Savannah Harbor
Channel Deepening Feasibility Study
Elba Island LNG Terminal
March, 2008

INTRODUCTION

The purpose of this analysis is to examine the potential benefits to Liquid Natural Gas (LNG) tanker operations from the proposed deepening of the Savannah Harbor Federal Channel. The LNG terminal in Savannah Harbor is located along the Federal Channel on Elba Island, approximately ten miles northwest of the mouth of the river. A map of the project area showing the Elba Island Terminal is shown in Figure 1.

Methodology

This analysis calculates National Economic Development (NED) benefits in accordance with current Corps of Engineers guidance contained in ER 1105-2-100, Appendix E, Section II, Navigation (April 22, 2000), and additional guidance contained in Institute for Water Resources Report 91-R-13, National Economic Development Procedures Manual, Deep Draft Navigation (November 1991). Benefits are presented in annual terms, and are converted to average annual equivalents using the FY08 Federal interest rate for water resources projects of 4 7/8 percent. The base year of the analysis is 2015 and a 50 year period of analysis is used.

Benefits to LNG tanker operations are estimated based on information obtained through interviews with representatives of the Elba Island LNG Terminal, the US Coast Guard, the Harbor Pilots, and the Docking Pilots. Information was collected regarding frequency of LNG tanker calls, vessel dimensions, current operating procedures, current terminal features, future terminal expansion plans, likely future tanker dimensions, and the likely operating conditions that will exist if the channel is deepened. Particular emphasis was given in the interviews to understanding the current operating procedures of the LNG tankers and to understanding the scheduling practices in the port.

Benefits are calculated by comparing transportation costs for LNG tankers for the without and with project conditions. Transportation costs and project benefits are calculated in annual terms over the 50 year period of analysis. Key assumptions made in this analysis are explained in the text, and sensitivity analyses on those key assumptions are presented in the final section.

Description of Proposed Deepening Project

The Savannah Harbor Expansion Project consists of the proposed deepening of the Federal Channel in the Savannah River from the current authorized depth of 42 feet to an

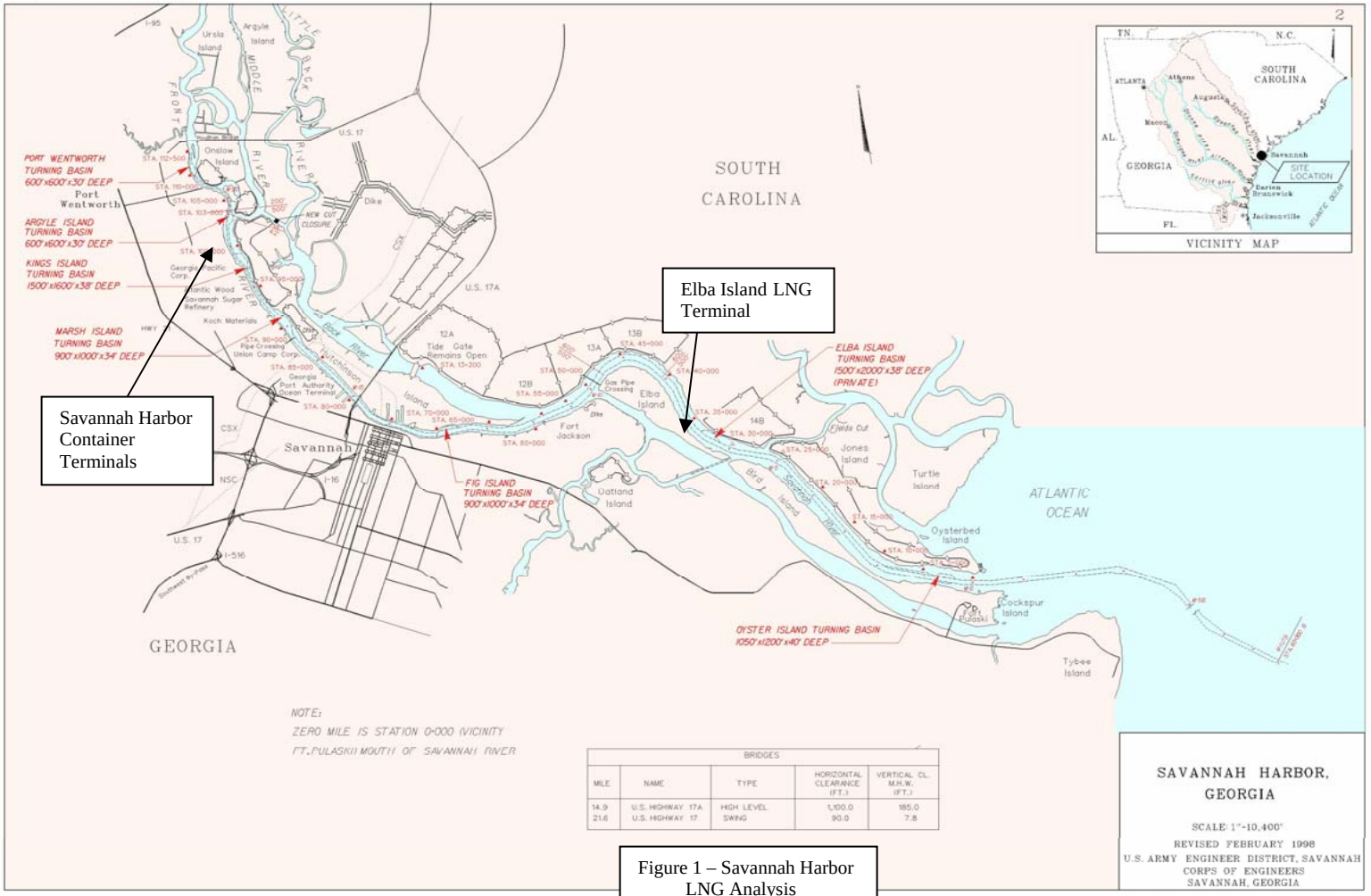

Figure 1 – Savannah Harbor LNG Analysis

improved depth of 48 feet. Channel depths in one foot increments from 43 feet to 48 feet are analyzed for economic justification and to determine the economically optimal channel depth. The LNG terminal is located on the north side of Elba Island, with the berthing area and most terminal facilities located in the central and eastern areas of the island. The existing Federal Channel passes Elba Island to the north, and extends a total of 32.3 miles from deep water to the upstream limit of the project, including 21.3 miles of river channel, 2.3 miles of jetty channel, and 8.7 miles of bar channel to deep water. The LNG terminal is located approximately half-way between the mouth of the river and the containership berths located at the upper end of the channel. The improved, deeper channel would follow roughly the same footprint as the existing channel. Specific details regarding the proposed channel improvements are contained in the main report and the engineering appendices.

The channel deepening project is being formulated primarily to accommodate deeper containerships transiting up-river beyond the LNG terminal. However, since the channel passes directly by the LNG terminal, it was determined that a separate analysis should be performed in order to determine if and to what extent a deeper channel could benefit LNG vessel operations. The benefits developed in this report are incidental to the main project benefits in that they do not require additional construction costs to be achieved.

EXISTING CONDITIONS

Elba Island LNG Terminal

The Elba Island LNG terminal is one of only four currently functioning LNG terminals in the continental US. The other LNG terminals are located at Lake Charles, Louisiana, at Cove Point, Maryland, and at Everett, Massachusetts. The Elba Island terminal had been operational in the 1970's and early 1980's, but closed in 1982 due to market conditions. However, the terminal was reactivated in 2001 and has been increasing its receipts each year since. The terminal and inland pipeline are owned by Southern LNG/El Paso Corporation. Two other companies, Shell LNG and British Gas LNG Services, have long-term leases at the facility and own and distribute the product. LNG is brought to the terminal by Shell LNG and British Gas LNG, delivered into the pipeline system, and distributed to locations in Georgia and, to a lesser extent, South Carolina.

The Elba Island Terminal currently has 4 storage tanks with a total storage capacity of 350,000 cubic meters. Recent improvements at the terminal include completed construction of a double berth slip and increased throughput capacity. These improvements are referred to as the Elba II expansion. It is expected that this expansion will allow the terminal to increase its receipts from 60 vessel calls per year currently to an estimated 118 vessel calls per year by 2009. With the Elba II expansion complete, the peak maximum throughput capacity of the terminal will be 34 million cubic meters per day.

While the Elba II expansion at the Elba Island LNG terminal is largely complete, the terminal is planning an additional, more significant expansion project known as Elba III. The Elba III expansion will include the construction of two new, larger storage tanks, increased send-out capacity, and construction of new pipeline at inland locations. These improvements will essentially double the capacity of the terminal, increasing its tank storage capacity to 750,000 cubic meters, and increasing its peak daily maximum throughput capacity to 59 million cubic meters per day. This expansion project has been submitted to the Federal Energy Regulatory Commission (FERC) for review, where its environmental impacts are being evaluated and public comments are being accepted. If approved, it is expected that the expansion will be complete between 2010 and 2012.

The recent berth construction at Elba Island has resulted in significant benefits to terminal and port operations. Previously, LNG vessels moored in a portion of the existing Federal Channel to offload at the terminal. This caused significant impacts to other vessels transiting the channel and required extensive operating restrictions to other vessels. Those restrictions included the requirement that all large vessels passing the berthed LNG vessel be escorted by two tug boats while passing. With the new double berthing slip inside the terminal, the LNG vessels no longer berth alongside the channel, and these passing restrictions have been lifted, bringing greater efficiency to other vessels' operations and increased ease of movement throughout the harbor. The current berth depth at the terminal is 42 feet, matching the 42 feet authorized channel depth.

