BASELINE COST ESTIMATE

COLUMBIA RIVER CHANNEL DEEPENING

CORPS PLAN

Prepared By: CENPW-EC-DX

June 1999

SECTION 1

SUMMARY SPREAD SHEETS

****TOTAL PROJECT COST SUMMARY****

PROJECT: COLUMBIA RIVER CHANNEL DEEPENING - BASELINE COST ESTIMATE
DISTRICT: PORTLAND
25-Jun-99

LOCATION: COLUMBIA RIVER, OR/WA
P.O.C.: PAT JONES, CHIEF, COST ENGINEERING SECTION

CURRENT MCACES ESTIMATE PREPARED: Oct-98
EFFECTIVE PRICING LEVEL: Oct-98

AUTHORIZ./BUDGET YEAR: 2000
EFFECT. PRICING LEVEL: OCT 99

ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED ESTIMATE FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
09- - -	CHANNELS AND CANALS	114,374	18,197	16%	132,571	3.3%	118,148	18,798	136,946	Oct-02	10.2%	130,199	20,715	150,914
06- - -	ENVIRONMENTAL RESTORATION	3,505	876	25%	4,381	3.3%	3,621	905	4,526	Oct-02	10.2%	3,990	997	4,987
	TOTAL CONSTRUCTION COSTS =====>	117,879	19,073	16%	136,952	3.3%	121,769	19,702	141,471		10.2%	134,189	21,712	155,902
01 - - -	LANDS AND DAMAGES (Disposal & Mitigation)	17,240	925	5%	18,165	3.3%	17,809	956	18,764	Oct-00	3.3%	18,397	987	19,384
30 - - -	PLANNING, ENGINEERING AND DESIGN	2,400	240	10%	2,640	4.5%	2,508	251	2,759	Jul-00	0.0%	2,508	251	2,759
31 - - -	CONSTRUCTION MANAGEMENT	7,088	709	10%	7,797	4.5%	7,407	741	8,148	Oct-02	13.4%	8,399	840	9,240
	TOTAL COST =========>	144,607	20,947	14%	165,554	3.4%	149,493	21,650	171,143		9.4%	163,494	23,790	187,284
UTILITY OWNER COST FOR UTILITY RELOCATIONS		13,763	1,376	10%	15,139	3.3%	14,217	1,422	15,639	Oct-02	10.2%	15,667	1,567	17,234
NON-FEDERAL DREDGE COST TO BERTHS		1,198	0	0%	1,198	3.3%	1,238	0	1,238	Oct-02	10.2%	1,364	0	1,364
	TOTAL COST =========>	159,568	22,323	3.4%	181,891	3.4%	164,948	23,071	188,019		9.5%	180,525	25,357	205,881

APPROVED: Howard B Jones — CHIEF, PLANNING AND ENGINEERING DIVISION

Davis J Moriarty — CHIEF, PROGRAMS AND PROJECT MANAGEMENT DIVISION

Patrick J. Jones — CHIEF, COST ENGINEERING BRANCH

APPROVAL DATE: JUL 0 1 1999

tpcsTOT2coe

******COLUMBIA RIVER COST SUMMARY******

PROJECT: COLUMBIA RIVER CHANNEL DEEPENING - BASELINE COST ESTIMATE

DISTRICT: PORTLAND

25-Jun-99

LOCATION: COLUMBIA RIVER, OR/WA

P.O.C.: PAT JONES, CHIEF, COST ENGINEERING SECTION

						AUTHORIZ./BUDGET YEAR: 2000				FULLY FUNDED ESTIMATE				
CURRENT MCACES ESTIMATE PREPARED:		Oct-98				EFFECT. PRICING LEVEL: OCT 99								
EFFECTIVE PRICING LEVEL:		Oct-98												
ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
09- - -	CHANNELS AND CANALS	98,085	15,584	16%	113,669	3.3%	101,322	16,098	117,420	Oct-02	10.2%	111,657	17,740	129,397
06- - -	ENVIRONMENTAL RESTORATION	3,505	876	25%	4,381	3.3%	3,621	905	4,526	Oct-02	10.2%	3,990	997	4,987
	TOTAL CONSTRUCTION COSTS =====>	101,590	16,460	16%	118,050	3.3%	104,942	17,003	121,946		10.2%	115,647	18,738	134,384
01 - - -	LANDS AND DAMAGES	17,240	925	5%	18,165	3.3%	17,809	956	18,764	Oct-00	3.3%	18,397	987	19,384
30 - - -	PLANNING, ENGINEERING AND DESIGN	2,065	207	10%	2,272	4.5%	2,158	216	2,374	Jul-00	0.0%	2,158	216	2,374
31 - - -	CONSTRUCTION MANAGEMENT	6,111	611	10%	6,722	4.5%	6,386	639	7,025	Oct-02	13.4%	7,242	724	7,966
	TOTAL COST =========>	127,006	18,203	14%	145,209	3.4%	131,295	18,813	150,109		9.3%	143,443	20,665	164,108
UTILITY OWNER COST FOR UTILITY RELOCATIONS		2,949	295	10%	3,244	3.3%	3,046	305	3,351	Oct-02	10.2%	3,357	336	3,693
NON-FEDERAL DREDGE COST TO BERTHS		740	0	0%	740	3.3%	764	0	764	Oct-02	10.2%	842	0	842
	TOTAL COST =========>	130,695	18,498	14.2%	149,193	3.4%	135,106	19,118	154,224		9.3%	147,642	21,001	168,643

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******WILLAMETTE RIVER COST SUMMARY******

PROJECT: COLUMBIA RIVER CHANNEL DEEPENING - SPONSOR PLAN COST ESTIMATE — DISTRICT: PORTLAND — 25-Jun-99

LOCATION: COLUMBIA RIVER, OR/WA — P.O.C.: PAT JONES, CHIEF, COST ENGINEERING SECTION

CURRENT MCACES ESTIMATE PREPARED: Oct-98 — AUTHORIZ./BUDGET YEAR: 2000 — FULLY FUNDED ESTIMATE

EFFECTIVE PRICING LEVEL: Oct-98 — EFFECT. PRICING LEVEL: OCT 99

ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
09- - -	CHANNELS AND CANALS	16,288	2,613	16%	18,901	3.3%	16,826	2,699	19,525	Oct-02	10.2%	18,542	2,975	21,516
	TOTAL CONSTRUCTION COSTS =====>	16,288	2,613	16%	18,901	3.3%	16,826	2,699	19,525		10.2%	18,542	2,975	21,516
01 - - -	LANDS AND DAMAGES	0	0	9%	0	3.3%	0	0	0	Oct-00	4.5%	0	0	0
30 - - -	PLANNING, ENGINEERING AND DESIGN	335	34	10%	369	4.5%	350	35	385	Jul-00	0.0%	350	35	385
31 - - -	CONSTRUCTION MANAGEMENT	977	98	10%	1,075	4.5%	1,021	102	1,123	Oct-02	13.4%	1,158	116	1,274
	TOTAL COST =========>	17,600	2,744	16%	20,344	3.4%	18,197	2,836	21,033		10.2%	20,050	3,125	23,175
UTILITY OWNER COST FOR UTILITY RELOCATIONS		10,813	1,081	10%	11,894	3.3%	11,170	1,117	12,287	Oct-02	10.2%	12,309	1,231	13,540
NON-FEDERAL DREDGE COST TO BERTHS		458	0	0%	458	3.3%	473	0	473	Oct-02	10.2%	521	0	521
	TOTAL COST =========>	28,871	3,826	13.3%	32,697	3.4%	29,839	3,953	33,793		10.2%	32,880	4,356	37,236

