BERTH 97-109 CONTAINER TERMINAL
PROJECTED THROUGHPUT

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Prepared by: Port of Los Angeles Engineering Division

Introduction

To support port-wide planning efforts and the specific requirements of environmental documents, the Port of Los Angeles Engineering Division has developed a method to estimate throughput for container terminals for the years 2005, 2010, 2015, 2025, and 2030. This paper addresses the general method of calculating projected cargo throughputs and then addresses the specific assumptions made when this method is applied to the numerous alternatives being studied in the environmental analysis of Berths 97-109. Port staff initiated this effort in late 2002 and have continued to revise estimates and this paper as alternatives changed and new information became available, such as actual throughput numbers.

General Methodology

Two main sources of information regarding the container volume demand and capacity projections for the San Pedro Bay area were utilized in this report: the Mercer market-based study and the JWD Capacity Analysis Report. A third source of information was actual terminal throughput, which was used to set the initial 2005 projection.

The Mercer Study[1], dated July 2001, evaluated the potential container throughput demand for the two San Pedro Bay Ports, the Port of Los Angeles (POLA) and the Port of Long Beach (POLB). This market-based forecast was prepared by Mercer Management Consulting to project long-term trends for various types of waterborne cargo, including containerized cargo. Their approach examined a wide range of market conditions, trade scenarios, demographics, trade barriers, and economic models for trading partners on a global basis. Although this forecast does examine general infrastructure and cargo handling capabilities of both the POLA and POLB, it is primarily a *demand* based market forecast that projects the volume of cargo that would be handled at the San Pedro Bay Ports, provided the physical capacity to do so was unconstrained.

The throughput projections were reported in terms of total number of TEUs (twenty-foot equivalent units) passing through both ports. Using best professional judgment on the information available at this time, staff distributed the throughput forecast by Mercer to individual terminals using the following method. As the Ports of Los Angeles and Long Beach are very similarly sized facilities, and are likely to remain so for the foreseeable future, 50 percent of the total projected cargo throughput for a given year was assumed to come through the Port of Los Angeles, and the other 50 percent through the Port of Long Beach. A uniform per-acre throughput projection for all terminals was determined by dividing this number by the projected total acreage port-wide dedicated to container terminals for the corresponding year. Although individual container terminals

[1]Mercer Management Consulting. July 2001. *San Pedro Bay Long-Term Cargo Forecast Update.*

do operate today at different throughput-per-acre levels, and will continue to do so in the future, it is speculative to predict which terminals, if any, will process throughput at slightly higher or lower densities. Terminals that operate at higher densities than their competitors do so with significantly increased operational costs. These increased costs seldom can be passed on to customers in the extremely competitive container shipping business. It is unreasonable to assume that, over time, a terminal will be able to maintain significantly denser, and correspondingly more expensive, operations than its competitors.

Table 1 shows how the Mercer forecast was used to determine a demand-based projection for each of the Port's container terminals. As the Mercer Study only projected demand through 2020, the projected annual rate of growth between 2010 to 2020 of 6.0 percent was used to extrapolate a 2025 demand value to correspond to the 2025 capacity projection described below. It should be noted that the port-wide projected throughput-per-gross-terminal-acre figures were greatly influenced by the addition of the Pier 400 Terminal acreage (484 acres) in 2005. This resulted in a port-wide average per-acre decrease in throughput from 4,700 TEUs/gross acre (gr. ac.) in 2002 to 4,000 TEUs/gr. ac. by 2005. However, this only represents an average, and as discussed previously, terminal throughput will typically vary from one terminal to another.

