EXHIBIT F

Four documents comprising an Economic Opportunities Analysis:

Economic Opportunities Analysis Section 1: *Trends, Opportunities and Market Factors,* **Appendix A:** *Focus Group Participants*, and **Appendix B:** *Supplemental Data Tables*; Versions recommended by the Planning and Sustainability Commission, August 2015.

Economic Opportunities Analysis Section 1, Appendix C*: Portland Harbor Analysis*, Version recommended by the Planning and Sustainability Commission June, 2012, and recommended again in the same form, August 2015.

Economic Opportunities Analysis Section 2: *Demand*, and **Section 3***: Supply*; Versions recommended by the Planning and Sustainability Commission, August 2015.

Economic Opportunities Analysis Section 4: *Community Choices*; Version recommended by the Planning and Sustainability Commission, August 2015.

CITY OF PORTLAND
ECONOMIC OPPORTUNITIES ANALYSIS:
Section 1. Trends, Opportunities & Market Factors



Prepared for:

City of Portland Bureau of Planning & Sustainability

March 2016 Revised Draft

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E. D. Hovee & Company, LLC

Economic & Development Services

EXECUTIVE SUMMARY

The EOA is an analysis of the 20-year supply and demand for employment development and land in the city. It is prepared according to State Administrative Rule OAR 660-09-0015 and consists of four sections:

1. Trends, Opportunities & Market Factors
2. Long Range Employment Forecast (Demand)
3. Buildable Land Inventory (Supply)
4. Community Choices (Comprehensive Plan proposals to meet employment land needs)

This report is Section 1 and provides a review of national, regional, and local employment trends, opportunities and market factors. The report documents existing conditions and current trends in employment that will serve as a basis for the future employment forecast.

KEY FINDINGS

- National employment trends indicate leading job growth in health, education and professional and business services.
- The 2000-2008 business cycle was a period of unusually slow job growth, not only for Portland but for the 7-county metro region and the nation. However, the pace of job growth in the 2008-2013 period, averaging 1.3% per year in Portland and 1.4% in the region, has already exceeded the previous business cycle. Despite the depth of job losses during the great recession (2008-2010), the city and region have since led the state's economic recovery.
- A pivotal question is whether the city will continue to generate a stable share of the region's job growth, outperforming national job-sprawl trends. Multnomah County's long-term 25% capture rate of regional job growth over the 1980-2008 period has fluctuated widely since 2000. Portland had a nearly flat 5% capture rate of regional growth during the sluggish 2000-2008 business cycle and then rebounded to 23% capture rate in the 2008-2013 period.
- It is apparent that the "hot spot" locations where job growth is occurring within the City have shifted in recent years. Business districts with the most robust job growth rates since 2000 have been the hospital and college campuses, Central City's subdistricts outside of Downtown, some town centers with substantial health care and education employment, and the Columbia Corridor east of 82nd Avenue.
- Industrial employment declined in the 2000s at the same time that the city experienced increases in industrial land development, freight volumes, and added value of manufacturing products. Industrial employment is also a primary source of middle-wage jobs that have been shrinking nationally and regionally since 1980.

- The EOA identifies ten categories of employment areas (locations, sites and types of space) referred to in the report as "employment geographies". Among these, the institutional geography is experiencing the strongest job growth, followed by urban centers (primarily due to institutional growth) and then the Central City, neighborhood commercial and industrial geographies.

NATIONAL TRENDS & FORECAST REVIEW

Following a period of relatively rapid growth in the 1980s, the rate of job growth slowed in the 1990s and further slowed in the early part of this decade. Job growth picked up after 2010 during a period of economic recovery, but is then projected to further slow to about 0.9% annual growth between 2025 and 2035.

Manufacturing is projected to decline from about 16% of all non-farm jobs in 1990 to between 6% and 7% by 2035. Service sector jobs have increased from about 67% of the nation's non-farm job base in 1990 to 73% as of 2005. While all service sectors are expected to add jobs, only professional services, education and health are projected to increase their share of the employment base over the next 25 years.

REGIONAL EMPLOYMENT TRENDS

The pattern of the 7-county Portland metro area (PMSA) employment has followed that of the nation, slowing considerably post-2000 to a rate of approximately 0.8% per year (to 2008). Metro has prepared an updated forecast of job growth to 2040 (with 2035 established as the pertinent growth target for the City of Portland). Metro's regional forecast indicates a more robust job growth rate averaging 1.8% per year from 2010 to2035, consistent with long-term trends. PMSA employment grew at an average annual rate of 2.1% from 1980 to 2008, spanning the last three business-cycle periods. Job growth rates are expected to range from 0.6% for manufacturing to 2.3% for professional services and 2.6% to 2.7% in education and health services in the 2010-2035 period.

PORTLAND EMPLOYMENT TRENDS

In 2013, there were 393,742 covered jobs in Portland, equivalent to 38% of the 1.02 million employment base of the 7-county PMSA. To understand long term growth trends, the EOA focused on the 1980-2008 and 2000-2008 periods, since they reflect the peak-to-peak periods of the recent business cycles – timeframes that reduce the short-term business cycle distortions of the growth trend. From 1980 to 2008, Multnomah County added approximately 114,800 new jobs, resulting in a 1.1% average annual growth rate and a 25% capture rate of PMSA job growth. The city's share of Multnomah County employment increased slightly in this period. After 2000, both region and city job growth slowed substantially.

From 2000-2008, Portland employment increased by approximately 3,120 jobs. This reflects a 5% capture rate of PMSA job growth in that period and an overall job growth rate averaging only about 0.1% per year. In comparison, statewide and PMSA job growth rates averaged 0.8% per year. However, local job growth has rebounded since 2008, recovering the 23,000 jobs lost in Portland and 63,000 jobs lost in the region from 2008 to 2010. In the 2008-2013 period,

Portland had 1.3% average annual job growth, compared to 1.4% in the region, and the city's capture rate was 23%.

The 2000-2008 period also provides an insight into shifts between different employment sectors within the region. Manufacturing jobs declined by about 3.3% per year, with all industrial employment dropping at an annual rate of 2.6%. At the same time, the city experienced increases in industrial land development, freight volumes and added value of manufacturing products. Retail jobs also declined. Employment in education and health care sectors increased at a rate averaging 2.3% per year. The loss of the share of employment in the industrial sectors may be exaggerated due to 2001 changes in the way employment data is classified.

When looking at *geographic subareas*, Portland's Central City commercial areas accounted for 27% of the city's employment base as of 2008; regional and town centers (or urban centers) accounted for 5%; neighborhood commercial areas comprised another 18%; industrial districts represented 30%; and with institutional and residential areas each contributing 9-10%. As noted, institutional areas experienced the city's strongest job growth, adding 8,800 jobs at an average annual rate of 3.6%.

However, employment varies greatly within these broad geographic groupings. For example, in the Central City, employment declined somewhat in the downtown and South Waterfront subareas, while increasing for the River and Lloyd Districts. Within industrial areas, employment has declined within Harbor and Airport Districts and Harbor Access Lands while increasing for Columbia East of 82nd, the Dispersed Employment areas, and for the Central City Industrial (or incubator) districts of Central Eastside and Lower Albina.

For urban centers, strong gains have been experienced for Hollywood, Gateway and Lents, focused in health care and education, while St. Johns, Hillsdale and West Portland have experienced stable or declining employment. Of the neighborhood commercial areas, employment within dispersed commercial areas has increased while the job count has declined for commercial corridors and nodes.

DEMAND ANALYSIS ISSUES – FOCUS GROUP INPUT

In 2009, the City organized six focus groups involving 58 participants to provide input on the demand for different types of employment - central city office, close-in incubator, manufacturing and distribution, neighborhood commercial, transit oriented development/mixed use corridors, and campus institutional. The findings included the following:

- *Recent trends*- Despite relatively slow employment growth over the last several years, the mid-decade was relatively good for Portland's major employment generators – at least up to the point of the economic downturn starting in 2007-08.
- *Emerging trends* - the overarching theme is "change". There is a promising long-term outlook provided that the pending economic recovery proves sustainable with the view that the City and region respond to shape this change in ways that keep Portland competitive for added investment and employment. Specific types of change include:

  - ✓ The Central City office market becoming more diverse with strong growth in lower cost incubator space.
  - ✓ Industry concerns that skilled workforce development and the freight transportation system will not be able to keep pace with their changing needs.
  - ✓ Neighborhood commercial corridors seeing more mixed-use development and high densities along major transit streets.
  - ✓ Health care providers expect "tremendous" growth.
- *Business space and location needs* – Expected space needs are relatively diverse, and there seem to be growing opportunities for more mixed-use and denser commercial space versus more traditional manufacturing and distribution activity.
- *Density and redevelopment* – Opinions on the potential for greater density uses and redevelopment of existing uses ranged from extreme caution expressed by manufacturing and distribution focus group participants to bullish support from /mixed-use corridor participants. All the focus groups discussed the practical implications and means by which employment uses could grow up rather than out.
- *Economic prosperity and creative vitality* – There are different strategies for creating and maintaining prosperity. A key challenge is to harness these diverse interests into a coherent whole. For example:
  - ✓ Emphasizing the Central City as a critical component to a healthy regional economy.
  - ✓ Balancing goals of sustainability and job growth.
  - ✓ Small neighborhood businesses as a primary economic engine.
- *Public role in economic development* – Participants argued that public strategies should emphasize a more business-friendly environment in general with more flexible regulations, more reliance on public-private partnerships, new business incentives, and less "picking winners" with targeted efforts.

DEMAND ANALYSIS ISSUES – DATA ASSESSMENT

Key findings:

- *High rise office development* – There is solid potential for additional mid to high-rise development primarily in the Central City but also elsewhere. Mid-/high-rise development outside the Central City has been limited to adaptive reuse in close-in areas and medical/health care facilities at campus institutions and urban centers such as Gateway and Hollywood. Proximity to retail and housing is increasingly important for future office development. The Central City reports a relatively slow overall job growth rate (0.3%) from 2000-08 – with strongest growth in the River and Lloyd Districts and some employment loss in the CBD.
- *Incubator and manufacturing districts* – These two types of space can contribute to future export-oriented job growth in Portland. Harbor and Airport Districts and Harbor Access Lands remain strongly oriented to manufacturing, transportation and distribution but service employment has been the dominant source of job growth in recent years. The Central City incubator districts of Central Eastside and Lower Albina have a more

diverse job base and have been experiencing job growth above the citywide rate – albeit concentrated in service sector activities together with information/design and construction. Overall, employment within industrial areas declined slightly.

- *Neighborhood commercial districts* – These dispersed concentrations of employment space have been a significant contributor to the city's job base, but with somewhat surprising job loss indicated over the 2000-08 time period, primarily within residential zones and along commercial corridors. Commercial corridors (including those with TOD/mixed use potential) still account for 27% of jobs outside of the city's urban centers and industrial areas, despite a net loss of nearly 5,200 jobs from 2000-08. Neighborhood-serving services and retail generally appear well distributed throughout the city; with just a few gaps.
- *Institutional development* –These sites include 7 colleges and 10 hospitals (each on 10+ acre sites) but excluding Portland State University and Adventist Medical Center which are included with in the Central City and Gateway employment geographies respectively. These 17 institutions together accounted for about 35,200 in-city jobs as of 2008 and represent the city's fastest growing employment geography.

LOCAL SECTOR SPECIALIZATION

Two related analyses were conducted that are relevant to this EOA. Metro evaluated the region's comparative advantage in *employment* relative to the nation, finding that this region has a comparative advantage in manufacturing despite net job losses. Overall, non-manufacturing sectors show little to any substantial comparative advantage relative to the rest of the nation. However, Metro is projecting increased regional capture of national employment for finance activities, education and health care, and some management and personal services.

ECONorthwest also evaluated the City of Portland comparative advantage based on industry *value added* rather than employment. This analysis corroborates the results of the regional employment-base analysis. Both analyses indicate that Portland's comparative advantages are higher in the manufacturing sectors. Although, these sectors make up smaller shares of total economic activity, they generate larger overall economic impacts in value added and export value added, particularly professional services, wholesale trade, and management of companies. Consequently the ECONorthwest analysis indicates that the manufacturing sector's output may be insufficient as an *exclusive engine* for continued economic growth into the future.

MARINE TERMINAL FORECAST

Employment is not a very good indicator of the long-term land needs of the freight and distribution sectors of the economy. Despite a slight decline in industrial employment along Portland Harbor between 2002 and 2008, marine cargo tonnage and marine industrial development grew robustly during that same period.

The medium forecast scenario for marine cargo tonnage at Portland Harbor is 2.0% per year from 2010 to 2035. A variety of major investments in existing marine terminals since 2012 has substantially expanded Portland's existing capacity to accommodate that growth. Marine

terminal land needs over the next 20 years are estimated at 150 acres based on the medium cargo forecast and "practical" site size assumptions.

EOA IMPLICATIONS

Key implications for subsequent EOA work tasks include:

- Long-term job growth trends have fluctuated and create uncertainty for forecasting growth in the coming decades. The 2000's were a period of relatively slow job growth not only for Portland but for the metro region and nationally. Despite an economic downturn experienced just after 2000, followed by modest growth and a major recession at end of the decade, Metro is projecting that the nation and region should expect to return to a more normalized pattern of job recovery and stronger growth over the long-term horizon of next 25 years.
- For Portland, another question is whether the city will maintain the 25% capture rate of regional job growth that Multnomah County experienced over the 1980-2008 period. Portland's capture rate fell to 5% in the 2000-2008 business cycle and has since rebounded to 23% in the 2008-2013 period.
- Finally, it is apparent that the "hot spot" locations where job growth is occurring within the City have shifted in recent years. The focus of added Central City job gains has shifted from the traditional downtown core toward adjacent areas in the River and Lloyd commercial / mixed use districts and the emerging incubators of the Central Eastside and Lower Albina. Similar shifts are occurring within and between the City's industrial, urban center and neighborhood commercial areas. In numerical terms, by far the strongest growth has been in Portland's institutions.

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I. INTRODUCTION

The City of Portland is required to complete an Economic Opportunities Analysis (EOA) to comply with Oregon Statewide Planning Goal 9 and supporting administrative rules. State statutes also require the City's Comprehensive Plan to be coordinated with Metro's regional population and employment forecasts and allocations. The EOA rules also allow Portland the opportunity to shape its plan in a way that fits not only state and regional goals but also locally determined priorities and choices.

The intent of this EOA is to address both current and emerging market trends while at the same time addressing distinctive state, regional and City-defined policy objectives for employment and associated land development requirements. The economic analysis also addresses short-term employment demand and resulting land supply needs consistent with Goal 9 and reconciles buildable land supply with demand over a longer term time horizon to 2035.

APPROACH

This report covers economic trends, opportunities and market factors, including an assessment of local sector specializations, submarket real estate analysis, freight terminal demand, and wage distribution.

The analysis has drawn from a review of quantitative economic data for the U.S., state of Oregon, and Portland metro region as well as data specific to the City of Portland. The analysis also considers qualitative information affecting future opportunities and market factors, including results of six focus groups organized around demand analysis issue topics.[1]

Subsequent EOA reports are informed by the results of this initial trends analysis.

ORGANIZATION OF TRENDS, OPPORTUNITIES, AND MARKET FACTORS ANALYSIS

The remainder of this Task 1 report is organized to cover the following topics:

- National Trends & Forecast Review
- Portland Employment Trends
- Demand Analysis Issue – Focus Group Input
- Demand Analysis Issues – Data Assessment
- Local Sector Specializations
- Intensification Analysis
- Multiplier Analysis
- EOA Implications

[1] Information in this report has been drawn from sources generally deemed to be reliable. However, the accuracy of information from third party sources is not guaranteed, and is subject to change.

The observations and findings contained in this report are those of the authors. They should not be construed as representing the opinion of any other party prior to their express approval, whether in whole or part.

II. NATIONAL TRENDS & FORECAST REVIEW

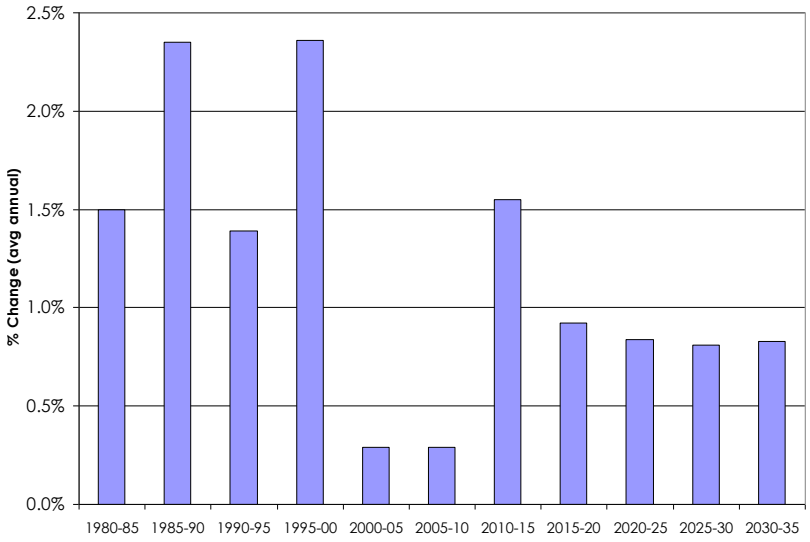
Consistent with Oregon Administrative Rules (OAR 660), Portland's EOA is set within the context of nationwide trends and projected future employment. Recent and forecast conditions are considered first for total employment, then with more detailed discussion of employment by sector.

NATIONAL EMPLOYMENT TREND & FORECAST

From 1980 to 2005, the nationwide job count grew by 48% to approximately 133.7 million non-farm jobs in 2005:

- Over the 25 year period of 1980-2005, employment across the U.S. increased at an average annual rate of 1.6% per year, reflecting a particularly rapid 1.9% rate of job growth during the 1980s. The 1980-90 time period also coincided with entry of a large baby boom cohort into the job market.

Figure 1. U.S. Non-Farm Employment Growth Rates (1980-2035)



Source: Global Insight, *2008 QR US Long-Term Outlook,* as compiled by Metro.

- Since 1990, job growth nationally has slowed to a more modest 1.3% annual rate from 1990-2005. During the first half of this decade (2000-2005), job growth was even more modest averaging 0.3% per year, reflecting a post-2001 period of economic contraction followed by a slow recovery.
- The national forecast predicts an economic recovery period for 2010-2015 with relatively strong anticipated job growth (1.5-1.6% per year) that declines over time to a rate of about 0.9% by 2025-2035. At these rates of projected employment growth, the U.S. would have about 173.5 million non-farm jobs by 2035, an increase of just under 40 million jobs (or 30% gain) compared to 2005 conditions.

Employment Sector Growth

When viewed by major employment sector, the most noteworthy change has been the continued shift of the nation's economy to less industrial and more service-related employment. This trend is expected to continue through 2035. However, several caveats are noted related to this shift.

Past employment sector shifts are difficult to quantify due to a 2001 change in how industries are classified in (from the Standard Industrial Classification system to the North American Industrial Classification System). The new NAICS system created two new sectors, management of companies and information, which are considered services but which encompass firms (or portions of firms) previously classified as industrial. While employment data from the year 2000 has been converted to NAICS (by the Oregon Employment Department), this conversion was not perfect. Some portion of the reported employment shift away from manufacturing is attributable to this change in job classification, although the exact portion is unknown.

Also of note is that while the focus of this trends assessment is employment, manufacturing has in many regions held a steadily increasing share of GDP. At least since 2000, there appears to be a contradictory relationship between industry output and industry employment. Consequently, job growth represents only one lens through which to assess an industry's economic contribution. Other measures of economic activity are addressed later in this report.

That said, the following changes are reported for job trends within the manufacturing sector nationwide:

Manufacturing:

- Nationally, manufacturing has declined from just over 16% of all non-farm jobs in 1990 to 10-11% of non-farm jobs in 2005 and is projected to decline to 6-7% of employment by 2035.
- Manufacturing has been declining not just as a share of the total but also in terms of numbers of jobs – from close to 18 million jobs in 1990 to just over 14 million in 2005 and to a projected 11 million by 2035.
- Every major manufacturing category except lumber experienced job losses between 1990 and 2005, and all sectors are forecast for job loss through 2035. Durable goods manufacturing, which tends to be more capital intensive, has experienced less rapid job loss than non-durables.

Other Industrial-Related Employment:

- With the exception of natural resources, all other *industrial-related* sectors experienced job growth from 1990-2005 and are projected for continued job growth through 2035. These other sectors include natural resources, construction, wholesale trade, transportation/warehousing/utilities (TWV), and information.[2]

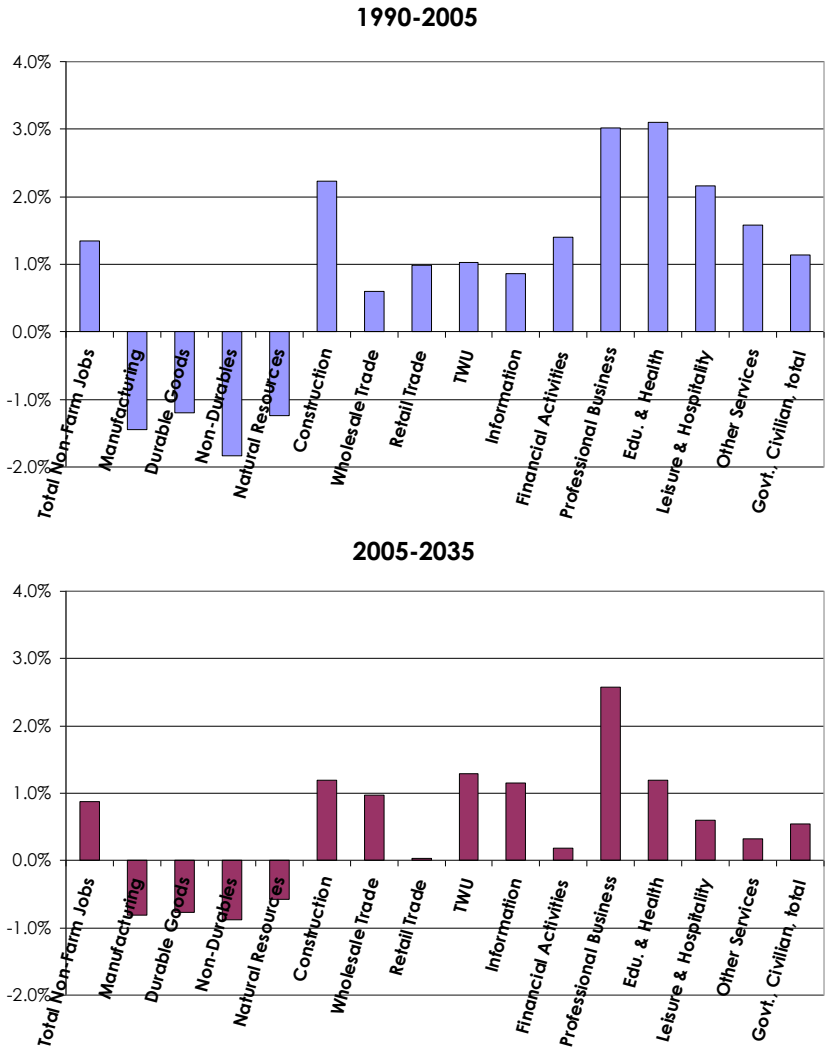
[2] Information is a new sector defined by NAICS that includes some previous industrially related SICs such as printing combined with more service sector related functions such as internet and software.

- Between 1990 and 2005 the other industrial-related sectors declined slightly in total employment share, from 16.6% to 16.2%, as growth was below rates experienced in non-industrial (service) sectors. However, through 2035 the non-manufacturing industrial sectors are projected to increase their share of the nation's employment to 17.4% by 2035.
- From 1990-2005, the fastest growing industrial sector was construction, with jobs increasing an average of 2.5% per year. From 2005-2035, the biggest gainer is forecast for jobs in transportation/warehousing/utilities (at 1.3% annually), followed closely by the construction and information sectors.

Service Sector Employment:

- Service sector jobs have increased rapidly since 1990. The most rapid growth rates are reported for education and health (up by 3.1% per year) and professional services (3%). The slowest growing service job sectors have been retail (up by just 1.0% per year) and government (1.1%). Finance, leisure and hospitality, and other services have increased at rates of 1.4%, 2.2% and 1.6% respectively.
- Overall, these service sectors have increased from about two-thirds (67%) of the nation's non-farm employment in 1990 to 73% as of 2005. The largest single service-related sector is government at 16.3% as of 2005.

Figure 2. Forecasted U.S. Job Growth Rates (1990-2035)



Source: Global Insight, *2008 QR US Long-Term Outlook,* as compiled by Metro.

- While all service sectors (except retail) are expected to add jobs, only professional services, education and health are projected to increase their share of the employment base over the next 25 years. Declining shares (slower growth) are projected for retail trade, financial activities, leisure and hospitality, and government.

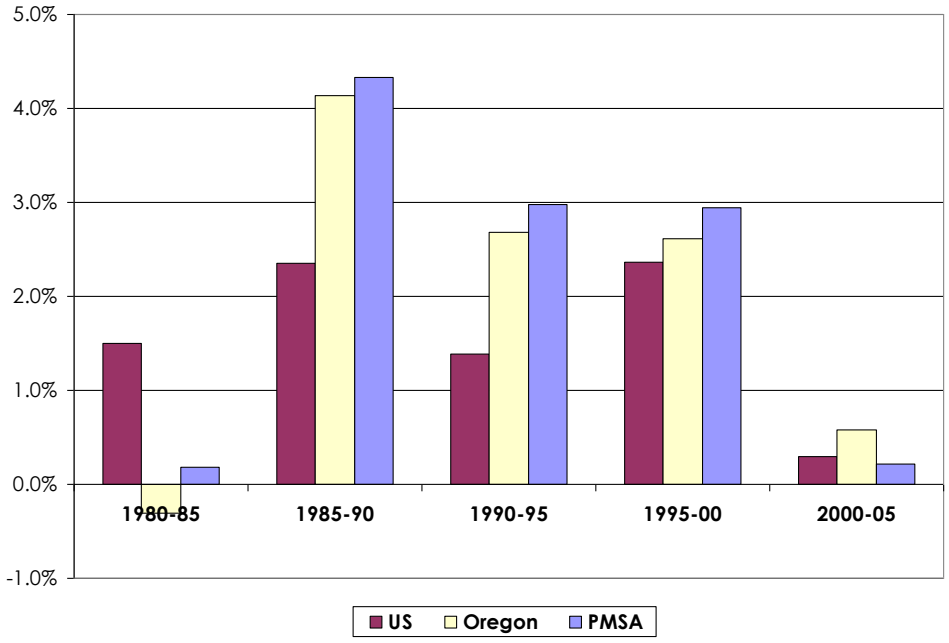
STATEWIDE & REGIONAL EMPLOYMENT CONTEXT

Statewide & Metro Area Employment Growth Trends

Over a 25-year period extending from 1980-2005, patterns of employment growth for the nation, Oregon, and the Portland metro area have been similar. Exceptions include:

- In the first half of the 1980s, Oregon and the Portland metro area were harder hit than the nation during a period of overall economic slowdown. In the latter half of the decade, this pattern was reversed as employment growth rates accelerated, exceeding 4% per year both statewide and for the metro region.

Figure 3. Employment Growth Rates – U.S., Oregon & Portland PMSA (1980-2005)



Source: Metro, Oregon Employment Department, and E. D. Hovee & Company, LLC.

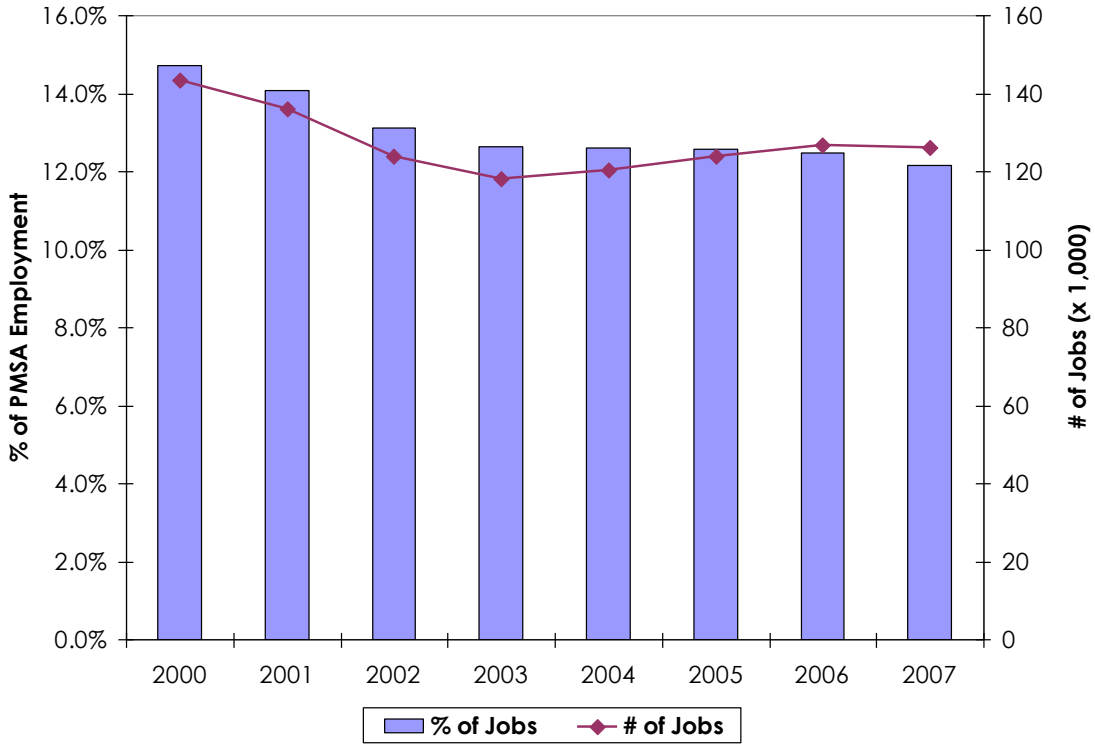
- This pattern of strong employment growth statewide and regionally continued (though at somewhat slower rates) through the 1990s, with the nation nearly catching up to the state and region in the latter half of that decade.
- In the 2000s, employment stagnated – nationally, statewide and regionally – through a recession with a slow job recovery. While at fairly modest levels, employment growth statewide exceeded that of the PMSA, the only such 5-year period since 1980.

Manufacturing Focus?

Manufacturing often receives particular attention because of its historic role as a pivotal traded sector and as source of relatively high wage jobs, both nationally and in this region. As a share of PMSA employment, manufacturing has not reversed its declining share of the region's job base – at best holding its own from 2003-2005 at 12.6% of total non-farm jobs (Figure 4). The experience of the last several years offers the hint of a possible opportunity for slowing the now decades long slide in U.S. manufacturing. This is illustrated by a year-to-year review of manufacturing employment in the Portland metro area from 2000-07. This period is chosen as it essentially extends from the recession just after 2000 back to a subsequent peak in 2006.

As indicated by the following graph, the metro region experienced a sharp drop in manufacturing jobs during the economic recession of 2001-2003. This was then followed by a post-recovery increase of about 7% back to a peak year of 2006. This recovery nationally was aided by a weak dollar encouraging added exports, especially for durable goods manufacturing.

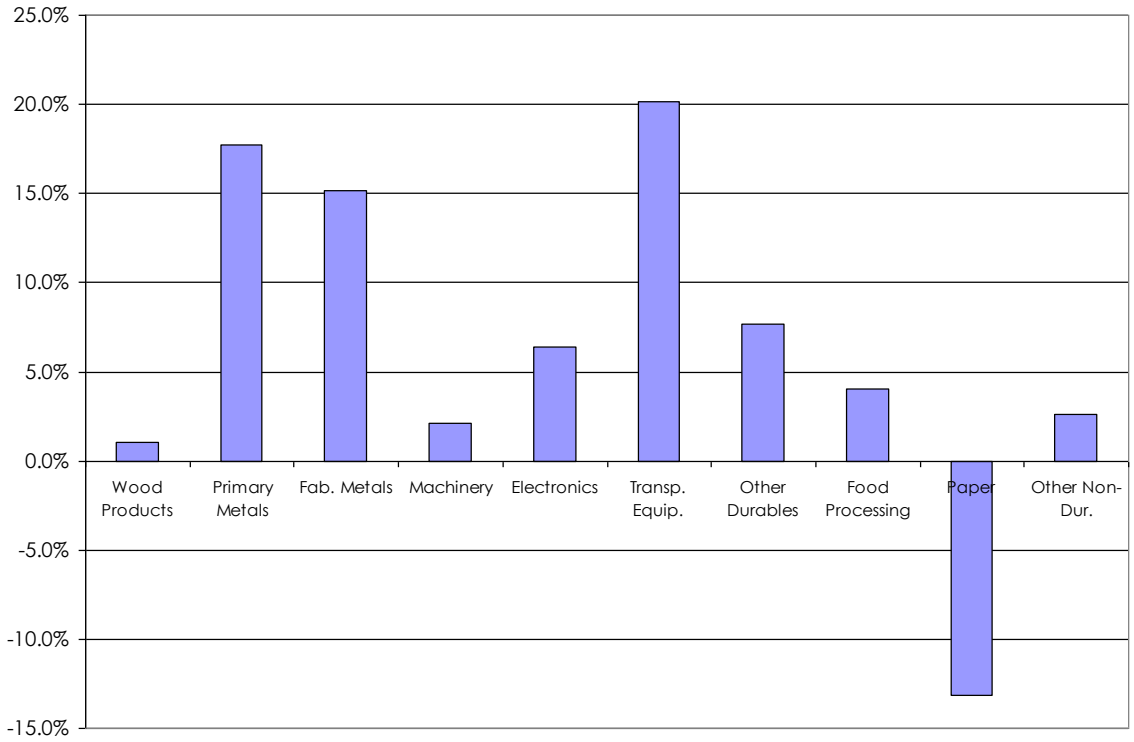
Figure 4. Portland PMSA Manufacturing Job Trend (2000-2007)



Source: Metro.

A more detailed look at the 2003-2007 period shows the differences in this manufacturing employment resurgence by sector. While there was considerable employment contraction in the 2000-2003 time period, the strongest post-2003 gains were indicated for transportation equipment and primary/fabricated metals, followed by more modest gains for electronics and food processing.

Figure 5. Portland PMSA Manufacturing Job Surge (2003-2007)



Source: Metro.

A key question with economic recovery in the years ahead is whether this resurgence proves to be temporary. Alternatively the question is whether there are opportunities for continued longer lasting competitive gains for durable goods as with metals, transportation equipment and/or electronics.

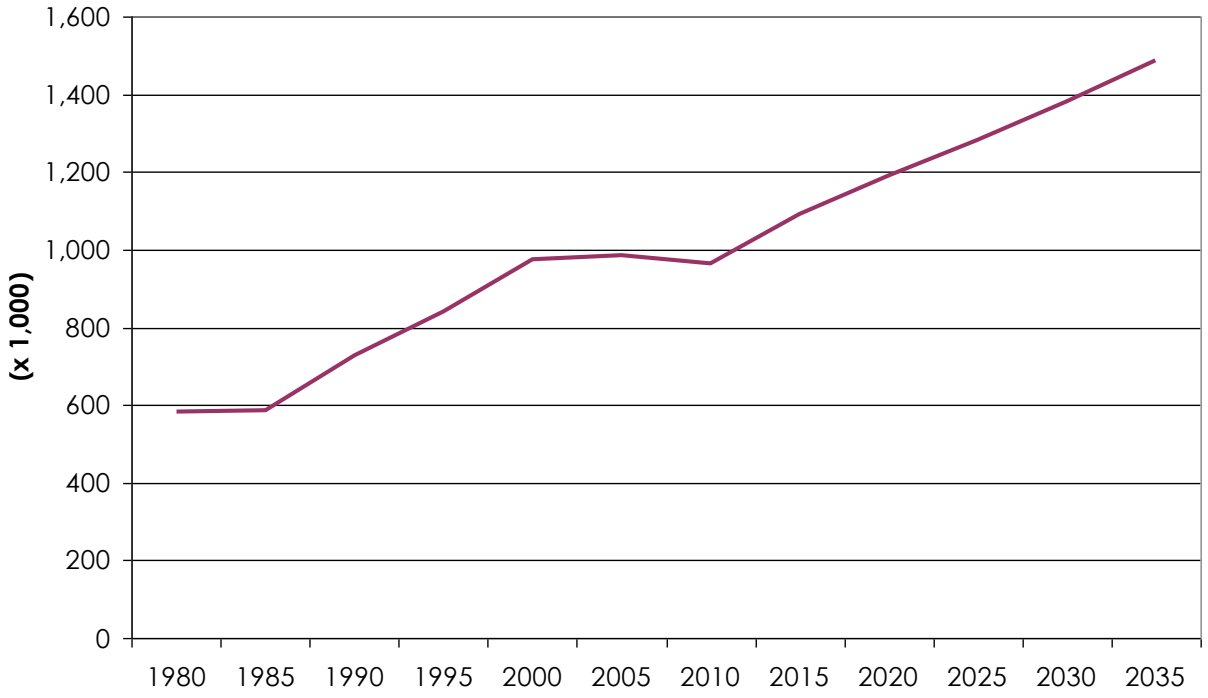
With non-durables, a question is whether the recent observed growth in regional food processing can be sustained. Opportunities may be linked to greater emphasis on consuming products grown and manufactured closer to home.

Metro projects that manufacturing's share of the region's total job base will be 8.3% of total employment by 2035. The total number of manufacturing jobs is projected to stabilize at between 120,000 and 125,000 between over the 2020-35 time period.

Metro Area Employment Growth Forecast

Looking to the future, Metro developed a range of low, moderate and high growth employment forecast alternatives to the year 2040 and has selected an official forecast slightly less than the moderate forecast. The following chart displays trends from 1980 to 2005, and then resulting revised forecast to 2035 (the forecast period for this EOA).

Figure 6. Portland PMSA Employment Forecast Range (to 2035)



Source: Metro. Data for 2010 reflect BLS actual employment, with subsequent years as Metro forecast results.

With the baseline forecast, Portland PMSA non-farm employment would increase from recession dampened figure of less than 1 million jobs in 2010 to nearly 1.5 million in 2035, a gain of over 520,000 (for 54% job growth) with an average annual growth rate in the range of 1.7% per year over the 2010-2035 time period.

III. PORTLAND EMPLOYMENT TRENDS

This section analyzes recent City of Portland employment trends within the national and regional context. While some citywide changes parallel those of the nation and/or region, it is clear that Portland's position as the largest city in the region and state has created distinctive market niches as well as future opportunities and limitations.

Topics covered by this initial data review are:

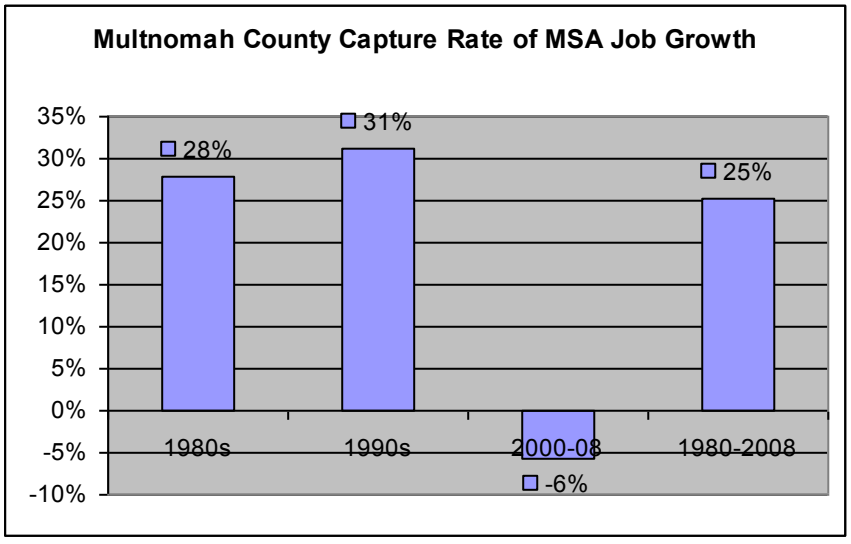
- Citywide Employment Trends
- Detailed Development & Employment Trends:
  - ✓ Employment by City Subarea
  - ✓ Employment & Development by Expansion Type
  - ✓ Development by Valuation, Density & Site Type

Geographic and sector employment trends will be used to inform the distribution of projected employment in later tasks for this EOA.

CITY AND COUNTY EMPLOYMENT TRENDS

The following long-term employment trends analysis is based on county data because reliable, comparable city data is not available before 2000, due to changes in data reporting and major city annexations in the 1980s and 1990s. Figure 7 shows that the short-term (2000-08) job losses are inconsistent with long-term trends.

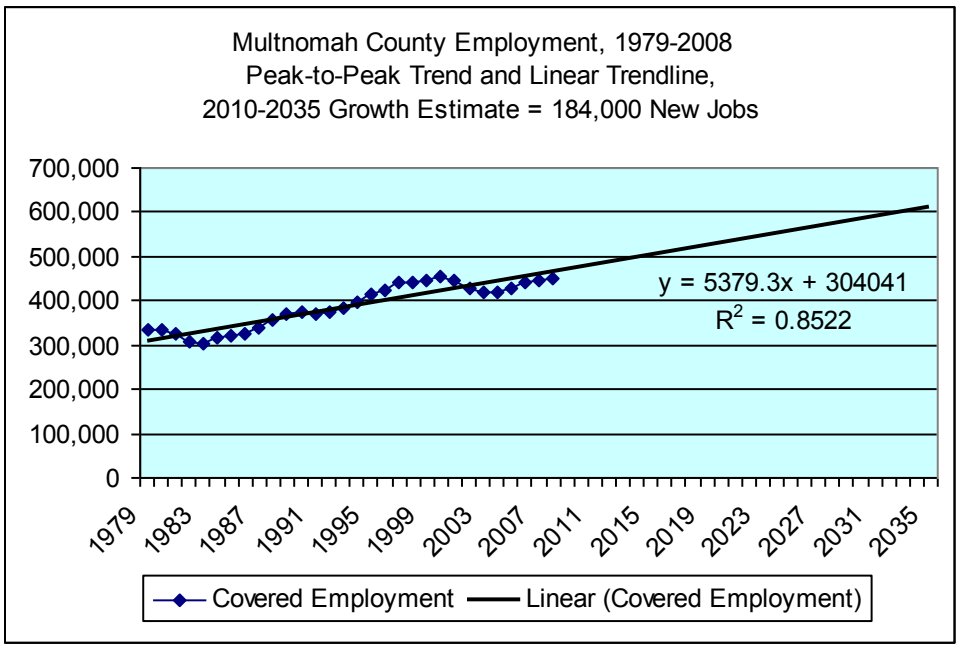
Figure 7. Multnomah County Capture Rate of Regional Job Growth (1980-2008)



Source: Bureau of Planning and Sustainability from Oregon Employment Department QCEW data.

Despite slower job growth after 2000, long-term employment trends in Multnomah County reveal a general linear growth pattern, as shown in Figure 8. Given this linear pattern, a commonly used forecasting method is a linear trendline, which is a best-fit straight line through a series of historical data points (regression analysis). The trendline shown in Figure 8 is based on 1979-2008 annual employment data, representing county peak-to-peak data periods of the last three business cycles. A trendline is most reliable when its R-squared value is at or near 1, and this trendline results in a generally close-fit R-squared value of .85. The years when actual employment levels varied most from the trendline resulted particularly from the employment fluctuations of short-term business cycles.

Figure 8. Multnomah County Employment Trendline, 1979-2035

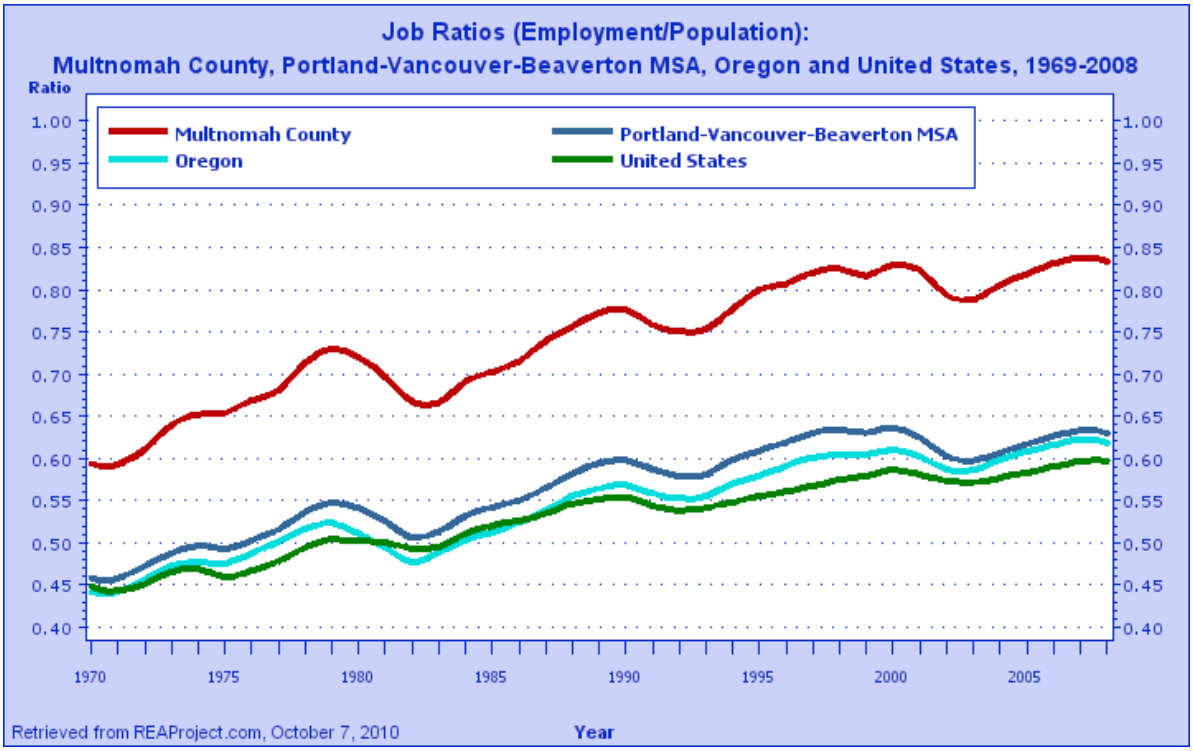


Source: Bureau of Planning and Sustainability from Oregon Employment Department QCEW data.

If Multnomah County's long-term linear job growth pattern continues along this trendline, 184,000 new countywide jobs will be added between 2010 and 2035, which reflects a 34% county capture rate of new PMSA Covered Employment in this forecast period. In 2008, the City of Portland accounted for 87% of Multnomah County employment, up from 86% in 2000. Assuming a slightly declining city share of county jobs over time, estimated at 82% of new Multnomah County jobs from 2010 to 2035, the trendline in Figure 8 indicates that 151,000 new Portland jobs will be added in the forecast period. This growth level would represent a 28% city capture rate of PMSA job growth to 2035.

Employment trends are also linked to population trends at the regional level, but Multnomah County has long been a job center in the region and has substantially more jobs than resident workers, such as shown on the following graph.

Figure 9. Employment-to-Population Job Ratios



Source: Oregon Regional Economic Analysis Project from U.S. Bureau of Labor Statistics data.

Geocoded (mapped) employment data is available for 2000 and 2008, allowing a review both of citywide and sub-city employment trends. This employment dataset is based on jobs covered by unemployment insurance, which generally equates to an estimated 85% of the total workforce.

2008-2013 Employment Trends

In 2013, there were 393,742 covered jobs in Portland, equivalent to 38% of the 1.02 million employment base of the 7-county PMSA. Since 2000, employment in Portland has fluctuated substantially. Analysis of recent City employment trends in this report focuses on the 2000-2008 period, because it is the most recent complete business-cycle. However, the 2000-2008 business cycle was a period of unusually slow job growth, averaging 0.1% annual growth in Portland, 0.8% in the 7-county metro region, and 0.5% nationally. However, the pace of job growth in the 2008-2013 period has already exceeded the previous business cycle, averaging 1.3% per year in Portland and 1.4% in the region. Despite the depth of job losses during the great recession (2008-2010), the city and region have since led the state's economic recovery. Portland had a nearly flat 5% capture rate of regional growth during the sluggish 2000-2008 business cycle and then rebounded to 23% in the 2008-2013 period.