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****HOPPER COST SUMMARY****

PROJECT: COLUMBIA RIVER CHANNEL DEEPENING - BASELINE COST ESTIMATE — DISTRICT: PORTLAND — 25-Jun-99

LOCATION: COLUMBIA RIVER, OR/WA — P.O.C.: PAT JONES, CHIEF, COST ENGINEERING SECTION

CURRENT MCACES ESTIMATE PREPARED: Oct-98 — AUTHORIZ./BUDGET YEAR: 2000 — FULLY FUNDED ESTIMATE

EFFECTIVE PRICING LEVEL: Oct-98 — EFFECT. PRICING LEVEL: OCT 99

ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
09. . .	CHANNELS AND CANALS	29,687	4,750	16%	34,437	3.3%	30,667	4,907	35,573	Oct-02	10.2%	33,795	5,407	39,202
	TOTAL CONSTRUCTION COSTS =====>	29,687	4,750	16%	34,437	3.3%	30,667	4,907	35,573		10.2%	33,795	5,407	39,202
01 . . .	LANDS AND DAMAGES	0	0	0%	0	3.3%	0	0	0	Oct-00	3.3%	0	0	0
30 . . .	PLANNING, ENGINEERING AND DESIGN	800	80	10%	880	4.5%	836	84	920	Jul-00	0.0%	836	84	920
31 . . .	CONSTRUCTION MANAGEMENT	1,781	178	10%	1,959	4.5%	1,861	186	2,048	Oct-02	13.4%	2,111	211	2,322
	TOTAL COST =========>	32,268	5,008	16%	37,276	3.4%	33,364	5,176	38,540		10.1%	36,741	5,702	42,443

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****PIPELINE DREDGING COST SUMMARY****

PROJECT: COLUMBIA RIVER CHANNEL DEEPENING - BASELINE COST ESTIMATE — DISTRICT: PORTLAND — 25-Jun-99

LOCATION: COLUMBIA RIVER, OR/WA — P.O.C.: PAT JONES, CHIEF, COST ENGINEERING SECTION

CURRENT MCACES ESTIMATE PREPARED:		Oct-98				AUTHORIZ./BUDGET YEAR: 2000				FULLY FUNDED ESTIMATE				
EFFECTIVE PRICING LEVEL:		Oct-98				EFFECT. PRICING LEVEL: OCT 99								
ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
09- - -	CHANNELS AND CANALS	48,576	7,772	16%	56,348	3.3%	50,179	8,029	58,208	Oct-02	10.2%	55,297	8,848	64,145
	TOTAL CONSTRUCTION COSTS =====>	48,576	7,772	16%	56,348	3.3%	50,179	8,029	58,208		10.2%	55,297	8,848	64,145
01 - - -	LANDS AND DAMAGES	14,455	640	4%	15,095	3.3%	14,932	661	15,593	Oct-00	3.3%	15,425	683	16,108
30 - - -	PLANNING, ENGINEERING AND DESIGN	500	50	10%	550	4.5%	523	52	575	Jul-00	0.0%	523	52	575
31 - - -	CONSTRUCTION MANAGEMENT	2,915	291	10%	3,206	4.5%	3,046	305	3,350	Oct-02	13.4%	3,454	345	3,799
	TOTAL COST =========>	66,446	8,754	13%	75,199	3.4%	68,679	9,047	77,726		8.9%	74,698	9,928	84,627

******ROCK EXCAVATION COST SUMMARY******

PROJECT: COLUMBIA RIVER CHANNEL DEEPENING - BASELINE COST ESTIMATE   DISTRICT: PORTLAND   25-Jun-99

LOCATION: COLUMBIA RIVER, OR/WA   P.O.C.: PAT JONES, CHIEF, COST ENGINEERING SECTION

CURRENT MCACES ESTIMATE PREPARED:		Oct-98				AUTHORIZ./BUDGET YEAR: 2000				FULLY FUNDED ESTIMATE				
EFFECTIVE PRICING LEVEL:		Oct-98				EFFECT. PRICING LEVEL: OCT 99								
ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
09 . . .	CHANNELS AND CANALS	35,587	5,694	16%	41,281	3.3%	36,761	5,882	42,643	Oct-02	10.2%	40,511	6,482	46,993
	TOTAL CONSTRUCTION COSTS =====>	35,587	5,694	16%	41,281	3.3%	36,761	5,882	42,643		10.2%	40,511	6,482	46,993
01 . . .	LANDS AND DAMAGES	0	0	0%	0	3.3%	0	0	0	Oct-00	3.3%	0	0	0
30 . . .	PLANNING, ENGINEERING AND DESIGN	700	70	10%	770	4.5%	732	73	805	Jul-00	0.0%	732	73	805
31 . . .	CONSTRUCTION MANAGEMENT	2,135	214	10%	2,349	4.5%	2,231	223	2,454	Oct-02	13.4%	2,530	253	2,783
	TOTAL COST =========>	38,422	5,977	16%	44,400	3.4%	39,724	6,178	45,902		10.2%	43,773	6,808	50,581

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****MITIGATION COST SUMMARY****

PROJECT: COLUMBIA RIVER CHANNEL DEEPENING - BASELINE COST ESTIMATE
DISTRICT: PORTLAND
25-Jun-99

LOCATION: COLUMBIA RIVER, OR/WA
P.O.C.: PAT JONES, CHIEF, COST ENGINEERING BRANCH

CURRENT MCACES ESTIMATE PREPARED: Oct-98
EFFECTIVE PRICING LEVEL: Oct-98

AUTHORIZ./BUDGET YEAR: 2000
EFFECT. PRICING LEVEL: OCT 99

ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
										FULLY FUNDED ESTIMATE				
09- - -	CHANNELS AND CANALS	524	131	25%	655	3.3%	541	135	677	Oct-02	10.2%	597	149	746
	TOTAL CONSTRUCTION COSTS =====>	524	131	25%	655	3.3%	541	135	677		10.2%	597	149	746
			0	0%										
01 - - -	LANDS AND DAMAGES	2,785	285	10%	3,070	3.3%	2,877	294	3,171	Oct-00	3.3%	2,972	304	3,276
30 - - -	PLANNING, ENGINEERING AND DESIGN	140	14	10%	154	4.5%	146	15	161	Jul-00	0.0%	146	15	161
31 - - -	CONSTRUCTION MANAGEMENT	31	3	10%	35	4.5%	33	3	36	Oct-02	13.4%	37	4	41
	TOTAL COST =========>	3,480	433	12%	3,914	3.4%	3,597	448	4,045		4.4%	3,752	472	4,224

