1 INTRODUCTION

1.1 GOALS AND METHODOLOGY OF STUDY

This market analysis is intended to support the brownfields economic redevelopment effort in New Jersey with a specific focus on preparation of modern intermodal freight infrastructure. To best serve North Jersey Transportation Planning Authority's (NJTPA's) needs for this study, a unique tripartite methodology has been developed. This includes an examination of trends and growth patterns in the warehousing industry, focusing on the Northern New Jersey region in addition to and parallel to a survey of the analogous region of the Pacific SW; identification of factors associated with successfully redeveloped brownfield sites on a nationwide level; and the resultant forecast for potential accommodation of freight warehousing operations at brownfield sites in the Northern New Jersey region.

Figure 1-1 shows the location of the NJTPA region within the quad-state north Atlantic agglomeration. A radius of 75 miles centering on Port Elizabeth encircles the region and all of the other most dense areas of the agglomeration. The NJTPA region is a slice right through the center of the largest and most advanced market for international trade in the world. This study considers feasibility of the area roughly corresponding to the NJTPA region to become the "Supply Area", i.e., the area in which skilled services and brownfield land use resources are to be supplied to add value to international trade flows to and from a larger 17-state market.

This study seeks to maximize benefits to the inhabitants of the immediate NJTPA region of the region's unique features by visualizing their positive future use. More specifically, the study objectives for Northern New Jersey are five-fold:

1. *Demand*: Maximize the value-added benefits derived from being located near the center of the largest and most advanced market for international trade in the world;
2. *Supply*: Maximize the benefits of being located immediate to this market's three greatest distribution assets: the Port of New York and New Jersey maritime facilities, the CSX and NS mini-bridge rail termini and Newark Airport;
3. *Functions*: Identify and forecast trade-related activities that optimally prosper in the dense urban areas while maximizing benefits owing to supply/demand proximity;
4. *Land Use*: Delineate activities whose spatial configurations correlate with the value and incidence of brownfields sites;

Figure 1-1: Location Map of NJTPA Region

5. *Development Strategy*: Elevate to the status of regional development policy both the process and plan for the local fulfillment of land-use demands for international trade-related value added services. Value-added services are activities performed to increase the potential resale value of the commodity being handled. Sample activities include barcoding, kitting, product manipulation, pick and pack, and assembly of marketing materials.

The study hypothesizes that location of value-added activities immediate to the Ports of New York and New Jersey (PONYNJ) will strengthen its competitiveness. To the extent these new activities provide globally involved livelihoods for the region's inhabitants, the PONYNJ will, in turn, be empowered to expand its capacity. This is seen as the brownfields win-win program.

This study attempts to visualize the future, with a perspective of forty years. Within this period there are several market defining events whose criticality will be demonstrated. They are the deepening of the Port's channels to 45 feet by 2006 and to 50 feet by 2010. Without these events this report need not be written.

Candid interviews, fax-back questionnaires and site visits have provided feedback from various types of warehouse operations that represent potential tenants for New Jersey's brownfield sites, and information has been compiled on brownfield sites that have been redeveloped for myriad uses throughout the nation. This report summarizes our findings and presents the specific site selection criteria required to narrow the number of brownfield sites for the remainder of this study.

1.2 WAREHOUSE DEVELOPMENT TRENDS

The widespread implementation of just-in-time supply chain principles and the rapid growth of eCommerce has dramatically altered the industrial landscape throughout the nation as businesses seek new ways to store, handle and ship their products. Optimization of the logistics process has become a requirement for business success and companies are reaping great benefits from the strategic advantages that effective distribution offers. The new breed of distribution center facility is often technically sophisticated and bears little resemblance to the warehouses of old.

By the year 2020, a significant increase in Asian containers shipped directly to PONYNJ is anticipated. Proper distribution and storage facilities will be crucial to the successful growth of the PONYNJ region as logistics operations that currently take place in the region around the Ports of Long Beach and Los Angeles will also be required in New Jersey. Approximately 30% of imports bound for the PONYNJ 17-state market region, as defined in Section 2.5, are

currently warehoused in the San Pedro Bay area prior to further movement eastward as domestic freight via truck or Trailer-on-Flatcar (TOFC or "piggyback") across the nation. In order for the shift of traffic directly to the PONYNJ to occur, two basic conditions must be satisfied: the deepening of the access channels to 50 ft as currently planned, and the establishment of adequate distribution facilities in the NJTPA region to satisfy the demands of the cargo. To better understand the requirements of these distribution facilities, Moffatt & Nichol has surveyed and analyzed the characteristics of existing warehousing operations in the Los Angeles area. This survey has formed the basis for an analysis of the ecology of the new distribution center types as this explosive growth continues.

1.3 NATIONAL BROWNFIELDS REDEVELOPMENT

Brownfields are defined as "abandoned, idled or under-used industrial or commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination that can make redevelopment of the property financially or logistically prohibitive".

Our study of brownfields redevelopment across the nation is summarized in Section 4 and Appendix C, which contains descriptions of projects where industrial or commercial brownfields have been successfully converted to productive use. Patterns of redevelopment are identified in this study and issues specific to brownfield sites are discussed.

1.4 DISTRIBUTION DEMAND AND CARGO FORECAST, 2000 - 2040

Shift in the market share of Asia, primarily from China, represents the New Jersey region's fastest growing partner in international containerized trade. The 17-state region around the Ports of New York and New Jersey consumes 31% of Asia's exports to the USA, but the Port's marine facilities currently capture only a small percentage of this traffic. Currently, most of the Asian traffic is routed via the West Coast of the North America, especially the Ports of Los Angeles and Long Beach; i.e., the ports of San Pedro Bay. A comprehensive discussion of international trade patterns and the containerized cargo market is contained in Section 6.

This study includes economic projections on the growth of the NJTPA region, particularly with regards to the shift in cargo traffic patterns directly to the PONYNJ as a consequence of the planned dredging of channels to 50 ft. A comprehensive effort has been made to analyze international containerized cargo forecasts over a 40 year planning horizon and the resulting supply and demand for port-related warehousing. Cargo forecast information is provided herein.

2 EXISTING CONDITIONS IN NJTPA REGION

2.1 INFRASTRUCTURE

The NJTPA region has historically been and continues to be a huge consumer market. The region is densely populated, with mature road and rail systems. Growth in the imports and exports generated in the region has exploded. Efficient transportation corridors for freight movement are important for the anticipated continued growth to be accommodated. Figure 2–1 illustrates the dense existing transportation network and major facility locations.

2.1.1 Port of New York and New Jersey

The Port of New York and New Jersey (PONYNJ) is the third largest container port in North America and the largest port complex on the East Coast. According to the Port Authority of New York and New Jersey (PANYNJ) data for the PONYNJ, totals of 2,456,886 TEUs and 2,465,993 TEUs were handled in 1997 and 1998, respectively. These figures include loaded and empty containers. Twenty-foot equivalence units (TEUs) represent a standard unit for counting containers of various lengths and for describing the throughput volume of cargo. One standard 40-foot ISO series 1 container equals 2 TEU's.

Elizabeth Port Authority Marine Terminal (EPAMT) and Port Newark

The PANYNJ is landlord to the terminal operators on these peninsular port facilities, located in Union and Essex Counties, respectively. Containerized cargo is mainly handled at EPAMT, however there is one container berth on Port Newark. These facilities also handle bulk, break bulk, and roll-on/roll-off (ro-ro) cargoes. These are the busiest container terminals in the Port, handling approximately 77% (1.9 million TEU in 1997) of the Port's container traffic. Together, the facilities have almost 1,000 acres of dedicated container terminal area.

Global Marine Terminal

Global Marine Terminal is a privately owned and operated facility, located in Jersey City, Hudson County, at the border of Bayonne. This 100-acre container facility handled approximately 7.1% (175,000 TEU) of the Port's containerized trade in 1997.

Figure 2-1: NJTPA Region's Transportation Infrastructure

Howland Hook Marine Terminal

While not included within the political jurisdiction of the NJTPA region, the Howland Hook Marine Terminal complex in Staten Island, New York should be seen as an important contributing factor for the analysis covered in this study due to its location west of the Hudson River toward the south end of the EPAMT complex.

It is readily accessible to major truck routes, and has the capability for on-dock rail service connecting to the North American intermodal rail network. The PANYNJ leased Howland Hook from the City in April, 1985, and in turn leased the terminal on a long-term basis to Howland Hook Container Terminal, Inc. in 1995. In September, 1996, the 187-acre terminal was reactivated for container operations. It has the capacity to handle 425,000 containers annually. According to the PANYNJ, work is progressing rapidly in the rebuilding of the Staten Island Railroad which extends between Arlington Yard and Cranford, New Jersey. When completed, this line will provide direct intermodal service for Howland Hook and local customers.

2.1.2 Airports

Newark International Airport

The PANYNJ operates Newark International Airport under lease to the City of Newark. Located in Union and Essex Counties, the 2,000+ acre airport is 16 miles from midtown Manhattan. In 1998, 1,086,459 tons of air cargo moved through the airport, comprising 40% of total air cargo moved through JFK, LaGuardia and Newark Airports.

United Parcel Service has a 28-acre facility in the South Area of the Airport, and Federal Express also runs a state-of-the-art automated sorting facility at its regional hub within the Airport. The Airis Corporation is in the process of constructing several buildings to complete its 292,200 sq ft International Air Cargo Center in the North Area.

John F. Kennedy International Airport

John F. Kennedy International Airport (JFK) is operated by The Port Authority of New York and New Jersey under a lease with the City of New York. Located in the southeastern section of Queens County, New York City, the 4,930 acre airport is 15 miles by highway from midtown Manhattan. In 1998, 1,612,743 tons of air cargo moved through the airport, making it the busiest cargo airport on the East Coast.

JFK's Air Cargo Center consists of 35 cargo handling and cargo service buildings and a U.S. Post Office Airport Mail Facility. Japan Airlines and Nippon Cargo have advanced cargo handling facilities within the Airport of 260,000 and 175,000 sq ft, respectively. United AirLines recently opened a 98,500 sq-ft Cargo Transfer Center in the Airport, which is equipped to handle bulk containerized shipments as well as providing reefer space. Several other air cargo facilities are currently under construction, increasing the already sizable share of the region's logistics providers that is located here.

Teterboro Airport

PANYNJ owns Teterboro Airport, and leases it to Johnson Controls World Services. This Bergen County airport is located 12 miles from midtown Manhattan. It is located on 827 acres, 329 of which are undeveloped. Business services include charter flights, public service initiatives and cargo movement. This latter service is limited to domestic cargo.

2.1.3 Highways

Figures 2–2 and 2–3 illustrate the dense network of highways that service New Jersey and the NJTPA region, and Figure 2–4 shows within a ten mile radius the region's key transportation assets centering around EPAMT.

The New Jersey Turnpike and Route 1&9 both provide access to EPAMT/Port Newark/Newark International Airport in the North-South direction. East-West access to the EPAMT area is possible via Route 78 and Route 22. Route 169 abuts the Global Marine Terminal, and provides access to the NJ Turnpike spur. The NJ Turnpike northern extension can be accessed from Teterboro Airport via Route 46.

Note that figures 2–2 through 2–4 also indicate the New Jersey highways that impose restrictions on tandem trucks and/or overloaded ocean-going containers. Some restrictions only apply to cargo destined for or originating in areas outside NJ. Local roads to Newark, Elizabeth and Manhattan exist, and are not regulated for use by standard trailer trucks.

Figure 2-2: New Jersey Highways with Restricted Truck Access

Figure 2-3: NJTPA Highways with Restricted Truck Access

Figure 2-4: EPAMT Highways with Restricted Truck Access

Planning for the construction of a multimillion-dollar truck corridor ("Portway") is currently underway. The Portway project is intended to relieve congestion by separating truck traffic from highways, using new bridges and former railroad rights-of-way. Phase One of the project would connect marine terminals at EPAMT and Port Newark to the Croxton Intermodal terminal in Secaucus, N.J. as well as to railyards at Kearny, Croxton, Oak Island, the former APL Stacktrain terminal and the New York, Susquehanna & Western Railway. Figure 2–5 illustrates the latest proposed Portway route and locates the major rail intermodal terminals in the vicinity of EPAMT. Approximate highway travel distances from EPAMT are tabulated in the figure.

Round trip standard trucking operating costs, by distance from EPAMT, are summarized in Figure 2–6. The following rationale was used to develop costs:

- Pickup and dropoff of cargo = 2.5 hrs @ $65/hr
- Mainline haul on loaded outboard journey = $1.10/mile
- Return trip will be with empty container (85% of the time). Trucking cost is 50% of "loaded" trip, or $0.55/mile
- Dropoff clearance = 1 hr @ $65/hr

This graphic makes clear why a number of developers are constructing warehouse space around Exit 8A of the NJ Turnpike (Middlesex County) – the trucking cost is reasonable and the warehouse rent is cheaper than at locations closer to the Port. This trend is discussed in greater detail in Section 3.

2.1.4 Rail

Figure 2–7 provides a view of the NJTPA region's extensive rail network. Norfolk Southern (NS) Railroad and CSX Transportation (CSXT) have access to the Conrail Shared Asset main line that services the NJTPA region's ports. ExpressRail and Portside, both located at or near EPAMT/Port Newark and serving these facilities, connect into the main line. ExpressRail causes traffic congestion at EPAMT due to an at-grade crossing. Port Jersey Railroad is a short line rail link that connects the Global peninsula and many commercial storage warehouses with the Conrail Shared Asset.

Landbridge cargo from the West Coast terminates close to the region's port facilities, including railheads at some of the intermodal terminal locations indicated previously in Figure 2–5. For the purposes of this study, these can effectively be considered "ports", since the cargoes offloaded there enter the domestic transportation system to be distributed to end user by truck, much like import cargo leaving a port or airport.

Figure 2-5: Proposed Portway and Major Rail Intermodal Terminal Locations

Figure 2-6: Round Trip Trucking Cost from EPAMT (Loaded 1st Leg, 85% Empty 2nd Leg)

Figure 2-7: NJTPA Region's Rail Network

2.2 BROWNFIELDS

As shown in Figure 2–8, there are over 7,000 known contaminated sites in the NJTPA region, many of which are brownfield sites as defined in Section 4. Other sites exist that may be perceived to be contaminated, thus also are defined to be brownfields. As stated earlier, one of our current objectives is to perform a market study to determine the levels of warehousing and associated freight distribution activity that may be attracted to the region. The brownfield site database must be narrowed down to a manageable number of sites in order to focus in on the most promising ones. The database at the time of this study contains many blanks in the "size of lot" field, which is one of the easiest ways to eliminate potential plots. At the time of the final revision to this report, the project team was in the process of conducting extensive reconnaissance efforts to determine sizes of locations and to gather more information on the sites. The study team has developed other quantifiable criteria with which to "rank" sites. This is discussed in Section 5.

2.3 EMPLOYMENT LEVELS

Table 2-1 summarizes the labor force in New Jersey. Education statistics are included since distribution center activities increasingly require more skilled workers. The last entry of the table is an estimate of warehouse employees in New Jersey. This does not include underemployed workers, who may be in search of higher wages, better benefits and career opportunities. Complete tables are presented in an appendix to this report.

Table 2-1: New Jersey Employment Characteristics[1]

	NJTPA Region	NJ State
Employed Labor Force	2,973,952	3,963,196
Labor Force Employed in Manufacturing	17.6 %	16.8 %
Manufacturing Labor Force	522,453	666,296
Labor Force with High School Diploma	77.4 %	76.7 %
Labor Force with College Degree	26.6 %	24.9 %
Total Labor Force	3,111,813	4,154,983
Unemployment Rate	4.4 %	4.6 %
Labor Force Available for Warehouse Employment	17,131	21,848

Assumption 1: Transportation, material handlers, and laborers accounts for 9.1% of all US manufacturing employment.
Assumption 2: The combined unemployment percentage for transportation, material handlers, and laborers equates to 3.3% of all US manufacturing employment.

[1] U.S. Department of Labor; DCG Corplan Consulting LLC.

Figure 2-8: Existing Brownfield Sites in NJTPA Region

2.4 ENVIRONMENTAL ISSUES

The nature of the Port area is industrial and commercial. Land use adjacent to the Harbor ranges from tidal wetlands to heavy urban development. As a result of long-established urbanization, the area's natural environment has been affected. Recreational opportunities are limited. Inland, the land uses are devoted more to residential, commercial and industrial activities, and the road and rail network in the region developed to support these sectors. Urban planning was in its infancy, therefore rail facilities were generally at-grade, without thought to minimizing vehicular traffic. Accordingly, traffic congestion is problematic in the region.

In terms of air quality the following six pollutants have been identified by the EPA as being of concern in the study area:[2]

- Carbon monoxide - levels have declined in recent years,
- Sulfur dioxide and sulfate - levels have continued to decline
- Nitrogen dioxide - concentrations in the area continue to remain below the level of the air quality standard
- Particulate - in 1996, concentrations were the 2nd lowest recorded since particulate sampling commenced in 1986
- Lead - concentrations have remained unchanged or have declined and have remained in compliance with air quality standards
- Ozone - levels have improved over time, however NYC is listed as a "high-severe" ozone non-attainment area

2.5 INTERNATIONAL TRADE IN THE PONYNJ MARKET AREA

In the context of this study, international trade is defined as trade (import-export) in manufactured goods. Approximately 96% (by weight) of this country's trade[3] in manufactured goods is moved in marine ISO containers. The remaining 4% is via air freight. Particularly in the advanced U.S. market, the line between international and domestic trade is getting more difficult to draw. Typically a distribution system or facility is deemed international if its throughput is at least 60% of foreign origin. Activities requiring significant skills are increasingly carried out on internationally manufactured goods at stopover ports while still enroute to their final destinations. This process of adding value enroute takes place in the U.S. almost entirely on import trade flows.

[2] Feasibility Report for NY & NJ Harbor Navigation Study, US Army Corps of Engineers, December 1999.
[3] These statistics do not include the growing volume of trade with NAFTA countries.

Figure 2–9 presents the incidence of trade transactions in 1999 of containerized cargo in the 75-mile radius surrounding EPAMT. This perhaps better than anything else illustrates the trade intensity of the NJTPA region. Each of the myriad of circles represents a annual volume of trade transactions in a specific 5-digit zip code that either originate (export) or terminate (import) international trade flows. The comparable circles shown in Figure 2–10 isolate only the containerized cargo moved through the Port of New York and New Jersey.

Figure 2–11 presents a tighter 10-mile radius illustrating the cargo movements. This view is of particular importance because, as will be discussed in Section 6.2, this area poses the greatest opportunity for warehouse expansion and, subsequently, brownfield development. Figures 2–12 and 2–13 show the location of warehouses by 5-digit zip code within the region. Comparing the warehouse density with the cargo movements previously shown, we see that surface area of warehousing tends to correlate with the volume of trade transactions. It should be kept in mind that the fit is good, but not perfect. It should also be noted that these spatial representations, both the incidence of trade and the location of warehouses, are extremely dynamic, i.e., change from year to year. As will be noted throughout this report, this is the most disconcerting fact facing planners attempting to formalize the development needs required.

To get a better understanding of the warehousing needs represented by the illustrated cargo movements, a discussion of the underlying distribution demand and trade patterns is first required. Figure 2–14 pictures the 1999 PONYNJ containerized cargo market area, i.e., the area of demand conceptually corresponding to the NJTPA supply area. This is a 17-state market area that absorbs 95% of all the containerized import and export flows that pass through the PONYNJ. The market can conveniently be broken into two sub-areas: the 13 states that form the core area and the 4 states comprising the extended market. The 13-state market area is found within a 400-mile radius from the port (maximum effective trucking distance). Shippers and consignees located within this radius generate roughly 75% of the approximately 7 million loaded containers of manufactured goods traded internationally in 1999. The remaining 4 states compose a growing share of the market area thanks to increasingly successful intermodal rail access via the Port. The total market area accounts for:

- 40% of the U.S. total containerized trade;
- 38% of the U.S. total population; and
- 41% of the U.S. gross domestic product.

Figure 2-9: Cargo Movements within 75-mile Radius of EPAMT – Year 1999

Figure 2-10: PONYNJ Cargo Movements within 75-mile Radius of EPAMT – Year 1999

Figure 2-11: Cargo Movements within 10-mile Radius of EPAMT – Year 1999

Figure 2-12: Existing Warehouses within 75-mile Radius of EPAMT

Figure 2-13: Existing Warehouses within 10-mile Radius of EPAMT

Figure 2-14: 1998/99 PONYNJ Containerized Cargo Market Area

Table 2–2 gives a statistical view of the ports that handle the trade produced by the NJTPA region. While the market area generates 95% of the containers handled by the PONYNJ's marine terminals, the amount handled by the marine terminals accounts for only 28.4% of the region's total trade. If one considers both direct and indirect cargoes, West Coast ports handled nearly 40% of the total. West Coast ports (Direct) refers to containers unloaded or loaded in West Coast ports and transferred to intermodal stack trains for cross-country delivery to the market area. Most of the containers delivered to the 400-mile radius market area are transported to intermodal railyards located within the NJTPA region. There the containers are transferred from rail car to truck for the final leg of their journey. West Coast ports (Indirect) refers to container loads of manufactured goods destined for the market area that are unloaded in the immediate vicinity of the Ports of Long Beach and Los Angeles and, following some form of value added process, are transported via domestic modes to their final destinations within the market area.