2000-08 Employment by Sectors

Figure 10 reports employment at the detailed sector level with the 2008 distribution and net change both in terms of numerical change and annual average growth rate (AAGR). Throughout the remainder of the report, employment sectors are aggregated to broader categories to provide a more manageable amount of information.

Figure 10. Portland Citywide Employment (2000-2008)

	NAICS		2000	2008	2008 Distrib.	Change Net	AAGR
Industrial	11	Agriculture	180	210	0%	30	1.9%
	22	Utilities	3,960	2,580	1%	(1,380)	-5.2%
	23	Construction	19,840	18,380	5%	(1,460)	-1.0%
	31	Man: food, textile, apparel	5,990	5,800	1%	(190)	-0.4%
	32	Man: wood, petrol, chemicals	9,120	6,740	2%	(2,380)	-3.7%
	33	Man: metal, machine, computer	24,670	17,800	5%	(6,870)	-4.0%
		Manufacturing subtotal	*39,780*	*30,340*	8%	*(9,440)*	*-3.3%*
	42	Wholesale Trade	25,510	20,380	5%	(5,130)	-2.8%
	48	Transportation	19,770	15,650	4%	(4,120)	-2.9%
	49	Transport & Warehousing	9,160	8,010	2%	(1,150)	-1.7%
		Industrial subtotal (21-42, 48,49)	*118,200*	*95,550*	*24%*	*(22,650)*	*-2.6%*
Retail	44	Retail	22,130	22,200	6%	70	0.0%
	45	Retail: Dept, misc.	14,940	10,830	3%	(4,110)	-3.9%
		Retail subtotal (44,45)	*37,070*	*33,030*	*8%*	*(4,040)*	*-1.4%*
Services	51	Information	12,350	11,570	3%	(780)	-0.8%
	52	Finance & Insurance	21,390	18,810	5%	(2,580)	-1.6%
	53	Real Estate	9,870	8,580	2%	(1,290)	-1.7%
	54	Prof., Scientific, Tech Services	25,530	27,200	7%	1,670	0.8%
	55	Management	6,820	14,590	4%	7,770	10.0%
	56	Admin Support, Waste	14,020	21,770	6%	7,750	5.7%
	61	Education	29,640	35,510	9%	5,870	2.3%
	62	Health & Social Asst.	40,960	49,150	13%	8,190	2.3%
	71	Arts, Enter., Recreation	6,200	6,280	2%	80	0.2%
	72	Accommodation & Food	30,410	35,770	9%	5,360	2.0%
	81	Other Services	17,190	17,210	4%	20	0.0%
		Service subtotal (51-81)	*214,380*	*246,440*	*63%*	*32,060*	*1.8%*
Public	92	Public Administration	17,110	17,500	4%	390	0.3%
Other	99	Unclassified?	2,760	120	0%	(2,640)	-32.4%
		Total	389,520	392,640	100%	3,120	0.1%

Source: Oregon Employment Department, E. D. Hovee & Company, LLC. Employment in all categories has been rounded to the nearest 10 employees.

Observations

The 2000-2008 time period corresponds to the most recent complete economic cycle of the region and nation, representing a peak-to-peak period in Multnomah County employment. This has been a period of economic downturn early in the decade, followed by rebounding job growth through mid-decade and then substantial job losses with the recession after 2008.

Consequently, for the entire 2000-08 time period, job growth was experienced at relatively low rates for the city as well as for the state and nation, certainly in comparison with the prior decade of the 1990s:

- Within the City of Portland, post-2000 job growth has occurred at a rate of just 0.1% annually. Oregon's statewide growth rate post-2000 was at 0.8% per year, comparable to a similar growth rate in both non-farm and covered employment for the 7-county metro area (PMSA) over the same time period.
- Over this time period, Portland captured only about 5% of the net job growth in the region, a pattern of performance better than that of Multnomah County but well below city and county rates of job growth capture in prior decades.
- As of 2008, the City of Portland reported about 392,640 covered jobs, representing 38% of the 1.02 million employment base of the 7-county PMSA. This represents a relatively nominal increase of about 3,120 jobs over a six year period in Portland. Job declines are reported across multiple sectors, including every industrial sector for which data is provided.
- Taken together, the industrial sectors report job declines averaging 2.6% per year over the eight year period (for a combined loss of 22,650 jobs), despite a brief resurgence experienced mid-decade. There was a somewhat more rapid shift away from manufacturing employment – a subset of the overall industrial sector – of 3.3% annually, equating to a total loss of 9,440 manufacturing jobs over the 2000-2008 period. It is notable, however, that the Portland region lost a smaller share of its manufacturing jobs that the nation as a whole did. In addition, the value of manufacturing output rose by more than $9 billion for the 7-county region (Figure 23). The region's manufacturing sector is growing, but is becoming less labor intensive.
- Over this eight year period, retail employment in Portland changed little – with a nominal gain of about 70 jobs.
- The growth sectors – strong enough to more than offset industrial job losses – occurred across service sectors. The sector showing the strongest growth was health and social assistance (up by 8,190 jobs), followed by management, administrative support and waste management, education, accommodation and food, and professional/scientific/technical services – with minor gains noted for arts, entertainment and recreation.
- A major portion of the growth occurring within the administrative support sector has been for temporary employment agencies. While reported with this NAICS job classification, temporary employees actually may be placed in any sector and also likely serve to offset at least some portion of the reported industrial employment decline. Also noted is that much of the growth in the management sector is likely related to business sector reclassifications with new NAICS coding coming into place between 2000 and 2008.

- Not all service sectors experienced employment growth over the past decade. Loss of 2,580 jobs is indicated through 2008 for finance and insurance, with job losses also noted for the real estate and information sectors. [3]

Data Limitations

While the Quarterly Census of Employment and Wages or QCEW (also known as ES202) data is the most comprehensive and timely source available, there are at least two important data limitations, as they may affect the portrayal of job change over time: [4]

1) Employment has been parceled out to sites for employers with multiple sites, and this process may be more or less accurate in one of the two years for which data is drawn (with a tendency towards greater accuracy in more recent years).
2) Inconsistent NAICS classification by individual firms within the two comparison years, as industry classification largely represents self-reporting by firms to the Oregon Employment Department (OED).

A second set of issues related to changing employment classification is perhaps of greater concern:

- National changeover from the Standard Industrial Classification (SIC) to North American Industry Classification System (NAICS) occurred between 2000 and 2008, leading to new classifications and an inexact bridge between the two systems.
- The net result of this change in classification systems has been to accentuate a reported shift away from the industrial sectors, as the newly added service sectors of management of companies and information both encompass firms that often were previously classified as industrial. It is unknown exactly what portion of the shift away from what is reported manufacturing is attributable to the new NAICS system.
- There is also a trend toward companies reporting more than one NAICS, with a separate NAICS assigned to groups of employees. It is likely that this greater detail has led to the reported jump in employment within the NAICS category "management of companies". This trend results in a shift away from the industrial sectors, as employment appears to be increasingly split between a company's "primary" industry (e.g. warehousing, manufacturing) and other classifications (such as management or headquarters operations), which falls within the service sectors.
- Companies self-report NAICS, and sometimes are inconsistent over time.

[3] The Information sector was established with the transition from the Standard Industrial Classification (SIC) to North American Industry Classification System (NAICS) from what were a mix of industrial and service components.

[4] Alternative data sources include the Covered Employment Statistics, a sample survey-based time series that is adjusted to match ES 202 data, and the Economic Census, completed once every five years (with a several year lag before data release and not available at a sub-regional level).

Because of these issues, sector-level changes (for instance, the reported decline in manufacturing jobs and increase in service jobs) are best understood as shifts in the nature of the region's employment rather than necessarily as job growth or decline within individual firms. Employment data should also be viewed as most reliable when summed within a geographic subarea or to broad sector groupings, rather than when detailed sector-level data is compared over time.[5]

PORTLAND EMPLOYMENT GEOGRAPHIES

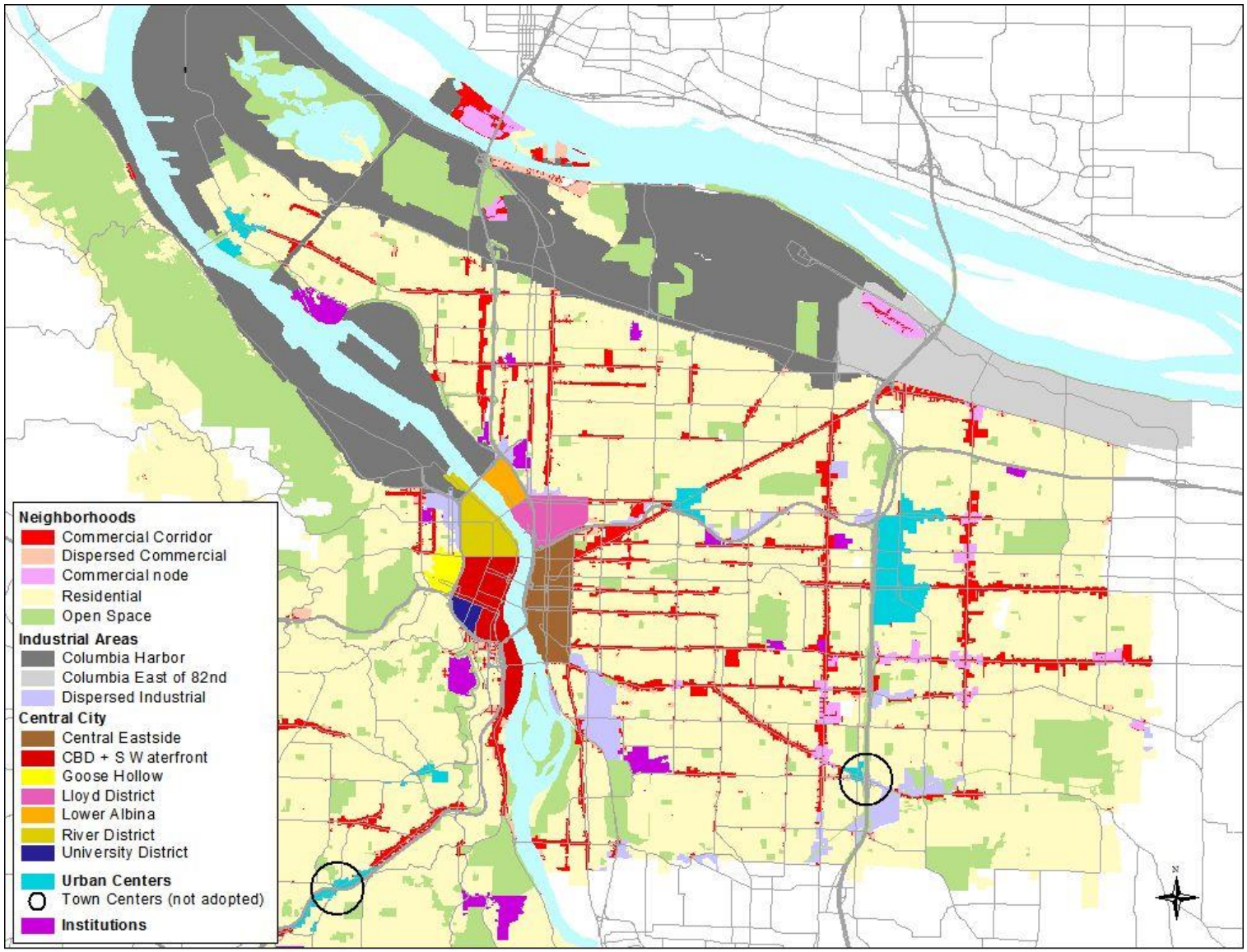
This section includes an analysis of Portland employment areas at a finer level of detail – geographic subareas that group together similar employment uses with common site characteristics and development patterns (Figures 8 and 9). Subareas are broadly grouped into categories of Central City, industrial, neighborhood commercial, institutional, and residential categories.

[5] The reliability of sector comparisons over time should also improve in the future, as more years of data and experience with the NAICS classification system take place. This will especially be the case when it is not as important to provide time series comparison with the 2000-2002 time period when much of the SIC to NAICS changeover occurred.

Figure 8. Employment Geographies

Subarea	Boundary Methodology
Central City Commercial	
CBD + South Waterfront	Central City Plan District subareas
University District	Central City Plan District subarea
River District	Central City Plan District subarea
Goose Hollow	Central City Plan District subarea
Lloyd District	Central City Plan District subarea
Central City Industrial/ Incubator	
Central Eastside	Central City Plan District subarea
Lower Albina	Central City Plan District subarea
Urban Centers	
Hillsdale Town Center	Plan District
Hollywood Town Center	Plan District
St. Johns Town Center	Plan District
Gateway Regional Center	Plan District
Lents Town Center	
West Portland Town Center	
Industrial Areas	
Harbor & Airport Districts	Industrial Sanctuary + adjacent ME comp plan designation
Harbor Access Lands	
Columbia East of 82nd	Industrial Sanctuary + adjacent ME comp plan designation east of 82nd
Dispersed Employment	Dispersed IS + ME comp plan designations
Neighborhood Commercial	
Commercial Corridors	Commercial corridors designated by BPS
Commercial Nodes	Tax lots surrounding key commercial intersections identified by BPS
Dispersed Commercial	Other tax lots in commercial zoning (auto-oriented, storefront or mixed employment)
Institutions	10 colleges and 7 hospitals with campus areas larger than 10 acres and more than 100 employees, except for Portland State University, which is included in the Central City's University District; and the Adventist Medical Center, which is included in Gateway Regional Center

Figure 9. Portland Geographic Subareas



Trend Observations by Employment Geography

Major observations from each employment geography are summarized below. As noted, submarkets are defined for each of the major employment geographies of Central City, urban centers, institutions, industrial, neighborhood commercial, and residential/open space employment activity. Added discussion of employment sector changes within geographies and accompanying graphs are located within the Demand Analysis – Data Assessment Topics section of this report.

- With 107,600 jobs, the **Central City Commercial** geography encompassed 27% of the city's job base in 2008. With a 0.1% average annual growth rate between 2000-2008, employment increased at about the same rate as employment increased citywide over the same time period.

  With nearly 66,400 jobs, the CBD + South Waterfront not surprisingly comprises the largest Central City subarea, although this core submarket experienced a loss of an estimated 3,100 jobs from 2000-08. The most rapid job growth occurred within the River District submarket (up by 2.1% per year), followed by the Lloyd District.

  Two Central City subdistricts – Central Eastside and Lower Albina – are included within the Central City Industrial/Incubator geography. These are often referred to as "incubator" rather than general industrial districts and have out-performed the overall Central City area with annual job gains of 3.2% and 2.3% per year respectively.
- **Urban centers** comprised just 5% of citywide employment in 2008 and experienced job growth averaging 1.4% per year. Of the six urban center submarkets profiled, Gateway has the largest employment base with about 9,500, followed by Hollywood at 6,500 and West Portland at 2,600.

  The highest levels of employment growth since 2000 are indicated for Hollywood and Lents Town Center, both averaging employment gains of better than 5% per year. Gateway also experienced employment growth, but at a much lower growth rate. The other urban centers experienced relatively flat to declining employment.
- **Institutions,** excluding PSU and Adventist Hospital, accounted for over 35,200 jobs in 2008 (nearly 9% of citywide employment), with job growth averaging 3.6% from 2000-08.
- **Industrial** areas comprise a total of 119,500 jobs (or better than 30% of employment citywide). Overall job growth has occurred at about the citywide average of 0.1% per year but with wide variation between districts.

  With more than 52,200 employees, the Harbor and Airport Districts geography accounts for more than two-fifths (44%) of the industrial total (or 13% of all employment citywide). The Columbia Corridor East of NE 82nd Avenue accounts for more than 19,400 jobs with Dispersed Employment at 17,200. The two Central City Industrial (or incubator) districts account for 18,000 and 3,300 jobs respectively.

  Harbor and Airport Districts report some job loss averaging less than 1% per year, with even more rapid attrition for Dispersed Employment. Job gains of close to 3% per year are noted for Columbia East of 82nd. Employment has increased 0.1% per year in all the

industrial areas combined. As noted, both the Central City incubator districts have experienced employment gains.

Harbor Access Lands are riverfront industrial lands in the Portland Harbor and along the Columbia River. As of 2008, Harbor Access Lands accounted for an estimated 9,300 jobs. From 2000-08, Harbor Access Lands experienced declining employment at a rate averaging 2.2% per year – a substantially more rapid rate of job loss than of the Harbor and Airport Districts geography. Reported employment losses were most substantial in manufacturing, followed by transportation, warehousing and wholesale trade. It is notable that a separate analysis indicates that the economic output (value added) in the Portland Harbor grew at 1.6% per year during approximately the same timeframe - 2002 to 2008. During that same time period, cargo volumes increased by 4.8% per year.[6] As discussed later in this report, employment may not be the best indicator of land needs in the harbor.

- With 70,400 jobs or 18% of citywide employment, the **neighborhood commercial** geography has experienced net job loss since 2000. Of the neighborhood-related employment activity, nearly 56% of jobs are indicated as located in Commercial Corridors, followed by Dispersed Commercial. Commercial Corridors account for the largest base of neighborhood activity with just over 39,000 jobs but lost jobs at a rate averaging 1.5% per year. Commercial Nodes (about 20 key intersections) supported 9,600 jobs in 2008 or 14% of the neighborhood-related jobs total. Taken together, neighborhood commercial areas experienced a net loss of 1,900 employees from 2000 to 2008 – coming primarily from reduced employment in Commercial Corridors. Job losses are noted for 6 out of 10 employment sectors, led by construction which decreased by more than 1,700 jobs. A countertrend is indicated for Dispersed Commercial, with close to 3,900 more jobs reported in 2008 than 2000.
- More than 38,900 jobs are reported for **residential** areas plus **open space.** The majority of these jobs are in residential areas which account for just under 10% of citywide employment. Job losses are exhibited in every employment sector, except public sector employment.

More detailed data for these submarkets is provided by the tables on the next two pages.

[6] EcoNorthwest, Portland Harbor Industrial Land Supply Analysis, February 2012)

Figure 10. Urban Centers & Institutions Employment (2000-2008)

	Central City - Non Industrial					Urban Centers						
	CBD + S Waterfront	University District	River District	Goose Hollow	Lloyd District	Gateway	Hollywood	St Johns	Hillsdale	Lents	West Portland	Institutions
Total Employment 2008												
Utilities	26	-	*	-	*	*	-	-	-	-	-	-
Construction	682	-	900	268	61	118	36	89	*	34	194	*
Manufacturing	275	*	481	*	*	150	*	*	*	*	*	-
Trans, Wareh. & Whlsle	800	*	2,478	24	341	242	46	95	5	*	36	*
Retail, Arts, Accommod.	11,033	353	4,337	1,935	5,616	2,705	950	388	286	89	292	353
Services	30,496	341	3,319	1,079	6,000	1,403	589	335	135	102	1,584	132
Information & Design	11,937	*	2,569	645	1,020	*	140	36	33	-	189	153
Education + Health	3,241	*	1,066	272	819	4,187	4,733	142	254	56	291	34,575
Public	7,740	182	95	-	1,684	487	*	*	-	*	*	-
Other/No NAICS	11	-	2	-	4	1	-	-	-	-	-	1
Total	66,365	3,925	16,162	4,444	16,704	9,514	6,513	1,313	742	324	2,605	35,234
2008 Distribution	*16.9%*	*1.0%*	*4.1%*	*1.1%*	*4.3%*	*2.4%*	*1.7%*	*0.3%*	*0.2%*	*0.1%*	*0.7%*	*9.0%*
Employment Change 2000-2008												
Utilities	(474)	-	*	-	(799)	-	-	-	-	-	*	-
Construction	(1,230)	(9)	787	10	(87)	(29)	(66)	23	4	12	140	1
Manufacturing	(576)	(26)	(672)	(186)	(39)	(13)	(25)	(3)	14	*	2	-
Trans, Wareh. & Whlsle	(1,039)	(8)	(2,495)	(139)	(435)	(628)	(22)	(64)	(27)	*	(98)	*
Retail, Arts, Accommod.	(592)	132	1,986	382	465	51	395	(50)	(133)	(11)	30	155
Services	1,732	(184)	1,538	(158)	2,672	(42)	(232)	120	24	45	(509)	36
Information & Design	(20)	*	825	(71)	13	(124)	75	6	(29)	-	(70)	(264)
Education + Health	635	222	590	(144)	(44)	995	2,147	116	(0)	56	108	8,792
Public	(1,243)	*	*	(797)	346	*	(5)	(133)	*	*	-	-
Other/No NAICS	(372)	(6)	(45)	(15)	(33)	(41)	(30)	(3)	(6)	-	(27)	(23)
Total	(3,098)	255	2,527	(1,119)	2,059	380	2,237	12	(168)	105	(429)	8,710
2000 Distribution	*17.8%*	*0.9%*	*3.5%*	*1.4%*	*3.8%*	*2.3%*	*1.1%*	*0.3%*	*0.2%*	*0.1%*	*0.8%*	*6.8%*
00-08 Annual Growth	*-0.6%*	*0.8%*	*2.1%*	*-2.8%*	*1.7%*	*0.5%*	*5.4%*	*0.1%*	*-2.5%*	*5.1%*	*-1.9%*	*3.6%*
Employment Distribution 2008												
Utilities	0%	0%	6%	0%	7%	1%	0%	0%	0%	0%	0%	0%
Construction	1%	0%	6%	6%	0%	1%	1%	7%	1%	11%	7%	0%
Manufacturing	0%	0%	3%	5%	0%	2%	0%	2%	3%	2%	0%	0%
Trans, Wareh. & Whlsle	1%	1%	15%	1%	2%	3%	1%	7%	1%	0%	1%	0%
Retail, Arts, Accommod.	17%	9%	27%	44%	34%	28%	15%	30%	39%	27%	11%	1%
Services	46%	9%	21%	24%	36%	15%	9%	26%	18%	32%	61%	0%
Information & Design	18%	0%	16%	15%	6%	1%	2%	3%	4%	0%	7%	0%
Education + Health	5%	77%	7%	6%	5%	44%	73%	11%	34%	17%	11%	98%
Public	12%	5%	1%	0%	10%	5%	0%	16%	0%	11%	1%	0%
Other/No NAICS	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Oregon Employment Department (OED), Portland Bureau of Planning & Sustainability, E. D. Hovee & Company, LLC. Agricultural jobs are not detailed. Asterisks (*) denote data not disclosed to meet OED confidentiality provisions.

Figure 11. Industrial Areas & Neighborhood Employment (2000-2008)

	Non-Central City Industrial				Central City Industrial		Neighborhoods			
	Harbor & Airport Districts	Harbor Access Lands	Columbia East	Dispersed Employment	Central Eastside	Lower Ablina	Commercial Corridor	Commercial Nodes	Dispersed Commercial	Residential
Total Employment 2008										
Utilities	*	-	-	*	-	-	-	*	-	*
Construction	3,573	571	1,830	1,527	2,227	418	1,020	64	1,959	2,800
Manufacturing	11,752	4,828	3,743	3,186	2,056	343	1,342	*	1,110	740
Trans, Wareh. & Whlsle	22,334	2,605	4,686	2,260	3,577	314	1,589	80	828	1,651
Retail, Arts, Accommod.	4,388	67	2,786	1,552	3,126	189	18,756	6,863	5,601	3,407
Services	7,257	1,186	3,606	6,017	3,118	191	8,966	1,511	5,052	7,494
Information & Design	1,127	9	888	1,484	1,406	101	2,383	154	3,160	2,277
Education + Health	849	54	559	696	1,659	*	4,881	621	3,690	17,501
Public	945	-	1,327	*	821	*	62	284	*	2,981
Other/No NAICS	2	1	4	-	2	2	25	-	13	49
Total	**52,227**	**9,321**	**19,429**	**17,183**	**17,992**	**3,254**	**39,050**	**9,589**	**21,718**	**38,928**
2008 Distribution	*13.3%*	*2.4%*	*4.9%*	*4.4%*	*4.6%*	*0.8%*	*9.9%*	*2.4%*	*5.5%*	*9.9%*
Employment Change 2000-2008										
Utilities	(15)	-	-	7	-	-	-	(15)	-	*
Construction	520	250	714	186	772	(160)	(1,347)	(60)	(323)	(1,586)
Manufacturing	(5,559)	(939)	(6)	14	(90)	(176)	(1,035)	(25)	665	(773)
Trans, Wareh. & Whlsle	(1,094)	(1,124)	1,045	(3,267)	(217)	(25)	(297)	(341)	(5)	(133)
Retail, Arts, Accommod.	425	(450)	12	(1,691)	608	23	(1,216)	(21)	1,825	(944)
Services	2,372	399	1,261	2,287	957	163	(148)	133	455	(2,073)
Information & Design	(2)	(102)	318	313	930	69	(72)	(113)	660	(601)
Education + Health	36	42	236	(173)	5	429	(434)	14	966	(537)
Public	706	*	473	(437)	821	*	(140)	*	(218)	492
Other/No NAICS	(185)	(23)	(75)	(88)	(82)	(7)	(432)	(46)	(180)	(918)
Total	**(2,796)**	**(1,977)**	**3,944**	**(2,849)**	**3,703**	**502**	**(5,132)**	**(576)**	**3,853**	**(7,078)**
2000 Distribution	*14.1%*	*2.9%*	*4.0%*	*4.9%*	*3.7%*	*0.4%*	*11.3%*	*2.5%*	*4.5%*	*11.8%*
00-08 Annual Growth	*-0.6%*	*-2.2%*	*3.2%*	*-1.8%*	*3.2%*	*2.3%*	*-1.5%*	*-0.7%*	*2.7%*	*-1.9%*
Employment Distribution 2008										
Utilities	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%
Construction	7%	6%	9%	9%	12%	13%	3%	1%	9%	7%
Manufacturing	23%	52%	19%	19%	11%	11%	3%	0%	5%	2%
Trans, Wareh. & Whlsle	43%	28%	24%	13%	20%	10%	4%	1%	4%	4%
Retail, Arts, Accommod.	8%	1%	14%	9%	17%	6%	48%	72%	26%	9%
Services	14%	13%	19%	35%	17%	6%	23%	16%	23%	19%
Information & Design	2%	0%	5%	9%	8%	3%	6%	2%	15%	6%
Education + Health	2%	1%	3%	4%	9%	46%	12%	6%	17%	45%
Public	2%	0%	7%	1%	5%	6%	0%	3%	1%	8%
Other/No NAICS	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Source: Oregon Employment Department (OED), Portland Bureau of Planning & Sustainability, E. D. Hovee & Company, LLC. Agricultural jobs are not detailed. Asterisks (*) denote data not disclosed to meet OED confidentiality provisions.

IV. DEMAND ANALYSIS ISSUES – FOCUS GROUP INPUT

A key component of this economic opportunities analysis has centered on six *demand analysis topics* of particular interest to the City of Portland with this EOA and Comprehensive Plan update. To assist with this assessment, focus groups were organized and conducted in 2009 to cover each topic area, with each group hosted by a business or community organization:

- *Central City Office* – hosted by the Portland Business Alliance
- *Close-In Incubator* – hosted by the Central Eastside Industrial Council
- *Manufacturing & Distribution* – hosted by the Columbia Corridor Association
- *Neighborhood Commercial* – hosted by the Alliance of Portland Neighborhood Business Associations
- *Commercial Corridor/Mixed Use/Transit Oriented Development (TOD)* – hosted by the Portland Streetcar, Inc.
- *Campus Institutional* – hosted by the Institutional Facilities Coalition

A total of 58 business and non-profit organization representatives participated in these six focus groups (including two who participated in two sessions). Participants are identified in Appendix A.

Focus group discussions covered recent and emerging trends, business space and location needs, questions regarding density and development, opportunities for economic prosperity and creative vitality, and economic development focus. This summary of focus group results has been organized around major themes that emerged across multiple groups in response to specific topic areas. The comments are reported without attribution of comments to specific individuals or organizations.

A separate report provides more detailed discussion of items of more particular interest within each of these six areas of demand analysis groupings (Appendix B).

SUMMARY THEMES BY DEMAND TOPIC

To summarize, Figure 15 provides an overview of major observations for each of the six demand analysis groupings covered. This chart is followed by a more detailed narrative describing focus group responses for each of the demand topics in more detail.

Figure 12. Focus Group Themes by Demand Topics

Discussion Question	Central City Office	Close In Incubator	Manufacturing & Distribution	Neighborhood Commercial	TOD/Mixed Use Corridors	Campus Institutional
Recent Trends	•Resurgent Central City office leasing has been realized (until the recession) •Tenants are drawn back in from the suburbs •Live-work options create added urban synergy	•Districts like Central Eastside are *on a roll* for diverse industry plus creative and tech oriented business •Close-in incubator space offers *grittier appeal* to young creatives	•Finding qualified labor and distance from U.S. markets are major industry issues •De-consolidation of distribution nationally with higher fuel prices works to Portland business advantage	•Neighborhood districts are finding their niche •Growth is organic and entrepreneurial •Business success depends on serving a mix of local and destination clientele	•Retail opportunity is driven by more residents moving back to the city •Diverse mixed use settings are available – Central City, mid-rise transit corridors, distinctive urban neighborhoods	•Regional institutions are investing in facility renewal to remain competitive •Locally oriented education and health care are moving closer to where clientele live or work
Emerging Trends	•Office market is becoming more diverse with entrepreneurial and sustainable business emphases •Central City has greater potential to increase its capture of the regional office market	•Businesses are *hyper-local,* serving each other and the downtown •A mix of business, from industrial to arts and dining, is supported •Desire is expressed for incubator needs to evolve naturally and organically	•Businesses draw needed labor both locally and nationally •There is a broad trend to sustainable design and business practices •A major concern is that freight transport capacity is not keeping up	•Increased area residential density is anticipated, but more infrastructure is needed •Increased orientation to the concept of a *20-minute neighborhood* is strongly endorsed	•Further intensification of development is expected with economic recovery •Successful TOD is all about reducing vehicle miles traveled (VMT) and location efficient development	•Locally-oriented education providers are decentralizing •Strong health care growth is expected to continue •Increased transit orientation of institutions is more critical with facility investment
Business Space & Location Needs	•New and alternate office locations are desired, especially close to the core •The *life cycle* of each business means changing choices over time for type and cost of space, for a more diverse office mix	•Options are desired for business condo arrangements and inexpensive space •Permitting & SDCs are cited as recurring issues with rehab of existing building space	•Increased cost of doing business is cited as a growing competitive concern for the Portland area •Maintaining the industrial sanctuary is critical for manufacturing and distribution	•Participants are *bullish* on options for increasing business vitality •More business tools/incentives together with robust planning for employment concentration are recommended	•More focus on job-related as well as residential mixed use development is encouraged •A new City of Portland job density paradigm	•Current impact mitigation process and mixed use limitations frustrate reinvestment •Affordable housing options are needed for students, faculty, workers

Discussion Question	Central City Office	Close In Incubator	Manufacturing & Distribution	Neighborhood Commercial	TOD/Mixed Use Corridors	Campus Institutional
Density & Redevelopment	•Desired are options for added density (FAR) and multi-block campus developments •A need is expressed to *think big enough* for greatly expanded jobs potential •Improving the city's business climate is cited as a priority initiative	•Streetcar extension will be the impetus for added development density •Multi-level manufacturing still exists, but widespread applicability is questionable •Code flexibility is key to maintaining close-in industrial	•Industrial site and transport needs make it difficult to exceed 35% site coverage (or FAR) •Distributors build *high-cube* space to get more product in the same building footprint •Requiring too much density may result in business leaving Portland	•Support for more housing density is viewed as generating positive business impacts •Rather than mandating commercial density, the suggestion is to *let density float* to what the market supports	•Density will come with transit service extension •More emphasis is recommended for mixed use development with a strong jobs mix •Live/work incubator opportunity is cited for as yet untapped resources (such as Gateway)	•More multi-story buildings are expected with medical; cautious interest is also expressed for higher education (out of downtown) •Increased density of development is predicated on better transit accessibility and service
Economic Prosperity & Creative Vitality	•Portland's Central City is viewed as vital to defining the *PDX brand* •PSU and housing are more important as future economic engines to Central City office vitality	•Incubator districts are integral for the centrality of a regional service supplier role •Close in business offers local networking and technology transfer capability	•Recommended is emphasis on balancing goals of sustainability and job growth •For Portland, sustainability can mean being both green and efficient	•Small business is described as the engine of the Portland economy •For increased economic contribution, offer more training for small and ethnic firms	•Portland offers the appeal of a village environment •Economic recovery depends on sustainability and greater emphasis to build *creative, tenacious minds*	•Expect institutions to remain critical as a major future job source •Higher ed and health care play a more important role in cultivating Portland area health & vitality
Economic Development Focus	•Marketing Portland as a competitive place to do business •Prioritize public investment in infrastructure and zoning flexibility	•Foster private investment in businesses, not just buildings •Restore the linkage between the City and private sector	•Prioritize multi-modal freight and worker transport infrastructure •Provide balanced support for industry with traded sector focus	•Offer improved access to resources for small business •Plan for change with less emphasis on mandates	•Foster creativity and job density on transit corridors •Re-tool the planning and zoning process •Build the urban university	•Recognized and support institutional contributions •Transition from regulatory emphasis to partnership roles

Source: Economic Opportunity Analysis focus groups conducted February-March, 2009.

RECENT TRENDS

Each focus group session began with the question: *What are the most important trends that have affected business, investment and development for your firm or organization over the past 3-5 years?*

Portland had been a dynamic place to be conducting business up to the point of the economic downturn starting in 2007-08. Major themes emerging from the six focus group conversations include the following:

- *Central City* office has, in recent years, experienced a resurgence of leasing activity (with the economic downturn only recently beginning to be felt). Some tenants have been drawn back in from the suburbs by the vitality and transit accessibility of the urban core, Portland is attracting and growing the sustainability industry, and the core area has benefited from the synergy of providing options for housing and work in close proximity.
- *Close-in incubator* areas (notably Central Eastside) have also been on a roll – but in a "grittier, more Portland" setting that is now home to businesses ranging from open source tech to distributors/brokers to destination retail. How to accommodate parking and diverse freight versus people transit is cited as the #1 issue. Bus and bike access is ever more important.
- *Manufacturing and distribution* firms of Portland's harbor and Columbia Corridor have found that obtaining qualified workers is a growing challenge, even in a time of economic downturn. The Pacific Northwest is still a small market; getting to market is a competitive challenge and competitors are primarily out of state. Distribution may be deconsolidating to more and smaller centers across the U.S., offering added market activity for Portland.
- *Neighborhood business districts* are finding their niche and for some (like the Pearl and Mississippi) the niche has rapidly matured. Portland is still "under-retailed, national chains want in." Much of the city's neighborhood business development has taken off on its own. The "coolest stuff is organic," responding to local entrepreneurial initiative and often "happened in spite of government." While businesses often start by serving a primarily local neighborhood clientele, success means that customers increasingly are "not from the neighborhood itself" but also drawn from the rest of the city and region.
- *Mixed use/TOD* discussion paralleled much of what was heard with neighborhood business districts. From empty nesters to young professionals, people are coming "back to the city." Portland's resurgence is based on residents "coming for character and texture" with diverse options ranging from high-rise Central City districts to mid-rise transit corridors to distinctive urban neighborhoods. "More rooftops" with greater discretionary income has served to drive much of the growth with in-city retail and dining – at least up to the time of the recession.
- *Campus institutional* activities are identified as primarily including education and medical institutions (outside Portland's Central City). Some nationally recognized education institutions in Portland face substantial reinvestment aimed at "renewal of facilities" to better meet science and technology needs and house more students (or faculty) on or near campus.

Locally oriented higher education institutions are increasingly focused on training for specific workforce needs – from nursing to welding – and look for locations and partnerships to get closer to the neighborhoods where the students are or will be. Similarly, medical institutions are looking to medium and smaller size facilities closer to where people live or work (including preparation for an aging demographic).

EMERGING TRENDS

The next question asked participants to look toward the future: *What do you see on the horizon as potentially important emerging trends for employment growth or change?* Participants were asked to comment on the next 3-5 years through a period of recovery from the current economic downturn and then beyond over the next 10-25 years (to 2035).

From virtually every group, the overarching theme is one of change. Portland's economic opportunities can be expected to be different in 2035 than they are today. Even as of 2009, the outlook appeared promising, provided that economic recovery proves sustainable and that the City and region respond to shape this change in ways that keep Portland competitive for added investment and employment:

- *Central City office* specialists see the market becoming "more diverse" with increased emphasis on serving and stimulating business entrepreneurs, including those in the still expanding sustainability sector. Much of this need for lower cost and more flexible space is expected to be met on the fringes of or outside of the Central City, in places such as the Central Eastside and Gateway. Assuming that metro urban growth boundary expansions continue to be limited, the Central City and other Portland locations can be expected to compete for increasing shares of regional office employment. Resurgent commuter interest in transit dovetails with and buttresses this trend. As one focus group participant said: "Now we're going to have to perform."
- *Central Eastside/close-in incubator* interests express a wide range of thoughts. Some see more restaurants, craft businesses, theaters, and smaller 2-story infill. OMSI and some private owners have large multi-block holdings that could redevelop once land prices go high enough to support redevelopment. Some strongly suggested that the district should be supported as zoned.

  The assumption that manufacturing will go away to be replaced with the creative class "is flawed." Because of proximity to the rest of the Central City, vendors are "hyperlocal." Doing business with neighbors next door or across the river downtown is part of the business culture. A common theme expressed is to not pick business winners; rather let this incubator environment "evolve naturally and organically."
- *Manufacturing and distribution* focus group participants see continuing impetus to draw from both within and outside the Portland labor market for needed workforce skills and experience. More sustainable building design and business practices also are a priority – affecting stormwater management, air quality, transportation efficiency and internal heating, ventilation and air conditioning (HVAC) systems. A major concern is that freight transport capacity is not keeping up – due to rail networks operating at capacity and increased local freeway and street congestion.

- *Neighborhood business districts* see their communities generally becoming more densely developed with added planning to "identify necessary infrastructure" as an increasingly important focus. The concept of a "20-minute neighborhood" radius for walking to achieve a broad range of day-to-day needs is strongly endorsed. Much of what happens within these business districts depends on neighborhood demographics and housing development including anticipated trends for smaller houses.
- *Mixed use corridors and transit oriented development* can expect to intensify with economic recovery. As with neighborhood business districts, much of the development potentially can be expected to be residentially driven – at somewhat higher levels of density. For the next half century, TOD is about reducing vehicle miles traveled (VMT) – creating location efficient mixed use real estate opportunities.
- *Campus institutional* users see the need to think "more broadband" with more evening and weekend classes closer to where students live and/or work for work force oriented educators. Health care providers expect "tremendous growth" over the next five years and new partnerships with educational institutions.

  Access to public transportation is a shared objective, with many of the institutions not currently well served by transit. Students at local colleges want to be able to commute into downtown; others (such as nursing students) go all over the city for work experience and rely on auto travel. To the extent that transit mode share can increase, needs for expensive (and increasingly structured) parking can be reduced.

BUSINESS SPACE & LOCATION NEEDS

This question and resulting discussion was aimed to better understand: *What are the most important requirements for business success at this type of location in Portland?*

Not surprisingly, space and location needs expressed through these focus group sessions were relatively diverse. However, common themes that emerged include opportunities for more mixed use and density with commercial-related uses versus strong desire for protection of more traditional manufacturing and distribution activity. More detailed notes follow:

- *Central city office* interests would like to seem more blocs of developable land – including at new or alternate locations close to the downtown core. For example, if the Vestas office project happens, it can be expected to draw added interest for office development to South Waterfront. Other opportunities may include sites at the edge of the River (Pearl) District and Central Eastside. EX employment or similar zoning is viewed as pivotal –offering a greater range of mid-rise development options. The Central Eastside (MLK to the waterfront) is cited as perhaps the "hottest market," Portland's new location for digital jobs.

  Incentives were discussed but not widely embraced for office development. Suggested instead: "Don't give me money, give me infrastructure."

  The life cycle of a business can involve several phases of space use – starting with funky, low cost creative space, transitioning (for some) to more traditional Class A office as the business matures. An emerging trend (not yet captured) in Portland is for business owned buildings, whether condo or stand-alone.

Proximity to work-force housing and residential amenities including schools is also seen as key to which office locations offer the best bets to prosper. One focus group participant put it this way: "if there were a decent elementary school, I'd be living (as well as working) in downtown Portland now."

- *Close-in incubator* focus group participants also cite the as-yet unmet opportunity for business condos. The ability to rehab a former warehouse as inexpensive shell space fits a definite tenant need; the Central Eastside can expect more success "if downtown fills up." Permitting and SDCs with reuse of existing space are cited as definite issues, to the point of keeping "Portland at a competitive disadvantage." Particularly problematic code issues cited include seismic retrofits, sidewalk standards, and needs for greater consistency and predictability in the permitting process.
- *Manufacturing and distribution* firms cite costs of doing business as a competitive concern with doing business in Portland. Costs include water/sewer rates and absence of performance based tax incentives for employers rather than for development. In the words of one participant: "Oregon doesn't even get the short look." Maintenance of the industrial sanctuary and limiting residential encroachment is viewed a pivotal – for reasons including maintenance of plant safety and security. Firms want a more solid and proactive message linked to work force opportunity in traditional industry: "We don't tell our story very well."
- *Neighborhood business district* participants are generally "bullish" on opportunities for increasing business vitality. Small business needs tools for storefront improvements and commercial development, tools to "really make our place special." PDC storefront loans and access to incentives/tax breaks are identified as desired. Interest is also expressed in a more "robust" planning process. A plan that is "set in stone doesn't work."
- *Mixed use and transit oriented development* should begin to focus more on employment as well as residential development potential. One focus group participant commented that employment policy is as crude today as housing policy in Portland once was – with not much changing since the 1980s. With this focus group, continuation of the current industrial sanctuary policy has been called into question. Recommended is that the City adapt to a paradigm for more concentrated employment.

  Noted as an example is computer chip manufacture in a multi-story setting in Hong Kong. Codes. Live/work development should be adapted to allow occupants to live "and/or" work on site as long as fire/life/safety requirements are met.
- *Campus institutional* users express frustration with the Impact Mitigation Plan (IMP) provisions of conditional use and/or institutional/residential zone requirements for project approval. Specifically cited as a concern limiting mixed use opportunity is the prohibition on commercial use in excess of 30% – a constraint on medical offices and/or on-site retail. Colleges are not an allowed in a commercial zone. Stated as a desire would be the creation of a higher education zone or perhaps a form-based code placing emphasis on characteristics and performance of development rather than use.

  Also noted is a desire for an affordable/workforce housing policy in conjunction with institutional uses. Suggested is City initiative for a more streamlined permitting process, perhaps offering a central point of contact for larger projects.

Portland's land use and permitting process received considerable discussion throughout all of the focus groups. Two themes of importance emerged: a) the desire for more flexibility to better respond to specific business or needs; and b) the desire for a more predictable and faster approval process. Recognizing that these two objectives can be in conflict with each other, one suggestion was to offer a two track approach: assurance of rapid-fire review and approvals for the standard project with the option for a very flexible but admittedly longer review process for the non-standard or pioneering application.

DENSITY & REDEVELOPMENT

The City and metro area have placed increased emphasis on building up rather than out as a means to better realize objectives for community livability and containment of urban sprawl. The question posed is: *In terms of market and financial feasibility, how viable are (varied) options as possible priorities with the next update of Portland's Comprehensive Plan?*

Some group discussions were asked and/or addressed this question more directly than others. While opinions are varied, this topic received thoughtful discussion with regard to the practical implications and mechanisms for growing up rather than out:

- *Central City office* developers, brokers and businesses reported increased pressure to go up again – not just in the downtown core but elsewhere in the Central City and beyond. Old Town should be prepared for higher buildings, but getting transfers of development rights (TDRs) is a "hassle." Another stated need is for sites that could accommodate large employer campuses. In the words of one participant, "we don't think big enough." While incentives do not appear to generate broad support, there is interest in marketing and related initiatives to "make the business climate more appealing."

  For nearby districts like Central Eastside, something like a 4-5 story cap might make sense to assure that each office product serves a distinct market niche. Also identified as having longer term office development opportunity is Gateway, based on proximity to affordable workforce housing.
- *Close-in incubator* opportunities also exist for higher density, even possibly for some manufacturing uses. The Pratt and Larson tile company is cited as an example of a manufacturer operating on more than one floor. Firms may be more willing to do multi-level industrial if they can set up cost-effective systems to get the product in and out. Greater flexibility on city code requirements – as for seismic and sidewalk standards – would also be required. Streetcar extension is expected to provide further impetus for greater density of employment. More supportive infrastructure will be needed – perhaps with MOUs for City investment much as happened in the Pearl and South Waterfront areas.
- *Manufacturing and distribution* areas of the Portland Harbor and Columbia Corridor see it challenging to exceed 35% site coverage if functional on-site parking and transportation (freight handling) capacities are to be adequately provided. The concept of industrial density is termed an "oxymoron" by one participant. There is concern with industries getting land-locked if site use is pushed too far. However, some distribution firms are going to higher cube space with up to 40 foot ceilings and high-rack distribution systems.

As one participant said, if density "economically makes sense, industry will do it." However, pushing density and industrial prices too rapidly could cause some firms to relocate from the Portland area.

- *Neighborhood business district* representatives indicate support more nearby residential density to support continuing commercial revitalization. Rather than mandating commercial density of development, the suggestion is to "let density float" to what the market will support. Another suggestion: "Give corridors the highest degree of flexibility."
- *Mixed use and transit oriented development* interests express strong support for increased density of development along and near transit. Specifically emphasized was greater attention to increased employment as well as housing and retail with mixed use development. Areas of Portland like Macadam that were developed with low-rise suburban densities could go from FARs of 2:1 to 3-4:1. Gateway was seen as an as-yet untapped resource with similar density potential – described by one participant as perhaps the "nation's largest live/work" opportunity.
- *Campus institutional* participants also expressed interest in greater density of development, a phenomenon already occurring with medical facilities. Colleges have approached this topic more cautiously due to concerns over student, alumni and neighborhood appeal. However, interest was expressed in considering more height if it is not overly visible and accompanied by better transit service. As was indicated for one institution, the question is: how does one "build a six-story building in a neighborhood?"

ECONOMIC PROSPERITY & CREATIVE VITALITY

As part of the Portland Plan process now underway, a critical issue and question is: *How can we position Portland in the world economy to remain a prosperous city, building on our competitive strengths and core values of equity and sustainability?*

This question was read verbatim in all of the 2009 focus group sessions. It is probably not surprising that each demand group can lay claim to its sector's importance to the future economic and creative vitality of the city and region. A key challenge for the plan updates may be how to harness these diverse activities into a coherent whole capable of enhancing Portland's economic prosperity and sustainability:

- *Central city office* participants noted that every healthy regional economy is accompanied by a strong Central City. What's more, the downtown, Pearl and SoWa are integral to the "Portland brand" – a city known for being comfortable, walkable and emphasizing quality of life. Enhancing the brand appeal requires strengthening the reputation of Portland State University as an "engine" of economic development.

  Also emphasized: "Get more mixed use downtown." Mixing in more residential with added building height and FAR capability is seen as pivotal to further strengthening of both retail and office competitiveness in Portland's Central City.
- *Close-in incubator* functions at the edge of the Central City are viewed as serving an integral economic role by facilitating the flow of goods and services citywide and regionally. Because it is increasingly challenging to pick the economic winners of the

next economic cycle, keep the district "malleable." In the words of another participant, because Portland does not have internationally tech education, "we are the sponge" providing the tech know-how and knowledge transfer capacity both in times of prosperity and even during the current downturn.

