

Value Engineering g

PRESENTATION REPORT

PROJECT:

Elwha River Restoration, Elwha
Dam Removal

DATE: December 15, 1995

Workshop Study conducted within a certified Module I course by SAMI LLC

UNITED STATES
DEPARTMENT OF THE INTERIOR
Bureau of Reclamation
VE Workshop Class Study
Denver Office

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VALUE ENGINEERING WORKBOOK

PROJECT:

Elwha River Restoration, Dam Removal

VE TEAM MEMBERS

NAME	TITLE/DISCIPLINE	OFFICE/PHONE NO.
Floyd Summers	Team Leader - Civil Engineer	Mid-Pacific Regional Office 916/979-2296
Phil Hansen	Team Member - Geologist	PN Regional Geology Office 509/633-9325
Brian Shinmoto	Team Member - Civil Engineer	Tracy Field Office 209/836-6261
Terry Zontek	Team Member - Archeologist	Great Plains Regional Office 406/247-7720

TEAMLIST.MEM

DESCRIPTION OF PRESENT DESIGN

Elwa River Restoration, Dam Removal

Elwa River Restoration Project, Dam Removal Plan:

This project would remove two dams, Elwha and Glines Canyon Dams, as proposed by the Dam Removal Task Group, to restore the Elwha River ecosystem and native anadromous fisheries. The Value Engineering study presented here will only deal with Elwha Dam.

Elwha Dam is located on the Elwha River, within the Olympic Peninsula of northwestern Washington. Elwha Dam was completed in 1913 at river mile 4.9, and includes a 108-foot-high concrete gravity section, gated spillways on both abutments, and a powerhouse with four generating units rated at 14.8 MW. Elwha Dam impounds Lake Aldwell, having a surface area of 267 acres and a storage capacity of 8,100 acre-feet at elevation 197.0. It is currently owned and operated by James River Corporation.

Dam removal plans should meet the following requirements:

- Remove Elwha Dam safely.

- Accommodate river flows during dam removal, through diversion channels and notches.

- Facilitate sediment management schemes, through controlled releases and planned construction schedules.

- Address environmental and cultural issues, by planning work shutdowns during certain periods and by restoring sacred sites to near pre-dam conditions.

The design process for development of the dam removal plans consisted of the following steps:

- Review existing information, including previous studies performed by others for the Draft Staff Report (March 1993) and The Elwha Report (January 1994).

- Develop reasonable dam removal alternatives by considering previous designs, existing site conditions, project objectives, and current construction practices.

- Identify and address issues that could impact construction, including streamflow diversion, sediment management, safety, and environmental concerns.

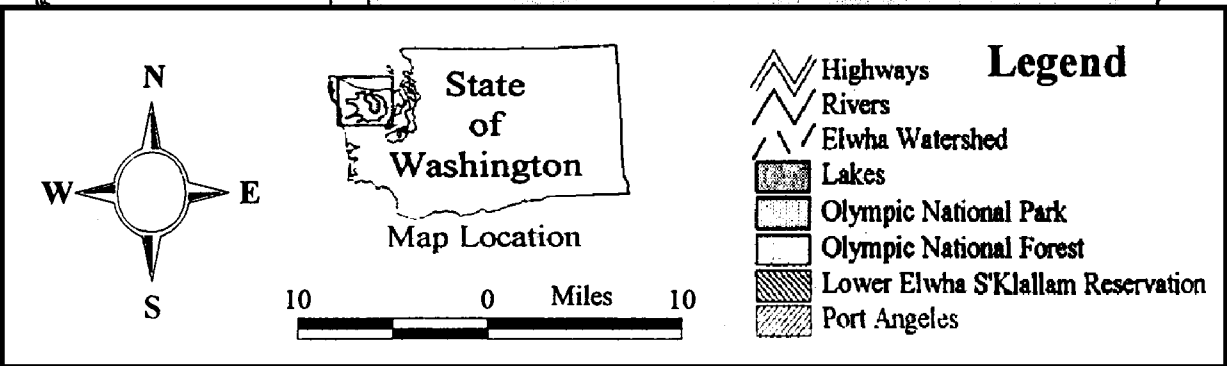
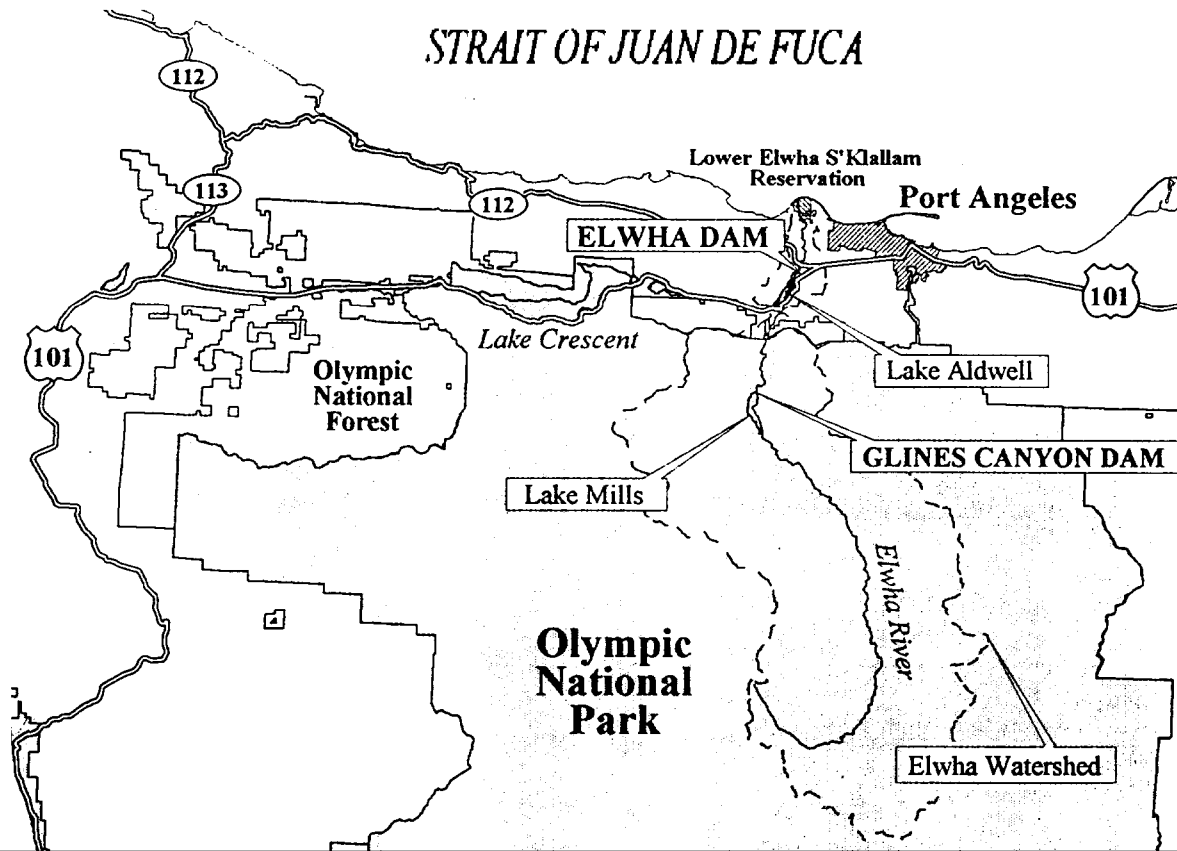
- Develop a construction sequence to minimize potential flood impacts, improve efficiency, and accommodate periodic shutdowns for salmon runs and potential flood flows.