Table 2-2: 1998/99 Regional Containerized Trade (TEUs)

	17 STATE REGION				13 STATE REGION			
	Imports	Exports	Total	% Share	Imports	Exports	Total	% Share
PONYNJ	1,106,716	855,167	1,961,883	28.4%	937,192	730,409	1,667,601	32.7%
Other North Atlantic Ports	825,752	609,786	1,435,538	20.8%	728,741	549,912	1,278,652	25.1%
West Coast Ports (Direct)	1,337,876	802,726	2,140,602	31.0%	909,028	545,417	1,454,444	28.5%
West Coast Ports (Indirect)	588,434	N/A	588,434	8.5%	424,051	N/A	424,051	8.3%
Canadian Ports	452,182	322,873	775,055	11.2%	183,814	90,066	273,880	5.4%
TOTAL	4,310,960	2,590,552	6,901,512	100.0%	3,182,825	1,915,804	5,098,628	100.0%

	4 STATE REGION			
	Imports	Exports	Total	% Share
PONYNJ	169,524	124,758	294,282	16.3%
Other North Atlantic Ports	97,011	59,874	156,885	8.7%
West Coast Ports (Direct)	428,849	257,309	686,158	38.1%
West Coast Ports (Indirect)	164,383	N/A	164,383	9.1%
Canadian Ports	268,368	232,807	501,175	27.8%
TOTAL	1,128,135	674,748	1,802,884	100.0%

Total Containers (Including Empties)	
PONYNJ:	2,550,447 TEUs
17 State Region:	8,971,962 TEUs

PONYNJ's low capture rate of the total trade within its market area has previously been recognized as a key weakness of the Port.[4] While this study has as an objective to maximize the

[4] See The Port Authority of NY & NJ, *Port Development and Investment Planning Report*, Executive Summary, January 27, 1999, page 11.

value-added benefits derived from being located near the center of this market, a direct corollary of doing so is that the Port's capture rate be improved accordingly.

Figure 2-15: Distribution of Containerized Trade, 50-400 Mile Radius From EPAMT, 1998/99

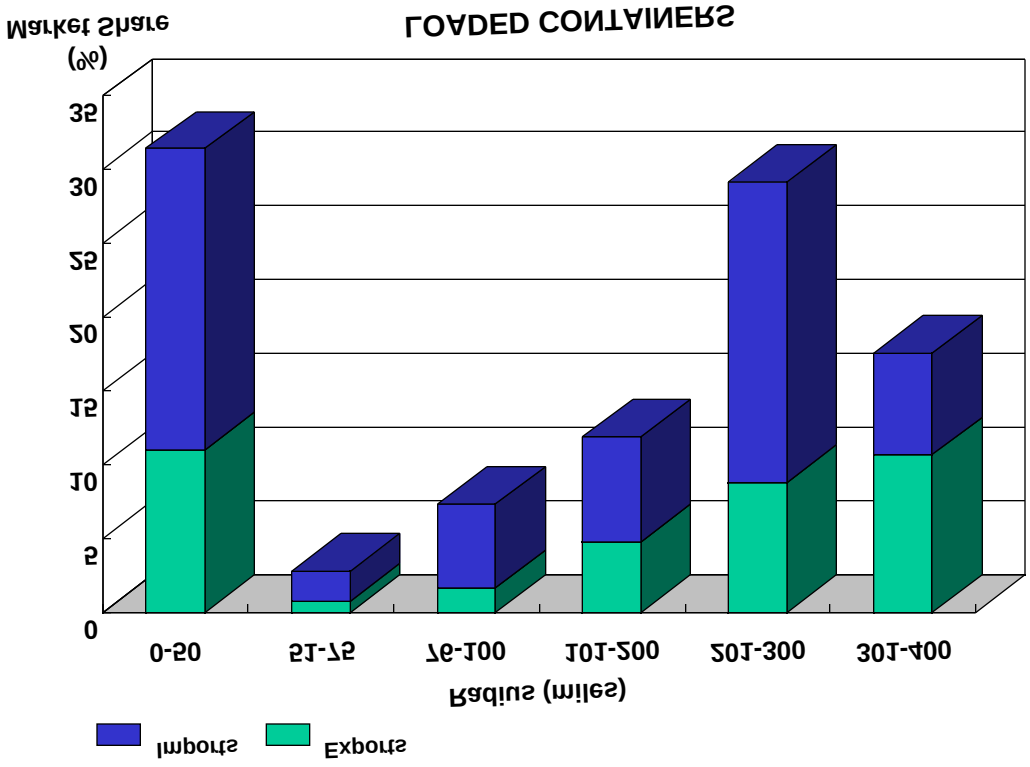
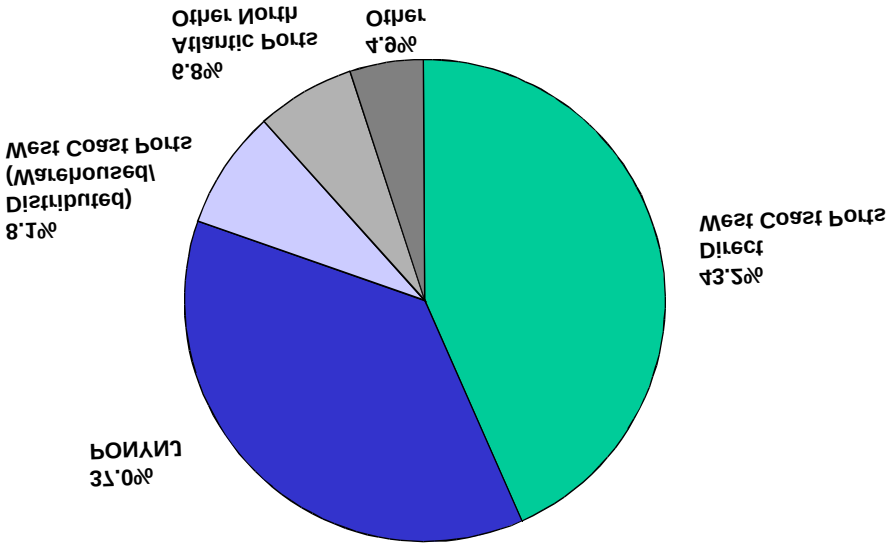


Figure 2–15 provides the distribution of containerized trade by distance from the center (EPAMT) of the 13-state market. The radius within which the NJTPA region is located is seen to account for approximately 40% of the total. Figure 2–16 illustrates the issue discussed earlier regarding point of origin, only this time with a focus on the market within the 75-mile radius. Again we note the leading role played here by West Coast ports. About 43% of the shippers and consignees within this market transport containerized goods by stack-train to West Coast ports where they are loaded (or unloaded) aboard ships for the journey abroad. A very significant share of the imports generated by the NJTPA market, 8%, is unloaded from containers on the West Coast and moved to distribution centers where some sort of value added processing is performed on these goods before shipping them eastward.

Figure 2-16: 1999 Port Shares for 75-Mile Radius Market Area



Summarizing this statistical analysis of the PONYNJ market area, demand is seen to be clearly segmented in terms of the port handling the containers. In terms of demand for warehousing, distribution or value added services, the following observations can be made:

- 28% of the potential market demand was via PONYNJ maritime facilities, whereupon it was already in 1999 susceptible to some level of warehousing, distribution or value-added services within the NJTPA region;

- 31% of the potential market demand was transported into the NJTPA region by stack-train off the West Coast, from whence it was already in 1999 susceptible to some level of warehousing, distribution or value added services;

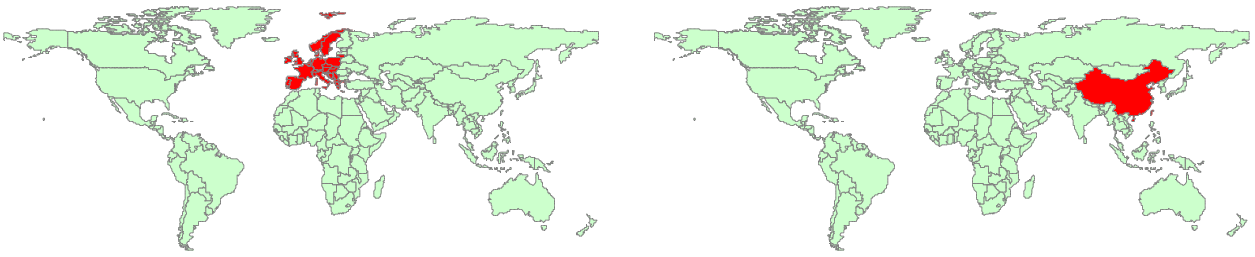
- 20.8% of the potential market demand was handled via other East Coast U.S. ports and thus was not susceptible in 1999 to warehousing, distribution or value added services in the NJTPA region;

- 11.2% of the potential market demand was handled via Canadian ports (Montreal or Halifax) and thus was not susceptible to warehousing, distribution or value added services in the NJTPA region; and

- 8.5% of the potential market has already undergone some level of value added processing on the West Coast prior to its delivery (as domestic freight) into the market and was thus not susceptible in 1999 to similar treatment in the NJTPA region.

Thus, approximately 59% of the total PONYNJ market constituted the total flow of containerized imports moving through the NJTPA region in 1999 to which warehousing or distribution services could have been performed if required. Before examining the work actually performed by the warehousing sector in the NJTPA region, it will be useful to take a better look at the nature of the cargo being moved via West Coast ports. Figure 2–17 compares the top ten countries of origin of TEU imports in 1999 via the PONYNJ with imports via West Coast ports. As one would suspect, container movements via PONYNJ into the market area are predominately from Western Europe, while those via West Coast ports are only from Asia, predominately from China.

Figure 2-17: Top Ten Sources of TEU Imports by Country of Origin, 1999



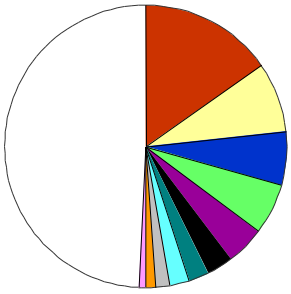
PONYNJ	
Country	%
Western Europe	45.3%
China	11.8%
India Subcontinent	6.9%
Hong Kong	6.7%
Taiwan	4.0%
Brazil	3.6%
Thailand	3.6%
Gulf/Egypt	3.4%
Japan	3.1%
Korea	3.0%

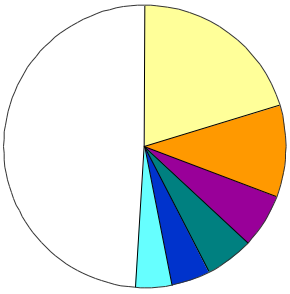
West Coast Direct	
Country	%
China	32.1%
Hong Kong	21.3%
Taiwan	11.8%
Korea	7.1%
Japan	6.0%
Thailand	2.2%
India Subcontinent	1.8%
Malaysia	1.7%
Philippines	1.6%
Indonesia	1.3%

With this distinction in mind, examine the comparison of commodities handled via the PONYNJ and the West Coast ports as listed on Figure 2–18. This figure reveals the commodity identification of the top 50% (by TEU) of the totals handled via either port. A clear distinction is again seen as the West Coast ports handle cargoes of textiles, electronics, toys and sporting goods (from Asia) while PONYNJ handles foods and beverages, apparel, household goods and

paper (predominately from Europe). The picture is one in which the two routes are involved in the movement of quite different mixes of commodities from quite different countries, which will not surprise anyone familiar with trends in containerized trade over the past twenty years. Note that this data comes directly from cargo manifests for direct shipments, and represents the best available information on the nature of imported commodities. Equivalent data does not exist, however, for the portion of West Coast imports that is warehoused in the San Pedro Bay area for value added services.

Figure 2-18: Top 50% of Imported Commodities, 1999





PORTLAND

Commodity	TEUs	%
Food & Beverages	63,012	12.5%
Apparel & Textiles	33,482	8.1%
Furniture	32,584	6.1%
Household Goods	24,552	5.2%
General Cargo & Misc.	17,982	4.4%
Paper Products	15,171	3.1%
Toys & Sporting Goods	9,213	2.3%
Plastics & Synthetic Resins	9,235	2.3%
Automotive	6,063	1.2%
Electronics & Photo Equip.	4,270	1.1%
Misc. Machinery & Equip.	3,621	0.9%
	210,103	50.8%

WEST COAST

Commodity	TEUs	%
Apparel & Textiles	158,720	20.4%
Electronics & Photo Equip.	81,589	10.7%
General Cargo & Misc.	39,225	6.3%
Toys & Sporting Goods	32,249	5.2%
Furniture	28,149	4.2%
Plastics & Synthetic Resins	26,439	4.2%
	370,858	50.7%

3 WAREHOUSING TRENDS

The widespread adoption of Just-in-Time principles and the rapid growth of eCommerce is dramatically altering the industrial landscape throughout the nation as businesses seek new ways to store, handle and ship their products. The continuing proliferation of dot.com firms has helped create strong demand for a new breed of distribution center facility that is often technically sophisticated and bears little resemblance to the dingy warehouses of old. Once largely ignored, logistics has become a key process that must be optimized for successful business today as chief executives have discovered the strategic advantages that doing so offers.

To identify the most important trends in this extremely dynamic industry, Moffatt & Nichol has spoken confidentially with representatives of major global manufacturers to assess their logistics plans for the present and future, conducted site visits to top distribution facilities actively involved in the latest warehouse logistics practices, and interviewed leading industrial property real estate experts involved in the building and selling/leasing of modern distribution center facilities.

3.1 DISTRIBUTION AND RE-ENGINEERING THE GLOBAL PRODUCTION PROCESS

To understand how shippers and consignees are dealing with some of the massive changes taking place, M&N discussed on a confidential basis re-engineering efforts currently underway by major global high-tech companies. A quick summary of these talks is the following outline of steps in the global production strategy adopted by one of the world's top 20 manufacturers. These production components are worked out on a global scale for assembly and distribution and service primarily in the United States, to a lesser extent in Europe and even less in Asia.

Steps in the Process:

1. Undifferentiated Product
   - 1.1 Placement of the order (a sale is made);
   - 1.2 Manufacturing for routing: production of undifferentiated and unpaid-for components for specific trade routing aboard maritime storage capacity[1];
   - 1.3 Stuffing the ISO container: consolidation of components, maximizing box capacity;

[1] See discussion of Pendulum Service in Section 6.

1.4 Routing and storage of the ISO container: the shipping and port subsystem is best controlled via contract relations with the liner carrier. This transportation link is the longest in the system and is highly dependent on the service levels provided. For this reason, a contingency for slack time is always built into the system's minimum storage time;

2. Differentiated Product

2.1 Stripping the ISO container: shift to the differentiating delivery system, bar coding, scanning, labeling;

2.2 Warehousing: only where necessary, results in lost time and incurred costs including inventory, climate control, and security;

2.3 Process extension: R&D, marketing, sales, organization, quality control, planning the differentiating process and individual sale accounts;

2.4 Differentiation: repacking, kitting, assembly, manipulation, packaging and order fulfillment;

2.5 Customs Inspection;

2.6 Delivery: transloading, piece transportation;

2.7 Change of Possession: possession by customer; and

2.8 Customer Service: maintenance, repair or replacement.

This process, originally labeled a "greenfields logistic system", is seen as being able to compress the order-payment cycle to its ideal minimum. The process elucidated above has been developed by a business-to-business supplier of high tech components, and appears to correspond well to the system later depicted in Figure 3–3.

3.2 NATIONAL WAREHOUSING DEVELOPMENTS

As a result of the increased focus on logistics processes over the last few years, the warehousing industry, particularly the private and third-party logistics (3PL) sectors, has witnessed explosive growth, and is projected to continue to grow at a rate of 15-20% over the next two years, according to estimates by the International Warehouse Logistics Association (IWLA). Warehousing has become an extension of many manufacturers' and retailers' operations by providing the expertise and flexibility required to meet customers' needs. Modern distribution centers are often involved in performing value-added services, making the warehouse an

essential link in the logistics chain. For the purposes of the current study, value-added warehousing practices can be defined as activities that are performed to increase the potential resale value of the commodity. Specific examples of work of this nature being performed in most of the facilities interviewed as part of this survey are provided later in this section.

The IWLA estimates that approximately 30 million square feet of new public and contract warehouse space was built nationwide in 1998. Many manufacturers are deferring to external operations to handle their warehousing and distribution services. Drop-shipping, the practice of outsourcing the picking, packing and shipping of items directly to consumers, is becoming more and more common, with distributors even placing the retailers' names and logos on the packaging for them. 95% of the users of 3PLs reported positive effects on costs, customer satisfaction and system performance; while 98% state that they are "very satisfied" or "satisfied" with the performance of their 3PLs, as reported by the IWLA.

Advances in information technology such as the proliferation of electronic data interchange (EDI) usage have contributed to the modernization of the warehouse industry. Now online, EDI provides information required to update records in real time that are required to keep a warehouse operation running smoothly. Through the use of EDI, inventory is immediately allocated to that order when an order is placed in the warehouse; the inventory information is reduced when the item is shipped, and the inventory is immediately available to fill incoming orders when new shipments are received and stored. In addition, some large warehousing operations are using automated machinery to improve efficiency. Smaller distribution centers, however, are primarily still picking and filling orders by hand, while using EDI to track inventory. More information on the role of technological innovations in warehousing is provided elsewhere in this section as part of the discussion of Amazon.com's Nevada operation.

3.2.1 ECommerce Warehousing Trends

As previously mentioned, a new approach to logistics and warehousing has developed as a result of the rapidly growing eCommerce market. Traditional models of distribution and warehousing are yielding to technologically sophisticated multi-functional product transformation centers.

Business-to-business (B2B) eCommerce involves the electronic exchange of information between two or more businesses that, directly or indirectly, results in a transaction. Representative transactions include traditional purchases and other events such as fulfillment, bids in a real-time auction, inventory replenishment, establishing new accounts, account lookup, and account maintenance.

The consumer eCommerce (B2C) market is estimated to have been $15 billion in goods and services in 1998, and is forecasted to grow to $380 billion by 2003. The B2B eCommerce market is larger and is predicted to grow dramatically. The GartnerGroup market analysts project rapid growth of the B2B eCommerce market from $144 billion in goods and services in 1999 to over $7.3 trillion in 2004.

For the purposes of our study, the Retail Distribution Centers will handle primarily B2B eCommerce, while direct to consumer B2C activity will be addressed by the Consumer Distribution Centers.

Internet B2C retailers have typically adopted two approaches to satisfying the fulfillment needs of their online customers. Some large companies with sizable operating budgets, such as Amazon, have developed their own distribution networks. Amazon has built a network of seven distribution centers whose combined U.S. acreage exceeds three million square feet.

Other eCommerce retailers have outsourced their fulfillment operations to logistics experts such as Federal Express and United Parcel Service, or to 3PLs that offer retailers and wholesalers the ability to store and ship goods without having to carry inventory in their own facilities. Small companies often use these types of distribution centers to avoid the cost of operating their own facilities while they grow, often by using drop-shipping to satisfy order requirements.

Whether owned by the company or outsourced to a 3PL, typical eCommerce distribution centers are often highly mechanized operations that utilize the latest technological innovations to reduce order-to-mailbox time. These logistics facilities are commonly computer controlled, conveyor fed and capable of carrying out many post-manufacturing value-added processes from call centers to storage to custom-designed shrink wrapping.

Nevada

Perhaps more than any other state, Nevada has benefited tremendously from the increased need for distribution centers in recent years. Situated at the hub of the 11-state western region, Nevada leads the nation in the number of square feet of warehouse space, with more than 48 million square feet in 1999 according to one estimate by commercial real estate firm Colliers International. Reno is conveniently located at the intersection of Interstate Highway 80, the major east-west route connecting New York City and San Francisco, and U.S. Highway 395, which provides fast travel to Los Angeles. The region also boasts an international airport and is serviced by Union Pacific Railroad, which operates more than 1,200 miles of line for its freight.

As a result of its excellent ground and air service, Nevada is no more than two days from any delivery location in the U.S. Among the major cities accessible within a single day's drive are Los Angeles, San Francisco, Portland and Salt Lake City, resulting in a total market area of 51 million consumers that can be serviced via overnight delivery, a key requirement in the demanding eCommerce logistics market. UPS has built a large western hub in the Reno/Sparks area, all the major air shippers have a presence in the area and dozens of trucking companies are also located here.

State officials have been very aggressive in marketing Nevada to developers and Internet retailers. The tax climate is extremely favorable, with no corporate or personal income tax, no unitary or inventory tax, and competitive sales and property tax rates. In addition, the state has minimal disclosure and reporting requirements. Local officials are quick to intervene on behalf of distribution and eCommerce companies needing help finding local business partners or cutting through red tape. Nevada is a right-to-work state with no major union presence in its warehousing industry. Utilities support in the Reno area is comparable to the best available in the nation, and Nevada Bell installs high-speed data lines very quickly, a vital concern for eCommerce operators. One online vendor of mobile communications equipment, iGo, was able to have new T1 data lines installed in just three days, compared to the five weeks that the same company had to wait at their San Jose, CA location. As a result of the myriad advantages offered, warehousing now runs an important second to gaming as the largest industry in the state.

Reno is home to some large traditional warehouse operations such as J.C. Penney with 1.7 million sq ft and Kmart with 1.4 million sq ft, as well as many of the best known Internet retailers, among them Amazon, Barnes & Noble, Alibris and HardwareStreet.

Case Study: Amazon.com

Amazon provides a suitable case study to illustrate the requirements of today's larger eCommerce merchants, while also illustrating the particular advantages of Nevada for western distribution. The company started with a single warehouse in Seattle, and has expanded its total distribution center footage tenfold during 1999. Amazon currently has a network of seven distribution centers in McDonough, GA; Campbellsville, KY; Grand Forks, ND; Coffeyville, KS; New Castle, DE; Fernley, NV and Seattle, WA.

Amazon management works with expert consultants using the Supply Chain Strategist software package from i2 Technologies in Dallas to help design and optimize its distribution network. Factors such as location of customers and suppliers, inbound and outbound freight rates,

warehousing expenses, labor issues and cost impact are taken into account by the program in recommending potential sites for development of new distribution centers. Amazon's management then considers issues such as taxation, employment levels and the nature of the community to narrow its selection. The company chose its Fernley, NV location to service the state of California, its largest geographic market. The cost of industrial space in Nevada is about 50 percent less than comparable space in California. Also among the many benefits Nevada offers is the lack of a consumer sales tax, resulting in savings that Amazon can pass on to its customers.