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******SHILLAPOO LAKE COST SUMMARY******

PROJECT: COLUMBIA RIVER CHANNEL DEEPENING - BASELINE COST ESTIMATE
DISTRICT: PORTLAND
25-Jun-99

LOCATION: COLUMBIA RIVER, OR/WA
P.O.C.: PAT JONES, CHIEF, COST ENGINEERING SECTION

CURRENT MCACES ESTIMATE PREPARED: Oct-98
EFFECTIVE PRICING LEVEL: Oct-98

AUTHORIZ./BUDGET YEAR: 2000
EFFECT. PRICING LEVEL: OCT 99

ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FULLY FUNDED ESTIMATE FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
06- - -	ENVIRONMENTAL RESTORATION	3,465	866	25%	4,331	3.3%	3,579	895	4,474	Oct-02	10.2%	3,944	986	4,931
	TOTAL CONSTRUCTION COSTS =====>	3,465	866	25%	4,331	3.3%	3,579	895	4,474		10.2%	3,944	986	4,931
			0	0%										
01 - - -	LANDS AND DAMAGES	0	0	0%	0	3.3%	0	0	0	Oct-00	3.3%	0	0	0
30 - - -	PLANNING, ENGINEERING AND DESIGN	250	25	10%	275	4.5%	261	26	287	Jul-00	0.0%	261	26	287
31 - - -	CONSTRUCTION MANAGEMENT	208	21	10%	229	4.5%	217	22	239	Oct-02	13.4%	246	25	271
	TOTAL COST =========>	3,923	912	23%	4,835	3.4%	4,058	943	5,001		9.8%	4,452	1,037	5,489

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******FISHER/WALKER/LORD COST SUMMARY******

PROJECT: COLUMBIA RIVER CHANNEL DEEPENING -BASELINE COST ESTIMATE | DISTRICT: PORTLAND | 25-Jun-99

LOCATION: COLUMBIA RIVER, OR/WA | P.O.C.: PAT JONES, CHIEF, COST ENGINEERING SECTION

CURRENT MCACES ESTIMATE PREPARED: Oct-98 | AUTHORIZ./BUDGET YEAR: 2000 | FULLY FUNDED ESTIMATE

EFFECTIVE PRICING LEVEL: Oct-98 | EFFECT. PRICING LEVEL: OCT 99

ACCOUNT NUMBER	FEATURE DESCRIPTION	COST ($K)	CNTG ($K)	CNTG (%)	TOTAL ($K)	OMB (%)	COST ($K)	CNTG ($K)	TOTAL ($K)	FEATURE MID PT	OMB (%)	COST ($K)	CNTG ($K)	FULL ($K)
6 . . .	ENVIRONMENTAL RESTORATION	40	10	25%	50	3.3%	41	10	52	Oct-02	10.2%	46	11	57
	TOTAL CONSTRUCTION COSTS =====>	40	10	25%	50	3.3%	41	10	52		10.2%	46	11	57
			0	0%										
01 . . .	LANDS AND DAMAGES	0	0	9%	0	3.3%	0	0	0	Oct-00	3.3%	0	0	0
30 . . .	PLANNING, ENGINEERING AND DESIGN	10	1	10%	11	4.5%	10	1	11	Jul-00	0.0%	10	1	11
31 . . .	CONSTRUCTION MANAGEMENT	2	0	10%	3	4.5%	3	0	3	Oct-02	13.4%	3	0	3
	TOTAL COST =========>	52	11	21%	64	3.6%	54	12	66		8.6%	59	13	72

SECTION 2

NARRATIVE

13 July, 1999

COLUMBIA RIVER CHANNEL DEEPENING

DRAFT BASELINE COST ESTIMATE (BCE) NARRATIVE

COLUMBIA RIVER, OR/WA

1. Project Description: The Columbia River Channel Deepening (CRCD) project would consist of deepening the existing navigation channel from RM 6.0 to RM 105.5 on the Columbia River, and RM 0.0 to RM 12.0 on the Willamette River. The channel would generally be deepened from the current authorized depth of 40 feet to a new depth of 43 feet. The typical width of the navigation channel would be 600 feet, the same as the existing channel. About 25 mcy of sand and 0.9 mcy of rock or rock-like materials would be dredged including new work and maintenance material. Hopper, pipeline and clamshell excavation methods would be employed. Hopper dredge disposal would be at designated ocean disposal sites, and flow lane sites. Disposal for pipeline and clamshell dredging would be primarily at existing and new upland disposal areas, with some flow lane disposal for rock excavated by clamshell. Three mitigation areas would be constructed. The baseline cost estimate (BCE) covers only new deepening work. No operations and maintenance dredging costs are included in the BCE.

Estimates have been prepared for two different plans, the sponsors' plan and the least cost plan. These plans differ primarily in disposal locations. The sponsors' plan proposes the use of several upland disposal areas that would be more expensive than those included in the lease cost plan, because the sponsor's plan sites were a greater distance from the river reaches to be dredged. The sponsors have proposed these more distant sites because they can sustain industrial development if filled with dredge material, or the material can be sold for commercial uses. The estimate for the least cost plan and is the BCE. However, the sponsors' plan may be adopted for implementation, because the sponsor has agreed to pay the difference between the cost of the sponsors plan and least cost plan.

2. Basis of Design. The basis for the design of the deepening project is given in the Feasibility Report, to be published in summer 1999.

3. Estimate References:

ER 1110-2-1302 (Civil Works Cost Engineering), APPENDIX G (Preparation of Dredge Cost Estimates)

EP 1110-1-8 (Construction Equipment Ownership and Operating Expense Schedule)

4. Construction Schedule: The proposed construction schedule is given below. Dredging is assumed to begin on June 1 each year. This schedule indicates that the proposed work can be accomplished within the 2-year construction time frame.