Domestic LNG Market and Hinterlands of LNG Terminal

The LNG market in the US is small but growing rapidly. Recent changes in market conditions, including new sources of LNG supply to the US, technological advances that have decreased costs for liquefacation and shipping, and higher energy prices in general, have all contributed to significant growth in US LNG imports since 2000 (US LNG Markets and Uses, Energy Information Administration, January 2003). This growth is expected to continue in the future. US LNG imports are projected to grow from 16.8 billion cubic meters in 2004, to 114.8 billion cubic meters by 2025, and to 123.2 billion cubic meters by 2030 (Annual Energy Outlook 2006, US Energy Information Administration). Growth in LNG imports is expected to meet most of the projected growth in US domestic demand for natural gas.

Overall US demand for natural gas from all sources is projected to grow by 20 percent by 2030, an average annual increase of 0.7 percent (Annual Energy Outlook 2006, US Energy Information Administration). Natural gas is used to heat 85 percent of homes in Georgia, and is used to fuel electricity plants throughout Georgia from which all homes, businesses and industries in the state benefit (Atlanta Gas & Light, www.aglc.com). As of 2004, there were 1,750,745 residential consumers of natural gas in Georgia, 128,549 commercial consumers, and 3,140 industrial consumers. LNG currently provides about 3 percent of the nation's natural gas supply, and this is predicted to increase to 16 percent by 2030 (Center for Liquefied Natural Gas, www.lngfacts.org). With continued, steady growth in demand for natural gas, and a growth in the portion of natural gas demand met by imported LNG, it is expected that there will be continued strong growth for LNG

throughout the study period. All four of the existing US LNG terminals have either recently expanded their capacity or have significant expansion plans in development.

The Elba Island Terminal serves primarily Georgia and South Carolina. Terminal officials estimate that about 80 percent of their LNG reaches end customers in Georgia, with the remaining 20 percent reaching South Carolina customers. As a result, the hinterlands of the Elba Island Terminal are defined as Georgia and South Carolina. With the Elba III expansion, the market for LNG landed at Elba Island will continue to consist primarily of Georgia and South Carolina, although a small portion of the market area may extend to Florida.

World LNG Market

The worldwide LNG market has been growing rapidly this decade. Between 2002 and 2004 LNG exports worldwide increased 35 percent, from 4 trillion cubic feet in 2002 to 5.4 trillion cubic feet in 2004 (Global Liquefied Natural Gas Market: Status & Outlook, 2004, US Energy Information Administration). This strong growth is expected to continue in the future, as LNG trade growth is driven by increasing energy demand and declining natural gas resources in gas-consuming countries (Global Liquefied Natural Gas Market: Status & Outlook, 2004, US Energy Information Administration). Global natural gas liquefication capacity worldwide is expected to increase from 6.6 trillion cubic feet/year in 2003 to 9.4 trillion cubic feet per year by 2007, based on the facilities currently under construction (Global Liquefied Natural Gas Market: Status & Outlook, 2004, US Energy Information Administration). According to the Energy Information Administration, world natural gas reserves are abundant, estimated at 5,500 trillion cubic feet, which is 60 times the volume used worldwide in 2003. The countries of Russia, Iran and Qatar combined hold more than 50 percent of worldwide natural gas reserves (Global Liquefied Natural Gas Market: Status & Outlook, 2004, US Energy Information Administration).

LNG Vessel Traffic, Fleet Characteristics and Commodity Volumes

Currently the LNG imports received at Elba Island come primarily from Trinidad, the southern Caribbean island off the coast of Venezuela. As the Elba Island facility expands and receives significantly more shipments, it is expected that some shipments will come from additional world-wide sources, most likely Qatar. Currently the terminal receives between 60 and 70 LNG vessel shipments per year. The current LNG vessels calling the terminal typically have a length of 940 to 960 feet, a beam of 135 to 145 feet, a draft of 38 feet, and are in the 125,000 cubic meter class of vessels. According to data from the Waterborne Commerce Statistics Center, the port of Savannah received a total of 2,463,000 short tons of LNG in 2004. These shipments were all made on foreign flag vessels originating in Trinidad, a trip with a sailing time of 4 ½ days. Actual loaded drafts ranged from 35 to 37 feet, with the majority having 36 foot drafts. The LNG vessels typically spend 22 to 24 hours at the berth before returning, and their drafts are typically reduced by 6 feet after offloading.

Recent historical LNG shipments to Savannah Harbor are shown below in Table 1. The figures for number of trips per year are estimated based on an average of 35,000 short tons per vessel call.

Table 1
Recent Historical LNG Shipments
Savannah Harbor

Year		Tonnage (short tons)		Number of trips
2005		2,493,000		71
2004		2,463,000		70
2003		969,000		28
2002		377,000		11
2001		64,000		2
2000		0		0

Source: Waterborne Commerce of the United States, US Army Corps of Engineers

Current LNG Vessel Operating Procedures

The LNG vessels currently navigate up the Savannah River under fairly constrained procedures, particularly on the inbound trip, in order to enhance the maneuverability of the vessels and ensure safe transit. The LNG vessels generally transit up the river to the terminal on the rising tide, and enter their berths at high water slack tide. Strong river currents and the somewhat limited maneuverability of the vessels typically prevent LNG tankers from entering the terminal at other than high water slack tide. While waiting for favorable tidal conditions or waiting for other large vessels also requiring high tide, the LNG tankers anchor off-shore. There is no officially designated anchorage area in the offshore area. Current procedures require two feet of underkeel clearance for LNG tankers while in the channel, and four feet while maneuvering off-shore. After offloading, outgoing LNG vessels are less restricted for exiting, but generally depart on the falling tide. The tidal range in Savannah Harbor is 6.9 feet.

The US Coast Guard has established a Regulated Navigation Area (RNA) around the LNG tankers to maintain a safe buffer zone around the vessels while they are entering and exiting the harbor. The current RNA requires a two mile security zone in front of and behind the LNG tankers on the inbound trips only.

There is currently significant coordination required to schedule the large number of large vessels which the Savannah River, coordination which is performed primarily by the pilots, in coordination with the US Coast Guard. Savannah Harbor is a large containership port, and containerships have tight port rotation schedules and often have scheduled appointments to transit the Panama Canal. Missing such appointments causes high costs to be incurred by the containership operators, and regularity is needed for their port rotation schedules. The largest containerships need to transit the Savannah River at high tide in order to have sufficient underkeel clearance. The requirements of the LNG

tankers to transit up the river on the rising tide, combined with the vessel restrictions of the RNA which prohibit nearby travel of other vessels, means that the LNG tankers often compete with the large containerships for high tide transit. The restricted nature of the LNG vessel operations and the competition for high tide with containerships results in inevitable delays to both LNG tanker and containership operations.

While these delays are minimized through careful coordination between harbor users, the harbor pilots, and the Coast Guard, some delays still occur. Based on data kept by officials at the LNG terminal, it is estimated that delays to LNG vessels due to river traffic and competition for favorable tides average 9.5 hours per vessel call, with average inbound delays of 4.8 hours, and average outbound delays of 4.7 hours.

LNG FLEET FORECAST

The LNG tanker fleet forecast developed for this analysis is the same for the without and with project conditions. With the Elba II expansion at the LNG terminal which is nearly complete, terminal officials expect the number of vessel calls to increase from the current 60 per year to 118 per year by 2009. If the Elba III expansion is approved and constructed, terminal officials expect further increases in LNG vessel calls to 213 per year by 2012. These projections are included in the base case LNG vessel fleet forecast.

As of December 2003, the world LNG fleet consisted of 206 tankers, of which 27 or 13 percent, were 140,000 cubic meters or larger (Global Liquefied Natural Gas Market: Status & Outlook, 2004, US Energy Information Administration). In addition, of 55 new LNG tankers under construction in 2004, 46 or 84 percent are 138,000 cubic meters in capacity or greater (Global Liquefied Natural Gas Market: Status & Outlook, 2004, US Energy Information Administration). As these new vessels are completed and enter the world fleet, the number of larger vessels calling Elba Island will likely increase over time.

The base case LNG fleet forecast includes the increase to 213 vessel calls at Elba Island per year by 2012, and a gradual shift in vessel size from the current 125,000 cubic meter vessel class to the larger 145,000 cubic meter vessel class over the period of analysis. While terminal representatives are predicting the use of even larger vessels at the terminal with the Elba III expansion, up to 200,000 cubic meters and greater, such large vessels are only in the planning stages and have not yet been constructed. The use of vessels larger than 145,000 cubic meters are included in a Higher Growth sensitivity analysis described at the end of this report.

A second sensitivity analysis for the fleet forecast representing lower growth is also performed, which includes only the increase in ship calls expected with the Elba II expansion, with the total number of ship calls per year limited to 118, still a significant increase over the current number of calls. The low growth scenario essentially does not include the Elba III expansion, since that project has not yet been approved.

WITHOUT PROJECT CONDITION

The without project condition is defined as those conditions that are expected to exist from the base year of 2015 through 2064, the 50 year period of analysis, in the absence of a channel deepening project. Without a channel deepening project, the Federal project will remain at its current authorized depth of 42 feet. The without project condition for this analysis incorporates the base case LNG fleet forecast, which includes the Elba II expansion and the planned Elba III expansion, and the corresponding increase in vessel calls expected at the terminal.