The second source of information utilized in this report was the November 2002 JWD Capacity Analysis Report[2], and subsequent revisions to this report. This report evaluated the physical capacity of POLA's existing and planned container terminal expansion for the years 2002, 2005, 2010, and 2025. Unlike the previous forecast approach, this report examined the physical throughput *capacity* of each terminal based on a detailed analysis of berthing and backland operational criteria. Reasonably foreseeable changes to operational labor practices, increased hours of operation, ship sizes, container stacking heights, and other factors were built into a capacity analysis model. The model forecast per-acre throughput capacities independently for each terminal. It also determined whether the backland or berth was the limiting factor for each terminal and reported an overall terminal capacity for each of the analysis years. In all cases, the JWD model yielded a maximum practical per-acre capacity for the terminal for the given year. The report was updated in June 2005 to include data for 2015 for all terminals. Data for 2015 was projected using assumptions consistent with the projections for the other years, which were not changed in this revision[3].

POLA staff evaluated the assumptions made in the JWD study and found them to represent reasonable forecasts of future conditions. The assumptions in the JWD report are specific to West Coast ports, and do not reflect trends or operating practices at Asian or other foreign ports. For example, the report shows 21 hours of effective operation for terminals operating around the clock, which allows for shift changes and other labor practices particular to the labor agreements at West Coast ports. No radical increases in throughput due to unforeseen technological changes are assumed, nor are radical decreases due to an expanded Panama Canal or the expansion of Mexican ports because the likelihood of either development actually occurring remains speculative at this time.

[2]JWD Group. November 2002. *Capacity Analysis Report Port of Los Angeles.*
[3]JWD Group. June 2005. *Capacity Analysis Report Port of Los Angeles.*

Since completion of the JWD Capacity Report, assumptions on the scope and timetable of expansions and improvements at Berths 97-109 have been slightly modified. JWD provided the underlying model, incorporating the details and assumptions listed above, to the Port. After discussions with JWD, it was agreed that the scope changes at the two terminals could be reevaluated using this model by adjusting two parameters: number of berths and gross terminal acreage. By varying these two inputs, the Port was able to generate throughput capacity projections for the proposed projects and all alternatives for Berths 97-109.

The Mercer Forecast and the JWD Capacity Report reported different container throughput projections for each of the analysis years. This difference was expected since the studies approached the cargo forecasts from different perspectives. Essentially, the reports discussed above can be used to provide an upper (capacity) and lower (demand) bound for projected terminal throughput for each of the analysis years. For all years where a Mercer demand figure was available, the JWD report's terminal capacity exceeded demand. Refer to **Table 2** for a summary of throughput projections for the proposed project.

For any given analysis year, where the capacity number is lower than the demand, it is clear that capacity will be the limiting factor. It can also be argued that in the opposite case, where demand is the lower number, it too will govern, as a terminal cannot process more cargo than is available. Port staff had some concerns that this approach could possibly underestimate the throughput for interim analysis years, as the total projected cargo demand increase is weighted toward the later years of the study. To address this concern, Port staff chose the approach described in the following two paragraphs.

For the earliest analysis year, 2005, a projection was calculated based on a 10 percent per year increase in throughput from its 2001/2002 actual levels. This used the best available data specific to the adjacent Yang Ming terminal, which is operated by the same stevedoring company as the China Shipping Terminal. This calculation yielded a value higher than projected demand and actually slightly higher than projected capacity, so the JWD capacity number was used. Since this initial 2005 projection was made, it has since been possible to collect throughput data for the years 2003, 2004, and 2005 to check this assumption. The results are shown on **Figure 1** and show that the 10 percent per year increase was very conservative for Berths 100-131, which actually saw a decrease in throughput per acre over this time period. The higher calculated 2005 value was used in the throughput analysis.

Projections for the more distant year, 2025, select the lesser of the demand and capacity projections for that year. It is unreasonable to assume a terminal could operate above its capacity, and projecting a throughput level above the average demand per acre this far in the future would be speculative. For the remaining analysis years, 2010 and 2015, a reasonable balance between the demand and capacity projections can be calculated by straight line interpolation between the 2005 and 2025 projection, assuming linear growth between those years. If this value is greater than the JWD projected capacity, the capacity value is used as a limiting value. **Figure 2** shows that for the proposed project, this line lies is higher than the JWD capacity in 2010, where the capacity governs, but between the JWD capacity and Mercer demand projections for 2015. This methodology

was reviewed by JWD, who concurred that it was a realistic and logical approach in a letter to POLA dated March 7, 2003.[3]