- *Manufacturing and distribution* firms of the Portland Harbor and Columbia Corridor place primary emphasis on balancing the twin goals of sustainability and added employment. Maintain the integrity of the industrial sanctuary; invest in the function of this area as the region's transportation and freight hub. A reminder: "Sustainability means more than green, it also means efficient."
- *Neighborhood business districts* see small business as the "engine" of the Portland economy – especially in a community that values quality of life as well as job growth. The public sector should be "more opportunity seeking." Rather than competing for large employees in a globally incentivized market, focus on a different strategy emphasizing training for small business. To contribute more, small business needs strengthened advocacy – both mainstream and especially ethnic firms.
- *Mixed use and transit oriented* development is pointing the way in Portland to a greener and more prosperous economic future. One focus group participant said that this is "one of the few places in the U.S. to be sustainable." Another observed that: "People want back into the village environment." And this: "Portland – we're more of a brand than we think we are."

  In the absence of major economic drivers, the region has no clear idea how people employ themselves today – the "market is always ahead of us." The composition of the economy is likely to be totally different again in 20 years – in ways that are as yet not readily determined. While a lower level of economic activity might be expected for much of the next decade, the region will be healthy again in 10 years if it emphasizes "creative, tenacious minds." Encourage industry to be more sustainable – looking for green opportunities not only in design but also business operations.
- *Institutional* uses are expected to be "critical" as an increasingly important source of employment in the future. Higher education and health care together play an increasingly important role in cultivating community health and vitality – both with an aging population and as a source of drawing new talent into Portland. Institutions are also proving to be leaders with green design – increasingly committed to achieving LEED standards with new buildings.

ECONOMIC DEVELOPMENT FOCUS

The final question asked was intended as a means to recap and summarize the focus group sessions: *What do you see as the single most important action that the City of Portland can take for improved business and employment opportunity with this Comprehensive Plan update?*

Unlike the other questions that involved open discussion, participants in each group were asked to identify their top suggestion on an individual basis – going around the table one-by-one. Not surprisingly, a wide range of suggestions were received. However, these responses appear to have fallen into a few major categories. Some were mentioned in virtually every group, while

others were identified less frequently albeit were of significant importance in a certain specific demand issues.

Mentioned Most Frequently:

- Need for greater regulatory flexibility better tailored to unique needs of individual businesses and/or business demand groupings (important across all six focus groups).
- More clearly demonstrated recognition of the contribution of business to Portland's vitality – a change from regulators to partners – asking "what can we do to help" (a theme expressed across all but the TOD/Mixed Use Corridors group).
- Greater City emphasis on cultivating business opportunity in Portland – with active marketing but without "picking winners" (a theme across all but the institutional group).
- Need for better business access to resources, incentives and/or tax structure reform – ranging from desired reform of the business income tax, to loan/incentive programs for small business to a point person/advocate for business in City Hall (identified by in some fashion by all but the manufacturing and distribution group).

Mentioned Less Frequently (but important with some focus groups):

- Investment in multi-modal transportation, utility and livability infrastructure for business competitiveness and density (of importance for Central City office, manufacturing and distribution, neighborhood commercial and campus institutional).
- Setting aspirational goals that are City-driven but with regional cooperation – getting Portland "back to a visionary place" (important for Central City office, neighborhood commercial and TOD/mixed use corridors).

V. DEMAND ANALYSIS ISSUES – DATA ASSESSMENT

Focus groups were intended to provide a qualitative assessment of recent and emerging trends as well as opportunities for future job development in Portland. The qualitative review is supplemented with a more quantitative, data driven assessment of recent trends and current conditions. Taken together, the quantitative and qualitative assessments are intended to better inform the determination of future opportunities and employment forecasting for subsequent phases of the Portland Plan process.

Demand topics considered with this more in-depth data analysis are similar to those of the focus groups, organized to cover:

- High rise office development
- Incubator & manufacturing districts
- Neighborhood commercial districts
- Institutional development

Incubator and industrial/manufacturing activity are reviewed together. Transit-oriented and mixed-use development is considered in conjunction with both high-rise and neighborhood commercial. As employment data has now been updated from 2006 (with the 2009 draft EOA) to 2008 (with this report), all data as well as related focus group perspectives provided with this demand analysis discussion is now as of the 2008-09 time period.

A. HIGH RISE OFFICE DEVELOPMENT

This topic is concerned with the extent to which high density central city product can be expected to grow over the forecast period, and the extent to which similar product will be realized outside of the Central City. The guiding question of this analysis is: *What is the demand for high density office product?* Questions that inform this central theme include:

- Where has high rise development occurred in the recent past?
- What has been the historic pace of new development and absorption of higher density office products?
- What areas of the region outside of the city are competing for dense products/top rents?
- How has employment changed within districts zoned for high rise development?

Location Trends: Mid-High Rise Office Development

The City of Portland's mid-high rise product (focused on development of 4+ stories) is still very much clustered within the Central City: the downtown, River District and Lloyd District. The Central City has supported 28 newly constructed 4+ story buildings over the past 20 years, and the renovation of an additional 43 buildings. Outside of these districts, recently constructed buildings of this size are more limited: eight mid-high rise buildings have been newly constructed and 11 renovated.

Non-Central City Office

Since 1990, office development or renovation of more than four stories outside Portland's Central City area are dispersed (Figure 16). However, all but two buildings fall within neighborhoods adjacent to the downtown and Lloyd District: Northwest, the Central Eastside (which has primarily seen renovations rather than new construction), North Macadam and the Adidas headquarters buildings near Swan Island. Outlying buildings consist of one four-story southeast medical building (at the Clackamas County border) and one four story mixed tenant office product at Airport Way.

Of the newly constructed (versus renovated) buildings, half are classified as Class A and half as Class B office product. The only buildings served by structured parking, however, are medical and corporate headquarter campus (Adidas).

Both multi-story development and either structured parking or reduced parking ratios are necessary to increase the employment capacity of Portland's land base. Without structured parking, even high-rise buildings will not achieve greater land efficiency as typical office parking provisions allow for roughly an equivalent square footage in parking as is provided in building space. Reduced parking ratios represent another approach to increasing efficiency of site utilization, but this is only achievable in areas that are well served by transit.

Figure 13. Non-Central City Office Development 4+ Stories (post 1990)

Year Built	Building Name	Use	Stories	Building Class	Parking	Building Address	Avg Weighted Rent	Rentable Building Area
Outer Southeast								
2008	Mt. Scott Professional Center	medical	4	A	surface	9300 SE 91st Ave	$30.00	52,500
Inner Southeast								
2003	Central Eastside Office Blding	mixed	4	B	surface	3611 SE 20th Ave	$20.00	20,000
1952/2007	RiverEast Center	mixed	4	B	surface	49 SE Clay St	NA	100,800
1928/2003	The Weatherly	mixed	12	B	surface	516-540 SE Morrison St	$21.00	69,900
1925/2004	Eastbank Commerce Center	mixed	4	B	surface	1001 SE Water Ave	$15.99	60,000
1920/2007	Olympic Mills Commerce Center	mixed	8	B	surface	107 SE Washington St	$18.15	108,300
Inner NW								
2005	NW Cntr for Orthopedics & Rehab.	medical	4	B	mixed	1515 NW 18th Ave	$24.00	33,300
2000	CNF Campus: Ad Tech 2	corporate HQ	5	A	surface	2055 NW Savier St	$25.50	248,200
1900/1998	Bridgetown Bldg	mixed	4	C	surface	1631 NW Thurman	$24.00	67,300
Inner North/Northeast								
2002	Adidas Village: Rome Blding	corporate HQ	4	A	structured	5055 N Greeley Ave	NA	67,300
2002	Adidas Village: Chamonix Blding	corporate HQ	4	B	structured	5055 N Greeley Ave	NA	54,000
1960/2002	Adidas Village: Athens Blding	corporate HQ	6	A	structured	5055 N Greeley Ave	NA	147,000
1960/2002	Adidas Village: Mexico City Blding	corporate HQ	4	B	structured	5055 N Greeley Ave	NA	22,200
Outer North/Northeast								
1996/2006	One Airport Center	mixed	4	A	surface	7700 NE Ambassador Pl	NA	73,300
Inner Southwest								
1989/2008	River Forum II	mixed	4	B	surface	4386 SW Macadam Ave	$24.50	38,600
1985/2004	River Forum I	mixed	5	A	surface	4380 SW Macadam Ave	$24.49	145,700
1996	PCG Corporate Center	corporate HQ	4	B	surface	4650 SW Macadam Ave	NA	41,400
1982/1991	ADP Plaza	mixed medical	4	B	surface	2525 SW First Ave	$24.60	180,800
1979/1991	Raleigh West Executive Bldg	mixed	4	B	surface	6443 SW Beav Hillsdale Hwy	$17.00	56,900

Source: CoStar March 2009, E. D. Hovee & Company, LLC.

Urban Centers Office

Portland's eastside urban centers (Hollywood Town Center and Gateway Regional Center) have supported a cluster of mostly three story buildings but very little new office construction and no Class A office product. Only two new office buildings have been constructed in Hollywood since 1981: the Providence Healthcare building and a small amount of leasable space associated with a new multi-story 24 Hour fitness club. Older multi-story office product is largely leased to medical users.

Medical/health care activity also appears to be the driver for Gateway office development. Two new medical buildings have been constructed since 1990 and one small (18,000 square feet) mixed-tenant building. Medical users – like educational institutions – are now a pivotal driver in many non Central locations, as they can support higher rents, are often concerned with conserving land for future expansions, and are interested in dispersing to serve both population growth areas and areas currently underserved.

Figure 14. Centers Office Development 4+ Stories

Center	Building Name	Building Use	Stories	Building Class	Building Address	Average Weighted Rent	Rentable Building Area
Hollywood Town Center							
1927/2007	K-2 Building	mixed	4	C	4152 NE Sandy Blvd	NA	26,000
2006	Phase I		3	B	4218 NE Halsey St	NA	76,400
1981	Hollywood Professional Bldg		3	B	3939 NE Hancock St	NA	19,200
1970	Building B	medical	3	C	5228 NE Hoyt St	NA	19,700
1966			3	C	3835 NE Hancock St	NA	10,200
1965	Providence Medical Office Build	medical	3	C	545 NE 47th Ave	$34.00	32,200
1947	Hollywood Square		3	B	1827 NE 44th Ave	$14.50	26,800
1941		medical	3	B	1235 NE 47th Ave	NA	178,200
1923		medical	3	C	2106 NE 47th Ave	NA	2,800
Gateway Regional Center							-
2008			3	B	11006 SE Division St	$21.00	18,000
2007	Oregon Clinic	medical	4	B	1111 NE 99th Ave	NA	101,600
1994	Gateway Medical Plaza	medical	3	B	10535 NE Glisan St	$29.57	23,100
1988	Multnomah Plaza		3	B	305 NE 102nd Ave	$18.18	46,600
1987	Columbia East Bldg		3	B	10011 SE Division St	$15.00	32,200
1979	Lincoln Bldg		3	B	9955 SE Washington	NA	25,300
1967	Parkway Plaza Professional Bldg	medical	3	C	10105 SE Division St	NA	8,900

Source: CoStar March 2009, E. D. Hovee & Company, LLC.

Office Drivers

Focus group participants suggested that proximity to both housing and retail is increasingly pivotal to attracting new office investment. The success of the Pearl and the River District is widely attributed to the mixed use environments of these districts – first for residential and more recently as a premier office address. These areas realized over one million square feet of office development from 1990-2009 as well as the bulk of newly development residential units.

The downtown, however – which supports less market rate housing – realized over 2.8 million square feet of office development over this time period, a greater volume although a significantly smaller rate of growth compared to the existing building stock. Lloyd District realized just under one million square feet of new development. One-quarter of the square footage developed within these areas was driven by institutional users (public and education).

Beyond housing, recent themes in office development activity include the Central City streetcar alignment, availability of low-cost historic building stock and institutional end-users. Only 13 office buildings of four or more stories have been developed in the city since 2000. Three of these were multi-tenant towers built in 2000 – 2002 (in the CBD, Lloyd and River District). Four additional buildings were developed by end-users (three for corporate headquarters). Of the six remaining buildings, four are 50,000 square feet or fewer. Other than updates that regularly occur within the office building stock, investment in renovated office product has focused on lower cost buildings in transitional districts such as Old Town and the Central Eastside.

Figure 15. Citywide Office Development Since 2000

	Development Post 2000		
Geography	New Construction	Renovation	Description
River District	3	6	New: 1 smaller flex, 1 mid-sized office property in 2008-2009 along streetcar; 1 new Brewery Block tower in 2002. Rehabs include the Brewery Blocks, Old Town's Creative Services Center (public), U of Oregon's White Stag renovation and an update to an Old Town tower.
Gateway	1	0	Mid-sized medical
Downtown	3	18	New: 1 smaller office condo along streetcar, 1 built for non-profit end-user, 1 tower in 2000. Renovation: largely upgrading of historic properties already in office use.
Lloyd	1	0	1 tower in 2001
Close-in	4	0	1 smaller medical, 3 corporate headquarters buildings
Central Eastside	1	4	Renovation of three mid-sized former industrial buildings into office/flex use and update of 1 mid-sized office tower. New: 1 smaller multi-tenant space in industrial area
Hollywood	0	1	Small historic office rehab
Airport Way	0	1	Update of mid-sized office
John's Landing	0	2	Small and mid-sized office updates
Total	13	32	

Source: CoStar, E. D. Hovee & Company, LLC.

In general, office development has not been significant over the past decade. Larger towers were only recently (as of 2009) being initiated again and exclusively within the CBD: the ZGF tower, the Morrison Bridgehead project and Park Avenue West.

Density Realized vs. Zoned

The following map illustrates building square footage, per site, as a percentage of total square footage allowable by zone (base zone, without bonuses). This is displayed to inform conversations on whether zoned capacity should be increased in any areas.

Only Central City subareas, key commercial corridors and the Northwest neighborhood are identified as being developed at more than 10% of zoned capacity. The largest density of taxlots in which development approaches zoned capacity appears to be within the Northwest neighborhood, west of I-405 and north of Burnside.

Comparative Development Feasibility

High rise development typically is associated with a rent or price premium. The caveat to this would be renovation of historic buildings which may have originally been designed for office, warehouse or some other use. Available data indicates that the top tier of office rents is above $26 per square foot (as of 2009), down from a peak above $30 in 2006 and paradoxically below what is required to support market rate high rise construction despite office towers recently constructed or planned.

Other areas that have succeeded in attracting top of the market rents beyond Portland and include:

- St Vincent's Providence Medical Center (Hwy 26/Beaverton)
- Kruse Way (Lake Oswego)
- Cascade Park (east Clark County)
- Dispersed product in outlying southwest (Tigard, Tualatin, Wilsonville)

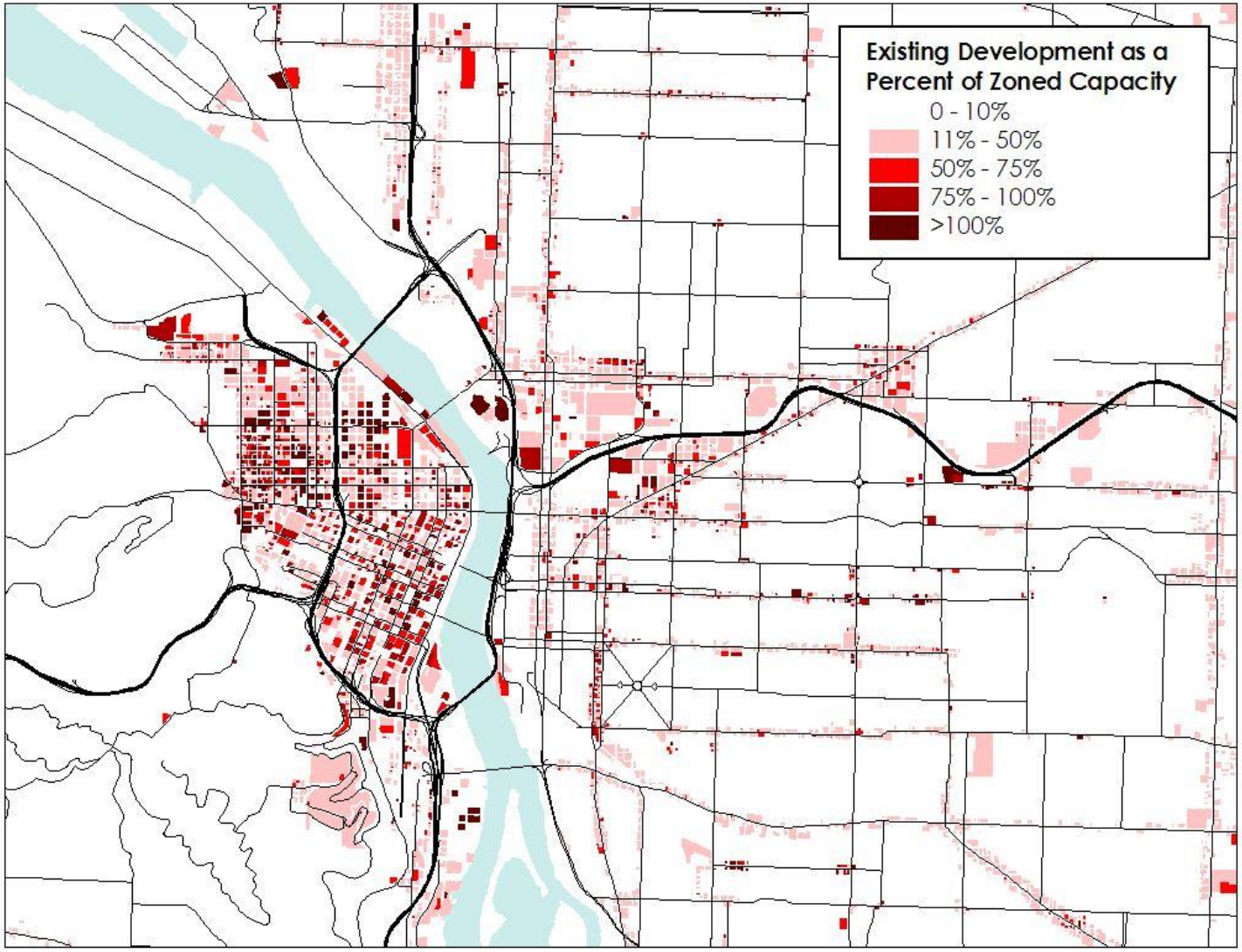
As of 2008, however, Portland's Central City still encompassed more than half of the region's total office product and close to 60% of its Class A office product. Continued investment in new buildings and reinvestment in Portland's historic building stock is expected to continue over the 25 year forecast period.

Portland has successfully retained a critical mass of employment activity within its historic core and thus far at least limited the development of major competing fringe centers. Kruse Way would be the primary exception, but remaining land within that office cluster is now relatively limited.

However, future high rise construction within the City of Portland will increasingly compete with office clusters located elsewhere throughout the region. There is recent evidence of an emerging trend for a more dispersed pattern of office center development, Class A office development since 2000 has been fairly equally dispersed throughout the region, with Portland's Central City capturing about one-third of new construction.

Midrise construction and renovation of office space appears to be the primary Central City opportunity to compete for a larger share of the regional office space market, according to a 2011 study by ZGF and ECONorthwest (*Cost Competitiveness of the Central City*). Comparing office tenant types by their location preferences, the types that were found most likely to shift to or away from the Central City are "cost conscious" tenants motivated primarily by rent levels and "urban character" tenants especially in creative services attracted by urban amenities. The study compared the cost competitiveness of Central City and suburban locations for five development prototypes, finding higher Central City development costs for each prototype. Cost gaps could

Figure 16. Existing Development as a Percent of Zoned Capacity



Source: Portland Bureau of Planning & Sustainability, E. D. Hovee & Company, LLC.

be overcome by a range of location incentives or amenities for developers, office tenants and office employees. The study distinguishes the high-density core and mid-density edge areas of the Central City, and the latter appears best suited to compete in these expanding office markets.

EMPLOYMENT TRENDS WITHIN PORTLAND'S URBAN GEOGRAPHIES

Job change is the final lens used to gauge current and potential demand within Portland's mid and high-rise districts. These *urban geographies* include the Central City districts (both non-industrial and industrial/incubator) plus urban centers outside the Central City area.

2008 Employment

In 2008 there were nearly 108,000 jobs within the primarily commercial areas of the Central City, with another 21,000 jobs in the Central City incubator/industrial districts of the Central Eastside and Lower Albina. The majority of Central City jobs – over 66,000 – have been situated within the Central Business District (including South Waterfront). In terms of job numbers, the Lloyd District is the second largest subdistrict which is approaching 17,000 jobs followed closely by the River District at just over 16,000.

2000-08 Employment Change

Both in and outside the Central City, the service sector has dominated Portland's job gains from 2000-08. This pattern has held for traditional commercial areas as well as the city's industrial districts.

Industrial areas accounted for 9,000 (or 28%) of the net citywide gain of over 32,000 service sector jobs. Much of the demand for service sector employment within industrial districts is being accommodated by 1-2 story rise business park and flex space, rather than by traditional multi-level office buildings.

As noted, at least some portion of the service sector job growth reported with employment data for industrial areas likely represents reclassification of industrial employment to service sector activities. For example, within the management sector (newly created with NAICS) which included holding company and corporate activities, reported employment more than doubled from 6,800 to 14,600 jobs; a portion of this increase is undoubtedly due to industry reclassification.

The major drivers of office demand in mid and high-rise office districts for Portland's urban geographies vary somewhat by district. Significant changes occurring between 2000 and 2008 are noted as follows:

- Within Portland's CBD (including South Waterfront), service sector employment increased by more than 1,700 jobs over this period, with another 635 jobs added in education and health services. These gains were not adequate to offset a net CBD job loss of nearly 3,100 jobs.

- The River District experienced a net gain of more than 2,500 jobs from 2000-08, with office-related job gains concentrated in services (+1,500), information and design (+825), and education and health (+590) – offset in part by net loss of industrial employment with legacy manufacturing and transportation, warehousing and wholesale firms. Strong growth of non-office employment (+2,000) is also noted for Pearl District activity in retail, arts and accommodations (including dining).
- Portland's Lloyd District also realized a substantial reported net job gain (up by more than 2,000). This was led by gains of office-related service sector jobs (+2,700), partially offset by some loss of industrial job base.
- Goose Hollow reported nominal employment growth in construction with job losses in nearly ever other industry sector, for a total employment decrease of 1,100.
- Of the non-Central City Commercial geographies, Hollywood is noted for the largest employment gain (over 2,200), indicated as being primarily related to education and health (+2,150).
- While overall employment increased only nominally in the Gateway area, strong growth was indicated for education and health (up by almost 1,000 jobs), offset by losses in a number of other job categories.
- Other urban geographies – including the University District in the Central City and other Urban Centers of St. Johns, Hillsdale, Lents, and West Portland – appear to have experienced very little job change over the 2000-08 period.

Figure 19 depicts the components of employment change across each of Portland's urban geographies from 2000 to 2008.

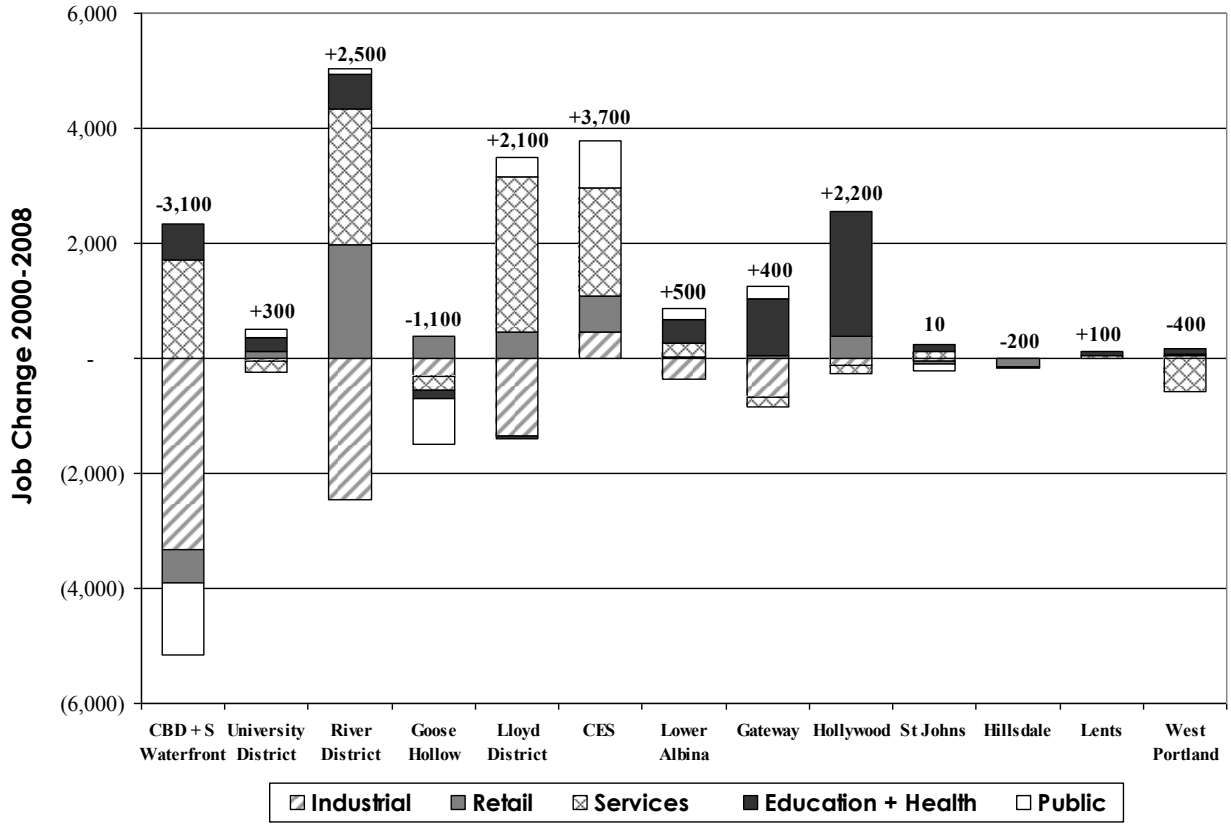
Employment Mix

Portland's urban geographies differ not only in terms of recent employment gain or loss, but also with regard to the 2008 mix (or distribution) of employment:

- Approximately 46% of CBD employment is comprised of service businesses (ranging from professional to financial services), with 17-18% each in sectors of information and design and retail, arts and accommodations activity and 12% in the public sector. Together, these functions account for 92% of CBD employment.
- River District employment is relatively diverse, with retail, arts and accommodations accounting for 27% of employment, followed by services (at 21%), then information and design (16%), and with a still significant (15%) portion in transportation, warehousing and wholesaling activity.
- Services and retail (including arts and entertainment) account for about 70% of the Lloyd District employment.
- Central City incubator districts have an increasingly diverse mix of employment activity. Industrial accounts for 44% of Central Eastside employment, with strong added components of retail and service activities (at 17% each). In Lower Albina, industrial use accounts for a lesser 33% of district employment; education and health accounts for nearly half (at 46%).

- Retail represents the largest employment sector (at 30-44% of job base) for Goose Hollow, St. Johns and Hillsdale. For Gateway and Hollywood, education and health services are dominant employment activities, followed by retail. For Lents and West Portland, services represent the sector with the highest levels of district employment.

Figure 17. Sectoral Trends within Urban Geographies



Source: Oregon Employment Dept., Bureau of Planning & Sustainability, E. D. Hovee & Company, LLC.

While retail is important across all of the urban geographies, it is the #1 employment sector for only four of the urban geographies – River District, Goose Hollow, St. Johns and Hillsdale. Other districts have experienced some level of business specialty and concentration – based on a combination of historical location decisions and ongoing agglomeration benefits (attracting similar businesses). Dominant or major forms of employment across all urban geographies require some form of office or related building space – though the configuration and density of development varies substantially both within and between Central City and other Urban Centers outside the city core.

INDUSTRIAL AREAS

Portland has several different kinds of industrial areas: manufacturing/distribution, incubator and mixed. For this section of the EOA analysis, the *Columbia Harbor* geography includes the geographies of Harbor and Airport Districts and Harbor Access Lands combined. Columbia Harbor has been classified as a manufacturing/distribution industrial district. The Central City industrial districts of Central Eastside and Lower Albina are considered incubator, meaning they include a broader mix of industries. This mix is reflected in recent zoning amendments allowing greater amounts of office product – normally restricted within industrial sanctuaries – for information and design services. The Columbia Corridor (east of NE 82nd Ave) and the Dispersed Employment areas are considered mixed industrial areas.

The guiding question for this discussion is: *What competitive advantages are offered by the City's manufacturing/distribution and incubator districts – both currently and prospectively?* More specific aspects of this guiding question are:

- What job trends are observed within these districts?
- In what ways are job patterns similar or different between the manufacturing/distribution and incubator districts?
- What niches are forming within the incubator districts? Are they distinct from Columbia Harbor or other employment districts?
- How do incubator districts complement the Central City business district activity?
- What have absorption trends (demand) been in these districts?

Industrial/Incubator Employment Trends

Employment within Portland's five industrial areas totaled close to 119,500 in 2008, representing 30% of employment citywide. In total, industrial areas report a net increase of approximately 500 jobs 2000-08, a gain averaging 0.1% annually. Employment losses were greatest in manufacturing (-6,800 jobs), followed by a net loss of nearly 4,700 transportation, warehouse and wholesale jobs. It should be noted that the employment trends in industrial geographies are contradicted by trends showing increased manufacturing output and cargo volumes over roughly the same time period. This is discussed later in this section.

Off-setting job losses in the industrial areas were an increase of approximately 9,100 service sectors jobs excluding retail and public administration (but including education and health). Again, some portion of these jobs likely reflects re-classification of jobs classified as industrial in 2000. An increase in utilizing temporary employment agencies has also likely caused some industrial areas jobs to be reported in other geographies (where temp agency offices are located).

District-Specific Trends

One of the most important distinguishing factors between these districts – and the driver behind the "incubator" classification applied to the Central City districts – lies with their employment composition. Despite recent shifts towards service sector employment, Columbia Harbor retains close to 75% of its job base within the industrial sectors. Manufacturing represents 27% of total

employment with transportation, warehousing and wholesale activities at 40%; construction accounts for another 7% of Columbia Harbor employment.

As noted, this district is particularly distinguished by its high share of employment within the transportation and warehousing sectors. Columbia Harbor is also by far the largest industrial area, comprising 52% of total industrial area employment citywide. However, employment has declined in recent years, especially for the Harbor Access Lands portion of the Columbia Harbor geography.

Within the city's other industrial areas, industrial jobs represent a range of 33% of district employment in Lower Albina to 53% in Columbia East of 82nd. Retail accounts for 17% of employment in Central Eastside and 14% in Columbia East of 82nd. In the other industrial districts, retail accounts for less than 10% of the job total.

In Dispersed Employment areas, just 42% of jobs are associated with industrial sectors. At 35%, services are almost double their share as in any other industrial district, indicating that land use may have diverged from the zoning designation of these areas.

Service businesses (including information/design and education/health but excluding public administration employment) range from 17% of the job base in the Columbia Harbor to 55% in Lower Albina (for which Portland Public Schools is a major educational anchor employer). Service employment also exceeds industrial employment for the city's Dispersed Employment areas.

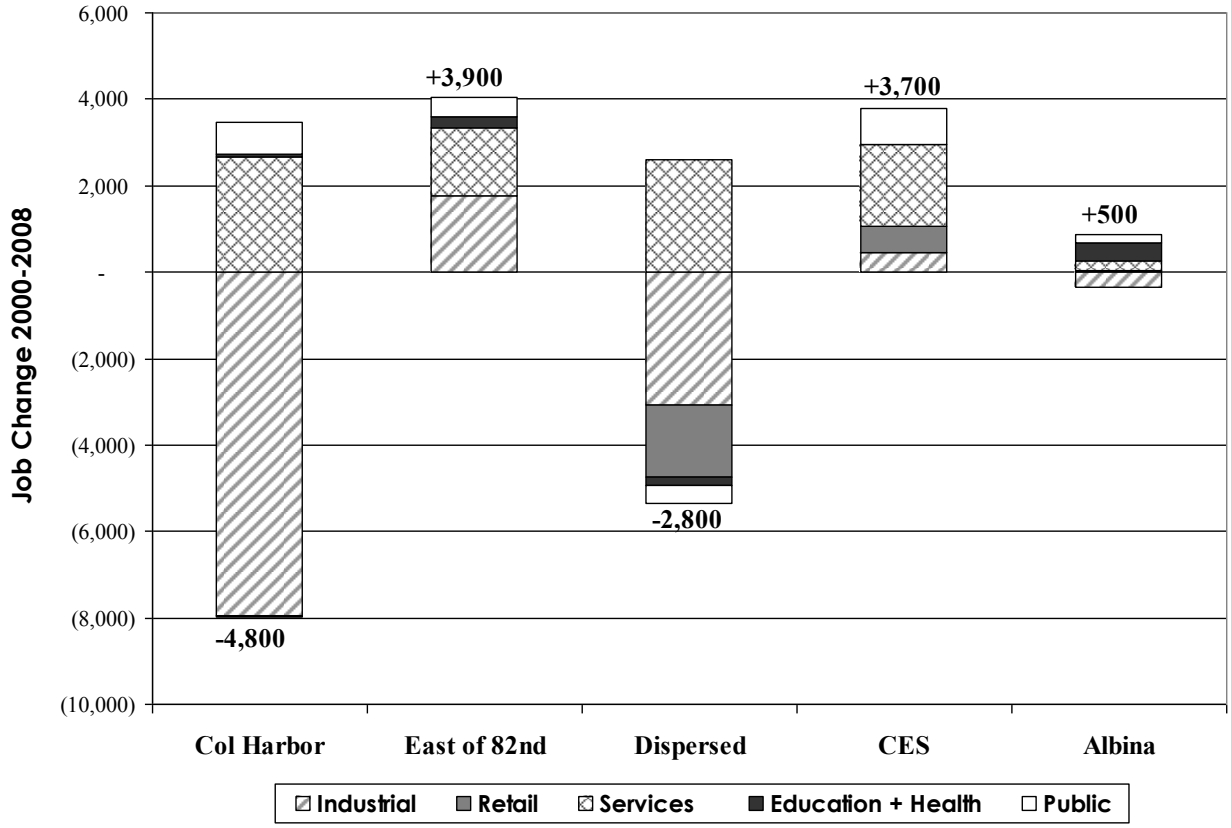
Net Job Gains vs. Losses

As illustrated by the following graph, the Columbia Harbor and Dispersed Employment areas experienced net job loss from 2000-08. While not directly depicted by the graph, job losses (in percentage terms) where most substantial for Harbor Access Lands, a subset of the Columbia Harbor geography.

Conversely, the Columbia East of 82nd area as well as Central Eastside and Lower Albina incubator districts realized employment gains. Despite declining industrial employment, the Columbia Harbor and Dispersed Employment areas experienced some partial offsets with service sector job gains. Employment growth in the East of 82nd Avenue area was fairly balanced between service and industrial sector activity; a lesser proportion of industrial job growth is noted for Central Eastside.

Overall, Portland lost an estimated 22,700 industrial jobs between 2000 and 2008 (albeit with some portion likely reflecting a classification shift into the service sectors). Of this total, about 11,450 of the industrial job loss (or 50%) occurred within the city's five identified industrial districts; the remaining 50% is associated with declining industrial employment or shifts away from industrial employment classifications experienced elsewhere in the city.

Figure 18. Industrial Areas Sector Changes (2000-2008)



Note: As "hybrid" or incubator districts, information for Central Eastside (CES) and Lower Albina is also shown with the Central City Commercial geographies.

Source: Oregon Employment Dept., Bureau of Planning & Sustainability, E. D. Hovee & Company, LLC.

Information & Design Services Trends

This sector has been identified as being of particular relevance in the industrial districts, especially the City's emerging incubator districts. The Employment Opportunity Subarea within the Central Eastside Industrial Sanctuary allows out-right greater amounts of office space if occupied by information and design business types. The change sought to recognize the compatibility of business-serving businesses within the Central Eastside, the desire of these businesses to locate within the district, and the difficulty of reusing the district's historic multi-level industrial building stock for traditional industrial uses.

Information and Design Services (NAICS 51 and 54) consist of the information sector (except movie theaters), and the professional and technical services sector (except lawyers and accountants). The Central Eastside increased employment within this sector by about 930 jobs. However, it added an equivalent number of "traditional" service business jobs, and another 600 retail jobs, suggesting district attraction that extends beyond information and design. It should also be noted that the Central Eastside includes commercial as well as industrial sanctuary zoning; sector growth has not been cross-tabulated with zoning within the district.

Also of interest is how this sector changed in other city geographies. With a net gain of 825 jobs, the River District attracted almost as much of the employment growth in this sector as the Central Eastside. Another net gainer with this sector was Dispersed Commercial – up by 660 jobs from 2000-08. In contrast, information and design employment declined slightly (by about 20 jobs) in the CBD.

Participants in the focus groups conducted in 2009 described both the importance of keeping residential uses out of the Central Eastside and increasing zoning flexibility, recognizing its role as a complement to the CBD. The growth rates within the CES indicate that it is successfully attracting new jobs, with somewhat greater net job gains through 2008 than for the River District (the closest contender as a CBD business alternative).

Building Development Trends

Despite job losses across the industrial sectors, Portland has realized development of new industrial building construction at an average rate of 1.5 million square feet per year (resulting in an end of 2008 in-city industrial building inventory of 81 million square feet). The amount of new industrial construction realized is significantly greater than the amount of development that occurred within either the retail or office building sectors (which realized 170,000 and 400,000 square feet annually citywide).

Figure 19. Recent Industrial Development Trends (2003-2008)

	Annual Average		Total
Subarea	New Construction	Annual Absorption	Rentable Building Area
Central City			
CBD	-	(7,000)	1,176,000
Lloyd District	-	53,000	2,671,000
NW Close In	-	3,000	1,044,000
Johns Landing	-	6,000	386,000
Inner Neighborhoods			
SW Close In	-	-	217,000
NE Close In	1,400	45,000	3,813,000
SE Close In	-	253,000	7,171,000
Industrial Areas			
Hayden Island/Swan Island	-	226,000	9,570,000
Rivergate	540,000	513,000	11,810,000
Guild's Lake	1,200	77,200	12,137,000
East Portland			
Airport Way	54,000	246,000	11,550,000
Mall 205	-	(300)	231,000
Gateway	-	16,000	1,615,000
East Columbia	832,000	730,600	17,641,000
Total	1,428,600	2,161,500	81,032,000

Source: CoStar, E. D. Hovee & Company, LLC.

Observations of note from these data have included the following:

- Industrial development activity has located primarily within the Columbia Corridor: East Columbia (which includes some properties outside of the city), Rivergate and Airport Way. East Columbia and Rivergate report significant annual average new construction at 830,000 and 540,000 square feet per year (through 2008) respectively.
- Business park activity has dominated East Columbia development, whereas Airport Way was more equally split between stand-alone buildings (averaging around 25,000 square feet annually) and business park development.
- Recent development within both East Columbia and Rivergate also has had a significantly larger format, averaging 70,000 and 160,000 square feet respectively (reflecting Rivergate's distribution emphasis).
- The apparent disconnect between industrial jobs and industrial development may be related to high rates of industrial vintage relocation (existing businesses moving to new buildings, potentially leaving empty buildings unfilled – although vacancy rates have steadily fallen over the past five years to under 8% today) or changes in building use (with increased square feet per employee).

Thus far, Portland's manufacturing and distribution space does not appear to have realized the change in form and density that has been occurring with office and retail product, which are moving towards denser urban forms both within the Central City and along commercial corridors. While focus group participants cited a Central Eastside manufacturer that functions in a multi-story environment, this appears to be an anomaly. [7] A more common trend observed within the region's industrial parks is high cube space, in which building footprints are reduced by developing very high ceiling, single story warehouses (which can store more product in a given amount of building floor area).

Beyond Employment Trends

The recent disconnect between employment and real estate trends is especially pronounced within the industrial sectors. While this Trends, Opportunities and Market Factors report is primarily concerned with employment trends and employment as a driver of land needs, it is important to note that jobs are not the only land driver or measure of an industry's economic contribution.

For instance, during this most recent period of industrial job loss, the Bureau of Economic Analysis reports that the value of manufacturing output increased by more than $9 billion for the 7-county region (Figure 23). More specifically, the economic activity in the Portland Harbor grew at 1.6% per year during approximately the same timeframe - 2002 to 2008. During that same time period, cargo volumes increased by 4.8% per year. Within the manufacturing sector at least, business growth (or profit) appears to contradict job growth, due in part to high commodity

[7] The firm involved cited with multi-story Central Eastside manufacturing activity is an example of a long-time business located in historic building stock. New industrial or warehouse development has yet to replicate the multi-story patterns of the first half of the last century.

pricing and strong export markets. Equivalent data for other industrial sectors such as transportation and warehousing is suppressed due to confidentiality.

Figure 20. Portland-Vancouver MSA Gross Domestic Product Trends (2001-2006)

	($ millions)		Change	
Industry	2001	2006	Net	AAGR
All industry total	77,200	103,400	26,200	6.0%
Private industries	69,600	94,000	24,400	6.2%
Manufacturing	12,000	21,000	9,000	11.8%
Transportation and utilities	3,600	4,300	700	3.6%
Retail trade	4,300	4,900	600	2.6%
Professional and business services	8,700	11,000	2,300	4.8%
Education and health services	5,400	7,600	2,200	7.1%
Leisure and hospitality	2,300	3,000	700	5.5%
Information, Communication, and Technc	8,200	15,800	7,600	14.0%
Government	7,500	9,400	1,900	4.6%
Private goods-producing industries	*16,600*	*26,700*	*10,100*	*10.0%*
Private services-providing industries	*53,100*	*67,300*	*14,200*	*4.9%*

Source: Portland Bureau of Planning and Sustainability, Bureau of Economic Analysis, April 2009.

Focus Group participants – both for this study and for the 2006 Working Harbor Reinvestment Strategy – offer some suggestions into how industrial employment trends, complicated by data inconsistencies, can be interpreted:

- For at least some industries, productivity improvements have led to growing output while employment has declined. For industrial uses, this activity was especially pronounced during a period when the value of the U.S. dollar was relatively low, stimulating export demand.
- Both industrial real estate brokers and City permit data report that the bulk of recent demand has been for warehouse and distribution uses; these typically are associated with lower employment densities than manufacturing.
- Distribution and wholesale activity in Portland may have benefitted from some "deconsolidation" of the national and global distribution industry, especially as higher fuel prices re-emerge with economic recovery. Having more but smaller distribution centers across the nation in smaller metro markets (such as Portland) can result in reduced transport costs.
- In older industrial areas and waterfront industrial areas, site reuse (and associated employment growth) is limited by a number of issues. These include:
  - ✓ *Contamination:* owners aren't yet lowering prices sufficiently to reflect the full cost of clean up, and in many cases the full extent of liability has yet to be resolved (as with Willamette River superfund sites).
  - ✓ *Retrofitting:* Building retrofitting is expensive, and the industrial sector typically seeks the lowest cost land and space of any sector.
  - ✓ *Zoning:* requiring a business to utilize either rail or water access limits the pool of qualifying businesses and will slow land absorption.

- ✓ *Flood plain:* particularly smaller sites become more expensive on a per square foot basis when floodplain or other environmental regulations are in play.

Regional data indicates that recent industrial sector growth has concentrated on the outskirts of the region, where greenfield development is more prevalent. Portland could capture this growth in the future if site re-use could be facilitated, stabilizing its industrial job base.

- Participants in the 2009 focus groups conducted for this EOA also added weight to the idea that employment in the harbor area has shifted towards the service sector: modern industry is described as "service-oriented" rather than needing heavy industrial space (e.g., retailers needing auxiliary warehouse space). In many cases, future demand was described as more likely to reflect industrial design and sales and marketing, with less space devoted to on-site manufacturing. Flex space – with a larger office component, higher parking ratios, and a broad range of space sizes – was described as a building product more in demand (especially in the Columbia Corridor east of I-205).

NEIGHBORHOOD COMMERCIAL DISTRICTS

Neighborhood subareas incorporate the majority of areas outside of the Central City, Urban Centers, Institutions, and Industrial districts. Three different types of neighborhood subareas are covered: Commercial Corridors, Commercial Nodes, and Dispersed Commercial.

These Neighborhood districts account for close to half (42%) of the city's retail jobs and also a broad mix of employment across almost all sectors. The key guiding question for this sector is: *What is the current and future role of neighborhood commercial in Portland's changing economy?* Related questions for this demand analysis issue topic are:

- What trends have neighborhoods realized in employment?
- What broad demand trends can be predicted for additional neighborhood retail, either from a market or planning perspective?
- What trends have neighborhoods realized in building development?
- What are the implications of neighborhood employment and building development for realizing greater amounts of Transit Oriented Development?

Neighborhood Commercial Growth Trends

In total, Neighborhood subareas accounted for an estimated 70,400 jobs as of 2008, 18% of the citywide job total. The sectors in which neighborhoods capture the greatest share of citywide covered employment are:

- Retail, arts, accommodation & food service: 42%
- Information & design: 19%
- Construction: 17%
- Services: 17%

While a significant contributor to the city's jobs base, employment data indicates that neighborhood commercial subareas lost an estimated 1,900 jobs between 2000 and 2008. Neighborhood district job losses appear to be pulling down the city's overall employment performance; this loss dwarfs that of any other geography except residential and open space.

Neighborhood district employment losses occurred in the majority of sectors except retail, arts, accommodation & food service (up by nearly 590), services (+440), information and design (+475), education and health services (+550). Net job losses were greatest with Commercial Corridors (-5,100 jobs) and Commercial Nodes (-580). Only Dispersed Commercial is indicated as experiencing net job growth (+3,900).

Commercial Corridors

The city's Commercial Corridors encompass the largest share of Neighborhood jobs, accounting for 56% of Neighborhood district jobs.

The corridor designation indicates areas in which the City seeks to concentrate commercial activity. Commercial Corridors encompass both general commercial (auto-oriented) and storefront commercial zones, as well as much denser central employment and central housing zones. For this analysis, the corridors geography includes only corridors outside of plan areas and industrial areas, although many of those areas contain designated commercial corridors as well.

However, employment within the city's Commercial Corridors declined by more than 5,100 net jobs from 2000-08, reflecting a rate of job loss averaging 1.5% per year. Job losses were experienced across all sectors and particularly pronounced for construction, retail, and manufacturing activities.

Job losses indicated by employment data are somewhat surprising given that the focus groups have been bullish on neighborhood commercial growth potential and continued consumer support for these districts. The discrepancy could be due to perception or varying definitions of neighborhood business districts (as this definition of Commercial Corridors excludes nodes as well as town and regional centers).

Commercial Nodes

These areas have covered about 12 intersections and, at 9,600 jobs, represent the least overall employment of the neighborhood geographies considered. Employment declined by nearly 600 jobs from 2000-08, for job loss averaging 0.7% per year. Similar to corridors, these Commercial Nodes experienced reduced employment across most sectors (except education and health).

Dispersed Commercial

This geography is zone-based and includes both auto-oriented and storefront commercial zones that are not in designated commercial corridors. Dispersed commercial areas tend to cluster as "second tier" corridor space and also constitute small areas of discrete zoning (commercial corners).

Dispersed Commercial areas accounted for about 21,700 jobs in 2008 (or 31% of neighborhood employment). A net gain of 3,900 jobs is noted for 2000-08 (up by 2.5% per year) – the only one of the neighborhood geographies for which an employment increase is reported.

Nearly one-half of the employment increase occurred with retail, arts and accommodations (including dining) uses. Job gains are also noted for education and health, manufacturing, information and design, and service sector businesses

Dispersed Commercial areas appear to function somewhat differently with a broader mix of job types compared to the other neighborhood geographies. Both industrial sectors and services are more prevalent within this geography. Retail is less important as a share of the total as compared with Commercial Corridors and Nodes.

Corridors, Nodes and Dispersed Commercial include both auto-oriented and storefront commercial zones.

RESIDENTIAL & OPEN SPACE ZONES

As of 2008, these non-employment geographies make up a surprising 10% of covered employment citywide, a total of over 38,900 jobs. Employment within residential zones includes schools, some institutions, home-based businesses and non-conforming uses. Not counted with employment data are individuals not covered by unemployment insurance (likely including many home occupations as sole proprietors, a factor that is likely of greater significance within residential zones).

