



US Army Corps
of Engineers
Portland District

Corps vs Sponsors' Plan Costs

Plan	Contract Costs in the BCR	Restoration Costs <i>not</i> in the BCR	Total Project Costs
Corps	\$129 m	\$20 m	\$149 m
Sponsor's	\$136 m	\$20 m	\$156 m



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Contracts Included in Benefit-to-Cost Ratio

Pipeline	\$ 73 million
Rock Excavation	\$ 20 million
Hopper	\$ 12 million
Lois Island	\$ 12 million
Mitigation	\$ 4 million
Miller-Pillar	\$ 3 million
Berthing Areas	\$ 1 million
ESA Monitoring & Research	<u>\$ 4 million</u>
	\$129 million



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Contracts *not* Included in Benefit-to-Cost Ratio (*\$20*)

Shillapoo Lake Restoration

Lord/Walker/Hump/Fisher

Tenasillahe Island Interim

Tenasillahe Island Long-Term

White Tailed Deer

Purple Loosestrife

Bachelor Slough Restoration



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Accounts Used in each Contract

- 09 Columbia River Channels and Canals
- 06 Environmental Restoration
- 01 Lands and Damages
- 30 Engineering and Design
- 30 Engineering During Construction
- 30 Monitoring and Research
- 31 Construction Management



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Contract Summary Sheets

****COLUMBIA RIVER COST SUMMARY****										PAGE 1 OF 1				
PROJECT: COLUMBIA RIVER CHANNEL IMPROVEMENT PROJECT - DRAFT BCE UP DATE					DISTRICT: PORTLAND					1-Jun-02				
LOCATION: COLUMBIA RIVER, OR/WA					P.O.C.: PAT JONES, CHIEF, COST ENGINEERING SECTION									
CURRENT MCACES ESTIMATE PREPARED IN:					AUTHORIZ./BUDGET YEAR: 2000					FULLY FUNDED ESTIMATE				
EFFECTIVE PRICING LEVEL:					EFFECT. PRICING LEVEL: OCT 01									
ACCOUNT NUMBER	FEATURE DESCRIPTION	COST (\$K)	CNTG (\$K)	CNTG (%)	TOTAL (\$K)	OMB (%)	COST (\$K)	CNTG (\$K)	TOTAL (\$K)	FEATURE MID P T	OMB (%)	COST (\$K)	CNTG (\$K)	FULL (\$K)
09---	COLUMBIA R. CHANNELS AND CANALS	72,214	10,890	15%	83,104	0.0%	72,214	10,890	83,104			80,617	12,161	92,778
06---	ENVIRONMENTAL RESTORATION	18,009	4,502	25%	22,511	0.0%	18,009	4,502	22,511			20,119	5,028	25,147
	TOTAL CONSTRUCTION COSTS ==>	90,223	15,392	17%	105,615	0.0%	90,223	15,392	105,615			100,736	17,189	117,925
01---	LANDS & DAMAGES (Disposal & Mitigation)	16,575	862	5%	17,437	0.0%	16,575	862	17,437			16,939	873	17,812
01---	LANDS & DAMAGES (Envir. Restoration)	2,475	160	6%	2,635	0.0%	2,475	160	2,635			2,742	177	2,919
30---	CR ENGINEERING & DESIGN	2,097	210	10%	2,307	0.0%	2,097	210	2,307			2,289	229	2,518
30---	CR ENGINEERING DURING CONSTRUCTION	319	32	10%	351	0.0%	319	32	351			362	38	400
30---	CR MONITORING & RESEARCH	9,116	912	10%	10,028	0.0%	9,116	912	10,028			9,116	912	10,028
31---	CR CONSTRUCTION MANAGEMENT	9,021	901	10%	9,922	0.0%	9,021	901	9,922			10,075	1,005	11,080
	TOTAL COST ==>	129,826	18,469	14%	148,295	0.0%	129,826	18,469	148,295		9.7%	142,259	20,423	162,682
	UTILITY OWNER COST FOR UTILITY RELOCATIONS	0	0	0%	0		0	0	0			0	0	0
	NON-FEDERAL DREDGE COST TO BERTHS	843		0%	843		843	0	843	Jun-05	11.7%	942	0	942
	TOTAL COST ==>	130,669	18,469	14%	149,138	0.0%	130,669	18,469	149,138		9.7%	143,201	20,423	163,623

Important

Columbia River Total Project Costs

ACCOUNT NUMBER	FEATURE DESCRIPTION	COST (\$K)	CNTG (\$K)	CNTG (%)	TOTAL (\$K)
09---	COLUMBIA R. CHANNELS AND CANALS	72,214	10,890	15%	83,104
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Timing for Contracts in BCR

