Draft

ECONOMIC ANALYSIS WORK PLAN
SAVANNAH HARBOR EXPANSION PROJECT
DEEP-DRAFT CHANNEL IMPROVEMENTS

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I. INTRODUCTION

Savannah Harbor was last deepened subsequent to the Corps of Engineers 1992 Feasibility Study. In 1998, the Georgia Port Authority published a Feasibility Study, and deepening to no more than 48 feet was authorized by Congress, subject to the requirements in the October 1999 Chief's Report.

In order to address the economics, the Savannah District, U.S. Army Corps of Engineers, is proposing to accomplish the economic studies under contract. This document provides a detailed plan of work for the items required to meet the Federal standards for NED economic analysis, as well as to answer questions or resolve issues that have been raised by project stakeholders. The detailed studies proposed in this plan of work are sufficient to accurately measure NED benefits, as well as to provide professional assessments of the state of the industry and of Savannah's competitive position within the South Atlantic port range.

The Project Guidance Memorandum (dated 31 October 2002) from the HQUSACE specifies that both the Trade Forecast and Fleet Forecast need to be revised. New analyses are proposed for both areas, as well as in-depth multiport and regional analyses, to document the economic viability of the expansion project. The interest in a regional "superport" expressed by some in the environmental community is an interesting concept and one that is compatible with the proposed multiport analysis. Although the viability of this concept is uncertain, the proposed Regional Analysis can satisfy one of the major questions raised by project stakeholders. The PGM is also specific in requiring a proper incremental analysis of the proposed alternatives, in order to formulate the most cost efficient plan. The work proposed herein supports that requirement, specifically in the methodology for benefit calculations. The proposed model will be developed so that all data is analyzed in one-foot increments. This will allow the District to aggregate at whole feet, to analyze possible alternative channel depths or features.

A new NED benefits model will be produced that conforms to Corps of Engineers Deep Draft Planning Guidance. This model will enable the Savannah District's economists to use the data they have already collected, along with additional data, to analyze the NED benefits of the proposed expansion project. Development of the benefits model will be coordinated with PMI through SAD through regular interim milestones. Training in the use of the model is also included in this deliverable.

In summary, the work plan provides the products necessary for a successful reanalysis of the expansion project economics and will contribute to a much greater understanding of the container trade in the South Atlantic port range.

II. COMMODITY PROJECTIONS

INTRODUCTION

Commodity projections constitute one of the major inputs to harbor improvement studies, typically having a direct effect on NED benefits based on the growth and timing of future benefiting cargo volumes. The nature of commodity forecasts is long term, spanning upwards of 50 years. Although most of the NED benefits accrue within the first two decades of the inception of projects, from the standpoint of discount rates and net present value this is still a substantial period of time for forecasting. Traditionally, most forecasts range in duration from three to five years upwards to a decade. The long-term forecasts necessitated by the large span of useful lives of deep-draft harbor improvements and the uncertainty of world trade require that commodity projections be carefully documented with respect to assumptions, data inputs, and interpretation of outputs. Sensitivity analysis is a critical component of all forecasts because of the underlying assumptions that they inherently reflect.

WORLD TRADE FORECASTS

Global models and databases designed to project trends in growth, industrial development, and international trade flows are used by different vendors for a wide range of products, from chemicals to computers. Forecasts based on these models have guided government policies in measuring international trade competitiveness as well as in sizing global markets. The most common global trade forecast models cover about 85 countries and regions in a matrix that would exceed 7,000 cells (85*85 = 7,225). The trade forecasts cover 80 commodities that can be aggregated. The output includes total ocean tons, containerizable tons, and 21 equivalent units (TEUs). The current forecasts extend to 2015 and can be expanded to 2050 based on long-term trends.

U.S. TRADE FORECASTS

The global trade models usually allow for the U.S. to be represented by regions (approximately six) that reflect the principal coastal ranges such as North Atlantic (Maine through Virginia), South Atlantic, Gulf Coast, Pacific South, and Pacific North. National waterborne coastal trade share forecasts were initiated by DRI/McGraw-Hill (DRI) for the Institute for Water Resources (IWR) as part of a U.S. trade forecast. The capability to disaggregate U.S. trade flows to regional levels remains inherent in the models. A trade flow forecast for the South Atlantic (excluding Norfolk) is the normal output of these regional (U.S.) models of waterborne world trade flows.

The South Atlantic waterborne trade forecast (excluding Norfolk) can be used as the basis for the multiport projections. Alternatively, if Norfolk is included in the multiport analysis, the South Atlantic will have to be augmented by the inclusion of Norfolk directly as a part of the regional forecast or indirectly by adopting a North Atlantic Coast projection to the traffic base of Hampton Roads. Regardless of the approach, the world trade models applied to the U.S. generate regional (coastal) projections that embrace multiple ports.

SAVANNAH HARBOR FORECASTS

None of the global and U.S. trade models are directly applicable at the port level. There has been some discussion at IWR about developing a methodology to disaggregate regional (coastal) waterborne trade projections to local ports as part of a top-down approach to local harbor projections while maintaining consistency within a port (coastal) range.

The common approach is to disaggregate regional (coastal) shares to the ports based on existing and projected market shares of ports and based on applying the regional coast cargo growth rates to port traffic. The allocation process is subjective and suggests that more than one approach can be used to apply the regional growth in tons and percentages of the traffic at particular ports. There should be consistency between the approach taken for Savannah Harbor as a subset of the South Atlantic and similar disaggregations to other competing ports for the multiport analysis. Fortunately, there are customs district data for the ports that can be used to validate top-down disaggregations of coastal data to local levels. The Savannah Customs District includes Savannah, Georgia, and Wilmington, North Carolina.