- Prepare feasibility-level cost estimates for removal of each dam, based on the preferred dam removal alternatives and assumed demolition methods.

- Document design studies by preparing a technical memorandum and feasibility drawings.

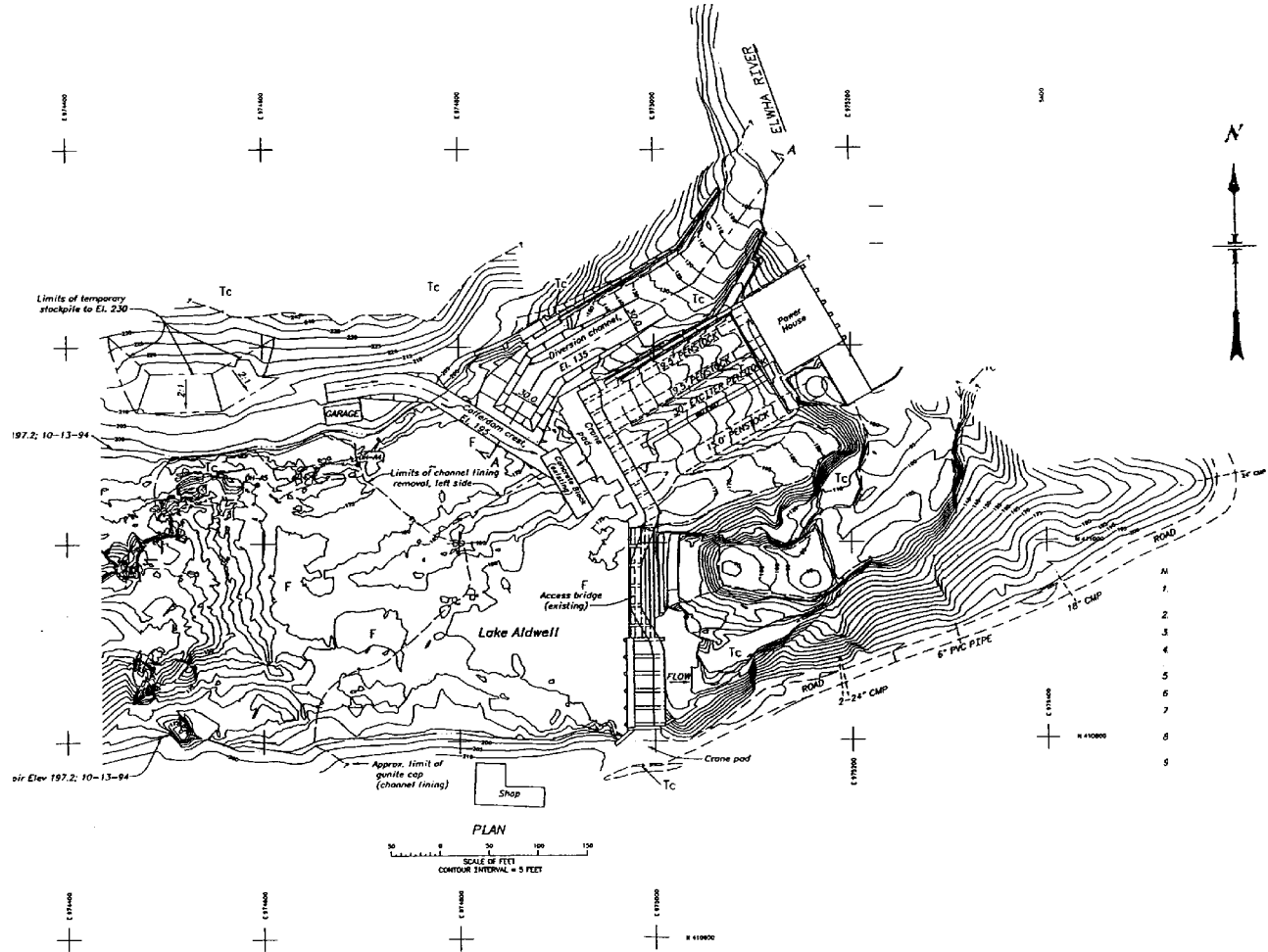
The field cost of dam removal is currently estimated as \$10,500,000, including a 20 percent allowance for