After the alternative modeling effort for Berths 97-109 began, it was determined that the analysis should also consider cargo projections out to year 2030. Because neither the Mercer nor JWD study projected throughput beyond 2025, two assumptions were made. First, after discussions with staff from JWD, it was assumed that the JWD throughput capacity for 2025 was essentially a maximum practical capacity for the terminals, based on current assumptions. These include the fact that POLA terminals, by 2025, are operating at 24 hour, 7 day per week operations and container operations are densified to the maximum extent practical. Assuming any increase beyond this level of throughput would have to assume a change in container terminal operations, such as dual-lift cranes or extensive automation, that is not foreseeable at this time and would by its nature be the subject of a future environmental analysis. The second assumption was that, by applying a continual 6 percent growth rate to the Mercer Demand Projections, the demand would outstrip capacity at all POLA terminals by 2030. The 2030 throughput projection is therefore the JWD capacity projection for 2025 for both terminals.

In addition to total throughput in TEUs for each terminal, number of ship calls required to achieve this throughput has also been projected. One of the inputs to the JWD capacity model is the average number of "lifts" per ship visit, which represents the number of containers loaded and unloaded from a ship on an average visit. This number was based on a review of ship call data for each individual terminal, and is scaled up in later forecast years to represent larger ships and increasing fractions of cargo bound for the Port. The number of containers can be converted to TEUs by multiplying by a conversion factor, also unique to each terminal, that takes into account the ratio of 20-, 40-, and 45-foot containers used by each shipping line. Dividing the projected annual throughput of a terminal by the average number of TEUs loaded and unloaded during a ship call gives an approximation of the number of ship calls for the year.

The approximation of ship calls was further refined by considering ship scheduling method used by most shipping lines. For the most part, container ships of a given size are arranged into "strings" that allow a shipper to call at the Port of Los Angeles once per week per string, providing a regular schedule for the shipper's customers. Each string will represent 52 annual ship calls, therefore the total annual ship calls should be a multiple of 52. Additional ship calls are not added individually but instead by adding a "string", or another weekly ship call. Although shippers do not tend to run bi-weekly services, a multiple of 26 was used for the Port's throughput forecasts, to allow for schedule irregularities, invitees, and diversions. The number of annual ship calls generated by the method described in the previous paragraph was rounded up to the next multiple of 26, unless it was within three calls of the next lowest multiple of 26, in which case it was rounded down. This method is assumed to yield an estimate of annual ship calls that is slightly high, but is consistent with the real-world operations of shipping lines.

[3]Letter, Mark Sisson, JWD Group, to Port of Los Angeles, 7 March 2003.

Specific Assumptions – Berths 97-109

The throughput capacity analysis model generated by JWD for the combined China Shipping/Yang Ming terminal was provided to the Port in the form of an Excel spreadsheet. All the alternatives were analyzed using this spreadsheet and varying the acreage and number of berths as appropriate to each alternative. The results are summarized in **Table 3** showing gross terminal acreage, number of berths, capacity projection (JWD), demand projection (Mercer), and the final projection determined by the Port, for each analysis year in each alternative. Assumptions used to adjust the gross terminal acreage and number of berths are listed below. The abbreviation YML is used for Yang Ming Lines, and CSL for China Shipping Lines. In all cases, it is assumed that there is no change in number of berths or total terminal acreage between 2025 and 2030.

Proposed Project

The Proposed Project assumes the CSL terminal is operated independently from YML. This assumes CSL has an arrangement to use YML's in-gate. By 2005, this alternative assumes CSL is using the existing 72 acres (Phase I). By 2010, CSL is assumed to have developed an additional 17 acres (Phase IIa) on the adjacent fill. By 2015, terminal acreage is assumed to include an additional 18 acres (Phase IIb) on the adjacent fill, and 35 further acres (Phase III) located on the adjacent fill, redeveloped the Catalina Terminal backland, and other properties. No acreage is assumed to be added between 2015 and 2030. The number of berths is 1 CSL berth in 2005, and 2 CSL berths thereafter, representing the increase in berth length from 1,200 feet to 2,500 feet.