DREDGING REACH	VOLUME	DREDGING TYPE	PLANT
		YEAR 1	
U/S of CRM 78	700,000	O&M	Hopper
CRM 42-78	7,800,000	Construction + O&M	2 - 30" pipelines
CRM 29-78	2,800,000	Construction + O&M	Hopper
CRM 3-29	6,500,000	Construction + O&M	2 - Hopper
CRM 63-67	240,000	Construction (Rock)	Clamshell
Columbia/Willamette	210,000	Construction (Basalt)	Drill & Blast
		YEAR 2	
U/S of CRM 78	6,600,000	Construction + O&M	2 - 30" pipelines
D/S of CRM 78	3,000,000	O&M	30" pipeline
D/S of CRM 78	4,000,000	O&M	Hopper
Willamette River	800,000	Construction	Hopper
CRM 101-107	180,000	Construction	Clamshell
WRM 7-11	30,000	Construction	Clamshell

a. Overtime. Overtime would be necessary for the dredging and rock excavation. The hopper, pipeline and clamshell dredges would be operating 24 hours a day 7 days a week; however, there would be three shifts a day for each dredge. The drilling and shooting of rock would be 10 hours a day, 6 days a week.

b. Construction Windows. Fisheries agency concerns about fish entrapment and interference with salmon migration have resulted in designated in-water work periods in the Columbia and Willamette Rivers. The clamshell , pipeline and hopper dredging windows are year-round. The in-water work period for blasting in the Columbia River would run from November to February. In the Willamette River, the in-water work period for blasting would run from March to October (based on ODFW preferred in-water work period, prior to listing of Spring Chinook). Willamette River costs would be revised after the Portland Harbor Remediation Plan. These blasting windows would allow drilling and blasting operations to be conducted intermittently until completed.

c. Acquisition Plan. It is anticipated that construction would require two years to complete. Three major dredging contracts were planned, one for removal of common materials (primarily sand) by hopper, another for removal of common material by pipeline, and one for rock excavation. Additional dredging contracts may be required if annual funding limitations occur. Upland disposal site improvements would be accomplished during the dredging contracts.

A separate contract would be used to construct the mitigation areas. The sponsors are responsible for dredging the berths at the ports. Utility owners would be responsible for accomplishing the relocations of their underwater utilities.

5. Subcontracting Plan. No subcontracting is anticipated in any of the contracts.

6. General Estimating Information.

a. Determination of Types of Dredging. The types of dredging equipment assumed to be used, by river mile, were determined by Corps design personnel for the least cost plan, and by sponsors' personnel for the sponsors plan. Factors considered included economics (D2M2 program), river conditions, distance to disposal areas, past practice, and judgement.

b. Estimating by River Mile. The cost of the dredging was estimated river mile to adjacent river mile, in order to accurately capture costs of varying quantities, depths of cut, distances to disposal sites, and types of dredging equipment.

c. Sources of Dredging Information. Sources of dredging expertise consulted in the preparation of the BCE include: John Chew of New York District, Kim Callan of Walla Walla District, Bob Parry of Seattle District, Manson, Great Lakes, Dutra, Corps personnel from San Francisco District and Los Angles District, and Ogden Beeman & Associates, Inc., representatives of the sponsor. There have been no large dredging contracts on the Columbia River in recent years except for hopper dredging. However, the historical dredging information used was modified to account for the conditions anticipated on the Columbia River including river flows, traffic, current and congestion in the work area.

d. Sources of Historical Data. Previous projects used as sources of historical data include: Coos Bay Channel Deepening, Oakland Harbor Channel Deepening, Los Angeles Harbor Deepening, and the Kill Van Kull Channel Deepening in New York Harbor. Historical information obtained for these projects included types of equipment used, labor crew makeups, production rates and difficulties encountered that might be similar to those anticipated for CRCD. Additional information was obtained from modifications to these projects, which included audited monthly equipment costs. Unit costs developed in the BCE were compared to actual costs from these projects to assess reasonableness of the estimate.

e. Hazardous, Toxic and Radioactive Waste (HTRW) Remediation Costs. No specific costs for HTRW remediation were included in the BCE. A waiver was received from Higher authority, which stated that HTRW aspects did not need to be considered in the Feasibility phase, but that they must be considered in the Planning, Engineering and Design (PED) phase of the project. Costs for the HTRW explorations and analysis work, to be accomplished during PED, are included in the BCE. HTRW remediation work is expected to be minor in nature, primarily at the upland disposal sites. Therefore associated remediation costs would be relatively small. These costs are considered to be covered by contingencies in the BCE.

f. Site Access. Access to the dredging areas should not be difficult, since these areas have been dredged in the past. Access to some of the disposal areas and mitigation areas must be developed, but would generally not be difficult.

g. Rock Borrow Areas. Outfall rock at the disposal areas would be acquired from commercial quarries. Several quarries up and down the river would be used. A representative quote for the rock materials was obtained from Goble Quarry.

h. Production Rates for New Work Dredging. The new work dredging of sand materials would likely be the same rate as the usual maintenance dredging.

i. Equipment/Labor Availability. Hopper, pipeline and clamshell dredge(s) of the appropriate sizes would most likely be available on the West Coast at Seattle, San Francisco or Los Angeles. Drill boats are expected to be mobilized from the east coast (Florida) or assembled from scratch at a facility on the west coast. Appropriate crewmembers would likely come with the dredge plant.

j. Environmental Concerns. See EIS and Feasibility Report.

k. Contingencies by Feature or Sub-Feature.

1) Construction Contingency. A contingency of 16% has been used for the 09 account (hopper, pipeline and rock excavation) to cover uncertainties in all the dredging quantities, and in the unit prices for rock excavation and pipeline dredging in particular. The unit prices for hopper and clamshell dredging are more certain. The range of acceptable crew composition, operating costs, production rates, equipment availability, uncertain weather conditions, ship traffic and material variations are also covered by the construction contingency. A contingency of 25% has been used for the 09 (mitigation) to account for uncertainties in quantities and unit prices.

2) Contingencies for Functional Accounts. The contingency included in the 01 account cost is 5% for the disposal sites and 9% for the mitigation sites. Contingencies of 10% were included in the 30 and 31 accounts to cover uncertainties in engineering, design and construction management related 09 accounts discussed above.

l. Effective Dates for Labor, Equipment, Material Pricing. The effective date for all pricing is May 1998.

7 . Quantities.

a. Typical Cross-Section. A cross-section sketch is provided for the typical excavation prism which shows the pre-dredge survey data, the required dredging pay depth, the maximum dredging pay depth, and the post-dredge survey data. The dredging area design width and slopes are also shown. See attachment 1.

b. Computation of Common Dredging Quantities. The quantities of common excavation were computed based on channel sounding data obtained primarily in the Winter/Spring of 1995, and on the maximum dredging pay depth. Standard dredge quantity software was used to generate the quantities. The quantities of rock excavation were deducted from the appropriate river reaches.

c. Computation of Rock Excavation Quantities. The quantities of rock excavation were computed based on historical locations of rock in the Columbia and Willamette Rivers, and the summation of condition surveys conducted over recent years. The lowest levels to which these sections of river have been dredged were considered top of rock. Then quantities of rock to be removed were computed based on the top of rock and proposed excavation depths. Rock would be excavated several feet below the proposed new authorized depth of 43 feet in order to minimize damage to dredges during future O&M dredging operations.