Amazon's Fernley distribution center takes up 12 acres, employs more than 500 fulltime workers and contains over 10 miles of conveyor belts. The facility stocks books, music, videos, consumer electronics and toys and is designed to handle several hundred thousand units a day, shipping to customers around the globe. Amazon's policy is to fill orders from the closest distribution center to the point of delivery, but will ship out of another facility is an item is out of stock or weather problems occur.

Among the technological innovations employed at Amazon facilities is the use of radio-frequency scanners to direct the picking operation where workers pull goods off shelves to fulfill Web orders. Software also keeps complete information on the length, width, height and weight of every item to determine optimal pick rates, locations, picking and storage patterns and packing options for each customer order. By minimizing the number of steps the pickers must take to gather all needed items, the technology has resulted in a 70 percent improvement in operational efficiency.

3.2.2 Warehouse Worker Compensation Statistics

The American Warehouse Association (AWA) and the Canadian Association for Warehousing and Distribution Services (CAWDS) conducted a compensation survey in 1996 that represents the best available information on the rates paid to warehouse employees. Eighteen warehouses in the Eastern U.S. and 31 in the Western U.S. took part in the survey. The following table summarizes the reported wage range and the average rates for a representative selection of job descriptions.

Table 3-1 Warehouse Workers Compensation Statistics[2]

	Eastern U.S.		Western U.S.	
Job Classification	**Avg. Hourly Rate Range**	**Ave Hourly Base Rate**	**Avg. Hourly Rate Range**	**Ave Hourly Base Rate**
Management				
General Manager		$29.89	$22.29-$24.25	$27.18
Operations				
Operations Manager		$22.10		
Traffic Manager		$18.59		$23.66
Dispatcher		$15.08		$13.57
Driver (Local)	$10.11-$12.83	$12.21	$9.91-$12.20	$11.13
Freight Clerk		$9.00	$8.47-$11.59	$10.13
Distribution Center Manager	$14.40-$19.64	$17.07		
Shipping & Receiving Clerk		$9.00	$8.41-$10.13	$9.96
Warehouse Foreman/Supervisor	$10.61-$16.12	$13.96	$15.50-$20.24	$15.50
Forklift Operator	$8.73-$12.33	$11.45	$7.80-$10.55	$9.39
Order Filler/Picker		$8.94		
Warehouse Worker	$6.62-$9.86	$9.54	$7.57-$9.80	$8.68
Equipment Repair Person	$9.79-$12.84	$11.94		$11.30
Data Processing				
Director, Data Processing		$24.50		
Senior Computer Operator		$14.00		
Office Operations				
Operations Manager (Controller)		$23.45	$13.49-$14.27	$15.02
Accountant		$15.81		$19.12
Accounts Payable Clerk		$10.06	$9.41-$11.97	$10.45
Bookkeeper		$12.32		
Data Entry Clerk				$8.27
Receptionist	$8.39-$10.99	$10.22		$8.93
Customer Service				
Customer Service Manager		$21.00		$17.72
Senior Customer Service Rep		$18.73		$13.42
Customer Service Rep	$7.58-$10.33	$9.41	$8.97-$11.64	$10.23
Sales				
Sales Manager				$27.21
Human Resources				
Human Resource Manager				$19.13

3.3 NJTPA REGION WAREHOUSING

Anyone flying into Newark Airport is familiar with the fact that the NJTPA region is already densely populated with warehouses, as was illustrated in Figure 2–12. Traveling in and around New Jersey, one is also familiar with massive warehousing complexes along the New Jersey

[2] 1996 Compensation and Financial Ratios Survey Report, American Warehouse Association and Canadian Association of Warehousing and Distribution Services, 1996.

Turnpike from Exit 10 (Edison) down to Exit 8A (Cranbury) in the Middlesex County area, as well as further in Pennsylvania near Philadelphia (Mechanicsburg) and in the Baltimore (Hanover) area. As discussed in Section 2–5, this industry handled a share of the 2.5 million TEUs imported to the region in 1999. It is highly likely that these same warehouses also handled an even greater volume of domestic freight that moved through this region. It is also possible that a significant share of the imported TEUs may have been transported directly to the location of final demand. Most shoppers have noted, for instance, containers parked near Walmart or Home Depot stores at their local shopping centers. Quite obviously, goods in these containers were not routed via a warehouse. In fact, one might say that the store itself was a "retail warehouse".

The CoStar Group, Inc., a leading provider of information services to the commercial real estate industry, has a database of 5,323 industrial facilities (over 95% of the total) in Northern New Jersey (including Ocean County as the southernmost county). The total warehousing square footage contained in this database as of year-end 1999 was 607.7 million. Note that the dynamic nature of the industrial real estate market makes it extremely difficult to gather accurate and up-to-date information on existing conditions because "existing conditions" no longer exist by the time the data is collected and processed. Best available information has been utilized to establish a picture of overall conditions and emerging trends. For this study, M&N performed a statistical analysis combining data available from the Department of Energy with real estate industry figures to profile existing warehouse space (private and public) as presented in Figure 2–12, within a 75-mile radius of the EPAMT and Figure 2–13, within a 10-mile radius. The 10-mile radius presents the greatest opportunity for development of warehouse activities, as discussed in Sections 5 and 6. It is anticipated that warehouse operators will tend to expand in the immediate vicinity of their existing installations before they look elsewhere.

3.3.1 New Jersey Public Warehousing

The characteristics of the public warehousing industry located within the NJTPA region are well documented by a recent study done on behalf of the PANYNJ.[3] Note that this study was limited to public and contract warehousing and did not include the extremely large private warehousing sector, which is estimated to be more than 30 times that of the public sector. Nevertheless, the study provides excellent perspective on the nature of the New Jersey warehousing climate. The attributes of this industry are vividly pictured by a survey carried out by Leonard's Guide and

[3] Port Authority of New York and New Jersey, *Future Port Warehouse Requirements Study*, Prepared by Louis Berger & Associates, Inc., November 1999.

reprinted in the PANYNJ study. Those portions of the survey of pertinent to the NJTPA subject are reproduced here.

Table 3-2: Marketing Attributes and Distribution Services of Warehouses by Location 1998-99[4]

Distribution Services	17-County PANYNJ Region	Hinterland
Freight Consolidation	64.0%	66.7%
Pick & Pack	58.0%	82.1%
Local Delivery	69.0%	71.8%
Pool Distribution	48.0%	51.3%
Export / Import	18.0%	15.4%
Container Stripping	4.0%	0.0%
Sea Container Service	2.0%	0.0%
Rail/Truck Trans-loading	1.0%	0.0%
UPS Service	2.0%	5.1%
Bar Coding	3.0%	5.1%
Full Computer Service	6.0%	0.0%
Full EDI Capabilities	7.0%	10.3%
Garment Distribution	2.0%	0.0%
Labeling	5.0%	0.0%
Order Fulfillment	6.0%	5.1%
Logistics Consulting	3.0%	2.6%
Order Preparation	1.0%	0.0%
Promotions	0.0%	2.6%
Same Day Shipment	1.0%	2.6%
Shrink Wrap	3.0%	2.6%
Special Handling	1.0%	5.1%
Store Displays	2.0%	0.0%

This description of the public warehousing industry in the PANYNJ region and immediate hinterland reveals a sector fully engaged in a basic storage function, mainly for domestic goods. Indications are that about 20% of the warehouses are also involved in some manner in the storage of exports or imports. Even fewer strip containers. What is most interesting about this survey is that it reveals an industry whose members are basically not involved in value-added services.

The PANYNJ study also provides a similar survey by Leonards Guide regarding the products handled by these same public warehouses. Those portions of the survey of pertinent interest to the NJTPA subject are reproduced here.

Table 3-3: Products Handled by Location of Warehouse[5]

Product	17-County PANYNJ Region	Hinterland
General Merchandise	40.0%	17.9%
Food	39.0%	51.3%
General Commodities	35.0%	38.5%
Paper	11.0%	25.6%
Electronics	14.0%	12.8%
Chemicals	20.0%	23.1%
Furniture	5.0%	7.7%
Garments/Clothing	8.0%	2.6%
Medical Products	5.0%	5.1%
Pharmaceuticals	9.0%	5.1%
Plastic Polymers	2.0%	7.7%
Sporting Goods	1.0%	0.0%
Toys	3.0%	2.6%

The survey reinforces the view that storage is the primary function of the New York and New Jersey public warehouse sector by indicating that the commodities handled are typically domestically produced and subject to relative long term storage. Commodities that characterize imports like garments, sporting goods and toys are not generally handled.

Interviews with public warehouse operators have confirmed that value-added services are relatively weak in the New York-New Jersey area in comparison with some other regions. Our study has indicated that flexibility to respond to shifting needs of the customer base is critical to the economic viability of warehouse operators with their fixed lease liabilities.

While the PANYNJ study focused on the need for on-site warehousing, it concentrated on the current function of the sector, i.e., storage. Nevertheless, it did identify 5 niches of potential importance to the Port: 1) the handling of heavy containers, 2) Export Packaging, 3) Just-In-Time, 4) Freezer/Refrigerated, and 5) Industrial. As regards whether or not these niches require proximity to the port for their success, the study offfered the following conclusions[6]:

1. *Heavy containers*: A heavy container is one which, together with chassis, weighs more than the current 80,000 lbs gross vehicle highway weight limit. Due to cost efficiencies, heavy

[4] Source: Leornards Guide, National Warehouse and Distribution Directory, 1998/99; Louis Berger & Associates, Inc. 1999 ; See Table 1.4.6.

[5] Sources: Leonards Guide, National Warehouse and Distribution Directory, 1998/99; Louis Berger & Associates, Inc. 1999 ; See Table 1.4.7.

containers are a desireable service for marketing to international trade. The legal conduct of this niche activity depends on available on-port facilities without permits or a dedicated network such as the proposed Portway corridor which is intended to allow overweight container traffic;

2. *Export Packaging*: A marginal niche with on-port dependency. More suitable for port areas engaged in breakbulk;
3. *Just-In-Time*: Predicted to be a major growth sector in the future. On site locations are desirable but not essential to serving this niche.
4. *Freezer/Refrigerated*: Off-port sites can serve local regional needs.
5. *Industrial*: The largest growth potential and capable of being handled from off-port locations.

The PANYNJ Warehouse Requirements Study concludes its analysis as follows: "Public warehouse throughput costs which are common to on-port and off-port locations appear to be definitely lower as distance from the port increases and more of the warehouse work force is reported to be non-union. Although wages are lower, the main advantage stressed by the operators was that they had more *flexibility* to cater to customer demands for service that arise such as late shifts, scheduling appointments for pickup of merchandise before or after regular business operating hours…."[7] The report consistently found Philadelphia and Baltimore warehouse locations more competitive than sites closer to the PONYNJ.

In keeping with the PANYNY study's findings that the NY/NJ region's existing public warehousing sector is domestically oriented, highly focused on providing basic storage functions and tending to relocate further away from the port, the study found the average physical dimensions of the warehouse and site on the rise. On the average, the study concluded, the typical installation is expected to be 300,000 square feet, with an increased cubic capacity provided by a clear ceiling height of 30 feet. The study noted that the latest designs call for a building 1,000 ft long and 300 ft wide, with 30 doors on each of the sides to facilitate cross docking. The study predicts that such "mega-warehouses" are expected to dominate in 2020 and part of the advantage of these "big-box" installations is their lower cost per square foot compared with conventional distribution or storage warehouses. It goes on to advise that warehouse locations provide sites five times the footprint to insure adequate space for expansion. (The size implied by this conclusion is 35 acres.)

[6] Ibid, see page 4-2, especially Table 4.1.1. Factors Influencing Port Dependency of Niche Markets.
[7] Ibid, (Section 3.5.1, Throughput Costs), p. 3-31.

3.3.2 New Jersey Private and Third-Party Warehousing

While the New Jersey public warehousing sector continues to represent the older generation of logistics facilities, the private and third party sectors are reflecting the newer trends in distribution. The private and third-party sectors are particularly dynamic and are subject to dramatic change as developers continue to speculate by building new facilities. Comprehensive data on existing facilities and new construction is difficult to obtain. M&N has determined that the best available source of this information is from real estate developers and market consultants and we have performed our research accordingly.

The counties of Northern New Jersey (including Ocean County) provide approximately 600 million square feet of industrial inventory space, predominantly big-box warehouse facilities. The CoStar database reports approximately 6.5 million square feet of new construction completed in New Jersey in 1999. According to research done by Cushman & Wakefield's Research Services Group, approximately 2.6 million square feet of new inventory space was built in 1998. A 1999 study by Sitar Company, a real estate brokerage and consultant, stated that nearly 4 million square feet of inventory was in the process of being developed throughout the region. All real estate research consultants state that Central New Jersey continues to be a hot area for distribution center development.

The recent trend in New Jersey industrial real estate has been toward increasingly large, state-of-the-art big-box facilities servicing a mix of international, national and regional 3PLs, warehousing/distribution companies and manufacturers. The best estimate for the customer base for these centers indicates that only half rely on the PONYNJ for delivery of product. Much of the material handled is of domestic origin and the cargo that is imported comes predominantly from Western Europe.

The region along the New Jersey Turnpike from Exit 8A (Cranbury, Jamesburg, South Brunswick) to Exit 10 (Edison) has experienced particularly strong growth as developers in Middlesex County have taken advantage of the ready availability of land and resultant lower prices. Some of the largest real estate development firms active in New Jersey, including Keystone Property Trust and ProLogis, discussed their warehousing properties with Moffatt & Nichol.

Demand for quality warehouse/distribution space in New Jersey has resulted in a recent vacancy rate of less than 8% in the region, one of the lowest such rates in the nation. Rents have risen accordingly, particularly in the northernmost counties, where quality space is scarce and less

land is available for development. Keystone Property Trust estimates rental rates for their properties in Middlesex County (Exits 8A to 10) to be in the range of $4.00-$4.50 per square foot triple net[8], while Bergen County properties can have rents over $7.00 triple net, particularly in the Meadowlands area. Cushman & Wakefield's industrial statistics for the fourth quarter of 1999 indicate an average direct net rental rate of $5.52 per square foot in Northern N.J., as opposed to a rate of $4.57 for comparable warehouse space in Central N.J.

This cost differential has been a major factor in the migration of warehousing operations to the Middlesex County hub. As stated in the Sitar Company profile, "Blocks of 150,000 square feet of space remained scarce. Tenants were competing for space in the northern counties of the region with limited choices and facing much higher rents. Some tenants preferred moving to the central part of the region and paying lower rents."[9] Driven by market demand, rental prices are still escalating in the Northern counties of Bergen, Essex and Morris, but have leveled off in the Central counties of Middlesex, Mercer and Monmouth as a result of the abundance of newly developed distribution center spaces there.

Reported 1998 selling prices for warehouse facilities overall in New Jersey ranged from $30-$35/sf for older traditional warehouse facilities to $40-$45/sf for new modernized spaces. Prices in the northern counties were even higher. Real estate investment trusts (REITs) dominate sales in the region.

One estimate of the growth of the Exit 8A warehousing activity holds that the facilities existent in 1999 represented only half of what is planned for the area. Developers continue to take advantage of the widely available land to satisfy customer demand for attractive quality space for large companies looking for distribution facilities and retailers in need of storage.

Among the major companies that have already established distribution facilities in the Exit 8A area are Barnes and Noble, Ryder Integrated Logistics, United Postal Service, United Packaging, Cooper Tire and Mitsubishi Consumer Electronics America, Inc. Some of the companies that have decided to locate in the north despite the higher land costs are fragrance manufacturer Givaudan Roure, Meadox Medicals, Konica USA and Neumann Distribution.

[8] A triple-net lease is one in which the tenant pays all ongoing operating expenses, including property taxes, utilities, insurance premiums, maintenance and repairs. Triple net properties are considered by many to be the most liquid and secure real estate investments available.

[9] http://www.sitarcompany.com/uli_industrial_1999.html, Sitar Company, ONCOR International, Iselin NJ.

To illustrate further the trend toward the Exit 8A area, a brief profile of Barnes and Noble's New Jersey distribution facility follows.

Case Study: Barnes and Noble

Barnes and Noble, the nation's largest bookseller, chose to locate their new 340,000 sf warehouse and distribution facility in South Brunswick, in part because of a business utilization incentive from GPU Energy and economic development incentives provided by the New Jersey Economic Development Authority (EDA). The EDA sold nearly $32 million in taxable bonds to develop the facility with the Morris Company. The facility is owned by EDA and is leased to Barnes and Noble.

In choosing a location for the facility, Barnes and Noble looked closely at three different states but ultimately chose the New Jersey site because of its proximity to the excellent highway network and location close to the major population centers that form such a large percentage of its customer base. The distribution center allowed Barnes and Noble to triple its capacity, reduce transportation costs and control inventory more efficiently by consolidating its regional operations into one centralized location. The facility, which handles up to 25,000 boxes of books a day, provides more than 300 jobs for the region.

Barnes and Noble's Chief Operating Officer, Steve Riggio, commented, "We received a great deal of support from the state and local government. We were particularly impressed by the willingness of the Department of Labor to create customized training programs to support our expansion and the EDA to put together an attractive financing package. EDA financing enabled us to reduce financing and construction costs."

In May, 2000, Barnesandnoble.com began offering same-day delivery of all in-stock items to all Manhattan addresses out of the Exit 8A distribution center. All orders placed on the website before 11AM will be delivered by 7PM that evening. This trend toward same-day service may become more and more common as eCommerce retail continues to evolve.

3.3.3 NJTPA Region Real Estate Costs

It can be seen in Table 3–4 that real estate costs vary by distance from the Port. Costs to purchase warehouse space in the central and southern counties of the NJTPA region can be less than half that of the northern counties. From this standpoint, it would seem obvious that developers would opt for lots in the central and southern counties. This is evidenced to some degree by the development of regional distribution centers around Exit 8A by several large

retailers as previously discussed. However, as discussed in subsequent sections, proximity to end-user is very important to the new breed of warehouse operator. Over 40% of existing warehouse space is located within a 10-mile radius of the Port. The operators of these warehouses will likely expand in the immediate vicinity of their existing space if adequate room is available to fill their needs.

Table 3-4: New Jersey Warehouse Real Estate Costs

		SIOR		Realtor Survey	
County	**Community**	**Cost/Acre 5-10 Acre Lot Size**	**Net Rent/SF (100Msf)**	**Cost/Acre 5-10 Acre Lot Size**	**Net Rent/SF (100Msf)**
Bergen	(North) Fair Lawn Hackensack Teaneck Oakland	$320,000	4.75	$200,000 - $350,000 $200,000	$4.75
Essex	(North) East Orange Irvington Newark West Orange Fairfield	$320,000	4.75	$250,000-$400,000 $250,000	$4.75
Hudson	(North) Bayonne Jersey City	$320,000	4.75	$300,000-$400,000 $300,000	$5.55 $4.75
Hunterdon	(None)			No large sites available	
Middlesex	(Central) Edison New Brunswick 8A Cranbury	$110,000.00	4.40	$80,000-$140,000 $125,000-$135,000	$4.40
Monmouth	(Central) Asbury Park	$110,000.00	4.00		$4.00
Morris	(North) Morristown	$110,000.00	4.75	$150,000-$175,000	$4.75
Ocean	(South) Lakewood	$88,000.00	4.40	 See fax for list. No prices	$4.00
Passaic	(North) Clifton Passaic Paterson	$320,000.00	4.75	$175,000-$200,000	$4.75
Somerset	(Central) Somerville	$110,000	$4.40	$125,000-$135,000	$4.40
Sussex	(None)	NA		$75,000-$100,000	$3.75
Union	(Central) Elizabeth Plainfield	$110,000	$4.40	$125,000-$300,000	$4.40
Warren	(None)	NA		$80,000-$125,000	$4.00

3.4 PACIFIC SOUTHWEST ANALOGOUS REGION MARKET SURVEY

While the research cited in the previous section appears to explain rather well the current trends in warehousing containerized imports handled directly by the PONYNJ maritime facilities or from West Coast ports via stack train (direct), it leaves totally unexplored the issues of primary concern to our study, that is, the nearly 600,000 TEUs of imports in 1999 currently undergoing forms of value-added services on the West Coast prior to being transported to destinations within the NJTPA market area.

The motivation for exploring this activity is derived from the possibility that, by 2010 when the PONYNJ channels are dredged to 50 ft, this cargo may begin to be shipped directly to the Port of New York and New Jersey. Forecasts indicate that increasing containership size and concomitant economy of scale will make shipping of Asian trade directly to the PONYNJ via the Suez Canal increasingly competitive in price. The condition for this happening is, of course, that the attendant value-added activities could be shifted also as discussed fully in Section 6. Proper distribution and storage facilities will be crucial to the successful growth of the PONYNJ region as logistics operations that currently take place in the region around the Ports of Long Beach and Los Angeles will also be required in New Jersey.

To better understand the requirements of these distribution facilities, Moffatt & Nichol has surveyed and analyzed the characteristics of existing warehousing operations in the Los Angeles area. M&N's West Coast warehousing and distribution activities study consisted of the following actions:

- Extensive statistical analysis was carried-out based on 1998/99 PIERS and other data related directly to distribution of West Coast import flows;
- Trends which surfaced from our statistic analysis were discussed with Port of Long Beach and Los Angeles officials, representatives of major liner carriers, third party agents, and other known local experts in the field;
- On site interviews were carried out at a number of the most representative distribution-related facilities in the San Pedro Bay region (all located within 15 miles of the Ports of Long Beach and Los Angeles); and
- Discussions were conducted with major global companies involved with or intending to become involved with outsourcing value-added activities that could best be performed at or near the maritime port.