GENERAL LOCATION AND VICINITY MAP



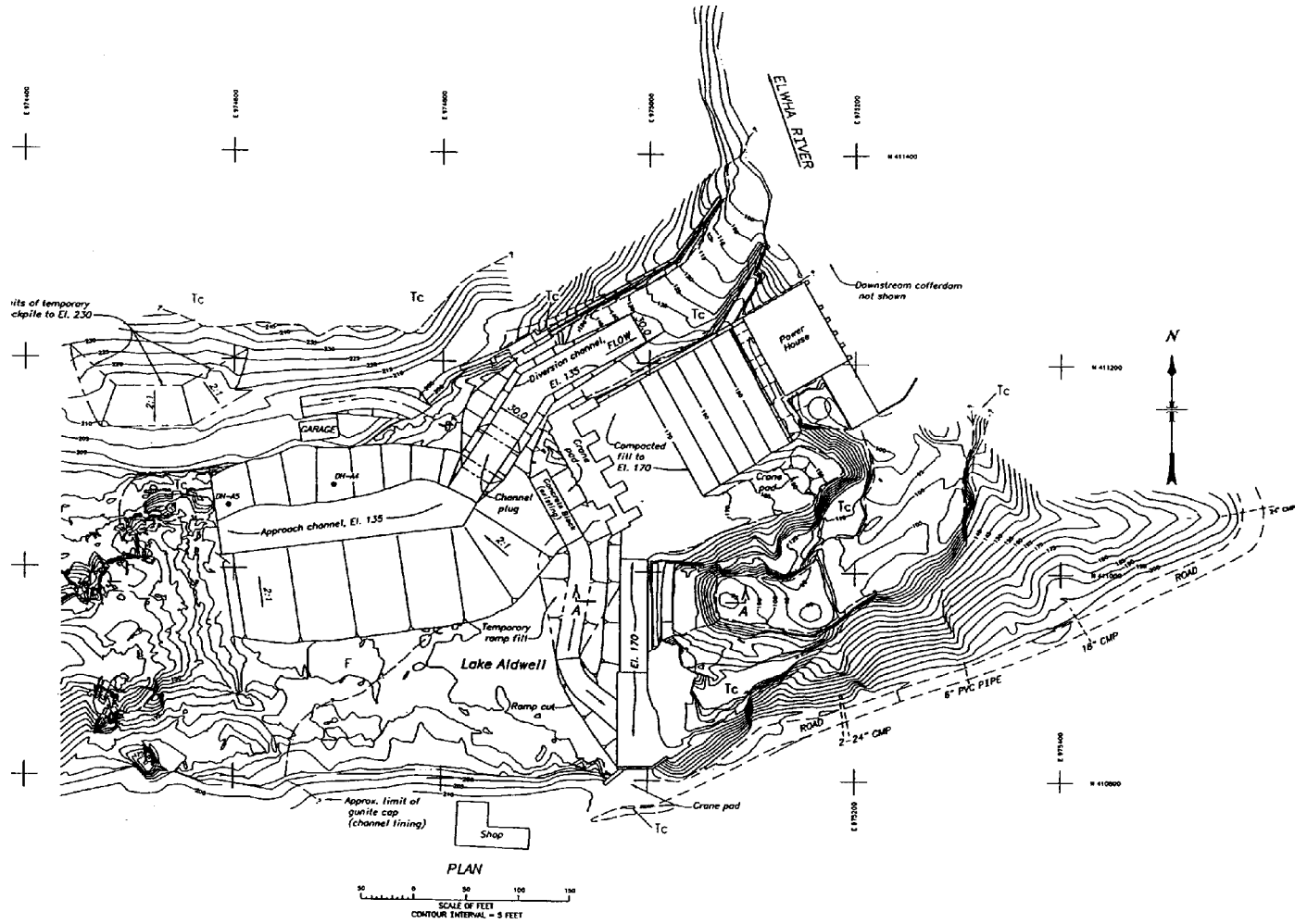
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ORIGINAL CONCEPT - ELWHA STAGE 1