MILESTONES AND ELAPSED TIME

Task	Duration (weeks)	Elapsed Time (weeks)
1. World Trade Waterborne Forecast	8	8
2. U.S. Trade Waterborne Forecast	4	8
3. South Atlantic Region Waterborne Trade Forecast	4	12
4. Savannah Harbor Waterborne Trade Forecast	4	16

DELIVERABLES

Each of the four tasks would constitute a deliverable (draft report), except tasks 1 and 2, which would be performed concurrently. The deliverables would contain technical documentation as well as all assumptions used to develop the forecasts. Major assumptions will be identified and subjected to a sensitivity analysis. There would be a total of three deliverables that would constitute a final report based on responses to comments. It is suggested that checkpoint meetings be held at the conclusion of tasks 2, 3, and 4, corresponding to weeks 8, 12, and 16 (elapsed time), respectively.

III. VESSEL FLEET FORECASTS

INTRODUCTION

Vessel fleet forecasts are analogous to commodity forecasts in that they project the number and size of vessels and related sailing drafts that are expected to call under without-project and with-project conditions. Vessel fleet forecasts reflect trends in markets and vessel technology, including size, as well as vessel operations and itineraries.

Typically, vessel fleet forecasts use a top-down approach beginning with a world fleet and extrapolating down to the port fleet or a bottom-up approach moving from a port fleet to a world fleet. Fleet forecasts are usually bounded by the two populations with respect to world and port fleet characteristics. The objective of fleet forecasts is to determine the extent to which the vessel size trends observed in the world and port fleets are reflected and transcended in each other.

If the port fleet is a perfect subset of the world fleet, the trends and vessel fleet size distributions will be the same. However, in most instances the port fleet reflects local or regional conditions and vessel size deployments that are not consistently exhibited by the world fleet. Therefore, the relevant world fleet with respect to the port fleet must be identified and used as the basis for discerning trends germane to the subset of the world fleet.

WORLD FLEET - EXISTING

There is a variety of data on the population of the existing world fleet. Sources such as Clarkson and Lloyd's will be used to display world fleet size characteristics and trends. Of particular interest will be documented changes in the world fleet from the previous Savannah Harbor vessel fleet forecasts.

WORLD FLEET – PROSPECTIVE

Short-term world fleet trends are usually based on new building orders and other secondary information. These trends will be compiled and assimilated from various secondary sources. The nature of these trends is short term, frequently covering the span of orders for new buildings and some near-term extrapolations.

SAVANNAH HARBOR FLEET – EXISTING

Data compiled by the Savannah District based on the Savannah Harbor Pilots Association will be used to display the characteristics of the vessel fleet calling Savannah. It is expected that the District data will reflect detailed vessel characteristics for the past three calendar years (2001 through 2003) for the following: (1) vessel name; (2) date; (3) time; and (4) draft. These data will be matched with Clarkson vessel characteristics to include: (1) vessel type; (2) age (DOB); (3) length (LOA); (4) length between perpendiculars (LBP); (5) breadth; (6) draught; (7) deadweight tons (DWT); (8) gross registered tons (GRT); (9) TEU rating; (10) service speed; (11) engine manufacturer; (12) bunker capacity; (13) fuel consumption; (14) hull number; (15)

horsepower, and (16) tones per inch immersion factor (tpi). The crewing complement for the vessel types and sizes will also be specified based on IWR vessel characteristics and vessel operator interviews. A sample of vessel tpi factors will be compared with estimated tpi based on formulae compiled by the Jacksonville District as a measure of quality control of the data in instances where it is available and to supplement missing tpi values when it is not compiled and/or reported.

Cellular vessels will be described by the additional characteristics of the vessel line calling Savannah and the "service" represented by that line/vessel. "Service" refers to the domestic U.S. ports and world area(s) and major ports of vessel itineraries represented by particular lines and vessel calls at Savannah. For example, it is important to identify vessel calls at Savannah and Panama Canal transits due to the existing Panamax vessel size constraints of the Canal. Similarly, it is important to identify whether Savannah calls are first or last with respect to U.S. domestic and foreign ports.[1]

The container liner vessel service patterns are particularly important with regard to trends in vessel deployments such as service to the U.S. East Coast and Savannah by way of the Panama Canal or Suez Canal from Asia. Consequently, the container liner services calling Savannah should be described in terms of distinct service patterns for the time in which the line's services were reasonably stable.[2] In some instances, lines and service patterns with respect to vessel deployment will be stable for a considerable length of time (for example, rotations between Northern Europe and the U.S. East Coast or the Mediterranean and the U.S. East Coast). In other instances, there will be changes in lines and service patterns calling Savannah such as restructuring of alliances and vessel sharing arrangements.[3] In all instances, the objective of linking the service pattern to the vessels is to identify the vessel fleet characteristics for particular world areas reflected by service patterns and ports as a linkage to the commodity forecast for world trading partners.

SAVANNAH HARBOR FLEET – PROSPECTIVE

Interviews with vessel operators, particularly liner services, will be held to determine pending or prospective changes in vessel deployment with respect to size, port calls, and service patterns. Vessel operator plans to enlarge the fleet by size (capacity) or number of calls, including new or changed service patterns, will be incorporated into the baseline fleet. It is expected that the vessel operator interviews will be conducted with local representatives or, where appropriate, with domestic offices to determine the likelihood of planned or prospective changes in fleet characteristics.