Regarding the San Pedro Bay market for container-related value-added services, the first and perhaps most interesting observation was the reason why no previous comprehensive statistical analyses appear to have been done – the field is simply too dynamic. West Coast operators are a new breed who are hungry for business and want to turn a profit and establish their reputation as quickly as possible. In order to procure potential business, they will offer as many value-added services as are appropriate for any given customer. Their opportunities for new business are limitless, and the operators are highly inventive in their endeavors. One example, cited later on in this section, is a start-up consumer distribution center that agreed to pick and pack an order for a customer, shipping to over 60 different locations within a one-day turnaround. The operation was a success despite the complicated logistics and the fact that it was the first time the operator had attempted such a process.

Using the examples found on the West Coast, we can identify the most important trends and recent developments that affect the planning of new warehousing facilities for the PONYNJ region.

3.5 TYPES OF FACILITIES

The M&N survey of the warehousing market in the San Pedro Bay region indicates a marked evolution in the distribution function of warehousing operations on the West Coast. Local West Coast experts describe the warehousing sector as undergoing "explosive change", to be understood not in terms of static statistical cross-sections in time, but instead as an ecology of business forms in the process of becoming. This report attempts to describe the services performed in terms of four types of distribution systems:

- Traditional Storage Warehouse System;
- Just-In-Time Distribution System;
- Retail Distribution System; and
- Consumer Distribution System.

The reader need keep in mind, however, that these descriptive categories are a convenience. Most of the companies interviewed find their place on the ladder of change somewhere in between rungs, since no facility is solely dedicated to one function. In fact significant overlap often exists between them as each facility's function changes with need to satisfy the various requirements of their clients.

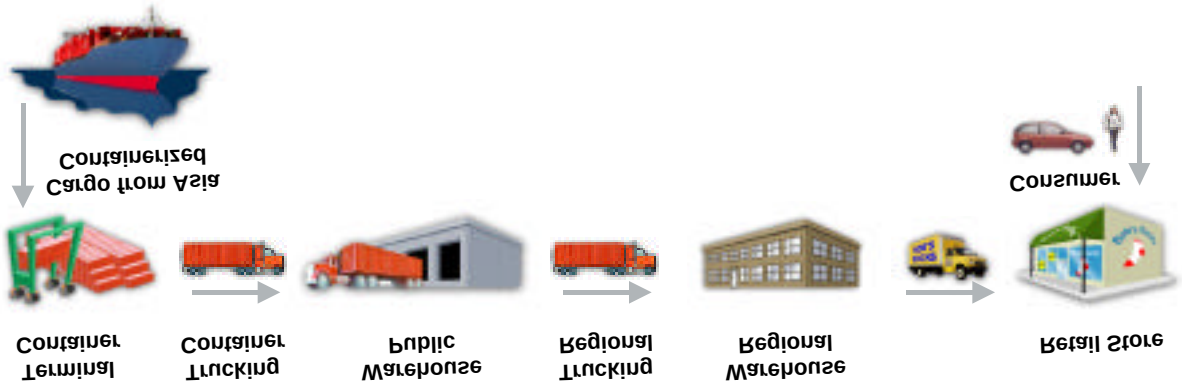
To good extent, the traditional storage warehouse system no longer exists in the region around the Ports of San Pedro Bay. The widespread implementation of the just-in-time philosophy of inventory management and the advent of the burgeoning eCommerce market have profoundly changed the nature of this industry. Rather than serving as simply storage facilities, the vast majority is now functioning in some capacity as distribution centers. Discussion of each of the various systems follows.

3.5.1 Traditional Storage Warehouse System

The Port of Los Angeles has on-site only one of this traditional type of warehouse that is still so prevalent on the East Coast, and its useful life is in question. While domestic demand for the "big-box" storage function remains on the outskirts of the greater Los Angeles region, its use in handling international trade has nearly disappeared. The sole use of the one existing warehouse around the Port is for holding "unclaimed cargo" that has not yet passed customs. As the manager of that warehouse commented, "physical storage of goods from containers is dead" in the San Pedro region. His operation has reported a significant increase in the rate at which shipments go through the warehouse over the last few years – he stated that over the previous two years, the volume it handled had quadrupled in the same amount of space.[10]

Such traditional warehouse systems are far from dead here on the East Coast, where they represent the majority of existing operations. It is thus extremely useful to describe the system of service that it represents, and it is shown graphically in Figure 3-1.

Figure 3-1: Traditional Storage Warehouse System



[10] Crescent Warehouse Company, Ltd.

- Container vessels arrive daily (sometimes hourly), having transversed the Pacific trade route which links Southeast, East, and North Asia with the Ports of San Pedro Bay (Los Angeles and Long Beach).
- Thousands of containers over an 18-hour period surge into the storage yards of container terminals.
- Containers of manufactured goods "dwell" in the terminal yard until they are either drayed to intermodal stack train terminals (on- or off-dock) or, for those that are of interest to this description, they clear customs and are placed on chassis for local delivery. Note that it is at this point in the system that control of the box is transferred from the carrier to the consignee and payment of the carrier must take place. Procedures that follow are typically not covered by a container liner carrier contract.
- Typically, owner-operated truckers dray the chassis loads of goods to public warehouses. As in the case of the container terminal itself, truckers struggle also at the warehouse over inconvenient business hours, bureaucratic procedures, slow service, overweight boxes and poorly maintained chassis. These issues, coupled with the very low prices for their services that truckers can negotiate, make this link one of the system's weakest and least predictable.
- At the public warehouse, the container is stripped and its contents sorted by ownership. The container may sit for some time at the warehouse prior to being trucked back to the marine terminal. Owners are notified and after a duration that may last months, request the warehouse to prepare an order for pick-up.
- From the public warehouse the goods are transported by domestic truck[11] to the East Coast to proprietary regional warehouses. Again, the cargo may rest for a duration until the owner asks that a retail order be prepared for local delivery to local stores.
- To finalize the system so that it will be recognized as one in which we all participate, the consumer completes the cycle by parking his car near the store and patronizing the retailer.

Inventory turnover at these facilities is slow, hence the need for relatively large (200,000 sf) buildings. Surveys indicate that throughput at such facilities is on the order of 22,000 TEU/year. The resulting 9 sf of warehouse floor space per TEU per year is the highest ratio of the four warehousing categories, making it the least productive type.

Table 3–5 lists a typical make-up of a large, traditional warehouse facility. It is included here as a baseline, and will later be contrasted with emerging distribution center employment needs.

[11] In some cases the truck van is moved eastward by TOFC rail service.

Table 3-5: Traditional Warehouse Staff Composition (excludes value-added activities)[12]

Job Classification	Percent of Total
Management	**11.5**
Managers & Officers	11.5
Professional & Technical	**0.8**
Professional	0.7
Technical	0.1
Service Occupations	**2.8**
Janitors, porters, cleaners	1.7
Guards	1.0
Maintenance and Production	**53.8**
Tractor-trailer drivers	1.3
Supervisor (nonworking)	6.3
Industrial truck operator	13.8
Maintenance and repair	4.1
Conveyor operator/tender	2.2
Locker plant attendant	13.3
All other laborers	11.5
Misc. maintenance and production	3.3
Clerical Occupations	**29.0**
Accounting clerk	0.9
Bookkeeper	3.1
General office clerk	6.3
Secretary	1.6
Shipping packers	4.3
Shipping/receiving clerk	1.9
Stock clerk	7.9
Misc. clerical	3.1
Sales Occupations	**1.9**
Sales agents	1.5
Misc. sales	0.3
Total	**100.0**

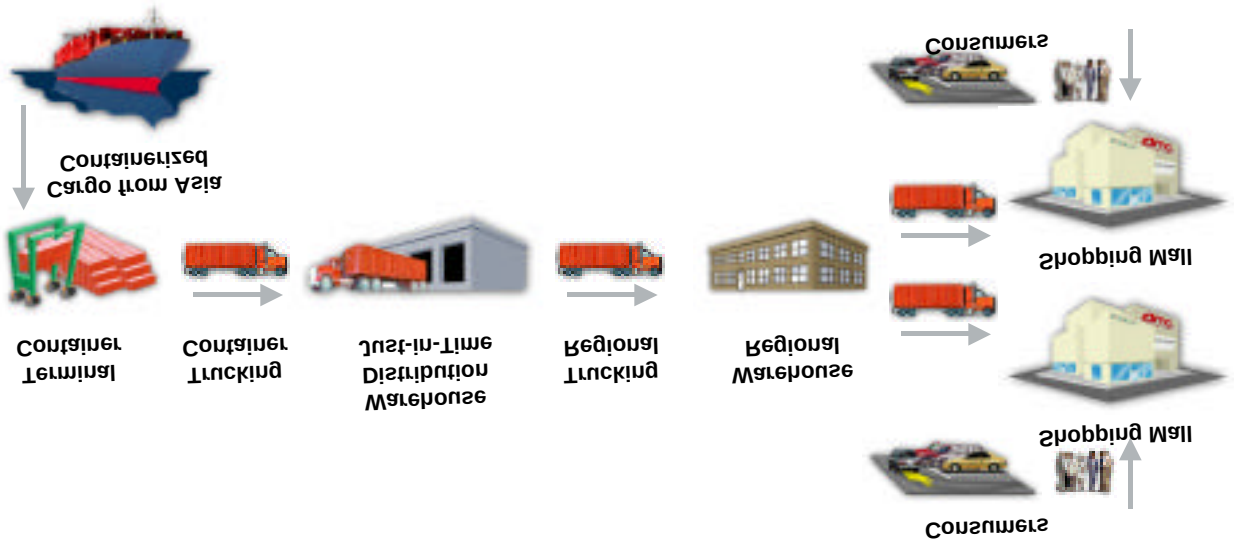
3.5.2 Just-In-Time Distribution Warehouse System

The widespread implementation of the just-in-time (JIT) philosophy to inventory and distribution practices has transformed most traditional storage warehouses in the POLA/POLB area into JIT distribution centers. The goals of just-in-time can be summarized as "the right product, in the right quantity, at the right time at the right place." The principle calls for receiving products at each step of the distribution process just in time to be used in the next step. The JIT distribution

[12] DCG Corplan Consultants LLC.

process, shown in Figure 3–2, results in a greatly increased rate of movement of product and an associated decrease in required storage space at every step in the process.

Figure 3-2: Just-In-Time Distribution System



The most impressive impact of the widespread JIT production revolution is felt within the distribution system itself, primarily at the level of public warehouse. In essence, its storage function is cut out. Containers drayed from the marine terminal are “cross-docked”, i.e., the goods transferred directly across a bay (commonly 100 ft wide) from the smaller ISO container to the larger over-the-road van. Massive cross-docking terminals have been developed around the ports of Los Angeles and Long Beach where, in fact, waiting time losses are incurred along the order of the previous system owing primarily to double-digit growth in demand. However, such cross-docking or transloading facilities produced numerous economies. Located as they are within the overweight container permit zone of the two ports, goods in overweight containers can be legally redistributed close to the marine terminals. Empty containers can then be returned to their owners quickly, with little or no demurrage charge. Major economies in volume per trip could be gained by shifting the load from inefficiently sized containers to larger semi-trailers. Truckers providing service between the Port terminal and the transloading facility could make more trips in a single day, thereby improving earnings.

Sensing the potential of this event, logistics specialists began studying the function of the transloader and quickly concluded this to be best point for adding increased value enroute. One of the key actions was to reorganize contract transloading facilities to provide internal conveyance between the containers to trucks serving the various regional warehouses of the

owner. It was thereafter only a short step to open the package and insert promotional materials corresponding to store's regional marketing program. Thus, the warehouse traded its storage function for an increased role in the actual production of the goods for sale.

Adoption of JIT and production enroute concepts corresponded with the reorganization of the nation's retail distribution from a "downtown" orientation to one focusing on large volume distribution points or shopping centers. A key step along the way was the development of the regional warehouse serving many shopping centers. Once a subsystem directly linking the transloading center with the regional distribution center was formalized, time loss within the subsystem immediately decreased. Instrumental in this process was barcoding of goods as they exited the container and entering them immediately into a computerized information system which allows their location to be directly tracked. Nevertheless, the weakest and most unpredictable link remained (and remains) between the marine terminal and the transloading center.

The vast majority of the larger scale logistics providers in the San Pedro Bay area interviewed for this study have adopted JIT principles, and carry out some form of transloading, albeit often very limited in scope. Distribution facilities can process shipments in and out (transload) within 24 to 48 hours. One example of this process in action is a major chain store with a dedicated transloading operation setup at a warehouse very close to the Ports.[13] Containers from Asia are trucked to the facility where the product is unloaded directly onto dedicated conveyors destined for various regional warehouses located throughout the country. The warehouse is set up as a cross-dock operation, where cargo comes in on one side of the building and exits from the opposite. The majority of these containers are unloaded, sorted and trucked out within a single day. At peak periods, 250 40-ft containers per day can be processed in this manner through an 80,000 sf facility.

In addition to the typical manual cross-dock operation, our survey also found an automated facility with overhead conveyors and sorters emanating from the truck bays on one side of the building and outputting to dedicated bays on the opposite side.[14] This setup also has the added advantage of keeping a large section of the floor of the warehouse open and available for possible use for value-added services.

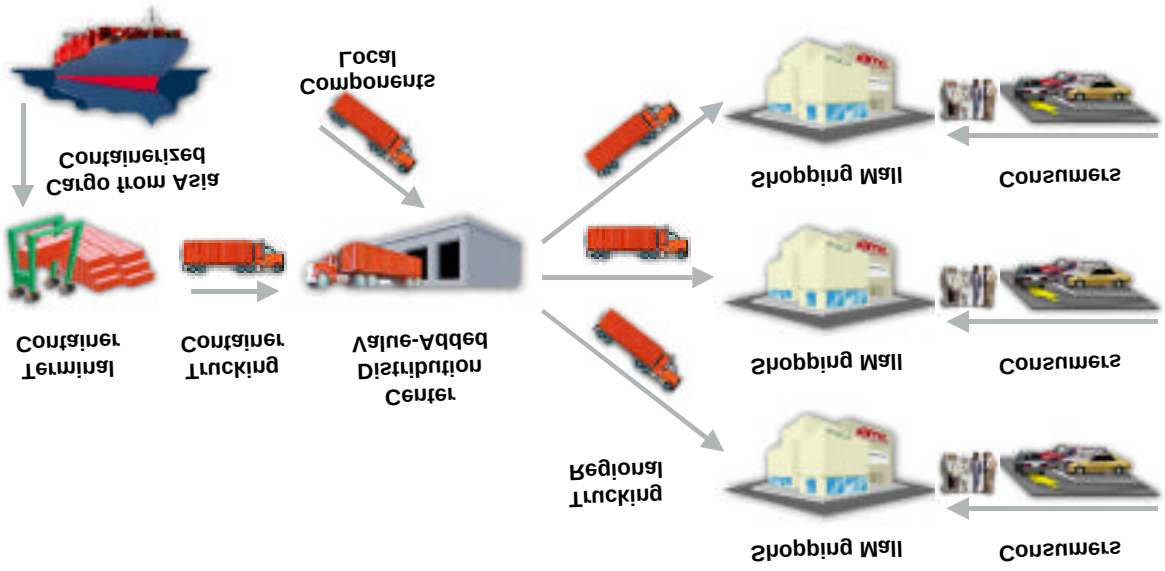
[13] California Cartage Co.
[14] DSL Transportation.

The optimal size for a JIT warehouse for the purposes of this study is approximately 100,000 sf. On average, JIT distribution warehouses of this size have a throughput of 40,000 TEUs per year. This rate varies quite a bit depending on the nature of the actual operation since some products move much faster than others. Automated cross-dock operations have higher throughput. The automated equipment at the facilities we visited was located overhead, leaving much of the floor space open. The use of space had not yet been optimized, so such buildings tend to be larger. Our estimated ratio of space required per TEU per year consequently is provided as a range between 1 and 7.

3.5.3 Retail Distribution Center System

One of the most interesting recent developments found in the San Pedro Bay market is the trend toward retail distribution direct from the warehouse facility in which the containers are unloaded, and the value-added services frequently associated with this process. Many facilities that handle cargo from the Ports of Long Beach and Los Angeles function as illustrated in Figure 3–3. The need for a separate regional warehouse owned by the retailer is eliminated by using the value-added warehouse as the distribution center. Orders from the retailers are sent electronically to the distribution warehouse by EDI (Electronic Data Interchange) or by email, and the product is shipped directly to the retail outlet requiring the inventory.

Figure 3-3: Retail Distribution Center System



Roughly 75% of the West Coast operations interviewed carried out some level of retail distribution. This widespread proliferation of the new form of production enroute was

unexpected, but not surprising on further reflection. Comparing this approach with the previously described JIT system, the major difference is that there is no longer the need for a regional warehouse. This storage enroute function was severed as a JIT savings.

Corresponding to the needs of this system, the shopping store often grew to itself become a warehouse of sorts. On the other hand, the extraction of storage impacted the center receiving the container from the marine terminal in two critical ways. First, the need to take advantage of legal overweight drayage and the critical importance of minimizing delays of first day delivery from the marine container terminal mandated the center's location to be within a few miles of the terminal. "No more than ten miles" was cited by several West Coast facility managers.[15] In line with the same trade-off between the cost of land and the cost of transportation (eg. time and dependability) that pushes the location of traditional storage facilities beyond the 75-mile radius, the trade-off operating in reverse now pulled the center back to within the ten-mile radius. In the process, the distribution center lost almost entirely its storage function and minimized its cross-docking functions to focus almost exclusively on the provision of value-added services to contract accounts. Not only does building size go down as a result, but its nature changes radically. Because product development and marketing gains importance, the distribution center now requires a sales department and the need for attractive surroundings becomes a vital factor in marketing.

Performing value-added services generally increases the number and type of employees, so the center takes on the aspect of a small assembly plant. Although not always apparent, the systems savings of this hybrid are such that customers appear to be ready to pay premium prices for the service. In terms of land use, the centers still rely on speculative building on short leases (three years) but now are often incorporated into attractively landscaped distribution parks.

Due to the demanding nature of customer demand, retail distribution centers in reality often serve various functions depending on specific requests. One such facility in the San Pedro Bay area recently handled a transloading job involving the distribution of the contents of two containers directly to 63 different retail outlets.[16] They were able to complete the job within 24 hours, providing what was termed "air freight service for ocean container cargo." The same facility also recently completed several value-added projects involving kitting operations where pieces shipped from different countries needed to be packaged together for shipment to retail outlets for sale as a single unit. Not only did the distribution facility handle the value-added pick

[15] In most cases, each distribution center had its own dedicated trucking service.
[16] Custom Air Warehouse.

and pack process, but they also teamed with their client to custom design the cardboard backing and the plastic packaging required. This type of intensive value-added project dramatically increases the time required to between 8 and 12 weeks for a typical project, with most of that time devoted to planning and design. A significant percentage of the retail distribution centers space is devoted to the more traditional function of inventory storage for chain stores. Among the most common products found in our market survey were consumer electronics and chinaware, both of which are stored for periods up to 3 months before being shipped out to cover orders.

The average size of these retail distribution centers is estimated to be approximately 80,000 sf, in which approximately 12,000 TEUs are processed on a yearly basis. The estimated ratio of space required per TEU per year is estimated as 6.5.

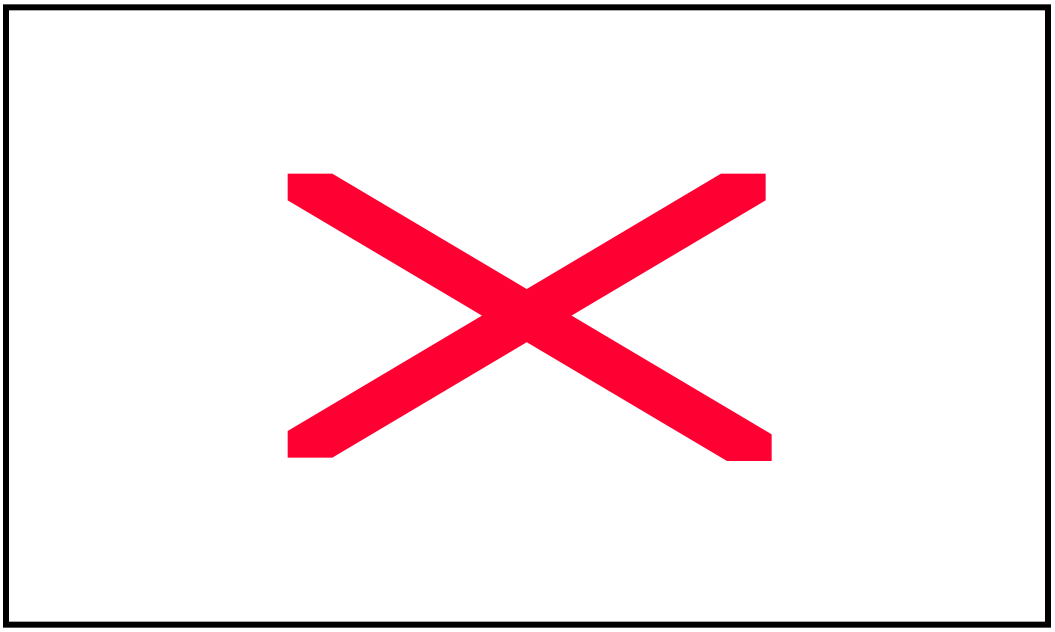
A final point should be made regarding the crucial role in this nation's business to business logistics that the Ports Complex of San Pedro Bay currently plays. It is quickly positioning itself to become an almost irreplaceable element of every global corporation's production system. Following this model, the PONYNJ can also find a comparable position if the proper conditions fall into place. This point will be revisited in Section 6.

3.5.4 Consumer Distribution Center System

The most remarkable new development in the warehousing market is the burgeoning consumer eCommerce market, which has the potential to fundamentally alter the function of the entire industry. Presently, only approximately 2% of the San Pedro Bay warehousing market results from eCommerce activity, but virtually all of the facilities visited were already actively participating in eCommerce pilot programs, or were attempting to develop into the sector. All companies involved cited the new function as their fastest growing (double digit) and most lucrative.