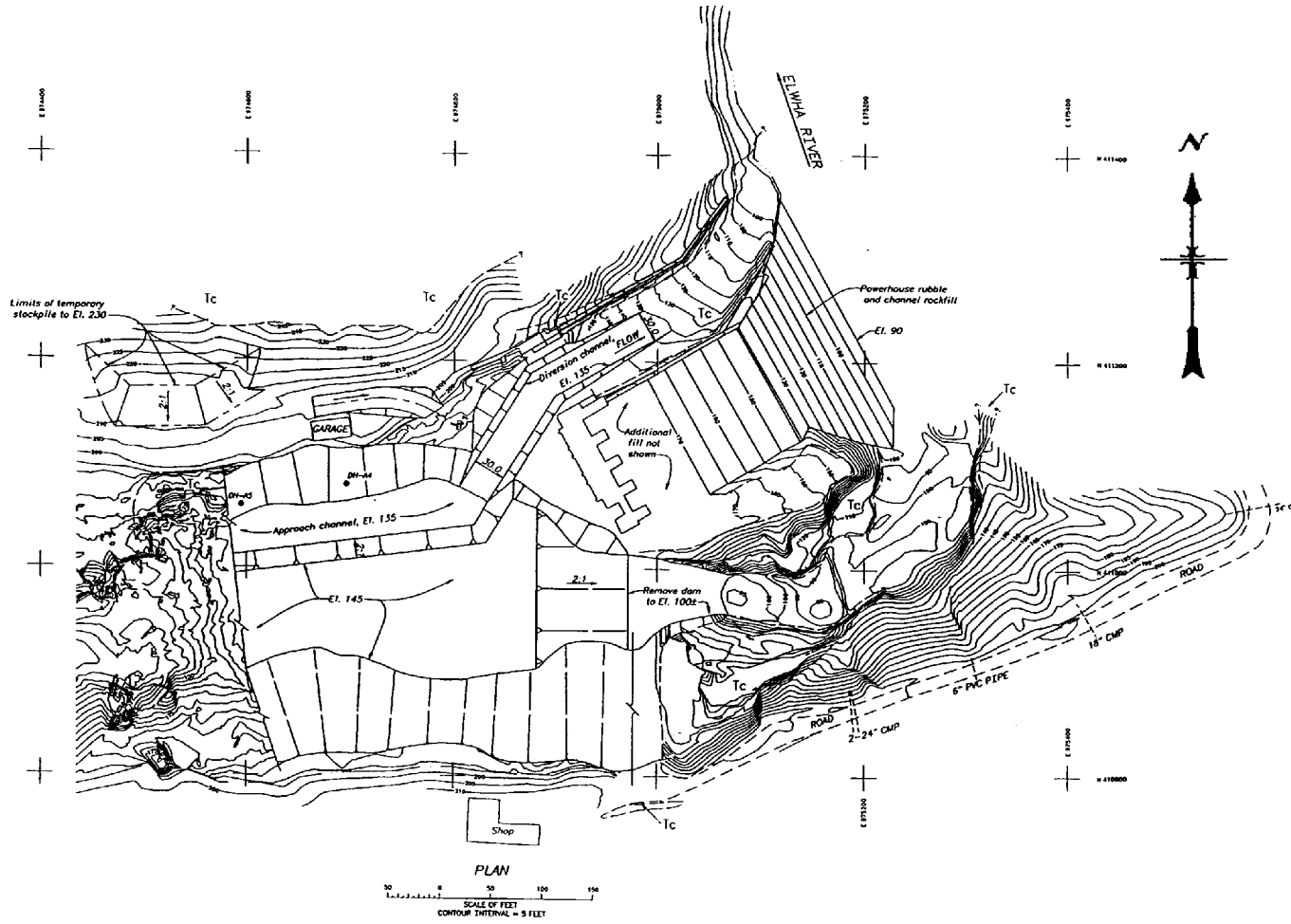
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ORIGINAL CONCEPT - ELWHA STAGE 2



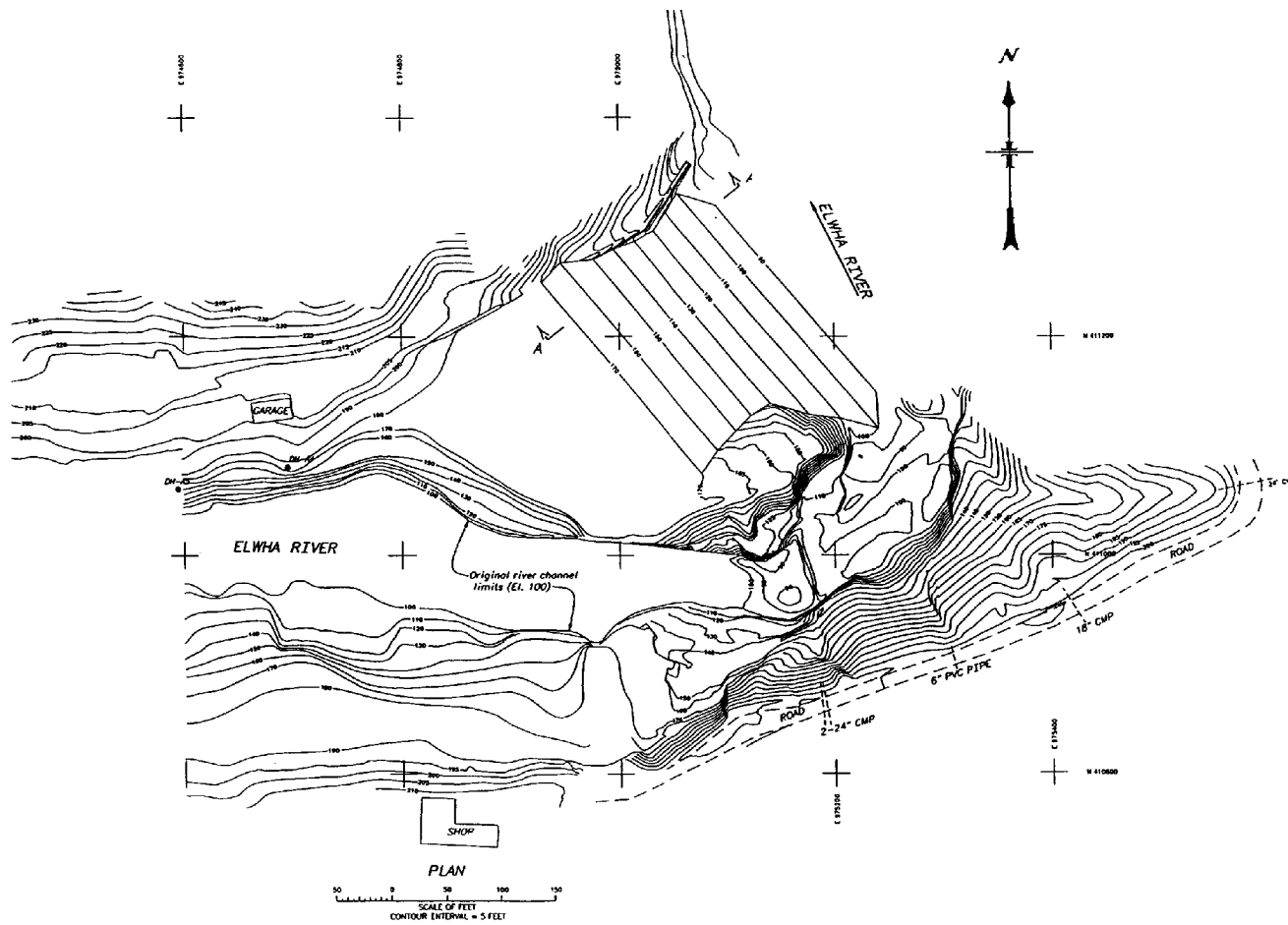
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ORIGINAL CONCEPT - ELWAH STAGE 3