WORLD FLEET PROJECTIONS

[1] Most liner container services at U.S. ports have multiple port calls on the same coast with occasional calls on different coasts.

[2] It is recognized that the service patterns of individual lines are in some instances contingent on consortiums and alliances, including space-sharing arrangements that tend to blur the distinctions between lines, vessels, and services across entities. Moreover, changes in these commercial arrangements can have a wide range of impacts with respect to the services offered.

[3] There is at least one major disruption to lines and service patterns calling Savannah from the breakup of the "Grand Alliance" consortium of major liner carriers calling the U.S. East Coast.

An unconstrained world fleet projection assumes a ubiquitous fleet that can transcend the globe. For certain vessels this is true. For example, most general cargo and roll-on-roll-off (RORO) vessels can transcend the globe unimpeded by geographic barriers such as the Panama Canal. However, a subset of the bulk sector and container vessel fleet cannot be deployed in unrestricted itineraries. The restriction of the Post-Panamax container vessels to regional services that do not transcend the Panama Canal is indicative of the need to regionalize container vessel world fleet forecasts.

The regionalization of world container fleets is accomplished by stratifying fleet size by major service patterns (deployments) for world areas served and adjusting service patterns for shifts in volume, markets, operations (transshipment) or impediments to vessel deployments such as the existing Panamax lock size constraints of the Panama Canal. For example, typical container vessel service rotation (round trip or "pendulum") patterns directly calling Savannah would include: (1) Far East, U.S. West Coast, Panama Canal, U.S. East Coast; (2) Far East, Panama Canal, U.S. East Coast; (3) Far East, Panama Canal, U.S. East Coast, Northern Europe and or Mediterranean, Middle East; (4) Mediterranean, Middle East or Northern Europe, U.S. East Coast; (5) U.S. East Coast, East Coast South America; and (6) U.S. East Coast, West Coast South America. However, there are other container deployments that could also affect Savannah with respect to transshipment services and links to Savannah through hub ports such as Kingston, Freeport, and the Caribbean, including Panama.

One very important element of the vessel fleet forecast is the potential occurrence of an enlarged Panama Canal for Post Panamax container vessels. Currently, no Post Panamax vessels "around the world liner services" are provided because of the Panamax lock size constraints. Post Panamax vessels must either operate in a "pendulum" fashion, such as the Far East to U.S. West Coast or pivot at or before the Panama Canal. In some instances, these vessels will pivot at transshipment ports adjacent to the Canal; in other instances lines have determined that existing volume and deployment do not warrant serving Panama or trans-Atlantic crossings. The restrictions on Post Panamax vessels and their regionalization would be effectively erased by expansion of the Panama Canal lock sizes. Consequently, a vessel fleet forecast should reflect the probability that the Panama Canal lock constraints that preclude Post Panamax vessels could be eliminated in the next decade.

SAVANNAH HARBOR PROJECTIONS – WITHOUT PROJECT

The Savannah Harbor share of the relevant world fleet is based on the service patterns calling and expected to call the U.S. East Coast, including Savannah. Unlike bulk vessels, general cargo ships, including containers, usually make multiple calls along a coast. For example, common U.S. East Coast container vessel port calls are New York, Norfolk, and Savannah or New York, Norfolk, and Charleston. The container vessel service patterns calling the U.S. East Coast, South Atlantic, and Savannah will be used to derive changes in the size distribution of the vessel fleet for the without-project conditions at Savannah Harbor. To the degree that Post Panamax vessels would call the U.S. East Coast for particular service patterns (for example, South East Asia/ Mediterranean and U.S. rotation), these vessels would be light loaded at Savannah or alternatively call a competing South Atlantic port with greater depth.

Without-project conditions for the vessel fleets will reflect an extension of the existing fleets for the major categories of vessels that would benefit from improvements to Savannah Harbor. For container vessels that make multiple port calls along the US East Coast the without project vessel fleet will reflect the current and expected fleet distribution. To the extent that there may be navigation constraints other than draft affecting vessels such as beam and two-way passages, it will be necessary to derive a forecast of affected vessels exclusive of draft considerations. Similarly, to the extent that there are safety factors regarding hazardous materials, such as expanded use of LNG fleet calls at Savannah, it may be necessary to include the universe of affected vessels regardless of draft.

SAVANNAH HARBOR – WITH PROJECT

Harbor improvements, particularly deepening, can affect the use of existing vessels or deployment of larger vessels. Under with-project conditions, the size and number of vessel calls will reflect the degree to which existing or larger vessels can be cost effective. For the bulk sector, this is tantamount to replacing the constrained fleet with larger vessels as a share of the relevant world fleet.

For container vessels, the service patterns primarily determine the size distribution of the fleet, irrespective of absolute constraints such as the Panama Canal. Under with-project conditions, the effect of the existing fleet is to have more efficient use, particularly if Savannah is a first or last port of call that is otherwise not affected by the Panama Canal lock size constraints. It is possible that under with-project conditions vessel deployments and service patterns could change, which would affect the size of ships calling Savannah. For example, if a service pattern calling the U.S. East Coast has Post Panamax vessels, it is likely that this service would not call Savannah Harbor except under the with-project conditions. Therefore, under the with-project conditions, there is a potential for shifts in port deployments or new service patterns for container vessels that would be shared with other U.S. East Coast ports.