Covered employment within residential zones is dominated by education and health care (at 45% of total covered employment). This likely reflects those institutional users to which special institutional or employment designations have not been applied (particularly as with neighborhood schools). Services account for another 19% of residential jobs, and retail comprises only 9%.Retail Growth Potential

As previously noted, close to half (42%) of the city's retail jobs are located within the City's neighborhoods-based employment geographies. Retail growth is a driver for neighborhood business districts and commercial corridors, but not the primary driver. Jobs data indicates that retail comprises just under one-third of neighborhood jobs across all subareas.

Generally, Portland is adequately retailed. Focus group participants tied retail growth potential to household growth and leakage data supports this assessment. As of 2008, the national demographics firm ERSI Business Analyst estimates that the city supports about $6.5 billion annually in resident-generated demand for retail, food and drink, but generates $7.6 billion in yearly sales volume. This indicates that, in addition to serving local resident needs the city serves as a regional destination market, attracting and supported by residents of surrounding communities throughout the metro region and beyond.

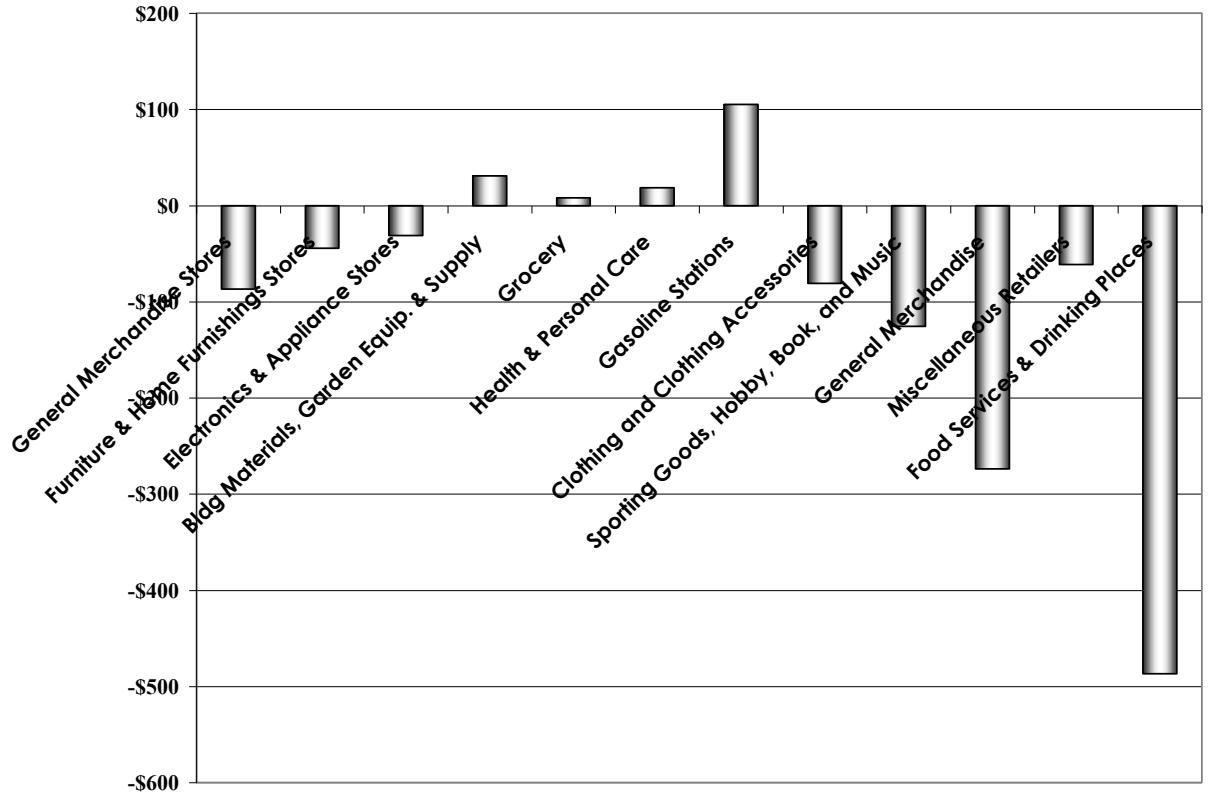
The following graph illustrates citywide retail leakage by store type. Negative numbers indicate store types in which supply exceeds demand: there is no sales leakage, or dollars spent by Portland residents outside of the city (in reality of course, residents shop in a variety of

jurisdictions, but the *net* result indicates that Portland retail supply is adequate to meet the shopping needs of Portland residents).

Retail sales leakage is reported within four retail categories, indicating there may be room for growth to meet residents' needs for building materials and garden supply (an estimated $87 million in sales leakage); grocery ($7.8 million); health and personal care ($18.5 million), and gas stations (over $100 million).

Retail types estimated to have captured the greatest share of non-resident as well as resident spending potential are restaurants and bars, general merchandise (department stores), and sporting good stores.

Figure 21. City of Portland Leakage by Store Type (2008)



Source: ESRI, E. D. Hovee & Company, LLC.

These numbers may in also reflect shopping patterns for Portland residents or store classifications that diverge from the national average (for instance, Portland residents may spend less on gas). On the 4-county metro level (including Clark County), retail demand appears to be more in line with supply. In 2008 there was an estimated $24 billion in retail demand and $23 billion in retail sales.

Given that greater retail supply is not needed to meet the needs of residents (of either the city or the 4-county region), retail development over the longer term is dependent primarily on some

combination of population and/or income growth coupled with destination tourism activity. Portland can also increase its capture of the regional retail market available by strengthening its destination districts and out-competing surrounding communities.

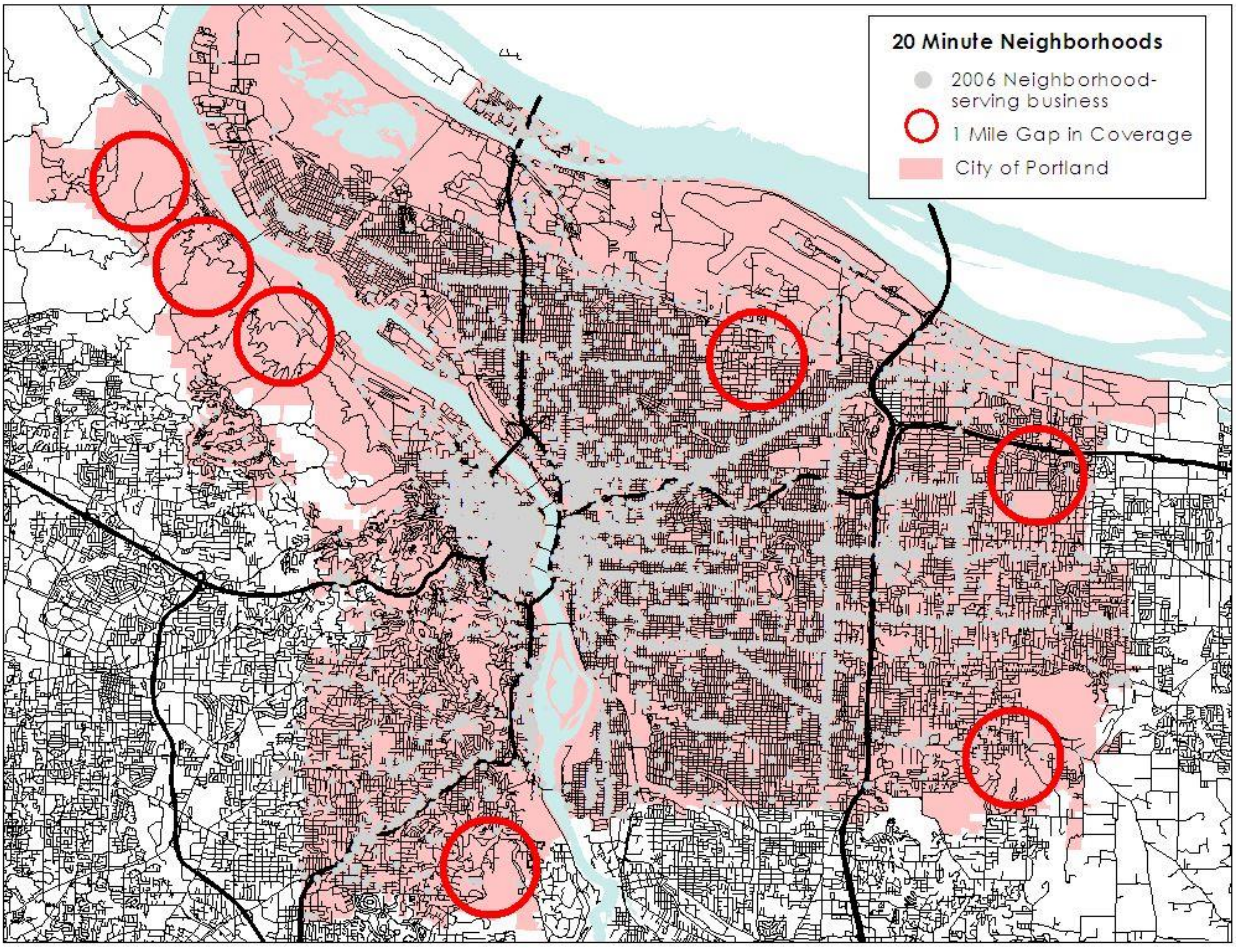
Complete Neighborhoods

Portland's retail districts and corridors are a mix of neighborhood-serving and destination businesses, a distinction deriving as much from a business's product or service mix as from its NAICS classification. Some businesses function as destinations purely because of their status within a business cluster (e.g., as with retailers along NW 23rd or within Lloyd Center Mall); other businesses – such as dry cleaners or convenience markets – are located within a destination business cluster but may primarily serve adjacent households. Many of Portland's commercial corridors function as destination shopping districts, or as a mix of local and destination shopping.

One of the City's planning objectives is to encourage complete or "20 minute" neighborhoods, meaning that daily goods and services are available to households within a walkable distance (equating to roughly one mile). Figure 24 shows these neighborhood serving businesses, which comprise about ¼ of total employment, and identifies areas of gaps in retail coverage.

Based on this visual overview, retail opportunities appear to be reasonably well distributed throughout the city except for a few areas that have more than one mile gap between businesses. Neighborhood-serving businesses blanket the city's commercial corridors and virtually duplicate the arterial street grid. Retail densities decrease east of I-205 (outside of Gateway and SE 122nd), within the Cully neighborhood (west of I-205) and along the narrow but limited residentially populated Northwest corridor between the Willamette River and Forest Park.

Figure 22. Neighborhood Serving Retail Locations



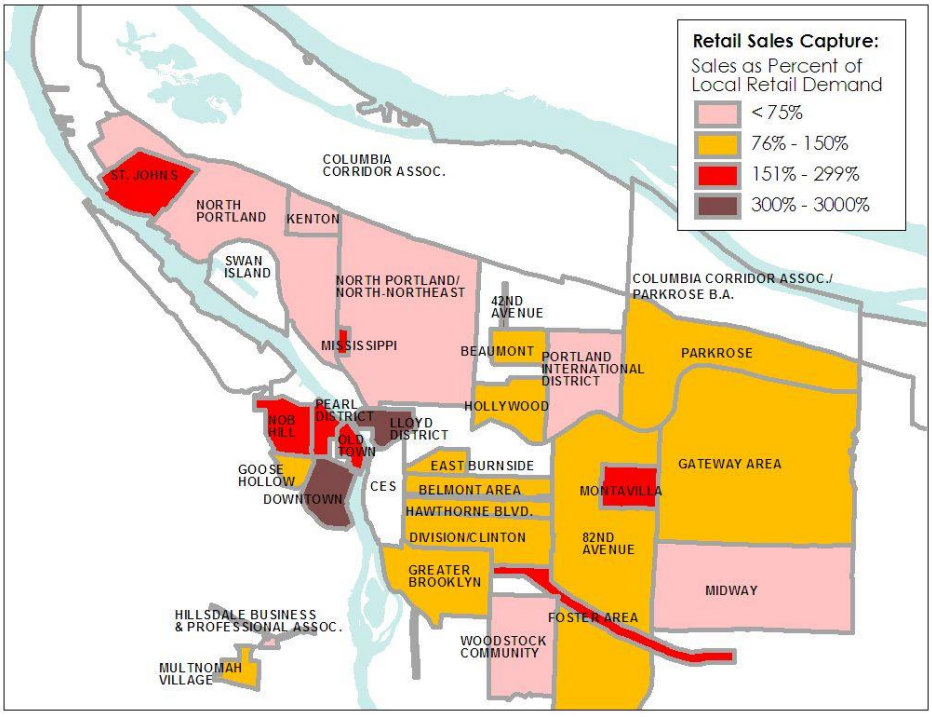
Source: Oregon Employment Department, E. D. Hovee & Company, LLC.

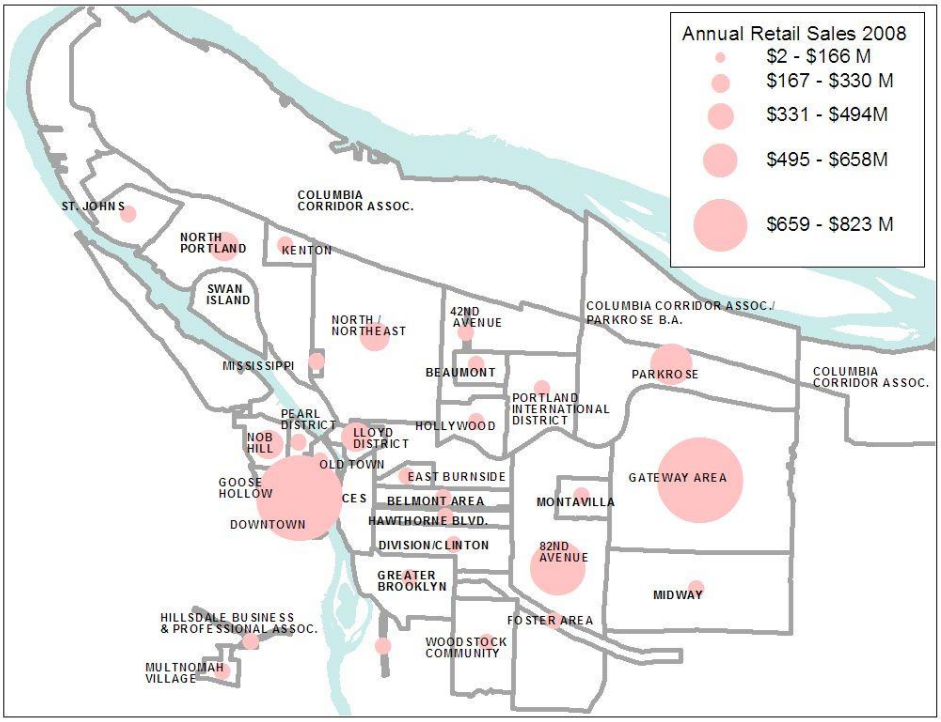
Business Associations

Portland's Business Associations provide another way to analyze retail distribution. Out of the 34 associations, five are predominantly industrial and sales do not represent retail. Of the remaining 29 business associations, 17 reported sales in excess of estimated household demand – these districts function as destinations.

Central City districts top the list for sales capture, given the destination status of downtown retail in general. Neighborhoods with the highest capture rates include Montavilla, Mississippi, St. Johns and Nob Hill. In terms of sales volume, Gateway, 82nd Avenue, North/Northeast and the North Portland Business Association top the list.

Figure 23. Non-Industrial Business District Capture Rates & Sales Volumes (2008)





Note: Data is only displayed for non-industrial business associations.

Source: ESRI, Portland Bureau of Planning & Sustainability, E. D. Hovee & Company, LLC.

Figure 24. Business Association Supply & Demand (2008)

Type	Business Association	(in $ millions) Demand	Supply	Supply Rank	Sales Capture (Supply/Demand)
Industrial	Swan Island Business Association	$1.5	$157.6	12	10630%
Central City	Lloyd District Business Association	$11.4	$264.7	8	2328%
Industrial	Central Eastside Industrial Council	$14.6	$260.2	10	1785%
Industrial	Columbia Corridor Business Association	$136.7	$1,212.9	1	887%
Neighborhood	42nd Avenue Business Association	$2.0	$16.4	31	819%
Central City	Downtown Retail Council	$131.4	$822.8	2	626%
Central City	Old Town Chinatown	$32.9	$85.4	24	259%
Central City	Pearl District Business Association	$60.7	$151.7	13	250%
Neighborhood	Foster Area Business Association	$49.9	$120.4	18	241%
Neighborhood	Montevilla Business Association	$45.8	$101.1	20	221%
Neighborhood	Historic Mississippi	$6.4	$12.4	32	192%
Town Center	St Johns	$62.8	$102.5	19	163%
Neighborhood	Nob Hill Business Association	$168.9	$261.8	9	155%
Regional Center	Gateway Area Business Association	$495.3	$744.8	3	150%
Industrial	Columbia Corridor Association and Parkrose I	$236.4	$349.7	5	148%
Central City	Goose Hollow Business Association	$71.1	$86.1	23	121%
Neighborhood	Hawthorne Business Association	$106.8	$124.9	16	117%
Town Center	Hollywood Boosters	$106.5	$121.9	17	114%
Neighborhood	Greater Brooklyn Business Association	$141.0	$146.9	14	104%
Neighborhood	East Burnside Business Association	$51.6	$53.7	27	104%
Neighborhood	Multnomah Village Business Association	$25.9	$26.4	29	102%
Neighborhood	Westmoreland Business Association	$6.4	$5.8	33	90%
Neighborhood	82nd Avenue Business Association	$627.9	$550.2	4	88%
Neighborhood	Belmont Business Association	$114.9	$99.3	21	86%
Neighborhood	Beaumont Business Association	$42.7	$36.1	28	84%
Neighborhood	Division-Clinton Business Association	$165.4	$128.7	15	78%
Neighborhood	Kenton Business Association	$34.2	$25.6	30	75%
Neighborhood	North Portland Business Association	$399.3	$273.5	7	68%
Neighborhood	International Business District	$151.5	$90.6	22	60%
Neighborhood	North-Northeast Business Association	$571.2	$317.7	6	56%
Neighborhood	Midway Business Association	$296.9	$165.0	11	56%
Neighborhood	Woodstock Business Association	$135.5	$74.4	25	55%
Town Center	Hillsdale Business Association	$14.1	$1.7	34	12%
Industrial	NW Industrial	$0.0	$72.5	26	NA

Source: ESRI, Portland Bureau of Planning & Sustainability, E. D. Hovee & Company, LLC.

Neighborhoods with relatively lower retail capture include Hillsdale, Woodstock, Midway, North-Northeast, North and Kenton. North-Northeast and North appear to be large districts with lower capture rates despite relatively larger sales volumes. The caveat is that some business associations have been narrowly defined to include a commercial corridor only and not the surrounding households (such as NE 42nd Avenue and Foster Area); sales capture rates for these business districts are therefore not a good estimate for whether surrounding neighborhoods are adequately served. High capture rates can also describe areas with relatively little housing, such as Old Town or Lloyd District (which has a relatively low residential mix and supports a regional mall).

To encourage added retail in areas where existing stores or related customer services are more limited, identifying *market drivers* to each specific neighborhood district represents a key opportunity and challenge:

- Retail is drawn to areas with high household density or high household income and offering good traffic/pedestrian counts plus street visibility. Existing retail locations reflect these market preferences.
- As referenced by focus group participants, neighborhood commercial growth will require greater household density. Encouraging household density – through zoning and project subsidies – may have a greater impact on retail site selection than either introducing commercial zoning or supporting commercial development in areas in which these are now missing.
- Since most (though not all) of the city currently has 20-minute coverage, a priority opportunity may be more to encourage locating critical urban retail services (e.g. grocery) and supportive infill rather than to create new or expanded retail districts.

Neighborhood Commercial Growth Trends: Building Development

Retail space has dominated the inventory of newly developed commercial space within Portland's neighborhoods, averaging about 300,000 new square feet annually over a five year period (from 2003-08) outside of the Central City. However, retail employment fell by about 4,000 jobs with 2/3 of that loss coming from the neighborhoods despite significant new building development.

The disconnect between these two trends may in part be due to service jobs locating within retail spaces. Also noted is that a significant contributor to neighborhood retail has been dining, which is no longer defined with retail (for employment classification purposes) but with arts, accommodations and food services. This sector is as large within the neighborhood geographies as the retail sector; however, it too declined over the study time frame.

Rather than corresponding necessarily to retail users (as defined by NAICS), retail space is increasingly becoming defined as either a) ground floor space within densely developed districts, with office or residential above, or b) a lower density or smaller footprint product (in comparison with office) within more suburban or main street settings.

Citywide, retail building development over the 2003-08 time period was dominated by Cascade Station, within the Airport Way subarea. That subarea has seen over 620,000 square feet of new large format/power center retail development over this five year period. This is close to twice the square footage added to the CBD (356,000 square feet) over the same time period, about 2/3 of which was ground floor space in residential buildings.

Figure 25. Recent Retail Development Trends (2003-2008)

Subarea	Annual Average New Construction	Absorption	Total Rentable Building Area
Central City			
CBD	71,200	39,400	9,195,000
Lloyd District	6,900	17,100	4,689,000
Johns Landing	6,000	2,400	335,000
NW Close In	8,400	15,700	1,803,000
Inner Neighborhoods			
SW Close In	8,600	6,600	902,000
NE Close In	24,700	26,200	2,810,000
SE Close In	20,500	40,000	4,085,000
Industrial Areas			
North Portland	47,700	39,600	2,506,000
Rivergate	-	(1,300)	349,000
East Portland			
Airport Way	124,100	139,000	2,710,000
Mall 205	30,500	53,700	3,760,000
Gateway	14,900	32,500	3,720,000
East Columbia	39,500	55,600	3,060,000
Total	403,000	466,500	39,924,000

Source: E. D. Hovee & Company, LLC.

The other top subareas for attracting new (and inventoried) retail development were neighborhoods, with almost all growth locating along commercial corridors such as Killingsworth, Alberta, Lombard, MLK, Belmont, Division and Hawthorne. In-fill development along commercial corridors may also be classified as commercial retail/service by default due to the typical smaller building size.

- North Portland: 140,000 square feet
- Mall 205: 153,000 square feet (a submarket extending beyond the Mall property only)[8]
- Inner Northeast: 125,000
- Inner Southeast: 100,000

Office development has been both more limited and more concentrated than retail over the study time frame, with only 800,000 square feet developed citywide compared with 1.7 million square feet of new retail space. In contrast with retail trends, about 60% of newly developed office space was located within the CBD + Lloyd District, another 24% in Gateway and the remainder consisted largely of Class B buildings of less than 35,000 square feet each dispersed throughout the city.

[8] Mall 205 is a submarket defined by CoStar and encompasses an area larger than the mall property.

Implications for Transit Oriented Development

Transit Oriented Development (TOD) describes dense development (a relative descriptor), either commercial or residential, with lower than average parking ratios and in close proximity to transit routes, either bus or fixed rail. TOD is also often viewed as occurring within a mixed use setting – as with residential (or in some cases office) above ground floor retail and related active use commercial space.

From a business owner's perspective, TOD offers commercial space that is probably on the leading edge of the density to which the private market is willing to develop. "Denser" development may command a cost premium associated with steel vs. wood frame construction, although buildings up to five stories can be achieved via wood framing, and this quality of development may be acceptable for certain users outside of the Central City.

Businesses will desire space within an area or corridor suitable for TOD if:

- The space is well-located and visible to target customers
- The space is affordable
- The business' customers can and will access the building in the absence of expansive parking options

The answer to these questions is not dictated by a building's status as a TOD, although TODs are likely to be well-located (on commercial corridors) and well-served by transit. Rather than business demand, the extent to which this region sees additional TODs along its commercial corridors will be influenced by:

- Continued density increases within Portland's neighborhoods;
- Continued resident and visitor preference for mixed use neighborhood retail districts (a vision to which participants in focus groups generally adhere, despite the indicated job losses);
- Flexibility with building uses allowed within commercial zones; and
- Over-all economic vitality and growth of the Portland metro region.

Continued growth in commercial rents to support more expensive construction techniques is also a consideration. In recent years Portland has seen significant market-driven in-fill commercial development occurring along relatively low-rent commercial corridors such as NE Alberta. The bulk of this development to date has been single story, indicating that the market will likely bring TOD projects – as opposed to infill – to those corridors now capable of achieving the highest rental rates.

Corridors reporting rents above $20 per square foot as of March 2009 include SE Bybee, NE Broadway/Weidler, N Williams, John's Landing, SE Belmont, N Mississippi and SE Division. While not a threshold that indicates certain development feasibility (which will vary according to construction technique, building configuration and building use mix), these reported rents have been on a par with the range reported for many Central City properties in the Pearl District, the West End and the CBD.

INSTITUTIONAL DEVELOPMENT

For this analysis, the focus is education and health institutions (but with secondary consideration of other public agency jobs). The key question for this topic is: *How will rapid growth of institutional employment and building needs be both accommodated within and potentially reshape development in Portland?* Related questions around this topic are:

- What job growth has occurred within Portland's major institutional campuses?
- What job growth has occurred for institutional users that may not be located on institutional campuses?
- What are the unique land requirements of institutional users, and how are those changing?

Institutional Definitions & Associated Employment

This section of the report tracks institutional-related employment in two distinct ways:

- Campuses for 10 colleges and 7 hospitals on sites of more than 10 acres, which account for an estimated 35,200 jobs as of 2008, excluding Portland State University (Central City) and Adventist Medical Center(Gateway Regional Center). This *campus institutional* category is a primary frame of reference for the EOA analysis.
- All institutional uses throughout the City, consisting of schools and hospitals in all Comprehensive Plan zones and all businesses in the IR zone – account for 2008 employment estimated at 54,400.

- A third, broader indicator of institutional employment is the combined education and health care sectors, which totaled 84,660 jobs citywide in 2008.

Employment Associated with Institutional Uses

As depicted by the chart on the following page, the discussion in this section begins more broadly on the 54,400 jobs represented by schools and hospitals throughout all zones of the City plus other businesses within the City's IR zone.

- From 2000-08, employment associated with these institutional uses within this zone increased at a rate averaging about 2.5% per year – well above the citywide job growth rate of just 0.1% per year.
- In 2008, 24% of employment situated within the IR zone was outside of hospitals and schools. The bulk of this was health-related (doctors offices, HMOs) and the remainder a mix of supportive uses such as retail and un-related businesses.

Institutional employment growth from 2000-08 has been stronger outside of institutional zoning than within this zone. These sectors averaged 2.5% annual growth citywide, compared with a growth rate of close to 2% within the IR zone. This appears to be primarily due to relatively flat employment with schools, while hospital and related IR zone employment increased more substantially.

Figure 26. Institutional Employment Trends (2000-2008)

	General Commercial CG	Central Commercial CX	Central Employment EX	Institution IR	Industrial Sanctuary IS	Mixed Employment ME	Commercial Storefront NC,OC,UC	Open Space OS	SFR R2.5,R5, R7,R10	MFR R1,R2,R3, RH,RX	Total
					2008						
Institutions (defined by NAICS)											
Schools	448	3,257	12,821	4,968	1,402	140	358	583	5,513	4,383	33,873
Primary	*103*	*228*	*114*	*1,110*	*1,380*	*1*	*251*	*583*	*5,214*	*1,760*	*10,744*
College	*345*	*3,029*	*12,707*	*3,858*	*22*	*139*	*107*	-	*299*	*2,623*	*23,129*
Hospitals	-	3,330	3,181	5,430	1	-	99	-	-	5,232	17,273
Other businesses within IR Zone											
Health related				2,771							2,771
Other				531							531
	448	6,587	16,002	13,700	1,403	140	457	583	5,513	9,615	54,448
2008 Share	*1%*	*12%*	*29%*	*25%*	*3%*	*0%*	*1%*	*1%*	*10%*	*18%*	*100%*
AAGR 00-08	*5%*	*4%*	*4%*	*2%*	*3%*	*-1%*	*22%*	*26%*	*-2%*	*3%*	*2.5%*
					2000						
Institutions (defined by NAICS)											
Schools	297	3,009	9,313	4,586	1,080	154	92	91	6,691	2,313	27,626
Hospitals	-	1,866	2,441	4,378	-	-	-	-	35	5,395	14,115
Other businesses within IR Zone											
Health related	-	-	-	1,666	-	-	-	-	-	-	1,666
Other	-	-	-	1,174	-	-	-	-	-	-	1,174
	297	4,875	11,754	11,804	1,080	154	92	91	6,726	7,708	44,581
2000 Share	*1%*	*11%*	*26%*	*26%*	*2%*	*0%*	*0%*	*0%*	*15%*	*17%*	*100%*

Source: Oregon Employment Department, Portland Bureau of Planning, E. D. Hovee & Company, LLC.

Trends within Key Institutions

Rather than reflect zoning designation, the institutional geography reported in Figure 14 (earlier in the report) reflects land owned by 17 hospitals and colleges on sites of at least 10 acres and 100 employees each. Total employment of 35,200 is more than double the 13,700 jobs located within IR-designated zoning. For these 17 large site institutions, employment grew at about 3.6% per year, above the average of 2.5% for citywide institutional employment.

Hospitals

- Oregon Health & Science University
- Shriners Hospital
- Portland Veteran's Hospital
- Providence Portland Medical Center
- Legacy Emanuel Hospital & Health Center
- Legacy Good Samaritan Hospital
- Kaiser Medical Centers

Colleges

- Portland Community College (Sylvania)
- Portland Community College (Cascade)
- Portland Community College (Southeast)
- Reed College
- Lewis & Clark College
- University of Portland
- Multnomah Bible College
- Concordia University
- Western States Chiropractic College
- Warner Pacific University

Note: Adventist Medical Center and Portland State University (PSU) are not included in the Institutional employment geography – Adventist is part of the Gateway Regional Center and PSU is included with the Central City University District.

Many of these institutional uses are located on what could be considered as legacy sites that are in or near residential neighborhoods. Site decisions made decades ago for what typically began as relatively modest uses may have been for reasons unrelated to factors that would be considered today if these institutions were to start anew.

Implications for Future Development

Taken together, the city's 54,400 institutional use jobs account for about 14% of its jobs base. The bulk of these are associated with the city's colleges and hospitals. Institutions are key employment drivers and now among the fastest growing economic sectors in Portland.

With its moderate growth (mid-case) scenario, Metro forecasts that education and health care employment will increase by a combined average rate of 2.8% per year. This is well above the average projected growth rate of 1.7% for all regional employment and more than double anticipated public agency job growth.

To the degree that Portland continues to capture a relatively high share of medical and educational employment (particularly for higher education), growth needs for this sector can be

expected to account for an increasing share of the city's total job base and associated building space requirements.

Based on the combination of this quantitative review and qualitative assessment from the institutional focus group, key challenges for the city's institutions (both larger and smaller) will include:

- Opportunities for maintaining a strong in-city presence as a key economic development driver – offset by growing impetus for decentralization to get closer to residential populations.
- Improved transit access or other transportation options to better serve patrons and employees – especially for institutions currently not conveniently located near transit.
- Potential for increased density of development – as an alternative to expanded site area.
- Consistency of land use approach and approval process for institutional users – especially those situated within or near residential neighborhoods.

VI. LOCAL SECTOR SPECIALIZATIONS

This analysis considers local sector specializations both for the Portland metro area and the City of Portland. A common approach to defining comparative advantage is via location quotient (or LQ), which compares a geography's concentration of employment with the national average.

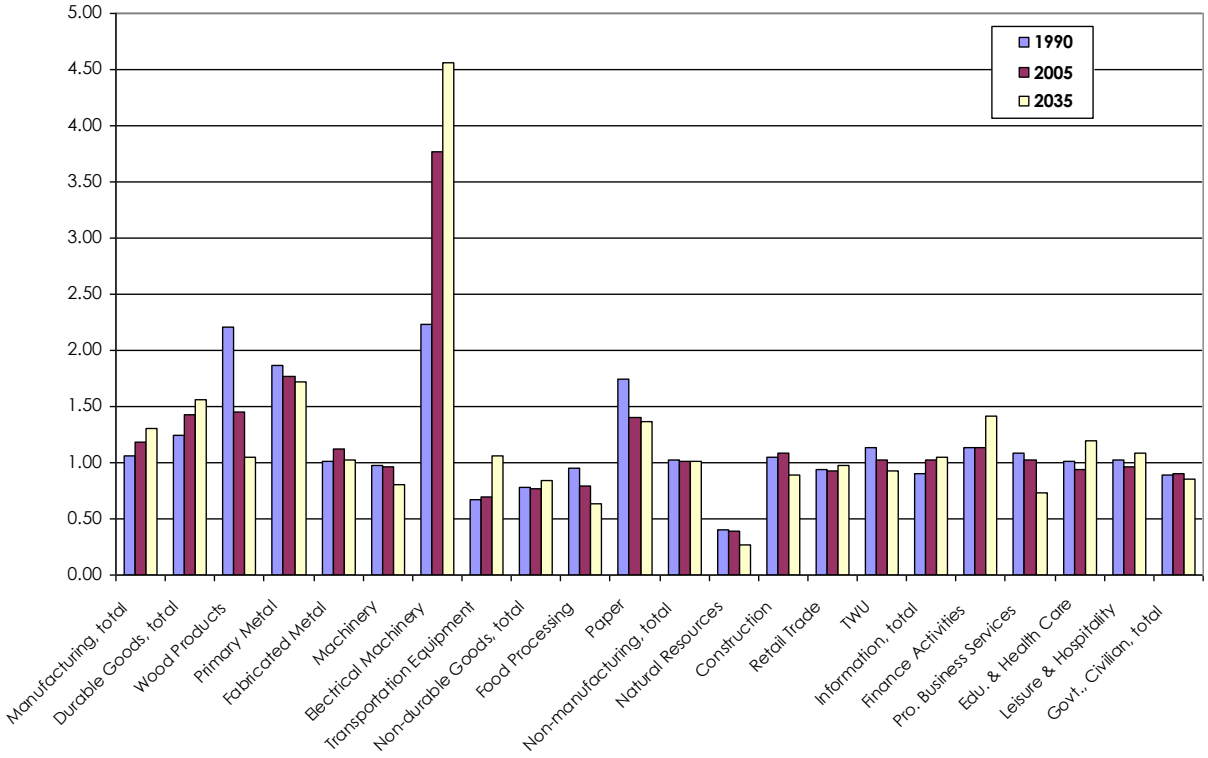
Portland can be defined as having a comparative advantage for sectors in which employment concentration is above the national average: a LQ of one or above.[9] For example, if 20% of the region's employment is in a particular sector versus just 10% of the nation's job base, the location would be 2.0 – meaning that this region has twice the concentration of employment in that sector as the nation.

PORTLAND METRO SPECIALIZATIONS

The following chart illustrates changes in LQ by major job sector for the historic period 1990-2005 and as projected by Metro to 2035. The greatest detail is provided for manufacturing sub-sectors.

[9] While comparative advantage analysis offers a snapshot of the relative concentration of employment in a region compared to the U.S. at a point in time, that advantage may be a reflection of both historic and current competitive advantage of the region relative to the nation. This changing competitive position can be indicated by the *shift* portion of *shift-share* analysis – with the shift indicated as the change in location quotient (LQ) between two or more different points in time.

Figure 27. Changing Portland Competitive Advantage – All Industries (1990-2035)



Source: Global Insight, *2008 QR US Long-Term Outlook* and Metro.

Manufacturing LQ

The Portland metro area has gone from a slight comparative advantage relative to the nation in *manufacturing* in 1990 (LQ – 1.06) to a more substantial position as of 2005 (LQ – 1.18). This indicates that the region better maintained its manufacturing job count while net job loss was experienced across the nation as a whole. Metro has forecast that this comparative advantage may increase by 2035 to an LQ of as much as 1.30. If realized, this forecast would allow for a net manufacturing job gain of about 7% between 2005 and 2035.

LQs have increased since 1990 for manufacturing sectors of electrical machinery and transportation equipment, while declining for wood products, food processing and paper. Metals and machinery have about held their own relative to the nation. Looking forward to 2035, Metro has forecast continued LQ gains for electrical machinery and transportation equipment; the other manufacturing sectors are projected to hold steady or decline.

Non-Manufacturing LQ

Overall, non-manufacturing industrial sectors show relatively little comparative advantage relative to the rest of the nation. These sectors have experienced relatively minor changes in LQ since 1990, with slight gains noted for construction and information and losses for natural resources, transportation and warehousing, and utilities. These trends are largely expected to

continue forward except for construction where declining LQ is forecast (albeit after a continued surge that was projected to about 2010). Also noted is that Metro projects a growing LQ potential for publishing (a subsector of the information sector).

For most service sectors, Portland does not show any substantial comparative advantage relative to the rest of the U.S. – with the modest exceptions of finance activities (especially real estate) and professional business services (notably management of companies). Looking forward, Metro is projecting increased comparative advantage for finance activities, education and health care and other services (including personal services), but reduced LQ for professional business services (except management of companies).

CITYWIDE VALUE ADDED CLUSTERS

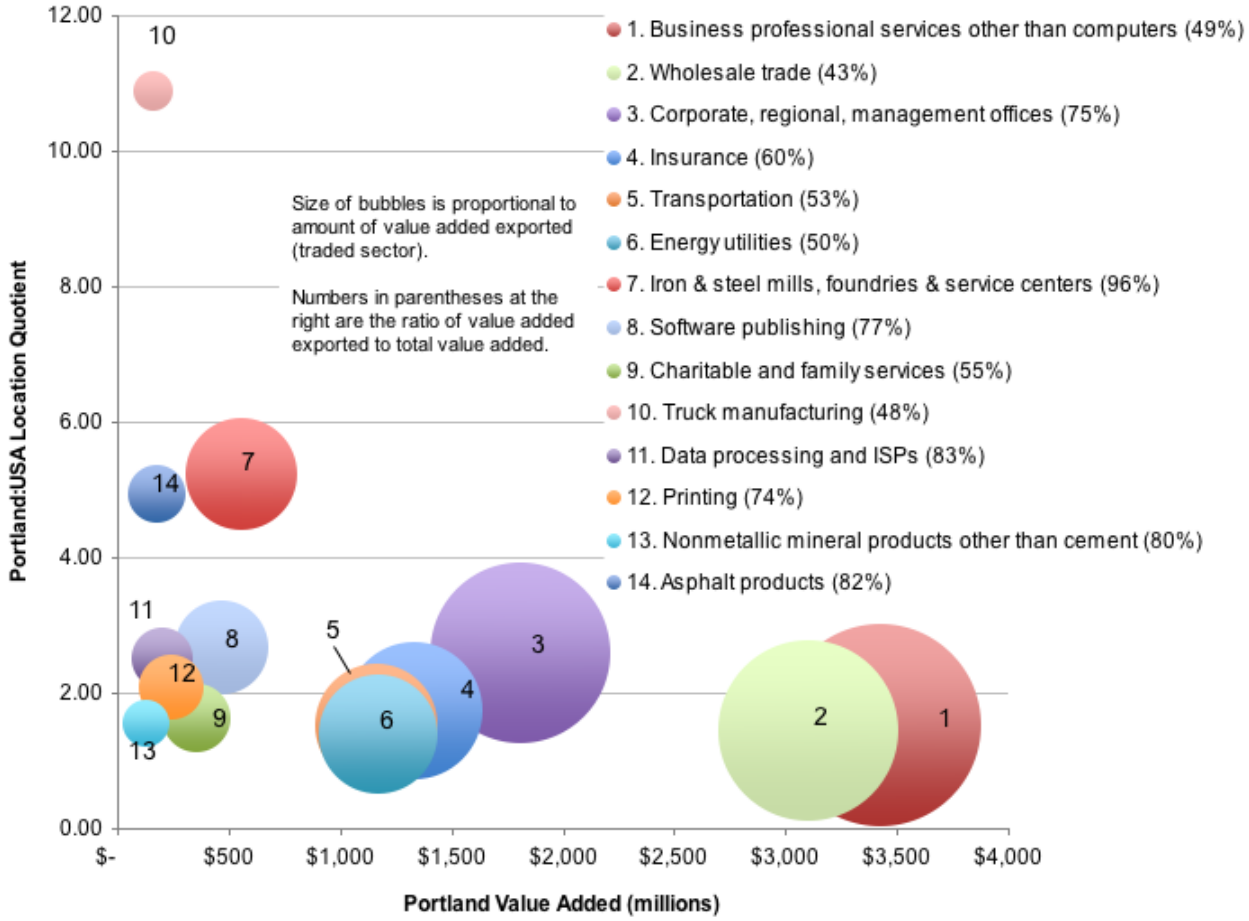
In a 2009 study for the Portland Development Commission, ECONorthwest has investigated LQ on the basis of an industry's valued added (output) rather than employment, identifying city specializations relative to the nation rather than regional specializations. Value added describes the market value of a business' production of goods and services, including payroll and the contributions of capital, land and property. This approach elevates the importance of industry output, in addition to considering employment levels.

ECONorthwest's conclusions are that Portland supports two kinds of clusters:

- Specialized firms with high location quotients – such as truck manufacturing, iron and steel mills, insurance and software publishing – but that are relatively small contributors to the overall Portland economy in terms of value added and export amounts; and
- Firms with above-average but lower location quotients (1.5 – 2.5) that generate much larger amounts of industry output, as well as export output from sales outside the region. These are dominated by professional services and wholesale trade, many of which tend to serve the regional and statewide markets (although professional firms with national scope can also serve as local economic engines). These moderate city specializations also include management of companies, insurance, transportation, and energy utilities.

ECONorthwest's results tend to corroborate the employment-base results released by Metro in 2008: both LQ analyses indicate that Portland's location quotients are higher in the manufacturing sectors. However, these are smaller shares of total economic activity than in the past. Consequently, the ECONorthwest analysis indicates that manufacturing's output may be insufficient as an *exclusive engine* for continued economic growth into the future.

Figure 28. Value Added Portland Clusters (2007)



Source: ECONorthwest, 2009.

VII. INDUSTRIAL LAND DEMAND ANALYSIS

The primary method for determining land demand is employment growth. However, in the industrial areas there are indications that employment may not be the best measure of economic performance and the future demand for industrial land. Additional research has been compiled to supplement the industrial land demand forecast based on employment growth to analyze additional land demand drivers.

Absorption Trend Comparison

Reviewing long-term industrial land absorption trends is one method to estimate future industrial land needs, although this approach does not account for possible future shifts between industrial sectors.

Historic absorption is available only for properties along the Willamette and Columbia (west of the rail bridge) between the river and the nearest parallel street or railroad right-of-way. This area represents about one-third of the City's industrial areas, but likely a greater portion of land absorption. The other primary area that has realized industrial development during this time frame (post 1960) is the Columbia Corridor east of 82nd Avenue and north of Sandy Boulevard. A land absorption trend estimate is currently being completed for this second geography so that a citywide industrial absorption trend can be approximated.

Figure 29. Industrial Land Demand Comparison with Past Trends

Absorption Trends	Acres per year
Portland Harbor 1960-1997 absorption trends, all industrial uses (source: PHILS)	45
Portland Harbor 1960-1990, marine uses (Portland only. Source: Port of Portland)	24
Portland Harbor 1960-1990, all uses (including parks and residential. Source: Port of Portland)	39
Portland Harbor 2002-2008, developed industrial land	18

Absorption Forecast

	All Industrial Areas		Columbia Harbor	
	driven	terminals	driven	terminals
Low	(9)	(9)	(5)	(5)
Mid	45	45	30	30
High	104	104	69	69

Source: Portland Harbor Industrial Lands Study Feb 2003, Bureau of Planning; E.D. Hovee & Company, LLC. Portland Harbor Industrial Land Supply Analysis, Feb 2012, ECONorthwest

The historic absorption figures available indicate an increase in annual absorption between 1990 and 1997. The bulk of this absorption occurred within the Port's Rivergate development and on Swan Island.

Commodity Flows

Commodity flows provide another indicator of economic activity and terminal and distribution facility needs. The overall freight volume handled in the Portland region is forecast to roughly double in tonnage and triple in value between 2007 and 2040 (see Draft Portland/Vancouver Commodity Flow Forecast, 2014).

There are two studies that analyze the cargo moving through the Portland Harbor. The 2003 *Portland Harbor Industrial Land Study* (PHILS) reports that cargo volumes increased at an average annual rate of 2.3% between 1960 and 2000. Marine terminal investments of note that accompanied this increase include the 85 acre Portland Bulk Terminal facility at Port of Portland and a 20-acre expansion of the container terminal at T-6. The 2012 *Portland Harbor Industrial Land Supply Analysis* found cargo volume growth continues to be robust in recent years. From 2002-2008, cargo volumes increased by 4.8% per year. This study of marine terminal cargo volumes and land absorption needs plus the 2010 *West Hayden Island Economic Foundation Study* take a cargo-specific approach, factoring in the known size and capacity of existing terminals, existing cargo volumes, cargo forecasts, and the size requirements of modern terminal facilities. With the goal of understanding these factors in more depth, the City also commissioned a study of the operational characteristics of different marine terminal types, which includes case studies of best-in-class facilities with land area and cargo throughput information.[10] More information about marine cargo forecasts, and associated land needs can be found later in this section.

The Port of Portland notes that land needs associated with commodity flows an inherently difficult to forecast. Over the past 10 years, the Port has twice been the fastest growing on the West Coast, and also the fastest declining. This short-term fluctuation results from decisions within the handful of steamship line companies on whether or not to utilize Port of Portland facilities, and is independent of shipping growth associated with business activity. For this reason, longer term trend data is more reliable. There is also some level of opportunistic growth that can be driven by a specific opportunity, driven by the competitive market. For example, other ports in the lower Columbia River have recently announced new projects to ship coal. Local ports are able to respond to these opportunities not because growth of that commodity had been forecast, but because they had an inventory available development-ready land. If the Port of Portland waits for a specific business opportunity to arise before land can made available, as long as other Ports have more readily developable land supply, Portland will probably not be competitive.

Gross Domestic Product Output

Industry output provides a third measure of the health and growth of an industry. Data on industry output is available (via the Bureau of Economic Analysis) on a metro area level.

Between 2001 and 2006 there was a substantial increase in output among many industries, including manufacturing and information and technology. Manufacturing output (across the seven county PMSA, the smallest geography for which data is available) increased at an annual rate of close to 12%, compared to an annual average increase of 6% for the PMSA economy as a whole.

[10] Worley Parsons, Operational Efficiencies of Ports/Terminals World--Wide, February 2012

GDP data portrays manufacturing as a growth industry, rather than the declining industry that employment trends suggest. Industry stakeholders describe several factors that influenced this sector's recent profitability gains, including:

- Substantial increases in commodity and product pricing;
- Substitution of technology for labor, and
- A low valued dollar that fueled export growth.

These factors may continue in future years. However, the challenge remains of predicting land needs based on industry output; as yet no clear quantitative relationship between the two measures has been identified.