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ORIGINAL CONCEPT - ELWHA STAGE 4



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SPECIAL CRITERIA

USERS:
1. Elwha S'Klallam - Elwha Dam is located at or near the creation site of the S'Klallam people. The project must approximate predam conditions.
2. Construction costs must be less than \$10.5 million.
CODES:
1. Comply with Toxic Waste Codes.
2. Comply with Safety Codes
RESTRICTIONS:
1. Consideration of Native American religious beliefs regarding sacred sites
2. Steep embankments
3. Confined construction site
4. Subjective ideas regarding restoration
DESIGN HISTORY: (RESPONSIBILITIES, COMMITMENTS, STATUS, ETC.)
Project is the outgrowth of controversy surrounding the relicensing of the Gines Canyon Dam hydroelectric powerplant. Congress enacted Public Law 102-495 to restore the Elwha River anadromous fisheries and ecosystem to the pre-dam conditions. A programmatic environmental impact statement has been issued. Specific restoration activities will be dealt with in an "implementation" EIS. The Congress has not appropriated funds to implement restoration activities.

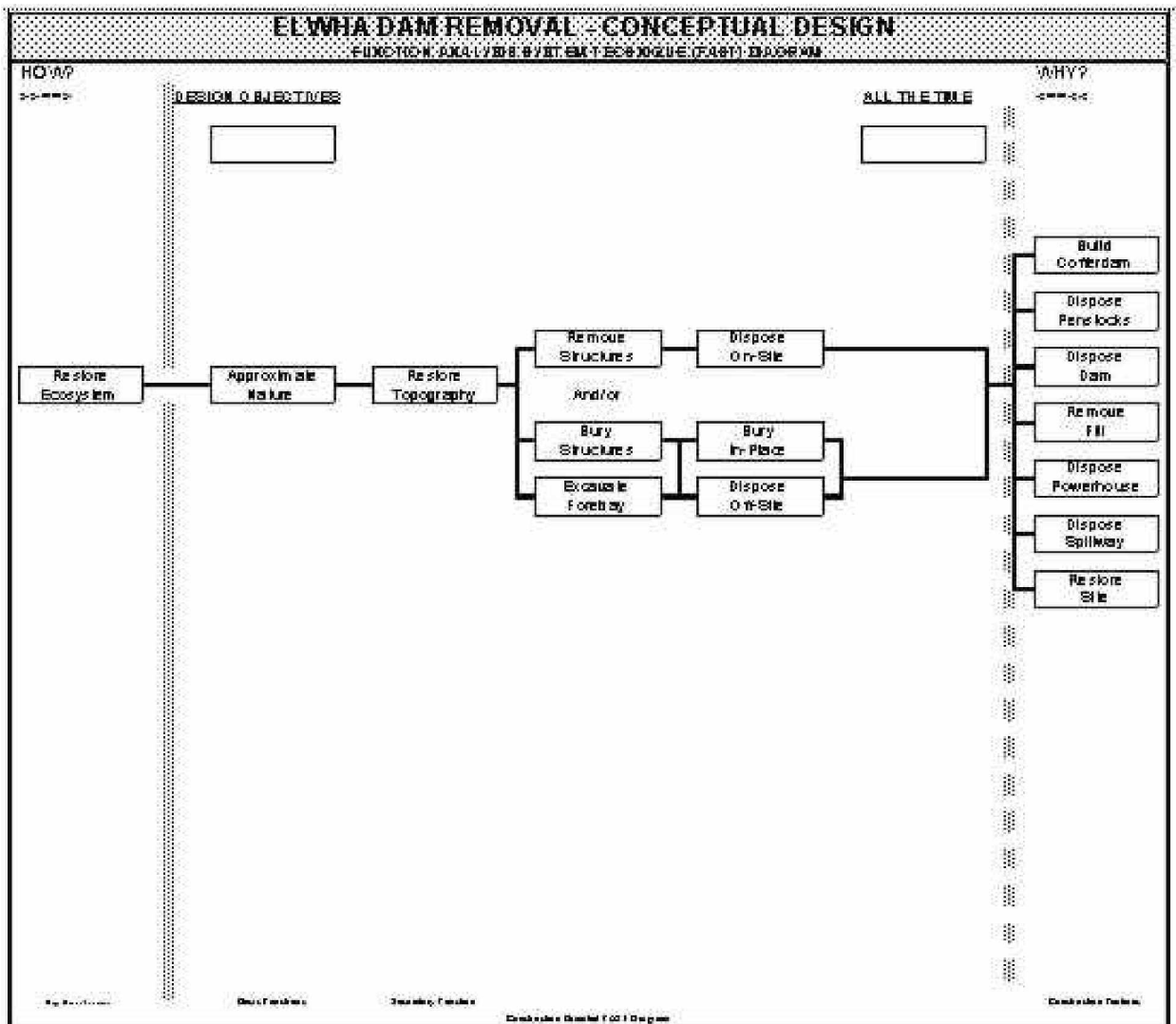
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FUNCTION ANALYSIS

PROJECT: Elwa River Restoration, Dam Removal
 STUDY Preferred Design Alternative
 ITEM:

COMPONENT	VERB (ACTIVE)	NOUN (MEASURABLE)
Mobilization	Position	Equipment
Left Cofferdams	Facilitate	Worksite
Remove North Spillway	Remove	Intrusion
Left diversion channel	Divert	Water
Remove Cofferdam	Restore	Flow
Remove Penstock	Remove	Intrusion
Remove Powerhouse	Remove	Intrusion
Remove intake structure	Restore	Obstacle
Remove right spillway	Restore	Topography
Remove gravity section	Restore	Topography
Excavate forebay	Restore	Topography
Restore site	Stabilize	Surfaces

FUNCANAL.TAB



CRS01101/ELWH_FAST.MXD

Function Analysis System Technique (FAST)

The VE Study Team used the function analysis process to generate a Function Analysis System Technique (FAST) diagram designed to show the present conceptual design preferred alternative from a functional point of view. The function analysis and resulting FAST diagram aided the VE Study Team in identifying design features that are critical to meeting requirements that support the critical functions, and those that meet noncritical design objectives.