MILESTONES AND ELAPSED TIME

Task	Duration (weeks)	Elapsed Time (weeks)
1. World Fleet Existing	3	3
2. World Fleet Prospective	3	6
3. Savannah Harbor Fleet Existing	3	9
4. Savannah Harbor Fleet Prospective	3	12
5. World Fleet Projections	4	16
6. Savannah Harbor Fleet Projections Without Project	4	20
7. Savannah Harbor Fleet Projections With Project	4	24

DELIVERABLES

Each of the seven tasks would constitute a deliverable (draft report) for review and comment. There would be a total of seven interim deliverables that would constitute a final report based on

responses to comments. It is suggested that checkpoint meetings be held at the conclusion of tasks 4, 6, and 7, corresponding with weeks 12, 20, and 24 (elapsed time), respectively. Total elapsed time for all of the tasks is 24 weeks, exclusive of review and responses to Corps comments and not including internal technical review.

IV. BENEFITS CALCULATION METHODOLOGY AND MODEL

INTRODUCTION

The NED benefits from a deepening project are primarily captured in reductions in vessel transportation costs. Unit cost savings to shippers are provided by more efficient loading of the existing fleet, along with the use of larger, more space efficient vessels. These savings are assumed to be passed on to consumers in the form of lower prices for imported or exported goods. Additional savings result from elimination of tidal delays, reduced "light loading," changes in the origin-destination mix, and other efficiencies that can be related to the deepened channel.

The vessel fleet forecast and commodity trade forecast are critical elements of the transportation cost savings calculations because they define the ton-mile-cost relationships used later in the benefit calculations. Thus, the benefit methodology must respond to changes over time as the fleet and trade volume change. Specific trade routes must be modeled for trade flow shifts over time, and the status of the Panama Canal is of critical importance. If the canal is enlarged to accommodate Post-Panamax vessels, the impact on Savannah deepening benefits could be pronounced. Because so much of Savannah's traffic is of Far East origin, the port would increase its utilization with a more efficient canal. How this issue will be handled will be the subject of future discussions with the Savannah District and the project sponsor; but at a minimum, a probability function should be included in the benefits model to cover the possibility of an enlarged Panama Canal. The potential for an expansion of the Panama Canal will become a part of the sensitivity analysis to reflect uncertainties with respect to the both the probability of the event and the timing of its occurrence in the next decade or beyond.

An integral feature of the economic analysis is to analyze all proposed alternatives incrementally, to ensure that the most efficient alternatives are selected for final analysis. The benefits model will capture and utilize vessel data in one-foot increments, to facilitate this analysis. Thus, the vessel transportation cost savings will be shown for each foot of draft over the relevant range, facilitating a true incremental analysis of possible alternative channel depths and features.

PREVIOUS MODELS AND STUDIES

The 1992 Savannah Harbor Deepening Analysis calculated transportation cost savings for containerships and dry bulk vessels at one-foot draft increments. It is probable that there are no containerships for every one-foot draft increment calling Savannah (that is, there may be gaps in the draft of the current fleet, in that some increments might not be represented in the fleet). Nevertheless, the 1992-style analysis of benefit calculations for "synthetic" ships could be used again. This method essentially uses linear interpolation to one-foot increments of the vessels listed in the IWR Deep Draft Vessel Cost data. Vessel operating costs, immersion factors, TEU or DWT capacity, and operating costs are thereby calculated by one-foot increments over the relevant range of vessel drafts to produce a synthetic fleet. The carrying capacities of these synthetic vessels are also the result of interpolations, so that the vessel draft capacity-operating cost relationships established by IWR remain intact. Regression analysis can also be used to determine these synthetic vessel characteristics. A similar approach was used by Booz-Allen-

Hamilton in the July 1998 Feasibility Analysis. The only difference is that some of these synthetic, or calculated, vessels may not actually be represented in the world fleet (or in the Savannah fleet) but exist as part of a universe of all potential benefiting vessel drafts to be populated by the Savannah fleet forecasts (without and with project conditions). This methodology is more for computational purposes than for calculating benefits to actual ships. This approach was used in both the 1992 and (it is believed) the 1998 analyses. The Fleet Forecast, however, will display vessel calls, by actual (or forecasted) vessels. These vessels may not correspond to the one-foot differences in draft. They may in fact be clustered at a fairly narrow range.

A second possible approach would be to use the actual fleet distribution in calculating benefits. This approach is easier to understand, conceptually, but may have gaps in the distribution of vessel drafts. This is not a flaw, however. The projected fleet would be used for calculation of the future transportation cost savings for each alternative, in a foot-by-foot incremental analysis. Given the stringent review expected for this study, this may be a better alternative. GEC will work with the Corps to make this decision early on in the study process.

METHODOLOGY

The methodology envisioned is a Microsoft Excel spreadsheet model, with live links to Microsoft Access databases, to facilitate the use of the data collected by the Savannah District on vessel sailing drafts and underkeel clearances. The model will allow the District to calculate the transportation savings for each major trade route and vessel type, by draft increment or TEU/DWT increment, at 10-year forecast intervals. These can be compared to the future without-project condition model to compute the benefits. Tidal delay benefits will also be included in the model, with transportation savings calculated for the same ship parameters used to compute transportation savings. Inbound and outbound tidal delays will be calculated separately, by trade route. The benefits model can also include an option to allocate traffic to another Savannah River location for incremental analysis.