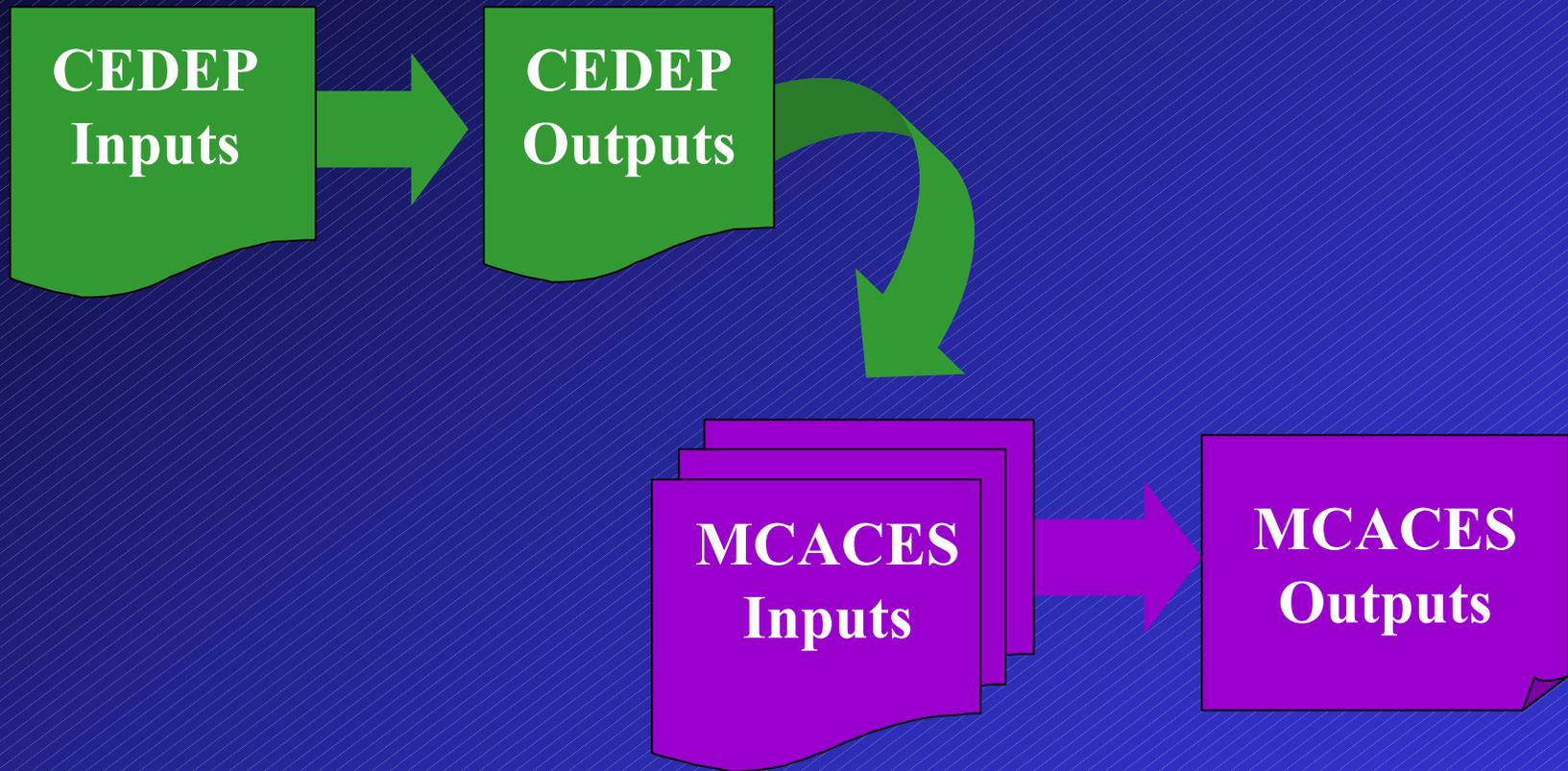
Contract/duration (mo)	FY 04				FY 05				FY 06			
	1	2	3	4	1	2	3	4	1	2	3	4
Pipeline/24			█									
Rock Excavation/24			█									
Hopper/24			█									
Lois Island/8					█				█			
Mitigation/6			█									
Miller-Pillar/9								█				



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Producing the Cost Estimate

Computer Software Programs





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Cost Engineering Dredge Estimating Program *(CEDEP)*

- Corps of Engineers Software
- Reasonable and Fair Estimates
 - Hopper
 - Pipeline
 - Mechanical (Rock Excavation)



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BCE Methodology

Dredge Type	River Mile	Quantity (CY)
Hopper	4-29 to Sump	4,040,000
	Flowlane	1,910,000
	29-42	
	51-55	
	59-62	
Pipeline	42-105.5	8,400,000
Mechanical	63-67	237,000
	87-90	50,625
	101-104	70,000



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BCE Estimate Methodology

- Quantity
 - Total Dredging Prism
 - Existing O&M and New Work
- Prepared CEDEP for each River Mile
- CEDEP output unit costs in MCACES w/new work quantity

