

Planning and Environmental Division

# **Economic Analysis Procedures For Stakeholder Evaluation Group 14 February 2006**



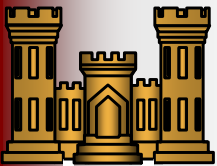
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# Purpose

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*To provide an overview of the requirements and procedures for conducting deep-draft navigation economic analyses in accordance with standards and guidance as applied by the U.S. Army Corps of Engineers*



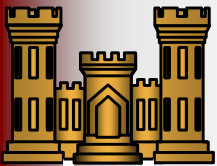
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# Topics to be Discussed

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- Guidance
- Concepts of Federal Benefit-Costs Analysis
- Nine-step Methodology
- Example Benefit Computation
- Questions and Answers(?)



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# Guidance

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- Principles and Guidelines
- Engineer Regulation 1105-2-100
- Institute for Water Resources Report 91-R-13



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# Concepts of Federal Benefit-Cost Analysis

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- National Economic Development (NED) Benefits
  - Conceptual basis for benefits
  - NED vs. Regional Economic Development
- National Economic Development Costs
  - Associated costs
  - Interest during construction



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# Benefit-Cost Analysis Concepts

## (Continued)

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- “With-” and “Without-project” Conditions
- Average Annual Benefits and Costs
  - Interest rate
  - Price level
  - Period of analysis
- Incremental Analysis

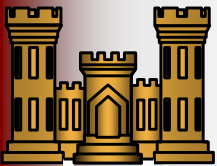
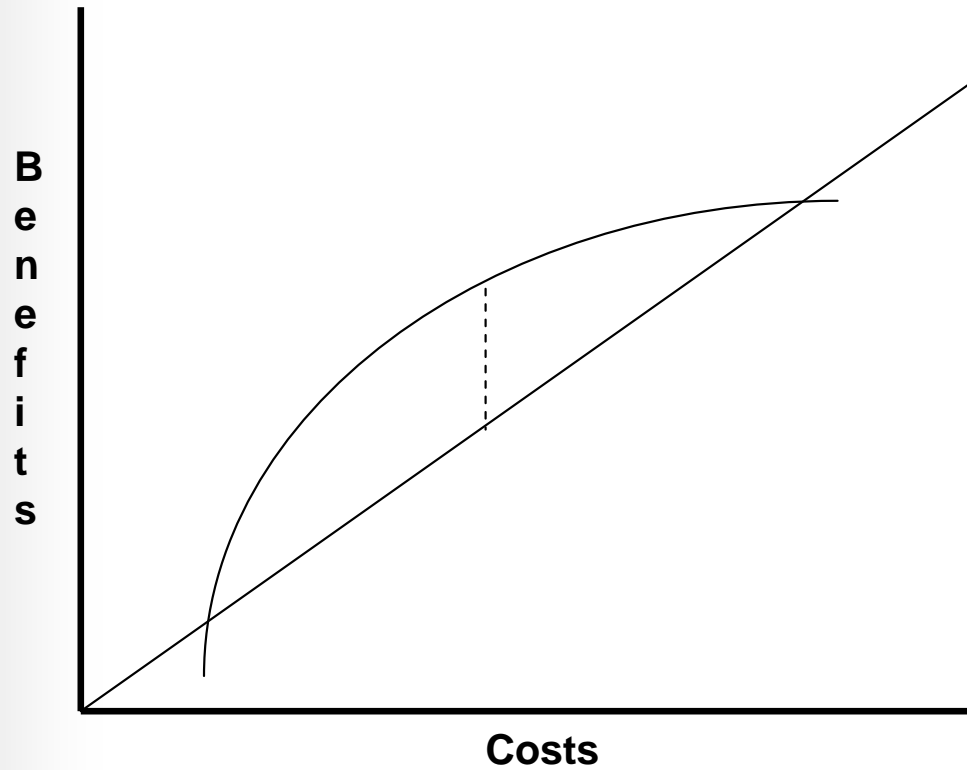