Alternative 1 –No Project Alternative (China Shipping)

This alternative assumes that no future acreage is added to the existing 72 acres at CSL, and that the wharf at Berth 100 will not be used. To generate container throughput, it is assumed that the CSL backlands will be used as an extension of the YML Terminal, which also will not be improved. The number of berths used will be the existing 2.5 berths at YML for 2005. For 2010 and 2015, the number of effective berths is reduced to 2.25, to compensate for the reduced effectiveness of the existing berths at YML as larger ships come on line and the existing wharf's depth, configuration, length, and 50' gage crane rail become more and more outmoded. In 2025 and 2030, the number of effective berths is further reduced to 1.75 as ships grow even larger. Acreage for all years is 261 acres, which is the existing 186 acres at YML plus the existing 72 acres at Berth 100.

Alternative 2 –No Federal Action at China Shipping

This alternative assumes that the backlands will be constructed on Channel Deepening Project fills, but that no berthing will be provided at Berth 100. The backlands will be used as an extension of the YML terminal. It is also assumed that there will be no improvements of the YML Berths. The 2.5 berths (YML's) are assumed for 2005, with a total terminal acreage equal to CSL's 72 acres plus YML's 186 acres. For 2010 and 2015 the number of effective berths is reduced to 2.25, and further reduced to 1.75 in 2025 and 2030, for the same reasons given in Alternative 1. Acreage for 2010 is 89 acres at CSL plus the existing 186 acres at

YML. By 2015, an additional 28 acres is assumed to be developed on the adjacent landfill. No acreage is assumed to be added between 2015 and 2030.

Alternative 3 –Reduced Construction Alternative – No B102 Wharf

This alternative is the same as the Proposed Project, except the 925-foot B102 wharf would not be built. The number of available berths assumed for this alternative remains 1, as 1,575 feet is too short to be occupied by two ships.

Alternative 4 –Reduced Construction Alternative – No B100 South Wharf

This alternative is the same as the Proposed Project, except the 375-foot B100 south wharf extension is not built, and the Catalina Terminal area is not developed, reducing the Phase III area expansion by 12 acres to 23 acres. For 2010 through 2030 the available number of berths is assumed to be 1.5, as a total wharf length of 2,125 feet can occasionally accommodate two ships.

Alternative 5 –Reduced Construction and Operations Alternative

In this alternative, only the existing 72 acres of backland and 1,200 feet of wharf are constructed, and no further expansion is assumed. The number of berths used in the model remains 1 for all years.

Alternative 6 –Omni Cargo Terminal Alternative

No throughput analysis has been performed for this alternative. The document assumes annual throughput volumes at the proposed Omni terminal would vary by commodity: 506,467 container TEUs; 17,987 auto TEUs; and break-bulk commodities totaling 5,159,570 tons. Under this alternative, 364 annual ship calls and 1,456 tugboat trips would be required. In addition, this alternative would result in up to 3,982 truck trips, and up to 245 annual round-trip rail movements. These throughput estimates were derived using volume estimates from an existing Omni terminal of a similar size at the Port of Los Angeles.

Alternative 7 –Nonshipping Alternative

No throughput analysis has been performed for this alternative. No throughput is assumed for this alternative.