Consumer eCommerce is perhaps the largest factor that has contributed to the new economic paradigm illustrated in Figure 3–4. The function of the warehouse is transformed into that of a consumer distribution center that unloads containers, sorts and inventories the contents, performs value-added services, then ultimately sends single items straight to the home of the consumer. No intermediate warehouses are required under this system, and traditional retail outlets are replaced by Internet shopping.

Figure 3-4: Consumer Distribution Center System



Various manufacturers are currently running Internet fulfillment pilot programs at distribution centers in the San Pedro Bay area. In one case, containers of sneakers are being imported from Thailand and combined with shoelaces from Taiwan before being packaged and sent out via UPS to the home of the Internet consumer.[17] A similar operation at another facility combines electric guitars, amplifiers and accessories made in different Asian countries into a single package for direct shipment to consumers.[18]

Another eCommerce related operation is returns processing, in which items sent back by customers are processed and repaired or sent back to stock. The Internet retail company in this case has a staff member located fulltime at the warehouse to evaluate and sort the returns.[19] This cooperative effort is indicative of the very close relationship that must be developed between the distribution centers and their clients under this new system.

The surveyed facilities in the San Pedro region that perform consumer distribution functions are all located by necessity as close to the port's marine terminals as possible (for the same reason previously discussed for the retail distributor). From a systems point of view, the port-related distribution center serves a dual function as both the first point of landfall for the goods, where

[17] California Cartage Company.
[18] Nippon Express USA, Inc.
[19] Custom Air Warehouse.

value-added services can be performed and/or domestic or NAFTA components can be incorporated, but most importantly, is also the point in the internet fulfillment cycle where the goods are handed off for final delivery (via UPS or other carrier) to the retail consumer. Comparison between Figure 6.4 and the previous figures indicates the tremendous productivity growth that this system offers the economy.

The consumer distribution center requires approximately 25,000 sf of storage space, through which approximately 11,000 TEUs are handled yearly. Due to the quick nature of eCommerce purchasing, it is estimated that the required floor space per TEU per year is quite low, at approximately 2.3.

3.6 MASTER-PLANNED INDUSTRIAL CENTERS

To complement the new types of activities performed by modern distribution centers, the physical appearance of the facilities has undergone dramatic change as well. Newly constructed distribution centers are attractive as well as functional and often look more like office complexes than warehouses. Landscaped surroundings are the norm as owners have realized the sales advantages of using well-designed modern facilities as showcases to attract potential clients. With this in mind, developers are commonly building individual warehousing/distribution facilities as part of master-planned industrial centers.

Case Study: Watson Industrial Center South

The 350-acre Watson Industrial Center South property in the City of Carson (close to the Ports of Los Angeles and Long Beach) is representative of this new type of planned urban development (PUD). Developed, owned and managed by Watson Land Company, the environment consists of 6.67 million square feet of attractive and functional industrial buildings ranging in size from the 28,687 sf building leased to Hertz and Copley Press to K-Mart's massive 435,138 sf building. A plan view of the layout of the facility is included as Appendix B, along with photographs of some of the buildings and roadways.

The Watson Center offers close access to the POLA/POLB and Los Angeles International Airport and is convenient to five different freeways; the San Diego (405), Harbor (110), Long Beach (710), Artesia (91) and Terminal Island (103). Among the other benefits of the Industrial Center is Watson's maintenance service program, which includes building painting, yard and roof upkeep and site landscaping. In addition, the masterplanned nature ensures compatible tenants.

3.7 COMPARISON OF FACILITIES

The rapid growth of retail and consumer distribution systems portend high levels of national productivity for decades to come. There should be no underestimating the significant economic importance of making sure that this kind of distribution is promoted. Visits to the masterplanned industrial developments highly involved in these activities springing up around the Ports of Long Beach and Los Angeles leaves no doubt that port, transport and urban planners in California understand and support this new contributor to their regional economic growth.

Table 3–6 provides a breakdown of the functions typically provided by the various distribution center types. Please note that this listing is comparative in nature and the actual functions likely to be performed at each type of center will vary significantly based on the needs of the clients.

Table 3-6: Distribution Center Activity

Activity	Traditional Warehouse	Just-In-Time Distribution Center	Retail Distribution Center	Consumer Distribution Center
Basic Services				
Storage	X	X		
Transloading	X	X	X	X
Customs	X	X		
Foreign Trade Zone	X	X		
Freight Forwarding	X	X		
Trucking	X	X		
Value-Added Services				
Logistics		X	X	X
Barcoding		X	X	X
Sorting		X	X	X
Labeling		X	X	X
Marketing Materials		X	X	X
Scanning			X	X
Repacking			X	X
Pick & Pack			X	X
Kitting			X	X
Packaging Design & Manufacture			X	X
Manipulation			X	X
Repair			X	X
Internet Fulfillment				X
Special “Piece” Manipulation				X

Characteristics of the various types of distribution centers are provided in Table 3-7. Note that these numbers are comparative in nature and are intended to show relative relationships between categories rather than indicating actual projections.

Table 3-7: Distribution Center Characteristics

Activity	Traditional Warehouse	Just-In-Time Distribution Center	Retail Distribution Center	Consumer Distribution Center
Labor				
Permanent	4	15	25	25
Part Time	6	30	20	20
Total	10	45	45	45
Unit Size (sq. ft.)	200,000	100,000	80,000	25,000
TEU/year	22,000	40,000	12,000	11,000
Sq. ft./TEU/year	9	1-7	6.5	2.3

4 NATIONAL SURVEY OF BROWNFIELDS REDEVELOPMENT

As defined by the United States Environmental Protection Agency (EPA), "brownfields are abandoned, idled, or under-used industrial or commercial facilities where expansion or redevelopment is complicated by real or perceived environmental contamination that can make redevelopment of the property financially or logistically prohibitive." It is nearly impossible to determine the exact number of such sites in the nation, but the EPA estimates there are at least 500,000 sites with a high potential for some contamination based upon their previous industrial or commercial use. Most are located in urban areas where heavy manufacturing or other industrial activities have occurred, but brownfields can also be smaller commercial lots where some form of contamination is suspected but may be undocumented.

Not content with the federal definition, some states have sought to expand the brownfields concept to include any property that is contaminated (e.g., landfills) where cleanup and creative redevelopment can bring significant value to the land parcel. Still others (e.g., California community action groups) would further broaden the definition to include any suspect property where remediation might improve public health, promote economic recovery, create ownership opportunities for the community, or enhance quality of life in the targeted area.

To develop representative case studies on successful redevelopments of brownfield sites, our survey reached out to the regional offices of the federal EPA, state environmental protection agencies, state economic development officials, local redevelopment agencies, enterprise zone administrators, and leading industrial and commercial realtors.

4.1 GENERAL FINDINGS

Appendix C provides descriptive summaries of instances where industrial or commercial brownfields have been successfully converted to productive use. These examples involve states from coast to coast and a number of observations can be made about the characteristics of these properties:

4.1.1 Environmental Cleanup

Understandably, most owners of contaminated industrial or commercial properties are reluctant to expend funds for cleanup unless (and until) forced by regulatory agencies, threatened by legal action, or fined. Most corporate finance executives view real estate speculation as an unacceptable use of capital, since holding of idle or under-used property awaiting a questionable

future sale or lease incurs long-term carrying expenses. Therefore, unless owners of vacant or near-vacant brownfields see a near-term opportunity for economic benefit, abandonment may be the preferable option. Among the surveyed examples of successful conversions, the vast majority of these brownfield sites are properties that had reverted to public ownership as a consequence of tax default or bankruptcy of the previous occupant.

Based upon review of successfully converted brownfield sites, new occupants are seldom potential sources of contamination, although it may be too early in the process to tell. Even among those parcels that will continue to be utilized by the same operations that had previously contaminated the property, so-called "voluntary" agreements with regulatory agencies insure that further environmental damage will be substantially mitigated through changes in process or improved waste management.

A look at successful conversions indicates that relaxation of environmental clean-up standards and special incentives have become the most important change influencing potential reuses of brownfield sites. While properly assuring adequate and necessary protection for housing developments on suspect sites, these changes are broadening the opportunity to attract many types of non-residential uses.

4.1.2 Location

In essence, successful brownfields conversions are real estate deals where location advantages outweighed environmental problems. Almost invariably, they represent "higher and better" use of the property than those of the most recent previous occupants, and developers recognized changes in the local commercial/industrial real estate market as new opportunities.

Typical projects in central business districts are conversions from former industrial or commercial uses to strategically located "higher" uses such as hotels, convention centers, concert halls, museums, sports arenas, or transportation centers.

On the periphery of the central business districts and in interstitial neighborhoods, the most typical conversions are to urban residential developments or senior citizen housing projects.

In suburban areas, large sites oriented to major highways have been the easiest conversions. These brownfields opportunities typically appeal to developers of regional shopping malls, low-rise or medium-rise office buildings, and business or industrial parks which include value-added distribution centers. Frontage parcels command the highest prices, but interior lots with more

modest values attract service companies and light industry, while traditional warehousing usually opts for the rear tracts.

4.1.3 Dowager Properties

Frequently, structures on brownfield sites are functionally obsolete and fail to meet market expectations. Accordingly, these dowager properties seldom can command rent levels high enough for building owners to recoup the cost of clean-up and rehabilitation. Typically these buildings are on crowded sites with little opportunity for expansion, inadequate truck access and minimal parking. The structures are old and unsuitable for layout of modern production or distribution operations, with inadequate column spacing, low ceiling clearance, minimal floor loading, antiquated lighting and utility systems, etc. Moreover, many are located in rundown neighborhoods with serious security problems and access involves travel through congested city streets unsuitable for large trucks.

It must also be recognized that time is of the essence in completing commercial and industrial real estate deals. Most potential occupants have 30-90 day timelines and therefore have little interest in lengthy clean-ups or fix-ups. Ideally, end users prefer clear, ready-to-go sites.

4.2 SURVEY RESULTS

Table 4-1, based upon results of the national survey, classifies by type of current use successful conversions of brownfield sites. The pertinent observation is that freight-related facilities represent approximately half of these examples, including sites rehabilitated for manufacturing operations and industrial parks, mixed-use parks, warehousing/distribution operations, transportation facilities, and wholesalers.

Table 4-1: Successful Conversions of Brownfield Sites[1]

Freight-related facilities	Non-freight-related facilities
Industrial plants or industrial parks	Residential
Mixed use parks	Recreational/entertainment facilities
Warehouse/distribution facilities	Civic installations
Transportation facilities	Commercial/office parks
Wholesaling facilities	Retail (including shopping centers)
	Senior or low-cost housing
	Engineering/R&D facilities
	Hotels
	Farms

An equally important observation is that another half of the conversions have involved non-freight-related facilities. This reflects the tendency for local development officials to look upon the brownfield sites as an opportunity to improve urban housing stock or provide senior citizen or low-cost housing projects, build recreational or entertainment facilities, or accommodate municipal service facilities—together accounting for approximately half of the listed nonfreight-related uses.

4.3 BROWNFIELDS REDEVELOPMENTS, EPA GRANTEES, PILOT PROGRAMS, SUCCESSFUL CONVERSIONS

4.3.1 Brownfields Showcase Communities

The Brownfields National Partnership was launched in 1996. The purpose of the Partnership is to promote cooperation between public and private interests to redevelop brownfields; community revitalization in distressed areas; and to tie economic gains with environmental gains. In 1997, the Partnership, together with other federal partners, developed the Brownfields National Partnership Action Agenda. The Action Agenda seeks to promote brownfields redevelopment by focusing on specific commitments to brownfields efforts. This spurred the selection of Showcase Communities, to demonstrate that community revitalization is possible through cooperation between agencies.

To date, there are 16 Brownfields Showcase Communities designed by Federal agencies – Federal Empowerment & Enterprise Communities (EZ/EC's)[2]. These communities serve as models for other communities throughout the country:

[1] *National Survey of Firms That Have Located on Brownfields Sites*, DCG Corplan Consulting LLC.

- Baltimore, Maryland
- Chicago, Illinois
- Dallas, Texas
- East Palo Alto, California
- Glen Cove, New York
- Kansas City, Kansas & Missouri
- Los Angeles, California
- Lowell, Massachusetts
- Portland, Oregon
- Providence, Rhode Island
- St. Paul, Minnesota
- Salt Lake City, Utah
- Seattle/King County, Washington
- Southeastern Florida (Eastward Ho!)
- Stamford, Connecticut
- Trenton, New Jersey

The showcased communities receive publicity, federal funding, and a federal employee to assist in implementing brownfields projects. Summaries of the showcased communities' initiatives are included in Appendix C.

4.3.2 Brownfields Initiatives

Many communities have benefitted from taking stock of their brownfields. Most realized the potential of these sites, and in order to lure potential investors and developers, had to undergo various similar processes to promote them. The brownfields pilot programs studied are in urban areas, with high percentages of poverty, minority population and unemployment. Those communities that originally developed around an industrial core have suffered from urban blight. Low-income families have created communities in the previously uninhabited areas. In general, the Brownfields programs contain the following features:

- Establishment of partnerships with agencies and community groups
- Availability of preliminary environmental assessments.
- Monitoring of environmental assessments

[2] From "Federal Register", Volume 65, No. 52, Thursday 3/16/00 – Brownfields Initiative

- Development of a database of brownfields sites in the area, including locations, sizes and types of contamination. This enables potential investors/real estate developers to "One-Stop Shop", that is, view all the available sites in a community, and have all the relevant facts of contamination sources, level of effort required for cleanup, etc.
- Prioritizing of brownfields sites

The initiatives usually focus on a region, which may contain more than one brownfield site. As the process moves forward, sites are ranked according to perceived redevelopment potential. Community support and funding sources are of paramount importance to successful conversion. More information on initiatives' structures, plans, funding sources and successful conversions is contained in Appendix C.

5 BROWNFIELDS REDEVELOPMENT CONDITIONS FOR NJTPA REGION

5.1 POTENTIAL MARKETS FOR NJTPA REGION BROWNFIELD SITES

As identified in our national study, brownfields redevelopment sites represent a very wide range of facilities and usages, approximately half of which are freight-related industrial or commercial operations. Both the warehousing investigation and the national brownfields study found that location is of paramount importance in determining the attractiveness of any given site to a potential tenant.

The existing brownfield sites in the NJTPA region provide myriad development opportunities. While the specific focus of this study is development of freight infrastructure facilities, it should also be noted that the remaining brownfield sites may also prove attractive for non-freight developments since a number of different housing and recreational usage opportunities exist for these sites, as was discussed in Section 4.

A significant percentage of the sites located near the PONYNJ can likely be successfully developed to serve as distribution centers for international containerized cargo following the models described in our Pacific SW study. These freight-related operations associated with value-added processing of Asian imports require close proximity to the intermodal transportation infrastructure that already exists near the ports.

As discussed in Section 2.5, international containerized trade that serves the NJTPA region can be divided into two general categories for the purposes of this study: that which is shipped to the NJTPA region either directly through the PONYNJ or via stacktrain transfer from West Coast ports, and the Asian cargo that has value-added services performed in San Pedro Bay warehouses prior to being shipped across the country. The cargo forecasts of this study deal with the Asian imports currently being warehoused on the West Coast, since it is that quantity that is likely to have a share shifted to the PONYNJ as a result of the currently planned dredging of access channels.

Imports shipped directly to the PONYNJ plus cargo that arrives via stacktrain is already being warehoused in the NJTPA region in the manner discussed in Section 3.3. The approximately 600 million square feet of existing warehouse space in the region likely support this directly imported cargo, as well as domestically manufactured goods and air freight, but data is not

available to determine the existing percentage breakdown of supply for these facilities. While growth of this sector may also represent a potential market for brownfield sites, the volume of this potential demand for additional land cannot be determined without data to support a forecast. While best available information on the existing New Jersey warehouse climate has been provided, a comprehensive survey of industrial real estate market conditions and potential growth is beyond the scope of this study. Conversations with top real estate developers indicate that the warehousing market is so dynamic and speculative in nature that it is impossible to predict who the next client seeking a facility will be and how much space they will require.

New trends appear constantly in today's industrial real estate market and developers must quickly adjust and respond to demand. A case in point is the recent transformation of many older industrial buildings into telecom or carrier hotels to serve as electronic information hubs. Some 200 of these facilities have sprung up around the nation as of early 2000, filled with the computers, generators, fiber optic cables and satellite dishes that form the infrastructure of eCommerce. Local examples include the former Macy's building on Market St. in Newark, the former Estee Candy Warehouse in Parsippany and the former Moishe's cold storage facility in Jersey City. It is possible that developers focused on this type of usage may be interested in acquiring a brownfield site for this and/or other purposes, but such real estate speculation is highly uncertain and is not the focus of this current study.

It is clear, however, that when cargo shipments are shifted from West Coast ports to the PONYNJ, new warehousing facilities required to service this demand will certainly be required in the NJTPA region. Development of appropriate distribution facilities is vital in achieving and maintaining the projected shift in Asian containerized cargo traffic patterns. A forecast of the amount of land required for these new distribution centers is provided in Section 6.

5.2 FAVORABLE CONDITIONS FOR WAREHOUSE FACILITIES

Consistent patterns of site selection were observed for the San Pedro Bay area distribution facilities included in the Pacific SW survey. All facility managers interviewed provided information on the site selection criteria used to determine their current locations and also listed the most desirable characteristics when looking for a new site. Each of their criterion is discussed in detail below.

5.2.1 Location

All West Coast facilities visited as part of this survey are located within 15 miles of the point of arrival of cargo, whether it be ocean containers from the Ports of Long Beach and Los Angeles, or air cargo from Los Angeles International Airport. The just-in-time distribution operations with the highest volumes of incoming ocean containers tend to be located closest to the Ports to minimize drayage costs. The facilities that function primarily as retail distribution centers have lower incoming traffic frequency so can be located slightly farther away. However, managers of retail distribution centers need to remain close to all of their facilities, so they are inclined to keep them grouped closely together. Since some retail distribution centers have evolved from more traditional warehouses, these tend to be close to the Ports. In all cases, each facility is located no farther than 0.5 mile from a freeway and is no more than a fifteen-minute drive from the Ports or the airport.

5.2.2 Environmental/Zoning

During our West Coast warehousing survey, we did not encounter facilities specifically developed on brownfields, but did learn of one vacant site in the South Gate area (the Purex building) currently being developed for industrial use.

Almost every facility we visited was already developed before the tenant/operator took possession. Warehouse managers wanted nothing to do with land ownership, environmental cleanup or building construction. When interviewed, each retail and consumer distribution center explained that they wanted to move into planned unit developments (PUDs) that had comfortable amenities and pleasant environs, as the facilities in this regard tend to serve as showrooms for potential customers/retailers. Information on one such development is included in Appendix B.

Operators of value-added distribution centers are extremely cognizant of the environment regulations governing disposal of waste, stormwater runoff and pollution. Industrial zoning is much preferred, with a location within an industrial park development being ideal since security is also a concern.

Reuse of brownfield sites may potentially introduce new levels of airborne pollution generated by truck movements to otherwise non-active properties. Through a survey of major freight-related users, the demand by truck type has been evaluated and is shown in Table 5-1. Truck-load (TL) accessibility denotes use of 18-wheel semi-trailers, some with heavy–load capabilities

(port-related uses), and most requiring substantial apron allowances for turning radius (185 feet is becoming an industry standard). Less-than-truck-load (LTL) categories include step-vans and mosquito trucks, such as Fed-Ex or UPS, that can provide just-in-time inventory accessibility.

Table 5-1: Demand by Truck Type

Industry	NAICS	TL Truck Accessibility	LTL Accessibility
Manufacturing	31-33	X	X
Wholesale Trade	421-422	X	X
Air Transportation			
Scheduled Freight Air Transportation	481112		X
Nonscheduled Chartered Freight Air Transportation	481212		X
Rail Transportation			
Line-Haul Railroads	482111	X	
Short Haul Railroads	482112		X
Water Transportation			
Deep Sea Freight Transportation	483111	X	
Coastal and Great Lakes Freight Transportation	483113	X	
Inland Water Freight Transportation	483211	X	X
Truck Transportation			
General Freight Trucking, Local	484110		X
General Freight Trucking, Long Distance, Truckload	484121	X	
General Freight Trucking, Long Distance, Less Than Truckload	484122	X	X
Support Activities for Transportation			
Support Activities for Air Transportation	488100		X
Other Airport Operations	488119		X
Support Activities for Rail Transportation	488210	X	
Port and Harbor Operations	488310	X	
Marine Cargo Handling	488320	X	
Other Support Activities for Road Transportation	488490		X
Freight Transportation Arrangement	488510		X
Packing and Crating	488991	X	X
Warehousing and Storage			
General Warehousing and Storage	493110	X	X
Refrigerated Warehousing and Storage	493120	X	X
Farm Product Warehousing and Storage	493130	X	
Other Warehousing and Storage (e.g. Foreign Trade Zones)	493190	X	X

The heaviest concentration of both TL and LTL truck use will be in the following industries, resulting in higher air-borne pollutants generation from diesel motors:

- Manufacturing
- Wholesale Trade
- Inland Water Freight Transpiration
- Packing and Crating
- General Warehousing and Storage
- Refrigerated Warehousing and Storage
- Other Warehousing and Storage

The New Jersey Department of Environmental Protection (NJDEP) has established a 3-minute idling rule for truck motors that is in conjunction with the Federal EPA and enforced by local health and police organizations. It is unlikely that this legislation would be modified to support brownfields redevelopment, therefore, the issue of truck idling beyond the allotted time is of no consideration for this study.