Quantities of the conglomerate rock to be excavated at Slaughter's Bar, Lower Vancouver Bar and Vancouver Turning Basin, all of which are on the Columbia River, were based on a depth of 47 feet, plus one foot paid overdepth. For the Broadway Bridge reach quantities for conglomerate rock were computed to 46 feet plus one. For basalt to be blasted and removed in the Columbia River, quantities were computed to a depth of 49 feet plus one. In the Willamette River, basalt quantities were computed to 46 feet plus one.

Only volumes inside the contour for the required excavation depth were included in the rock quantities. Quantities outside the excavation contour (46, 47, and 49 feet depending on location) were not included in the paid overdepth of one foot.

d. Combination of O&M and New Work Quantities. Both new work and O&M quantities would be dredged under these contracts, but only the new work costs were included in the BCE. Combining these materials would lead to greater efficiency than would be accomplished by dredging the O&M materials and then the new work materials. Dredging unit costs were estimated in CEDEP using the combined new work and O&M quantities, then the new work quantities were input into MCACES, along with the unit prices generated in CEDEP.

e. Overdepth Quantities for Dredging of Sand. Paid overdepth quantities (one foot below the required excavation line) were included in the required excavation quantity. For purposes of this estimate, all of this overdepth is assumed to be dredged, since a contractor might choose to maximize his pay amount by dredging all paid yardage. A 0.5-foot overdig amount, below the maximum dredging pay depth, was added as non-pay yardage for pipeline and clamshell estimates. For hopper dredging, non-pay yardage was determined based on historical data from sand wave dredging accomplished by the dredge Newport in recent years. See paragraph above for planned overdepth in rock.

f. Quantities Along Channel Slopes (in Sand). These slopes often slough during dredging, making it difficult to clean out the corner between the channel bottom and the slope.

This added dredging effort is accounted for by the paid overdepth, the unpaid overdepth, the added cleanup dredging time, and contingencies. For the pipeline a 5% cleanup dredging time was added and for the clamshell a 15% was added.

8. Corps of Engineers Dredge Estimating Program (CEDEP).

a. General. CEDEP was used to prepare the dredging estimates for all hopper, pipeline and clamshell dredging, including mobilization and demobilization of the dredges and associated equipment. The rock drilling and blasting, upland disposal site development, mitigation area and utility relocation estimates were prepared using MCACES. All overhead, profit and bond were computed in MCACES, not in CEDEP. The new Excel version of CEDEP was used for the hopper, pipeline and clamshell dredging estimates.

b. Dredging Areas. Areas to be dredged were provided by Cartography, by river mile. The areas to be dredged were used in CEDEP with the excavation quantities to determine the depth of cut, which has a very important effect on dredging costs.

9. Inputs to CEDEP.

a. Density of Sand. All non-rock was assumed to be loosely deposited sand weighing about 1,900 grams per liter. A material factor of 1.0 was used for this loose sand material.

b. Crew Makeups. Crew makeups were modified in CEDEP, where necessary, using recent experience on large pipeline, clamshell and hopper dredging projects.

c. Equipment Rates. CEDEP equipment rates were used in some cases, while audited equipment rates from modifications on recent dredging contracts were used in other cases.

d. Labor Rates. Labor rates were updated using recent Davis-Bacon information. A workman's compensation rate of 30% was used in CEDEP and MCACES dredging labor. This reflects longshoreman's insurance rates per review of modification estimates and discussions with SAIF personnel. Overtime percentages were computed in CEDEP and MCACES as appropriate.

e. Hydrosurveys. Hydrosurvey costs were included in CEDEP, including a survey boat and crew. Costs for pre-dredge surveys, surveys during construction and post-dredge surveys were covered.

f. Permits. No permits need to be obtained because all environmental clearances would be covered by the EIS. Thus no costs associated with permits would be incurred.

g. Fuel Price. A fuel price of $0.70 per gallon for diesel fuel was used in the CEDEP program. This is the price for diesel fuel in the Portland area when provided in bulk to a marine customer. An additional 1-% was added to the dredging contingency to account for significant increase in diesel fuel from September 1998 to June 1999.

h. Interest Rate, Economic Index. A cost-of-money rate of 6.25% per year was used. This was the rate in June 1998. An economic index of 6145, which reflects 2000 costs, was used.

i. Cleanup Factor. A cleanup factor of 0.95 was used for the pipeline and hopper dredging. For rock excavation a cleanup factor of 0.85 was used. This factor covers an estimated 5% and 15% additional dredging time required after the major dredging work is complete, to cleanup slopes and corners where surveys show material was missed, or where sloughing has occurred, respectively.

j. Bank Factor. The quantity for a given reach of river in combination with area to be dredged yields a bank height, which is converted to a bank factor in CEDEP. This factor varies for the different dredge types. The greater the bank factor, the more efficient the dredging operation is, up to a maximum point where no further improvement in efficiency results.

k. Effective Working Time (EWT). Dredges would typically work 7 days a week, 24 hours a day, due to the high capital expense associated with the purchase of these machines. However, maintenance activities would reduce the actual working time somewhat, based on the type of dredge, types of material being excavated, and the condition of the equipment. An EWT percentage of 80% was used for hopper and 65% for pipeline dredging based on historical performance. For basalt rock excavation the EWT was set at 50%, due to high maintenance requirements resulting for the hardness of the rock material. The nonuniform nature of the rock material also affects the EWT. The EWT for excavating the conglomerate material using a clamshell dredge is about 52%.

10. Mobilization (Mob), Demobilization (Demob) and Preparatory Work. This would vary for the different contracts, depending on how the work is broken out. CEDEP has been used to compute mob and demob for each contract.

a. Initial Mob and Demob.

1) Sand Dredging Contract. This would consist of transporting two 30" pipeline dredges, one D-8 dozer, 966 loader, 70-ton crane, ramp barge and all associated equipment, and two medium sized hopper dredge. It is anticipated that this equipment would be available from various locations on the West Coast.

2) Rock Excavation Contract. This would consist of transporting 2 drill boats, one 21 CY (13 CY in rock) clamshell dredge, two 2,000 CY scows, two 1,500 HP tugs and associated equipment.

a) Mobilization and Demobilization - Drill Boats. This has been calculated in detail for the drill boats in the backup. It is anticipated that 2 drill boats would be mobilized. Mobilization was assumed to occur from Florida. Demobilization would be back to Florida. The drill boats might be assembled from scratch at some facility on the West Coast. The cost of assembling drill boats on the West Coast would be roughly the same as mobilizing-demobilizing existing drill boats from the east coast.