Other potential delay savings (or costs) would result from the possibility of one-way traffic with a design vessel in the channel. Benefits for passing areas need to be calculated based on expected harbor operations. This type of delay analysis should be quantified using a queing model. A spreadsheet queuing model will be developed and used as a screening tool to determine if more detailed queuing analyses are required for possible one-way traffic delays, potentially requiring the use of the IWR "Harbor Sim" or similar traffic delay model. A more detailed queuing analyses is not included in this plan of work because it would require a significant expenditure and time for development and testing. The District should recognize, however, that it may later become necessary if the one-way traffic issue becomes critical from the standpoint of delays to vessels.

It is envisioned that the spreadsheet model benefit outputs will be transferred to a Microsoft Access database so that all post-model calculations can be made externally to the spreadsheet model itself. This allows economists to better focus on the data used in each model run and creates a more transparent audit trail. The model will allow runs at alternative project depths to facilitate the required incremental analysis of alternatives.

Since Risk and Uncertainty are critical elements in projecting benefits over a long forecast period, Sensitivity Analysis is a key need in the economic analysis. The model will be structured so that the NED benefits can be readily evaluated under assumptions different from those used in screening the alternatives. Scenarios such as alternative fleet forecast assumptions, different trade forecast conditions, or different operating parameters can all cause changes in the project formulation, so it is imperative to include the ability to quickly change major assumptions in the economic analysis to evaluate the effects of such changes. This can be done by including sensitively parameters in the model, or by altering the input data and rerunning the model to calculate the effect.

Once the logic has been clarified, GEC and the District should confer with the South Atlantic Division and Headquarters' review staff to ensure agreement with the conceptual framework of the analysis. Following this conference, any final changes will be made by GEC, and basic model coding will be accomplished and tested. Subsequent to this testing, the model will be turned over to the District to be populated with data. GEC will assist the District with training in the use of the model, as needed.

DELIVERABLES

GEC will produce and deliver a tested basic spreadsheet model of vessel costs, by trade route and ship size, that is capable of calculating the transportation cost savings and tidal delay savings accruing to the proposed deepening. The model will include a sensitivity test feature. Training of the District staff in the model's use will also be included.

Extensive coordination with the Project Delivery Team is an additional work item. Weekly meetings and other conferences will be attended as needed over the next year. Travel expenses, if needed, would be additional. This item is estimated at $15,000.

MILESTONES AND ELAPSED TIME

Task	Duration (weeks)	Elapsed Time (weeks)
1. Literature Search for New Models	2	2
2. Examine Data Sets for Model Use	1	3
3. Develop Model Logic Flowchart	4	7
4. Develop Test Models for Specific Parameters	4	11
5. Develop "Draft" Level Model	4	15
6. Obtain Feedback from Corps HQ	2	17
7. Incorporate Feedback into Draft Model	2	19
8. Develop Working Model	4	23
9. Test Runs to Validate Model	2	25
10. Train District Staff in Model Use	3	28*

*Although the total is seven months, it is possible to conduct some tasks simultaneously (doubling up on assigned personnel). A more realistic timeframe is 5 ½ to six months total elapsed time.

V. MULTIPORT ANALYSIS

INTRODUCTION

Multiport analysis is a systematic assessment of the effects of the with-project condition on other ports. It includes the effects of authorized projects at other ports on the with- and without-project conditions. Conceptually, multiport analysis is an adjustment to NED benefits that includes systems analysis of port competition. In actual practice, multiport analysis is a systematic comparison of alternative transportation costs for cargoes that could use the project port or be handled through alternative ports.

The objective of multiport analysis is to allow the planner to adjust the traffic forecast for shifts of cargoes among alternative ports in response to the with-project condition at the port of study, as well as other authorized projects with local cooperation agreements at alternative ports. Since the purpose of multiport analysis is to account for changes in the with-project condition traffic forecast, only commodities affecting NED benefits and handled by alternative ports for competitive hinterlands must be analyzed. The entire universe of cargoes handled by the project port is seldom subject to a multiport analysis. Only commodities that could be affected by projects at the port or at alternative ports that would affect the traffic forecasts and benefits should be considered. Therefore, the purpose and scope of multiport analysis is usually much more limited and well defined than is suggested by the words "multiport analysis."

METHODOLOGY

Multiport analysis consists of a series of sequential steps. Figure 1, Flowchart of Deep-Draft Navigation Benefit Evaluation Procedure (Multiport Analysis), is an application of the P&G's nine steps for multiport analysis. Conceptually, multiport analysis entails an extension of the study scope to include other ports. Multiport analysis consists of commodity flows in competitive (overlapping) port hinterlands.[4]

The P&G study steps are followed as the tasks to be performed for a multiport analysis of Savannah Harbor. These tasks will constitute the steps to be executed for a multiport analysis and should each represent a set of deliverables for scheduling and review purposes.

DETERMINE ECONOMIC STUDY AREA

For a multiport study, the common port hinterlands are delineated by analyses of competitive cargoes. It is envisioned that a multiport study for major container ports along the U.S. South Atlantic Coast would constitute the economic study area, including ports at Hampton Roads, Charleston, and Jacksonville and a domestic hinterland that extends from New Orleans upward along the Mississippi River that would include Memphis, St. Louis, and Chicago and major urban areas east of these locations. The multiport alternatives would include a potential new super port on the Savannah River in South Carolina.

[4] *National Economic Development Procedures Manual, Deep Draft Navigation*, pp. 155 - 156.