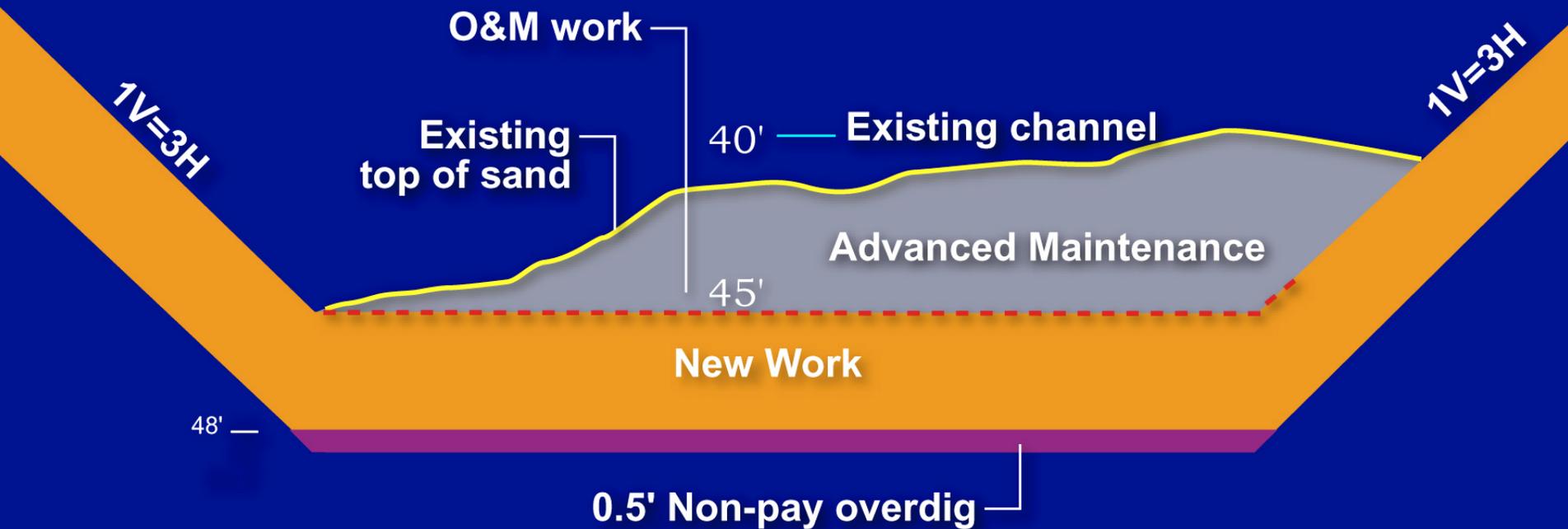


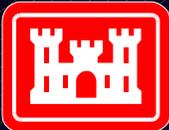
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Important CEDEP Inputs for *all* Dredging Contracts

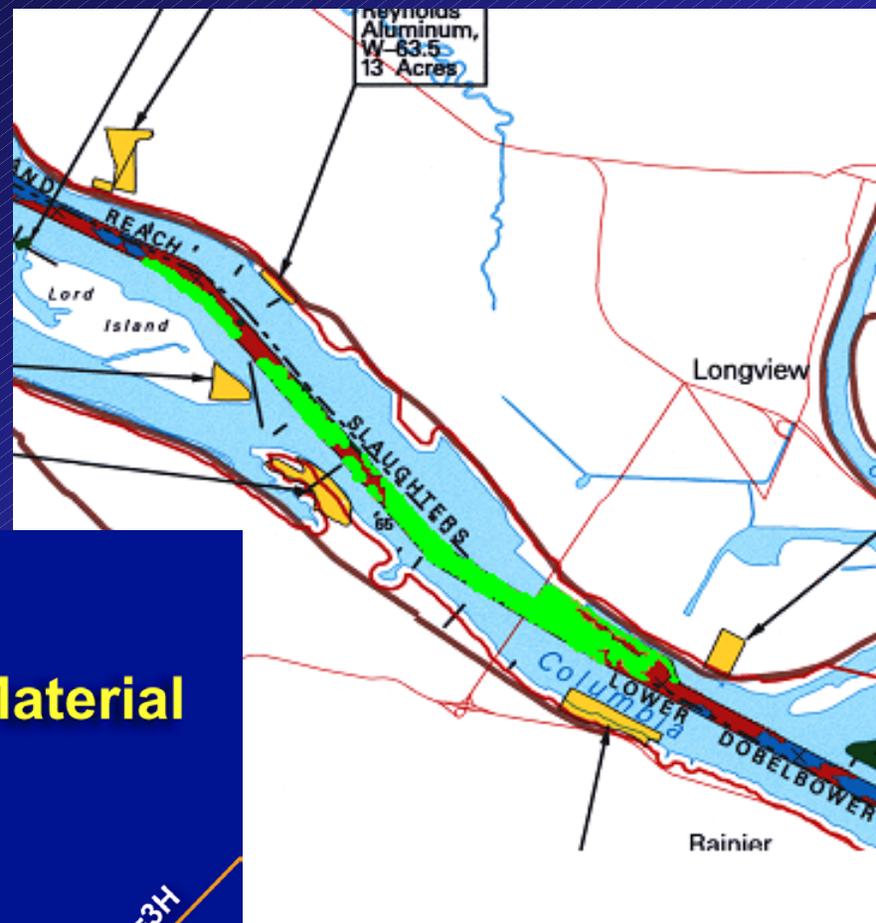
- Size of Dredge
- Quantity
- Surface Area
- Fuel Costs
- Distance to Disposal Area
- Effective Work Time
- Mob-Demob

