			2,562,976.17	2,562,976.17
0601 Fish Facilities at Dams	1.00	EA	2,562,976	2,562,976
			682,245.95	682,245.95
0001 Temporary spillway weir crest	2.00	EA	1,364,492	1,364,492
0003 Safety railing	1.00	LS	16,994	16,994
			182,772.00	182,772.00
0004 Paint existing TSW crests	1.00	EA	182,772	182,772
			330,246.32	330,246.32
0002 ReHab & modify existing gate upper leaves	3.00	EA	990,739	990,739
			7,979.27	7,979.27
0005 Remove existing TSW leaf ass'y, support & struct	1.00	EA	7,979	7,979

MCNARY LOCK AND DAM
TEMPORARY SPILLWAY WEIR
VALUE ENGINEERING STUDY

APPENDIX B

CONTACT DIRECTORY

Contact Directory

<u>NAME</u>	<u>ORGANIZATION</u>	<u>TELEPHONE</u>	<u>EMAIL</u>
David Salgado, mechanical	Walla Walla District	509-527-7526	David.J.Salgado@usace.army.mil
Lori Corbett, specifications	Walla Walla District	509-527-7559	Lori.K.Corbett@usace.army.mil
Doug Newton, structural	Walla Walla District	509-527-7568	Doug.P.Newton@usace.army.mil
Cary Rahn, PM	Walla Walla District	509-527-7564	Cary.L.Rahn@usace.army.mil
Kevin Crum, VEO	Walla Walla District	509-527-7557	Kevin.E.Crum@usace.army.mil

MCNARY LOCK AND DAM
TEMPORARY SPILLWAY WEIR
VALUE ENGINEERING STUDY

APPENDIX C

COST MODEL

Cost Model

Cost Model - Original Design (in \$000's)