A full crew, and 100% ownership and operational costs, were assumed for preparation and set-up of the drill boats. For transfer of the equipment, 25% of crew and operational costs were used, along with tug costs.

A tank barge with 60,000 lb capacity would be mobed to supply pourvex. Pourvex is the liquid explosive that would be used to blast basalt.

Initial mobilization was assumed to be to the Warrior Rock reach on the Columbia River. Interim mobilizations were assumed to the remaining rock excavation sites. Demobilization was assumed from PO Range reach on the Willamette River.

b) Mobilization and Demobilization - Off-Loading Equipment. Off-loading equipment mob/demob has also been computed in the backup. Equipment included in this activity is: 966 loader, 35-ton crane, and 16 CY rock skiff, three dump trucks and D6 cat. Equipment requirements would vary between water based off-loading and land based off-loading. Initial and interim mobs between sites were computed.

b. Interim Mobs and Demobs. These were the mobs/demobs from one reach of the river to another. There were six mob/demobs anticipated for the clamshell dredge (for rock excavation) and one for the hopper dredge. See the MCACES estimate for a listing of these mob/demobs, along with mileages from one reach to the next.

11. Hopper Dredging. Hopper dredging was estimated by the West Coast Team. Hopper dredging is assumed for use in the lower 30 miles of the Columbia River, where rough ocean conditions predominate, and at several other locations along the Columbia and Willamette Rivers where it is the more cost effective method. Disposal for hopper dredging would be accomplished at one offshore site and at eleven flowlane sites in the Columbia and Willamette Rivers. See the drawings in the main report, section 4 for locations of disposal areas. Two medium-sized hopper dredges were assumed. The Padre Island, owned by Natco, was used as the reference dredge. It has a capacity of 3,800 CY. Cycle times and production rates were computed based on recent projects on which the Padre Island was utilized. A 5% increase in dredging time was assumed for new work. Hopper dredging would be performed primarily in sand waves on the channel bottom.

12. Pipeline Dredging.

a. Determination of Pipeline Dredge Sizes. Pipeline dredge sizes were chosen as follows:

1) Various pipeline diameters (18", 24" and 30") were checked to obtain the least cost by river mile, but in the final analysis two 30-inch dredges were chosen in order to accomplish the work within the two-year construction contract period.

2) River miles were grouped together by disposal area.

3) Assured the dredging times were consistent with the project schedule, which calls for initial construction to be completed in 2 years.

It was decided to assume that all the new work pipeline dredging would be accomplished by two 30-inch pipeline dredges, working over two years. The first year, these two dredges would remove 7.7 mcy from downstream of RM 78. The second year, the two 30-inch dredges would remove 6.7 mcy from upstream from RM 78. In the second year, additional O&M dredging of the newly constructed channel downstream of RM 78 could add about 3 mcy of pipeline dredging and require a third 30-inch dredge.

b. Determination of Pipeline Lengths. Pipeline lengths were determined using maps generated by Cartography. Distances were scaled off from the centroid of a given RM to the centroid of the designated disposal area for that RM. Floating pipeline was assumed at a maximum of 2,500 LF, since it is the most expensive type of pipe, and this is the maximum amount of this type of pipe that is normally mobilized on a job. All other pipe used to traverse water was assumed to be submerged. Shore pipeline lengths were scaled off the maps. Average pipeline lengths were computed based on half the RM to be dredged, half the disposal area length, and the additional distance between the RM to be dredged and disposal area at their closest approach. A length of "Equivalent Additional Pipeline" was added to all pipeline estimates, in the amount of 1,000 feet. This covers any vertical height of pumping that might be required, as well as any abnormal pipeline losses.

c. Production Rates. Production rates for pipeline dredging were computed in CEDEP based on material type, bank height, pipeline lengths (distance to disposal areas), pumping horsepower, type of cutterhead, operator experience, effective working time, and cleanup time required. Standard production charts account for the above-listed data, and were used in CEDEP to compute production rates. Computed production rates are then compared to historical rates, as practicable, to assure reasonableness and are modified where appropriate.

d. Boosters. Use of boosters is sometimes necessary where pumping distances are high. The use of a booster leads to about a 15% loss in pumping efficiency per booster for the dredge, and can also be a disadvantage due to the maintenance problems they require. Occasionally their use is cost-effective; however, for long pumping distances or higher heads. CEDEP runs were performed with and without boosters to determine if booster use would yield lower unit costs.

Boosters were determined to be cost effective at several river miles on the sponsor and least cost plan.

e. Pipeline Dredge Labor Crews. A pipeline dredging crew comprised of 21 personnel, 22 when a booster was required, was used in CEDEP. This covers all personnel required to work the dredge for three 8-hour shifts per day.

f. Pipeline Dredge Shore Crew. The shore crew is composed of personnel required at the disposal site while the pipeline is dredging. This crew is comprised of: outside equipment operator foreman, two outside equipment operator, D-8L dozer with blade and winch, 966 front end loader, hydraulic crane (4wd & 45 ton), barge with ramp and three deckhands.

g. Pump Horsepower. Prime and secondary horsepower associated with the pumps on a 30-inch dredge were 9,000 and 3,310 respectively. Dredge pump horsepower relates to production rates and fuel usage.

h. Modified Dredge Areas. At a few RMs, computed bank height was too low for CEDEP to accomplish an estimate using a 30-inch dredge. At these RMs, the bank height was increased slightly to obtain output from CEDEP.

i. Variable Parameters in CEDEP. Key parameters that changed from RM to RM were: quantities, areas to be dredged, and pipeline lengths. All other parameters in the pipeline CEDEP runs remained constant from RM to RM.

13. Rock Excavation.

a. General. More details on the development of the rock excavation estimate are available in the backup material. Additional rock requiring excavation, beyond that included in the BCE, may be discovered during the PED phase of the project.

b. Mechanical Dredging. Removal of conglomerate rock in the Columbia River at RMs 63-67 and 105 would be accomplished using a clamshell dredge.

c. Blasting. Basalt in the Columbia River at RMs 87, and possibly 101, and in the Willamette River at RMs 3-7 and 10-11, would be broken up using blasting, with removal by a clamshell.

d. Dredge Type and Size. Discussions with industry personnel indicate that a 13 CY (rock) clamshell bucket would be appropriate for digging shot basalt in the Columbia River.

e. EWT for Clamshell Dredge. Based on historical record for previous rock excavation projects, an EWT of 50% was adopted for the blasted basalt to be removed at several locations. An EWT of 52% was adopted for dredging of the conglomerate materials at several other locations. The previous projects examined included: Coos Bay Channel Deepening; John Day Drawdown: Cargill Grain Loading Facility, Rock Dredging - 1/28 to 3/6/97; and SD & Lumber Rock Dredging - 2/25 to 3/2/95; and Kill Van Kull in New York.

f. Swell Factors. The swell factors used for rock are:

1) Basalt: 1.50

2) Slaughters Bar, Vancouver Turning Basin and Lower Vancouver Turning Basin Conglomerate: 1.30

3) Broadway Bridge boulders, gravels & sands: 1.25

Swell of the blasted basalt was computed based on the sum of the drill plus sub-drill depths. Sub-drilling (and hence the blasting) would occur to depths deeper than the design excavation depths. Thus, swelling would occur in both the rock above the design excavation depth, but also to a depth of rock (the sub-drill depth) below the design excavation depth. This additional swelling, and requisite additional excavation, is computed in the backup and accounted for in the basalt excavation estimate.

g. Disposal of Rock Materials. Disposal of rock materials would be accomplished at the following areas:

1) Slaughters Bar material would go to O-64.8..