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# Net Benefits

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# Principal Direct Economic Benefits

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- Elimination or Reductions in Transportation Cost(s)
- Shift-of-Origin or Destination
- Induced Movements

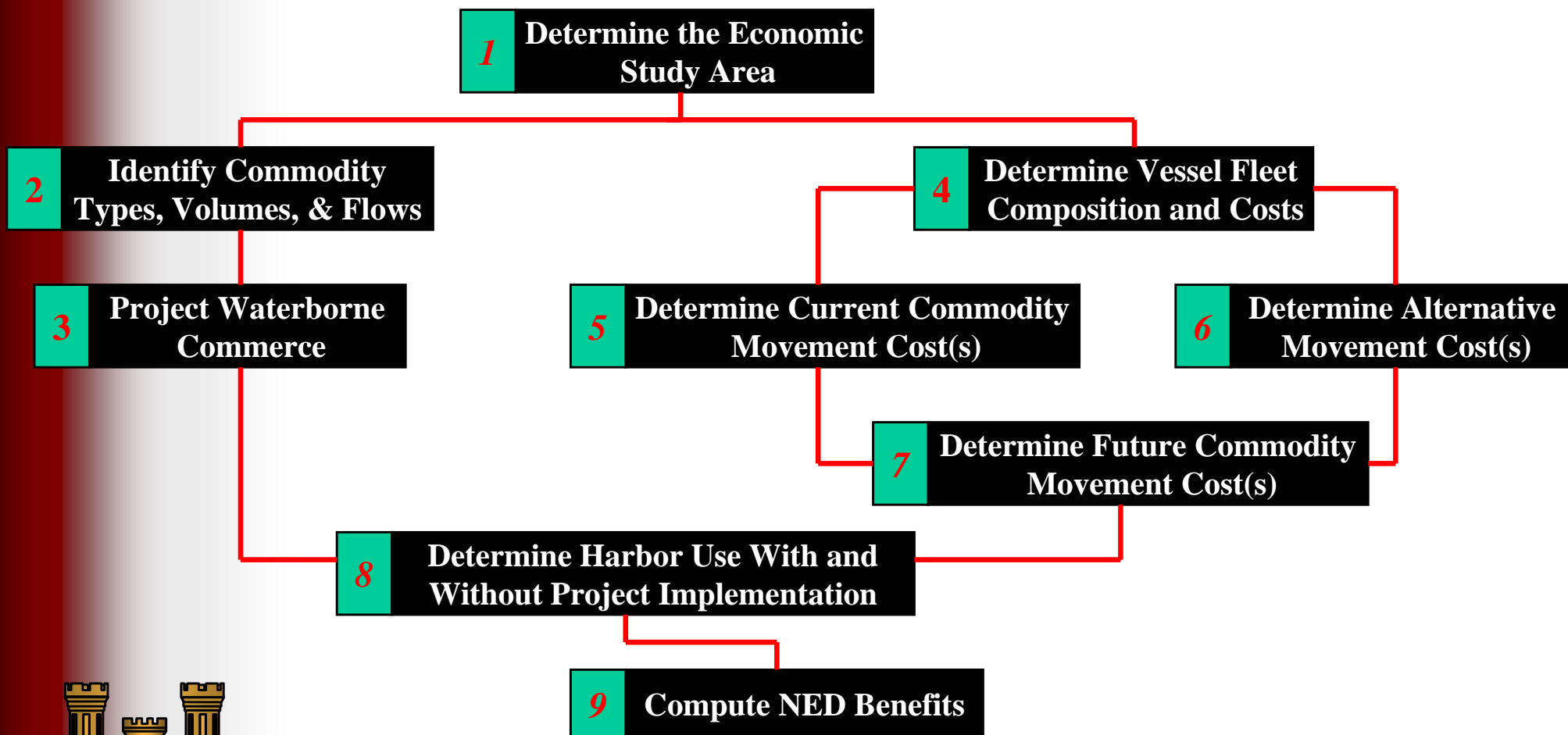


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# Evaluation Process Schematic