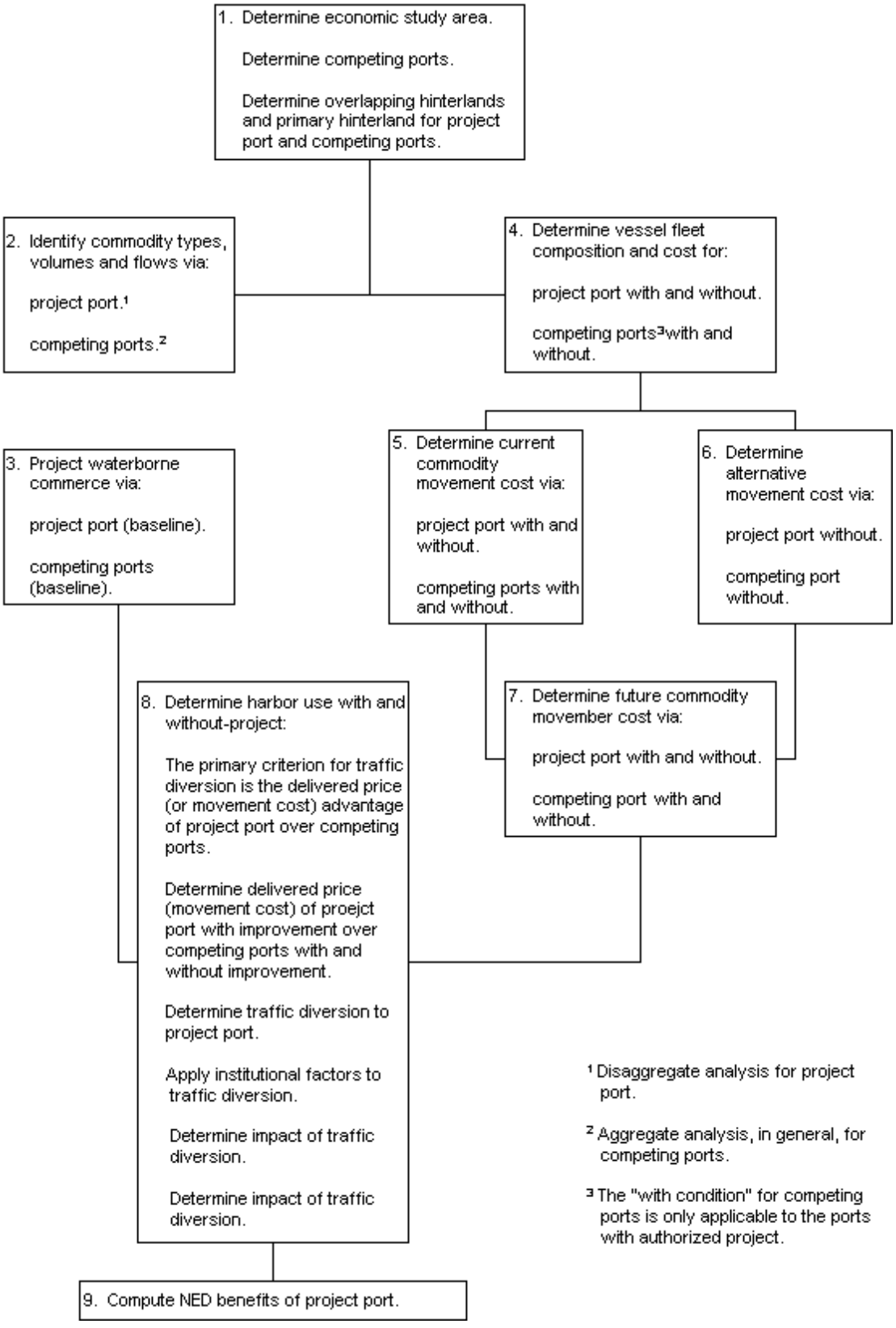

Figure 1. Flow Chart

IDENTIFY TYPES AND VOLUMES OF COMMODITY FLOW

The major competitive cargoes for overlapping hinterlands would exclude local imports and exports and most likely focus on containerized imports that move by rail or truck to interior hinterland destinations greater than 250 miles from Savannah. The assumption is that import cargoes dominate the shared hinterlands of these ports, whereas exports tend to be less substantial or more localized in nature. Of particular interest will be the Norfolk Southern and CSX intermodal rail terminals served by Savannah compared to other ports in determining the competitive rail hinterland for intermodal movements.

The Port Import Export Reporting Service (PIERS) data can be used for containerized imports to identify (with some exceptions) a sample of domestic destinations of imports.[5] Usually the PIERS data will require cleaning and review to determine the accuracy and completeness of the major inputs with regard to domestic destination. It is suggested that a sample of the PIERS data be used to reflect seasonal commodity flows and volumes. The available data regarding record size of individual shipments and number of records (shipments) for multiple ports is voluminous; consequently, the sample timeframes should be carefully identified to avoid a large cumbersome database of repetitive movements that does not add to the rigor of the analysis of overlapping (competitive) hinterlands.

Based on the PIERS data and port and vessel operator interviews, the shared hinterland can be determined with regard to major markets. It is suggested that the markets be defined at the three-digit zip code level to determine domestic transport costs for rail intermodal and truck.

PROJECT WATERBORNE COMMERCE

The major trade route cargo volumes for the competing ports will be determined for the overlapping hinterland, excluding local or other traffic deemed to be relatively captive to the port. The cargoes will be projected based on South Atlantic Coast trade forecasts (competing ports) and Savannah port forecasts.