The without project condition for the overall harbor deepening project includes significant increases in containership traffic at the port, as detailed in the primary economic analysis. As world containership trade continues to increase, it is expected that containership traffic at Savannah will correspondingly increase, including both the number of vessel calls and the sizes of the vessels. In the without project condition, without a deeper channel, as containership vessels increase in size it is expected that an increasing percentage of containerships will need to use the tide to transit that river. With the increasing size of containerships, combined with the increasing number of containerships, it is expected that the competition between LNG tankers and large containership vessels for favorable tidal conditions will increase significantly over the period of analysis. This will cause increased delays for both containerships and LNG tankers, and will increase total operating costs on a per-trip basis.

WITH PROJECT CONDITION

The with project condition includes construction of a deeper channel in the Savannah River. Depths from 43 feet to 48 feet are analyzed. Detailed descriptions of the proposed channel deepening plans are contained in the main report and engineering appendices. With the project, containership operations will be less tide-restricted. With the containerships able to operate more freely through the tidal cycle, there will be less competition between the LNG tankers and the large containerships for transit at high tide. The LNG vessels need to transit up-river on the high tide for maneuverability reasons, and will retain this requirement regardless of the depth of the channel. However, the deeper channel will reduce the need for containerships to wait for high tide, which will thereby reduce competition for high tide between containerships and LNG tankers. The deeper the channel depth analyzed, the more significant the degree to which that competition is reduced. The reduced competition for high tide for incoming vessels will result in a reduction in traffic-related delays experienced by LNG tankers.

CALCULATION OF BENEFITS

General Approach

The benefits to LNG tanker operations with the project are derived from the degree to which the project reduces traffic-related LNG tanker delays. Annual benefits equal the difference between the expected delays without the project and the expected delays with the project. An Excel spreadsheet model was developed to relate expected containership draft and channel requirements to traffic-related LNG tanker delays. The model incorporates summary fleet forecast data for containerships over the period of analysis, as developed for the primary economic analysis by the Corps in 2007. The dollar value of the reduced LNG tanker delays with the project is determined by combining the degree of delay reduction at each channel depth with the hourly operating cost of LNG tankers.

LNG Vessel Operating Costs

New LNG tankers currently cost $150 to $160 million for a 138,000 cubic-meter ship, more than double the cost of very large oil tankers, due primarily to their highly specialized construction which includes insulated cryogenic containment for the cargo (The Global Liquefied Natural Gas Market: Status and Outlook, December 2003, US Energy Information Administration). Personnel at the Elba Island LNG terminal estimated typical daily operating costs for the LNG tankers which call the terminal at $58,000 per day. The larger tankers expected to call the terminal in the future will have operating costs of $65,000 per day. These figures are supported by published figures, which cite operating costs between $55,000 and $65,000 per day for LNG tankers (The Global Liquefied Natural Gas Markets: Status and Outlook, December 2003, US Energy Information Administration). Using costs of $58,000 per day yields operating costs for LNG tankers of $2,417 per hour.

This figure was compared to the Corps of Engineers Deep Draft Vessel Operating Costs for FY 2008, developed by the Corps Institute for Water Resources (IWR). While no specific values for LNG tanker operating costs are included in the vessel cost tables, information was obtained from IWR to convert traditional tanker costs to LNG tanker costs for comparably-sized vessels. Those calculations yield operating costs for the 125,000 cubic meter LNG tankers of $2,024 per hour at sea, and $1,492 per hour at port. For the purpose of this analysis, this IWR-derived figure is used to calculate project benefits. However, the higher hourly cost provided by the terminal and supported by Energy Information Administration data is used in a sensitivity analysis at the end of this report.

Detailed Benefit Methodology

LNG tankers are required to dock during the slack period following a rising tide. Currently they compete with containerships that, given the existing controlling depth of Savannah Harbor, need to transit the channel with tidal assistance. The potential benefit to LNG carriers is indirect as additional depth provided by deepening the channel reduces the need for containerships to use the tide when transiting Savannah Harbor. Priority is given to containerships as they need to make their appointment times at the Panama Canal. As a result LNG ships wait for containership traffic to clear before they begin their move into or out of Savannah Harbor.

The study approach was to determine the joint probability that an LNG tanker and a containership will both be waiting for the tide. However, since the LNG tankers always need a rising tide (their delays are not depth-related), the joint probability becomes the probability of a containership waiting for additional depth to transit the channel. To simplify the analysis, an average depth needed was computed for those containerships needing tidal assistance for both the with and without project conditions. Using the tidal range of 6.9 feet, a mean tide curve was developed to show the relationship between depth available and time. This curve was used to determine the probability of delay for the average containership needing additional depth. Separate probabilities were calculated for containerships both entering and exiting the harbor.

This probability is then multiplied by the estimated average time that an LNG tanker would have to wait for a containership to transit all or a portion of the channel. This product provides the expected LNG wait time in hours, which is then multiplied by the hourly cost for LNG carriers. The resulting product is an estimate of the delay cost per trip. The delay cost per trip is then multiplied by the number of LNG trips into and out of the harbor along with the number of containership trips requiring tidal assistance, to yield the estimated total annual delay cost for LNG tankers due to competition with containerships for high tide access.

The same containership fleet projections are used in this analysis as those used for the feasibility study for harbor improvement. The distribution of the containership fleet by operating draft is provided in the containership fleet projections. This distribution, combined with an underkeel clearance of four feet, is then compared to the existing and proposed channel depths to determine annually the number of vessels that would require tidal assistance entering and departing from the harbor. The annual number of vessels is then converted to a daily estimate by dividing by 360. To simplify the calculations, a weighted average of additional depth needed is determined and that depth is plotted on a mean tide cycle function for Savannah Harbor to determine the number of hours that the given depth is not available. This time is then divided by the tide cycle of 12.4 hours to determine the probability of containership tide delay.

Delays are developed for both arrivals and departures of LNG carriers. Each type of delay has two components. Arriving LNG ships may have to wait for containerships leaving the harbor on the tide or containerships arriving and needing tidal assistance to reach their berths. The time needed for containerships to leave their berths and reach the mouth of the river is just under 3 hours. The LNG ship is delayed for this length of time to avoid passing the containership. For containerships entering the harbor at high tide the LNG ship must keep a distance of two miles between itself and the containership. Assuming an operating speed of 10.5 knots, this delay is about 12 minutes. This operating procedure is mandated by the Coast Guard to prevent the possibility of a collision with an LNG vessel.

Departing LNG carriers may have to wait for incoming containerships to pass by Elba Island. Since Elba Island is located approximately half way between the mouth of the

river and the containership berths, this wait is about 1.5 hours. There will be a similar wait for containership vessels that are departing their berths.

Delay cost for the LNG vessels is the product of the expected delay in hours and the cost per hour for the operation of the LNG vessel. The expected delay per LNG vessel trip both into and out of the harbor is the product of the number of containerships needing tidal assistance entering and leaving the harbor, their respective probabilities of delay, and the respective delays that they impose on LNG vessels.

The hours of delay calculated above are then multiplied by the LNG vessel hourly operating cost as developed from IWR vessel operating cost tables. Although IWR currently does not publish vessel operating cost for LNG ships, personnel at IWR indicated appropriate increases in hull, labor and insurance costs for similarly sized oil tankers to yield a reasonable approximation of LNG hourly operating costs.

Delay costs are calculated for each year of the study period as the projections for the number and size distribution of both the containership fleet and the LNG fleet change over time. LNG vessels and containership are projected to increase in size over time. Although there are significant economies of scale in using larger vessels, hourly operating costs increase with vessel size, and thus delays become more costly.

The benefit of the channel deepening project for LNG tankers is the reduction in their delay time as fewer containerships need tidal assistance reaching and leaving their berths. The benefit is incidental and no separable cost needs to be incurred to achieve the benefit. The benefit is also indirect as a reduction in tidal delay to containerships from channel deepening also means less delay to the LNG tankers. LNG vessels will always come into their berths on the high and rising tide, but will be able to do so more freely with the project as there will be fewer containerships also using the tide.

To calculate these benefits, LNG tanker delay cost for the without project depth of 42 feet is compared to the delay cost for each proposed channel depth from 43 feet to 48 feet in one-foot increments. For the 43-foot, 44-foot, and 45-foot channel improvement project there was no change in the number of containerships requiring tidal assistance. Consequently there was no change in the amount delay experienced by LNG carriers. However delay for LNG carriers declines at greater channel depths, as fewer containerships are projected to be in need of tidal assistance with proposed project depths of 46 to 48 feet.

Delay cost is discounted for each year of the study period (2015-2064) and annualized using the capital recovery factor for an interest rate of 4 7/8 % and a fifty-year project life. The annualized delay cost for each proposed project depth is subtracted from the delay cost for the existing (42-foot) channel depth. As expected, the channel that provides the largest reduction in wait time for LNG carriers is the 48-foot channel, which has a reduction in delay cost of approximately $1,974,200.

Tables 2 and 3 show projections of the annual number of containership visits to Savannah Harbor requiring tidal assistance given four feet of underkeel clearance at the existing project depth and the project depths under evaluation. Table 2 displays outbound containership delays and Table 3 displays inbound containership delays. These tables are based on the containership fleet projections made by the Corps which are being used in the ongoing feasibility study of deepening the existing Federal channel. Tables 4 and 5 are the same as Tables 2 and 3, but converted to a daily basis.