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# Determine Economic Study Area

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- Area Considered Tributary to Proposed Harbor Improvement
- Boundaries or Not Fixed or Rigid; May Overlap with Other Ports
- May Vary by Commodity and/or Mode of Transport
- May Vary Under Future/Changing Conditions



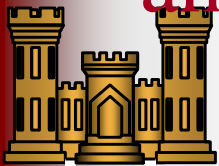
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# Identify Commodity Types, Volumes & Flows

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- Commodity Type and Annual Volume
- Size and Type of Vessel
- Origins & Destinations
- Trade Routes
- Volume of Individual Movements
- Frequency of Movements
- Volume Per Unit of Time (i.e., generally annually, or may be seasonally)



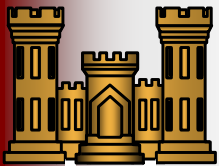
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# Project Waterborne Commerce

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- World Forecasts
- National Forecasts
- Trade Route Forecasts
- Regional Forecasts
- Port-Specific Forecasts
- Facility-Specific Forecasts
  - Relative to Commodity\Cargo & Fleet Service Regime (Forecasts)



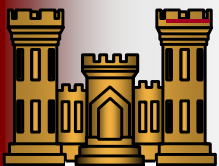
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# Determine Vessel Fleet Composition and Cost

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- Historical Fleet Composition\Service Regime
- Existing Fleet Composition\Service Regime
- Future or Foreseeable Fleet Composition or Service Regime
  - “With-Project”
  - “Without-Project”



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# Determine Current Commodity Movement Costs

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- Ocean Transit Costs
- Handling/Transfer Costs
- Hinterland/Tributary (Landside or Inland Waterway) Transit Cost



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# Determine Alternative Movements Cost

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- Lightering, Topping-Off, or Offshore Facilities
- Transshipment Facilities
- Pipelines
- Traffic/Port Facility Management
- Other Transport Modes
- Competitive Harbors
- Other?



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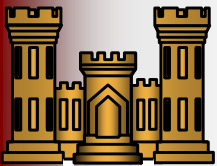
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# Determine Future Commodity Movement Cost

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Relative to Foreseeable & Probable Changes In:

- Fleet Service and/or Composition
- Port Logistics (Delays, Throughput Process, etc.)
- Port Throughput Capacity (Undertaken Relative to Time & Resources)