DETERMINE VESSEL FLEET COMPOSITION AND COST

Detailed vessel fleet characteristics for Savannah will be the basis for fleet costs. For competing ports, the vessel fleet costs will also be developed using the applicable types and sizes from Savannah Harbor. The vessel costs will be developed for incremental voyage distances of major trade routes. Vessel costs will include all related expenses such as pilotage, tug assistance, and port costs.

DETERMINE CURRENT COST OF COMMODITY MOVEMENTS

Vessel and related port costs will be linked to domestic transport costs to develop a least total cost throughput for cargoes and hinterlands served by rail intermodal and truck. The delivered

[5] Domestic origins of containerized export traffic are usually reported with much less specificity due to the use of intermediaries and non-disclosure of shipper locations.

price will be developed for without- and with-project conditions to reflect the incremental changes in the competitive position of Savannah Harbor under the with-project conditions.

DETERMINE CURRENT COST OF ALTERNATIVE MOVEMENT

The steps will be repeated for the alternative ports to link vessel and port costs to hinterland rail intermodal and truck costs.

DETERMINE FUTURE COST OF COMMODITY MOVEMENTS

The incremental costs between ports and overlapping hinterlands will be developed based on the differences between the Savannah Harbor with-project condition and competing ports. It is expected that there may be instances in which containerized cargo moves through Savannah or competing ports at higher costs than the "least total cost" due to other considerations such as transit time or institutional features (volume incentive rates rather than costs). In consultation with port traffic and marketing staff, efforts will be made to explain anomalies in the otherwise least total cost framework presumptions of multiport analysis.

DETERMINE USE OF HARBOR AND CHANNEL WITH AND WITHOUT PROJECT

Based on refinements to the previous task, this task will develop the delivered price advantage of Savannah over competing ports for the with- and without-project conditions. Carrier and port interviews will be used to identify competitive ranges for potential cargo diversions based on least total cost analysis. The interviews will also focus on institutional and service (non-cost) considerations that may influence traffic to shift (or not shift) to Savannah based on the with-project conditions. A sensitivity analysis will be conducted with respect to critical assumptions about institutional and service considerations.

COMPUTE NED BENEFITS

NED benefits for the net incremental cost savings will be computed for traffic diversions to or from Savannah from competing ports based on the with-project conditions at these ports.

MILESTONES AND ELAPSED TIME

Task	Duration (weeks)	Elapsed Time (weeks)
1. Determine Economic Study Area	1	1
2. Identify Types and Volume of Commodity Flow	3	3
3. Project Waterborne Commerce	3	6
4. Determine Vessel Fleet Composition and Cost	3	9
5. Determine Current Cost of Commodity Movement	3	12
6. Determine Current Cost of Alternative Movement	3	15
7. Determine Future Cost of Commodity Movements	3	18
8. Determine Use of Harbor and Channel With and Without Project	4	22
9. Compute NED Benefits	2	24

DELIVERABLES

Each one of the seven tasks would constitute a deliverable (draft report), except tasks 1 and 2, which should be performed concurrently. There would be a total of eight interim deliverables that would constitute a final report based on responses to comments. It is suggested that checkpoint meetings be held at the conclusion of tasks 2, 7 and 9, corresponding with weeks 3, 18, and 24 (elapsed time), respectively. Total elapsed time for all of the tasks is 24 weeks, exclusive of review and responses to Corps comments and not including internal technical review.

VII. REGIONAL PORT ANALYSIS

INTRODUCTION

Public review comments and items of litigation interest resulting from the 1998 Feasibility Study by GPA were highlighted by a request for a Regional Port Analysis in the final analysis of the Savannah Harbor Expansion. Project stakeholders felt that there should be a study of allocating Federal improvement funds at one regional port in the South Atlantic range, rather than a perceived push to deepen several ports. It was argued that this would make sense economically (since fewer funds would be expended) and environmentally (since the impact of dredging would only occur at one port rather than at several).

PORT CAPACITY ANALYSIS

For the purposes of this analysis, several factors need to be examined. First is the capacity of the various container-capable ports in the South Atlantic. This will require more than just a literature search to determine a list of crane capacity, berthing, marshalling space, etc. These factors need to be considered, but must also be examined in light of the expected future traffic in the region. The throughput capacity, along with storage, port congestion, infrastructure availability, and other factors, will need to be inventoried and analyzed. Desktop models to assist the Corps economists in calculating various capacity measures can be readily developed. These would probably be straightforward spreadsheet type models of the various metrics involved in evaluating throughput capacity, such as berth, yard, and gate capacities, as well as some landside connections. The port capacity analysis would include the potential new super port on the Savannah River in South Carolina.

PORT INFRASTRUCTURE SURVEY

The availability of infrastructure is a critical decision variable for shipping lines in their service decisions. A comprehensive assessment of available infrastructure at the selected ports in the region must be made, showing comparisons of channel dimensions, berthing, crane availability, rail and truck service, marshalling space, storage facilities, gate availability, and container service facilities. This assessment will provide an overall view of the relative position of the regional ports in terms of their ability to handle increasing volumes of container traffic.