Figure 30. Portland-Vancouver PMSA Gross Domestic Product Trends (01-06)

			Change	
Industry	**2001**	**2006**	**Net**	**AAGR**
All industry total	77,200	103,400	26,200	6.0%
Private industries	69,600	94,000	24,400	6.2%
Manufacturing	12,000	21,000	9,000	11.8%
Transportation and utilities	3,600	4,300	700	3.6%
Retail trade	4,300	4,900	600	2.6%
Professional and business services	8,700	11,000	2,300	4.8%
Education and health services	5,400	7,600	2,200	7.1%
Leisure and hospitality	2,300	3,000	700	5.5%
Information, Communication, and Technol	8,200	15,800	7,600	14.0%
Government	7,500	9,400	1,900	4.6%
Private goods-producing industries	*16,600*	*26,700*	*10,100*	*10.0%*
Private services-providing industries	*53,100*	*67,300*	*14,200*	*4.9%*

Source: Bureau of Economic Analysis, US Dept. of Commerce, April 2009

Other Indicators

In order to better understand this dynamic, ECONorthwest examined trends in land efficiency from 2002-2008 in the Portland Harbor using several different measures. They calculated the economic activity measured in terms of employment, real market value, value added, and cargo tonnage. The value added and real market value measures appear to grow, however the US Consumer Price Index grew by 3.0%, indicating that these measure grew less than the rate of inflation, while the cargo tonnage grew at a faster pace (Table 30).[11]

[11] ECONorthwest, Portland Harbor Industrial Land Supply Analysis, February 2012 (Appendix C)

Figure 30. Portland Harbor Measures of Economic Activity (per acre)

Measure	2002	2008	AAGR
Value Added	$1,147,614	$1,217,713	1.0%
Real Market Value	$776,715	$838,091	1.3%
Employment (jobs)	6.21	5.75	-1.3%
Cargo Tonnage	3,873	4,928	4.1%

Source: ECONorthwest, Portland Harbor Industrial Land Supply Analysis, February 2012

VIII. ECONOMIC MULTIPLIER ANALYSIS

As discussed above, there can be a disconnection between employment growth and the demand for new building space and development sites, especially within the industrial sectors. Another way to look at the situation is economic multipliers, which represents the relationship between direct investment in economic activity at a particular site and the resulting multiplier (or ripple effect) throughout Portland and the metro region. The three most common types of economic multipliers are provided within this EOA report are measures of:

- Employment
- Personal income (to residents of the region)
- Output (or added gross receipts)

For example, an employment multiplier of 2.00 indicates that for every job directly associated with a place-specific investment, another job is created off-site through indirect and induced economic effects elsewhere in the region. Indirect effects occur as the new economic activity makes purchases from other businesses in the region. Induced effects occur as the direct employees of the new economic activity are able to make added purchases from increased disposable income from local retail and services.

Multipliers are based on the nationally recognized IMPLAN input-output model. IMPLAN data is available for every county in the U.S. Multipliers used with this analysis are those for the seven-county metro region (PMSA) as of 2009. Economic multipliers are typically reported by NAICS employment sector. For the Portland EOA, NAICS specific multipliers have been aggregate to six industrial/commercial building types based on the City of Portland's projected 2035 mix of sector employment and anticipated allocation of employment sectors to building types.

This essentially reflects weighted averaging of specific building types. For example, the General Industrial building type is associated with a relatively high 3.15 overall jobs multiplier. The key components of the General Industrial multiplier are manufacturing (with a 3.69 multiplier) and construction (2.04). Other building types involve different employment sectors but with a similar weighting methodology applied.

Figure 31. Economic Multipliers By Building Type

	Economic Multiplier		
Building Type	**Jobs**	**Income**	**Output**
Office	1.95	1.87	1.98
Institution	1.62	1.69	2.13
Flex / BP	2.19	2.12	1.91
General Industrial	3.15	2.50	2.15
Warehouse	2.36	1.95	1.95
Retail	1.64	1.76	1.97

Source: E. D. Hovee & Company, LLC based on IMPLAN

Multipliers are relevant to district-specific land supply decisions because they suggest the importance of looking beyond direct site-specific employment opportunities. For example, although job density is low on industrial land, the General Industrial and Warehouse multipliers are high. That is, industrial acres have the potential to generate a greater number of secondary and tertiary off-site jobs that an acre of retail. All other things being equal, this could be a factor if one must allocate a limited supply of land to different industry types. Or, put another way, some of our retail and office job growth is dependent on having an adequate industrial land supply.

IX. LAND EFFICIENCY ANALYSIS

The purpose of this analysis is to estimate the portion of future employment-related development that will take place on parcels with a significant amount of existing building square footage – sites that are not included in the Buildable Land Inventory.

METHODOLOGY

The analysis is based on development activity from 1999-2011 to assign it to the type of site in 1999 – vacant, LoFAR, or HiFAR.[12] The LoFAR category corresponds to the underutilized or redevelopable sites in the BLI and is defined as sites with less than 20% of the building square footage allowed by zoning (based on applicable zoned FARs) based on existing building square footage in 1999. For industrial properties, only vacant parcels are considered buildable.

RLIS assessor data is used to create a side-by-side comparison of tax lots with a "new year built" or for which there was more than 50% building square footage added (as opposed to a minor addition). A review of the assessor data revealed a number of parcels for which there was no building square footage indicated in 1999 but had a 1999 building value of over $25,000, which indicated some kind of improvement. Tax parcels greater than 10,000 square feet in size with missing data have been cross-checked with development permit data to better determine which parcels were: a) previously developed in 1999 with no added building space developed through 2011, or b) previously developed but added some amount of net new building space since 1999. This analysis was limited to parcels for which there was comparable data regarding building square footage, land and improvements valuation with matching tax records in 1999 and 2011. Excluded are parcels for which there is not a matching tax parcel identifier or for which other data is missing in either year. Also excluded are parcels for which building square footage was increased by less than 50%, but with no new built data between 1999-2011 indicated. For these reasons, the analysis should be viewed as representing a conservative representation of development activity on employment lands over this time period.

Using the revised parcel dataset, development activity is assigned to the type of site in 1999 – vacant, LoFAR, or HiFAR (Figure 32). The proportion of development activity that occurs on vacant or LoFAR is development that would occur on sites in the BLI (industrial geographies are limited to vacant sites). Development that takes place on HiFAR parcels is on parcels that are not included in the BLI.

The data analysis shows that the campus institutions present a unique case. These campuses consist of large parcels with existing development that places them in the HiFAR category. So as to not skew the overall results, the campus institutions were eliminated from this analysis because these areas are treated differently in the BLI (development capacity based on master plans, not vacant/underutilized parcels).

[12] The initial method was to analyze employment data (ES202) data to identify job growth that took place on sites with existing development and no new development from 2000-2008. This analysis proved to be too difficult to manage because of employers with multiple tax parcels and dispersed employment that was reported to different tax parcels over the analysis period.

Figure 32. Land Efficiency Analysis (Net Added Building Space 1999-2011)

Forecast Geographies	On Sites that Were Previously Vacant	LoFAR	HiFAR	Total	% on Vac/Lo	
Central City Commercial	4,753,957	286,431	3,605,539	8,645,927	58%	
Central City Incubator	589,616	230,191	41,871	861,678	95%	
Columbia Harbor	4,259,890	2,262,671	91,150	6,613,711	64%	Vacant
Columbia East	3,932,091	502,344	75,646	4,510,081	87%	Vacant
Dispersed Employment	543,702	241,891	491,278	1,276,871	43%	Vacant
Neighborhood Commercial	3,111,419	12,073	2,236,145	5,359,637	58%	
Town Centers	135,913	0	341,128	477,041	28%	
Regional Center	694,329	0	160,986	855,315	81%	
Institutions	407,270	4,800	2,164,726	2,576,796	16%	
Total	18,428,187	3,540,401	9,208,469	31,177,057	70%	
Total (w/o Institutions)	18,020,917	3,535,601	7,043,743	28,600,261	75%	
% of Change	59%	11%	30%	100%	70%	
% of Change w/o Institutions	63%	12%	25%	100%	75%	
Aggregate Geographies						
Central City	5,343,573	516,622	3,647,410	9,507,605	62%	
Industrial	8,735,683	3,006,906	658,074	12,400,663	70%	Vacant
Commercial	3,941,661	12,073	2,738,259	6,691,993	59%	
Institutions	407,270	4,800	2,164,726	2,576,796	16%	
Total	18,428,187	3,540,401	9,208,469	31,177,057	70%	
Total w/o Institutions	18,020,917	3,535,601	7,043,743	28,600,261	75%	

Source: E.D Hovee & Company

OBSERVATIONS

This supplemental analysis provides added insight into development patterns for different employment geographies. From a market perspective, the data indicates that newly built sites tend to occur on vacant or low value property. However, considerable acreage has experienced building expansion on properties with existing high value improvements. The overall results show that roughly 60% of Central City and Commercial development took place on vacant or LoFAR land and approximately 70% of industrial development took place on vacant land. A significant portion of new development (30-40%) is occurring on parcels with a significant amount of existing development (HiFAR) that is not included in the BLI.

Both for newly built sites and expansions, the market evidences continued preference for unconstrained sites. The market can shift to support development of environmentally constrained and/or potential brownfield sites where fewer unconstrained property opportunities are available. This analysis is useful as a means to better refine realistic land needs in employment land supply and demand analysis.

X. MARINE CARGO FORECAST

PORTLAND HARBOR MARINE TERMINALS

The Harbor Access Lands geography benefits from its superior connectivity: the confluence of two rivers, access to domestic markets via two major rail lines (UP and BNSF), and interstate freeway access to I-5 (north-south) and I-84 (east-west), and access to global markets via the Pacific Ocean. Having all of this connectivity in the heart of the City of Portland, with strong local and regional policies in place to preserve harbor land for industrial use, creates a special place for water-dependent industrial firms. However, the industrial harbor land supply in the Portland region is fixed, and vacant developable land is rare and usually constrained. (See Appendix C. ECONorthwest, *Portland Harbor Industrial Land Supply Analysis*, May 2012)

A primary source of past economic growth in Portland has been marine-related economic activity, including marine industrial and marine cargo uses. These uses are projected to continue to grow over the next 30-years, with particular growth forecasted in the marine cargo and related transportation, warehousing, utility, and wholesale trade sectors. The Portland Harbor serves as a major economic engine for the regional economy. Studies indicate that cargo and manufacturing activities dependent on waterborne transportation contribute significantly to the metro region's economy. These studies indicate that marine-related economic activity generates from 20,000 to 100,000 jobs and from $1.4 to 3.4 billion annually in regional income.[13]

The Port of Portland has four marine terminals located along the Willamette and Columbia Rivers. These terminals accommodated 575 ocean-going vessels in 2010, though over the past two decades it was not uncommon for the Port to accommodate 800 to 1,000 ocean-going vessels in a year. Not counting cargos received or shipped via inland barges, the Port of Portland shipped over 13 million short tons of cargo in 2010.

Harbor industrial development tends to have low floor-to-area ratios (FAR) and a relatively low number of jobs per acre. But despite declining employment in recent years, the Portland Harbor experienced an increase in cargo tonnage at a faster pace than the rate of industrial land development in the area. [14] Therefore, given the disconnected relationship between employment growth and cargo activity in the harbor, there is a need to base the need for additional marine terminals on cargo forecasts as a supplement to any land needed to support future industrial employment growth in the Harbor Access Lands geography.

MARINE CARGO FORECAST

While employment forecasts traditionally form the basis of employment land supply analysis, employment is not a very good indicator of the long-term land needs of the freight and distribution sectors of the economy. Despite a general decline in industrial employment between 2002 and 2008 (-1.3% AAGR), cargo tonnage handled in the Portland Harbor went up 4.1% per

[13] Entrix, West Hayden Island Economic Foundation Study, July 2010

[14] ECONorthwest, Portland Harbor Industrial Land Supply Analysis, May 2012 (Appendix C of this report).

year during that same period. An average of 18 acres of land was developed each year during that period.[15]

The methodology used in the EOA to estimate marine terminal land needs was developed by ECONorthwest in a report attached as Appendix C. There have been several attempts to understand how cargo tonnage trends may impact future land needs in the Portland Harbor. Extrix studied this topic in 2010, based on cargo forecasts completed in 2009. The most recent cargo forecasts are based on a 2010 study by BST, refined to specifically call out cargo demand for Portland and Vancouver and updated with the most recent economic data in 2012.[16] Cargo forecasts generally assume an adequate land supply will be made available (that is, they do not attempt to predict how any land supply constraint might impact growth). The most recent BST forecast demand for the region in 2040 (including both Portland and Vancouver) ranges from 39 million to 67 million metric tons. For the Portland Harbor, the forecast range is 28 million to 43 million metric tons. A medium forecast scenario is estimated at the midpoint between BST's high and low scenarios. The cargo forecast is also adjusted to 2035 (see Figure 33), calculated at midpoints between the 2030 and 2040 forecasts, in order to more accurately assess land demand for each cargo type within the 2035 planning horizon.

Figure 33. 2035 Portland Harbor Cargo Forecast, Public and Private Terminals

	2010 Cargo	2035 Cargo Volume (draft 2016 revision)			2040 Medium
Cargo Type	Volume	Low	Medium	High	Cargo Volume
Metric Tons					
Automobiles	376,000	929,000	1,035,250	1,141,500	1,206,000
Containers	1,129,000	1,933,000	2,314,250	2,695,500	2,583,500
Breakbulk	966,000	1,115,500	1,208,000	1,300,500	1,242,000
Grain	6,113,000	6,597,500	8,958,000	11,318,500	9,078,000
Dry Bulk	6,193,000	9,878,500	13,385,000	16,891,500	14,093,500
Liquid Bulk	5,948,000	6,955,000	7,463,250	7,971,500	7,461,500
TOTAL	20,724,000	27,408,500	34,363,750	41,319,000	35,664,500
Average annual growth rate		1.1%	2.0%	2.8%	1.8%

Source: BST Associates, ECONorthwest, and BPS
Note: Low and High forecasts to 2040 were made by BST Associates for the Portland and Vancouver Harbor Forecast Update, 2012. ECONorthwest calculated the medium scenario. BPS calculated 2035 forecast volumes.

Future capacity needs for additional marine terminal space are estimated by subtracting the available capacity of existing terminals from forecast future volumes. Existing capacity estimates by ECONorthwest in 2012 have been updated in Figure 33 to account for major recent investments at automobile, grain and dry bulk terminals at Portland Harbor, which have substantially expanded their capacity to handle future growth.

[15] EcoNorthwest, Portland Harbor Industrial Land Supply Analysis, May 2012

[16] BST Associates, Portland and Vancouver Harbor Forecast Update, February 2012

Figure 34. Capacity Gains from Recent Marine Terminal Investments

	Marine terminal investments since 2012			Total Existing Capacity (metric tons)	
Terminal	Investment ($ millions)	Year	Capacity Gain (metric tons)	2012	2016
Automobiles			118,800	889,000	1,007,800
Auto Warehousing - Ford	$9.5	2014-16	118,800		
Containers				3,999,000	3,999,000
Breakbulk				2,350,000	2,350,000
Grain			2,650,000	7,100,000	9,750,000
Columbia Grain	$44	2014	1,900,000		
Louis Dreyfus	$21	2015	750,000		
Dry Bulk			3,250,000	12,200,000	15,450,000
Canpotex	$165	2015	2,250,000		
Kinder Morgan	$9.50	2013	1,000,000		
Liquid Bulk				8,280,000	8,280,000
TOTAL				34,568,000	40,836,800

Source: Investment estimates by ECONorthwest. Capacity estimates by Port of Portland.

Unmet capacity needs are identified by cargo type and forecast scenarios in Figure 35. These unmet capacity needs assume 90% capacity utilization in the low and medium forecast scenarios. The high scenario assumes utilization at the historical peak volume, such that new demand consists of new market opportunities that require new facilities.[17] With the low scenario forecast, existing terminals could handle all commodity types except automobiles. With the high scenario forecast, additional new terminals would be needed for automobiles, containers, grain, and dry bulk commodity types. With the medium scenario forecast, additional terminals would be needed for automobiles and grain commodities.

Figure 35. 2035 Portland Harbor Cargo Forecast Capacity Shortfall

	2035 Forecast Capacity Shortfalls		
Cargo Type	Low	Medium	High
Metric Tons			
Automobiles	-21,980	-128,230	-535,500
Containers	0	0	-810,500
Breakbulk	0	0	0
Grain	0	-183,000	-4,218,500
Dry Bulk	0	0	-9,931,500
Liquid Bulk	0	0	0
TOTAL	-21,980	-311,230	-15,496,000

Source: ECONorthwest, BPS

[17] EcoNorthwest, Portland Harbor Industrial Land Supply Analysis, May 2012

Based on the size trends of new terminals being constructed on the West Coast, the market preference for most new marine terminals is expected to be for parcels larger than 100 acres to accommodate unit-train rail-loop access and ensure competitiveness.[18] The actual acres needed to accommodate the projected marine terminal need varies, depending on the commodity type, and depending on how important it is to have an optimal terminal design. For example, it is possible to operate a grain terminal on less than 10 acres, but a modern rail-loop terminal would likely require 100+ acres.

Figure 36. 2035 Portland Harbor Medium Forecast Land Needs

Cargo Type	2035 Medium Forecast	Existing Capacity	Capacity Shortfall	Medium Forecast Land Needs (acres)		
				Minimum	Practical	Rail Loop
Automobiles	1,035,250	1,007,800	-128,230	50	100	100
Containers	2,314,250	3,999,000	-			
Breakbulk	1,208,000	2,350,000	-			
Grain	8,958,000	9,750,000	-183,000	30	50	100
Dry Bulk	13,385,000	15,450,000	-			
Liquid Bulk	7,463,250	8,280,000	-			
TOTAL	34,363,750	40,236,800		80	150	200

At the City's request, Worley Parsons completed a detailed analysis of the operational and land consumption characteristics of modern ports.[19] The report included case studies of innovative international facilities. Provision of efficient rail operations is one of the primary ways that modern terminals maximize cargo throughput for a given terminal.

Using information collected from Worley Parsons and the forecast information described above, estimated land need under the medium scenario through 2035 for Portland Harbor ranges from 80 acres at "minimum" site sizes to 150 acres at "practical" site sizes and 200 acres at rail-loop site sizes (access for unit trains), as shown in Figure 36. Generally, rail-loop site sizes reflect current development practices that maximize rail loading efficiency (if these larger sites are available within a given market area); practical site sizes reflect typical case studies examined and other information sources; and minimum site sizes reflect examples of more land-efficient case studies and operating terminals built under historical market conditions.

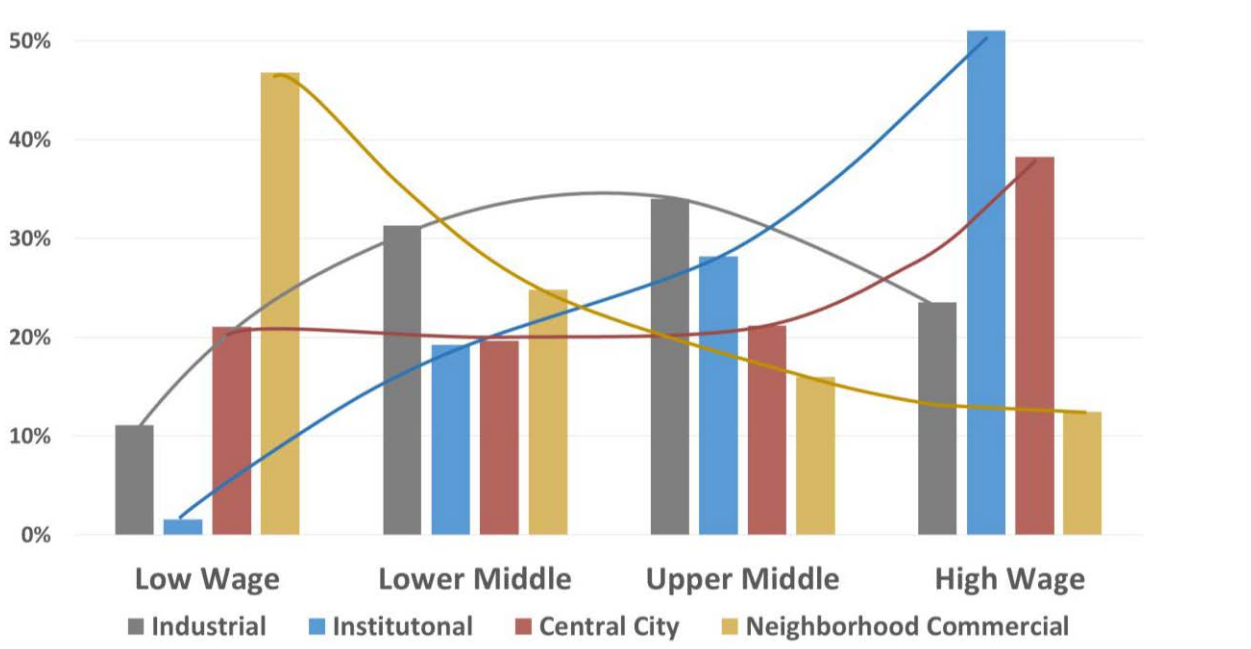
[18] Entrix, West Hayden Island Economic Foundation Study, July 2010

[19] Worley Parsons, Operational Efficiencies of Ports/Terminals Worldwide, 2012

XI. WAGE DISTRIBUTION AND JOB POLARIZATION

The mix of businesses and employment geographies in the local economy shapes the income-distribution and economic equity of the population. As shown in Figure 35, employment in the Central City and institutional geographies is concentrated in high-wage occupations that primarily require college education; industrial geography employment is concentrated in middle-wage occupations; and neighborhood commercial employment is concentrated in low-wage occupations.

Figure 37. Wage Quartile Comparison of Portland's Employment Geographies, 2012

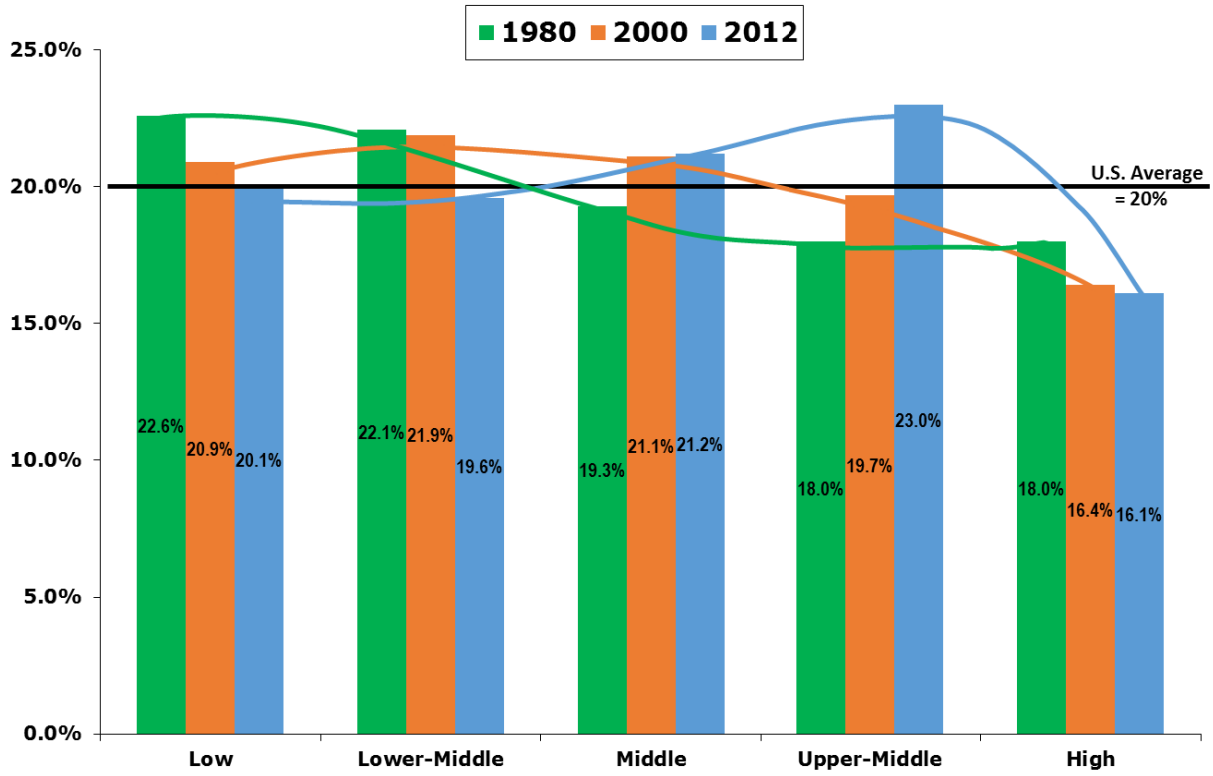


Source: Bureau of Planning and Sustainability. The wage distribution of covered employment in Portland's EOA employment geographies is grouped by citywide wage quartiles. The Low Wage quartile is less than $26,400 annually; Lower Middle is $26,400-46,400; Upper Middle is $46,400-67,600; and High Wage is more than $67,600.

Since 1980, the wage distribution of the economy has been changing, and job growth has become increasingly polarized in low- and high-wage occupations with shrinking middle-wage job opportunities (Josh Lehrer, 2012). This national trend is mirrored in the state and the region. For the majority of the workforce that doesn't have a 4-year college degree, middle-wage job opportunities are primarily in industrial and administrative-support occupations.

Portland has been less affected by this trend, having a relatively balanced economy that supports a predominantly middle-class population (Brookings Institution, Berube and Tiffany, 2004). Nevertheless, Portland's primarily lower-middle income distribution of households in 2000 has shifted to a more upper-middle income distribution by 2012, as shown in Figure 36.

Figure 38. Proportion of Households in Portland by National Quintile Income Category

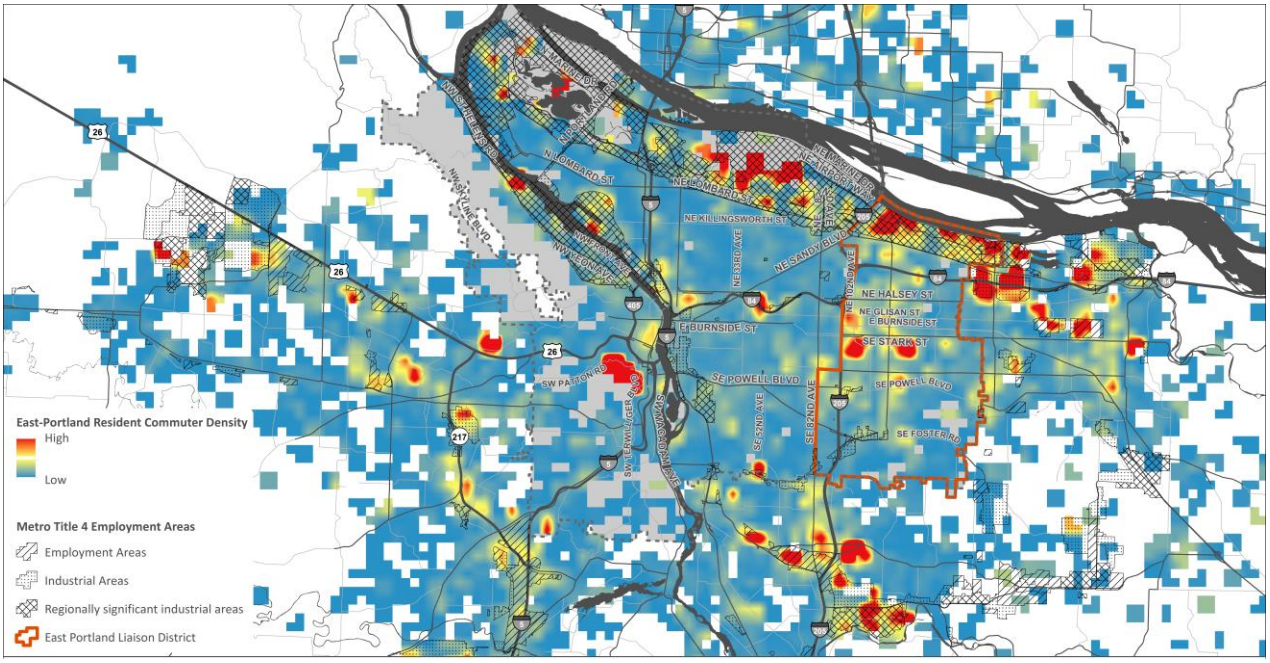


Source: Bureau of Planning and Sustainability and Brookings Institution (Alan Berube and Thatcher Tiffany, The Shape of the Curve, August 2004) from U.S. Census data. The income distribution of Portland households is grouped by national income quintile categories.

Industrial job growth also provides an important equity role in expanding income self-sufficiency for Portland's diverse population and reducing income disparities for people of color and East Portland residents. For example, 27% of the workers of color in Multnomah County are employed in middle-wage industrial occupations, compared to 17% of white workers (Coalition of Communities of Color, 2010). In contrast, only 23% of workers of color are employed in the high-wage professional and management occupations, compared to 44% of white workers. As a result, people of color are disproportionately impacted by job-polarization trends and slower industrial job growth.

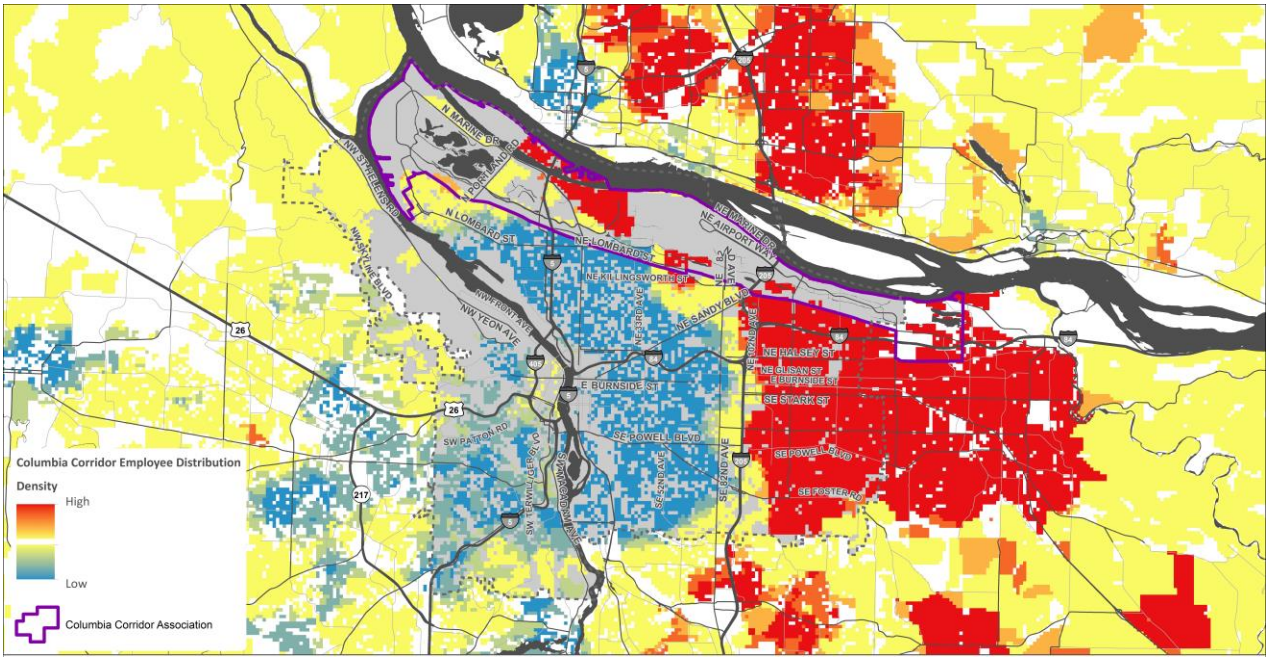
Similarly, residents of the East Portland neighborhoods work disproportionately in industrial districts and especially the Colombia Corridor, as shown in Figure 37. Conversely, workers in the Colombia Corridor industrial districts live primarily east of I-205 and are underrepresented in inner and West Portland neighborhoods, as shown on Figure 38. While labor markets are commonly considered to be regional in scale, there also appears to be substantial interdependence between East Portland's predominantly middle-/moderate-income neighborhoods and Portland's large middle-wage industrial districts.

Figure 39. Where East Portland Residents Work



Source: Bureau of Planning and Sustainability (August 2014) from Longitudinal Employment and Housing data, U.S. Census.

Figure 40. Where Columbia Corridor Workers Reside



Source: Bureau of Planning and Sustainability (August 2014) from Longitudinal Employment and Housing data, U.S. Census.

XII. EOA IMPLICATIONS

This section is intended to *set the stage* for the next steps of this economic opportunities analysis. Key implications of this trends and opportunities analysis for remaining portions of the economic opportunities analysis are summarized as follows:

- Long-term job growth trends have fluctuated and create uncertainty for forecasting growth in the coming decades. The 2000's were a period of relatively slow job growth not only for Portland but for the metro region and nationally. Despite an economic downturn experienced just after 2000, followed by modest growth and a major recession at end of the decade, Metro is projecting that the nation and region should expect to return to a more normalized pattern of job recovery and stronger growth over the long-term horizon of the next 25 years.
- For Portland, another question is whether the city will maintain the 25% capture rate of regional job growth that Multnomah County experienced over the 1980-2008 period. Portland's capture rate fell to 5% in the 2000-2008 business cycle and has since rebounded to 23% in the 2008-2013 period. The answer to this question has significant ramifications not only for Portland's economic vitality but for regional urban growth management.
- Finally, it is apparent that the "hot spot" locations where job growth is occurring within the City have shifted in recent years. The focus of added Central City job gains has shifted from the traditional downtown core toward adjacent areas in the River and Lloyd commercial / mixed use districts and the emerging incubators of the Central Eastside and Lower Albina. Similar shifts are occurring within and between the City's industrial, urban center and neighborhood commercial areas. In numerical terms, by far the strongest growth has been within Portland's institutional geography.

As a final note, this Task 1 report has focused on employment in terms of Goal 9 requirements for an Economic Opportunities Analysis. The resulting employment analysis addresses trends with respect to the number and types of jobs including categorization by land use designation. However, it is important to note that employment is one of many approaches to measuring economic activity.

Because the focus of this report is how business uses land, employment and building development are emphasized. Other factors – such as wage levels, technology and capital intensiveness, monetary output and comparative regional advantage (or location quotients) – are not directly considered. This report also does not evaluate which industries and jobs the region should endeavor to encourage, but rather reports past trends as illustrated via employment data.

APPENDIX A. FOCUS GROUP PARTICIPANTS

As identified by the following listing, a total of 58 individuals participated in six focus groups conducted in 2009 for this Economic Opportunities Analysis. The interest and time given by all participants is gratefully acknowledged.

Figure 41. Focus Group Participants

Participant Name	Firm/Organization
Central City Office:	
Gregory Goodman	City Center Parking
Ted Gilbert	Gilbert Brothers
David Lake	Liberty NW
Scott Andrews	Melvin Mark Companies
Jeff Bourlag	NBS Realtors
Brian Owendoff	Opus NW
Steve Pfeiffer	Perkins Coie
Bernie Bottomly	Portland Business Alliance
Carly Riter	Portland Business Alliance
Josh Schlesinger	Schlesinger Companies
Matt Cole	Shorenstein
Close In Incubator:	
Pete Eggspuehler	Beam Development
Eva Schweber	Cube Space
Debbie Kitchin	Inter Works
Mickael Zokoych	Michael's Italian Beef & Sausage
Peter F. Fry	Planning Consultant
Daniel Yates	Portland Spirit
Bob Rogers	Robert R. Rogers Co.
David Lorati	School Specialty Co.
Manufacturing & Distribution:	
Corky Collier	Columbia Corridor Alliance
D. A. Albrecht	Concordia University
Jay Griffith	Evraz Inc NA
Wayne Matulich	ITT Technical
Linda Craig	Norris & Stevens
Gary Hunt	Oregon Transfer
Ann Gardner	Schnitzer Steel
Mike Williams	Silver Eagle Manufacturing
Deon Kampfer	WM

Participant Name	Firm/Organization
Neighborhood Commercial:	
Michael Zokoych	Central Eastside Industrial Council
Cindy Sturm	Cindy Sturm Real Estate
Bob LeFeber	Commercial Realty Advisors
Jean Baker	Division Clinton
Tony Fuentes	NW Children's Business/Fox Chase Alliance
Michelle Marx	SERA Architects
Gerry Boeher	St. Johns Boosters
TOD/Mixed Use Corridors:	
Pete Eggspuehler	Beam Development
John Carroll	Carroll Investments
Kevin Cavenaugh	Cavenaugh Development
Jeana Woolley	JM Woolley & Associates
Tom Kemper	Kemper Company, LLC
Vern Rifer	Rifer Development
Kim Knox	Shiels Obletz Johnsen
Rick Gustafson	Shiels Obletz Johnsen
Campus Institutional:	
Theresa Paulson	Concordia University
Michael Sestric	Institutional Facilities Coalition
Scott Davis	Kaiser Permanente
Richard Bettega	Lewis & Clark College
David Groff	Linfield College
Glenn Ford	Linfield College
Gary Andeen	Oregon Independent Colleges Association
Wing-Kit Chung	Portland Community College
Ty Wyman	Providence Medical Center
Edwin McFarlane	Reed College
Jennifer Baters	Reed College
Townsend Angel	Reed College
Andrea Cook	Warner Pacific College
Steve Stenberg	Warner Pacific College

APPENDIX B. SUPPLEMENTAL DATA TABLES

On the following pages are provided supplemental detailed U.S. employment trend and projection data covering:

- U. S. Non-Farm Employment Trend and Projection (by employment sector and covering the 1980 – 2035 time period
- Portland Metro Location Quotients Relative to the U.S. (by employment sector and covering the 1990 – 2035 time period)

Figure 42. U.S. Non-Farm Employment Trend & Projection (1980-2035)

	U. S. Employment (in millions)												Annual % Change		% of Total		
	1980	1985	1990	1995	2000	2005	2010	2015	2020	2025	2030	2035	1990-05	2005-35	1990	2005	2035
Total Non-Farm Jobs	90.53	97.51	109.49	117.31	131.79	133.69	135.62	146.5	153.33	159.9	166.49	173.54	1.3%	0.9%	100.0%	100.0%	100.0%
Private Employment	74.15	80.98	91.08	97.87	111	111.89	113.24	123.29	129.36	135.4	141.28	147.88	1.4%	0.9%	83.2%	83.7%	85.2%
Manufacturing	18.73	17.82	17.70	17.24	17.27	14.23	11.99	12.78	12.63	12.00	11.52	11.14	-1.4%	-0.8%	16.2%	10.6%	6.4%
Durable Goods	11.68	11.03	10.74	10.37	10.88	8.96	7.46	8.20	8.04	7.57	7.28	7.10	-1.2%	-0.8%	9.8%	6.7%	4.1%
Lumber	N/A	N/A	0.54	0.57	0.61	0.56	0.43	0.55	0.53	0.49	0.46	0.47	0.2%	-0.6%	0.5%	0.4%	0.3%
Primary Metals	N/A	N/A	0.69	0.64	0.62	0.47	0.37	0.38	0.37	0.37	0.33	0.29	-2.5%	-1.6%	0.6%	0.4%	0.2%
Fabricated Metals	N/A	N/A	1.61	1.62	1.75	1.52	1.29	1.47	1.50	1.45	1.39	1.30	-0.4%	-0.5%	1.5%	1.1%	0.7%
Machinery	N/A	N/A	1.41	1.44	1.46	1.17	1.05	1.20	1.18	1.11	1.05	1.00	-1.2%	-0.5%	1.3%	0.9%	0.6%
Electronics	N/A	N/A	1.90	1.69	1.82	1.32	1.15	1.01	0.94	0.90	0.94	1.01	-2.4%	-0.9%	1.7%	1.0%	0.6%
Transport. Equipment	N/A	N/A	2.13	1.98	2.06	1.77	1.39	1.61	1.47	1.24	1.11	1.10	-1.2%	-1.6%	1.9%	1.3%	0.6%
Oth. Durables	N/A	N/A	2.45	2.43	2.56	2.15	1.79	1.99	2.05	2.01	1.99	1.92	-0.9%	-0.4%	2.2%	1.6%	1.1%
Non-Durables	7.05	6.78	6.96	6.87	6.39	5.27	4.53	4.58	4.59	4.43	4.25	4.04	-1.8%	-0.9%	6.4%	3.9%	2.3%
Food Proc.	N/A	N/A	1.51	1.56	1.55	1.48	1.45	1.55	1.62	1.62	1.62	1.61	-0.1%	0.3%	1.4%	1.1%	0.9%
Paper	N/A	N/A	0.65	0.64	0.60	0.48	0.41	0.42	0.43	0.42	0.40	0.38	-2.0%	-0.8%	0.6%	0.4%	0.2%
Other Non-Dur.	N/A	N/A	4.80	4.67	4.23	3.31	2.67	2.61	2.55	2.39	2.22	2.05	-2.4%	-1.6%	4.4%	2.5%	1.2%
Non-Manufacturing	71.79	79.69	91.79	100.07	114.53	119.45	123.63	133.71	140.71	147.90	154.95	162.39	1.8%	1.0%	83.8%	89.3%	93.6%
Natural Resources	1.08	0.97	0.76	0.64	0.60	0.63	0.72	0.66	0.56	0.55	0.53	0.53	-1.2%	-0.6%	0.7%	0.5%	0.3%
Construction	4.45	4.79	5.27	5.28	6.79	7.33	6.52	7.61	8.11	8.74	9.57	10.47	2.2%	1.2%	4.8%	5.5%	6.0%
Wholesale Trade	4.56	4.91	5.27	5.43	5.93	5.76	5.76	6.35	6.98	7.66	7.87	7.69	0.6%	1.0%	4.8%	4.3%	4.4%
Retail Trade	10.24	11.73	13.18	13.90	15.28	15.28	15.40	15.59	15.38	15.38	15.32	15.44	1.0%	0.0%	12.0%	11.4%	8.9%
Auto parts	N/A	N/A	1.49	1.63	1.85	1.92	1.95	1.91	1.81	1.79	1.78	1.80	1.7%	-0.2%	1.4%	1.4%	1.0%
Food & Bev.	N/A	N/A	2.78	2.88	2.99	2.82	2.94	2.78	2.61	2.60	2.55	2.52	0.1%	-0.4%	2.5%	2.1%	1.5%
Other Retail	N/A	N/A	8.91	9.39	10.44	10.54	10.51	10.89	10.96	11.00	10.99	11.12	1.1%	0.2%	8.1%	7.9%	6.4%
TWU	3.61	3.73	4.22	4.51	5.01	4.92	4.95	5.76	6.38	6.88	7.19	7.23	1.0%	1.3%	3.9%	3.7%	4.2%
Information	2.36	2.44	2.69	2.84	3.63	3.06	2.78	2.96	3.15	3.44	3.80	4.32	0.9%	1.2%	2.5%	2.3%	2.5%
Printing	N/A	N/A	0.87	0.91	1.03	0.90	0.80	0.82	0.84	0.86	0.89	0.95	0.2%	0.2%	0.8%	0.7%	0.5%
Internet, etc.	N/A	N/A	1.82	1.93	2.59	2.16	1.98	2.14	2.32	2.58	2.91	3.37	1.1%	1.5%	1.7%	1.6%	1.9%
Financial Activities	5.02	5.81	6.61	6.83	7.69	8.15	8.24	8.57	8.42	8.44	8.44	8.61	1.4%	0.2%	6.0%	6.1%	5.0%
Finance & Ins.	N/A	N/A	4.98	5.07	5.68	6.02	6.11	6.33	6.22	6.21	6.22	6.39	1.3%	0.2%	4.5%	4.5%	3.7%
Real Estate	N/A	N/A	1.64	1.76	2.01	2.13	2.13	2.24	2.20	2.23	2.22	2.22	1.8%	0.1%	1.5%	1.6%	1.3%
Professional Business	N/A	N/A	10.85	12.85	16.67	16.94	17.73	21.96	25.16	28.42	32.30	36.37	3.0%	2.6%	9.9%	12.7%	21.0%
Pro., Sci., Tech.	N/A	N/A	4.54	5.08	6.70	7.02	7.88	8.98	10.20	12.29	14.79	17.96	2.9%	3.2%	4.1%	5.3%	10.3%
Mgmt. of Companies	N/A	N/A	1.67	1.69	1.80	1.76	1.80	1.72	1.60	1.53	1.45	1.39	0.4%	-0.8%	1.5%	1.3%	0.8%
Admin & Waste	N/A	N/A	4.64	6.08	8.17	8.16	8.05	11.26	13.36	14.60	16.06	17.02	3.8%	2.5%	4.2%	6.1%	9.8%
Edu. & Health	7.07	8.66	10.98	13.29	15.11	17.37	19.90	21.61	22.87	23.64	24.09	24.81	3.1%	1.2%	10.0%	13.0%	14.3%
Education	N/A	N/A	1.69	2.01	2.39	2.83	3.24	3.06	3.01	3.05	3.06	3.09	3.5%	0.3%	1.5%	2.1%	1.8%
Health Care	N/A	N/A	9.30	11.28	12.72	14.54	16.66	18.55	19.86	20.60	21.03	21.73	3.0%	1.3%	8.5%	10.9%	12.5%
Leisure & Hospitality	6.72	7.87	9.29	10.50	11.86	12.81	13.53	14.12	14.39	14.73	14.95	15.33	2.2%	0.6%	8.5%	9.6%	8.8%
Arts & Entertain.	N/A	N/A	1.13	1.46	1.79	1.89	1.97	1.95	2.09	2.29	2.42	2.54	3.5%	1.0%	1.0%	1.4%	1.5%
Accomm. & Food Ser.	N/A	N/A	8.15	9.04	10.07	10.92	11.56	12.17	12.30	12.44	12.53	12.79	2.0%	0.5%	7.4%	8.2%	7.4%
Other Services	2.75	3.37	4.26	4.57	5.17	5.39	5.72	5.31	5.34	5.52	5.69	5.93	1.6%	0.3%	3.9%	4.0%	3.4%
Govt., Civilian, total	16.38	16.53	18.41	19.43	20.79	21.81	22.38	23.21	23.97	24.50	25.20	25.66	1.1%	0.5%	16.8%	16.3%	14.8%

Source: Global Insight, *2008 QR US Long-Term Outlook*, as compiled by Metro.

Figure 43. Portland Metro Location Quotients Relative to U.S. (1990-2035)

	1990	1995	2000	2005	2008	2010	2015	2020	2025	2030	2035
Manufacturing, total	1.06	1.09	1.12	1.18	1.22	1.27	1.23	1.22	1.26	1.28	1.30
Durable Goods, total	1.25	1.29	1.34	1.43	1.45	1.53	1.45	1.45	1.51	1.54	1.56
Wood Products	2.21	1.54	1.31	1.45	1.34	1.22	1.15	1.12	1.14	1.12	1.05
Primary Metal	1.86	1.47	1.68	1.77	2.09	2.22	2.03	1.82	1.67	1.66	1.72
Fabricated Metal	1.01	1.13	1.06	1.12	1.11	1.16	1.07	1.01	1.00	1.00	1.02
Machinery	0.98	1.01	0.97	0.96	0.95	0.96	0.85	0.80	0.80	0.80	0.81
Electrical Machinery	2.23	2.70	3.07	3.77	3.75	3.63	4.38	4.79	5.01	4.86	4.56
Transportation Equipment	0.67	0.67	0.73	0.69	0.71	0.83	0.74	0.82	0.97	1.07	1.06
Non-durable Goods, total	0.78	0.79	0.76	0.77	0.80	0.85	0.84	0.82	0.82	0.83	0.84
Food Processing	0.95	0.86	0.77	0.79	0.83	0.85	0.79	0.72	0.68	0.65	0.64
Paper	1.75	1.55	1.46	1.40	1.32	1.45	1.47	1.39	1.36	1.35	1.37
Non-manufacturing, total	1.03	1.03	1.01	1.01	1.00	1.00	1.01	1.01	1.01	1.01	1.01
Natural Resources	0.40	0.44	0.42	0.39	0.28	0.31	0.31	0.32	0.30	0.29	0.27
Construction	1.05	1.20	1.06	1.08	1.17	1.22	1.09	1.03	0.99	0.93	0.89
Retail Trade	0.94	0.93	0.95	0.93	0.95	0.94	0.98	0.96	0.96	0.97	0.98
Motor Vehicle & Parts	1.09	1.04	1.04	1.00	0.97	0.92	1.01	1.07	1.08	1.09	1.08
Food & Beverage Stores	0.82	0.80	0.85	0.89	0.93	0.89	0.97	1.01	1.01	1.03	1.05
Other Retail	0.96	0.95	0.96	0.93	0.95	0.96	0.97	0.93	0.93	0.94	0.94
Transp., Warehouse, & Utilities	1.13	1.08	1.04	1.02	0.98	1.01	1.00	0.95	0.91	0.90	0.93
Information, total	0.90	0.93	0.97	1.02	1.09	1.08	1.11	1.14	1.14	1.12	1.05
Publishing	0.78	0.99	1.27	1.37	1.56	1.66	1.86	2.14	2.36	2.51	2.48
Internet & Other	0.97	0.90	0.85	0.87	0.90	0.85	0.83	0.78	0.74	0.69	0.64
Finance Activities	1.14	1.13	1.14	1.14	1.13	1.12	1.20	1.28	1.34	1.39	1.42
Finance & Insurance	0.91	0.91	0.99	0.99	0.95	0.96	1.04	1.11	1.17	1.21	1.24
Real Estate	1.84	1.77	1.57	1.55	1.62	1.61	1.63	1.74	1.80	1.89	1.96
Pro. Business Services	1.08	1.14	1.06	1.03	1.01	1.01	0.93	0.88	0.83	0.78	0.73
Pro., Sci., & Tech.	1.21	1.20	0.98	0.95	0.91	0.90	0.89	0.85	0.76	0.67	0.59
Mgmt. of Companies	0.92	1.23	1.52	1.56	1.62	1.61	1.95	2.32	2.66	3.10	3.56
Admin. Support	1.01	1.05	1.02	0.99	0.96	0.99	0.81	0.73	0.70	0.67	0.65
Edu. & Health Care	1.01	0.92	0.92	0.94	0.92	0.90	0.95	1.01	1.07	1.14	1.19
Educational	1.04	0.98	1.02	1.00	0.96	0.96	1.09	1.21	1.29	1.38	1.45
Health Care	1.00	0.91	0.90	0.92	0.91	0.89	0.92	0.98	1.03	1.10	1.15
Leisure & Hospitality	1.03	1.01	0.98	0.96	0.96	0.95	0.99	1.03	1.05	1.08	1.09
Arts, Entertainment & Rec.	1.32	1.13	0.99	0.95	0.92	0.91	0.98	0.99	0.96	0.96	0.95
Accommodation & Food	0.99	0.99	0.98	0.96	0.97	0.96	0.99	1.03	1.07	1.10	1.12
Other Services	0.91	0.89	0.88	0.87	0.88	0.83	1.04	1.15	1.21	1.27	1.28
Government, Civilian total	0.89	0.85	0.90	0.90	0.91	0.91	0.86	0.85	0.85	0.83	0.85
Federal, Civilian	0.89	0.85	0.89	0.91	0.87	0.87	0.85	0.81	0.78	0.75	0.73
State & Local	0.81	0.79	0.84	0.85	0.86	0.86	0.82	0.81	0.82	0.81	0.83

Source: Global Insight, *2008 QR US Long-Term Outlook* and Metro.