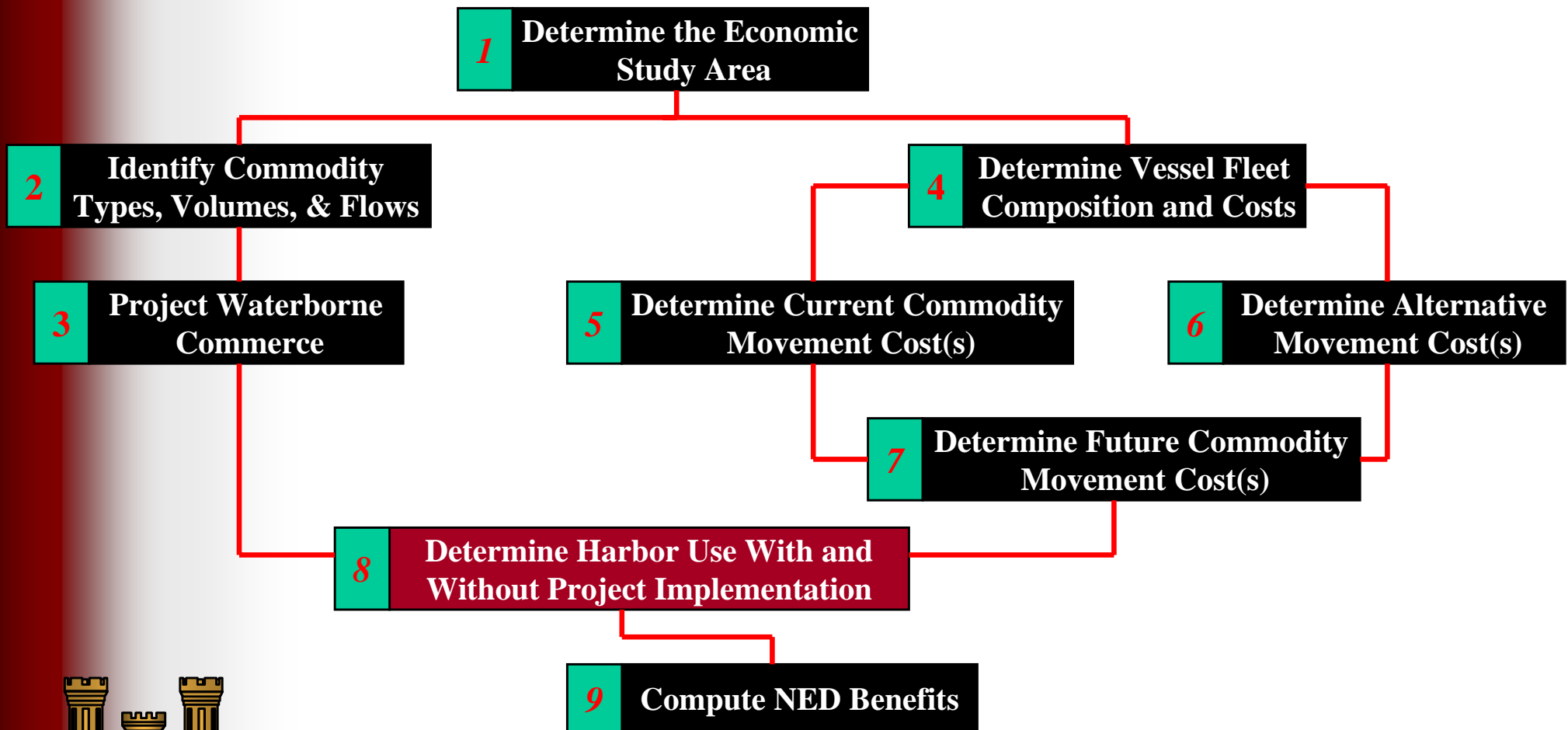


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# Evaluation Process Schematic

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# Multi-port Analysis

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- Overlapping hinterlands
- Cargo May not be Captive to Port Under Study
- Effects of With Project Condition on Other Ports
- Considers Authorized Projects at Alternative Ports



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# Determine Harbor Use Under “With” and “Without-Project” Conditions

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- Analyze Changes in Cost Functions & Demand Schedules
- Integrate Multi-Port Analysis (as Appropriate)



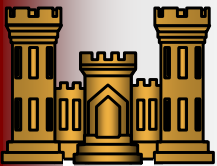
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# Calculate National Economic Development Benefits

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- Elimination or Reductions in Transportation Cost
- Shift-of-Origin or Destination
- Induced Movements



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# Example Benefit Calculation

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General Description of Cargo Movement and Waterway Depths			
Nature of Cargo Movement or Lading:			Bulk Broken\Crushed Coal
Nature of Trade\Direction:			Import\Inbound
Cargo Tonnage Per Year (Metric Tonnes):			4,500,000
Origin:			South America
Destination:			Tampa Bay, Florida (United States)
Approximate In-transit Distance (NM); Unladen:			480.0
Approximate In-transit Distance (NM); Laden:			1,340
Cargo Density\Stowage Requirement(s):			
- Pounds per Cubic Foot			55.0
- Pounds per Cubic Meter			1,942.6
- Metric Tonnes per Cubic Meter			0.881
Applied Channel Depth(s) (feet)			
Colombia (Various)			50.0
Tidal Influence\Variation:			Not Significant
United States (Tampa, Florida)			38.0
Tidal Influence\Variation:			Not Significant



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# Example Benefit Calculation