Effects on air quality, however, are of considerable importance for urban brownfield locations. Narrow streets and property-line build-outs of older buildings will create elevated carbon monoxide levels where numerous LTL shipments can only be accommodated. Serious planning efforts must be made that will create open truck-ways for larger, more infrequent deliveries as well as common loading facilities that may serve several operations simultaneously.

5.2.3 Intermodal Accessibility

Most of the surveyed just-in-time distribution facilities in the San Pedro Bay area have rail access directly on site or located nearby, and piggyback TOFC operations are fairly common at these types of facilities. However, the retail and consumer distribution facilities do not typically use rail to transport product and their managers stated it was of little importance when they select a site since their products are transported almost exclusively with trucks.

Truck accessibility is consistently listed as one of the most important factors in selecting a site. All facilities studied are located very close to freeways and are within fifteen minutes of the Ports. The balance between drayage costs and rental prices is one of the most important issues for a facility in the San Pedro Bay area.

Since most brownfield sites are concentrated in older urban areas, congestion and inadequate road access is a common problem. The modern distribution warehouse, with its emphasis on cross docking type operations, typically has a much greater volume and frequency of trucking movements than a traditional storage facility. Brownfield sites that require trucks to travel extensively over city streets are unlikely to meet needs of modern warehouses.

For motor truck transportation terminals, limitations on the length of access routes are a key consideration. By law, states may not deny reasonable access between the National Network (i.e., the Interstate Highway System) and terminals for vehicles of legal width and length. In practice, this usually means a distance of one mile on state highways, but in the case of New Jersey, that distance can be a maximum of two miles. As confirmed by the national survey, brownfield sites will not be acceptable for terminals if they are beyond the lawful distance, or

access is restricted for low clearances, weight limitations, or other rules. (Note: New Jersey has 22 highways with structures of 13'6" or less clearance and nine major routes that are restricted for truck movements as shown on Figures 2–2 through 2–4.)

5.2.4 Size/Layout

The size of the operations examined in the San Pedro Bay region study varies from as small as 14,000 sf for a retail and consumer distribution center receiving product primarily from the airport and domestic shippers to 600,000 sf for a very high volume just-in-time transloading facility. Most operators handling Asian containerized cargo from the POLA/POLB agree that basic units of 40,000 sf storage space per customer are appropriate. The number of these units required would vary depending on the usage requirements of the facility.

Note that the demand in the New Jersey warehousing market has been for increasingly large, state-of-the-art facilities of over 300,000 sf. The average existing tenant in this region is currently a large company seeking manufacturing and/or distribution space in a modern industrial park setting. This study assumes that most distribution centers that will develop in New Jersey as a consequence of the shift in Asian traffic directly to the PONYNJ will mirror the conditions of the existing facilities in the San Pedro Bay area rather than following the development trends now exhibited in New Jersey. For this reason, a basic unit of 40,000 sf per customer has been utilized in our projections.

Regarding building layout, a width of 100 ft is often stated to be the most serviceable for cross-dock operations, where incoming containers are unloaded on one side and trucks are packed and dispatched from the other side. All operators requested as many truck bays as possible along the long side of the warehouse building. Desired ceiling height for maximum efficiency should be a minimum of 35 ft clear.

The site must be capable of accommodating the common semi-trailer lengths ranging from 45 to 53 feet, their greater turning radius, and on-site holding of equipment waiting for dock space. An absolute minimum of approximately 125 ft of clear space was requested between the loading dock and the fence to allow for truck turnaround and yard maneuverability. 185 ft is becoming the industry standard minimum clear space.

5.2.5 Rent/Terms of Lease

The range of rents reported in the San Pedro Bay area for warehouse facilities is approximately $0.40 to $0.55 per square foot per month, excluding tax, insurance and maintenance. Rents in this area increase with proximity to the Ports of Long Beach and Los Angeles.

Five-year leases for warehousing facilities are common in the region, with some 10-year leases also reported. One owner/operator commented that a shorter-term lease of 1-2 years might be more appealing to companies just getting into the business.

5.2.6 Employment and Special Skills

Union labor is relatively nonexistent at the West Coast facilities. Virtually all of the distribution facilities in the San Pedro Bay area utilize leased labor to perform much of their work. As a matter of fact, only one union warehouse facility was found. This facility cannot compete with the rates charged by the others and relies on their niche position as a general order bonded customs warehouse to survive. All other facilities rely heavily on the temporary work force. The average rate paid to the labor supplier was reported to be $9 per hour for basic non-skilled warehouse workers, and it is estimated that the workers themselves are paid approximately $6 to $6.50 per hour. Automated cross-dock facilities require skilled laborers who command higher rates, as do forklift operators.

Warehousing manpower requirements have been viewed traditionally as a need for strength and endurance. As warehousing shifts from pure storage to flow-through facilities that do more than cross-docking, however, these personnel requirements are changing dramatically. Concurrent with the information explosion, customers now look to warehouses to maximize information management through technology, and as warehousing operations become more complex, they are providing more “customization” in the form of value-added services. In serving retail customers, for example, the job has advanced far beyond the simple job of picking the order, building and staging the pallet, and loading the truck. Rather, warehouse employees have become more valuable labor resources because they often can provide a higher degree of customization than machines are capable of performing.

Value-added operations are commonly performed in workgroups, with one fulltime staff member supervising a team of four to five temporary workers. The more complicated tasks, such as sorting and entering inventory by SKUs (stock keeping units), is always handled by experienced fulltime staff. Repetitive and manual assembly line work is normally performed by leased labor.

In one case, a labor-intensive value-added project involving sorting, application of price stickers and repackaging chinaware was outsourced to The Arc (formerly Association for Retarded Citizens).[1]

All of the San Pedro Bay area facilities we spoke with are extremely pleased with the performance of their temporary workforce, which in the Los Angeles area is primarily of Mexican descent. One of the facilities with branches in other U.S. locations, such as Chicago, reported less success with using leased labor.[2]

With the aid of "knowledge workers" replacing laborers, successful warehouse operators can now contribute to the emerging objectives of the new distribution paradigm: inventory reduction, better customer service, and cost reduction.

5.3 SITE SELECTION CRITERIA

5.3.1 Distance from Highway Interchange

Nearly all distribution center operators surveyed chose proximity to highway as the key factor for comparison of potential sites. Their business relies heavily on providing finished goods to the end-user in a timely fashion. The trucking restrictions imposed by NJ on some highways should not affect any trucks servicing these centers. *Accordingly, value-added distribution centers should be within 1 mile of a highway interchange.*

5.3.2 Distance from Cargo "Start Point"

Cargo "start point" refers to the location the international cargo, raw materials, or components first enter the system. The ports and airports qualify as cargo "start points", as do the railheads transporting cargo from the West Coast. Successful operators of just-in-time and internet fulfillment centers want to get their product from start point to end-user with a minimum amount of product dwell time. The distance from "start point" to distribution center was cited as being an important determinant in choosing a site. The following distance recommendation should be viewed as a starting basis for site selection. It should be recognized that fully appropriate sites may exist in locations just outside of the criteria range stated and should be carefully evaluated as well. *Value-added distribution centers should optimally be within a radius of 6-10 miles of a cargo "start point". Note that this criteria takes into account highway drive time.*

[1] Henry Bath, Inc. dba Shipmates Warehouse.
[2] Nippon Express USA, Inc.

5.3.3 Lot Size

Distribution center size varies considerably by activity and size of customers' accounts. The study team determined the optimal size of a typical center "unit"– a least common denominator that can be replicated as needed by the operator. *The dimensions of the unit are 480 feet x 300 feet, resulting in a minimum lot size of 3.3 acres. This site size was determined to be the minimum required to accommodate a 100 ft by 400 ft warehouse space, a truck turnaround area of 185 ft by 400 ft in the front, 40 ft clearance on either side, and a 20 ft corridor behind the building.*

5.3.4 Lot Characteristics

It should be noted that potential sites with derelict or inadequate buildings will have higher development costs than building-free sites. The cleanup and preparation costs for different sites will certainly affect their rankings so must be taken into account when selecting the most suitable locations.

6 SHIFT DYNAMICS AND CARGO FORECAST, 2000 - 2040

Given the importance of the specific distribution functions described in the previous sections, what scenario provides for their ultimate shift to the East Coast and what volume of Asian containerized cargo throughput could be generated by 2040 as a result? Also, assuming the throughput to land area ratio that currently exists for these functions holds steady, what land demand could then be predicted for the NJTPA market area?

6.1 SHIFT TO PONYNJ FROM WEST COAST PORTS

The PANYNJ has published in its recent master plan report[1] an in-depth analysis of the economics that control the allocation of Asia cargo via liner container shipping to the U.S. ports of the Atlantic Coast and the Pacific Coast. As previously noted, currently the lion s share of containerized cargo moves via West Coast ports and then by stack train to the PONYNJ region.

Figure 6-1: Market Impact of Container Ship Size

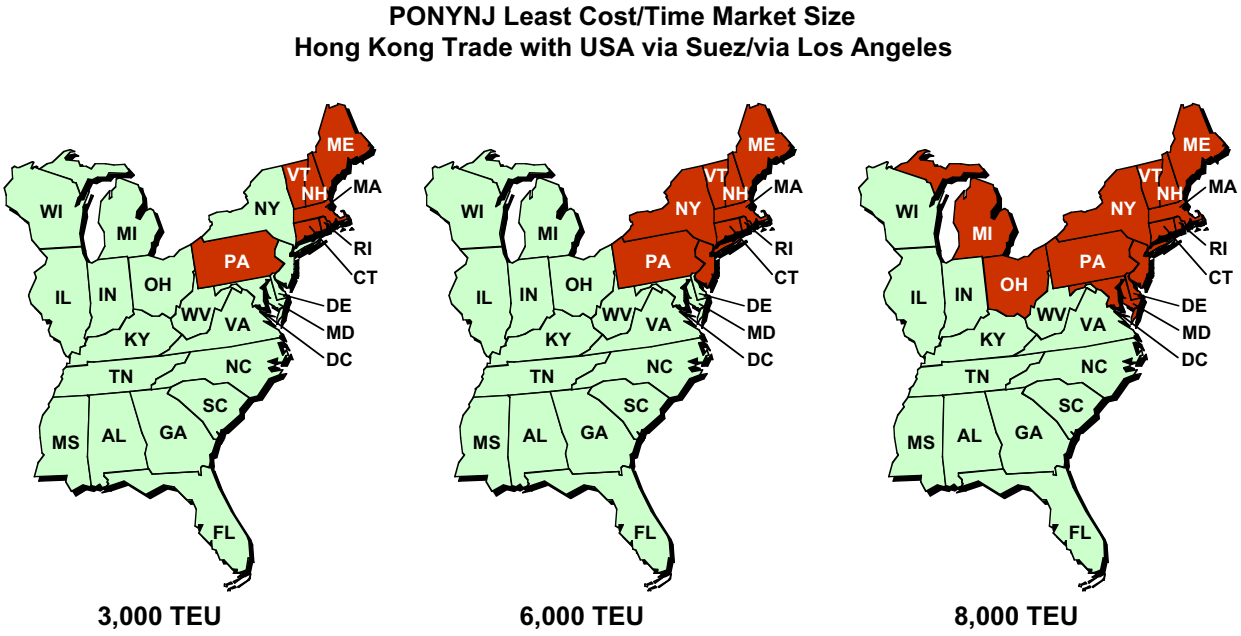


Figure 6—1 provides an instructive overview of the results of this analysis. The figure relates the size of the direct market served by the PONYNJ to the size of ship used for direct vessel service

[1] The Port Authority of NY & NJ, *Port Development and Investment Planning Report,* Vol. 1, The Market, January 1999.

to the Port via the Suez Canal instead of via the trans-Pacific route to West Coast ports and stack train. The assumptions used for preference of the trans-Suez route are 1) the door-to-door costs via the Suez Route are $500 per TEU less expensive than similar service costs via the trans-Pacific, and 2) the time differential cost of PONYNJ over POLB/LA does not exceed a threshold of three days. With this in mind, note that using a ship of 3,000 TEU capacity (the current average size), the PONYNJ is least cost for states directly to the north and only Pennsylvania to the south and not for any other states. In this case, the PONYNJ does not even win its own two states of New York or New Jersey.

Taking advantage of economies of scale incorporated in larger ship capacity, the PONYNJ market area served at least cost by a 6,000 TEU ship increases as shown. It is well to keep in mind that currently 16% of the world s fleet capacity is carried in ships of this size or greater and that 40% of all ships on order exceed this size. With assumptions remaining equal, here the market has grown to include the market roughly corresponding to a 400-mile radius around the Port (13 states).

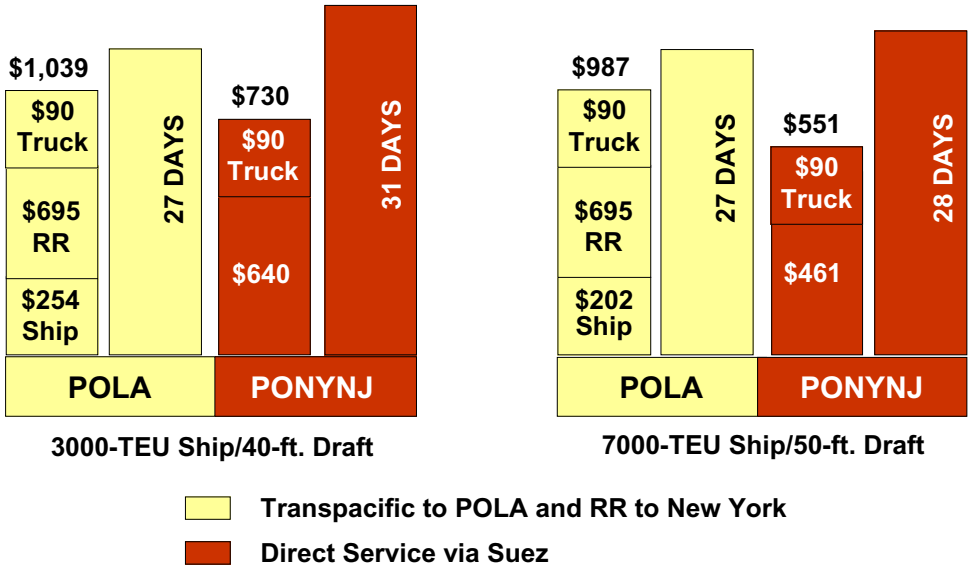
An even larger expansion of the market area results from an increase in the capacity of ship to 8,000 TEUs. Currently there are no ships on order of this size, but it is highly likely that by 2002 at least 10 of this capacity will have entered the construction cycle. Using current technology, and holding a channel depth of 50.0 ft constant, the maximum sized ship could be expected to range from 13,000 to 18,000 TEUs.

As ship size increases, the economies of shipping Asian cargo directly to PONYNJ via the Suez Canal also increase. As noted in the PANYNJ master plan report, this does not include trade with Northern China, Korea or Japan. It does, however, include trade with the golden triangle served by the ports of Shanghai (Yangtze River Valley), Hong Kong, and Kaohsuing as well as trade via the Port of Singapore and its tributary ports.

A graphical comparison of the cost impact of larger sized container ships is provided with Figure 6—2. The charts compare the costs via the PONYNJ by means of the Suez Canal route and via the Port of Los Angeles using the trans-Pacific route and stack train for two different sizes of ship; 3,000 TEUs and 7,000 TEUs. The cost components include the ship (based on total fleet systems cost), truck (to a location within a 75-mile radius) and the additional cost of stack train transcontinental service for the POLA option. The duration of service is also shown. The comparative costs for the 3,000 TEU service shown indicates a 30% savings for PONYNJ, however, as previously noted, because of time lost enroute this savings is insufficient to cause a

shift of cargo routing in favor of the trans-Suez route direct to the PONYNJ. On the other hand, the deployment of a 7,000 TEU ship greatly improves the situation with concomitant economies of scale and the cost differential increases to 56%. This is considered more than sufficient to shift the cargo route direct to the PONYNJ via the Suez Canal for containerized cargo from Shanghai southward.

Figure 6-2: Comparison Cost Impact of Large Container Ships, Hong Kong to New York



It should be kept in mind, however, that transport service and time reductions are not the only factors that must be realized to make feasible this shift. In addition, the other key factor is the provision of value-added distribution services to support the cargo in the immediate PONYNJ region, such as is provided by the facilities already existent in the vicinity of the San Pedro Bay ports.

7,000 TEU ships require a channel depth of 50 feet to provide fully loaded service. According to the schedule established by the PANYNJ and the USCOE, all PONYNJ channels will dredged to this depth by 2010. Based on the assumption that this date can be held, it is expected that the shift to direct routing via the Suez will take place around this date. Based on past experience, once the dredging procedures commence around 2005, adjustments to ship rerouting will begin initially with a degree of light-loading on the Europe (Algeciras) to U.S. Atlantic (PONYNJ) leg. Section 6.2.4 will discuss the special characteristics of the future Suez route that make it specially suited to the big ship s role as a wareship for the new value-added pendulum service linking U.S. West Coast ports in one continuous service to U.S. Atlantic ports on the East Coast.

6.2 TRADE DISTRIBUTION DYNAMICS

6.2.1 Location of Value-Added Services and the Global Flow of Containerized Trade

Companies operating in the global market are re-engineering core and partnered activities in a manner designed to minimize the time and space consumed by the distribution of components. All evidence indicates that for these companies, the optimum transfer point between the ISO container and the mode used for extended inland distribution to retail outlets or to the consumer is at the first landfall of the container, i.e., at the first port of call of the liner service. For a global distribution system, optimally this transfer point would constitute the sole node between the foreign origin and the final retail store or consumer. In the best case, this node would be at a global maritime hub that receives multiple, competitively priced and regularly scheduled mega-wareship calls per day from all key global production/distribution points. Reasons cited for this are:

- Economies of time: once transferred from the wareship and following whatever value-added manipulation is called for, the goods can be immediately transferred to the fastest land mode for domestic distribution;
- Economies of space: once off the ship, transfer can be made to larger (volume or weight) domestic carriage;
- Economies of consolidation: the hub is the least cost to consolidate components from both international and domestic origins for the purpose of assembly for final and unique demand; and
- Economies of distribution: potential for accumulating larger domestic shipment sizes to multiple destinations.

6.2.2 Growing Importance of Local Distribution

Along with the benefits realized by utilizing the first port of call as the only distribution node for the market, another driving factor is the need to maximize the local share of the total volume of goods distributed. Economies related to small and time-fixed package delivery, particularly as a result of direct household Internet fulfillment, should be maximized along with hub-port related economies of locating the facility as close to the marine terminal as possible. Shipments of consumer items are to be moved directly from the port-side center to retail outlets or directly to homes via shippers such as UPS and its competitors. To maximize time efficiency and costs, the hub port should also be in or near the market s largest single consumption center.

Logically then, the San Pedro Bay ports area is an extremely attractive location for this type of activity on the West Coast since a major share of the total distributed volume is located within, say, 75 to 100 miles. Concerning value-added warehousing of goods destined for other markets such as the NJTPA region, the Los Angeles area will continue to retain this market share as long as direct and cost effective marine service directly to the PONYNJ is not available. Once an alternative becomes available, as is the case commencing in 2005, then a shift of value-added activities to the NJTPA area is anticipated to proceed along with the shift in container routing.

6.2.3 Value-Added Distribution Activities and Commodity Differentiation

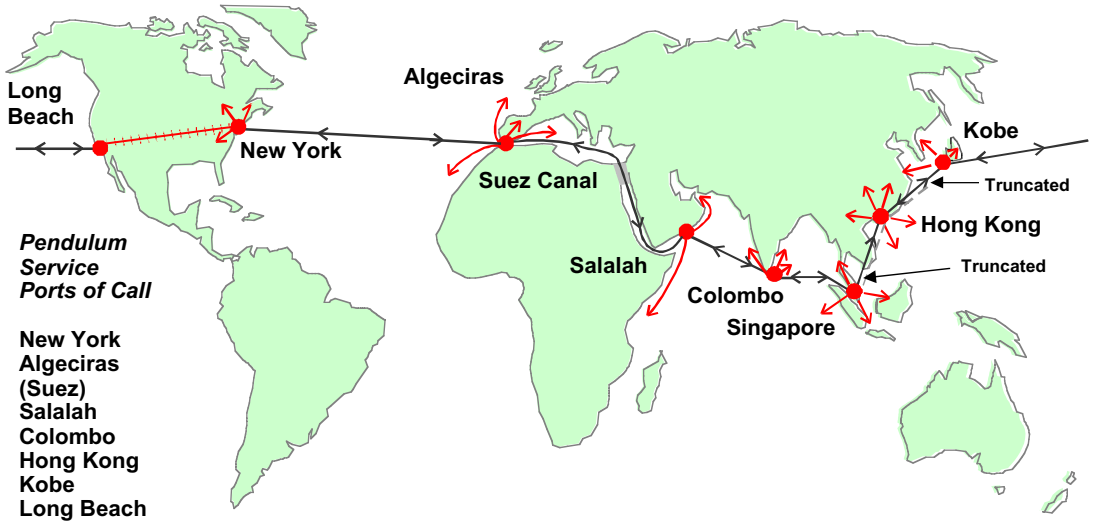
Statistically speaking, there appears to be a relationship between the value of a commodity and whether or not it will enter into a distribution system including value-added processes performed at a center in the vicinity of the port. However, discussions with companies have found that the value relationship is neither direct nor predictable. The actual process that takes place is intended to differentiate the commodity a final time prior to coming to rest in the consumer s hand. The easier the component or commodity can move in volume without differentiation close to the point of consumption, the better. It is this characteristic, best described as the state of art of distribution within a complex global distribution system, that defines what and where value can be added, not necessarily the value of the commodity itself. The inference of this, and the expectation of the industry, is that over time the value threshold will lower as more and more companies learn how to take advantage of JIT distribution economies. This is described as a complex process impacting on how we produce, how we price, with whom we partner, how and where we differentiate, and, most importantly, how and where we consume, a process which relentlessly advances .