Table 6 displays estimates of the expected annual delay cost of outbound LNG vessels waiting for outbound containerships by year and by project depth (existing and proposed). Each entry in the table is the product of the daily number of movements of containerships needing tidal assistance, their probability of delay based on the average number of feet needed, the extent of the delay (in hours) that they impose on LNG carriers, and the hourly cost of the delay by size and number of LNG vessels. Table 7 provides similar estimates for outbound LNG vessels delayed by inbound containerships. Table 8 is the sum of entries in Tables 6 and 7.

Tables 9, 10 and 11 provide similar estimates for inbound LNG vessels. Table 12 displays total inbound and outbound delays for LNG vessels, and is the sum of entries in Tables 8 and 11. Table 13 is the same as Table 12 only with the entries multiplied by the present worth factor for each year.

Table 14 shows the projected annual delay cost for LNG tankers for each project depth examined. Total delays costs equal the sum of the discounted present value of the benefits for each project depth, multiplied by the capital recovery factor for a fifty-year project life. Table 15 shows the expected annual benefit of deepening the existing channel to each of the proposed depths. The benefit at each depth is the difference between the delay cost at the 42-foot channel depth (the without project condition) and the delay cost at the channel depth being evaluated.

Table 2
Annual Containership Trips
Requiring Tidal Assistance
Outbound
GEC Forecast

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	748	748	748	748	610	438	268
2016	2	776	776	776	776	633	455	278
2017	3	806	806	806	806	658	473	289
2018	4	838	838	838	838	683	491	300
2019	5	871	871	871	871	710	511	312
2020	6	903	903	903	903	737	530	324
2021	7	937	937	937	937	764	550	336
2022	8	973	973	973	973	793	571	348
2023	9	1010	1010	1010	1010	824	593	362
2024	10	1049	1049	1049	1049	855	615	375
2025	11	1089	1089	1089	1089	888	639	390
2026	12	1131	1131	1131	1131	922	664	405
2027	13	1175	1175	1175	1175	958	690	421
2028	14	1221	1221	1221	1221	995	717	437
2029	15	1269	1269	1269	1269	1034	745	454
2030	16	1319	1319	1319	1319	1075	774	472
2031	17	1367	1367	1367	1367	1114	803	489
2032	18	1418	1418	1418	1418	1156	833	508
2033	19	1471	1471	1471	1471	1199	863	526
2034	20	1526	1526	1526	1526	1243	896	546
2035	21	1582	1582	1582	1582	1289	929	566
2036	22	1641	1641	1641	1641	1337	964	587
2037	23	1703	1703	1703	1703	1387	1000	609
2038	24	1766	1766	1766	1766	1439	1037	632
2039	25	1832	1832	1832	1832	1492	1076	655
2040	26	1900	1900	1900	1900	1547	1116	680
2041	27	1965	1965	1965	1965	1601	1154	703
2042	28	1965	1965	1965	1965	1601	1154	703
2043	29	1965	1965	1965	1965	1601	1154	703
2044	30	1965	1965	1965	1965	1601	1154	703
2045	31	1965	1965	1965	1965	1601	1154	703
2046	32	1965	1965	1965	1965	1601	1154	703
2047	33	1965	1965	1965	1965	1601	1154	703
2048	34	1965	1965	1965	1965	1601	1154	703
2049	35	1965	1965	1965	1965	1601	1154	703
2050	36	1965	1965	1965	1965	1601	1154	703
2051	37	1965	1965	1965	1965	1601	1154	703
2052	38	1965	1965	1965	1965	1601	1154	703
2053	39	1965	1965	1965	1965	1601	1154	703
2054	40	1965	1965	1965	1965	1601	1154	703
2055	41	1965	1965	1965	1965	1601	1154	703
2056	42	1965	1965	1965	1965	1601	1154	703
2057	43	1965	1965	1965	1965	1601	1154	703
2058	44	1965	1965	1965	1965	1601	1154	703
2059	45	1965	1965	1965	1965	1601	1154	703
2060	46	1965	1965	1965	1965	1601	1154	703
2061	47	1965	1965	1965	1965	1601	1154	703
2062	48	1965	1965	1965	1965	1601	1154	703
2063	49	1965	1965	1965	1965	1601	1154	703
2064	50	1965	1965	1965	1965	1601	1154	703

Table 3
Annual Containership Trips
Requiring Tidal Assistance
Inbound
GEC Forecast

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	593	593	593	593	476	453	166
2016	2	615	615	615	615	494	470	172
2017	3	639	639	639	639	513	488	179
2018	4	664	664	664	664	534	507	186
2019	5	690	690	690	690	555	527	193
2020	6	716	716	716	716	575	547	200
2021	7	716	716	716	716	575	547	200
2022	8	771	771	771	771	620	589	216
2023	9	801	801	801	801	643	612	224
2024	10	832	832	832	832	668	635	233
2025	11	864	864	864	864	694	660	241
2026	12	897	897	897	897	720	685	251
2027	13	932	932	932	932	748	712	260
2028	14	968	968	968	968	778	739	271
2029	15	1,006	1,006	1,006	1,006	808	769	281
2030	16	1,046	1,046	1,046	1,046	840	799	292
2031	17	1,085	1,085	1,085	1,085	871	828	303
2032	18	1,125	1,125	1,125	1,125	903	859	314
2033	19	1,167	1,167	1,167	1,167	937	891	326
2034	20	1,210	1,210	1,210	1,210	972	924	338
2035	21	1,255	1,255	1,255	1,255	1,008	959	350
2036	22	1,302	1,302	1,302	1,302	1,046	994	364
2037	23	1,351	1,351	1,351	1,351	1,085	1,031	377
2038	24	1,401	1,401	1,401	1,401	1,125	1,070	391
2039	25	1,453	1,453	1,453	1,453	1,167	1,110	405
2040	26	1,507	1,507	1,507	1,507	1,210	1,151	421
2041	27	1,559	1,559	1,559	1,559	1,252	1,191	435
2042	28	1,559	1,559	1,559	1,559	1,252	1,191	435
2043	29	1,559	1,559	1,559	1,559	1,252	1,191	435
2044	30	1,559	1,559	1,559	1,559	1,252	1,191	435
2045	31	1,559	1,559	1,559	1,559	1,252	1,191	435
2046	32	1,559	1,559	1,559	1,559	1,252	1,191	435
2047	33	1,559	1,559	1,559	1,559	1,252	1,191	435
2048	34	1,559	1,559	1,559	1,559	1,252	1,191	435
2049	35	1,559	1,559	1,559	1,559	1,252	1,191	435
2050	36	1,559	1,559	1,559	1,559	1,252	1,191	435
2051	37	1,559	1,559	1,559	1,559	1,252	1,191	435
2052	38	1,559	1,559	1,559	1,559	1,252	1,191	435
2053	39	1,559	1,559	1,559	1,559	1,252	1,191	435
2054	40	1,559	1,559	1,559	1,559	1,252	1,191	435
2055	41	1,559	1,559	1,559	1,559	1,252	1,191	435
2056	42	1,559	1,559	1,559	1,559	1,252	1,191	435
2057	43	1,559	1,559	1,559	1,559	1,252	1,191	435
2058	44	1,559	1,559	1,559	1,559	1,252	1,191	435
2059	45	1,559	1,559	1,559	1,559	1,252	1,191	435
2060	46	1,559	1,559	1,559	1,559	1,252	1,191	435
2061	47	1,559	1,559	1,559	1,559	1,252	1,191	435
2062	48	1,559	1,559	1,559	1,559	1,252	1,191	435
2063	49	1,559	1,559	1,559	1,559	1,252	1,191	435
2064	50	1,559	1,559	1,559	1,559	1,252	1,191	435

Table 4
Daily Containership Trips
Requiring Tidal Assistance
Outbound
GEC Forecast