## (Continued)

### Planning and Environmental Division

<b>General Vessel Description:</b>		<i>Bulk Carrier of Aggregate Foreign Registry; Self Propelled</i>	
<b>Cargo or Lading:</b>		Broken\Crushed Coal	
<b>Vessel Specifications (Self-Propelled Bulk Carrier)</b>			
Deadweight Tonnage (DWT, in metric tonnes)		67,490	
Deadweight Tonnage (DWT, in short tons)		74,390	
Cargo-to-Total-Deadweight Coefficient or Ratio		0.918	
Cargo Deadweight Tonnage (DWT, in metric tonnes)		61,956	
Gross Registered Tonnage (GRT, in metric tonnes)		36,330	
Net Registered Tonnage (NRT)		?	
Length Overall (LOA, in feet)		731.4	
Length Between Perpendiculars (LBP, in feet)		700.4	
Beam or Breadth (in feet)		105.9	
Maximum SLLD (Summer Loadline) Draft (in feet)		43.5	
Underkeel Clearance (in feet; static condition)		3.0	
Service Speed (estimated SS; in knots)		14.5	
Applied Average Transit Speed At Sea (in knots)		13.3	
Bulk Solid Capacity (Volumetric Capacity; cubic metres)			
Grain		78,620	
Bale Cubic		75,480	
Self-Discharge Rate (cubic meters per hour)		4,350	
Immersion (TPI; tonnes, calculated IWR)		164.33	
Immersion (TPI; tonnes, adjusted; working)		160.41	
Applied Vessel Operating Cost At-Sea (\$/hour)		\$903	
Applied Vessel Operating cost In-Port (\$/hour)		\$743	



# Example Benefit Calculation

## (Continued)

### Planning and Environmental Division

<b>Without-Project Condition (38-Foot Depth)</b>			
Waterway Reference Depth (feet):			38.0
Cargo Tonnage Per Year:			4,500,000
Vessel Transit Draft (feet):			35.3
Average Cargo Tonnage Per Vessel Call:			48,014
Number of Trips or Vessel calls Required Per Year:			93.7
Self-Discharge Rate (cubic meters per hour):			4,350
Self-Discharge Rate (metric tonnes per hour):			3,833.0
Hours In-Port Loading\Unloading (South America):			6.3
Hours In-Port Loading\Unloading (United States); Self Discharge:			12.5
Hours in Port; Other Requirements:			2.0
Total Vessel Hours In-Port:			20.8
Vessel Operating Cost In-Port (\$/hour):			\$743
Total Vessel Costs In-Port:			\$15,473
Distance; Transit At-Sea:			1,820
Applied Transit Speed At-Sea:			13.3
Total Hours In-Transit At-Sea:			136.7
Vessel Operating Cost At-Sea (\$/hour):			\$903
Total Vessel Costs At-Sea:			\$123,435
Total Vessel Operating Costs for Cargo Delivery:			\$138,907
Average Estimated Cost Per Tonne of Cargo:			\$2.893
Total Vessel Delivery Cost(s) Per Year:			\$13,018,722



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# Example Benefit Calculation

## (Continued)

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<b>With-Project Condition (48-Foot Depth)</b>			
Waterway Reference Depth (feet):			48.0
Cargo Tonnage Per Year:			4,500,000
Vessel Transit Draft (feet):			42.5
Average Cargo Tonnage Per Vessel Call:			61,956
Number of Trips or Vessel calls Required Per Year:			72.6
Self-Discharge Rate (cubic meters per hour):			4,350
Self-Discharge Rate (metric tonnes per hour):			3,833.0
Hours In-Port Loading\Unloading (South America):			6.3
Hours In-Port Loading\Unloading (United States):			16.2
Hours in Port; Other Requirements:			2.0
Total Vessel Hours In-Port:			24.5
Vessel Operating Cost In-Port (\$/hour):			\$743
Total Vessel Costs In-Port:			\$18,179
Distance; Transit At-Sea:			1,820
Applied Transit Speed At-Sea:			13.3
Total Hours In-Transit At-Sea:			136.7
Vessel Operating Cost At-Sea (\$/hour):			\$903
Total Vessel Costs At-Sea:			\$123,435
Total Vessel Operating Costs for Cargo Delivery:			\$141,613
Average Estimated Cost Per Tonne of Cargo:			\$2.286
Total Vessel Delivery Cost(s) Per Year:			\$10,285,721