Elwa River Restoration

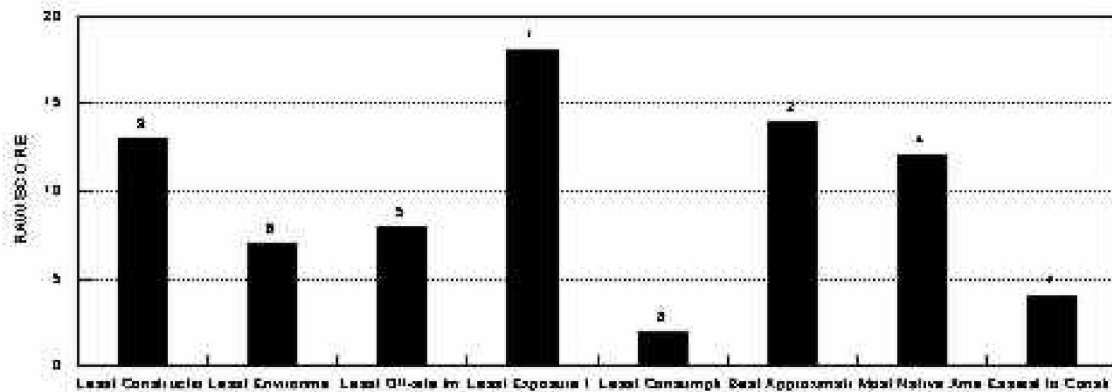
VALUE ENGINEERING STUDY

COST MODEL

COMPONENT/PERCENT PROJECT COST		PROJECT COST PROPORTION	
Remove Structures	(55.7%)		
Penstocks	(12.7%)		
Powerhouse	(17.6%)		
Intake	(6.4%)		
Right Spillway	(3.3%)		
Gravity Section	(10.4%)		
Transformer	(0.0%)		
Buildings	(0.1%)		
L. Channel Lining	(0.4%)		
L. Spillway	(4.8%)		
Excavate Materials	(18.9%)		
Left Div. Channel	(5.1%)		
Forebay	(13.8%)		
Mobilization	(5.7%)		
Site Access	(0.6%)		
Build Cofferdams	(3.2%)		
Upstream	(2.5%)		
Downstream	(0.7%)		
Breach US Cofferdam	(2.3%)		
Restore Site	(13.7%)		

CRITERIA WEIGHTING PROCESS

PROJECT:	Elwha River Restoration		
COMPONENT:	Elwha Dam	FUNCTION:	Dam Removal
CRITERIA	RAW SCORE (WEIGHT)	RANK	
A. Least Construction Cost	13	3	
B. Least Environmental Disturbance	7	6	
C. Least Off-site Impacts	8	5	
D. Least Exposure to Construction Hazards	18	1	
E. Least Consumption of Non-renewable Resources	2	8	
F. Best Approximation of Natural Topography	14	2	
G. Most Native American Cultural Acceptance	12	4	
H. Easiest to Construct	4	7	



How Important

- 4 - Major prominence
- 3 - Medium prominence
- 2 - Minor prominence
- 1 - Letter/Letter - no prominence with score one point

		CRITERIA							
		B	C	D	E	F	G	H	
other number	A	A	A	D	A	A	A	A	A
	B	2	C	1	2	3	2	1	4
	C	B	D	3	B	E	F	G	B
	D	3	D	3	1	3	3	3	3
	E	C	D	1	C	E	F	C	C
	F	D	1	1	1	3	3	1	4
	G	D	D	D	D	D	D	D	D
	H	4	4	2	2	2	2	4	
other number	E	F	4	G	H	4	4		
	F	G	2	F	4	4			
	G	2	G	4	2	4			
other number	H	G	2	G	4	4			
		2	G	2	4	4			

Note: Drop Criteria with Raw Score of 0
 (Criteria which gets dropped may be considered in Advanced User Benefits Analysis)

VALUE ENGINEERING - ALTERNATIVE EVALUATION

Elwa River Restoration, Dam Removal			
PROJECT:			
COMPONENT :		Elwa Dam Removal	FUNCTION: N:
		Restore Ecosystem	
NO.	SELECTED ALTERNATIVES	ADVANTAGES	DISADVANTAGES
1	Bury penstocks and surge tank on-site under rubble and reservoir sediments. Configure fill to blend into hillside.	<ul style="list-style-type: none"> a. Reduce the exposure of construction personnel to safety hazards by minimizing handling of penstocks and surge tanks b. Restore site to best approximation of natural topography c. Least construction cost d. Least offsite impacts 	<ul style="list-style-type: none"> a. Penstocks, surge tanks and rubble remain on-site although completely covered b. Requires more compacted backfill to insure stability of disposal site slopes c. Possibly more vulnerable to flooding during construction

ALTEVAL.TAB

VE PROPOSAL DESCRIPTION

PROJECT Elwa River Restoration, Dam Removal

:

PROPOSAL NO 1. THIS PROPOSAL DISPOSES THE PENSTOCKS, SURGE TANK AND RUBBLE ON-SITE.