PORT OF LOS ANGELES
TERMINAL THROUGHPUT DEMAND FORECAST

9/7/2007

CONTAINER TERMINAL	GROSS TERMINAL AREA (ACRES) 2002 (August)	2005	2010	2015	2020	2025 (note 4)	Actual data from May 2001 thru April 2002
B100-131 see notes1&2	226	261	323	323	323	366	based on full build out of terminal, incl. GATX and add'l fill
B136-147 see note 3	176	176	233	233	243	243	based on EIS/EIR proposed project alternative
B206-209	84	84	84	84	84	84	assumes hugo neu remains, no westways
B212-225	192	192	192	192	192	192	includes 24 acres at TICTIF
B226-236	208	230	285	285	285	285	incl 24ac@tictf. 2ac & 20 ac exp by 2005, 55 ac laxt exp by 2010
B302-305	291	291	331	331	331	331	40 ac exp by 2010
B401-406	0	484	484	484	684	684	200 ac exp by 2020, 01/02 teu's via RDP at B145/147
Total Area	1177	1718	1932	1932	2142	2185	
MERCER PROJECTIONS							Mercer Management Consulting. July 2001. The Mercer Study evaluated projections to the year 2020. The year 2025 throughput projection is an extrapolation from 2020 to 2025 @ 6% per year.
POLA Total teu's	5488000	6827000	9847000	13172000	17629500	23592200	
Teu's/gr acre	4700	4000	5100	6800	8200	10800	

1) Includes use of 40 acres in B100 for year 11 months of the 2001/2002. (effective acreage for entire year of 222 acres).

2) 2010 acreage based on wharf improvement alternative that maintains current wharf alignment for Berths 121-131.

3) 2001/02 teu/gr. ac. calculation is based on the Berth 136-147 operating area of 125 gross acres for majority of 01/02 year; although August 2002 area is 176 acres.

4) The total full build out acreage shown for 2025 include assumptions for additional acreages at numerous terminals, which will be part of subsequent EIRs

TABLE 1

PORT OF LOS ANGELES
BERTHS 97-109 THROUGHPUT ANALYSIS

revised 09/07/07

TERMINAL	Gross Terminal Area (acres)	Market **Demand** Mercer Study (7/2002) teu's/gross acre [2]	Terminal **Capacity** JWD Study (6/2005) teu's/gross acre [1]	**POLA Projection For teu's/gross acre [3]**	Notes
BERTH 97-109					
2005	72	4000	5600	**5600**	based on 10%/year increase from 2001/2002 Yang Ming actuals, capacity limited
2010	89	5100	6800	**6800**	limited by JWD capacity
2015	142	6800	8600	**8200**	straight line increase from 2005 to 2025
2025	142	10800	10900	**10800**	Mercer value is limiting factor
2030	142	n/a	10900	**10900**	Terminal at JWD Capacity

[1] The 10/2002 JWD Study (with 6/2005 update) evaluated potential terminal capacity based on maximizing backland and berthing facilities utilization with assumed increases in labor productivity ship sizes, and other terminal improvements or advancements that may or may not occur in the time frames considered.

[2] The Mercer forecast is a port of LA/LB combined thru-put demand analysis. The teu's per gross acre calculations represent a 50% market share for the Port of LA spread evenly to each terminal based on their size in gross acres. The teu's per acre are a port wide number.

[3] The POLA projections for the Berths 97-109 terminal were based on an evaluation of the information of both the Mercer and JWD information.

TABLE 2

BERTHS 97-109 TERMINAL THROUGHPUT ANALYSIS
China Shipping Container Terminal EIS/EIR Alternatives