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# Example Benefit Calculation

## (Continued)

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Summary of Annual Reduction(s) in Waterborne Transportation Costs							
						\$13,018,722	
						\$10,285,721	
						\$2,733,001	



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# Plan Selection

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Alternative Project Depths (in Feet)	Avg. Annual Equivalent Cost	Avg. Annual Equivalent Total Benefit	Avg. Annual Equivalent <u>Net</u> Benefit
45.0 ft.	\$13,000,000	\$15,210,000	\$2,210,000
46.0 ft.	\$13,650,000	\$16,107,000	\$2,457,000
47.0 ft.	\$14,469,000	\$17,797,000	\$3,328,000
48.0 ft.	\$15,482,000	\$18,888,000	\$3,406,000
49.0 ft.	\$24,152,000	\$27,775,000	\$3,623,000
50.0 ft.	\$37,919,000	\$39,057,000	\$1,138,000



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# Questions P P

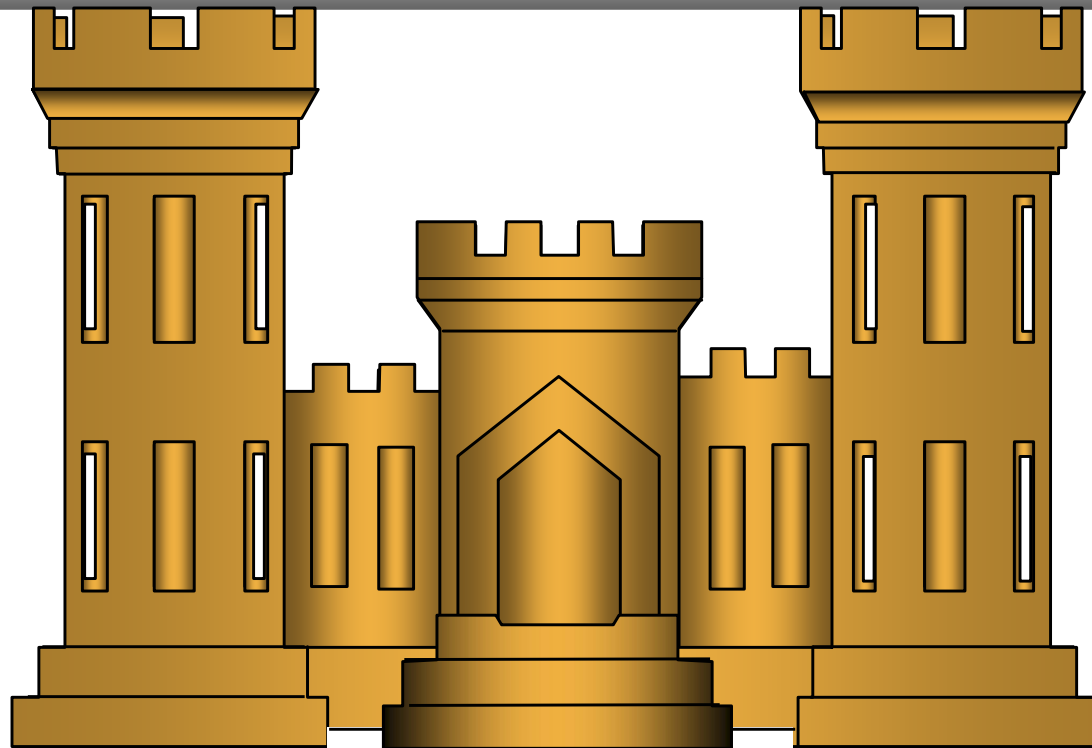


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# Mobile District

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