Generic Channel Prism in Sand

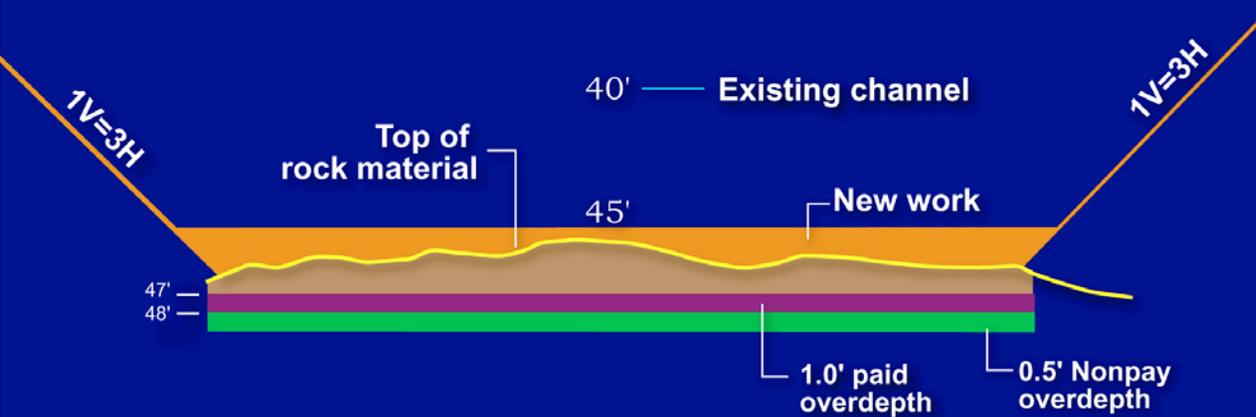




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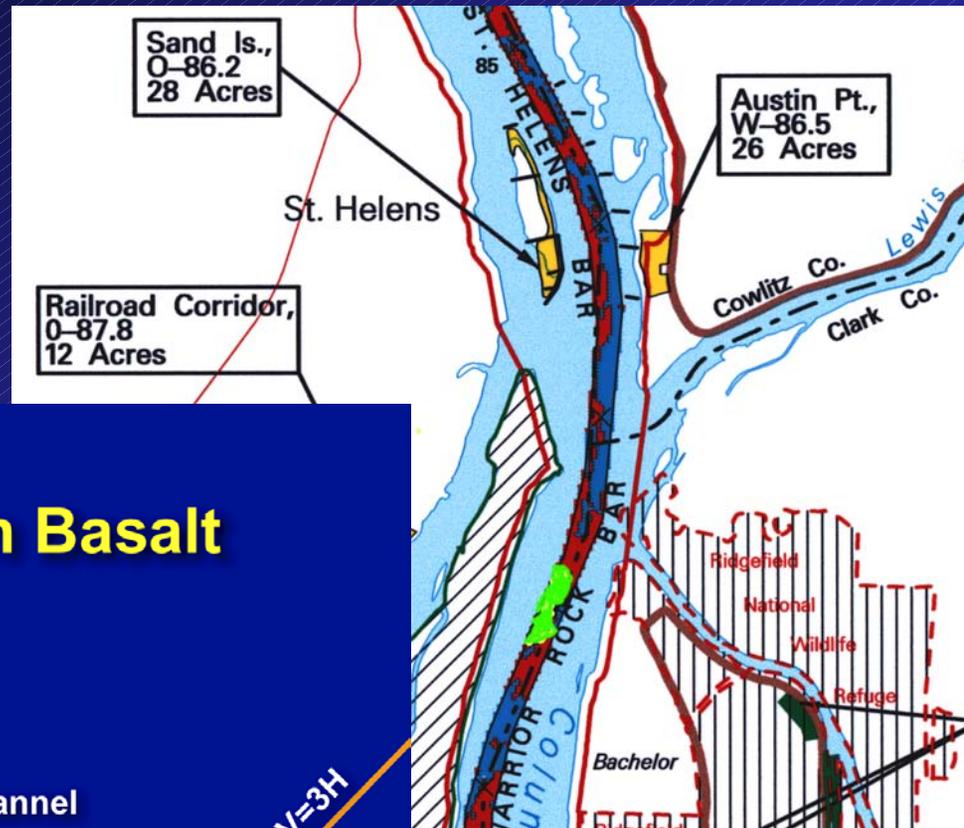