09/07/07

Capacity Projections - Throughput in TEU's per Acre

	Alternative	2005 Gross Terminal Acreage	2005 # of Berths	2005 JWD	2005 Mercer	2005 POLA projection (2002 + 10%/yr)	2005 Total Projected Throughput (TEUs)	2005 # of Ship Calls, "Average Ship"	2005 "Average Ship" Lifts Per Call	2005 Ship Calls based on weekly & biweekly services	2010 Gross Terminal Acreage	2010 # of Berths	2010 JWD	2010 Mercer	2010 POLA projection (Inter-polated)	2010 Total Projected Throughput (TEUs)	2010 # of Ship Calls, "Average Ship"	2010 "Average Ship" Lifts Per Call	2010 Ship Calls based on weekly & biweekly services	2015 Gross Terminal Acreage	2015 # of Berths	2015 JWD	2015 Mercer	2015 POLA projection (Inter-polated)	2015 Total Projected Throughput (TEUs)	2015 # of Ship Calls, "Average Ship"	2015 "Average Ship" Lifts Per Call	2015 Ship Calls based on weekly & biweekly services	2025 Gross Terminal Acreage	2025 # of Berths	2025 JWD	2025 Mercer	2025 POLA projection (lesser of JWD/ Mercer)	2025 Total Projected Throughput (TEUs)	2025 # of Ship Calls, "Average Ship"	2025 "Average Ship" Lifts Per Call	2025 Ship Calls based on weekly & biweekly services	2030 Gross Terminal Acreage	2030 # of Berths	2030 POLA projection (JWD capacity)	2030 Total Projected Throughput (TEUs)	2030 # of Ship Calls, "Average Ship"	2030 "Average Ship" Lifts Per Call	2030 Ship Calls based on weekly & biweekly services
	Proposed Project[2]	72	1.00	5600	4000	5600	403,200	68	3,300	78	89	1.50	6800	5100	6800	605,200	92	3,630	104	142	2.00	8600	6800	8200	1,164,400	170	3,795	182	142	2.00	10900	10800	10800	1,533,600	214	3,960	234	142	2.00	10900	1,551,000	216	3,960	234
1	**No Project Alternative**[1]	258	2.50	4900	4000	5600	1,444,800	242	3,300	260	258	2.25	6100	5100	5800	1,496,400	228	3,630	234	258	2.25	6400	6800	6000	1,548,000	225	3,795	234	258	1.75	6300	10800	6300	1,638,000	229	3,960	234	258	1.75	6300	1,638,000	229	3,960	234
	YM	186	2.50				1,041,600	242		260	186	2.25				1,078,800	228		234	186	2.25				1,116,000	225		234	186	1.75				1,180,900	229		234	186	1.75	6300	1,180,900	229		234
	CS	72	0.00				403,200	0		0	72	0.00				417,600	0		0	72	0.00				432,000	0		0	72	0.00				457,100	0		0	72	0.00	6300	457,100	0		0
2	**No Federal Action at China Shipping**[1,3]	258	2.50	4900	4000	5600	1,444,800	242	3,300	260	275	2.25	5700	5100	5600	1,540,000	234	3,630	234	303	2.25	5400	6800	5400	1,636,200	238	3,795	260	303	1.75	5400	10800	5400	1,638,000	229	3,960	234	303	1.75	5400	1,638,000	229	3,960	234
	YM	186	2.50				1,041,600	242		260	186	2.25				1,041,600	234		260	186	2.25				1,004,400	238		260	186	1.75				1,005,500	229		234	186	1.75		1,005,500	229		234
	CS	72	0.00				403,200	0		0	89	0.00				498,400	0		-26	117	0.00				631,800	0		0	117	0.00				632,500	0		0	117	0.00		632,500	0		0
3	**Reduced Construction Alt. - No B102 Wharf**[3]	72	1.00	5600	4000	5600	403,200	68	3,300	78	89	1.00	6800	5100	5900	525,100	80	3,630	78	142	1.00	5100	6800	5100	724,200	105	3,795	104	142	1.00	6600	10800	6600	936,000	131	3,960	130	142	1.00	6600	936,000	131	3,960	130
4	**Reduced Construction Alt. - No B100 S Wharf**[2]	72	1.00	5600	4000	5600	403,200	68	3,300	78	89	1.50	6800	5100	6800	605,200	92	3,630	104	130	1.50	8400	6800	8200	1,066,000	155	3,795	156	130	1.50	10700	10800	10700	1,392,000	194	3,960	208	130	1.50	10700	1,392,000	194	3,960	208
5	**Reduced Const/ Operations Alt**[2,3]	72	1.00	5600	4000	5600	403,200	68	3,300	78	72	1.00	6200	5100	6200	446,400	68	3,630	78	72	1.00	6900	6800	6900	496,800	72	3,795	78	72	1.00	8800	10800	8800	630,000	88	3,960	104	72	1.00	8800	630,000	88	3,960	104
6	**Omni Cargo Terminal**	n/a									n/a									n/a									n/a									n/a						
7	**Non-Shipping Alternative**	n/a									n/a									n/a									n/a									n/a						