2) Materials from areas above and including Warrior Rock would go to Austin Point (W86.5).

Materials would be hauled on flat deck steel barges towed by 1500 hp tugs. Materials would be off-loaded at the disposal sites. A Cat 966 front end loader situated on the barge, and a 35-ton crane with a 16 CY skiff based on land were assumed for off-loading the rock. Rock would be unloaded from the skiff into dump trucks, which would haul materials to the actual disposal site. A D-6 dozer would spread the materials at the disposal site. The number of barges needed to allow for continuous excavation varies from site to site, as computed in the backup. CEDEP was used to assist in the computations. Fill factors, cycle times, production rates, and hauling times for each disposal site were computed in the backup and entered into CEDEP.

h. Blasting. Blasting would be used to loosen basalt materials. Drilling would be accomplished using drill boats similar to those owned by Great Lakes Dredge and Dock, or equivalent. These rigs were used recently on a project (Kill Van Kull) in New York that involved in-water blasting. The drill boats were about 150' by 120' in plan area, and each has 3 drills on board. A crew of about 16 people would man each drill boat. Drilling and shooting would only occur during daylight hours, because of safety concerns expressed by the Coast Guard and OSHA. Velocities in the Columbia were similar to those experienced on the New York project, so they should be tolerable. Drilling would be accomplished on a 10' x 10' pattern, using 4.5-inch diameter holes, which are 8' to 10' in depth. Steve O'Hara of Great Lakes has indicated that the daily direct cost of one drill boat, including equipment and labor, is $17,200/day in 1997 price level.

1) Blasting Materials and Supplies. The backup has calculations of the quantities and costs of the explosives, datacord, blasting caps, starters, and boosters anticipated to be used at the various rock excavation sites.

2) Drilling Production. Based on production levels achieved at New York Harbor, it is anticipated that 35 holes would be drilled per day by each drill boat. These holes would be drilled during one 10-hour shift per day. Drilling must be accomplished during daylight hours in the winter, therefore no more than a 10-hour shift would be used.

14. Upland Disposal Areas.

a. General. Designs for the upland disposal areas were received from the Sponsor. Designs for the disposal areas include several elements, such as dikes, spillway weirs, outfall pipes, pumping systems, utility relocations, clearing and grubbing, and access work. The containment dikes would be constructed of previously dredged sands. Ditches would be provided within the disposal areas as required to facilitate adequate drainage. Clearing and grubbing would be light.

b. Containment Dikes. Assume dike building crew would work 8 hours per day, 5 days per week. A D-8 dozer would be used for constructing dikes. The dike crew production rate is 360 LCY/hr.

c. Weirs. Weirs (spillways) have been assumed to be procured from Oregon Culvert of Tualatin, OR, (503)692-0410. Weirs would cost $6,500 each, FOB jobsite, including a riser and 2' stub for each weir. Discharge pipe would cost $47.00 per linear foot, FOB jobsite for 48-inch diameter 12-gage pipe. Bands, gaskets and bolts for the discharge pipe would cost $4.50 per linear foot, FOB jobsite. About 6 hours would be required to install each weir. Rock (12-inch minus) would be placed at the end of the outfall pipes to dissipate energy from drainage water. The cost of the rock would be $15/ton, FOB jobsite, as quoted by Goble Quarry, (503)556-9049. This is considered a typical outfall rock price for various locations along the river.

d. Return Water Pumpout Systems. Pumpout systems would be required at up to three disposal sites, and would generally be comprised of 40,000 gpm pumps at 20 feet of total head, with discharge lines. Pumping costs cover rental and operation/maintenance.

15. Mitigation Areas. Three mitigation areas are proposed. These measures are intended to improve wildlife habitat in several areas, as mitigation for construction of the upland disposal areas. Measures proposed include excavation of wetlands, dike construction, dike breaching, blockage of ditches, site tillage, irrigation, placement of snags and root wads, planting of riparian vegetation, clearing of blackberry thickets, removal of fencing, construction of water control structures, pumping, and construction of carp excluders.

16. Ecosystem Restoration. This consists of establishing wetlands in the Shillipoo Lake area, replacing 11 tide gates on the lower Columbia river at select locations, and excavating channels through spits at the upper end of Walker-Lord and Hump-Fisher Islands.

Developing the wetlands consists of constructing dikes and channels for areas or cells and installation of water control structures to regulate flow between the individuals cells. The new aluminum tide gates vary in diameter from 24 to 72 inches and have a manually operated fish slide gate attached for juvenile fish passage as needed. One or more new tide gates are to be installed at Deep River (RM 20), Grizzly Slough (RM 28), Warren Creek (RM 28), Tide Creek (RM 77), and Burris Creek (RM 81). Construction of the channels at the upper end of Walker-Lord and Hump-Fisher Islands would allow Columbia River flow into the embayments adjacent to the islands thus improving circulation and lowering water temperature.

17. Utilities Relocations. Utility owners would be responsible for relocation of utilities affected by dredging and disposal operations. The costs of utility relocations are considered in the economic analysis, but are not included in the baseline cost estimate because the utility owners must bear these costs, not the Federal Government or Sponsor.

18. Berth Dredging. Several of the container, wheat, corn and barley exporting facilities must be deepened. These costs were developed by the sponsor and are not part of the federal cost-sharing equation but are included in the total project costs for economic analysis.

19. Use of MCACES.

a. General. CEDEP results (quantities and unit prices for hopper, pipeline and clamshell dredging) were entered into MCACES in a summary manner. Portions of the BCE were directly estimated in MCACES, including rock excavation, upland disposal site construction, mitigation areas, utilities relocations, field office overhead, home office overhead, profit and bond. No land-based positioning equipment was included in the MCACES, because a ship-based global positioning system would be used for this purpose.

b. Overhead, Profit and Bond. Field office overhead (FOOH) costs include: insurance costs, project superintendent (and/or manager), project engineer, clerical staff, project trailer, sanitary, project sign, telephone, pickups, quality control, environmental protection, and other miscellaneous items. Home office overhead (HOOH) was input as a "rule of thumb" percentage for this type and size of project. A HOOH percentage of 4% was used since all contracts would likely be over $500,000 in value. Profit was computed using the weighted guidelines sheet in MCACES. This project is not considered very risky, so the profit percentage is relatively low. Bond costs were computed using the built-in table in MCACES.