APPENDIX C. PORTLAND HARBOR INDUSTRIAL LAND SUPPLY ANALYSIS

Portland Harbor: Industrial Land Supply Analysis

Prepared for the City of Portland:
Bureau of Planning and Sustainability

Prepared by ECONorthwest

in association with:

Maul Foster & Alongi, Inc.
and
Bonnie Gee Yosick llc

ECONorthwest
ECONOMICS · FINANCE · PLANNING

May 2012

Preface

This report addresses four questions about land in the Portland Harbor area. It supports the City of Portland's efforts to update its Economic Opportunities Analysis, plan for the land use in the Harbor area, and address issues related to the development and conservation of West Hayden Island.

ECONorthwest was the lead consultant to the City on this evaluation, assisted by subconsultants Maul Foster & Alongi, and Bonnie Gee Yosick LLC. This consultant team had substantial and appreciated assistance from many sources, but especially: City of Portland Bureau of Planning and Sustainability, Port of Portland, Port of Vancouver, Working Waterfront Coalition, and BST Associates.

Despite the assistance, ECONorthwest and its subcontractors alone are responsible for the report's contents. The report has been reviewed by City staff and an advisory committee, but the views expressed are those of the consultants and may not be shared by others who contributed to or reviewed this report.

Throughout the report ECONorthwest has identified sources of information and assumptions used in the analysis. Within the limitations imposed by uncertainty and the project budget, staff at ECONorthwest and the Bureau of Planning and Sustainability at the City of Portland have made every effort to check the reasonableness of the data, methods, and assumptions and to test the sensitivity of the results to changes in key assumptions. Any forecast of the future is uncertain. The fact that ECONorthwest and its team members evaluate the assumptions in this report as reasonable does not guarantee that those assumptions will prevail.

Summary

This evaluation starts from the assumption, embedded in the economic development policies of all local governments in the region, that the retention, expansion, and relocation to the region of industrial sectors is something that the region desires. It addresses the capacity of industrial land in the Portland Harbor area to accommodate future development, both for new public marine terminals and private marine-dependent businesses. It addresses *four questions posed by the City*:

1. Are the methods the City used to estimate the location and amount of vacant, partially vacant, and potentially buildable industrial land in the Portland Harbor area likely to yield reasonable estimates?
2. Given the estimated land supply in the Portland Harbor area, how suitable for a public marine terminal are the few sites identified by the City as having the best potential to accommodate such a terminal?
3. If those sites do not develop as marine terminals (for whatever reasons) to what extent can the Port of Vancouver play a role in accommodating forecasted cargo demand in the Portland region?
4. Finally, if existing vacant land in the harbor area and in Vancouver is estimated to be insufficient to accommodate forecasted or desired transshipment or industrial activity, what is the potential for more efficient use of industrial land in the Portland Harbor study area? That question implies answering the question: What does more efficient use of industrial land mean, and how would it be measured?

SUPPLY OF VACANT OR UNDERUTILIZED INDUSTRIAL LAND

The methods used for the City's evaluation of the supply of vacant land in the Harbor Area are sound, state of the practice, and produce results that have been confirmed by independent methods. When looking for where in the Harbor Area is vacant land that could potentially be assembled into a 100-acre (or, at a minimum, a 50-acre) site with waterfront access? the City correctly identified the two sites with greatest potential: Atofina and Time Oil.

POTENTIAL FOR MARINE TERMINAL SITES

Public marine terminals have specific land use requirements that are difficult to find. Ideally, sites must be large and flat, inside of an industrial zone, have significant shoreline on a navigable river, be served by both rail and truck, and free of contamination, wetlands, or other environmental constraints. Excluding West Hayden Island, there are no sites in the Portland Harbor that meet these ideal requirements, though there are a few sites that come close. This should not imply that West Hayden Island meets all the ideal site requirements (in fact West Hayden Island lacks sufficient truck access, and is constrained by wetlands), but is simply stating that the West Hayden Island site is outside the boundary of our study area. The questions are: how close do they come, and is there a way to cost-effectively develop these sites as productive public marine terminals?

The City of Portland identified the two sites in the Portland Harbor that are most likely to be suitable for development of a new public marine terminal: the Atofina site, and the Time Oil site. Of these two sites, development is technically possible on either, but there are major hurdles that would add significant costs. Both sites have some level of contamination, both sites would require negotiation and property acquisition from numerous property owners, and both sites are smaller than desirable, which precludes the possibility of an onsite rail loop. Ultimately, issues related to the Superfund cleanup of the Willamette River make all sites in the Portland Harbor very challenging (if not altogether unfeasible) for development in the near future.

ROLE OF VANCOUVER IN PROVIDING HARBOR-AREA INDUSTRIAL LAND

Recent forecasts suggest that under mid-range assumptions about cargo demand, the Port of Portland's existing marine terminals will reach the limits of their capacity (for at least some cargo types) in the next several decades. Once these facilities meet their capacity, the Port will need to develop new facilities, or else turn away demand. The Port of Vancouver shares many of the same attributes that make the Port of Portland an attractive place for marine shipping. Thus, the Port of Vancouver is a logical place to site new marine terminals, if sites are unavailable in the 4,000-acre Portland Harbor.

Projecting future land needs to accommodate demand for public marine terminals is difficult, and even the best forecasts suggest a wide-range of potential outcomes. Given mid-range (and presumably most likely) scenario for future demand, the Port of Vancouver may, in theory, have

enough developable land to accommodate regional growth in cargo volumes through 2040. The assumptions in variation of the mid-range forecasts show the Portland-Vancouver Region needing an additional 200 to 600 acres for new terminals by 2040: there is vacant industrial land with water-access that is in that range. In practice, however, competing demands for Port of Vancouver lands, policies and competition among affected jurisdictions, and the potential for higher growth in cargo volumes all make it possible, if not likely, that the land controlled by the Port of Vancouver would not be able to accommodate all of the regional demand for marine cargo. The "high" forecast of cargo demand, for example, is three times the mid-range demand.

From a regional perspective, it makes little difference whether terminal development occurs in Portland or Vancouver. Both cities function as part of the same regional economy, and share the same infrastructure and labor pool. At a local level, however, if demand for public marine terminals is shifted from Portland to Vancouver, the City of Portland would lose some industrial jobs and the income they generate to Vancouver.

POTENTIAL FOR INCREASED EFFICIENCIES IN THE USE OF LAND

Typical measures of efficiency of land use include employment, real market value, and built space. Harbor industrial development tends to have low floor-area ratios (FAR) and a relatively low number of jobs per acre. Thus, typical measures of efficiency would all tend to improve if industrial land were converted to other commercial uses. But industrial lands in general, and harbor lands in the case of this study, are clearly an important piece of the regional economy. Therefore, we suggest two alternative measures of efficiency that are more appropriate for harbor industrial land: value added and tonnage of cargo.

Data from recent years show some measures of economic output have been increasing faster than vacant land is being converted to developed land, and other measures have not. The region should continue to track these measures and adopt policies with the intention of increasing measures of economic output faster than vacant land is converted to developed land. This seems like an objective that could appeal to people with different interests: economic development, environmental amenity, or smart growth.

Table of Contents

Chapter 1 INTRODUCTION

Section 1.1 describes events leading to this study and what the City hopes to learn from it. The City wants to evaluate the potential for the Portland Harbor to support economic activity. It has four questions about the capacity of land in the Portland Harbor to support future economic activity: (1) about the supply of vacant and underutilized land in the harbor area for marine terminals or water-dependent industrial uses; (2) about the land needs and potential land available for new port terminals; (3) about the role of Vancouver as a regional port; and (4) about potential changes in the use of industrial land (one aspect of which is referred to as "land efficiency"). **Section 1.2** describes how the rest of the report is organized.

1.1 BACKGROUND AND PURPOSE

The City of Portland (City) is the center of a large regional economy: there are about one million jobs in the seven-county metropolitan area, and almost 400,000 jobs within the city limits.

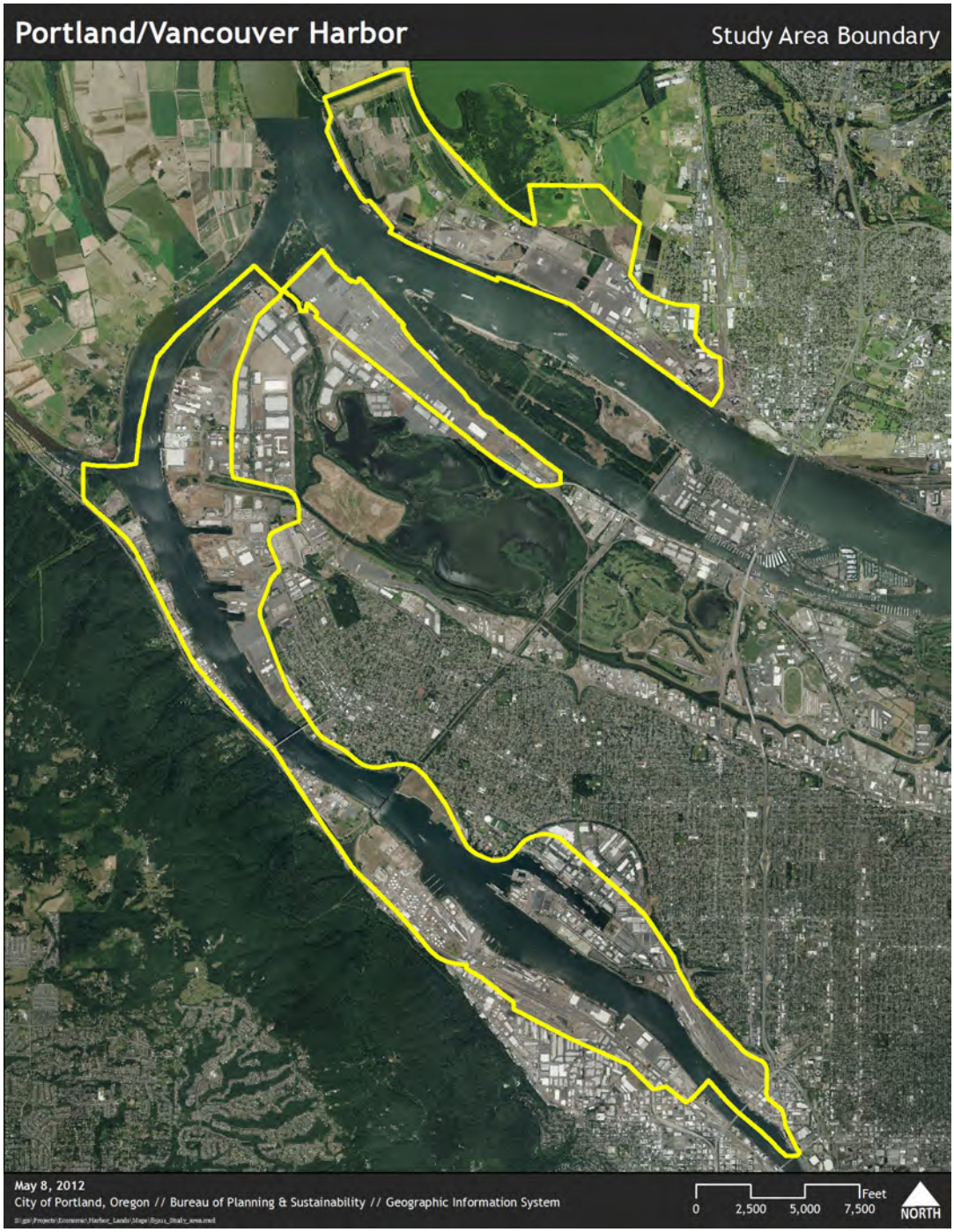
Many factors have contributed to the growth of the Portland economy, but one important factor is its ability to transport goods. Portland benefits from accessibility by highways (at the intersection of Interstates 5 and 84), rail (two Class 1 railroads - Union Pacific and BSNF, and short-line railroads), air (Portland International Airport), and sea (the Columbia and Willamette rivers).

The Portland Harbor is an industrial area located along the Willamette River that relies on the confluence of transportation infrastructure in the City (Exhibit 1.1). It contains about 4,000 acres of land located south of the Columbia River, west of I-5, and on both the east and west shores of the Willamette River. River-related industrial activities operate as a partnership between public marine terminals (owned and operated by the Port of Portland) and private businesses, including many marine-dependent industries. Key industrial sectors in the Portland Harbor include construction, manufacturing, warehousing, and transportation.

Over the past decade several studies of the Portland Harbor have been completed. The 2010 *West Hayden Island Economic Foundation Study* (prepared by Entrix for the City of Portland) summarized the conclusions of these studies:

> *"Portland Harbor serves as an economic engine for the metro regional economy… Past studies indicate that cargo and manufacturing activities dependent on waterborne transportation contribute significantly to the metro region's economy. These studies indicate that marine-related economic activity generates from 20,000 to 100,000 jobs and from $1.4 to 3.4 billion annually in regional income."*

Exhibit 1-1. Portland Harbor study area



Source: City of Portland, Bureau of Planning, 2011.

Another recent study, *Portland's Working Rivers: The Heritage and Future of Portland's Industrial Heartland* (2008 report prepared by Carl Abbott for the Working Waterfront Coalition) describes the impact of the harbor on the City. Some of its conclusions:

- The Portland Harbor is the nexus of a multi-modal system. The Willamette and Columbia rivers serve marine terminals, ocean shipping lines, barge lines, and bulk handling facilities. These waterborne facilities connect to railroads, interstates, commercial and general airports, and pipelines.
- Approximately 90% of harbor sites have access to rail routes, improving efficiency of transporting large loads from sea to land.
- Cargo forecasts by the Port of Portland further highlight the importance of the harbor: the volume of trade through Portland is expected to double by 2035.

In 2004, four river-related districts (Northwest Industrial District, Swan Island / Central Eastside, Rivergate, and Columbia Corridor) had employment about equal to the metropolitan area's three other industrial districts: the Sunset Corridor and 217 Corridor (where the electronics and computer industry is concentrated), and the Milwaukie/Clackamas Corridor (with a mix of manufacturing and distribution).

The importance of the harbor to the regional economy would be sufficient reason for the City to evaluate the harbor's needs for continued operation and expansion. But additional issues motivate the current evaluation. First, the City is in the process of concluding an extensive study of the City and regional economy (its *Economic Opportunities Analysis*, or EOA) as required by state land-use law. Second, the City has been engaged in studies of West Hayden Island, where there is a question about which land should be made available for future port development and which should preserved as natural areas.[1] Answering that question depends in part on whether alternative areas in or near the Portland Harbor study area have land that is appropriate and sufficient for the water- and port-related development that is expected or desired.

Thus, though several studies of development issues in the Portland Harbor area have occurred in the last five years, the City wanted an evaluation to (1) synthesize and evaluate the findings of previous studies as they relate to the harbor economy and industrial land uses, and (2) address three specific questions related to the development of industrial land in the Portland Harbor.

To that end, the City asked ECONorthwest (ECO) to re-examine the inventory of existing harbor lands, both in Portland and the broader region (including Vancouver). This report addresses the capacity of industrially-designated land in the harbor area to accommodate future development,

[1] A current proposal for West Hayden Island is to devote 300 acres of land for marine terminal development, while setting aside 500 acres for open space.

both for new public marine terminals and private marine-dependent businesses. It addresses four questions posed by the City, each new question building from the answer of the question preceding it:

1. Are the methods the City used to estimate the location and amount of vacant, partially vacant, and potentially buildable industrial land in the Portland Harbor area likely to yield reasonable estimates?
2. Given the estimated land supply in the Portland Harbor area, how suitable for a public marine terminal are the few sites identified by the City as having the best potential to accommodate such a terminal?
3. If those sites do not develop as marine terminals (for whatever reasons), to what extent can the Port of Vancouver play a role in accommodating forecasted cargo demand in the Portland region?
4. If existing vacant land in the harbor area and in Vancouver is estimated to be insufficient to accommodate forecasted or desired transshipment or industrial activity, what is the potential for more efficient use of industrial land in the Portland Harbor study area? That question implies answering the question: What does more efficient use of industrial land mean, and how would it be measured?

By answering these questions, this report helps the City move forward in its planning processes. It provides information to help with assumptions that the City's *Economic Opportunities Analysis* may be making about industrial land supply and the efficiency (density) at which that land is likely to develop. It helps the City assess the importance of West Hayden Island as a site for future development of new public marine terminals by evaluating the (limited) potential of suitable sites for such development elsewhere in the Portland Harbor.[2]

[2] This report does not, however, include any analysis regarding the applicability of its findings to state, regional or local planning policies: such information will presumably be provided as part of any additional analysis by the City.

1.2 ORGANIZATION OF THIS REPORT

This report has three additional chapters and three appendices:

Chapter 2, Framework and Methods: Summary of economic concepts underlying the analysis, and specific methods used to answer the four questions that are the focus of this report.

Chapter 3, Analysis: Current and likely future conditions for key factors affecting economic activity in the Portland Harbor.

Chapter 4, Summary of Findings: Briefly restates the important conclusions of our analysis.

Appendix A: Research Methods: Framework for understanding and methods for conducting our analysis (more detail than is provided in Chapter 2 of the main report).

Appendix B: Port Terminal Site Evaluation Criteria: Used by Maul Foster & Alongi, Inc. to evaluate the feasibility of potential sites in the Portland Harbor.

Appendix C: Analysis of Harbor Land Capacity and Demand, Portland and Vancouver: Provides greater detail (including a wealth of tables) on the data-driven methods used, in part, to determine the potential for the Port of Vancouver to accommodate forecast demand for the Portland Harbor, if there are insufficient sites in Portland to accommodate all of the expected demand.

Appendix D: Mapping Analysis: Presents the results of the City's visual survey of aerial maps of the Portland Harbor to classify the lands in one of several categories.

Chapter 2 FRAMEWORK AND METHODS

Section 2.1 discusses a *framework* for evaluation: concepts that underlie any evaluation of this type. It discusses (1) the role of industrial activity in the economy, (2) definitions of industrial use and industrial land, (3) factors relating to the supply of and demand for industrial land, and (4) the concept of land efficiency: what is it, why does it matter, and how is it measured. **Section 2.2** is more specific about the *methods* used for the evaluation (review of previous studies, secondary data, case studies, interviews) and how they are used to address this study's four questions. **Appendix A** provides a more detailed description of our framework and methods.

2.1 FRAMEWORK

2.1.1 WHY CARE ABOUT INDUSTRIAL LAND?

This study starts from the assumption, embedded in the economic development policies of all local governments in the region, that the retention, expansion, and relocation to the region of industrial sectors is something that the region desires. Industrial activity and employment is mainly classified as export oriented ("traded sector") and is likely to have jobs at higher than average wages.

2.1.2 DEFINING INDUSTRIAL LAND AND USERS

- **Industrial land:** What is commonly referred to as "industrial" land is land designated by a local government (in its comprehensive plan, and implemented by its zoning ordinances) to allow (but not necessarily require) industrial uses. In the Portland Harbor, the City does strictly limit non-industrial uses, and allows only river-related and river-dependent industry.
- **Harbor land:** A smaller subset of industrial land pertinent in this study is "harbor" land. For this study, we use the City's definition of the "Portland Harbor." A map of the Portland Harbor is shown previously in Exhibit 1-1.
- **Industrial users:** A recent analysis of industrial land published by the American Planning Association[3] used NAICS codes to define "industrial use" in urban areas, including a "strict" definition of construction, manufacturing, wholesale trade, and transportation and warehousing. This list, however, does not necessarily reflect the types of businesses that require industrial land. For example, many jobs in the construction industry are not physically located at a

[3] Howland, Marie. 2011. "Planning for Industry in a Post-Industrial World: Assessing Industrial Lands in a Suburban Economy." Journal of the American Planning Association. Winter, Vol 77, No 1. pp 39-53.

central, industrial location, but instead operate on sites throughout the region. Therefore, one should not focus exclusively on a list of NAICS codes to identify the range of businesses that could have demand for industrial land in Portland.

- **Public marine terminals:** Our analysis treats public marine terminals (i.e., the Port of Portland facilities) differently from other uses of harbor industrial land. These port terminals function as public infrastructure, facilitating economic activity for other industries in the region.

2.1.3 SUPPLY OF AND DEMAND FOR INDUSTRIAL LANDS

The total amount of land inside the Portland city limits is essentially fixed. Thus, for the City of Portland, the question of land supply focuses on how much land is vacant, partially vacant, or underutilized, and how much land is constrained (by environmental contamination, environmental overlays, and other issues).

In general, industrial land must accommodate most job growth in "industrial" sectors. It must also accommodate some job growth in "non-industrial" sectors. In other words, not all jobs in "industrial" sectors use industrially-designated land, and not all industrially-designated land is used by "industrial" sectors.

Analysis of land *supply* is about estimation, not forecasting. The use of "data layers" from Geographic Information Systems (GIS) is the standard technique for such estimation. Because it is estimation, the uncertainty is not about the future, but about the data and assumptions that are used to describe what is on the ground now. Our evaluation consists of a review of the data and assumptions.

Factors affecting supply and demand are not independent. Businesses and developers choose the land with the best value. Price makes a difference. In the Portland Harbor land may be more expensive (cost per acre) than at the region's periphery. But land in the Portland Harbor is also close to the downtown, labor markets, port terminals, and interstate highways. If it is only a little more expensive, it may still be a preferred location for growth. If it becomes too expensive, then prospective industrial users may locate elsewhere, on land that provides a better value (for example, because lower land cost and congestion are judged to more than offset the higher costs of being more distant from a preferred location). Businesses that need water access would have an incentive to bid more for land providing that access, and other businesses would find better value in alternative locations.

2.1.4 "EFFICIENT" USE OF INDUSTRIAL LAND

Efficiency is a measurement of how much output is produced per unit of input. In this case, the City's concern is about the amount of economic activity (output) generated per acre of land (input).

Traditional measures of efficiency

Typical measures of efficiency of land use include employment, real market value, and built space. These measures look at the amount of economic activity occurring on a property, but give relatively low marks to industrial development. Compared to an office tower, an acre of industrial development is likely to have much lower assessed value, employment, and gross square footage of built space. Thus, measures of the efficiency of employment land based on any of these measures in the numerator would all tend to improve if industrial land were converted to commercial uses.

But industrial lands (and harbor lands) are clearly important to the regional economy. If every jurisdiction allowed vacant industrial land to convert to commercial uses on the assumption that some other jurisdiction would provide the industrial land, the regional supply of industrial land would get smaller quickly. Land with port access is a particularly important and relatively rare component of all regional industrial land. Marine terminals provide access to other markets, facilitating commerce, and allowing traded-sector businesses to export their goods to other markets.

Alternative measures of the output component of efficiency

To evaluate the efficiency of the use of industrial land in the Portland Harbor, one needs a definition of efficiency that makes sense for industrial land. We suggest two alternative measures of efficiency that are most appropriate for harbor industrial land: value added, and tonnage of cargo.

- **Value added**: Value added is defined as the value of outputs (per unit or in the aggregate) minus the cost of inputs purchased from other firms used to create output.[4] Proponents of the industrial and manufacturing sectors point to its potential for high "value added." One measure of the efficiency of a fixed supply of industrial harbor land would be the amount of value added generated per acre for businesses located in the harbor.
- **Cargo:** There is a reasonable argument that much of the industrial land in the Portland Harbor area serves a regional need for

[4] In that sense, value added is a measure of a firm's contribution to GDP. Another way to think about this is that everything that a firm itself puts into the production of a product (primarily the labor of its employees and capital) "add value" to the raw materials and intermediate goods and services it purchases to make its final product.

transshipment. Therefore, a regional measure of transshipment activity might be appropriate for measuring the efficiency of such land. Some measure of cargo (e.g., tonnage, volume, value, berth utilization) is an obvious choice. Because data are more readily available for tonnage of cargo, that is an alternate measurement of land-use efficiency in the Portland Harbor that we examine in this report. If the City were interested in tracking these alternative efficiency measures in the future, then tracking multiple measures of cargo (i.e., tonnage and value) would provide a more complete picture of cargo trends.

2.2 METHODS

2.2.1 GENERAL DATA SOURCES AND TECHNIQUES

To conduct our analysis, we used the following data sources:

- **Existing studies**. Extensive analysis has been conducted regarding the Portland Harbor, industrial land, and port terminals. These efforts result in a library of reports and studies addressing different aspects of the regional economy. Appendix A includes a list of recent (or ongoing) studies that were reviewed in our analysis.
- **Secondary data sources**. ECO incorporated many secondary data sources into its analysis.[5] As with "existing studies," the objective is to leverage past research efforts to answer the questions posed in this study. Appendix A includes a list of the secondary data sources used in our analysis.
- **Interviews**: Many people in the Portland area have special knowledge of, and interest in, the Portland Harbor. ECO interviewed individuals from both the public and private sectors, and reviewed notes on past interviews that had been conducted for recent related studies.

2.2.2 EVALUATING CITY METHODS USED TO ESTIMATE PORTLAND HARBOR BUILDABLE LAND SUPPLY

ECONorthwest used the following methods to address this question:

[5] Secondary data sources are ones collected and readily available by someone other than the user (in this case ECONorthwest). Typical secondary sources are government agencies (e.g., U.S. Census, ODOT, Metro, Port of Portland).

- Review of studies summarizing industrial and harbor land supply: *Industrial Districts Atlas* (2004) and *Harbor ReDI Industrial Sites Analysis* (2009).
- Review of GIS shape files and cross-referencing to staff aerial analysis of harbor lands and Google Earth aerial photos (August 2011).
- Discussion of methods and BPS staff, and comparison to standard methods for developing land inventories and identifying buildable land.

2.2.3 ADDRESSING THE POTENTIAL SITES FOR NEW MARINE TERMINALS

To determine which sites might best accommodate a public marine terminal, we began by identifying the technical site requirements for a marine terminal. ECO interviewed representatives of the Port of Portland to identify their ideal site requirements, as well as which of these requirements could be reduced while still accommodating a working port facility. Members of the ECONorthwest team with experience running west coast ports looked for creative ways to adjust these site requirements to create a working terminal on smaller or otherwise constrained sites.

BPS staff identified sites that could potentially meet these criteria, based upon an aerial analysis of existing development in the Portland and Vancouver harbors.[6] ECO, reviewed the sites identified by the City of Portland, and toured the sites, conducting a visual inspection, documenting conditions affecting the suitability of each site for the proposed development.

2.2.4 ADDRESSING THE ROLE OF VANCOUVER IN HARBOR INDUSTRIAL LAND SUPPLY

We began by attempting a data-driven analysis. In principle, if we knew the capacity of existing marine terminals in Portland and Vancouver, and subtracted the forecast future demand for these areas, then we could identify the amount of demand that could not be accommodated by existing facilities. This demand (in tons of cargo) could then be translated into the acres of land necessary for new terminals to accommodate this growth. Comparing the required acres to support new terminals with the available land supply in the Portland Harbor and in Vancouver, we could identify how much of Portland's demand might need to be accommodated

[6] Aerial photos were taken in 2010 and 2011.

in Vancouver, and whether or not Vancouver had sufficient land to accommodate it.

This analysis established a high and low boundary for the potential land need. We also defined a "most-likely" scenario that falls between the two extremes. In order to give these numbers more context, and to help us arrive at the most-likely scenario, we conducted numerous interviews with representatives of the ports of Portland and Vancouver.

2.2.5 ADDRESSING THE POTENTIAL FOR INCREASED EFFICIENCIES

The City is interested in knowing if industrial land in the Portland Harbor can be used more efficiently in the future. To answer, we looked at recent economic trends in the Portland Harbor and in the City of Portland as a whole for changes in land-use efficiency for industrial users. For this analysis, we considered several measures of output in an efficiency measure: employment, real market value, value added, and tonnage.

We began by identifying all parcels in the Portland Harbor using GIS. We examined data from two different years: 2002 (one of the earliest years that data are available using North American Industry Classification System codes), and 2008 (the most recent year Quarterly Census of Earnings and Wages data are available). Comparing data from the two years we calculated the change in developed acreage in the Harbor, the corresponding change in real market value, and the net change in employment.[7]

We also collected data from different sources for two alternative measures of output (for the denominator): value added and cargo (volume, tonnage, and value). Unlike employment and real market value, data for value added and cargo tonnage is not tracked at a parcel-specific level. Instead, data is available at the regional, City, zip code or Census tract level. For our analysis, we used Port of Portland data on historical levels of cargo tonnage in the Portland Harbor, and the IMPLAN economic model for the zip codes that most closely align with the boundaries of the Portland Harbor for value added. We used the same years (2002 and 2008) as were used for other measures of efficiency.

[7] The time period used in this analysis, 2002 to 2008, does have limitations. Only having data for two years, doesn't allow for a detailed view of trends during the interim years. Moreover, a six-year period is relatively short, and may not be indicative of long-term trends. Nonetheless, these years allowed us to make the most efficient use of available data for our analysis. Moreover, the analysis focused on comparing how these different measures of efficiency changed relative to each other over the same period of time, and not on establishing long-term trends for each measure.

Chapter 3 ANALYSIS

Section 3.1 addresses whether or not the methods used by the City to estimate the location of buildable land in the Portland Harbor area yields reasonable estimates: it concludes that they are. **Section 3.2** addresses the potential for land in Portland Harbor (not including West Hayden Island) to accommodate a new Port terminal. It finds that the two areas that might have enough vacant land to be assembled into a development site of sufficient size are relatively constrained: they could, theoretically, accommodate small terminals of various types, but some of the costs of development would be high relative to alternative sites. **Section 3.3** addresses the potential for the Port of Vancouver to accommodate regional demand for expanded Port facilities. It concludes that under the most-likely scenario, the Port of Vancouver has about the right amount of land to accommodate the bulk of the region's forecast growth in marine cargo through 2040, but that alternative and reasonable assumptions lead to the conclusion that more land than what the Port of Vancouver now controls will be needed. **Section 3.4** addresses the potential for increased efficiency for the use of industrial land in the Portland Harbor. It concludes that value added and tonnage of cargo per acre are more appropriate than traditional measures of efficiency for harbor industrial lands, and that recent historical trends demonstrate the Portland Harbor has become more efficient by most efficiency measures.

3.1 EVALUATION OF METHODS USED BY THE CITY TO ESTIMATE BUILDABLE LAND

The question is whether the methods used by BPS to identify vacant and buildable land are likely to be accurate. Will they systematically over or under estimate the land supply? In particular, are they likely to miss areas of vacant, buildable land that are big enough for a marine terminal (sites of at least 50 acres of contiguous vacant of underutilized land that has river access and could be serviced)?

To begin to answer these questions, we looked at recent studies that sought to determine the supply of buildable land in the Portland Harbor. Exhibit 3-1 summarizes the findings of the City of Portland Economic Opportunities Analysis (EOA), including the first draft (Hovee, 2009), and final report (Hovee, 2012), as well as the West Hayden Island Economic Foundation Study (Entrix, 2011), and the City of Portland Bureau of Planning and Sustainability's internal effort to quantify buildable lands, described in Exhibit 3-2 as "BPS Aerial Survey."

Exhibit 3-1. Summary of previous study estimates of Portland Harbor buildable land supply

		City of Portland Harbor Land Supply		Parcels of Size: (3)	
Study	Year	Gross Acres (1)	Effective Acres (2)	50-250 Acres	250+ Acres
EOA Draft 1, Hovee	2009	266	61	0	0
EOA, Hovee, BPS	2012	326	108	0	0
Entrix, Inc.	2010	299	<50	2	0
BPS Aerial Survey	2011	590	178	3	0

Compiled by the City of Portland Bureau of Planning and Sustainability, from the following original data sources:
City of Portland Economic Opportunities Analysis, (E.D. Hovee and Company, 2012), and first draft (2009)
West Hayden Island Economic Foundation Study (Entrix, 2011)

Notes:
(1) Total acres of vacant land, without regard to environmental or contamination constraints
(2) Total acres adjusted for environmentally sensitive land, contaminated land, or land with insufficient infrastructure
(3) Number of individual parcels or polygons of the stated acreage

Although these recent studies come to different conclusions on the amount of vacant, buildable land, all of the studies show a relatively small supply of effective acres, ranging from less than 50 acres in the Entrix study, to 178 acres in the BPS Aerial Survey. For the purpose of identifying sites for public marine terminals, we need to consider not only the total acreage, but the size of the individual parcels Scattered small parcels of vacant land cannot accommodate a marine terminal, a single site (typically of 50 acres or more) is needed. These recent studies show that no more than three such sites are present in the Portland Harbor.

The City asked ECONorthwest to confirm that the methods used to identify these sites were reasonable. Some simple ideas and calculations help to answer that question:

- The state of the practice for land inventories is quite advanced. The Oregon statewide planning program's requirements for "buildable land analysis" (from the mid-1970s) spurred the use of Geographic Information Systems (GIS) throughout the state. All large cities and Metropolitan Planning Organizations in Oregon have been developing their GIS tools and datasets for over 25 years. Metro is looked to as a leader in the country on the use of GIS for land-use evaluation. The City of Portland has advanced its data in parallel with Metro. Databases that started as crude approximations have improved substantially. They have been reviewed and updated many times; data from more and more sources have been added (e.g.. tax assessment, public works); computer power and software have improved; digitized mapping of aerial photographs now allows accurate registration of those photographs to underlying layers of thematic maps. In short, the data are current and accurate, and the

ability to manipulate and summarize them is substantial, fast, and technologically reliable.

- The Portland Harbor area is not big by regional standards. The detailed BPS GIS data put it at just over 4,000 acres. As a back-of-the-envelop corroboration using different datasets and tools, ECO used Google-Earth to draw the approximate boundaries of the study area (Exhibit 1-1 above) and calculate areas: the result was 4,100 acres, the equivalent of a square 2.5 miles on a side. Just inspecting aerial photographs would allow one to find large, undeveloped acreages.
- The City has conducted three extensive studies of industrial and harbor land that resulted in detailed mapping: *Industrial Districts Atlas* (2004), *Harbor ReDI Industrial Sites Analysis* (2009), and the GIS-based inventory (2011). The 2011 inventory maps and data table are included as an Appendix to this report.
- ECO has worked on a dozen buildable land evaluations, and has written many reports on the steps for working from "all land" to "vacant, buildable land." ECO's conversations with BPS staff led to the conclusion that staff had used state-of-the-practice techniques. In summary, (1) from "all land" the land not in parcels is removed (e.g., water bodies, street and other rights of way); (2) of the land in parcels, the land that is developed and judged unlikely to redevelop easily (usually based on the value of improvements) is removed; (3) from the undeveloped or under-developed land, the land with physical or policy constraints is removed (e.g., wetlands, in flood ways, steep slopes).

All of the previous points strongly suggest that the information about the supply of developable industrial land in the Portland Harbor area that BPS has generated is very reliable. The buildable land inventory using GIS data that was done for the update of the Economic Opportunity Analysis looks reasonable by the tests we noted.

But despite good intentions and good analysis, there are details in any such analysis that require assumptions, and the assumptions can make a difference to the outcomes. For example:

- Which constraints are absolute, and which are restrictive? Does a slope of more than 10% preclude industrial development? 15%? What if the average slope on a large parcel is 10%, but half of the parcel has slopes less than 5%? What about soil contamination: can the site be remediated, or is the extent of the contamination and legal complexities such that the site is effectively off the market for the foreseeable future?
- When is land "underutilized"? Some vacant areas around buildings may be necessary for vehicle movement, production staging, or

occasional storage. Are large parking lots "vacant" or are they an essential part of the operations in the buildings adjacent to them? A low value for improvements does not necessarily mean that the owner has any interest in redevelopment.

- Ownership patterns. What might look like relatively large areas of vacant land on an aerial photograph may be in many parcels with many different owners. Land assembly and development may be very difficult. This point is illustrated by the findings in Exhibit 3-1, which show up to three sites with at least 50 acres using the BPS methods (ignoring parcel boundaries and looking at aerial photographs), but no sites of that size when using the methods in the Economic Opportunities Analysis (which did look at parcel boundaries).

For the Harbor Area land evaluation, our evaluation is that the buildable land inventory using GIS data that was done by BPS to update of the Economic Opportunity Analysis has generally made inclusionary rather than exclusionary assumptions: we think that is appropriate. BPS did not, for example, eliminate from its search for large, buildable parcels those with arbitrarily defined thresholds for buildability (e.g., proximity to services or the river, steep slopes, contamination), or those that had a particular ownership. All those parcels are still part of the dataset from which large sites were identified. The result, as Section 3.2 shows, is that the large sites identified have several challenges for development: challenges that were not screened out by earlier assumptions about buildability criteria. In other words, on that score, the methods used by BPS were inclusive, and the result is that there would be less chance of screening out land that might eventually prove to be capable of contributing to a large site for a marine facility.

An assumption that BPS did make, and that all buildable land evaluations that we are familiar with also make, is that developed parcels are, in general, not buildable parcels. They can, of course, become buildable parcels if their buildings are removed. Thus, it is theoretically possible that parcels that look developed (from assessment data, aerial photographs, and field surveys) could eventually be part of a land assembly large enough to accommodate a large marine terminal. The kind of detailed, property-level analysis needed to make judgments about land redevelopment and site assembly is not done as part of a regional or city buildable land evaluation.

But there is still the issue of "underutilized" land. A buildable land dataset, like the one BPS has developed, will be quite good (after field testing—and there has been plenty in the Harbor Area over the last 10 years) at distinguishing developed parcels from vacant parcels in most cases. But it is more difficult to determine when a generally vacant parcel is underutilized, and more difficult still to determine whether parcels that are

developed have underutilized remainders that might be considered as vacant and eligible for consolidation into a larger, developable site.

The documentation of the City of Portland's GIS-based Development Capacity Model[8] says that it (1) identifies (and presumably flags as undevelopable) "constrained" properties (i.e., significant environmental or historic resources), and (2) identifies developed parcels "significantly underutilizing their allowed development capacity (using less than 20% of available capacity, not including any development bonuses or incentives)" [that determination can be over-ridden by a judgment by BPS staff that a property is "likely" or "not likely" to redevelop]. The dataset has detailed information on parcel attributes (around 100 attributes per parcel), including building footprint (which allows a calculation of the amount of land not currently developed as a building). It has an algorithm for calculating "site area" by combining the acre of contiguous "underutilized" lots. In short, this is an extensive and well-documented dataset.

The BPS identification of potentially developable sites in the Portland Harbor did not rest entirely on technical analysis using GIS. Additional analysis done as part of the specific to the Harbor Lands Inventory also relied extensively on a review of aerial photographs, with staff performing a visual inspection of all sites along the Willamette River to ensure that any large areas of apparently vacant land had been included in the database of potential terminal sites, and that all of the sites identified by GIS appeared to have the development potential that was suggested by the data. Additionally, BPS staff made reasonable efforts to acquaint themselves with the sites, talking to Port of Portland officials, and visiting the areas, to make sure that the BPS analysis was grounded in a solid understanding of what was actually occurring on key sites in the Portland Harbor. In short, land uses and vacant lands identified in the visual survey were compared with the GIS/BLI data to ensure there were no large information gaps.

As a final check on the site inventory, we relied on our familiarity with the study area, the City documents cited above, and aerial photographs to see whether there were any large areas of vacant or underutilized land besides the two (Atofina and Time Oil sites) that the City identified as the best candidates for a new marine terminal. On the west bank of the Willamette River, we found nothing beyond the Atofina site: the north reach has only a narrow strip of mainly developed land; the south reach has a wider land area but is entirely developed along the waterfront. We found the following candidates on the east bank:

[8]http://www.portlandonline.com/cgis/metadata/viewer/display.cfm?Meta_layer_id=52965&Db_type=sde&City_Only=False

- Swan Island Industrial Park. Land at the south edge on the NE bank of the Willamette River could be classified as underutilized: it is an operation for transshipment of aggregate (10 acres). But even if the parking and storage on both sides of the site is counted, the site would still fall way short of the minimum threshold of 50 acres.
- McCormick and Baxter site, SE of BNSF bridge on east side of the Willamette River. Depending on what land is counted (e.g., backing out land for rail right of way, some existing buildings), this site may be 50 – 70 acres in size. This site was excluded from the City's analysis, primarily because it was recently proposed to be rezoned as EG2 in the River Plan, which (although it allows industrial development) does not allow rail yards, and requires greater setbacks and landscaping than other industrial zones (like IH for heavy industrial). Conversations with BPS staff indicate that the EG2 zone designation is one element of the River Plan that has been challenged, and there is a good chance that a revised River Plan will not propose the EG2 zoning for the site, which would make this site potentially available for marine terminal development.
- "Underutilized" land north of St. John's Bridge on east side of the Willamette. What may seem underutilized from a high-level aerial photograph is actually space for parking new cars from Asia—this is the Port of Portland's Terminal 4 operation (about 260 acres total, handling autos, forest products, steel, and dry and liquid bulks). This site is already part of the Portland area's supply of marine terminals and cannot be counted to add new capacity, unless it were redeveloped. Evaluating that possibility is beyond the scope of our study.
- Sites in the Terminal 5 and Terminal 6 area. There are some sites for infill (e.g., 50 acres off North Lombard in Terminal 6) but there is no water frontage available for a new terminal. Evaluating redevelopment of Port terminals is beyond the scope of our study.
- Kelly Point Park. About 50 acres at the confluence of the Willamette and Columbia Rivers, abutting Port properties of Terminals 5 and 6 is park land that is not available for development.

Of all the sites examined (beyond the Atofina and Time Oil sites already identified by BPS), the only one that met the minimum size requirements (and was not parkland) was the McCormick and Baxter site. The development potential of this site was studied extensively by the City in the past, and the results are described in the *McCormick & Baxter Site Reuse Assessment: Final Report* (June, 2001). The site could have potential for marine terminal development, but (as detailed in the 2001 site assessment) it is heavily constrained in several areas: relatively shallow water at the shoreline, inability to expand to adjacent parcels due to existing uses (Metro

open space and University of Portland campus), isolation from truck routes that require traveling through residential neighborhoods and up a relatively steep bluff, other infrastructure insufficiencies, and significant liens and encumbrances. While the challenges are substantial, they are not necessarily insurmountable, and the other sites identified by BPS face some similar challenges.

Ultimately, the site was excluded from further analysis, because it is less likely that adjacent lands could be assembled into the site, due to the adjoining zoning, and because past brownfield remediation work on the site was carried out in a way that limits future industrial uses, unlike the Atofina and Time Oil sites. Our brief review of the site constraints suggest it is at least as constrained as the Atofina and Time Oil sites, and would not be a better site for marine terminal development, due to the access constraints mentioned above. Thus, our answer to question posed is:

- BPS has used appropriate measures to identify vacant and buildable land.
- The two sites it has identified as meeting the minimum size requirements for a new marine terminal (Atofina and Time Oil) appear to be the two best sites that meet that size requirement with vacant land. Any other location would require assembling and redeveloping properties that now have buildings on them.[9]

3.2 POTENTIAL SITES FOR NEW MARINE TERMINALS

This section addresses the question: How suitable for a public marine terminal are the few sites in the Portland Harbor that have been identified by the City as having the best potential to accommodate such a terminal? Through previous planning efforts,[10] the City of Portland Bureau of Planning and Sustainability (BPS) identified the following minimum criteria to meet forecasted demand for new marine terminal sites in the Portland Harbor:

- Industrial zoning
- Deep-water harbor access
- Railroad access

[9] Whether such redevelopment could be, in some cases, financially feasible is a question beyond the scope of this study.

[10] West Hayden Island Economic Foundation Study, prepared by Entrix and Bonnie Gee Yosick LLC for the City of Portland Bureau of Planning and Sustainability, May 2010. City of Portland Economic Opportunities Analysis: Working Draft, prepared by E.D. Hovee and Company, LLC for the City of Portland Bureau of Planning & Sustainability, June 2011.

- Truck street access
- Vacant (unimproved or unoccupied brownfield) site-assembly area approaching 100 acres.

Using the methods described in Section 3.1 above, BPS staff identified only two sites that could potentially meet all these criteria. These are the two largest vacant sites in the Portland Harbor area: the 59-acre Atofina site, and the 43-acre Time Oil site. Both are brownfields, and both could potentially be assembled with nearby vacant sites.

This analysis looked only at vacant sites. It is always possible that some sites that are non-vacant today could be redeveloped as marine terminals in the future. When considering the opportunity to redevelop non-vacant sites, it is important to look at the net impact in economic activity. In other words, redeveloping existing sites would only be beneficial to the economy if the new use of the site were more efficient and able to accommodate more economic activity (whether measured by employment, output, cargo volumes, etc.) on the same acreage. Evaluating all non-vacant sites in the Portland Harbor to attempt to determine which might be most likely to redevelop in the future was beyond the scope of our analysis.

The ECONorthwest team reviewed the two vacant sites identified by the City of Portland, and evaluated maps of the Portland Harbor, including zoning, infrastructure and aerial photographs. Our preliminary review confirmed the City's findings: most of the Portland Harbor has active development on it, and these two sites have the greatest opportunity to accommodate new public marine terminals.