BACKGROUND

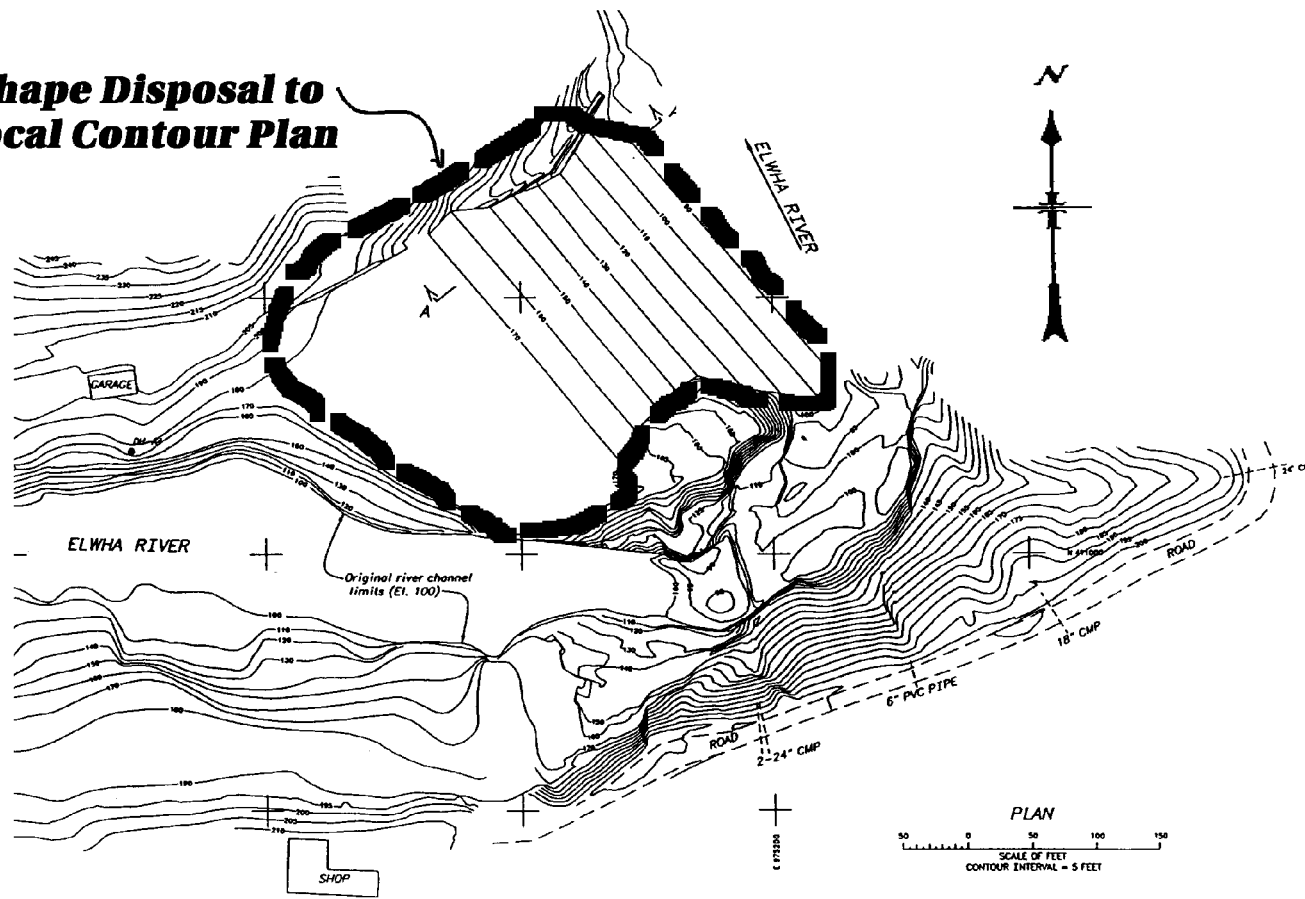
Due to environmental and Native American concerns related to relicensing of the Glines Canyon Dam hydroelectric powerplant, Congress passed Public Law 102-495, the Elwha River Ecosystem and Fisheries Restoration Act in October 1992. Elwha Dam, the lower of the two dams, completely blocks anadromous fish passage at river mile 4. Removal of Elwha Dam is essential for restoration of the anadromous fisheries. The dam is also in the vicinity of the S'Klallam creation site. Restoration of the dam site and reservoir to as close as possible to pre-dam conditions is important for the continuation of the S'Klallam religion and culture.