[1] These three alternatives assume that there is no wharf at Berth 100, and that the backlands are operated as part of the B121-131 terminal.
[2] Straight-line projection for 2010 is limited by JWD capacity
[3] Straight-line projection for 2015 is limited by JWD capacity

Comparison of Projected and Actual Throughput per acre, 2001/2002 through 2005

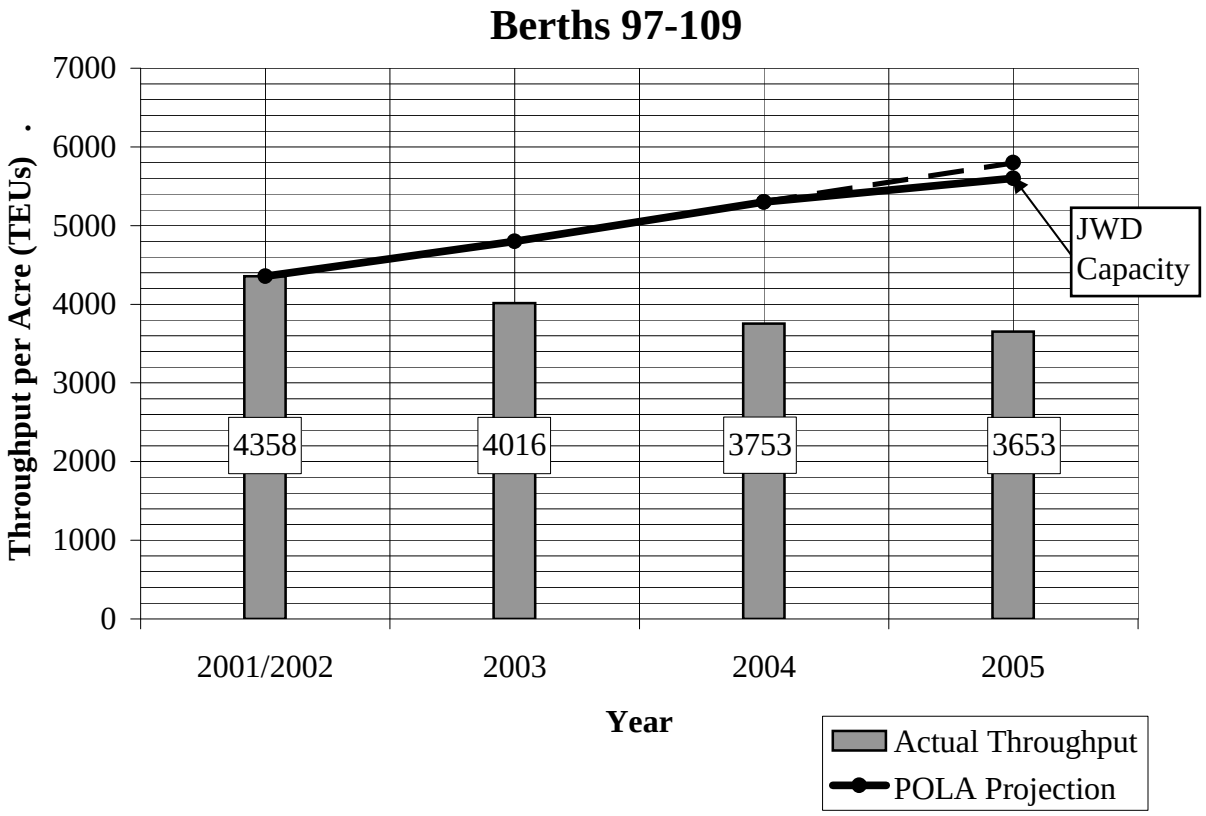
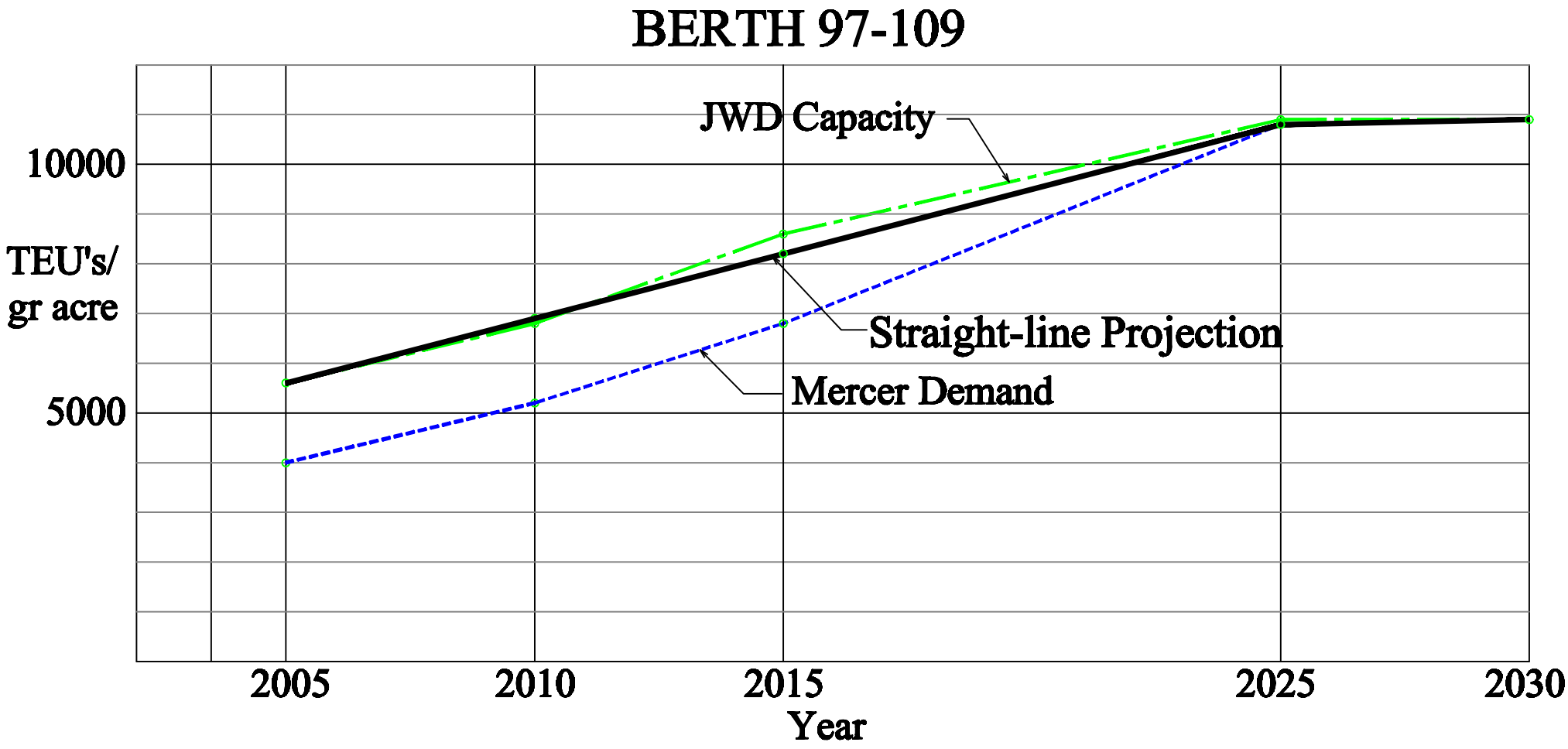


Figure 1



CHINA SHIPPING TERMINAL
THROUGHPUT PROJECTIONS

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FIGURE 2