6.2.4 Can a More Time Consuming Route Be More Effective?

In the face of higher costs, limited capacity, and poor intermodal service to the East Coast, increasingly containerized cargoes are being left onboard ship at Los Angeles/Long Beach and transported around Panama to the East Coast via a water route. How is this explained when the San Pedro Bay ports are the first ports of call in the U.S.? According to some of the carriers involved in this new trend, this routing is the product of owners being increasingly aware of what can be differentiated enroute and what cannot. They explain that if service levels continue to decline, especially on the intermodal rail system, cargo dropped in San Pedro will be done so either to enter the value-added process or because it is of extremely high value. Commodities shipped via Panama will tend not only to be lower in value but, more to the point, can remain in their current state of differentiation until change in ownership.

It is critical to stress that for the all water route via Panama, the Ports of San Pedro Bay are still the first ports of call in the U.S. The Suez Canal route directly to the East Coast makes the PONYNJ the first port of call in the U.S. Figure 6—3 illustrates the Pendulum Service most frequently cited by ship owners as the optimum trade route for realizing economies of scale owing to large ship size. Note the role of the Suez Canal route in completion of the Pendulum Service, whose full-circle is completed by the stack-train link overland between San Pedro and New York via Chicago. The full realization of this service awaits the provision of sufficient channel draft, especially in the PONYNJ. As noted, this will take place in a phased manner between 2005 and 2010.

Figure 6-3: Pendulum Service via Suez Canal



What is stressed by companies and carriers interviewed is that this Pendulum Service provides a single ship global service to the major production and consumption centers of the world. The mega-wareship can carry volumes of containers point-to-point from Hong Kong or Singapore to Algeciras or PONYNJ, while at the same time turning over volumes at points along the way strategically located to serve Southeast Asia, the India Sub-Continent, the Middle East, and the Mediterranean. Not only can space on board be turned over more often, but global companies can use this series of strategic locations as their production, differentiation, and distribution to consumption network. The economies and logistics options presented by the Pendulum Service are sufficient to overcome the current time advantage enjoyed by the trans-Pacific Route. Unfortunately, the PONYNJ cannot currently handle the large ship, so the role of the Ports of Long Beach and Los Angeles remains unchallenged. The Panama route may dent the relative

increase of mini-bridge traffic because it is an alternative to the stack train, however it does not diminish San Pedro s monopoly over value-added traffic.

6.2.5 Summary of Port-Related Distribution Dynamics

The dynamics of value-added distribution can be summarized as follows:

- Value will be added and products differentiated at the first port of call;
- Until the Suez extension of the Pendulum Service is realized, the Ports of Long Beach and Los Angeles will maintain their status as the first port of call for Asian produced imports to the United States;
- Meanwhile the division of container traffic coming off the ship that is moved on to stack train and the share going directly into distribution will shift. On the relative incline will be that going to distribution.
- Because of the pressure of inland distribution timing, tremendous pressure will be built over time in favor of the Suez Route, given that two conditions are fulfilled:
  1) PONYNJ channels are deepened to 50.0 feet as planned; and
  2) Space for the location of distribution centers is made available at competitive prices in close proximity to the port.

6.3 CARGO FORECAST

Moffatt & Nichol has performed a cargo forecast to estimate the demand for development of modern distribution centers to service the 17-state market region constituting the area of demand served by the NJTPA supply area. The forecast has a planning horizon of forty years and evaluates the potential economic benefits of shifting Asian containerized imports from the West Coast to direct service to the PONYNJ via the Suez Canal route. Direct costs of shipping cargo from the point of foreign origin to end destination zip code (including shipping, stacktrain, trucking and time delay costs) have been calculated for every zip code in the 17-state market region. By determining the point in time at which shipping directly to the PONYNJ is more cost effective than via the West Coast and stacktrain route, the pattern of forecasted shift was established.

Figures 6—4 and 6—5 present graphical representations of the distribution of containerized trade to the 17-state market region by 5-digit zip code for 1999 and as forecasted for 2020.

Figure 6—4:

Figure 6—5:

Table 6—1 summarizes the forecast from 1999 through 2040, differentiating between trade to/from:

- PONYNJ;
- Other North Atlantic Ports;
- West Coast Ports using landbridge to directly transport ocean cargo to East Coast;
- Cargo that requires warehousing; both in facilities on the West Coast prior to transport to East Coast as is currently the case, as well as the similar centers that are anticipated to develop in the NJTPA region; and
- Canadian Ports

Table 6-1: Forecast of Containerized Trade for the 17-State Market Region, 1999 to 2040

Trade Distribution	Year					
	1999	2000	2010	2020	2030	2040
	TEUs	TEUs	TEUs	TEUs	TEUs	TEUs
PONYNJ						
Exports	855,167	883,388	1,401,427	2,240,176	3,257,275	4,758,398
Imports	1,106,716	1,143,238	1,733,570	2,636,263	3,775,785	5,408,264
Total	1,961,883	2,026,625	3,134,996	4,876,439	7,033,060	10,166,661
PONYNJ (Warehouse Shift)						
Exports	-	-	-	-	-	-
Imports	-	-	80,089	262,864	439,623	749,826
Total	-	-	80,089	262,864	439,623	749,826
West Coast Ports (Warehoused)						
Exports	-	-	-	-	-	-
Imports	588,434	620,623	968,623	1,501,857	2,525,395	4,228,594
Total	588,434	620,623	968,623	1,501,857	2,525,395	4,228,594
West Coast Ports (Direct)						
Exports	802,726	836,404	1,152,493	1,571,454	2,315,852	3,380,458
Imports	1,337,876	1,394,007	1,920,822	2,619,090	3,859,754	5,634,097
Total	2,140,602	2,230,411	3,073,316	4,190,545	6,175,606	9,014,555
Other North Atlantic Ports						
Exports	609,786	638,102	990,013	1,525,160	2,346,373	3,605,251
Imports	825,752	864,096	1,340,643	2,065,320	3,177,380	4,882,110
Total	1,435,538	1,502,198	2,330,656	3,590,480	5,523,753	8,487,361
Canadian Ports						
Exports	322,873	338,063	526,476	813,270	1,254,283	1,931,622
Imports	452,182	473,456	737,327	1,138,980	1,756,616	2,705,226
Total	775,055	811,519	1,263,804	1,952,250	3,010,899	4,636,849
All Ports						
Exports	2,590,552	2,695,956	4,070,410	6,150,060	9,173,784	13,675,730
Imports	4,310,960	4,495,419	6,781,074	10,224,375	15,534,554	23,608,117
Total	6,901,512	7,191,375	10,851,484	16,374,435	24,708,337	37,283,846

Note: 1) Figures for 1999 represent actual cargo, while 2000-2040 figures reflect forecasted cargo at a growth rate of 4.28% CAGR.
Source: Moffatt & Nichol Engineers, based on adjusted PIERS and other data

The graphical pattern of forecasted growth of the various points of delivery is provided as Figure 6—6. Note the PONYNJ warehouse category, which illustrates the rate at which the shifted demand is projected to grow for distribution centers in the NJTPA region.

Figure 6—6: PONYNJ 17-State Market Area Trade Forecast, 2000-2040

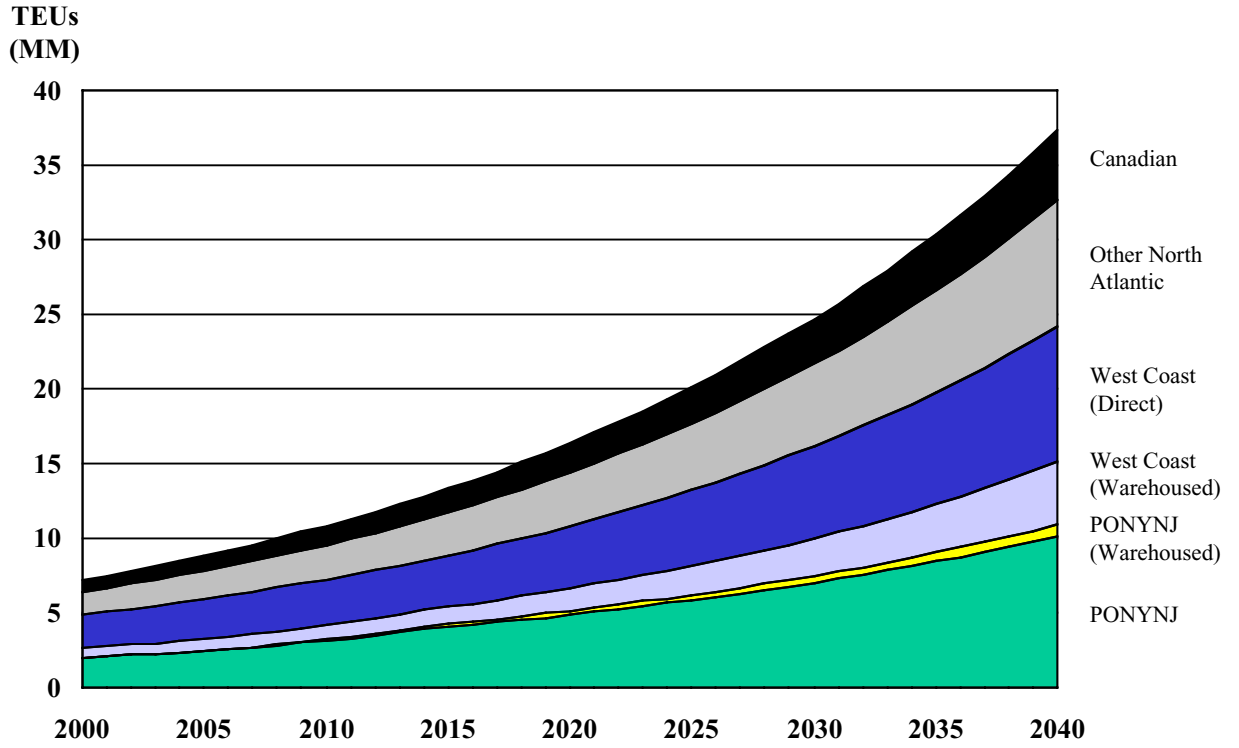


Table 6—2 presents a summary of the forecast of potential requirements for distribution center facilities in the NJTPA region based on the anticipated shift in traffic patterns. The table provides figures for cargo requiring warehousing, i.e., after passing customs, undergoing value added services of the type currently being performed on the West Coast. Over the 40-year period shown, the share being warehoused in the NJTPA region is expected to increase gradually as the dredging program commences around 2005, then more rapidly as the market shift takes effect over time as a result of economies of scale related to larger vessels accessible to the PONYNJ after dredging. It should also be noted that while the region will benefit most from the diverted Asian trade if the planned dredging occurs, a potential future for the value-added warehousing industry discussed herein still exists if the PONYNJ s access channels are not dredged.

Table 6—2: PONYNJ Market Area Trade Forecast, 2000 to 2040

	Int l Containerized Cargo Requiring Warehousing		NJTPA Region Forecasted Quantities				
Year	West Coast (TEUs)	NJTPA (TEUs)	Associated Domestic Cargo	Total TEUs	Facilities	Acres	Employment
1999	588,434	--	--	--	--	--	--
2005	799,215	8,770	5,847	14,616	2 to 5	7 to 16	44 to 107
2010	968,623	80,089	53,393	133,482	22 to 44	73 to 147	484 to 979
2015	1,161,675	199,351	132,901	332,252	55 to 111	182 to 365	1,210 to 2,437
2020	1,501,857	262,864	175,243	438,107	73 to 146	241 to 482	1,606 to 3,213
2030	2,525,395	439,623	293,082	732,706	122 to 244	403 to 806	2,684 to 5,373
2040	4,228,594	749,826	499,884	1,249,710	208 to 417	687 to 1,375	4,576 to 9,165

Note that the forecasted quantities potentially requiring value-added warehousing in the NJTPA region include associated domestic cargo in a ratio of 60% international to 40% domestic. Performance of value-added activity on international cargo is quite likely to result in drawing associated domestic cargo that is required in the product transformation process. Many of the companies (e.g., Wal-Mart) that will require value-added services may also participate in a Buy American program that calls for the usage of a specified percentage domestically produced products. For the purposes of this analysis, an average domestic percentage of 40% was taken into account to address these considerations.

Yearly estimates of the acreage and employment requirements, provided 100% of the potential shift to the NJTPA region is actually captured, are tabulated as well. For the purposes of estimating the number of facilities and potential employment created as a result, a range has been provided. The low end of this range assumes a typical distribution center of 40,000 sf, with 22 employees, a throughput of 6,000 TEU/yr, and a ratio of 3.3 acres per facility to allow for adequate site space as discussed in Section 5.3. This resulted in a throughput ratio of 1,818 TEUs/acre. The provided range allows for the potential of a throughput ratio up to 50% lower, or 909 TEUs/acre.

6.3.1 Air Cargo Growth Rate

Table 6—3: Airport Revenue Freight (Short Tons)

Year	JFK	EWR	Region
1994	1,499,121	872,699	2,412,195
1995	1,637,677	958,419	2,626,580
1996	1,667,550	975,906	2,671,146
1997	1,701,841	1,068,594	2,797,087
1998	1,620,541	1,086,462	2,730,841

Air cargo movement is also on the rise is almost all U.S. market sectors. Forecasts predict a rise of over 6% for all North American market sectors from 1998-2018.[2] Table 6—3 provides annual revenue freight data as reported by the PANYNJ for the two largest air cargo airports serving the NJTPA region. The annual growth rate of air cargo at Newark Airport has been 9.8%, 1.8%, 9.5% and 1.7% for the last four reported years, respectively. It is extremely difficult to forecast the growth rate of air cargo to this region s airports based on the limited information available. This study s focus is on the containerized trade that constitutes 96% of international trade by weight, rather than the relatively small international component that is delivered by air. For general discussion purposes of this study, a general growth rate of 4.2% (equivalent to the region s general growth rate) may suffice for air cargo growth in lieu of a more accurate projection.

While not the principle focus of this study, the role of air cargo in creating jobs for skilled workers should be noted. Air cargo is typically higher priority, higher value items than ocean cargo and commonly does not require much product manipulation. However, a specialized industry does exist to handle and service air cargo and is a complement to the value-added activities addressed herein. As previously noted, future growth prospects are far less predictible and is frequently episodic in nature.

[2] *Journal of Commerce*, February 10, 2000.

7 GLOSSARY OF TERMS

17-State Market Region: The area of demand conceptually corresponding to the NJTPA supply area. Made up of two sub-areas, the 13-State and the 4-State Extended Market Regions, the area absorbs 50% of all the containerized import and export flows that pass through the PONYNJ.

> ***13-State Market Region***: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont and Virginia
>
> ***4-State Extended Market Region***: Illinois, Indiana, Michigan, Ohio

3PL – Third-Party Logistics Provider: Independent company providing logistics-related services. Different types include brokers, forwarders, intermodal marketing companies, freight bill payment firms, carriers, or various combinations of these. The range of services provided is limited only by the agreements with clients. For the purposes of this study, 3PLs specifically refer to those specializing in the warehousing and distribution segment of the market.

Analogous Region: The San Pedro Bay region surrounding the Ports of Los Angeles and Long Beach containing a flourishing distribution center industry that serves as a model for potential development of the Northern New Jersey area.

Barcoding: Application of a barcode, a machine-readable symbol used to encode information in order to automate business processes such as retail sales, shipping and tracking, inventory management, asset tracking and automated data entry. Standardized barcoding symbologies have been developed for most business processes. For example, the retail industry uses UPC (Uniform Product Code) symbols to process all goods in a retail store.

B2B – Business-to-Business ECommerce: The electronic exchange of information on the Internet between two or more businesses that, directly or indirectly, results in a transaction. Typical B2B web activity includes company web sites, product supply and procurement exchanges, specialized or vertical industry portals, information sites and brokering sites.

B2C – Business-to-Consumer ECommerce: The electronic exchange of information between a business and a retail end consumer that results in a transaction. Represents the retail part of eCommerce on the Internet.

Big-Box Retailer: Large-scale retailers, often chain stores, sometimes defined as 25,000 sq ft or larger in size. Among the most well-known examples of this class of retail outlet are Wal-Mart and Home Depot.

Brownfields: Defined by the U.S. EPA as "abandoned, idled or under-used industrial or commercial facilities where expansion or redevelopment is complicated by real or perceived

environmental contamination that can make redevelopment of the property financially or logistically prohibitive."

COFC – Container-on-Flatcar: A variation of TOFC, in which an international or domestic shipping container (but not the chassis unit) is lifted on and off a standard 90-foot flatcar. COFC is also in wide use throughout the United States.

Cross-Docking: Warehouse operation in which cargo comes in on one side of the building and is loaded and trucked out on the other side. Cross-dock operations typically call for long, narrow buildings of 100 ft width, with many loading docks running along both long sides of the warehouse.

Drayage: A service offered by a motor carrier for the cartage of rail or ocean containers from a dock to an intermediate or final destination, or the charge for such cartage.

Drop-shipping: The practice of outsourcing the picking, packing and shipping of items directly to consumers. Distribution centers commonly place the retailers' names and logos on the packaging as well, so that the consumer in most cases is not aware that a 3PL has been involved in the process.

ECommerce: Buying and trading of goods and services through the Internet.

Economy of Scale: Economic rule that states that relative savings are realized when the size of a vessel, plant, enterprise, etc., is increased. For example, lower production cost of an automobile due to production of a large number of cars of the same type is due to economy of scale.

EDI – Electronic Data Interchange: A standard format for exchanging business data electronically. An EDI message contains a string of data elements, each of which represents a singular fact, such as a price, product model number, and so forth, separated by delimiters. The entire string is called a data segment. One or more data segments framed by a header and trailer form a transaction set, which is the EDI unit of transmission (equivalent to a message). A transaction set often consists of what would usually be contained in a typical business document or form. The parties who exchange EDI transmissions are referred to as trading partners.

Heavy Containers: Containers which, together with chassis, weigh more than the current 80,000 lb gross vehicle highway weight limit.

Intermodal Transport: The coordinated passage of goods by way of two or more primary modes of transport (sea, air, rail, road) from origin to destination, as defined by the shipper and consignee.

Just-in-Time: Logistics philosophy calling for receiving products at each step of the distribution process "just in time" to be used in the next step. Has revolutionized inventory and distribution practices to result in a greatly increased rate of movement of product and an associated decrease in required storage space at every step in the process.

Kitting: A specialized logistics process in which a specified number of components are put together in a sequenced manner into pre-packaged kits from bulk inventory. Most commonly performed on items that are shipped in bulk but sold individually, such as with electronics parts.

Landbridge: The movement of Asian cargo to the East Coast by land originating from West Coast ports. Developed as an alternative to an all-water route direct to the East Coast from Asia. See stack trains below.

Pick and Pack: Logistics process in which inventoried items are picked from the shelves of a warehouse/distribution facility, checked for accuracy, then packed for delivery to a customer.

PUD – Planned Unit Development: Masterplanned facilities providing space for a number of individual tenants sharing roads, maintenance services and manicured surroundings.

SKU – Stockkeeping Unit: An identification, usually alphanumeric, of a particular product that allows it to be tracked for inventory purposes. Typically, an SKU (pronounced with the individual letter or as "skyew") is associated with any purchaseable item in a store or catalog. For example, a woman's blouse of a particular style and size might have an SKU of "3726-8," meaning "Style 3726, Size 8." The SKU identification for a product may or may not be made visible to a customer.

Stack-train: Doublestack trains (DST) have the ability to carry two stacked containers on each platform, thereby providing a cost-effective means for transporting cargo. Doublestack trains are composed of "well cars" generally between 90 feet (handling up to two 45-foot containers over two 40-foot containers) and 300 feet (handling up to five 40-foot containers over five 45-foot containers). Doublestack trains were originally developed by American President Lines as an efficient "land bridge" from West Coast ports to East Coast markets and an alternative to the all-water route to the East Coast from Asia. Doublestack trains are now extensively used to move maritime containers, as well as domestic containers (which have thinner walls and higher cubes than maritime containers) within high-volume corridors. Outside of the highest volume corridors, trains sometimes mix DST cars with COFC and TOFC cars. There is no doublestack access east of the Hudson.

Supply Area: The area roughly corresponding to the NJTPA region that may serve as the region to which skilled services and brownfield land use resources are to be supplied to add value to international trade flows to and from a larger 17-state market.

Tandem Trucking: Combination of a tractor and two semitrailers connected in tandem by a converter dolly. It should be noted that tandem trucking is not permitted in most of the states in the PONYNJ market area.

TOFC – Trailer-on-Flatcar: The oldest form of rail intermodal service. Originally, trailers were rolled onto trains using a ramp. Although the use of ramps has been discontinued, intermodal rail transfer facilities are sometimes still referred to as "ramps". With the TOFC, the truck chassis and its cargo van (which can be an international shipping container on a detachable

chassis, a domestic shipping container on a detachable chassis, or an attached trailer/van assembly) are typically lifted on and off of standard 90-foot flatcars using top picks or rubber-tired gantry cranes. The terms "piggy back" or, more succinctly, "pig" service are often used to describe the movement of attached trailer. TOFC service is extremely flexible and is in wide use throughout the United States for domestic and international traffic.

TEU – Twenty-foot equivalent unit: Standardized unit for measuring container capacity on ships, railcars, etc.

Transloading: Processing of contents of containers in and out of a warehouse/distribution facility within 24 to 48 hours.

Triple Net Lease: Lease in which the tenant pays all ongoing operating expenses, including property taxes, utilities, insurance premiums, maintenance and repairs.

Value-Added Services: Activities performed to increase the potential resale value of the commodity being handled. Sample activities include barcoding, kitting, product manipulation, pick and pack and assembly of marketing materials.

Photo A-1.
Last of the Traditional Storage Warehouses in the Ports of Los Angeles and Long Beach region. Has survived because of its niche position storing unclaimed cargo that has not yet passed through customs.