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	2.1	2.1	2.1	2.1	1.7	1.2	0.7
2016	2	2.2	2.2	2.2	2.2	1.8	1.3	0.8
2017	3	2.2	2.2	2.2	2.2	1.8	1.3	0.8
2018	4	2.3	2.3	2.3	2.3	1.9	1.4	0.8
2019	5	2.4	2.4	2.4	2.4	2	1.4	0.9
2020	6	2.5	2.5	2.5	2.5	2	1.5	0.9
2021	7	2.6	2.6	2.6	2.6	2.1	1.5	0.9
2022	8	2.7	2.7	2.7	2.7	2.2	1.6	1
2023	9	2.8	2.8	2.8	2.8	2.3	1.6	1
2024	10	2.9	2.9	2.9	2.9	2.4	1.7	1
2025	11	3	3	3	3	2.5	1.8	1.1
2026	12	3.1	3.1	3.1	3.1	2.6	1.8	1.1
2027	13	3.3	3.3	3.3	3.3	2.7	1.9	1.2
2028	14	3.4	3.4	3.4	3.4	2.8	2	1.2
2029	15	3.5	3.5	3.5	3.5	2.9	2.1	1.3
2030	16	3.7	3.7	3.7	3.7	3	2.1	1.3
2031	17	3.8	3.8	3.8	3.8	3.1	2.2	1.4
2032	18	3.9	3.9	3.9	3.9	3.2	2.3	1.4
2033	19	4.1	4.1	4.1	4.1	3.3	2.4	1.5
2034	20	4.2	4.2	4.2	4.2	3.5	2.5	1.5
2035	21	4.4	4.4	4.4	4.4	3.6	2.6	1.6
2036	22	4.6	4.6	4.6	4.6	3.7	2.7	1.6
2037	23	4.7	4.7	4.7	4.7	3.9	2.8	1.7
2038	24	4.9	4.9	4.9	4.9	4	2.9	1.8
2039	25	5.1	5.1	5.1	5.1	4.1	3	1.8
2040	26	5.3	5.3	5.3	5.3	4.3	3.1	1.9
2041	27	5.5	5.5	5.5	5.5	4.4	3.2	2
2042	28	5.5	5.5	5.5	5.5	4.4	3.2	2
2043	29	5.5	5.5	5.5	5.5	4.4	3.2	2
2044	30	5.5	5.5	5.5	5.5	4.4	3.2	2
2045	31	5.5	5.5	5.5	5.5	4.4	3.2	2
2046	32	5.5	5.5	5.5	5.5	4.4	3.2	2
2047	33	5.5	5.5	5.5	5.5	4.4	3.2	2
2048	34	5.5	5.5	5.5	5.5	4.4	3.2	2
2049	35	5.5	5.5	5.5	5.5	4.4	3.2	2
2050	36	5.5	5.5	5.5	5.5	4.4	3.2	2
2051	37	5.5	5.5	5.5	5.5	4.4	3.2	2
2052	38	5.5	5.5	5.5	5.5	4.4	3.2	2
2053	39	5.5	5.5	5.5	5.5	4.4	3.2	2
2054	40	5.5	5.5	5.5	5.5	4.4	3.2	2
2055	41	5.5	5.5	5.5	5.5	4.4	3.2	2
2056	42	5.5	5.5	5.5	5.5	4.4	3.2	2
2057	43	5.5	5.5	5.5	5.5	4.4	3.2	2
2058	44	5.5	5.5	5.5	5.5	4.4	3.2	2
2059	45	5.5	5.5	5.5	5.5	4.4	3.2	2
2060	46	5.5	5.5	5.5	5.5	4.4	3.2	2
2061	47	5.5	5.5	5.5	5.5	4.4	3.2	2
2062	48	5.5	5.5	5.5	5.5	4.4	3.2	2
2063	49	5.5	5.5	5.5	5.5	4.4	3.2	2
2064	50	5.5	5.5	5.5	5.5	4.4	3.2	2

Table 5
Daily Containership Trips
Requiring Tidal Assistance
Inbound
GEC Forecast

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	1.6	1.6	1.6	1.6	1.3	1.3	0.5
2016	2	1.7	1.7	1.7	1.7	1.4	1.3	0.5
2017	3	1.8	1.8	1.8	1.8	1.4	1.4	0.5
2018	4	1.8	1.8	1.8	1.8	1.5	1.4	0.5
2019	5	1.9	1.9	1.9	1.9	1.5	1.5	0.5
2020	6	2	2	2	2	1.6	1.5	0.6
2021	7	2	2	2	2	1.6	1.5	0.6
2022	8	2.1	2.1	2.1	2.1	1.7	1.6	0.6
2023	9	2.2	2.2	2.2	2.2	1.8	1.7	0.6
2024	10	2.3	2.3	2.3	2.3	1.9	1.8	0.6
2025	11	2.4	2.4	2.4	2.4	1.9	1.8	0.7
2026	12	2.5	2.5	2.5	2.5	2	1.9	0.7
2027	13	2.6	2.6	2.6	2.6	2.1	2	0.7
2028	14	2.7	2.7	2.7	2.7	2.2	2.1	0.8
2029	15	2.8	2.8	2.8	2.8	2.2	2.1	0.8
2030	16	2.9	2.9	2.9	2.9	2.3	2.2	0.8
2031	17	3	3	3	3	2.4	2.3	0.8
2032	18	3.1	3.1	3.1	3.1	2.5	2.4	0.9
2033	19	3.2	3.2	3.2	3.2	2.6	2.5	0.9
2034	20	3.4	3.4	3.4	3.4	2.7	2.6	0.9
2035	21	3.5	3.5	3.5	3.5	2.8	2.7	1
2036	22	3.6	3.6	3.6	3.6	2.9	2.8	1
2037	23	3.8	3.8	3.8	3.8	3	2.9	1
2038	24	3.9	3.9	3.9	3.9	3.1	3	1.1
2039	25	4	4	4	4	3.2	3.1	1.1
2040	26	4.2	4.2	4.2	4.2	3.4	3.2	1.2
2041	27	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2042	28	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2043	29	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2044	30	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2045	31	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2046	32	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2047	33	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2048	34	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2049	35	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2050	36	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2051	37	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2052	38	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2053	39	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2054	40	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2055	41	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2056	42	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2057	43	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2058	44	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2059	45	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2060	46	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2061	47	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2062	48	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2063	49	4.3	4.3	4.3	4.3	3.5	3.3	1.2
2064	50	4.3	4.3	4.3	4.3	3.5	3.3	1.2

Table 6
Expected Annual Delay Cost
LNG Vessels Outbound, Containerships Outbound
GEC Forecast
Undiscounted, ($000)

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	202.1	202.1	202.1	202.1	130.3	62.6	0
2016	2	211.7	211.7	211.7	211.7	138	67.8	0
2017	3	212.9	212.9	212.9	212.9	138.7	68.2	0
2018	4	222.6	222.6	222.6	222.6	146.4	73.5	0
2019	5	232.3	232.3	232.3	232.3	154.1	73.5	0
2020	6	241.9	241.9	241.9	241.9	154.1	78.7	0
2021	7	251.6	251.6	251.6	251.6	161.9	78.7	0
2022	8	262.7	262.7	262.7	262.7	170.5	84.4	0
2023	9	272.5	272.5	272.5	272.5	178.2	84.4	0
2024	10	282.2	282.2	282.2	282.2	186	89.7	0
2025	11	291.9	291.9	291.9	291.9	193.7	95	0
2026	12	301.6	301.6	301.6	301.6	201.5	95	0
2027	13	322.8	322.8	322.8	322.8	210.4	100.8	0
2028	14	332.6	332.6	332.6	332.6	218.2	106.1	0
2029	15	342.4	342.4	342.4	342.4	226	111.4	0
2030	16	362	362	362	362	233.8	111.4	0
2031	17	371.8	371.8	371.8	371.8	241.5	116.7	0
2032	18	383.6	383.6	383.6	383.6	250.7	122.7	0
2033	19	403.3	403.3	403.3	403.3	258.5	128	0
2034	20	413.1	413.1	413.1	413.1	274.2	133.4	0
2035	21	432.8	432.8	432.8	432.8	282	138.7	0
2036	22	452.5	452.5	452.5	452.5	289.9	144	0
2037	23	464.8	464.8	464.8	464.8	307.2	150.2	0
2038	24	484.6	484.6	484.6	484.6	315	155.5	0
2039	25	504.4	504.4	504.4	504.4	322.9	160.9	0
2040	26	524.1	524.1	524.1	524.1	338.7	166.2	0
2041	27	543.9	543.9	543.9	543.9	346.6	171.6	0
2042	28	546.8	546.8	546.8	546.8	348.4	172.5	0
2043	29	546.8	546.8	546.8	546.8	348.4	172.5	0
2044	30	546.8	546.8	546.8	546.8	348.4	172.5	0
2045	31	546.8	546.8	546.8	546.8	348.4	172.5	0
2046	32	546.8	546.8	546.8	546.8	348.4	172.5	0
2047	33	549.7	549.7	549.7	549.7	350.3	173.4	0
2048	34	549.7	549.7	549.7	549.7	350.3	173.4	0
2049	35	549.7	549.7	549.7	549.7	350.3	173.4	0
2050	36	549.7	549.7	549.7	549.7	350.3	173.4	0
2051	37	549.7	549.7	549.7	549.7	350.3	173.4	0
2052	38	552.6	552.6	552.6	552.6	352.1	174.4	0
2053	39	552.6	552.6	552.6	552.6	352.1	174.4	0
2054	40	552.6	552.6	552.6	552.6	352.1	174.4	0
2055	41	552.6	552.6	552.6	552.6	352.1	174.4	0
2056	42	552.6	552.6	552.6	552.6	352.1	174.4	0
2057	43	552.6	552.6	552.6	552.6	352.1	174.4	0
2058	44	552.6	552.6	552.6	552.6	352.1	174.4	0
2059	45	552.6	552.6	552.6	552.6	352.1	174.4	0
2060	46	552.6	552.6	552.6	552.6	352.1	174.4	0
2061	47	552.6	552.6	552.6	552.6	352.1	174.4	0
2062	48	552.6	552.6	552.6	552.6	352.1	174.4	0
2063	49	552.6	552.6	552.6	552.6	352.1	174.4	0
2064	50	552.6	552.6	552.6	552.6	352.1	174.4	0

Table 7
Expected Annual Delay Cost
LNG Vessels Outbound, Containerships Inbound
GEC Forecast
Undiscounted ($000)