20. Functional Costs: the Task and/or Project Managers provided Functional costs associated with this work as follows:

a. 01 Account - Lands and Damages:

1) Right-of-Way Acreage: This is the land required for access to the disposal sites.

2) Disposal Site Acreage: This is the land required for the disposal sites.

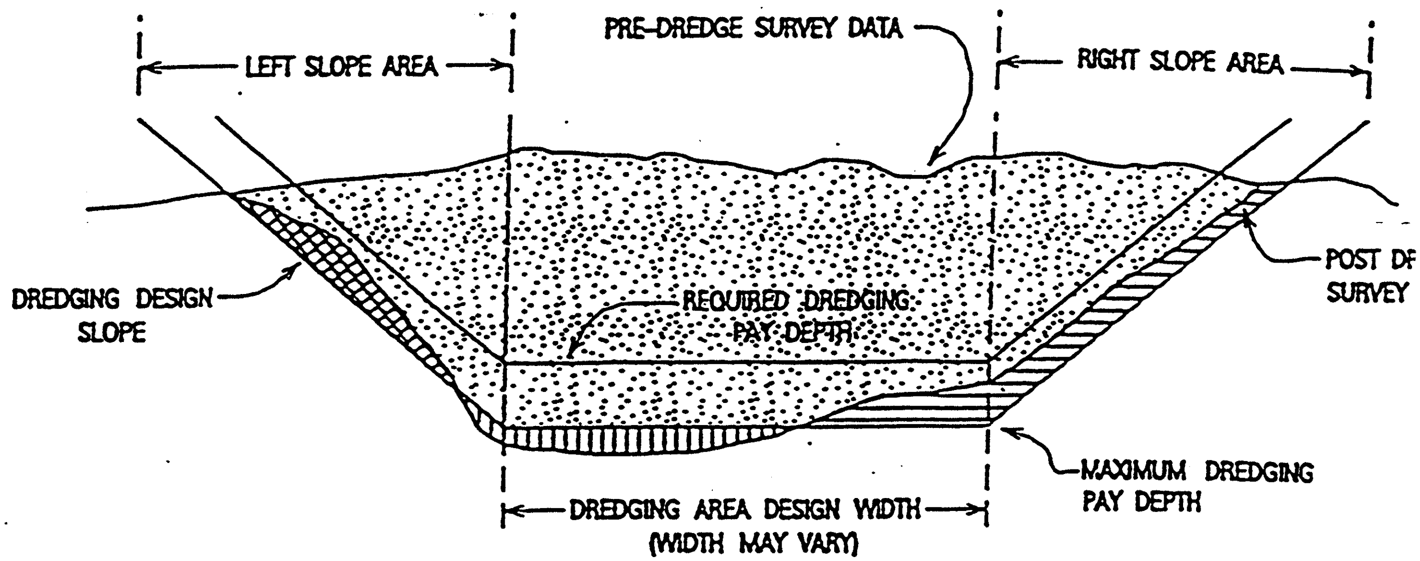
b. 30 Account - Planning, Engineering and Design:

1) Plans and Specifications: This item covers preparing plans and specifications, District review, technical review, contract advertisement and award activities.

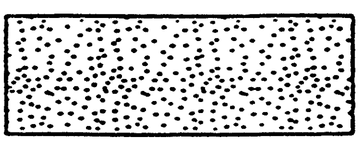
2) Engineering During Construction: This item consists of Planning and Engineering Division support to Construction Division during construction and participation in the prefinal and final inspections of the contracts.

d. 31 Account - Construction Management: This account covers construction management for the deepening contracts.

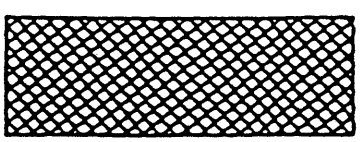
DESCRIPTIVE SKETCH
PAYABLE / NON-PAYABLE DREDGE QUANTITY



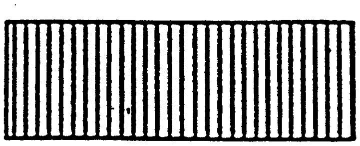
INBOUND PERSPECTIVE



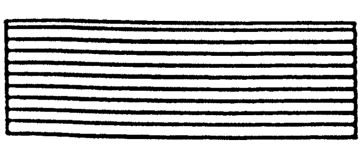
PAYABLE QUANTITY EXCAVATED FROM WITHI THE OVERALL DREDGING PAY AREA.



SLOPE AREA MATERIAL NOT DREDGED AND NOT CONSIDERED PAYABLE.



NON-PAYABLE MATERIAL EXCAVATED BEYOND THE MAXIMUM DREDGING PAY DEPTH.



NON-PAYABLE MATERIAL REMAINING WITHIN THE OVERALL DREDGING PAY AREA.

Attachment 1

SECTION 3

MCACES PRINTOUT

Columbia River Channel Deepening
Baseline Cost Estimate
Corps of Engineers Plan

Designed By: CRCD Team
Estimated By: O'Connor/Jones

Prepared By: CENWP-DX-C

Preparation Date: 06/04/99
Effective Date of Pricing: 10/01/98

Sales Tax: 0.00%

This cost estimate is the Baseline Cost Estimate for the Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement, Columbia & Lower Willamette River Federal Navigation Channel.

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** PROJECT INDIRECT SUMMARY - Contract **

		QUANTY	UOM	TOTAL DIRECT	FIELD OH	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT COST
5	Contract #1 - Hopper	1.00	JOB	23,277,613	1,163,881	2,444,149	2,507,086	293,927	29,686,657	29686657
7	Contract #2 - Pipeline	1.00	JOB	37,901,785	1,895,089	3,979,687	4,318,558	480,951	48,576,070	48576070
10	Contract #3 - Rock Exc	1.00	JOB	27,641,227	1,382,061	2,902,329	3,309,090	352,347	35,587,055	35587055
20	Contract #4 - Mitigation A	1.00	JOB	390,780	58,617	24,717	42,078	7,743	523,934	523934.31
25	Contract #5 - Shillapoo Lake	1.00	JOB	2,669,995	303,594	177,230	272,749	41,078	3,464,646	3464646
30	Contract #6 - Fisher/Walker/Lord	1.00	JOB	30,938	4,022	1,748	3,124	398	40,231	40230.66
TOTAL	Columbia River Channel Deepening	1.00	EA	91,912,338	4,807,264	9,529,860	10452685	1,176,445	117,878,592	117878592