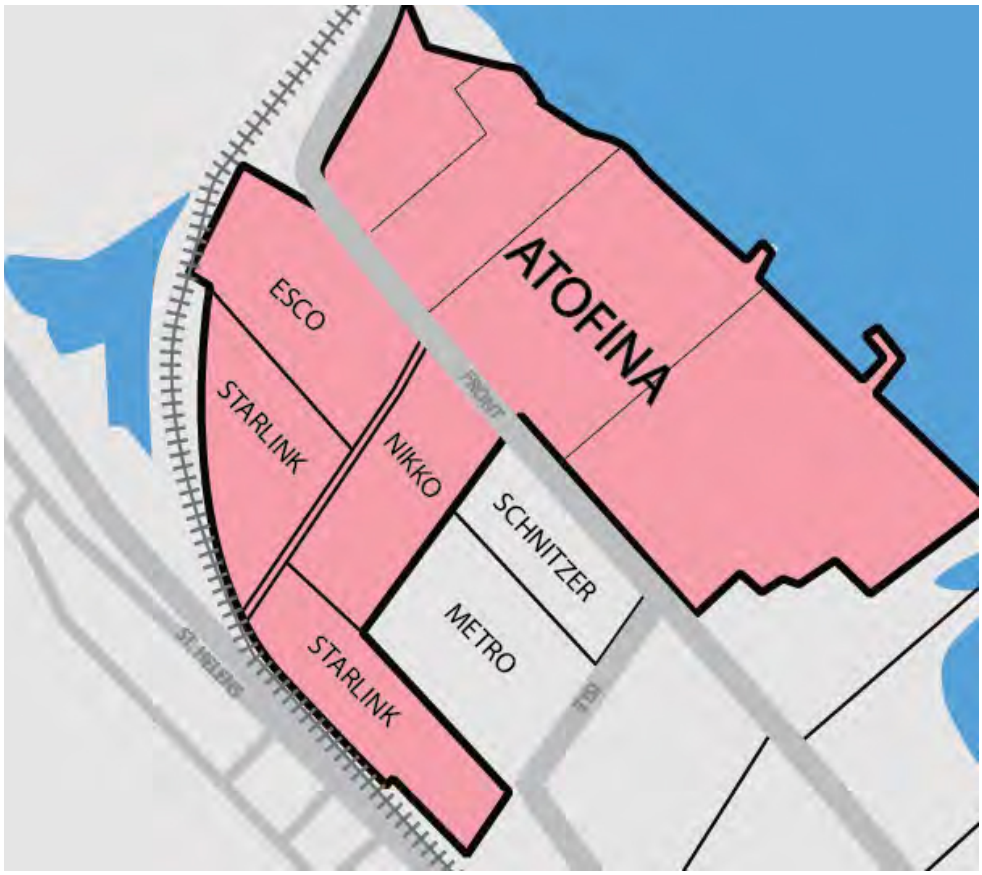
Staff from ECONorthwest and Maul Foster & Alongi toured these sites with BPS staff, documenting conditions affecting the suitability of each site for the proposed development. Key factors considered in the evaluation were: site access, existing uses, natural features, and contamination / remediation. After conducting this site visit, Maul Foster & Alongi developed a set of criteria for evaluating site feasibility for typical port terminals (see Appendix B).

Using these criteria, Maul Foster & Alongi evaluated the potential opportunities and constraints of these sites to accommodate development of a public marine terminal. A cursory site visit is insufficient to make a final determination of site feasibility. Nonetheless, the methods are consistent with the scope and budget, and are sufficient for identifying major opportunities and constraints for these potential sites, and for making a preliminary determination of site feasibility. Further investigation of these sites could be conducted to refine our feasibility findings.

3.2.1 ATOFINA

The Atofina site is a collection of parcels under several ownerships, which total approximately 114 acres (59 acres in the four main Atofina parcels, and an additional 55 acres in adjacent parcels across Front Ave.). The parcels are zoned heavy industrial (IH), and are bordered by industrial uses. The site is adjacent to SR 30 and fronts the Willamette River within the Portland Harbor. Exhibit 3-2 shows a map of the Atofina site.

Exhibit 3-2. Atofina site



Source: ECONorthwest, 2011.

The parcels that the Atofina site comprises have the following owners:

- Atofina: four vacant parcels totaling 59.14 acres
- Schnitzer: an 8.32-acre parcel, currently occupied by Air Liquide America Corporation
- Metro: a 10.43-acre parcel housing the regional solid waste transfer station
- Nikko (Gould Electronics): a 9.21-acre parcel, which is partially occupied by an operating RCRA C hazardous material landfill
- ESCO: a 10.51-acre parcel, which is a former landfill

- Starlink (Aventis Cropscience USA LP; Rhone Poulenc Ag): two significantly contaminated parcels totaling 16.42 acres, currently under remediation.

Access

Water depth in the Willamette River near the Atofina site ranges from 30 to 40 feet. The site has historically been used as a bulk-commodity manufacturing and shipping terminal. The waterside parcels (Atofina) provide a total of 2,700 feet of shoreline, and currently accommodate three existing piers on leases from the State of Oregon, Department of State Lands.

The aggregated Atofina site is served by a rail siding from the BNSF mainline. The siding is approximately 2,200 feet in length with three road 'at grade' crossings. While the site has rail access, it appears to be of insufficient size to accommodate a loop track, which would hamper efforts to build an efficient, modern port facility. Highway 30 access has been somewhat hampered by the closure of local streets accessing the highway.

Existing uses

Current industrial uses on the Schnitzer property as well as the Metro property seemingly eliminate 18.75 acres, while the existing Gould Superfund disposal site on the Nikko property reduces the available footprint by an additional 9.21 acres. The Nikko property contains an operational on-site 4.5-acre containment facility (Subtitle C closed hazardous waste landfill), and is approximately 25 to 30 feet higher in elevation than the surrounding property, with a structured fill containing 77,000 cubic yards of contaminated materials. The former ESCO landfill received non-recyclable wastes (e.g., foundry sand, slag, demolition debris) from ESCO's foundry operations from approximately 1953 to 1983. The landfill was closed with the approval of the Oregon Department of Environmental Quality (DEQ) and the Oregon State Health Division in 1983. The Starlink properties are undergoing extensive investigation and remediation.

Natural features

The property generally rises in grade from the Front Street ROW in the east to the rail ROW in the west, and has considerable natural gain exclusive of the Subtitle C landfill mass. Along the north and northwest perimeter of the site is a berm with a steep slope leading up to the BNSF main line on its approach to the rail bridge. Across the rail line, North Doane Lake and an environmental conservation land designation wrap the 'site' to the north and west.

The waterside parcel is partially within the FEMA Special Flood Hazard Area or was partially inundated by a 1996 flood event. The area is in a low to moderate earthquake hazard exposure area.

Contamination and remediation

The Atofina parcels are being remediated by Legacy Site Services (LSS), as the Atofina agent, under a consent order with DEQ, requiring source control and a site-wide feasibility study. The source control measures include both groundwater and stormwater migration controls. The site is included in the area of the Lower Willamette River that was designated a Superfund site in 2000 by the Environmental Protection Agency. Final remediation plans for the Portland Harbor Superfund site have not been determined. The potential liability for remediation of the Superfund adds a high level of risk for all affected properties, making prospective real estate transactions or development unlikely.

Other constraints

In addition to these property encumbrances the Atofina site is transected by Front Avenue (Service Level B; Priority Truck Route; peak-hour volume average of 106 vehicles and an average daily traffic volume of 640 vehicles, of which 92% are automobiles). Front Avenue separates the Atofina-owned parcels from the remainder of the site. Front Avenue provides primary access to the adjacent Siltronic site and is a public right of way. The Siltronic property does have alternate direct highway access to US 30, but there is an 'at-grade' rail crossing, and it does not readily serve the current land use configuration for the site. In addition to the Front Avenue ROW there is a pipeline easement adjacent to the east side of the street ROW.

While the total aggregated acreage appears to adequate for serving as a barge or bulk facility, current encumbrances, uses, and rights of way limit the useable area to 59 acres: the four parcels owned by Atofina to the East of Front Avenue, fronting the Willamette River.

Site assessment

Significant changes would need to be overcome to develop this site as a productive public marine terminal. To develop the entire site, NW Front Avenue would need to be closed, requiring additional infrastructure investments to provide alternative access to the Siltronic property. Without closing NW Front Avenue, this site is practically limited to 59 useable acres, with limited road and rail siding access.

While the site has rail access, site size and dimensions are insufficient to accommodate a rail loop track. Providing adequate rail service for the site is

even more challenging if development is limited to the 59 acres east of NW Front Avenue.

If NW Front Avenue were closed to accommodate development of the 114-acre site, the properties owned by Metro and Schnitzer are in active use, and would be unlikely to relocate. Property acquisition for the remaining parcels would be challenging, as it would require negotiations with five different private property owners. While acquiring these properties would provide additional acreage for development, acquisition would also involve additional costs as well as need for environmental remediation on these sites.

Ultimately, the site may be suitable for break bulk commodities, such as project cargoes, but the uncertainty of the planned and ongoing environmental remediation on the Atofina parcels--in addition to the uncertain liability for the Lower Willamette River Superfund remediation--probably make the cost of the land prohibitively high. The site *could* be big enough for a terminal, but the cost of preparing the site to accommodate such a terminal will make the effective land price very high relative to other industrial properties.

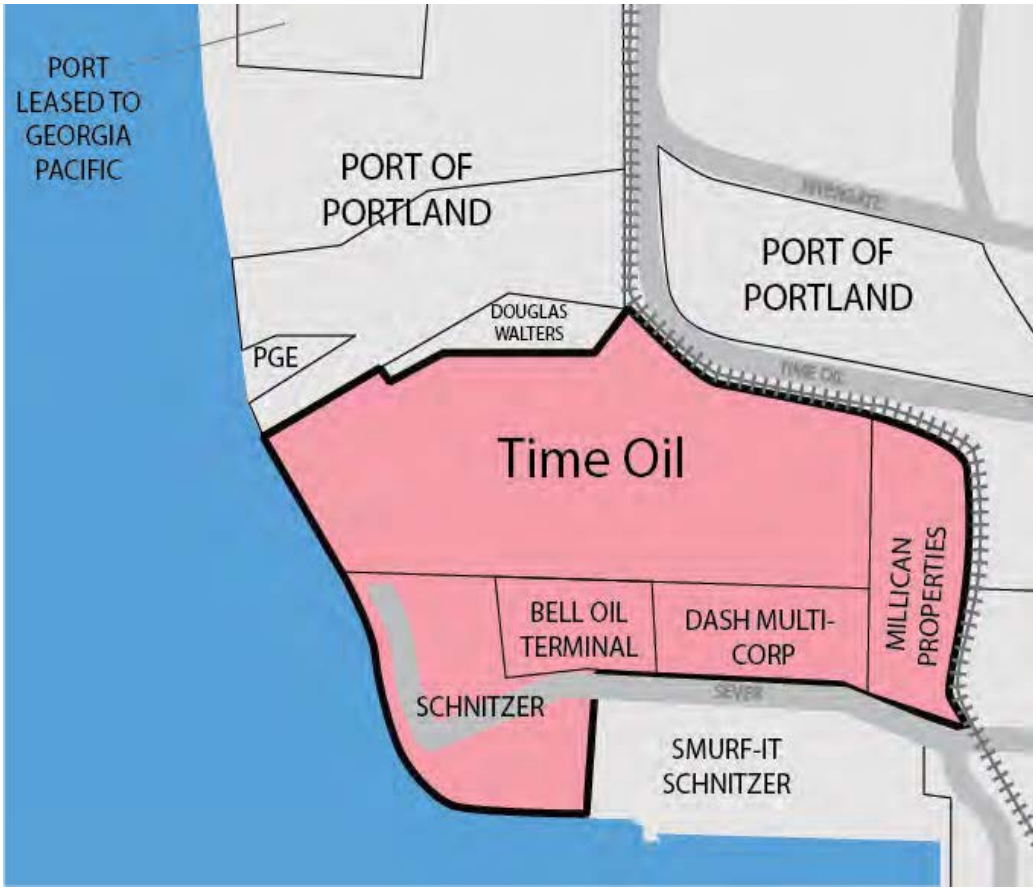
3.2.2 TIME OIL

The Time Oil site includes several separately owned parcels totaling approximately 84.2 acres. The subject parcels are adjacent to the Willamette River within the Portland Harbor and are zoned heavy industrial (IH) with a 'River' overlay designation. The site is bordered by industrial uses and also an area governed by a soon-to-expire natural resource management plan. Exhibit 3-3 shows a map of the Time Oil site.

The Time Oil site comprises parcels with the following owners:

- Time Oil: 43.41 acres
- Schnitzer Investment Corporation: 13.79 acres
- Bell Oil: 6.04 acres
- Dash Multi Corporation: 9.82 acres
- Millican Properties: 11.12 acres

Exhibit 3-3. Time Oil site



Source: ECONorthwest, 2011.

In addition to the aggregated property initially considered for the Time Oil site, there appears to be additional parcels totaling approximately 57 acres to the east of the Time Oil site, and bounded by Time Oil Street and Burgard Street. Including these parcels (not shown in Exhibit 3-3), the total potential aggregate site would be approximately 139 acres.

Access

Water depth in the Willamette River ranges from 30 to 40 feet. The aggregated site has approximately 1,400 feet of shoreline (pier head): the Time Oil parcels with 550 lineal feet, and the Schnitzer parcel with 850 lineal feet.

Historically there have been two piers on the parcels. The side channel serving the Schnitzer parcel is navigable, and is likely to be addressed in the Portland Harbor cleanup project.

The Time Oil site is served by a rail siding from the Union Pacific Railroad mainline of approximately 2,500 feet in length with two road 'at-grade' crossings and on-site railroad access. While the site has rail access, it appears to be of insufficient size to accommodate a loop track, which would

hamper efforts to build an efficient, modern port facility. Access to the specific site would require use of a private or Port-owned right of way, connecting to either Rivergate Blvd. or Burgard St., ultimately connecting to N Lombard St, a district collector and priority truck roadway.

Existing uses

Current industrial uses on the Schnitzer property appear to be temporary in nature. The Bell Oil Terminal is inactive; the Millican parcel is underutilized, and the Dash Multi Corp parcel is an operational tire recycler. There are several existing structures on the Time Oil and Schnitzer site, and evidence of removal of liquid storage tanks. The western half of the site is in a floodplain.

Contamination and remediation

Like most properties in the Portland Harbor, sediment in the adjacent channel and berthing area have known or suspected contamination. The upland properties have known or suspected contamination and are in various regulatory phases of investigation and remediation. The site is included in the area of the Lower Willamette River that was designated a Superfund site in 2000 by the Environmental Protection Agency. Final remediation plans for the Portland Harbor Superfund site have not been determined. The potential liability for remediation of the Superfund adds a high level of risk for all affected properties, making any real estate transactions or development highly unlikely.

Other constraints

To the north of the subject site there are high-tension power lines; a small parcel owned by PGE and a series of parcels owned by the Port of Portland with the presence of wetlands (some of these wetlands have environmental conservation zoning). The site is generally flat with mild slope to the river.

Site assessment

The Time Oil site faces challenges that would need to be overcome to be developed as a productive public marine terminal. While the core of the site (57 acres) has only two different private property owners, the remainder of the site is divided into several different owners. Depending on the desired use and scale of a proposed port terminal, additional property to the east of the site may need to be acquired. The number of private properties and owners makes site assembly a challenge, but not an insurmountable obstacle.

Compared to the Atofina site, the Time Oil site appears to have fewer challenges to redevelopment: it does not require closing a public street, it

appears to have less severe environmental contamination, and the possibility exists to acquire a larger aggregate site. The contamination is mainly along the river, not upland. It may be possible that lower lying contaminated land could be used as fill on other parts of the site and capped under the footprint of a new building.

The site would be a viable candidate for a marine terminal with the appropriate aggregation of key properties. Aggregating 80 to 140 acres would accommodate the transshipment of break bulk and some bulk commodities. Property configuration to make 1,400 feet of pier face accessible is critical to its usability. This site could be explored further for marine terminal use. It will be difficult, however, to negotiate any real estate transactions for this site while the liability for the Lower Willamette River Superfund remediation remains uncertain.

3.2.3 IMPLICATIONS

Public marine terminals have specific land use requirements that are difficult to find. Ideally, sites must be large and flat, inside of an industrial zone, have significant shoreline on a navigable river, be served by both rail and truck, and free of contamination, wetlands, or other environmental constraints. There are no sites in the Portland Harbor that meet these ideal requirements, though there are a few sites that come close. The questions are: how close do they come, and is there a way to cost-effectively develop these sites as productive public marine terminals?

The City of Portland identified the two sites in the Portland Harbor that are most likely to be suitable for development of a new public marine terminal: the Atofina site, and the Time Oil site. Of these two sites, development is technically possible on either, but there are major hurdles that would add significant costs. Both sites have some level of contamination, both sites would require negotiation and property acquisition from numerous property owners, and both sites are smaller than desirable, which precludes the possibility of an onsite rail loop.

Of the two sites, the Time Oil site is most suitable for development, as it does not have certain challenges faced by the Atofina site. The development of the Atofina site is further restricted by NW Front Ave. that bisects the site, and provides primary access to the Siltronic property. With this road in place, the site is limited to just 59 acres. Vacating the road would be costly, and would likely require significant infrastructure investments to be made to provide access to the Siltronic property. Even if the road were vacated, property on the other side of the road is contaminated or in active use. And the nature of the contamination on the Atofina site is considered to be more severe than contamination elsewhere in the Portland Harbor.

Ultimately, issues related to the Superfund cleanup of the Willamette River make all sites in the Portland Harbor unfeasible for development in the near future. Until a final agreement is reached, determining the specific liability for all property owners in the Harbor, there is too much cost uncertainty to negotiate a reasonable price for the land acquisition that would be necessary to assemble a site large enough for a new public marine terminal.

3.3 ROLE OF VANCOUVER IN HARBOR INDUSTRIAL LAND SUPPLY

The third question we were asked by the City is: What role can the Port of Vancouver play in accommodating forecast demand for cargo volumes in the Portland region? To answer this question, we reviewed estimates from recent studies on the current capacity and forecast demand for cargo in the region, and augmented this data-driven analysis through interviews with port officials. A more detailed description of our analysis is found in Appendix C: Analysis of Harbor Land Capacity and Demand, Portland and Vancouver.

3.3.1 EXISTING CAPACITY

The Port of Portland has four marine terminals located along the Willamette and Columbia Rivers. These terminals accommodated 575 ocean-going vessels in 2010, though over the past two decades it was not uncommon for the Port to accommodate 800 to 1,000 ocean-going vessels in a year. Not counting cargos received or shipped via inland barges, the Port of Portland shipped over 13 million short tons of cargo in 2010.

While the Port's existing marine terminals have excess capacity, that capacity is limited. As demand increases over time, the Port will reach a point when existing facilities are unable to accommodate the demand that is forecasted. If the Port is unable to find new ways to improve the efficiency of existing terminals, or find suitable sites to build new terminals, then the Port of Portland may miss potential cargo opportunities. The Port of Vancouver, located across the Columbia River from the Port of Portland, could accommodate some unmet demand.

Exhibit 3-4 summarizes the estimated capacity of public marine terminals in the Port of Portland. Total capacity for all cargo types in the Port of Portland is estimated to be over 21,000,000 metric tons. This capacity is significantly above current cargo volumes for all cargo types, except for grain, which saw a reduction in capacity when the Port closed the terminal

4 grain elevator in recent years, and is unable to accommodate historical levels.

Exhibit 3-4. Estimated capacity of public marine terminals, and recent peak cargo volumes, Port of Portland

Cargo Type	Estimated Capacity	Recent Peak Volume	Peak Year
Automobiles (units)	675,000	460,000	2006
Containers (TEUs)	700,000	330,000	1995
Metric Tons			
Automobiles	889,000	606,000	
Containers	3,999,000	1,885,000	
Breakbulk	2,100,000	1,130,000	2007
Grain	4,100,000	5,400,000	1995
Dry Bulk	10,700,000	5,460,000	2008
Liquid Bulk	-	-	N/A
Total	**21,788,000**	**14,481,000**	

Source: Estimates of capacity are from Port of Portland, reported in West Hayden Island Economic Foundation Study (Entrix, 2010), and confirmed through interviews with Port of Portland officials.
Reported recent peak cargo volumes are from Port of Portland Marine Terminal Statistics, 1980-2010.

3.3.2 FORECAST OF FUTURE CARGO VOLUMES

Our analysis did not include forecasting future cargo demand for the region. Instead, we were tasked with obtaining and reviewing the most recent forecasts. These forecasts were contained in the *Portland and Vancouver Harbor Forecast Update* (BST Associates, 2012). These forecasts were based on a 2010 study by BST Associates, but were refined to specifically call out cargo demand for the City's of Portland and Vancouver, and were updated with the most recent economic data.

Exhibit 3-4 shows the *capacity* of *existing public* marine terminals. Exhibit 3-5 shows the forecast *demand* for *existing and future public and private* marine terminals (measured as cargo volume) in the City of Portland in 2040. The forecast demand ranges from 28 million to 43 million metric tons. For context, in 2010 (the most recent year for which data is available) the Port of Portland reports it moved 13 million tons of cargo. Even the low scenario forecasts demand to be more than double 2010 levels by the year 2040, with an average annual growth rate of 1.5% per year.

Exhibit 3-5. Forecasted cargo volume, public and private, City of Portland, 2040

Cargo Type	Low	Medium*	High
Automobiles (units)	811,000	912,500	1,014,000
Containers (TEUs)	379,000	452,500	526,000
Metric Tons			
Automobiles	1,076,000	1,206,000	1,336,000
Containers	2,162,000	2,583,500	3,005,000
Breakbulk	1,132,000	1,242,000	1,352,000
Grain	6,686,000	9,078,000	11,470,000
Dry Bulk	10,278,000	14,093,500	17,909,000
Liquid Bulk	6,912,000	7,461,500	8,011,000
Total	**28,246,000**	**35,664,500**	**43,083,000**

Source: Low and High forecasts were made by BST Associates for the *Portland and Vancouver Harbor Forecast Update* (2012).
*Medium scenario is calculated by ECONorthwest as the average of the BST low and high scenarios.

Note that 2040 is an arbitrary date. It is not a key milestone. Demand for cargo does not stop growing for some assumed reason in 2040. It is simply the last date for which there is a forecast for cargo demand. Thus, our advice is not to focus on exact tonnage requirements, or exact acres needed to accommodate demand in 2040. It is more important to focus on the big picture. The City of Portland has a limited supply of land suitable for marine terminal development, and this supply will not increase. Demand for cargo has increased steadily for decades, and is forecast to continue to do so in the future. Over a long-enough period, the City will use its capacity to accommodate future growth. As it does, land prices will increase and redevelopment will become more possible than it appears now.

Nonetheless, the inevitable reduction of vacant land available for water-dependent uses in the Portland Harbor area is the motivation for considering ways to use the land efficiently, and whether neighboring jurisdictions might accommodate some additional amount of the forecasted growth. Looking at the 2040 gives good idea of how close the City (and the region) is to reaching its full capacity for public marine terminals.

3.3.3 CAPACITY SHORTFALL

Comparing the capacity of existing facilities with the forecast demand provides an estimate of the potential capacity shortfall for the Port of Portland is in 2040. Two factors complicate this analysis: (1) private marine terminals also handle a portion of the City's cargo volume, and there are not accurate estimates of the capacity of private terminals in the City; and (2) if the growth in cargo volumes comes from a different mix of clients and commodities than the terminals are currently handling, then the existing facilities may not be able to accommodate the new opportunities, which

means these facilities may not reach 100% of their capacity before new terminals are needed.

Our analysis needed to make assumptions on how to deal with these two issues. Variations in assumptions, combined with the wide range of the BST forecasts for cargo demand in 2040, result in an even wider range of estimates for capacity shortfall. To bookend our analysis, we created assumptions that would give us the lowest and highest possible shortfall, and then selected assumptions for a "most-likely" scenario.

The lowest shortfall scenario assumes the low demand forecast from BST, and assumes that existing facilities would be able to operate at 100% efficiency to accommodate forecast demand, and that private terminals will be able to continue accommodating cargo at their recent peak levels. The highest shortfall scenario uses the high demand forecast from BST, and assumes that existing facilities would continue operating at their historical peak levels, with all additional demand coming from new market opportunities that require new terminals. The most-likely scenario uses assumptions that fall between the range of these two bookends. Key assumptions for the most-likely scenario are existing facilities operate at 90% of capacity (i.e. to accommodate the forecast growth in cargo, we do not assume that existing facilities are able to use 100% of their capacity, since part of the growth in cargo volumes may be due to new users and new commodities that cannot use existing facilities), and we use the medium demand scenario, calculated as the average of the low and high scenario by BST Associates.

The results of these three scenarios are shown below in Exhibit 3-6. Note that the potential capacity shortfall ranges from less than 200,000 metric tons in the low shortfall scenario to more than 17 million metric tons in the high scenario. Ultimately, our most likely scenario shows a potential shortfall of 5,760,000 metric tons, with all of the shortfall occurring in dry bulk, grain, and automobiles.

Exhibit 3-6. Potential capacity shortfall, City of Portland, public and private marine terminals, 2040 (metric tons)

Cargo Type	Low	High	Most Likely
Automobiles (units)	(136,000)	(554,000)	(310,000)
Containers (TEUs)	-	(196,000)	-
Metric Tons			-
Automobiles	(187,000)	(730,000)	(410,000)
Containers	-	(1,120,000)	-
Breakbulk	-	-	-
Grain	-	(4,370,000)	(2,390,000)
Dry Bulk	-	(10,949,000)	(2,960,000)
Liquid Bulk	-	-	-
Total	**(187,000)**	**(17,169,000)**	**(5,760,000)**

Source: Calculated by ECONorthwest, with demand forecasts from BST Associates (2012).

3.3.4 LAND NEED FOR NEW PORT TERMINALS

Translating cargo volumes into acres for port terminals is challenging, and depends on a host of variables for which we have little or no data for this analysis. Will the terminal need rail access, if so will it need a dedicated rail loop, or will it be able to share rail infrastructure with adjacent terminals? Would another rail configuration like a ladder track work?[11]

The composition of the demand is important as well. For example, if you have demand for 10 million pounds of dry bulk, will that all be the same commodity type? If not, you may not be able to use the same terminal (for example a coal exporter and potash exporter may need to have completely separate terminals even though they are both dry bulk and would have very similar needs. Even the ownership of the cargos makes a difference (e.g., one exporter with a throughput of 10 million tons of potash may require different facilities, than 5 exporters each handling 2 million tons of potash a piece).

Because of the many variables, it is difficult to translate the potential shortfall numbers shown in Exhibit 3-6 into the number of terminals that would be needed to service that demand, and even more difficult to translate the number of terminals into acres. For the purposes of our analysis, we first looked to recent studies to find an industry standard or a rule of thumb for the size of marine terminals for various cargo types. The three sources we looked at were the *West Hayden Island Economic Foundation Study* (Entrix, 2010), the Draft Report on *Operational Efficiencies of Port/Terminal World Wide* (Worley Parsons, 2012), and the Maul Foster and Alongi evaluation criteria included with this report as Attachment B.

Unfortunately, there is little consensus among these sources on the land needed for each terminal. This is because the unique characteristics of each site, the needs of each unique user and commodity, and the market conditions and technologies available at the time existing facilities were built result in a wide-range of variables that are difficult to control for. In short, no conclusive rule of thumb exists, and if it did exist, it would not necessarily be applicable to each of the sites in the Portland and Vancouver harbors. Nonetheless, for the purposes of our analysis, we needed to make some assumptions on the acreage requirements for new terminals for various commodities. We again sought to use different assumptions to present a high and low bound on our analysis, and then to select

[11] Representatives of businesses in the Portland Harbor, as well as Port Officials, and other consultants with expertise in marine terminal development and cargo forecasts have stressed that there is no equal substitute for a loop track, and that other rail configuration such as a ladder track will not work, for attracting new port users in a competitive global economy.

assumptions in the middle of the range that we believe resulted in a most-likely scenario.

The details of these scenarios are shown in Appendix C: Analysis of Harbor Land Capacity and Demand, Portland and Vancouver. The most-likely scenario uses our most-likely capacity shortfall estimates, and assumptions on throughput (tons per acre of terminal land) from the *Operational Efficiencies of Port/Terminal World Wide* (Worley Parsons, 2012), based on tons per acre for case study ports in North America and Europe. It is optimistic, however, to think that all new terminals would achieve the level of efficiency identified in the Worley Parsons draft report, so we have shown another column for the "practical" (i.e., more conservative assumption of land need) land need, based on an average value of the assumptions in the various supporting documents used in our analysis. A final column was added to show the land need if a dedicated rail loop is included with the terminals that would require rail access. Exhibit 3-7 shows the results of our most likely scenario, with at least 170 acres of land needed, and up to 470 acres if rail access is included.

Exhibit 3-7. Acres of land needed for new public marine terminals in the City of Portland, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Acres Needed		
			Minimum	Practical	w / rail
Automobiles	(410,000)	Yes	120.0	270.0	270.0
Containers	-	No	-	-	-
Breakbulk	-	No	-	-	-
Grain	(2,390,000)	Yes	30.0	50.0	100.0
Dry Bulk	(2,960,000)	Yes	20.0	70.0	100.0
Liquid Bulk	-	No	-	-	-
Total	**(5,760,000)**		**170**	**390**	**470**

Source: Calculated by ECONorthwest
Note: This table estimates acreage needed, not the number of terminals needed. Terminal size can range from 150 to 200 acres for automobiles and containers, to as small as 5 acres for liquid bulk. Depending on terminal size assumptions, the acreage need for automobile cargo could be accommodated by anywhere from one to five terminals in the City of Portland.

Comparing the demand for land for public marine terminals in the City of Portland shown in Exhibit 3-7, with the supply of land in the Portland Harbor shown in Exhibit 3-1, shows an insufficient land supply. As described in Sections 3.1 and 3.2, the Portland Harbor has the potential for two (or perhaps three, if the barriers to development at the McCormick and Baxter site can be overcome) sites to accommodate public marine terminals. These sites (Atofina and Time Oil) have serious development constraints, and even if these constraints can be overcome, they would each only be able to accommodate one terminal of practical size.

The Portland Harbor probably has insufficient land to accommodate the forecast growth for public marine terminals in the City of Portland. An optimistic scenario would show the Portland Harbor with capacity to

accommodate perhaps two terminals of relatively small size (and without a modern rail loop to serve these terminals). A more conservative outlook (and a real possibility) is that the two potential sites in the Portland Harbor may be unable to overcome their significant barriers to redevelopment, which would mean the Harbor may not have any capacity to accommodate future development of marine terminals.

Given the expected growth in demand over the next 30 years, there are few easy solutions to accommodate the City of Portland's anticipated shortfall in land for public marine terminals. The City can take action to address the existing constraints to facilitate redevelopment, or look elsewhere for buildable land for public marine terminals. The following section addresses the latter solution: looking outside of the City of Portland for land for new marine terminals.

3.3.5 PORT OF VANCOUVER DEVELOPABLE LAND

This analysis presupposes that from a regional perspective, there is no benefit to having port development occur in Portland vs. Vancouver. Leadership for the ports, and for the cities, counties, and states they are located in, may have different opinions. Indeed many public policies exist that emphasize the importance of retaining and attracting industrial jobs, like those created by marine terminal development. However, the purpose of this analysis was to determine if it was *technically* possible (as opposed to *politically* desirable) to accommodate future marine terminal demand at the Port of Vancouver.

Additionally, our analysis assumed that the type of port users that would be attracted to the Port of Portland if land were available, would find the Port of Vancouver equally as attractive if there were no developable sites in Portland. This assumption may be true for many, but not necessarily all public marine terminal users. Portland and Vancouver are similar in many ways, sharing the same regional infrastructure and labor pool. But differences do exist between the two jurisdictions, and more so for specific sites within each jurisdiction. For the purposes of our analysis, we have assumed land at the Port of Vancouver would be an acceptable substitute for potential marine terminal users unable to find developable land in the Port of Portland.

Ideally, our analysis for the supply and demand for public marine terminals in the Port of Vancouver would have used the same methods as were used for the Port of Portland. Unfortunately, our analysis was constrained by both data limitations, and time/budget. Thus, we were asked to conduct a less rigorous analysis of the Vancouver land supply, making use of the best available data, gathered mostly from conversations and correspondence with officials from the Port of Vancouver.

ECO interviewed officials with the Port of Vancouver to understand their long-term plans for harbor industrial lands, and the challenges and opportunities that would arise from a greater share of regional industrial development locating in Vancouver versus Portland.

The Port of Vancouver is located along the banks of the Columbia River, with access to the same markets and same multi-modal transportation infrastructure as the Port of Portland. The port handles more than 500 ocean-going vessels each year, as well as river barges, with total annual cargo of more than 5 million metric tons.

The Port of Vancouver has room to grow. An analysis of aerial photos of Port land indicate roughly 750 vacant acres. The Port of Vancouver sent a memorandum to the City of Portland that further clarified their intentions for these 750 acres. The land includes approximately 450 acres of undeveloped greenfield land called Columbia Gateway. Approximately 350 acres of this property is planned to be developed as maritime, and the remaining 100 acres planned for heavy industrial. In addition, the port has 110 acres of available undeveloped light industrial land called Centennial Industrial Park. The light industrial properties could be available for development within 12-14 months, while the Columbia Gateway area is not expected to be ready for development for another 8-15 years. The Centennial properties are not waterfront parcels.

Terminal 5, now under development, added 200 acres of heavy industrial and maritime land. All but four acres of this property is river-dependent maritime land. The maritime portion has been, or will be, filled with rail infrastructure, new tenants, and cargos, including wind energy exports and a dry bulk exporter with up to 16 million ton export capacity. The sole industrial tenant is a rail-dependent propane distributor.

The Port of Vancouver is in a period of rapid growth and is currently undertaking a number of public and private development projects, including the West Vancouver Freight Access project. This public rail improvement project will create a unit train facility, more than doubling the miles of track within the port, along with adding a new, grade separate entrance from the BNSF Railway mainline. This project will increase capacity from 45,000 rail cars per year, to more than 160,000 per year, with 40 percent less delay.

Given the Port of Vancouver's holdings of vacant land, the recent dredging of the Columbia River to a depth of 43 feet, and ongoing investment in new rail infrastructure (i.e., the West Vancouver Freight Access project), the Port of Vancouver is well positioned to capture growth in the future. Officials from the Port of Vancouver believe that neither the Port of Portland or the Port of Vancouver have sufficient land and resources to accommodate **all** of the region's future growth on their own.

Instead, ports on both sides of the Columbia River will need to supply land for new public marine terminals.

The Port of Vancouver's undeveloped, unpermitted maritime and industrial land will accommodate some regional growth – from those businesses selecting the Washington business environment and requirements. Using the BST forecasts of cargo demand for the City of Vancouver, we conducted a similar capacity shortfall analysis for Vancouver as we did for Portland (as was described in sections 3.3.1 to 3.3.4).

Combining these analyses allows us to view the regional demand for and supply of land for public marine terminals. The result of this analysis is shown in Exhibit 3-8. Our most likely scenario shows that regional cargo volumes in 2040 could require between 210 and 570 acres of land for new marine terminals.

Exhibit 3-8. Acres of land needed for new public marine terminals in the Portland Metro Region (including Portland and Vancouver), 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Acres Needed		
			Minimum	Practical	w / rail
Automobiles	(570,000)	Yes	160.0	370.0	370.0
Containers	-	No	-	-	-
Breakbulk	(90,000)	No	-	-	-
Grain	(2,390,000)	Yes	30.0	50.0	100.0
Dry Bulk	(2,960,000)	Yes	20.0	70.0	100.0
Liquid Bulk	-	No	-	-	-
Total	**(6,010,000)**		**210**	**490**	**570**

Source: Calculated by ECONorthwest with demand forecasts from BST Associates, and other assumptions based on conversations with officials from the Port of Portland and Port of Vancouver, as well as supporting documents including: *Operational Efficiencies of Port/Terminal World Wide* (Worley Parsons, 2012) and *West Hayden Island Economic Foundation Study* (Entrix, 2010).
Note: This table estimates acreage needed, not the number of terminals needed. Terminal size can range from 150 to 200 acres for automobiles and containers, to as small as 5 acres for liquid bulk. Depending on terminal size assumptions, the acreage need for automobile cargo could be accommodated by anywhere from one to seven terminals in the Portland Region.

If each new port terminal requires a dedicated rail loop, the total acreage needed to accommodate regional cargo volumes in 2040 exceeds the current supply of 350 acres of vacant developable land at the Port of Vancouver planned for marine terminal development.[12] However, the Port of Vancouver has about 200 acres of vacant developable land that could technically accommodate marine terminal development, but is planned for other industrial uses. But about 100 acres of this amount is part of

[12] It is important to note that these projections are based on our "most-likely" scenario. The range of possible assumptions that could be used in this analysis is significant. When using our most conservative assumptions, our analysis showed a regional land need as low as 70 acres, and our most aggressive assumptions resulted in a land need of over 2,250 acres.

Centennial Industrial Park and are not on the waterfront parcels or linked to waterfront parcels, so 100 acres might be a more appropriate estimate. If these acres were included in the total supply, then the Port of Vancouver comes close to having a supply of land to accommodate regional cargo demand through 2040.

While this scenario is technically possible, it may not politically feasible or consistent with adopted policies of the affected jurisdictions: Vancouver's land supply could fall short. The high and low demand forecasts differ by + or – 20% from the most-likely forecast, and assumptions about whether a new terminal has rail loop access or not can easily double the need for land. Portland and Vancouver probably have adequate land now to accommodate a low-demand forecast with few new terminals sized for loop trains. But in our simulations, high demand plus loop-train access at all new terminals led to a overall land shortfall of almost 1,500 acres. If only 350 acres at the Port of Vancouver are available for marine terminal development (its current estimated based on policy) then unmet demand for public marine terminals in the region would be around 1,100 acres.[13]

3.3.6 IMPLICATIONS

The most recent forecasts for future cargo demand show the Port of Portland will be unable to accommodate forecast demand by 2040 without adding new capacity. However, the extent of that capacity shortfall depends on the assumptions used. Interviews with officials from the Port of Portland, and the author of the most recent cargo forecasts indicate that although actual tonnage for specific cargo types may differ from the forecasts, long-term trends have shown past forecasts for total cargo volume to be fairly accurate, and the most recent forecasts should be seen as reliable.

Taken at face value, these forecasts suggest that additional port capacity will likely by utilized in the future; however, accurately and reliably forecasting the future is impossible. Although our forecasts (and the BST forecasts which underpin them) include a broad range of assumptions, reflecting the high degree of uncertainty, there is no way to guarantee that the future will fall within our forecast range, let alone our "most-likely" scenario. No one knows exactly how demand for port facilities in the lower

[13] Although this is the "high-scenario," it is not also "highly unlikely." BST Associates, authors of the cargo forecasts used in this analysis, note that the high-scenario calls for 3.1% growth in cargo volumes per year, which is actually lower than the 4.1% average annual growth experienced on the Columbia River between 1962 and 2011.

Columbia will change in the future. Economist HE Haralambides effectively summarizes the difficulty forecasting port demand, stating:[14]

> "As a result of intertwined and extended hinterlands; abundant land infrastructure and short-sea feedering networks; continuously evolving liner shipping networks; and the infamous `mobility' of the container, demand is very volatile and unpredictable. Port market shares are unstable; investments in one region or country have an impact on another … In such a `fluid' environment, how could one forecast port demand with any degree of credibility?"

Competitive and volatile environments do not support reliable forecasting because outcomes depend on many randomly moving variables. Ultimately, whether or not demand for additional port facilities on the lower Columbia materializes will depend on market conditions – demand (what's produced and consumed in the Portland region), supply (what technologies are used to ship goods, what competing port capacity exists), and price. These factors will inevitably change over the next 30 years in ways that no one can predict, which means any attempt to forecast them should be taken with a grain of salt.

In other words, individual cargo types fluctuate year to year and are difficult to predict with accuracy, but long-term historical trends show that demand for total cargo volumes is less volatile, more predictable, and tends to grow at a pace that is linked to the global economy. While the Port's four public marine terminals are not operating at 100% of capacity today, it is very likely that they will reach the limits of their capacity in the next several decades, as demand increases. Once these facilities reach capacity, the Port of Portland will need to develop new facilities, or else turn away demand.

The Port of Vancouver shares many of the same attributes that make the Port of Portland an attractive place for marine shipping. Thus the Port of Vancouver is a logical place to site new marine terminals, if sites are unavailable in Portland.

From a regional perspective, it makes no difference whether terminal development occurs in Portland or Vancouver. Both cities function as part of the same regional economy, and share the same infrastructure and labor pool. However, at a local level, if demand for public marine terminals is shifted from Portland to Vancouver, the City of Portland would lose out on high-paying industrial jobs (and some of the residents that fill those jobs), which would have a detrimental effect on the Portland economy, and a

[14] Haralambides, H.E. (2002), Center for Maritime Economics and Logistics, "Competition, Excess Capacity, and the Pricing of Port Infrastructure".

positive impact on Vancouver's. In other words, some amount of economic activity (measured any number of ways: jobs, wages, output, value added, etc.) would occur in Vancouver, rather than Portland, and Portland would miss out on the resulting direct, indirect, and induced economic benefits.

Given the most recent forecasts of demand, and reasonable assumptions on current capacity and the likely size of new terminals, it would appear that the Port of Vancouver has a surplus of vacant industrial land to accommodate their likely future demand, and should the Port of Portland be unable to accommodate forecast growth, the Port of Vancouver could accommodate some (and perhaps all) of that growth. However, officials from the Port of Vancouver stress that a regional strategy will be necessary to respond to future demand for public marine terminals in the region, and if actual cargo volumes reflect the high-scenario projections from the BST forecasts, then the region is likely to have a significant shortfall of suitable land for new public marine terminals.

3.4 POTENTIAL FOR INCREASED EFFICIENCIES

What is the potential for more efficient use of industrial harbor land? The total amount of land inside the Portland city limits is essentially fixed. Unless submerged land is filled to create new dry land, the only way the City can get more land is to expand its boundaries, which is unlikely to occur due to the constraints of surrounding land. Therefore, the City is interested in using its supply of industrial land as efficiently as possible to accommodate the most economic activity.

3.4.1 RECENT TRENDS IN EFFICIENCY OF PORTLAND HARBOR LANDS

We examined trends in efficiency in the Portland Harbor using several measures. Because of data limitations (see Chapter 2 and Appendix A) we focused our analysis on the period between 2002 and 2008. We calculated the economic activity in the Portland Harbor for these years, measured in terms of employment, real market value, value added, and cargo tonnage. We then divided each of these measures by the number of developed industrial acres in the Portland Harbor for each year to get a measure of land efficiency: i.e., some amount of some measure of economic activity, per acre. We then looked as the change in that measure of efficiency over this period of time.

Recent trends in the Portland Harbor show different results, depending on the measure of efficiency used. These results are summarized in Exhibit 3-9.

Exhibit 3-9. Measures of economic activity per acre, Portland Harbor, 2002 and 2008

	2002	2008	AAGR
Value Added	$1,147,614	$1,217,173	1.0%
Real Market Value	$776,715	$838,091	1.3%
Employment	6.21	5.75	-1.3%
Cargo Tonnage	3,873	4,928	4.1%

Calculated by ECONorthwest with data from:
Value Added: IMPLAN
Real Market Value: Metro RLIS
Employment: Oregon Employment Department, Quarterly Census of Employment and Wages
Cargo Tonnage: Port of Portland
Acreage: Metro RLIS and Multnomah County Office of Assessment and Taxation

From 2002 to 2008, developed industrial land within the Portland Harbor increased from 2,757 acres to 2,863 acres, an average of 18 acres per year. Value added, real market value, and cargo tonnage all grew at a faster pace than developed industrial acres. By those measures, land was used more efficiently. Employment in the Portland Harbor, however, declined over that period (both in absolute terms, and per acre of developed industrial land). The measure of efficiency that is chosen makes a difference when evaluating trends in land use efficiency.

The next section explains each of these measures in more detail.

Employment

Employment density is a traditional measure of land-use efficiency. In fact, it is typically the basis for forecasting supply of and demand for employment land for all jurisdictions across the State, as they conduct periodic Economic Opportunity Analyses that are required by State law.

For our analysis, we obtained employment data from the Oregon Employment Department for all businesses in the City of Portland for 2002 and 2008. We used GIS software to isolate all employment located within the Portland Harbor for these two years. Total employment in the Portland Harbor declined from 17,134 to 16,466 over this period, a decline of roughly 111 jobs per year (or -0.7% per year).

The Oregon Employment Department QCEW data do have limitations that are worth noting:

- Although the geocoding process OED uses produces accurate results, it is possible that the exact location of some employers could be wrong by one or two hundred feet. This means that some employment in the Portland Harbor may appear outside the harbor boundary when using QCEW data, and conversely, some employment that is actually outside of the Portland Harbor may appear inside the harbor boundary.

- Some firms have multiple locations, but may only report employment at one location (such as at a company headquarters). Depending on how a company reports multi-site employment, all of the company's employment may be incorrectly reported as being inside or outside of the Portland Harbor boundary.

- QCEW data represents the number of *covered workers*. The data excludes members of the armed forces, the self-employed, proprietors, domestic workers, unpaid family workers, and railroad workers covered by the railroad unemployment insurance system. In the case of the Portland Harbor, the most important of these omissions is likely railroad workers. Other studies have shown a significant economic impact from railroad activity in the Portland Harbor, but these workers are excluded from the data.

We do not wish to imply that tracking employment density as a measure of economic activity is wrong or pointless. It is indeed an important measure, and one that the policy-makers, and the general public find useful for understanding the scale of economic activity. Despite the limitations listed above, the QCEW data is widely recognized as one of the most accurate employment data sources updated on an annual basis with site-specific data on all industries. We are just acknowledging that employment isn't the **only** measure of economic activity, and due to its limitations, other alternative measures may prove more useful for evaluating the economic performance of the Portland Harbor.

Real market value

Real market value is another typical measure of land-use efficiency. The relationship is a fundamental principle of urban economics: higher prices reflect the relative scarcity of some type of land or location, and that relative scarcity causes developers to substitute capital for land (i.e., to build more intensively). Higher-value development typically translates into higher assessed values and property taxes, which is seen as a benefit to local governments.

For our analysis, we obtained real market value for all parcels in the Portland region from Metro RLIS data for 2002 and 2008. Using GIS software, we calculated the sum of the real market value of all parcels within the Portland Harbor. The Harbor saw real market values grow from $2.14 billion in 2006 to $2.40 billion in 2008, an average annual increase of 1.9%. However, the US Consumer Price Index grew by 3.0% per year over this same time period, indicating that real market value in the Portland Harbor grew at less than the pace of inflation.

Data on real market value for this time period should be treated cautiously. The local and national real estate markets were booming during

this period. Multnomah County real estate values grew at above average rates: more than 8% during this period. The region has now had three consecutive years of declining real market values since 2008; a detailed analysis of property values in the Portland Harbor would probably mirror these broader regional trends. Over a long period (long enough to include the ups and downs of several business cycles—say, 20 years) inflation-adjusted changes in real market value in the Portland Harbor might be a useful indicator of land-use efficiency. For shorter periods, it is not a measure that can be used without interpretation.

Value added

Value added is a measure of economic activity that is not commonly used to measure land use efficiency. Value added, simply defined, is the difference between the sale price and the production cost of a good or service.[15] It is directly comparable to Gross Domestic Product (GDP) at the national level. Value added only considers the final cost of goods and services (the total of four components: wages, business income, other income, and indirect business taxes), and excludes the value of intermediate goods, to avoid double counting.

While value added is a good measure of economic activity at a regional level, the data are not typically collected at smaller geographic levels, and certainly are not available as time-series data at a parcel-specific level. This presents challenges for using value added as a measure of efficiency for the Portland Harbor.

We used the IMPLAN economic modeling software to obtain value added information for the smallest geographic areas possible (zip codes). ECO used the IMPLAN forecast of value added for the four zip codes that overlap the Portland Harbor for 2002 and 2008. Using a geographic boundary that is close to, but not exactly the same as, that of the Portland Harbor means that the measure of value added per gross developed acre should not be viewed as accurate in an absolute sense. But because our geographies and data sources were consistent in both years, the measure is still useful for observing trends over time.

Our analysis showed value added in the zip codes approximating the Portland Harbor increased from $3.16 billion in 2002 to $3.48 billion in 2008, an increase of 1.6% per year. However, the US Consumer Price Index grew by 3.0% per year over this same time period, indicating that value added in the Portland Harbor grew at less than the pace of inflation.

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[15] More accurately, the production costs are the outside purchases of materials and services, but do not count payments to employees for wages, salaries, and benefits. Thus, a lot of value added is a "return to labor;" it also includes returns to land and capital.