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	231.5	231.5	231.5	231.5	154.5	71.4	14.5
2016	2	246	246	246	246	166.3	71.4	14.5
2017	3	261.9	261.9	261.9	261.9	167.3	77.3	14.6
2018	4	261.9	261.9	261.9	261.9	179.2	77.3	14.6
2019	5	276.5	276.5	276.5	276.5	179.2	82.8	14.6
2020	6	291	291	291	291	191.2	82.8	17.5
2021	7	291	291	291	291	191.2	82.8	17.5
2022	8	307.2	307.2	307.2	307.2	204.2	88.9	17.6
2023	9	321.9	321.9	321.9	321.9	216.2	94.4	17.6
2024	10	336.5	336.5	336.5	336.5	228.2	100	17.6
2025	11	351.1	351.1	351.1	351.1	228.2	100	20.5
2026	12	365.8	365.8	365.8	365.8	240.2	105.5	20.5
2027	13	382.5	382.5	382.5	382.5	253.6	111.7	20.6
2028	14	397.2	397.2	397.2	397.2	265.7	117.3	23.6
2029	15	411.9	411.9	411.9	411.9	265.7	117.3	23.6
2030	16	426.6	426.6	426.6	426.6	277.8	122.8	0
2031	17	441.3	441.3	441.3	441.3	289.9	128.4	0
2032	18	458.5	458.5	458.5	458.5	303.6	134.7	0
2033	19	473.3	473.3	473.3	473.3	315.7	140.3	0
2034	20	502.9	502.9	502.9	502.9	327.9	146	0
2035	21	517.6	517.6	517.6	517.6	340	151.6	0
2036	22	532.4	532.4	532.4	532.4	352.1	157.2	0
2037	23	565	565	565	565	366.3	163.7	0
2038	24	579.9	579.9	579.9	579.9	378.5	169.3	0
2039	25	594.8	594.8	594.8	594.8	390.7	175	0
2040	26	624.5	624.5	624.5	624.5	415.1	180.6	0
2041	27	639.4	639.4	639.4	639.4	427.3	186.3	0
2042	28	642.8	642.8	642.8	642.8	429.6	187.3	0
2043	29	642.8	642.8	642.8	642.8	429.6	187.3	0
2044	30	642.8	642.8	642.8	642.8	429.6	187.3	0
2045	31	642.8	642.8	642.8	642.8	429.6	187.3	0
2046	32	642.8	642.8	642.8	642.8	429.6	187.3	0
2047	33	646.2	646.2	646.2	646.2	431.9	188.2	0
2048	34	646.2	646.2	646.2	646.2	431.9	188.2	0
2049	35	646.2	646.2	646.2	646.2	431.9	188.2	0
2050	36	646.2	646.2	646.2	646.2	431.9	188.2	0
2051	37	646.2	646.2	646.2	646.2	431.9	188.2	0
2052	38	649.7	649.7	649.7	649.7	434.2	189.2	0
2053	39	649.7	649.7	649.7	649.7	434.2	189.2	0
2054	40	649.7	649.7	649.7	649.7	434.2	189.2	0
2055	41	649.7	649.7	649.7	649.7	434.2	189.2	0
2056	42	649.7	649.7	649.7	649.7	434.2	189.2	0
2057	43	649.7	649.7	649.7	649.7	434.2	189.2	0
2058	44	649.7	649.7	649.7	649.7	434.2	189.2	0
2059	45	649.7	649.7	649.7	649.7	434.2	189.2	0
2060	46	649.7	649.7	649.7	649.7	434.2	189.2	0
2061	47	649.7	649.7	649.7	649.7	434.2	189.2	0
2062	48	649.7	649.7	649.7	649.7	434.2	189.2	0
2063	49	649.7	649.7	649.7	649.7	434.2	189.2	0
2064	50	649.7	649.7	649.7	649.7	434.2	189.2	0

Table 8
Expected Annual Delay Cost
LNG Vessels Outbound, Containerships Both Directions
GEC Forecast
Undiscounted ($000)

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	433.6	433.6	433.6	433.6	284.8	134	14.5
2016	2	457.7	457.7	457.7	457.7	304.3	139.2	14.5
2017	3	474.8	474.8	474.8	474.8	306	145.5	14.6
2018	4	484.5	484.5	484.5	484.5	325.6	150.8	14.6
2019	5	508.8	508.8	508.8	508.8	333.3	156.3	14.6
2020	6	532.9	532.9	532.9	532.9	345.3	161.5	17.5
2021	7	542.6	542.6	542.6	542.6	353.1	161.5	17.5
2022	8	569.9	569.9	569.9	569.9	374.7	173.3	17.6
2023	9	594.4	594.4	594.4	594.4	394.4	178.8	17.6
2024	10	618.7	618.7	618.7	618.7	414.2	189.7	17.6
2025	11	643	643	643	643	421.9	195	20.5
2026	12	667.4	667.4	667.4	667.4	441.7	200.5	20.5
2027	13	705.3	705.3	705.3	705.3	464	212.5	20.6
2028	14	729.8	729.8	729.8	729.8	483.9	223.4	23.6
2029	15	754.3	754.3	754.3	754.3	491.7	228.7	23.6
2030	16	788.6	788.6	788.6	788.6	511.6	234.2	0
2031	17	813.1	813.1	813.1	813.1	531.4	245.1	0
2032	18	842.1	842.1	842.1	842.1	554.3	257.4	0
2033	19	876.6	876.6	876.6	876.6	574.2	268.3	0
2034	20	916	916	916	916	602.1	279.4	0
2035	21	950.4	950.4	950.4	950.4	622	290.3	0
2036	22	984.9	984.9	984.9	984.9	642	301.2	0
2037	23	1029.8	1029.8	1029.8	1029.8	673.5	313.9	0
2038	24	1064.5	1064.5	1064.5	1064.5	693.5	324.8	0
2039	25	1099.2	1099.2	1099.2	1099.2	713.6	335.9	0
2040	26	1148.6	1148.6	1148.6	1148.6	753.8	346.8	0
2041	27	1183.3	1183.3	1183.3	1183.3	773.9	357.9	0
2042	28	1189.6	1189.6	1189.6	1189.6	778	359.8	0
2043	29	1189.6	1189.6	1189.6	1189.6	778	359.8	0
2044	30	1189.6	1189.6	1189.6	1189.6	778	359.8	0
2045	31	1189.6	1189.6	1189.6	1189.6	778	359.8	0
2046	32	1189.6	1189.6	1189.6	1189.6	778	359.8	0
2047	33	1195.9	1195.9	1195.9	1195.9	782.2	361.6	0
2048	34	1195.9	1195.9	1195.9	1195.9	782.2	361.6	0
2049	35	1195.9	1195.9	1195.9	1195.9	782.2	361.6	0
2050	36	1195.9	1195.9	1195.9	1195.9	782.2	361.6	0
2051	37	1195.9	1195.9	1195.9	1195.9	782.2	361.6	0
2052	38	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2053	39	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2054	40	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2055	41	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2056	42	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2057	43	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2058	44	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2059	45	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2060	46	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2061	47	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2062	48	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2063	49	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0
2064	50	1202.3	1202.3	1202.3	1202.3	786.3	363.6	0

Table 9
Expected Annual Delay Cost
LNG Vessels Inbound, Containerships Outbound
GEC Forecast
Undiscounted ($000)

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	631.3	631.3	631.3	631.3	407	195.6	0
2016	2	661.3	661.3	661.3	661.3	430.9	211.9	0
2017	3	665.3	665.3	665.3	665.3	433.5	213.2	0
2018	4	695.5	695.5	695.5	695.5	457.6	229.6	0
2019	5	725.8	725.8	725.8	725.8	481.7	229.6	0
2020	6	756	756	756	756	481.7	246	0
2021	7	786.3	786.3	786.3	786.3	505.8	246	0
2022	8	821.4	821.4	821.4	821.4	533	263.9	0
2023	9	851.8	851.8	851.8	851.8	557.3	263.9	0
2024	10	882.2	882.2	882.2	882.2	581.5	280.4	0
2025	11	912.6	912.6	912.6	912.6	605.7	296.9	0
2026	12	943	943	943	943	629.9	296.9	0
2027	13	1009.8	1009.8	1009.8	1009.8	658	315.3	0
2028	14	1040.4	1040.4	1040.4	1040.4	682.4	331.9	0
2029	15	1071	1071	1071	1071	706.8	348.5	0
2030	16	1132.3	1132.3	1132.3	1132.3	731.2	348.5	0
2031	17	1162.9	1162.9	1162.9	1162.9	755.5	365.1	0
2032	18	1200.5	1200.5	1200.5	1200.5	784.5	383.9	0
2033	19	1262.1	1262.1	1262.1	1262.1	809	400.6	0
2034	20	1292.8	1292.8	1292.8	1292.8	858.1	417.3	0
2035	21	1354.4	1354.4	1354.4	1354.4	882.6	434	0
2036	22	1416	1416	1416	1416	907.1	450.7	0
2037	23	1455.2	1455.2	1455.2	1455.2	961.7	470.1	0
2038	24	1517.2	1517.2	1517.2	1517.2	986.4	486.9	0
2039	25	1579.1	1579.1	1579.1	1579.1	1011	503.7	0
2040	26	1641	1641	1641	1641	1060.4	520.5	0
2041	27	1702.9	1702.9	1702.9	1702.9	1085	537.3	0
2042	28	1712.9	1712.9	1712.9	1712.9	1091.3	540.4	0
2043	29	1712.9	1712.9	1712.9	1712.9	1091.3	540.4	0
2044	30	1712.9	1712.9	1712.9	1712.9	1091.3	540.4	0
2045	31	1712.9	1712.9	1712.9	1712.9	1091.3	540.4	0
2046	32	1712.9	1712.9	1712.9	1712.9	1091.3	540.4	0
2047	33	1722.8	1722.8	1722.8	1722.8	1097.7	543.6	0
2048	34	1722.8	1722.8	1722.8	1722.8	1097.7	543.6	0
2049	35	1722.8	1722.8	1722.8	1722.8	1097.7	543.6	0
2050	36	1722.8	1722.8	1722.8	1722.8	1097.7	543.6	0
2051	37	1722.8	1722.8	1722.8	1722.8	1097.7	543.6	0
2052	38	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2053	39	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2054	40	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2055	41	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2056	42	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2057	43	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2058	44	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2059	45	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2060	46	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2061	47	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2062	48	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2063	49	1732.7	1732.7	1732.7	1732.7	1104	546.7	0
2064	50	1732.7	1732.7	1732.7	1732.7	1104	546.7	0