Generic Channel Prism in Cemented Conglomerate & Rock Material

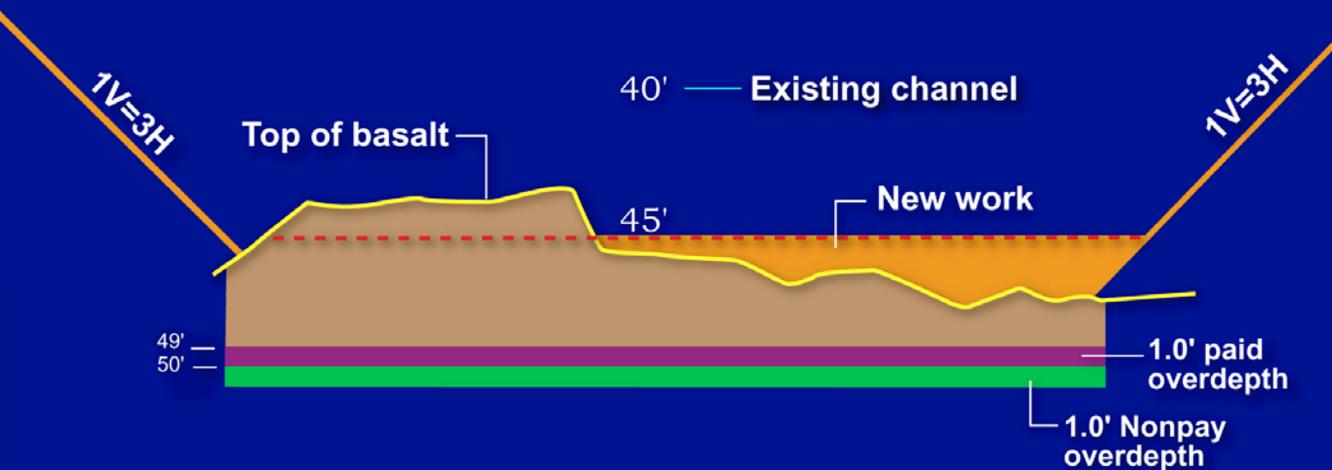




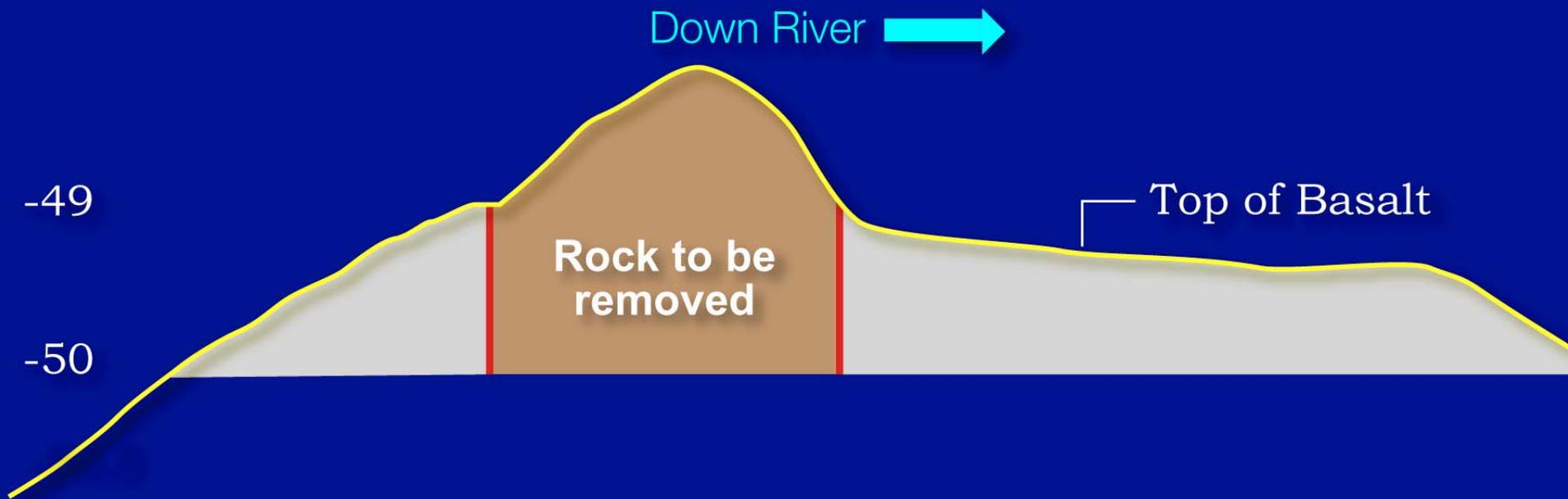
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Generic Channel Prism in Basalt



Generic Longitudinal Section





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Updated CEDEP Inputs

- Quantity
- Fuel Costs
- Mob-Demob
- Labor Rates
- Applicable Fixed Costs
- Local Factors Area Factors



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Updated Local Area Factors

Factor	2002 Report	1999 Report
Present Year	2001	2000
Economic Index	6012	6145
Interest Rate	5.50%	6.25%
Time Period	August 2001	June 1998
Fuel Rate	\$0.90/gal	\$0.70/gal



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Updated Mob-Demob

- Supplies Small Tools
- Operators
- Fuel, Plant Idle
- Subsistence Travel Expenses
- Local Hire
- Lump Sum Cleanup