VE PROPOSAL

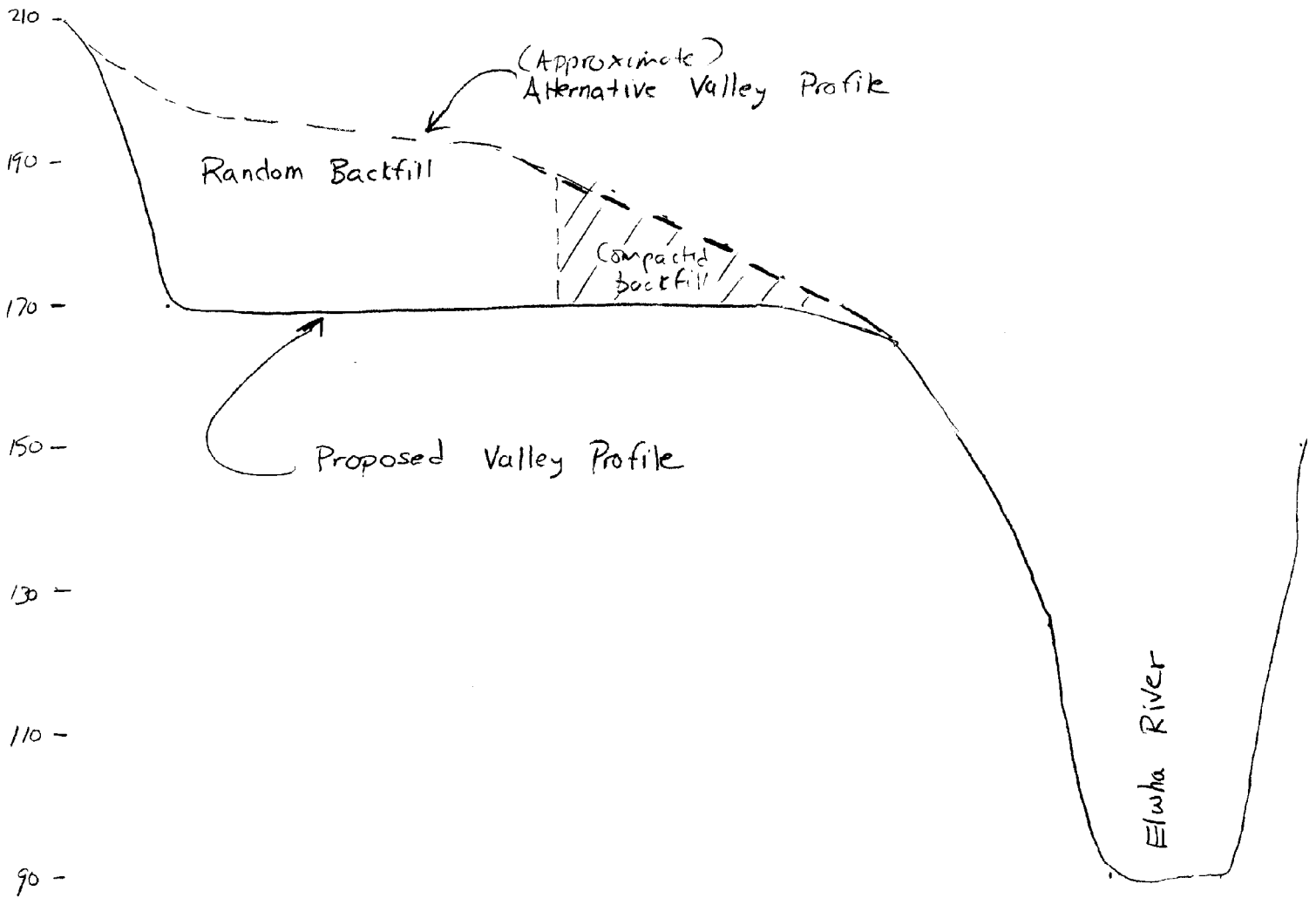
The VE proposal would differ from the original proposal by disposing of the power penstocks and the surge tank in their approximate current locations rather than using off-site disposal. On-site disposal of most of the rubble and natural rock and sediment removed from the old river channel is another feature of the VE alternative. Rubble and natural rock would be used to cover the penstocks and surge tank. The original proposal creates a flat and stepped configuration of compacted fill. The VE proposal would use compacted and uncompacted material to create a slope that would blend in to the north slope above the current left spillway. This use of the fill would more closely approximate the original appearance of the area.

VE PROPOSAL NO. 1 - GENERAL PLAN - Elwa River Restoration, Dam Removal

**Shape Disposal to
Local Contour Plan**



VE PROPOSAL NO. 1 – PROFILE & SECTION –
Elwa River Restoration, Dam Removal



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VALUE ENGINEERING PROPOSAL

PROJECT: Elwha River Restoration, Elwha Dam Removal

FUNCTION	ORIGINAL	VE CONCEPT
REMOVE STRUCTURES		
Penstocks and Surge Tank	Remove and Dispose off-site	Split, Fill, Bury on-site
Intake Structure	Demolish & Bury on-site	Demolish and Bury on-site
Left Channel Lining	"	Leave in place
Left Spillway	"	Demolish, bury on-site
Right Spillway	Demolish, dispose off-site	"
Gravity Section	"	"
Powerhouse	Demolish, bury on-site	"
EXCAVATION		
Left Diversion Channel	Excavate, dispose off-site	Delete Item
Forebay	Excavate, 25,000 cu. yds compacted backfill on site	Excavate, 50,000 cu. yds compacted backfill on-site
SITE RESTORATION		
	Haul excavated material 10 miles to waste disposal site	Dispose of excavated material on-site
COSTS:	\$10,500,000	\$ 8,934,400
SAVINGS:	\$ 1,565,600	

VALUE ENGINEERING PROPOSAL NO. 1

PROJECT: Elwa River Restoration		
COMPONENT Dam Embankment :	FUNCTION Remove Dam :	
ORIGINAL CONCEPT	VE CONCEPT	
Removed material hauled off-site	Removed material disposed on-site	
COST ITEMS	NONRECURRING*	LIFE CYCLE*
ORIGINAL CONCEPT	\$10,500,000	
VE CONCEPT (-)	\$ 8,934,400	
SAVINGS	\$ 1,565,600	
NUMBER OF UNITS (X)	1	
TOTAL SAVINGS	\$ 1,565,600	
VE STUDY COSTS (-)	0	
IMPLEMENTATION COSTS(-)	\$ 65,000	
NET SAVINGS	\$ 1,500,600	

* CHOOSE ONE METHOD-USE NONRECURRING IF LIFE CYCLE COSTING DOES NOT APPLY.
 VEPROP.TAB

INFORMATION/DATA DOCUMENTS CONSULTED

DOCUMENT (Name, Author, Dates, etc.)	INFORMATION RECEIVED/USED
Elwha River Ecosystem Restoration, Final Environmental Impact Statement. National Park Service, Olympic National Park. June 1995	Background
The Elwha Report. USDI. January 1994	Background

DOCUMENT.REC

CONSULTATION RECORD

CONSULTANT (Name, Title, Company)	CONTACT INFO (Telephone, address)	MAIN TOPIC DISCUSSED AND INFORMATION RECEIVED
Tom Hepler	236-9129 Ext 231 Bureau of Reclamation, Technical Service Center	Gave a 2 hour briefing and supplied background material, construction drawings, and cost estimates
Steve Higenbotham	236-9129 Ext 557 Bureau of Reclamation, Technical Service Center	Supplied background material, construction drawings, and cost estimates

CONSULT.REC

SUPPORTING DOCUMENTATION