Table 10
Expected Annual Delay Cost
LNG Vessels Inbound, Containerships Inbound
GEC Forecast
Undiscounted ($000)

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	44.9	44.9	44.9	44.9	30	13.9	2.8
2016	2	47.7	47.7	47.7	47.7	32.3	13.9	2.8
2017	3	50.8	50.8	50.8	50.8	32.5	15	2.8
2018	4	50.8	50.8	50.8	50.8	34.8	15	2.8
2019	5	53.7	53.7	53.7	53.7	34.8	16.1	2.8
2020	6	56.5	56.5	56.5	56.5	37.1	16.1	3.4
2021	7	56.5	56.5	56.5	56.5	37.1	16.1	3.4
2022	8	59.7	59.7	59.7	59.7	39.7	17.3	3.4
2023	9	62.5	62.5	62.5	62.5	42	18.3	3.4
2024	10	65.3	65.3	65.3	65.3	44.3	19.4	3.4
2025	11	68.2	68.2	68.2	68.2	44.3	19.4	4
2026	12	71	71	71	71	46.7	20.5	4
2027	13	74.3	74.3	74.3	74.3	49.3	21.7	4
2028	14	77.2	77.2	77.2	77.2	51.6	22.8	4.6
2029	15	80	80	80	80	51.6	22.8	4.6
2030	16	82.9	82.9	82.9	82.9	54	23.9	0
2031	17	85.7	85.7	85.7	85.7	56.3	25	0
2032	18	89.1	89.1	89.1	89.1	59	26.2	0
2033	19	92	92	92	92	61.4	27.3	0
2034	20	97.7	97.7	97.7	97.7	63.7	28.4	0
2035	21	100.6	100.6	100.6	100.6	66.1	29.5	0
2036	22	103.5	103.5	103.5	103.5	68.4	30.6	0
2037	23	109.9	109.9	109.9	109.9	71.2	31.8	0
2038	24	112.8	112.8	112.8	112.8	73.6	32.9	0
2039	25	115.7	115.7	115.7	115.7	76	34	0
2040	26	121.4	121.4	121.4	121.4	80.7	35.1	0
2041	27	124.3	124.3	124.3	124.3	83.1	36.2	0
2042	28	125.1	125.1	125.1	125.1	83.6	36.4	0
2043	29	125.1	125.1	125.1	125.1	83.6	36.4	0
2044	30	125.1	125.1	125.1	125.1	83.6	36.4	0
2045	31	125.1	125.1	125.1	125.1	83.6	36.4	0
2046	32	125.1	125.1	125.1	125.1	83.6	36.4	0
2047	33	125.8	125.8	125.8	125.8	84.1	36.6	0
2048	34	125.8	125.8	125.8	125.8	84.1	36.6	0
2049	35	125.8	125.8	125.8	125.8	84.1	36.6	0
2050	36	125.8	125.8	125.8	125.8	84.1	36.6	0
2051	37	125.8	125.8	125.8	125.8	84.1	36.6	0
2052	38	126.5	126.5	126.5	126.5	84.5	36.9	0
2053	39	126.5	126.5	126.5	126.5	84.5	36.9	0
2054	40	126.5	126.5	126.5	126.5	84.5	36.9	0
2055	41	126.5	126.5	126.5	126.5	84.5	36.9	0
2056	42	126.5	126.5	126.5	126.5	84.5	36.9	0
2057	43	126.5	126.5	126.5	126.5	84.5	36.9	0
2058	44	126.5	126.5	126.5	126.5	84.5	36.9	0
2059	45	126.5	126.5	126.5	126.5	84.5	36.9	0
2060	46	126.5	126.5	126.5	126.5	84.5	36.9	0
2061	47	126.5	126.5	126.5	126.5	84.5	36.9	0
2062	48	126.5	126.5	126.5	126.5	84.5	36.9	0
2063	49	126.5	126.5	126.5	126.5	84.5	36.9	0
2064	50	126.5	126.5	126.5	126.5	84.5	36.9	0

Table 11
Expected Annual Delay Cost
LNG Vessels Inbound, Containerships in both Directions
GEC Forecast
Undiscounted ($000)

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	676.2	676.2	676.2	676.2	437	209.5	2.8
2016	2	709	709	709	709	463.2	225.8	2.8
2017	3	716.1	716.1	716.1	716.1	466	228.2	2.8
2018	4	746.3	746.3	746.3	746.3	492.4	244.6	2.8
2019	5	779.5	779.5	779.5	779.5	516.5	245.7	2.8
2020	6	812.5	812.5	812.5	812.5	518.8	262.1	3.4
2021	7	842.8	842.8	842.8	842.8	542.9	262.1	3.4
2022	8	881.1	881.1	881.1	881.1	572.7	281.2	3.4
2023	9	914.3	914.3	914.3	914.3	599.3	282.2	3.4
2024	10	947.5	947.5	947.5	947.5	625.8	299.8	3.4
2025	11	980.8	980.8	980.8	980.8	650	316.3	4
2026	12	1014	1014	1014	1014	676.6	317.4	4
2027	13	1084.1	1084.1	1084.1	1084.1	707.3	337	4
2028	14	1117.6	1117.6	1117.6	1117.6	734	354.7	4.6
2029	15	1151	1151	1151	1151	758.4	371.3	4.6
2030	16	1215.2	1215.2	1215.2	1215.2	785.2	372.4	0
2031	17	1248.6	1248.6	1248.6	1248.6	811.8	390.1	0
2032	18	1289.6	1289.6	1289.6	1289.6	843.5	410.1	0
2033	19	1354.1	1354.1	1354.1	1354.1	870.4	427.9	0
2034	20	1390.5	1390.5	1390.5	1390.5	921.8	445.7	0
2035	21	1455	1455	1455	1455	948.7	463.5	0
2036	22	1519.5	1519.5	1519.5	1519.5	975.5	481.3	0
2037	23	1565.1	1565.1	1565.1	1565.1	1032.9	501.9	0
2038	24	1630	1630	1630	1630	1060	519.8	0
2039	25	1694.8	1694.8	1694.8	1694.8	1087	537.7	0
2040	26	1762.4	1762.4	1762.4	1762.4	1141.1	555.6	0
2041	27	1827.2	1827.2	1827.2	1827.2	1168.1	573.5	0
2042	28	1838	1838	1838	1838	1174.9	576.8	0
2043	29	1838	1838	1838	1838	1174.9	576.8	0
2044	30	1838	1838	1838	1838	1174.9	576.8	0
2045	31	1838	1838	1838	1838	1174.9	576.8	0
2046	32	1838	1838	1838	1838	1174.9	576.8	0
2047	33	1848.6	1848.6	1848.6	1848.6	1181.8	580.2	0
2048	34	1848.6	1848.6	1848.6	1848.6	1181.8	580.2	0
2049	35	1848.6	1848.6	1848.6	1848.6	1181.8	580.2	0
2050	36	1848.6	1848.6	1848.6	1848.6	1181.8	580.2	0
2051	37	1848.6	1848.6	1848.6	1848.6	1181.8	580.2	0
2052	38	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2053	39	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2054	40	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2055	41	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2056	42	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2057	43	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2058	44	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2059	45	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2060	46	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2061	47	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2062	48	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2063	49	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0
2064	50	1859.2	1859.2	1859.2	1859.2	1188.5	583.6	0

Table 12
Expected Annual Delay Cost
LNG Vessels, GEC Forecast
Undiscounted ($000)

