BERTH 97-109 CONTAINER TERMINAL
PROJECTED THROUGHPUT
**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

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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\textsuperscript{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 \textit{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\textsuperscript{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.


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.

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.

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3Letter, 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

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<td>1932</td>
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| MERCER PROJECTIONS | | | | | | |
|---------------------| | | | | | |
| POLA Total teu's | 5488000 | 6827000 | 9847000 | 13172000 | 17629500 | 23592200 |
| Teu's/gr acre | 4700 | 4000 | 5100 | 6800 | 8200 | 10800 |

### Table 1

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.

9/7/2007

**Note:**
- Actual data from May 2001 thru April 2002
- Based on full build out of terminal, incl. GATX and add'l fill
- See notes1&2
- See note 3
- See note 4
## PORT OF LOS ANGELES
### BERTHS 97-109 THROUGHPUT ANALYSIS

<table>
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<tr>
<th>TERMINAL</th>
<th>Gross Terminal Area (acres)</th>
<th>Market Demand</th>
<th>Terminal Capacity</th>
<th>POLA Projection For teu's/gross acre</th>
<th>Notes</th>
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<td>BERTH 97-109</td>
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<tr>
<td>2005</td>
<td>72</td>
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<td>5600</td>
<td>5600</td>
<td>based on 10%/year increase from 2001/2002 Yang Ming actuals, capacity limited</td>
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<td>6800</td>
<td>8600</td>
<td>8200</td>
<td>straight line increase from 2005 to 2025</td>
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<td>142</td>
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<td>10900</td>
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<td>Terminal at JWD Capacity</td>
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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
### TABLE 3

**BERTHS 97-109 TERMINAL THROUGHPUT ANALYSIS**

**China Shipping Container Terminal EIS/EIR Alternatives**

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Gross Terminal Acreage</th>
<th># of Berths</th>
<th>POLA Capacity (2010+10%/yr)</th>
<th>Total Projected Throughput (TEUs)</th>
<th># of Ship Calls/Year</th>
<th>Ship Calls/Per Call</th>
<th>Average Ship Lifts Per Call</th>
<th>Total Projected Throughput (TEUs)</th>
<th># of Ship Calls/Year</th>
<th>Ship Calls/Per Call</th>
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<td>603,200</td>
<td>4.323</td>
<td>82</td>
<td>3,300</td>
<td>78</td>
<td>1.000</td>
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<td>3,300</td>
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* These three alternatives assume that Berths 100, 101, and 102 are not wharves, and that the backlands are operated as part of the B121-131 terminal.

** Straight-line projection for 2010 is limited by JWD capacity.

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**Notes:**

1. Straight-line projection for 2010 is limited by JWD capacity.
2. 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

revised: 09/07/07

FIGURE 2