Photo A-2.
Just-in-time Distribution Center System – Automated overhead conveyor belt system facilitates cross-dock transloading operation while leaving much of main floor free for performance of value-added services.

MOFFATT & NIC
ENGINEE

Photos A-3 through A-5.
Retail Distribution Center System - Value-added services provided commence with the unpacking of a shipment of adapters that will then be kitted together with seven different components shipped from other countries. An assembly line process facilitates the packaging operation in which the items are packed in custom designed heat sealed plastic packaging along with a cardboard backing sheet. Finished packages (shown below on far right of photo) are then shipped directly to retail outlets.

Photos A-6 through A-8.
Consumer Distribution Center System: Stock is taken from inventory, a pick and pack process measures out the quantity ordered and the shipment is packed for UPS delivery to the consumer's home.

MOFFATT & NIC
ENGINEE

Photos B-1 through B-4.
Well manicured surroundings, such as these at the Watson Industrial Center South in the San Pedro Bay, CA region, provide all the amenities that the new breed of distribution centers require.

MOFFATT & NIC
ENGINEE

1 ALABAMA

Birmingham was awarded a $200,000 grant from EPA in 1995, as part of the EPA's Brownfields Initiative Grant. They targeted a 900-acre area, which was 40% vacant. They collaborated with the city's North Birmingham Industrial Redevelopment Project. By the project completion, they expect to have created 2 million square feet of commercial and industrial space, and 2000 jobs. The city created the Birmingham Environmental Clearinghouse, a database on brownfields in the area. Potential developers use the database as a one-stop shopping resource. The project's momentum increased property values in the project area. The North Birmingham Economic Revitalization Corporation (NBERC) works with investors to identify properties. The NBERC bought the 25-acre Sloss-Sheffield Steel and Iron Co. for $500,000.

2 CALIFORNIA

2.1 EAST PALO ALTO - BROWNFIELDS SHOWCASE COMMUNITY

EPA awarded East Palo Alto $125,000 as part of the Brownfields Pilot in May 1997. East Palo Alto created a Brownfields Environmental Job Training Program, where 17 students took a course in hazardous material operations and removal. Many took permanent jobs with companies in the area.

The Ravenswood industrial area erroneously thought the cleanup cost for their site would be on the order of $30 million. That number came from a 1990 master plan financial analysis by a consultant and was a worst-case scenario. The EPA studied the contaminated area in more depth, and determined the cleanup cost to be more on the order of $2 to $5 million. Contamination comes from pesticide factory, electric plating shop and auto wrecking yards.

Other areas in the showcase community include:

- Gateway 101, which will become a large retail center
- University Circle, for which a hotel conference center is planned

2.2 EMERYVILLE

Emeryville received $200,000 grant from EPA for Brownfields Initiative. They're targeting 10 sites (180 acres) for cleanup and redevelopment. The city and Catellus Development Corp. plan to build 200 units of residential housing on an abandoned 4 acres of railroad site.

The town used their $200,000 grant to develop a GIS database, categorizing over 500 sites in the City. "One-stop Shop" to potential purchasers and developers.

Much development is new construction. Many older warehouses are being rehabilitated for offices.

- 4 million sf new office space is planned,
- 830,000 sf new retail space is planned
- 488 new hotel rooms are planned
- 8400 new jobs are planned in next 20 years.
- 561 housing units
- $540 million total project cost
- $5.4 million in potential property taxes

The Chiron Corporation plans 12 buildings, and 2.2 million sf by 2018.

The Emeryville project has leveraged $644 million in private investment, and $6.3 million in public sector funding.

2.3 SACRAMENTO, CA

Sacramento received a $200,000 grant from EPA from their "Brownfields Pilot Initiative". They also received $350,000 from EPA Brownfields Cleanup Revolving Loan Fund (BCRLF) grant in 1997.

Two old railway properties are a focus of Sacramento's pilot initiative. The state is to oversee the initial cleanup. The City will oversee cleanup during redevelopment of distressed property. Planned developments include:

- 10 million sf office space
- 2700 units mid- to high-rise apartments
- 28 acres of parkland
- A new federal courthouse was constructed. While being developed, there were several contamination issues – the City responded with "Pilot Environmental Oversight Program"
- A community center, school and intermodal facility for light rail, Amtrak, and buses are all planned. At completion there will be 40 permanent jobs.

The above inspired Union Pacific to redevelop a 66-acre site. They will transform abandoned railway into retail, residential and multi-use properties.

3 COLORADO

3.1 DENVER

A former wastewater treatment plant is being developed into a $7 million armory for Colorado National Guard. 10 acres of this 52-acre site will eventually become a home to a new recreational park, an industrial park and a wildlife refuge. National Guard was interested in the former Northside Treatment Plant, but potential cleanup costs scared them off. EPA awarded Denver a $200,000 Brownfields Pilot grant. City spent $20,000 for NTP site assessments, and funded a cleanup that was completed in Fall 1997. Brownfields Pilot used $35,000 to hire Denver Planning Office to propose future uses for property. Total investment of site has reached $1.3 million. New industrial park and 400 anticipated jobs are planned.

4 CONNECTICUT

4.1 STAMFORD

Stamford Harbor Redevelopment Project, seeks to restore the 250-acre harbor area to a major economic and recreational resource. Targeted sites have been idle or underutilized for 30 years. They include: the 40-acre Northeast Utilities property a former manufactured gas plant contaminated by coal tar, PCB's, lead cyanide, asbestos and other by-products of the gas manufacturing process; the 17-acre site of a former fuel oil depot, for which a new residential complex is now planned; and the 22-acre Yale & Towne site, a former manufacturing complex and foundry now slated for housing and industrial space.

Current owner financed Northeast Utilities property, at $700k. They plan to develop a high-speed $3 million ferry terminal. Also planned are an $80 million sports and entertainment facility (25 permanent full-time jobs, 200 permanent part-time jobs), and a $90 million development including 150,000 sf office building, 250 housing units and 500 car parking facility (475 permanent jobs).

The fuel oil depot site will be studied to determine proper cleanup program. The site recently sold to an investment management company. The seller, an energy company, will pay for

cleanup costs. They plan a $50 million, 390,000 sf mixed-use development (200 permanent jobs).

500 units of housing, 100,000 sf retail space, and 200,000 sf industrial space are planned for the Y&T site. Investment is estimated at $150 million.

Stamford received a US Department of Housing and Urban Development (HUD) grant of $26.4 million, plus a $6.4 million demolition grant, which will leverage $35 million in private and municipal funds to convert low-income housing to mixed-income community.

5 FLORIDA

5.1 MIAMI

EPA Section 4 selected Miami for a $100,000 award as Regional Brownfields Pilot. The objective is to redevelop brownfields in Wynwood. Soil contamination is from underground storage tanks, sewer pipes and industrial chemicals. Wynwood's poverty rate is 51%, 62% Hispanic and 32% non-Hispanic black. One 5 to 6 acre site will be selected for Brownfields Pilot.

The City created the Wynwood Brownfields Workgroup to determine how brownfields redevelopment will proceed. They selected a first site for Brownfields Pilot environmental assessment. A City-held $128,000 demolition lien was reduced to 15% of current value to make property more attractive to prospective purchasers. This was a catalyst to development.

The Wynwood Brownfields Workgroup identified a prospective purchaser for a site. They prepared conversion plans, including identification of strategies to overcome obstacles to redevelopment, etc.

5.2 DADE COUNTY

EPA selected Dade County as a Brownfields Pilot and awarded them $200,000. The pilot will focus on Poinciana Industrial Center (PIC), a 30-acre site formerly used for commercial and industrial purposes. The county has a high percentage of minority population, low-income households, and under- and unemployment. Dade County's goal is to develop incentives and procedures to encourage private sector redevelopment. Brownfields redevelopment process will address legal, financial, technical and community involvement issues.

Planned activities include:

- Developing process for redeveloping brownfields
- Creating database of potential brownfields
- Community involvement plan
- Completing the PIC site assessments and remediation plans

6 INDIANA

6.1 INDIANAPOLIS

The City was awarded a $200,000 grant from EPA in 1995 – Brownfields Pilot is transforming a 6.7 acre abandoned concrete block factory (Spickelmier Industries – appraised just after cleanup at $182,500). Environmental assessments yielded evidence of soil contaminated by two underground storage tanks and the presence of asbestos. They cleaned up the site, and then the City awarded the project to 52nd St. Realty, who has committed to investing $2.38 million to develop into 20,000 sf office and light industrial space and self-storage. The site will be worth $2.62 million and will employ 4060 people at self-storage facility and 20,000 sf office space and light industrial complex. It will generate $53,000 in taxes.

6.2 EAST CHICAGO

Northwest Indiana Cities Brownfields Pilot (10 acres). The site, once a victim of illegal dumping, is now home to $5 million automobile shredding facility (10 new jobs). The mounds of garbage just had to be removed, the soil underneath was not contaminated. In 1997 the cleanup was complete and Industrial Scrap purchased the site and commenced plans to expand its metal recycling facility. Industrial Scrap's new automobile shredder became operational in 1998.

6.3 SOUTH BEND

The City was awarded an EPA Brownfields Pilot grant of $200,000. The Pilot targets brownfields in South Gateway, Lincolnway West and Western Avenue commercial corridors. South Bend's population has declined. In 1960, manufacturing jobs accounted for 60% of the workforce, now it's at 20% (1990). The Pilot's objective is to facilitate the revitalization of the three commercial corridors, performing environmental assessments, developing plans for brownfields cleanup, and implementing public outreach strategies.

Activities include:

- Identifying priority list of brownfields for assessment
- Conducting 15 Phase I environmental assessments on brownfields within 3 corridors
- Conducting Phase II environmental assessments as needed
- Implementing public outreach strategy

7 LOUISIANA

7.1 SHREVEPORT

HICA steel foundry and upgrade company was cleaned up for $1.3 million, and is now HICA Steel Castings, LLC. The original HICA facility was successful from 1960 to 1990, when operations started to decline due to market conditions. Poverty rates of 75%, the area was designated an Enterprise Zone. HICA shut down in 1996. Fears of environmental contamination dissuaded potential developers. EPA awarded the City a $200,000 Brownfields Pilot in 1996. HICA paid for the $360,000 cleanup. The City provided $200,000 from US HUD Community Development Block Grant funds to finance HICA's resurrection, and a local bank provided a $620,000 loan. HICA now employs 50-60 people, and will reach 250 within 2-3 years. The City's workforce development unit provides facility with employees through "On the Job Training-Job Training Partnership Act" (OJT-JTPA), which pays half the salary of OJT employees for their first 6 months.

The Pilot is:

- Developing an inventory of City brownfields an criteria for ranking sites
- Conducting Phase I environmental assessments
- Exploring legal, financial, and technological operations for brownfields cleanup, planning and redevelopment
- Educating community about brownfields
- Providing a forum to develop community based strategies for long-term brownfields redevelopment.

8 MARYLAND

8.1 BALTIMORE

Two sites exemplify the broad spectrum of brownfields pilot activities:

South Highland Avenue/Canton Industrial Area is 900,000 sf and contains a series of buildings that have a history of manufacturing and warehousing uses that will continue to be used for these purposes. The owners specialize in real estate, and knew that clients wanted to expand close to the Port area, but couldn't afford higher rents in industrial parks. Construction was almost complete on one building (almost completed factory) – new floors , roofs, lighting, lead-free paint jobs and asphalt pavement. The other building had a new floor constructed. A London-based precious metals company, C. Steinweg, has begun expansion into the area.

The 33-acre site was contaminated with lead, asbestos, PCB's, petroleum, hydrocarbons, and other heavy metals. Some buildings were obsolete and had to be demolished, others were renovated. The final site will employ 180 full time.

Fairfield Ecological Industrial Park (EIP) on South Side of Baltimore. Public outreach has focused on the area as a whole. It is a HUD Empowerment Zone. The 2200-acre site has an industrial and agricultural history. Some sections shipping lines and steel mills. The area suffered urban blight and flight. Only 6 families still live there, and most of the other houses have been uninhabited for over 10 years. New homes will not be built there, due to the industrial nature. They offer incentives for locating in the EIP – companies can use the relocation into the area as a marketing strategy or as an environmental or community benefit by cleaning up and attracting jobs. In next 5 years, they expect 1500-2000 jobs. The site is close to a host of port, rail and highway systems. Tax, loan and asset incentives are being offered to companies if they can adapt to certain environmental guidelines.

9 MASSACHUSETTS

9.1 CHICOPEE

Chicopee is an older manufacturing community of New England. EPA awarded $59,000 grant for Brownfields Assessment Pilot to study former industrial sites (90 known). Used to assess Bay State Wire Company site, two buildings - one housed a wire and metal parts manufacturer, abandoned since 1988. The $310,000 cleanup was funded by Community Development Block

Grant from HUD. The cleaned site has received interest from a manufacturer in the area who wants to expand. They received another $30,000 for environmental assessments from EPA in 1997. Chicopee's Pilot targeted a 3.75 acre former manufacturing site in low-income neighborhood. Fears from perceived contamination scared off potential developers. Benedict Broadcasting purchased the Conway Bedding site for $250,000, and plans a $2.5 million redevelopment project to build a state-of-the-art digital broadcasting station that would create 100 jobs. EPA awarded Chicopee another $111,000 for Bropwnfields Pilot assessments, bringing total funding to $200,000.

10 MICHIGAN

10.1 KALAMAZOO

The former Fisher-Graff industrial site, which was plagued with vandalism, gang activity and illegal dumping. Michigan Department of Environmental Quality, USEPA and City worked to assess the site and test for toxic substances. Results indicated that little cleanup was needed, and the City demolished the facility for $130,000. The Alumilite Corporation has purchased the property from the City for $20,000. It will expand its operations. Alumilite invested $400,000 to build a 10,000 sf building on the site. The facility will produce molded plastics. Eight jobs were retained and they think more will be created.

Kalamazoo received $100,000 Brownfields Grant from EPA, which funded the Kalamazoo Brownfields Redevelopment Initiative. BRI focused on a 3.5 acre site, and were awarded $29,000 by Michigan Department of Environmental Quality to perform Phase I and II environmental assessments. A 3.5-acre site was found to have low levels of heavy metal and hydrocarbon contamination, meaning the site required no remediation under Michigan State Law. The City prepared the property for commercial redevelopment for $89,000. A 1-acre parcel sold to MacKenzie's Bakery for $25,000. The City will use $1250 for job training program for neighboring residents, and the remainder will go toward improving infrastructure of surrounding neighborhood. Tax revenue will be $9-12,000. Site will serve as the center for baking and also a retail outlet.

11 MINNESOTA

11.1 ST. PAUL - BROWNFIELDS SHOWCASE COMMUNITY.

St. Paul has been a leader in brownfields redevelopment since 1980 when PA transformed 200 acre brownfields site into Energy Park, creating over 5000 jobs. The City identified 17 parcels, making up 1000 acres. If developed, the land could yield 13 million sf building space, 13,000 new jobs and $25 million in new tax revenues. They foster job creation and opportunity for local residents by requiring businesses locating there to hire 60% local residents for new positions, and pay minimum wage of $8/hr.

MN passed first brownfields legislation in the nation in 1988. In 1992, they enacted the MN Land Recycling Act, granting liability protection for voluntary parties who cleaned up sites to appropriate levels.

(11/98) St. Paul's Polluted Lands Task Force educates business owners on brownfields and business opportunities. The Lenders Roundtable on Brownfields meets monthly to involve banks and other institutions in brownfields' cleanup and redevelopment.

Activities:

- Redeveloping 100 acres of brownfields properties into business parks
- Creating 10 acre green corridor open space along Mississippi River and 30 acre Crosby Lake Business Park out of former tank farm. Upon completion, 505 new jobs.
- Bus links from Park to St' Pauls' East Side (17% unemployment)
- Securing financing for 30 acre Williams Hill Business Park (Phalen Corridor Initiative). When complete, 325 new jobs and $500,000 in taxes. Phalen Boulevard will be built along abandoned rail lines, 100 acres of previously inaccessible brownfields, and eventually create 1000 jobs for East Side residents.

Total redevelopment and remediation costs for those 1000 acres may range from $44 million to $100 million. Cleanup activities are not funded by an annual funding source. Since land is not available, opportunities for substantial manufacturing growth, expanded tax base and living wage jobs are lost to other locales and states.

12 MISSOURI

12.1 KANSAS CITY, KS AND MO - BROWNFIELDS SHOWCASE COMMUNITY.

Many of the area's brownfields are in Federal Enhanced Enterprise Community (EEC). Poverty rate of EEC is 39% and unemployment rate is 16.6% (11/98). Focus is Central Industrial District (CID), downtown, central business corridor, the central city neighborhoods of Kansas City, MO, the riverside areas of Kansas City, KS and Wyandotte County, and the scattered areas known as the "Industrial Crescent". Kansas City District of the Corps of Engineers has cost-share program to assume 50% of brownfields assessments in brownfields pilot. The cities formed the Kansas City Bi-State Brownfields Initiative (KCBI) and were able to receive an EPA Brownfields Assessment Demonstration Pilot grant.

Brownfields redevelopment program activities:

- Partnering with National Park Service to build riverfront "heritage trail"
- Utilizing HUD grants and secured loans ($14.2 mill) to help redevelop oldest functioning railroad roundhouse turntable in the US into the Westside Business Park – mixed use office, retail, commercial distribution, and educational facilities.
- Converting Union Station into science center, museum, retail and transportation complex.
- Renovating New York Life building into Utilicorp Headquarters
- Cleaning up Prior Bass site, railroad brass bearings foundry
- Preparing Kansas City Structural Steel – a 22-acre lead smelting and steel plant, for development into mixed-use business park.

They are creating a GIS database. The cities will analyze policies that have contributed to brownfields or have hindered their development. The cities are working to prevent sprawl in surrounding greenfields.

13 NEW JERSEY

13.1 NORTHERN NJ

North Bergen is part of an Urban Enterprise Zone (UEZ). UEZ targets metro-NJ areas by creating private sector jobs and private and public investment in these communities. 27 UEZ's in 29 municipalities around NJ.

Started in 1983, the UEZ program has created over 52,000 jobs since its inception, and has inspired $9.4 billion investments by businesses within zones.

Webvan is investing in a 16-acre facility along 91st St., a state-of-the-art distribution center. Webvan liked the convenient location. They will retrofit a building at 2101 91st St. (800 jobs).

13.2 CAMDEN

EPA Regional Assessment Demonstration Pilot in September 1996.

Economically depressed area, 36% unemployment rate, minority population. More than half of all industrial sites in the city are brownfields. The contamination includes chemicals, transformers, and other human health threats. Soil and groundwater contamination is suspected. Reinvestment has been slow, due to real or perceived contamination and potential cleanup costs.

As in most brownfields programs, Camden aims to:

- Establish partnerships for assessments and planning
- One stop shopping
- Make preliminary assessments available to potential developers
- Monitor completion of environmental assessments
- Prioritize Camden's brownfields as to redevelopment potential

In 1998, EPA awarded NJ Youth Corps $200,000 under Brw\ownfields Job Training and Development Pilot Program, to teach 30 young people basic cleanup skills related to brownfields.

Camden's Brownfields Site Reuse Committee wants to develop greenway along the riverfront, in conjunction with State of NJ Green Acres program.

13.3 TRENTON – BROWNFIELDS SHOWCASE COMMUNITY

EPA awarded Trenton a $200,000 grant under Brownfields Initiative in 1995. Once areas of contamination for a vacant, dilapidated property (illegal dumping ground) were defined, a developer purchased 1.5 uncontaminated acres for $12,000. They built a 10,800 sf, $300,000 candle-making facility on the property. Company hopes to add 5 more people. Construction of 2nd building is planned for late 1997. The 9,800 sf building will house fish wholesaling company.

Trenton's poverty rate is over 18%, unemployment rate = 11.8%, African-Americans = 48%, Latinos = 14% (11/98). Trenton's brownfields problems include infant mortality, childhood lead poisoning. Trenton began brownfields strategy after NJ Legislature enacted Industrial Sites Recovery Act (ISRA), which offered flexible cleanup options and financial resources for cleanup. The City has identified over 65 sites on 330 acres.

Trenton has been focusing on 30 of the sites that comprise 100 acres. Private and public investment to date exceeds $16 million, and has resulted in 1000 new jobs.

Trenton's redevelopment program includes:

Cleaning up and redeveloping seven sites for residential, commercial or industrial use. Cleanup has been completed at six other sites now being redeveloped, and is underway at 8 more sites, and environmental investigations are underway at 8 other sites.

14 TEXAS

14.1 SMITHVILLE

Beginning in 1995, the EPA Superfund Brownfields Program enabled city to redevelop the old Marhil Manufacturing site (foundry, welding, fabrication shop for a marine supply company). The site contained heavy contamination in the form of toluene, xylene, lead, xinc and iron. The levels were low enough so that the site did not have to be declared a Superfund site, instead it became an ideal candidate for the Superfund Brownfields Program. The City received $23,500 grant from EDA (Economic Development Administration of the US Dept. of Commerce). City started the cleanup in 1996 – removal of 55 drums of hazardous materials, 45 cy of lead sand. They still need to clean up trace levels of arsenic, which was to be completed by June 1997. In March 1997, the City acquired the property, which includes several warehouses, through a tax foreclosure sale. A small employer is currently leasing the space, is operating on it, and in 2 years, has the option to buy the property for $125,000, or the appraised value of the property (7 new jobs).

15 WISCONSIN

15.1 MILWAUKEE

EPA Regional Brownfields Pilot - They received $200,000 to provide guidance and oversight for brownfields pilot activities.

5 mile segment of active railroad through Milwaukee. Parts of area are leaking underground storage tanks (LUSTs).

They are hosting brownfields workshops, town hall meetings, establishing Citizens Technical Advisory Consortium, identifying brownfields, preparing databases.