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	1109.8	1109.8	1109.8	1109.8	721.8	343.5	17.3
2016	2	1166.7	1166.7	1166.7	1166.7	767.5	365	17.3
2017	3	1190.9	1190.9	1190.9	1190.9	772	373.7	17.4
2018	4	1230.8	1230.8	1230.8	1230.8	818	395.4	17.4
2019	5	1288.3	1288.3	1288.3	1288.3	849.8	402	17.4
2020	6	1345.4	1345.4	1345.4	1345.4	864.1	423.6	20.9
2021	7	1385.4	1385.4	1385.4	1385.4	896	423.6	20.9
2022	8	1451	1451	1451	1451	947.4	454.5	21
2023	9	1508.7	1508.7	1508.7	1508.7	993.7	461	21
2024	10	1566.2	1566.2	1566.2	1566.2	1040	489.5	21
2025	11	1623.8	1623.8	1623.8	1623.8	1071.9	511.3	24.5
2026	12	1681.4	1681.4	1681.4	1681.4	1118.3	517.9	24.5
2027	13	1789.4	1789.4	1789.4	1789.4	1171.3	549.5	24.6
2028	14	1847.4	1847.4	1847.4	1847.4	1217.9	578.1	28.2
2029	15	1905.3	1905.3	1905.3	1905.3	1250.1	600	28.2
2030	16	2003.8	2003.8	2003.8	2003.8	1296.8	606.6	0
2031	17	2061.7	2061.7	2061.7	2061.7	1343.2	635.2	0
2032	18	2131.7	2131.7	2131.7	2131.7	1397.8	667.5	0
2033	19	2230.7	2230.7	2230.7	2230.7	1444.6	696.2	0
2034	20	2306.5	2306.5	2306.5	2306.5	1523.9	725.1	0
2035	21	2405.4	2405.4	2405.4	2405.4	1570.7	753.8	0
2036	22	2504.4	2504.4	2504.4	2504.4	1617.5	782.5	0
2037	23	2594.9	2594.9	2594.9	2594.9	1706.4	815.8	0
2038	24	2694.5	2694.5	2694.5	2694.5	1753.5	844.6	0
2039	25	2794	2794	2794	2794	1800.6	873.6	0
2040	26	2911	2911	2911	2911	1894.9	902.4	0
2041	27	3010.5	3010.5	3010.5	3010.5	1942	931.4	0
2042	28	3027.6	3027.6	3027.6	3027.6	1952.9	936.6	0
2043	29	3027.6	3027.6	3027.6	3027.6	1952.9	936.6	0
2044	30	3027.6	3027.6	3027.6	3027.6	1952.9	936.6	0
2045	31	3027.6	3027.6	3027.6	3027.6	1952.9	936.6	0
2046	32	3027.6	3027.6	3027.6	3027.6	1952.9	936.6	0
2047	33	3044.5	3044.5	3044.5	3044.5	1964	941.8	0
2048	34	3044.5	3044.5	3044.5	3044.5	1964	941.8	0
2049	35	3044.5	3044.5	3044.5	3044.5	1964	941.8	0
2050	36	3044.5	3044.5	3044.5	3044.5	1964	941.8	0
2051	37	3044.5	3044.5	3044.5	3044.5	1964	941.8	0
2052	38	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2053	39	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2054	40	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2055	41	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2056	42	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2057	43	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2058	44	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2059	45	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2060	46	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2061	47	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2062	48	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2063	49	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0
2064	50	3061.5	3061.5	3061.5	3061.5	1974.8	947.2	0

Tabl 13
Expected Annual Delay Cost
LNG Vessels, GEC Forecast
Discounted ($000)

Year	Project Year	Project Depth						
		42	43	44	45	46	47	48
2015	1	1,058.2	1,058.2	1,058.2	1,058.2	688.2	327.5	16.5
2016	2	1,060.8	1,060.8	1,060.8	1,060.8	697.8	331.9	15.7
2017	3	1,032.4	1,032.4	1,032.4	1,032.4	669.3	324.0	15.1
2018	4	1,017.4	1,017.4	1,017.4	1,017.4	676.2	326.9	14.4
2019	5	1,015.4	1,015.4	1,015.4	1,015.4	669.8	316.9	13.7
2020	6	1,011.2	1,011.2	1,011.2	1,011.2	649.4	318.4	15.7
2021	7	992.8	992.8	992.8	992.8	642.1	303.6	15.0
2022	8	991.5	991.5	991.5	991.5	647.4	310.6	14.3
2023	9	983.0	983.0	983.0	983.0	647.5	300.4	13.7
2024	10	973.0	973.0	973.0	973.0	646.1	304.1	13.0
2025	11	961.9	961.9	961.9	961.9	635.0	302.9	14.5
2026	12	949.7	949.7	949.7	949.7	631.7	292.5	13.8
2027	13	963.8	963.8	963.8	963.8	630.9	296.0	13.2
2028	14	948.8	948.8	948.8	948.8	625.5	296.9	14.5
2029	15	933.0	933.0	933.0	933.0	612.2	293.8	13.8
2030	16	935.6	935.6	935.6	935.6	605.5	283.2	0.0
2031	17	917.9	917.9	917.9	917.9	598.0	282.8	0.0
2032	18	905.0	905.0	905.0	905.0	593.4	283.4	0.0
2033	19	903.0	903.0	903.0	903.0	584.8	281.8	0.0
2034	20	890.3	890.3	890.3	890.3	588.2	279.9	0.0
2035	21	885.3	885.3	885.3	885.3	578.1	277.4	0.0
2036	22	878.9	878.9	878.9	878.9	567.6	274.6	0.0
2037	23	868.3	868.3	868.3	868.3	571.0	273.0	0.0
2038	24	859.7	859.7	859.7	859.7	559.5	269.5	0.0
2039	25	850.0	850.0	850.0	850.0	547.8	265.8	0.0
2040	26	844.4	844.4	844.4	844.4	549.7	261.8	0.0
2041	27	832.7	832.7	832.7	832.7	537.2	257.6	0.0
2042	28	798.5	798.5	798.5	798.5	515.1	247.0	0.0
2043	29	761.4	761.4	761.4	761.4	491.1	235.5	0.0
2044	30	726.0	726.0	726.0	726.0	468.3	224.6	0.0
2045	31	692.3	692.3	692.3	692.3	446.5	214.2	0.0
2046	32	660.1	660.1	660.1	660.1	425.8	204.2	0.0
2047	33	632.9	632.9	632.9	632.9	408.3	195.8	0.0
2048	34	603.5	603.5	603.5	603.5	389.3	186.7	0.0
2049	35	575.4	575.4	575.4	575.4	371.2	178.0	0.0
2050	36	548.7	548.7	548.7	548.7	354.0	169.7	0.0
2051	37	523.2	523.2	523.2	523.2	337.5	161.8	0.0
2052	38	501.6	501.6	501.6	501.6	323.6	155.2	0.0
2053	39	478.3	478.3	478.3	478.3	308.5	148.0	0.0
2054	40	456.1	456.1	456.1	456.1	294.2	141.1	0.0
2055	41	434.9	434.9	434.9	434.9	280.5	134.6	0.0
2056	42	414.7	414.7	414.7	414.7	267.5	128.3	0.0
2057	43	395.4	395.4	395.4	395.4	255.1	122.3	0.0
2058	44	377.0	377.0	377.0	377.0	243.2	116.6	0.0
2059	45	359.5	359.5	359.5	359.5	231.9	111.2	0.0
2060	46	342.8	342.8	342.8	342.8	221.1	106.1	0.0
2061	47	326.9	326.9	326.9	326.9	210.8	101.1	0.0
2062	48	311.7	311.7	311.7	311.7	201.0	96.4	0.0
2063	49	297.2	297.2	297.2	297.2	191.7	91.9	0.0
2064	50	283.4	283.4	283.4	283.4	182.8	87.7	0.0

Table 14 Annual Delay Cost LNG Vessels ($000)			
Channel Depth, ft			
42		1,985.9	
43		1,985.9	
44		1,985.9	
45		1,985.9	
46		1,293.0	
47		617.5	
48		11.7	

Table 15 Annual Benefit Reduction in Delay LNG Vessels ($000)			
Channel Depth, ft			
43		0.0	
44		0.0	
45		0.0	
46		692.9	
47		1,368.4	
48		1,974.2	

SENSITIVITY ANALYSES

Four sensitivity analyses were conducted for this analysis. The first two sensitivity analyses examine how the project benefits change with changes in the LNG fleet forecast. A higher growth and a lower growth forecast are used. The third examines how the benefits change with the use of estimated LNG vessel operating costs provided by the terminal as opposed to operating costs derived from IWR tables. The fourth examines how the benefits could be affected with a proposed change in the Regulated Navigation Area around LNG tankers which is currently being considered by the Coast Guard. Brief descriptions of each sensitivity analysis and the resulting benefit values are described below.

Higher Growth LNG Fleet Forecast

The higher growth LNG fleet forecasts reflect the full increase in LNG tanker calls to Elba Island with the Elba III expansion (to 213 vessels per year) as in the base case, but also includes a shift to significantly larger vessels (up to 200,000 cubic meters) over the 50 year period of analysis, as projected by terminal representatives. Since larger vessels have somewhat higher hourly operating costs, the delay costs increase in the without project condition, and the value of the delay costs prevented with the project also increases. The results of this sensitivity analysis are shown in Table 16, below.

Table 16
Annual Benefit
Reduction in Delay
LNG Vessels
Sensitivity Analysis
Higher Growth
($000)

Channel Depth, ft	
43	0.0
44	0.0
45	0.0
46	755.6
47	1,491.9
48	2,152.9

Lower Growth Fleet Forecast

The lower growth LNG fleet forecast reflects the increase to 118 LNG vessel calls per year as projected with the Elba II expansion, but does not include the additional growth to

213 vessels calls per year projected with the Elba III expansion. The lower growth forecast includes a gradual shift to 145,000 cubic meter vessels, but no further shifts to even larger vessels, since those vessels are not yet constructed. This sensitivity analysis is the most conservative, reflecting uncertainty regarding the completion of the Elba III expansion and its impact on vessel calls, and also including only minor growth in vessel sizes. The smaller number of projected annual vessel calls results in lower annual benefits, as shown below in Table 17.

Table 17
Annual Benefit
Reduction in Delay
LNG Vessels
Sensitivity Analysis
Lower Growth
($000)

Channel Depth, ft	
43	0.0
44	0.0
45	0.0
46	383.9
47	758.1
48	1,093.7

Terminal-Provided Vessel Operating Cost

The typical LNG vessel operating costs provided by the terminal were higher than the operating costs derived from IWR vessel operating costs for oil tankers. While this analysis uses the IWR-derived costs to calculate the benefits to LNG operations, the higher costs provided by the terminal are used here for comparison purposes. This yields higher annual benefits, as shown in Table 18.

Table 18
Annual Benefit
Reduction in Delay
LNG Vessels
Sensitivity Analysis Terminal
Operating Cost
($000)

Channel Depth, ft	
43	0.0
44	0.0
45	0.0
46	757.0
47	1,493.3
48	2,156.6