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CEDEP

Input and Outputs

**Size of Dredge
Quantity
Surface Area
Fuel Costs
Distance to Disposal Area
Effective Work Time
Mob-Demob**

**Labor
Equipment
Crew
Gross Volume
Production Rates
Direct Cost**



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Labor

- Four categories of labor were used for dredging contracts
 - Management
 - Dredge Operators
 - Equipment Operators
 - Laborers
- Base Rate, Overtime, Social Security, Workman's Comp, State Unemployment, Federal Unemployment, Fringe, Holiday, Vacation



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Example of Laborer Rate

Mate

- Base Rate - \$31.66
- Overtime - 14%
- Social Security - 7.75%
- Workman's Comp - 30%
- State Unemployment - 3.5%
- Federal Unemployment - 1%
- Fringe - \$7.75/hr
- Holiday - 7 days
- Vacation - 8%



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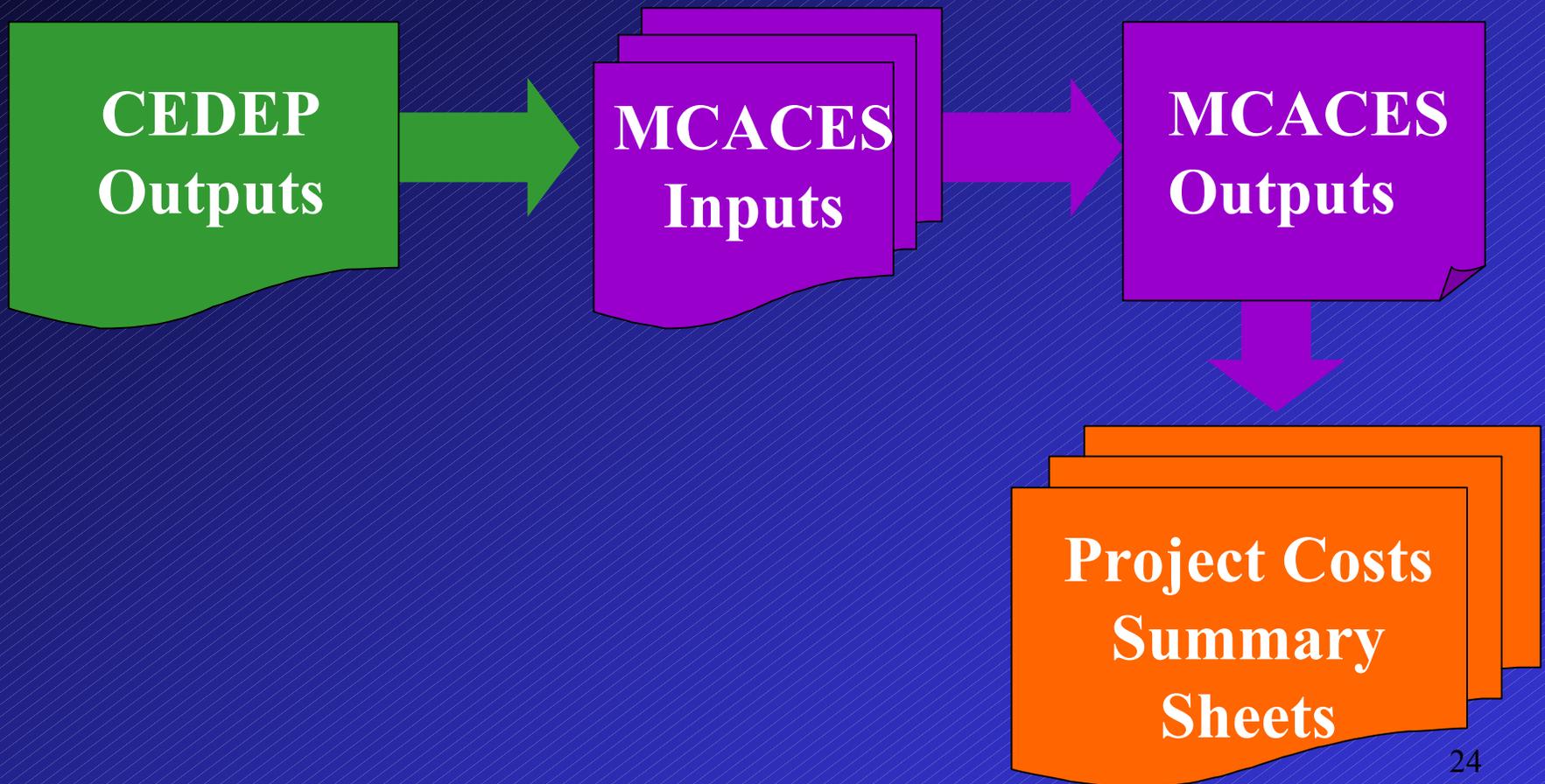
Equipment Database

- Ownership Costs
 - Depreciation
 - Facilities Capital Cost of Money
- Operating Expense
 - Fuel
 - Filters, oil and grease
 - Repairs



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Sequence used to Develop Baseline Cost Estimate





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Micro Computer Aided Cost Engineering System *(MCACES)*

- Corp of Engineers Computer Software
- Corps Districts across the Nation
- Over 10 years in use
- Used for all Corps construction cost estimating
- Current Updated Version 1.2