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HUB AND SPOKE ANALYSIS

An examination of the hub and spoke system must also be made. Although these operations are used to some extent, it is not clear that they will be the future for this port range, or will only be in limited use. This ties back into the trade forecast for the South Atlantic, which is a byproduct of both the trade forecast and multiport analysis for the Savannah Harbor Expansion. Extensive discussions with shipping lines and other industry professionals will be required to evaluate the future of this type of operational model. If the hub and spoke model is used, there may be a significant unintended impact in the number of calls required by smaller feeder ships, rather than reliance on larger vessels. Such things as port congestion, increased risk of collision or toxic spills, and groundings must all be weighed against the use of fewer larger vessels to move the

forecasted cargo. This analysis will be augmented by the use of “order of magnitude” cost models of these operations, which will allow the regional analysis to be tied back into the Multiport Analysis for overall consistency.

ENVIRONMENTAL SURVEY

Environmental constraints will also need to be studied. It is critical to examine the availability of suitable land for the large increase in landside infrastructure that would be required in order to handle the additional traffic, as well as to assess whether it is physically and economically feasible. An inventory and assessment of environmental constraints will be required for each port under consideration in order to make judgments of expansion potentials. Landside potentials and constraints on channel improvement must be identified and displayed for all ports in the range. Hinterland access must also be considered. One port could screen very well based on criteria immediately in the vicinity, only to fall out due to poor access to the hinterland of the range of ports. Finally, an assessment must be made of the secondary environmental impacts incurred by port expansion, both at the “superport” and at an array of improved ports. Increased traffic, congestion, and degraded air and water quality are all potential impacts that need to be identified to make sense of a decision to ration port improvement funds. These impacts would not be identified at an EIS or EA level. Rather, this study is intended to provide an array of the kinds of possible impacts that would need to be evaluated in detail if a regional port were to be proposed.

INSTITUTIONAL ANALYSIS

An institutional analysis is also called for, at least in rudimentary form. This would focus on "critical factors" enabling or inhibiting a port to expand, including community acceptance. An institutional analysis would have been critical to the acceptance of expansion at the Wando Terminal, for example. The institutional analysis would produce some comparative matrices for the "critical factors" for port expansion, some of which are very innocuous (for example, Charleston has limited or constrained rail access, whereas Wando has none).

The institutional analysis would approach the problem much as a steamship line would, looking at such thing as space, the ease and cost of in and out both berth and land, and the flexibility for expansion. The institutional analysis would concentrate on deal makers and deal breakers, some of which are evident (such as rail intermodal, dredge disposal, and bridge clearances). The political acceptability of improving or not improving may make any attempt to ration improvements infeasible. Furthermore, since most ports in the region depend on state funding, it must be clear that the “chosen” state would be both able and willing to fund a regional “superport.” Similarly, the shipping industry must be persuaded that rationing of port improvement would better serve their needs. The industry might be better positioned to continue the status quo rather than adopting a rationing scenario. These factors must all be included in the regional analysis for a balanced picture to emerge.

DELIVERABLES

The Regional Port Analysis will provide a series of sub-products, or topical reports and assessments, as well as an overall summary assessment for developing a regional "superport." The summary assessment would blend the conclusions reached in each of the sub-reports into a comprehensive evaluation of the regional port concept. Desktop models for evaluation of throughput capacity would also be provided, if desired.

MILESTONES AND ELAPSED TIME

Task	Duration (weeks)	Elapsed Time (weeks)
1. Port Infrastructure Survey	8	8
2. Desktop Capacity Models	4	12
3. Port Capacity Analysis	6	18
4. Hub and Spoke Analysis	4	22
5. Environmental Survey	8	30
6. Institutional Analysis	4	34
7. Summary Regional Analysis	4	38

VIII. SCHEDULE

A schedule has been developed for the economic analysis work plan of Savannah Harbor expansion project deep-draft channel improvements to reflect the five tasks: (1) commodity projections; (2) vessel fleet forecasts; (3) benefits calculation methodology and model; (4) multiport analysis; and (5) regional port analysis. The overall total task time is estimated to sixty weeks (fifteen months), beginning with commodity and fleet projections and culminating with multiport analysis and regional port analysis.

The elapsed time for each task has been extended by eight weeks to allow for review of interim products, scheduling of meetings and review of draft reports. The schedule does not explicitly include Internal Technical Review (ITR) by parties outside of the Corps unless these reviews are done concurrently with the District. The schedule does allow for review by members of the Vertical Team at Division and Headquarters.

The schedule is contained in Figure 2. The schedule reflects that the major inputs, commodity and fleet projections, can begin concurrently. Commodity projections will be an input to the fleet projections. Near the culmination of commodity projections and mid-point of the fleet projections the benefits calculation methodology and model task will be initiated. Multiport analysis will commence at the conclusion of the vessel fleet projections. The regional port analysis will commence near the mid-point of the multiport analysis.

The schedule assumes that the due date of May 2005 for the economic analysis is reasonable with respect to fully implementing and funding the completion of the five tasks over a fifteen month period in 2004 and 2005. Delays in commencing the analysis or disruptions to the continued flow of the work could result in the economic analysis requiring more than 15 months and/or exceeding the May 2005 time frame.

Task No.	Task	Elapsed Time (weeks)
1	Commodity Projections	18
2	Vessel Fleet Forecasts	26
	Benefits Calculation	
3	Methodology and Model	24
4	Multiport Analysis	26
5	Regional Port Analysis	26

Notes: Elapsed Time includes two months for review of interim and final products.

Figure 2. Economic Analysis Work Plan Savannah Harbor Expansion Project Deep-Draft Channel Improvements: Milestone Chart of Tasks