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MCACES

Input and Outputs

CEDEP Outputs
Labor Database
Equipment Database
Crew Database
Quantity
Production Rate
Material Costs
FOOH%, HOOH%
Profit & Bond
Mob & Demob

Direct Costs
Indirect Costs
Unit Costs
Backup Pages



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Major Cost Elements Developed in MCACES

- Upland Disposal Sites Construction
- Pipeline Shore Crew
- Rock Blasting
- Rock Dredged Material Off-loading & Disposal
- Mitigation Contract
- Miller – Pillar Restoration Contract



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Major Cost Elements Developed in MCACES *(\$20 m)*

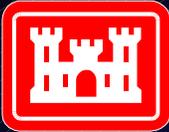
- Lord/Walker - Hump/Fisher Contract
- Tenasillahe Island Interim Contract
- Tenasillahe Island Long-Term Contract
- White Tailed Deer Contract
- Purple Loosestrife Contract
- Shillapoo Lake Restoration Contract
- Bachelor Slough Contract



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Updates to MCACES

- New CEDEP Results
- New Labor Rates and Fringes
- Latest Equipment Database
- Latest Unit Price Book
- New Material Prices
- 7 New Contracts



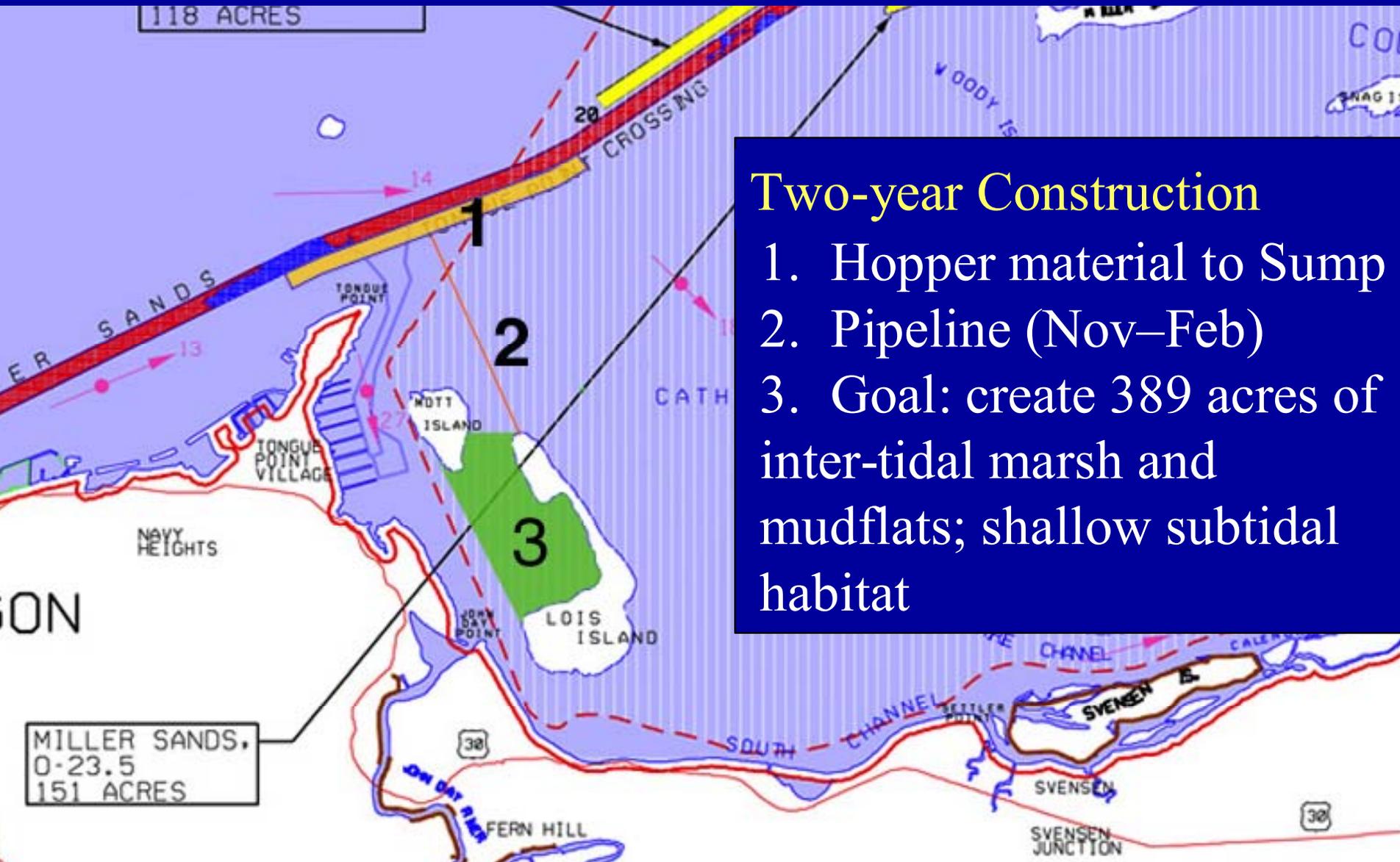
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Profit for Rock

Weighted Guidelines

	Rate of %	Weight Factor	Percentage
Degree of Risk	20	0.12	2.40
Difficulty of Work	15	0.12	1.80
Size of Job	15	0.03	0.45
Period of Performance	15	0.11	1.74
Contractor's Investment	5	0.08	0.38
Assistance by Government	5	0.12	0.60
Subcontracting	25	0.12	3.00
Total Rounded	100		10.4

Lois Island Restoration



Two-year Construction

1. Hopper material to Sump
2. Pipeline (Nov–Feb)
3. Goal: create 389 acres of inter-tidal marsh and mudflats; shallow subtidal habitat



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Rock Quantities

- Rock Locations from historical record
- Top of rock assumed as the deepest depth
- Oct '99 geophysical explorations
- Summer 2000 jet-probing and coring
- In-roads Software – Triangle Volume Method



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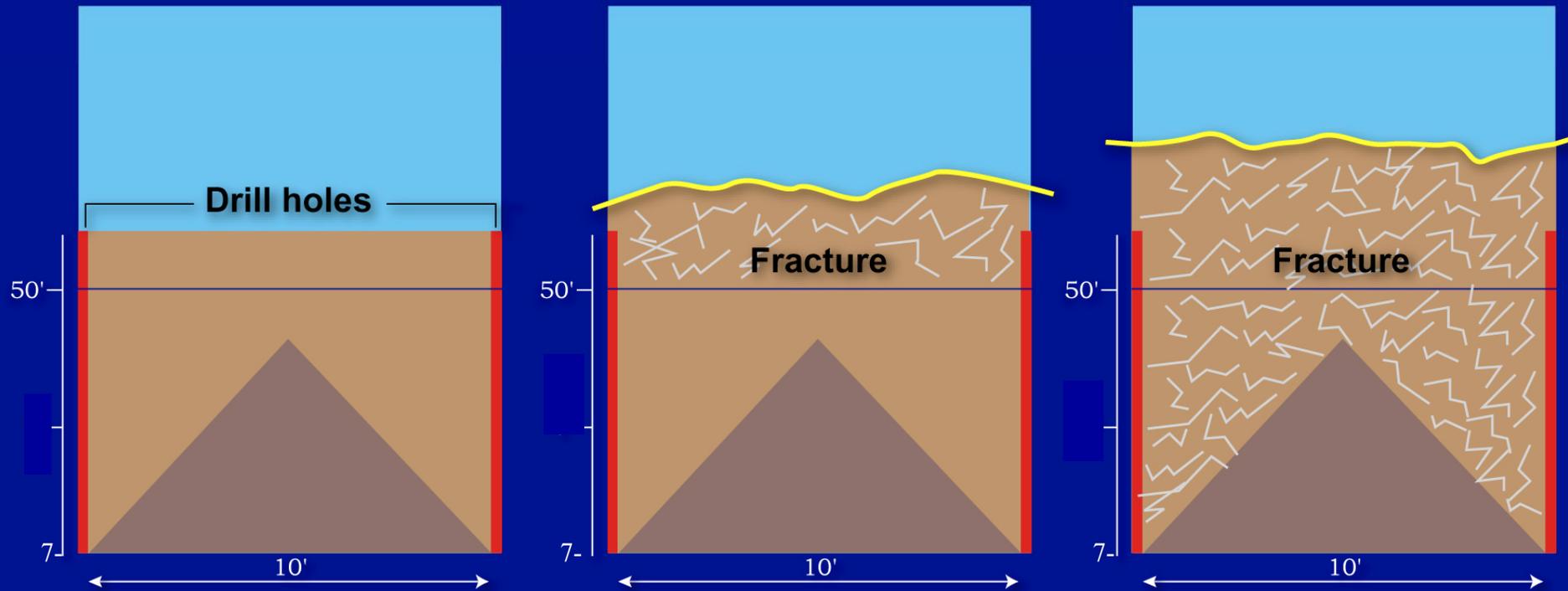
Rock

Material and Quantities

- In-place Yardage
- Slaughters Bar
 - Consolidated Rock Material 30% Swell
- Warrior Rock Basalt 50% Swell
- Vancouver Cemented Conglomerate 30% Swell



Rock Swell from Subdrill





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Basalt

(Key Assumptions)

- In-Water Work Period (Nov-Feb)
- Estimate includes fish protection
- Seismic and pressure monitoring
- Drill Barges Mob-Demob from Florida
- 2-Drill Barges, 3-Drills per Barge
- Drill pattern (10 ft x 10 ft)
- 4.5-inch diameter hole
- Over-depth (7 ft)
- 7-holes/hr, 49-holes/day

Off Loading Rock





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Verification for the Final Cost Estimate

- Verify Surface Areas
- Take Rock Quantities out of Pipeline Quantity
- Increase Overtime Percentage
- Review Effective Work Time Percentage
- Verify Pipeline Size
- Remove Booster from RM 74-75 (Corps Plan)
- Verify Pipeline Lengths