Cargo

The Port of Portland tracks cargo tonnage on a monthly basis and publishes annual data, dating back 30 years. While the data are only available for Port of Portland public marine terminals, and not privately-operated terminals, they are a good proxy for cargo shipped in the Portland Harbor, and the most comprehensive historical data available. The Port data show cargo volumes (measured in short tons[16]) increased from 10.7 million in 2002 to 14.1 million in 2008, an increase of 4.8% per year. Over this period, cargo volumes experienced more robust growth than any of the other efficiency measures used in this analysis. In other words, despite a decline in employment, and modest gains in real market value and value added, the Portland Harbor saw strong growth in cargo volumes per developed acre of industrial land.

Note that is not the same as saying that land in the Portland Harbor is what generated or somehow caused that tonnage to go through the Port.

3.4.2 OPPORTUNITIES FOR INCREASED EFFICIENCIES

The available data provide limited answers for understanding the potential for industrial land in the Portland Harbor to be used more efficiently. To supplement them, we interviewed key stakeholders in the Portland Harbor to solicit their input on (1) ways to measure efficiency, (2) challenges to improving efficiency, and (3) strategies to overcome those challenges.

To conduct these interviews as efficiently as possible, ECO staff met with about a dozen members of the Working Waterfront Coalition (WWC), rather than conducting separate interviews with similarly qualified individuals. Established in 2005, the WWC is an organization of businesses concerned about the environmental health and economic vitality of the Portland Harbor. Members of the WWC who were interviewed for this project, included representatives of the following businesses and organizations:

[16] 2,000 pounds per ton, as opposed to metric tons (1,000 kilos, about 2,200 pounds).

- The Greenbrier Companies
- CalPortland
- Northwest Pipe Company
- Schwabe, Williamson & Wyatt
- Kinder Morgan
- Smart Decisions
- Port of Portland
- Perkins Coie
- Schnitzer Steel
- Columbia Pacific Planning
- Evraz Oregon Steel Mills

Group members had different views based on their individual experiences in the Portland Harbor, yet the group as a whole agreed on most key points. Although no votes were taken at the meeting, the following points seemed to achieve consensus:

- **The Portland Harbor has many attributes that provide a competitive advantage for water-dependent industrial activity**. The Harbor benefits from its amazing connectivity: the confluence of two rivers, access to domestic markets via two major rail lines, inland waterways via the Columbia/Snake River system, and I-5 and I-84, and access to global markets via the Pacific Ocean. Having all of this connectivity in the heart of the City of Portland, with strong local policies in place to preserve harbor land for industrial use, creates a special place for water-dependent industrial firms. Members of the WWC recognize the importance of the Portland Harbor, and are committed to maintaining and enhancing its competitive advantages.
- **The constrained land supply is an issue**. Members of the WWC recognize that the industrial harbor land supply in the Portland region is fixed, and vacant developable land is rare and constrained. They believe this limitation is an important issue, and one that will become more important over time.
- **Businesses adjust to these constraints by taking measures that have the effect increasing output on an existing site (i.e., of increasing land efficiency).** Such measures include extra shifts, better machinery, tighter processing procedures, and more.
- **There are bigger public policy issues that are affecting demand for new development in the Portland Harbor**. While members of the WWC were concerned about the constrained land supply, they were more concerned with issues affecting demand: Superfund liability and a burdensome permitting process.
    - **Superfund liability**. The specter of the Superfund is hanging over the heads of all property owners in the Portland Harbor. They know that their liability for the Willamette River cleanup effort will be significant, but they do not know what their individual liability will be, or when a final agreement will be

reached. Members of the WWC expressed concern that it is nearly impossible to sell land in the Portland Harbor for new industrial development until a final agreement has been reached on the Superfund liability.

- **Permitting process**. Members of the group believe the local permitting processes to be time consuming, costly, and uncertain. Such beliefs are typical of most cities. But members of the group who operate facilities across the globe expressed their view that Portland's permitting process is more costly and difficult than most other places they do business. An implication for land efficiency is that permitting, its other intended benefits notwithstanding, makes private sector efforts to improve sites and increase efficiency more difficult. Thus, the City should be sure that the intended benefits are worth the tradeoff, and adjust its permitting process if they do not appear to be.

- **Traditional measures of efficiency do not apply for harbor industrial land, and alternative measures should be used**. Regarding the efficiency of land use, members of the WWC supported the conclusions of this report, that traditional measures (employment, real market value, and FAR) are ill suited for measuring the performance of water-dependent industrial land. The group suggested other measures of economic output, such as value added and cargo tonnage, are more appropriate measures of land-use efficiency in the Portland Harbor.

3.4.3 IMPLICATIONS

In our opinion, the main value of this attempt to measure land-use efficiency was to show what a slippery notion it is, and why simple statements about that efficiency are more likely to derive from opinion and a simple causal model than from an even semi-rigorous empirical analysis. In other words, things are complicated.

For example, many would say that land is being used more efficiently if it accommodates more employees. That kind of definition would be consistent with land-use planning practice and law in Oregon. By that measure, land use efficiency in the Portland Harbor decreased from 2002 to 2008.

But an alternative view—and one more likely to be taken by economists—is that labor (employment) and land are both inputs to a production process. They may be substitutes, or at least there is no necessity that they move together. If a business can use less land and even less labor and still increase its production, it is getting more efficient. If a lot

of businesses in an area are increasing their output on the same land they have always been on, then "land efficiency" can be said to be increasing.

In Portland Harbor the data shows mixed results. Despite declining employment, and growth in real market value and value added that is less than the rate of inflation, the Portland Harbor experienced an increase in efficiency as measured by cargo tonnage. If the City is interested in generating the most economic activity on the fixed supply of harbor industrial land, then value added and cargo tonnage may be more appropriate measures than employment. But these measures are inconclusive on whether the harbor increased in land use efficiency from 2002 to 2008.

That last point leads to a suggestion for policy discussion: instead of talking broadly about "land efficiency," talk specifically about changes in certain economic output per acre. Accept that there are different measures of output, and track several of them. That is what we did above. Our conclusion is that some measures of economic output have been increasing faster than vacant land is being converted to developed land, and other measures have not. The region should continue to track these measures, and adopt policies with the intention of increasing measures of economic output faster than vacant land is converted to developed land. This seems like a good objective for people with different passions: economic development, environmental amenity, or smart growth.

Finally, our simple analysis does not answer other questions that could be important for policy, such as (1) What is causing the increase or decrease in economic activity? (2) How does that change compare with other areas in the Portland region, or with other port areas in the U.S.? and (3) What policies would allow for even greater growth?

Chapter 4 SUMMARY OF FINDINGS

This report focused on issues related to the demand for and supply of land for water-dependent industrial employment in the Portland Harbor (about 4,000 acres of land along the Willamette River, from approximately the I-405 Bridge north of downtown to the confluence of the Willamette and Columbia Rivers). Its main conclusions are:

- The City and its partner agencies have spent years in study and data development for the study area. The City's mapping of vacant parcels is detailed and support its conclusion that outside of land already in Port of Portland Terminals, the best potential sites in the study area of a location and size that a new marine terminal would require are Atofina and Time Oil.
- These two sites meet mandatory criteria for minimum size (more than 50 acres) and location (frontage on the Willamette River) for a new marine terminal. That makes them *possible* sites, but not necessarily *likely* sites. The analysis in this report reconfirms findings of previous studies: small size and a lot of site constraints (especially the need to deal with the legal liabilities of prior soil contamination) make development of these sites for a marine terminal challenging.
- Even using the most detailed and recent data available, it is difficult to predict future land needs for public marine terminals with precision. While the potential land need through 2040 varies greatly depending on key assumptions, the most-likely scenario shows that the Port of Vancouver may, in theory, have enough developable land to accommodate regional growth in cargo volumes through 2040. In practice, however, competing demands for Port of Vancouver lands, competition among and public policies of affected jurisdictions, and the potential for higher growth in cargo volumes all make it possible, if not likely, that the land controlled by the Port of Vancouver would not be able to accommodate all of the regional demand for marine cargo.
- Regarding the efficiency of land use, for the time periods evaluated, we found a decline in employment, modest growth in real market value and value added (though less than the rate of inflation), and stronger growth in cargo volumes per developed acre of industrial land. The mixed results of the various measures of economic activity prevent us from drawing a strong conclusion. The region should continue to track these measures, and adopt policies with the intention of increasing measures of economic output faster than vacant land is converted to developed land. This seems like an objective that could appeal to people with different interests: economic development, environmental amenity, or smart growth.

Appendix A Research Approach

Section A.1 describes why getting clear about definitions and assumptions at the beginning of a study is important. **Section A.2** discusses a *framework* for evaluation: concepts that underlie any evaluation of this type. It discusses (1) definitions of industrial use and industrial land, (2) factors relating to the supply of and demand for industrial land, (3) the role of industrial activity in the economy and (3) the concept of land efficiency: what is it, why does it matter, and how is it measured. **Section A.3** is more specific about the *methods* used for the evaluation (review of previous studies, secondary data, case studies, interviews) and how they are used to address four key questions: about land supply for water-dependent uses, a new marine terminal, the role of Vancouver in the regional land supply for marine terminals, and land efficiency.

A.1 OVERVIEW

The purpose of research on public policy issues to provide information to a public debate about public action. The research *informs* decisions; it does not *make* decisions. Those decisions are usually made by elected and appointed officials on behalf of the citizens they represent.

Some of the issues that require action are controversial. People and groups have different opinions about the extent of the problem, its causes, and best ways it can be mitigated. Ultimately, most solutions that get adopted are a result of debate and compromise. Fundamental to a productive debate about problems and solutions are (1) an agreement on definitions, and (2) clarity about assumptions. Many discussions fail to lead to consensus on action because there was never consensus on definitions. Moreover, it is common for evaluation results to depend more on the assumptions selected than on the data collected in support of those assumptions.

Thus, the analysis in this report starts by trying to describe clearly the context for the questions being asked. That context is a foundation from which to identify data sources and analytical methods. Stated another way, the methods used for evaluation should be consistent with generally accepted ideas about how a regional economy and industrial development work. What do theory and prior empirical work suggest are fundamental contributors to (causes of) economic activity and industrial development, and which of those factors are most closely related to the questions this study is addressing?

Section A.2 provides a *framework* for evaluation: evaluation concepts that underlie any evaluation of this type. Section A.3 then discusses more specific *methods* for data collection and analysis that are consistent with that framework.

A.2 FRAMEWORK FOR THE EVALUATION

This section discusses a *framework* for evaluation. It discusses (1) definitions of key concepts used in the analysis, (2) the role of industrial activity in the economy, (3) factors relating to the supply of and demand for industrial land, and (4) the concept of land efficiency: what it is, why it matters, and how it is measured.

A.2.1 WHY CARE ABOUT INDUSTRIAL LAND?

No city or region exists that does not engage in economic activity. A concentration of economic activity is a defining characteristic of all cities.

A substantial but inconclusive literature investigates which economic activities provide the greatest net benefits to cities. Most of that literature assumes, at least implicitly, that (1) specialization allows consumers to get a variety of goods and services at lower prices; (2) if places specialize where they have comparative advantages, they will (a) produce goods more efficiently and be more competitive, but (b) have to trade to get everything they want; and (3) trading requires having something to trade; it means exporting some goods and services so that that money is available to pay for imports. It is that logic that leads economic development specialists to emphasize the importance of growing and retaining local firms that export goods and services: the payment for those exports brings money into the local economy that, among other things, allows purchases of desired goods and services not provided in the local economy.

Whether industrial activity generates larger economic benefits than other economic activities is a matter of debate in the professional literature of development economics.[1] Most economic development practitioners, however, believe that:

- Manufacturing is central to a strong regional economy (for a variety of reasons related to assumptions about greater value added, export

[1] See a recent debate sponsored by *The Economist* on the motion "This house believes that an economy cannot succeed without a big manufacturing base." (http://www.economist.com/debate/days/view/714; accessed 24 August 2011). The opening remarks of the moderator stated "Our topic for the next few days is one that has divided economic practitioners and commentators for as long as anyone can remember: how important is manufacturing?" Hypothetically, if the U.S. were manufacturing more products being sold abroad, its debt would be less. But are global and U.S. economic conditions such that manufacturing is the comparative advantage of the U.S.; maybe it should be exporting services (e.g., financial, accounting, medical, engineering, and so on) instead. Pro and con arguments are posted on-line and readers vote. Readers voted 3 to 1 in favor of the proposition.

orientation, multiplier effects, average wages, and employment social diversity) and their missions.[2]

- By extension, the supply of land to accommodate manufacturing (i.e., industrial land) is important: too little industrial land hinders the growth or utilization of regional economic capacity. It is not uncommon for economic development discussions to include a statement that a region lacks sufficient land for industrial development at what someone has judged to be reasonable prices.

While proponents of manufacturing and industrial development have arguments and data to support their beliefs, so do groups that have different opinions about the importance of manufacturing relative to other sectors. Some of their arguments: too much industrial land could impose opportunity costs on the regional economy and hinder the growth or utilization of regional economic capacity; land markets and resulting land price should be allocating land to highest and best use, and that preserving land for industrial users at the exclusion of non-industrial users would reduce regional economic well-being.

The disagreement between groups stems from different assumptions about the value of industrial uses on particular parcels of land relative to alternative uses. In debates about public policy on land use and development, advocates for any particular use usually argue that:

- Their preferred use of the lands in question generates greater net benefits for a region than the other potential uses.
- Regions should preserve lands for their preferred use even if other users are willing to pay higher prices for these lands. Stated differently, all sides frequently assume that their uses produce positive externalities for a local economy that justify the effective subsidy associated with keeping other users that might pay more for the lands at issue.
- Where the alternative use would pay *less* for land than their preferred use, their arguments go the other way: the preferred uses generate greater net benefits to a region because the alternative uses will not generate sufficient positive externalities to offset the lost consumer and producer surplus that results from requiring the land to be used for purposes that the market prices do not show to be the highest and best use.

[2] One should note, however, the likelihood of self-selection bias here: local economic development has typically been funded with a mission to retain and attract manufacturing jobs, and people attracted to the field of economic development are likely to start with or acquire that point of view.

The arguments for public-sector involvement in urban land markets (e.g., planning, zoning, urban renewal) are based fundamentally on arguments about external effects that are not incorporated into the market price of land transactions. Proponents for policies favoring industrial land (or any type of land use[3]) might make both sides of the argument: because of the important external benefits of industrial use (1) protect industrial land from being converted to uses that will pay more for that land, and (2) do not prohibit industrial uses from converting other land to industrial uses when it is willing to pay more for the land than those other uses.

This study cannot resolve the longstanding debate about the net benefits of industrial uses and land relative to other uses and land. Rather, *this study starts from the assumption, embedded in the economic development policies of all local governments in the region, that the retention and expansion of industrial sectors is something that the region desires*. The City of Portland specifically addresses industrial land uses in its Comprehensive Plan and Zoning Code. The Urban Development goal of the Comprehensive Plan calls for industrial sanctuaries, where industrial land is preserved for manufacturing purposes exclusively. This stance is reiterated in Goal 5: Economic Development, which identifies retention of industrial sanctuary zones, including maximizing linkages with and within these areas, as a primary objective. These policies are implemented via the city's zoning code, which restricts certain commercial uses in industrial zones and only permits changes to Industrial and Employment Comprehensive Plan designations, if stringent criteria are met. These policies demonstrate the City of Portland's commitment to protecting industrial lands for industrial use. With this commitment in mind, this study then investigates land and in the Portland Harbor to see what capacity they have (given different assumptions about user types and changes in technology and operations) to accommodate industrial users.

A.2.2 DEFINING INDUSTRIAL LAND AND USERS

A.2.2.1 Industrial land

What is commonly referred to as "industrial" land is land designated by a local government (in its comprehensive plan, implemented by its zoning ordinances) to allow (but not necessarily require) industrial uses.[4] Thus, land may be defined by public policy (e.g., plan or zone designation) or by actual uses. Such definitions may lead to an identification of roughly the

[3] For example, the fundamental argument for the preservation for West Hayden Island is that such preservation has external natural and social benefits that make the land more valuable to the region in its natural state than in development.

[4] Much of the overview in section A.2.2 is drawn from previous work ECO has done on industrial lands, especially work for the City of Tukwila, WA.

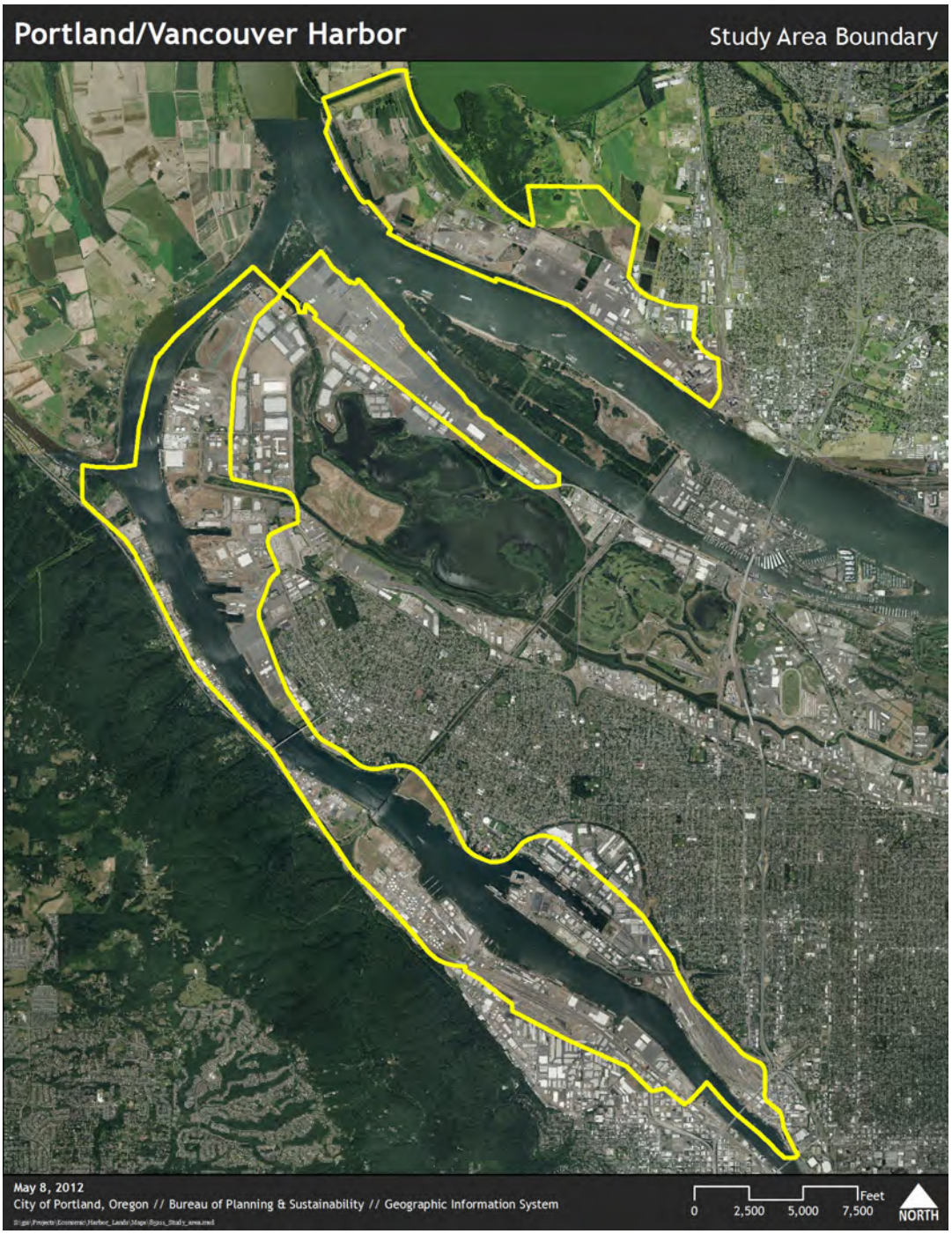
same land, but they are not identical. Industrial uses exist on land not zoned for those uses, and non-industrial uses exist on lands zoned industrial. Either definition, or both, may be appropriate for a particular policy issues.

A smaller subset of industrial land pertinent in this study is "harbor" land. That land could be defined in any of several ways. It could be, for example, land parcels that are within the boundaries defined for this study and also:

- With docking facilities
- Abutting a navigable waterway
- With active water-dependent industries (however "water-dependent" may be defined
- Owned by the Port of Portland
- Any combination of the above.

For this study, we use the City's definition of the "Portland Harbor," based on land designated industrial by the City's Comprehensive Plan in close proximity to the Willamette River. A map of the City's harbor lands is shown below in Exhibit A-1.

Exhibit A-1. Map of harbor lands in Portland



Source: City of Portland, 2011.

A.2.2.2 Industrial users

All industrial users

Land is designated industrial because it meets, or is intended to meet, the needs of the industrial users. These needs typically include proximity to transportation routes (interstate roadways, rail, water ports, airports),

relatively low-cost land (to accommodate the relatively large land needs of many industries), and a location that reduces conflict with other uses.

Industrial users are usually identified as a collection of sectors from the North American Industrial Classification System (NAICS). A recent analysis of industrial land published by the American Planning Association[5] used NAICS codes to define "industrial use" in urban areas. It described a *strict* definition and *loose* definition. The industries included in both definitions are shown in Exhibit A-2.

Exhibit A-2. NAICS codes presumed to be highly correlated with industrial land use

NAICS	Industry
Strict Definition	
23	Construction
31-33	Manufacturing
42	Wholesale trade
48-49	Transportation and warehousing
Loose Definition	
23	Construction
31-33	Manufacturing
42	Wholesale trade
48-49	Transportation and warehousing
221	Utilities
444	Building material and garden equipment and supplies dealers
511	Publishing industries (except Internet)
517	Telecommunications
518	Internet service providers, web search portals, and data processing services
562	Waste management and remediation services
811	Repari and maintenance
812	Personal and laundry services

Source: *Planning for Industry in a Post-Industrial World*, Marie Howland. See text for full citation.

These sectors share some basic characteristics. First, they are often referred to as part of the "traded" sectors, presumably because they have a greater propensity to be export-oriented and involved in direct creation of physical goods.[6] Second, they generally have the same building and land needs and site requirements. They cannot typically locate in high-rise office space or in storefront retail space, or in converted homes. This limitation is in part related to possible external effects that can make them unattractive neighbors; they can generate more noise, dust, smells, and visual impacts than other uses. (But many industrial uses can have *fewer* external impacts

[5] Howland, Marie. 2011. "Planning for Industry in a Post-Industrial World: Assessing Industrial Lands in a Suburban Economy." Journal of the American Planning Association. Winter, Vol 77, No 1. pp 39-53.

[6] But note that this distinction has always been fuzzy and is getting blurrier in today's economy. Many businesses in the Services sector are export-oriented: e.g., business services and tourism. Moreover, the notion of "basic" is also fuzzy and increasingly questioned.

of some types than businesses in other sectors have: e.g., on traffic). The limitation also relates to their general need for cheap land and proximity to transportation routes.

The industrial sectors shown in Exhibit A-2 are defined by industrial activities, but the list does not necessarily reflect the types of businesses that require industrial land. For example, many jobs in the construction industry are not physically located at a central, industrial location, but instead operate on sites throughout the region. Similarly, many utility jobs in the region are often in office towers in the Central City, and do not require industrial land. Therefore, the list of NAICS codes that constitute industrial uses (as defined by the American Planning Association) do not necessarily reflect the range of businesses that would have demand for industrial land in Portland.

Water-dependent industrial users

For this analysis, more important than "all industrial" users is the subset of industrial users that are either "water dependent" or "water related." Every type of job must, by definition, fit into one of 17 broad ("two-digit") NAICS categories. But at the most detailed level (six-digit) there are about 1,175 categories. If one wants information about "water-dependent" employment, one must define it as some combination of NAICS codes, and those codes, even at the finest level of disaggregation, may have firms that one might call water-dependent and others one would not. No standard data source defines business this way; one has to either combine NAICS codes or do primary research (e.g., site evaluations of phone surveys).

Even seemingly obvious NAICS codes like 3366, ship and boat building, may not be completely populated by water-dependent firms: smaller pleasure boats may be built or refurbished for shipping by truck or rail. And codes that may appear to have little to do with water (e.g., 3112, oil seed and grain milling) may have reasons to be close to the water because of the importance of bulk shipment. This report does not conduct analysis that requires a definition of water-dependent industrial users, and because of the difficulties of defining water-dependent industries by NAICS codes, we have not attempted to do so.

The City of Portland defines river-dependent uses as those that can be carried out only on, in, or adjacent to a river because they require access to the river for waterborne transportation or recreation. Included is any development, which by its nature, can be built only on, in, or over a river. The zoning language, however, does not distinguish specific water-dependent industrial uses.

Public marine terminals

Our analysis treats public marine terminals (i.e., the Port of Portland facilities) differently from other users of harbor industrial land. These port terminals function as public infrastructure, facilitating economic activity for other industries in the region. In this report, we examine certain questions related to broader harbor industrial land efficiencies, and other questions related to land supply specifically for new public marine terminals.

A.2.3 EVALUATING THE SUPPLY OF AND DEMAND FOR INDUSTRIAL LANDS

This section looks at how cities answer critical questions like: How much developable industrial land is there? How is it likely to be used? Will it be enough for the expected demand in the future?

A.2.3.1 Supply of industrial land

The total amount of land inside the Portland city limits is essentially fixed. Unless submerged land is filled to create new dry land, the only way the City can get more land is to expand its boundaries. But such expansions are unlikely, because the City is mainly surrounded by rivers, protected areas (Forest Park), and incorporated municipalities.

Thus, for the City of Portland, the question of land supply focuses on how much land is vacant, partially vacant, or underutilized, and how much land is constrained (by environmental contamination, environmental overlays, and other issues).

The Bureau of Planning and Sustainability (BPS) at the City of Portland has done extensive work to characterize the land supply in the Portland Harbor. It uses state-of-the-practice procedures (e.g., GIS data layers) consistent with Oregon planning law (e.g., statutes and administrative rules for statewide Goals 9 and 14).

Exhibit A-4 shows the typical process for categorizing and evaluating land supply. In summary:

- All land is either fully developed or not.
- If not, it is either (1) under development (in the pipeline), (2) buildable, or (3) not buildable (because of prohibitive physical or policy constraints.
- If buildable, a parcel of land may be (1) fully vacant, (2) partially vacant, or (3) potentially redevelopable.

- Buildable land in any of those categories has a *capacity* to accommodate new development. That capacity is defined by public policy and may be partially constrained by public policy.

Exhibit A-4. Conceptual framework for buildable land inventory and capacity analysis

The concepts and definitions illustrated in Exhibit A-4 are relatively well understood in Oregon planning practice. Our investigation suggests that the extensive work by BPS on the land supply in the Portland Harbor generally accepts these concepts, even if its definitions and methods are slightly different.

A.2.3.2 Demand for industrial land

Forecasting demand for industrial demand begins by identifying what types of users will consider locating on land designated industrial. In general, industrial land must accommodate most job growth in "industrial" sectors. It must also accommodate some job growth in "non-industrial" sectors.

Not all jobs in "industrial" sectors use industrially-designated land. For example, a head office of a manufacturing company may be in a downtown office/commercial zone rather than in an industrial part of a city. Another

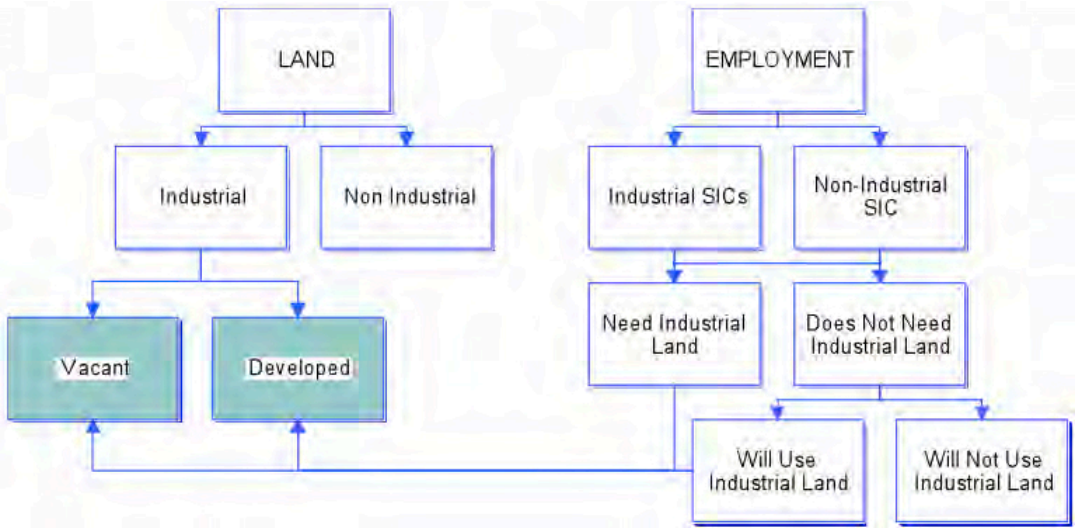
example is that some firms in the industrial sectors are allowed to locate in general commercial or mixed-use zones and may do so.

Not all industrially-designated land is used by "industrial" sectors. Some businesses that are referred to by the NAICS system as "services" need industrial land (for example, auto repair) because they share the same need for a location where land is cheap and where their activity is compatible with the surrounding neighborhood. In addition, non-industrial uses that don't necessarily *require* the characteristics of industrial land (low price, access to transportation, etc.) may nevertheless locate there if (1) they are not prohibited from doing so, and (2) the market conditions allow them to out-bid industrial uses. Big-box retailers with sufficient drawing power may not need surrounding retail: they can stand alone in industrial areas, where they may find cheaper land and better access to customers and suppliers. Services may locate in an industrial area to serve food and other convenience needs of industrial workers. Residential uses may also find an industrial area attractive if the environmental effects of industry are not too deleterious and the location is convenient for residential living. Most significantly, given the focus of this study, professional offices and other commercial uses may locate on industrial land because they can out-bid industrial uses.

This is one of the City of Portland's concerns: that large amounts of industrial land will convert to non-industrial uses. The City has already taken actions to alleviate this concern. Existing policies in the City's Comprehensive Plan and Zoning Ordinance (see Section A.2.1 of this document) aim to prevent the use of industrial land for non-industrial uses. Industrial sanctuary zones, for example, preserve land zoned as industrial for industrial purposes exclusively. The code does, however, allow for conditional use of industrial land for non-industrial purposes in these same areas.

Exhibit A-5 shows this relationship between "industrial" uses (as measured by industrial employment) and "industrial" land, and why studies of industrial land like this one are tricky.

Exhibit A-5. How industrial and non-industrial businesses use industrial land



Source: ECONorthwest, 2011.

On the "Land" side, the analysis in this study is concerned with only land designated as industrial, and is concerned with both vacant and developed industrial land. On the "Employment" side, the study cannot limit itself to industrial NAICS codes[7]: non-industrial users use industrial land. It also cannot limit itself to a subset of businesses that in some sense "need" industrial land, because many businesses that fail to meet whatever need criteria we might develop will still be users of industrial land.

In Oregon, state law requires that cities provide adequate land for 20 years of forecasted economic growth (Goals 9 and 14 of the statewide planning goals). As a matter of practice, (1) the common measure of economic growth used in a 20-year forecast is employment, and (2) some estimate of employees per developed acre, by broad industry type (e.g., retail, office commercial, industrial), is used to convert forecasted future employment to needed acres of land.

For several reasons related to market conditions and public policy, it is possible for (1) employment density to increase over time, and (2) an increasing amount of new employment-related development to occur as an intensification of development on an already developed parcel (rather than as new development on a "greenfield" parcel). If a region uses its land more "efficiently" (due to public policies, market forces, or a combination of both), then the ratio of employees per acre should increase, which would reduce the amount of demand for land in the forecast period.

[7] Formerly SIC codes, as shown in Exhibit A-3.

While employment is typically the measurement used to forecast demand for land, it may not be the best measurement for forecasting industrial land demand. Later, this appendix discusses other measurements that could be used to forecast demand, and to measure land efficiency.

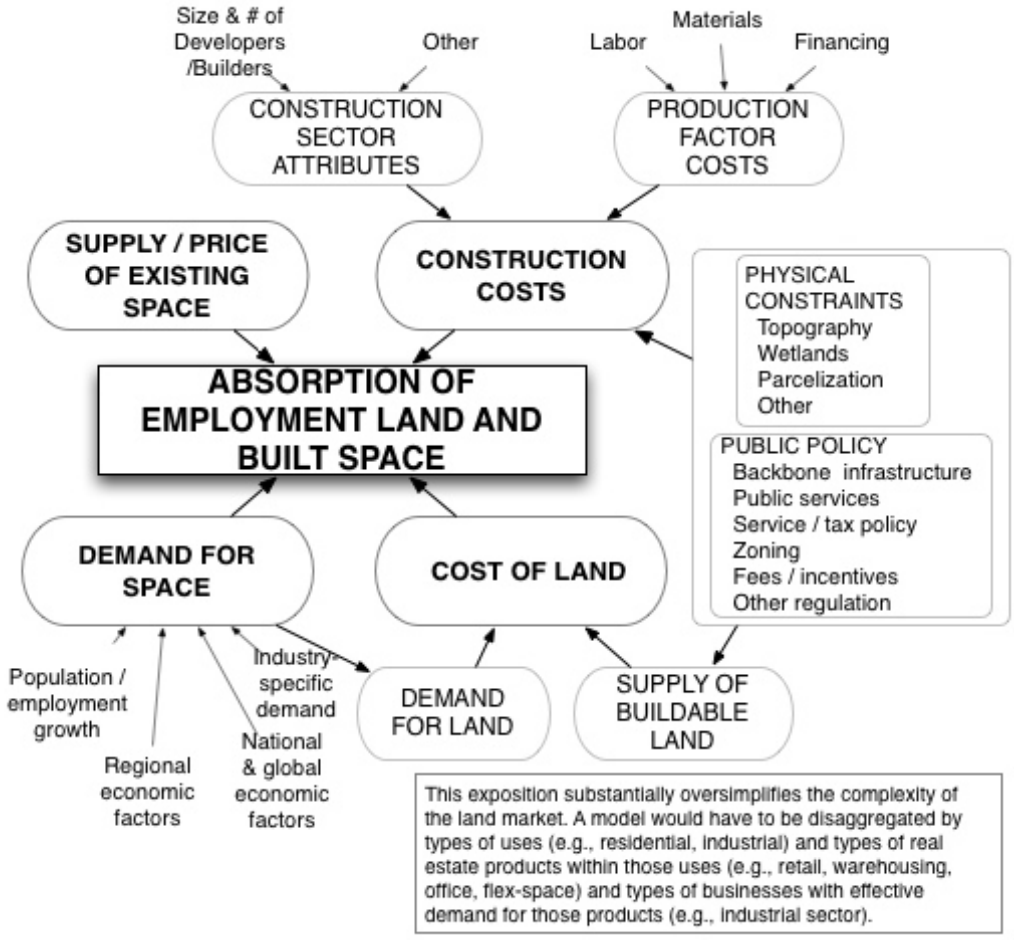
A.2.3.3 Comparing supply and demand

Factors affecting demand and factors affecting supply are not independent: in theory those factors interact to result in a market clearing price. Businesses and developers do not necessarily choose the cheapest land or the best (most expensive) land: they choose the land with the best value. In other words, price makes a difference. Below are some key points that describe how factors of supply and demand interact to determine where industrial development occurs:

- In any production processes, businesses try to economize on scarce (relatively expensive) resources by finding substitutes or changing the production process. For example, if serviced lands become scarcer, their prices should increase and businesses will substitute other factors (e.g., equipment) for land. In other words, as land gets scarcer, its price should rise and it should get used more intensively.
- With a fixed supply of total land, the supply of vacant, buildable land will decrease as development occurs.
- As the supply decreases (and as the real costs of providing services to that land increase), the price of land for new development will increase.
- As the price increases, users of land (businesses and developers) will try to economize on the use of land. They may do that by (1) using the available land in Portland more intensively, (2) choosing locations in other cities in the region more distant from the center that have more and less expensive buildable land, or, if no land elsewhere in the region has the desirable attributes at an affordable price, then (3) locating somewhere other than the Portland region.

Exhibit A-6 shows some of the many factors that affect the absorption of employment built space and land.

Exhibit A-6. Factors affecting the price and absorption of vacant land



Source: ECONorthwest, 2011

In the Portland Harbor, for example, land may be more expensive (cost per acre) than at the region's periphery. But land in the Portland Harbor is also close to the downtown, labor markets, port terminals, and interstate highways. If it is only a little more expensive, it may still be a preferred location for growth. If it becomes too expensive, then prospective industrial users may locate elsewhere, on land that provide a better value. If there is no land within the Portland region that provides this value, then the prospective industrial users may locate in other regions instead of Portland.

In an idealized market, such a value differential would be spotted by developers and businesses. In their efforts to secure the land they would bid up its price until it had little net advantage relative to all other land. In that idealized situation, all industrial land is equally suitable and every sub-area will, over time, get its share of new development.

But more realistically, a particular firm may have particular needs that are best met by land at a certain location. Though businesses on average

may be filling to pay only, say, $5 per square foot for the land, such a firm may be willing to pay, say, $8 per square foot. Thus, the question becomes one of making some assessment of whether the particular package of land attributes for properties in the Portland Harbor is going to be especially desired by some subset of businesses (e.g., water-dependent businesses).

A.2.4 "EFFICIENT" USE OF INDUSTRIAL LAND

Efficiency is a measurement of how much output is produced per unit of input. Thus, an efficiency measure requires a numerator (output) and a denominator (input). In this case, we care about the amount of economic activity (output) generated per acre of land (input). The denominator—acres—is relatively clear in theory and straightforward to measure. Thus, the bigger challenge is in choosing and measuring the numerator: economic activity. This section describes the various ways to measure efficiency of industrial land, and why some of these measures may be more appropriate than others.

If land use in an area becomes more efficient, then any given amount of economic activity will require less land than it would have otherwise. In an area with a fixed supply of industrial land, like the Portland Harbor, it makes sense to consider ways to use the land more efficiently to accommodate more economic activity. Typical measures of efficiency, however, may not be ideal for evaluating industrial land and marine terminals.

A.2.4.1 Traditional measures of efficiency

Typical measures in the numerator of an efficiency measure of land use include employment, real market value, and built space. These measurements look at the amount of economic activity occurring on a property. In general, advocates of economic development would prefer larger buildings, with higher value, and more employees to locate on a given parcel of land. But these measures of efficiency tend to give relatively low marks to industrial development.

Harbor industrial development tends to have low floor-to-area ratios (FAR) and a relatively low number of jobs per acre. Compared to an office tower, an acre of industrial development is likely to have much lower assessed value, employment, and gross square footage. Thus, measures of the efficiency of employment land based on any of these measures in the numerator would all tend to improve if industrial land were converted to commercial uses.

But industrial lands in general, and harbor lands in the case of this study, are clearly an important piece of the regional economy. If every

jurisdiction allowed vacant industrial land to convert to commercial uses on the assumption that some other jurisdiction would provide the industrial land, the regional supply of industrial land would get smaller quickly and, at the margin, industrial expansion would be slower than it would have been. Land with port access is a particularly important and relatively rare component of all regional industrial land. Marine terminals provide access to other markets, facilitating commerce, and allowing traded-sector businesses to export their goods to other markets.

In the context of the discussion in A.2.1 above, land with port access is necessary for the development of port and port-related facilities, and such facilities may have large external benefits for the region. Since the benefits are external (and, by definition, cannot be readily captured by owners of the land), they do not influence the price that private developers will pay for land. Thus, land prices that industrial users are willing to pay for land in the Portland Harbor probably do not reflect the full value to the Portland region of having that land in industrial use.[8]

A.2.4.2 Key issues for measuring efficiency

Regardless of what measure of economic activity is used in the numerator for calculating efficiency, there are fundamental issues that present challenges for defining and measuring efficiency and changes in efficiency for industrial land.

Efficient use of land versus efficient production of goods and services

Fundamental to land-use planning regulation in Oregon is the assumption that sprawl is inefficient, and that reducing sprawl saves valuable natural land (for farming, forestry, and the provision of ecosystem services) and promotes more intensive use of urban land (i.e., more density). This system intends to promote more efficient use of land. Denser development, however, does not necessarily mean more efficient production of goods and services for all types of businesses. Put another way, a public-sector mandated increase in certain measures of intensity of industrial land use (e.g., minimum FAR) may or may not increase the efficiency of a particular operation (measured by value added, employment, etc.).

This issue is critical when discussing land-use efficiency in the Portland Harbor. For some (perhaps many) industrial businesses located in the

[8] Proponents of other uses could make the same argument: that their external benefits are substantial and not capitalized in land value. A full technical evaluation of the relative net benefits would require extensive empirical work, is unlikely to be definitive, and is beyond the scope of this study.

Portland Harbor, pressure to develop at greater density is unlikely to increase the efficiency of their operations.

Site-specific land efficiency versus regional land efficiency

Site-specific efficiency refers to the economic activity on an individual site. If a user of a one-acre industrial parcel were to double some measure of economic activity (e.g., employment, value added, etc.) without developing more land, one could call that an example of increasing the efficiency of industrial land as a factor of production. This is often what is meant by increasing efficiency.

But what if a parcel serves the regional economy: in other words, what if it provides external benefits? For example, a warehouse may allow other businesses in the region to transport their goods. The warehouse could appear unchanged over time by many measures of economic activity (e.g., assessed value, employment, FAR), but it may be accommodating more goods for other businesses in the region, allowing these businesses to grow.

There are at least three implications. First, standard measures of economic activity like employment may be the wrong ones. The warehouse and its employment may not have changed: it may be that both are now more efficient because the warehouse is now processing more goods because of increases in demand, changes in technology, or some other factor. Second, even if the production per acre for that warehouse were to remain the same in terms of tons or cubic feet of cargo processed, the value of that cargo may have increased (so an argument can be made that efficiency should be measured as value, not tonnage). Third, and related, even if the value of cargo did not change much, its transshipment is a necessary component of what may be a different and rapidly growing industrial sector that is contributing to the regional economy.

An example of this regional land efficiency is the Port of Portland itself. A port's economic impacts extend well beyond its land and the land that surrounds it. In Oregon, the economy of eastern Oregon and Washington depend on the port facilities in the Portland area to ship grain and other products. Looking just at measures of production on land around a port can easily miss the point: a port is a regional facility that may benefit many businesses a great distance from the port. Thus, it may be "efficient" for a port to have relatively low-density uses that allow efficient transportation of goods, facilitating economic growth throughout the region.

Economies of scale and threshold effects

For many enterprises, as they grow for small and start-up to bigger and established, they achieve economies of scale. There are start-up costs that they have to incur, and there are relatively fixed ongoing operating costs

that must be amortized. It is common for costs per unit of output (or, in the case of transshipment) throughput to decline.

Economies of scale (because of declining marginal costs) almost certainly exist for port facilities. There is a large initial capital investment in facilities: once they are there, they can be used more intensively at a low additional (marginal) cost per unit of activity (e.g., tonnage handled). As more facilities, even of different types are available, the per-unit cost of operation and maintenance can decrease, and the attractiveness of and demand for the facilities may increase for users.

Politically, getting to some scale is probably important for users and for higher levels of government (state and federal) that provide financial assistance to ports: in the case of Portland especially, for dredging the Columbia River. In other words, there may be subtle or not-so-subtle threshold effects: if port operations drop below some level, its ability to sustain even those lower levels of activities may be seriously diminished.

Markets versus public policies

Many economists would argue that the best judges of the efficiency of a particular industrial use at a particular site are the owners and managers of the use in question. If they believe that they can operate more efficiently by adding employees, buildings, or equipment to their site, they will do so. If they believe they can profitably increase production without adding land, they will do so. If their land and land around their site has locational characteristics that make it particularly valuable for certain types of production, and if there are a number of businesses involved in that type of production, its price will rise, and the price is a measure of the increasing value (efficiency) of the land in production.

That argument, however, does not address a concern of cities like Portland about that market-based process: what if non-industrial and non-water-dependent commercial uses (e.g., offices and retail) outbid industrial uses for the land? Yes, the land value has increased (as have the cities' property-tax revenues), but perhaps at a greater cost to the regional economy.

A.2.4.3 Alternative measures of the output component of efficiency

In short, to address the question about the efficiency of the use of industrial land in the harbor area, one needs a definition of efficiency that makes sense for industrial land. Such a definition must make sense not only in theory, but also in the context of the data and methods that are available for measuring efficiency. We suggest two alternative measures of efficiency

that are most appropriate for harbor industrial land: value added, and tonnage of cargo.

Value added

Proponents of the industrial and manufacturing sectors point to its potential for high "value added." Value added means that the value of outputs (per unit or in the aggregate) less the cost of inputs purchased from other firms used to create output.[9] In economic terms, industrial activity is a "goods-producing" activity, and is generally considered to have strong potential for value added. A service industry, in contrast, tends mainly to sell transformed labor services. There is value added, of course, but this value added is often lower than in a goods-producing setting.[10]

Setting aside cross-sector comparisons, value added may be a better measure of output over time *within* sectors than employment or built square footage. A measure of the efficiency of a fixed supply of industrial harbor land would be the amount of value added generated per acre for businesses located in the harbor.

Cargo

There is a reasonable argument that much of the industrial land in the Portland Harbor area serves a regional need for transshipment. Therefore, a regional measure of transshipment activity might be appropriate for measuring the efficiency of such land. Some measure of cargo (e.g., tonnage, volume, value) is an obvious choice. Because data are more readily available, we suggest tonnage of cargo as an alternate measurement of land-use efficiency in the Portland Harbor.

The economic activity occurring on a parcel is only part of the impact that land has on the regional economy. Many users of harbor industrial land facilitate economic activity throughout the region. While most measures of efficiency fail to measure this broader impact, tonnage of cargo is a measurement that is consistent with the idea that port facilities have broader regional economic benefits.

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[9] In that sense, value added is a measure of a firm's contribution to GDP. Another way to think about this is that everything that a firm itself puts into the production of a product (primarily the labor of its employees and capital) "add value" to the raw materials and intermediate goods and services it purchased to make its final product.

[10] Often lower, but not always lower. Service sectors that use highly-trained human capital may have high productivity and high value added. In addition, as technology increases the productivity of physical capital, less manufacturing and construction activity is required to produce the same output. Communication systems, for example, are much more productive than they were in the past, but require much less "brick and mortar" type activities and, hence, less construction activity.

Methodologically, such an analysis should be done for the Portland Harbor in the aggregate, not for individual businesses or parcels. For this measure, it does not matter how much cargo occurs on a given parcel; it matters how much the amount of tonnage per developed acre of land is increasing.

A.3 METHODS

Section A.2 is a *framework*: it is about definitions and concepts related to the issues this study is investigating. It is a basis for selecting specific methods (data and analytical approaches) for addressing the four questions posed:

- Are the methods the City used to estimate the location and amount of vacant, partially vacant, and potentially buildable industrial land in the Portland Harbor area likely to yield reasonable estimates?
- How suitable for a public marine terminal are the few sites in the Portland Harbor that have been identified by the City as having the potential to accommodate such a terminal?
- What role can the Port of Vancouver play in accommodating forecast demand for cargo volumes in the Portland region?
- What is the potential for more efficient use of industrial harbor land?

We describe the methods we used to answer those questions in the rest of this section.

A.3.1 GENERAL DATA SOURCES AND TECHNIQUES

To conduct our analysis, we used the following data sources:

- **Existing studies**. Extensive analysis has been conducted regarding the Portland Harbor, industrial land, and port terminals. Local governments and service districts in the region (e.g., Metro, the City of Portland, the Port of Portland) are constantly evaluating past economic growth patterns, and planning for future economic development opportunities. These efforts result in a library of reports and studies addressing different aspects of the regional economy. These recent (as well as ongoing) efforts contain useful information for the analysis. *The scope for this study emphasized synthesizing and interpreting existing data over collecting new data*. Thus, ECO reviewed these related research efforts, and pulled their key findings into the analysis where appropriate.

  The City of Portland provided ECO with a list of over 30 recent, relevant documents. After an initial review of all of these documents,

ECO selected a subset of documents of particular value to its analysis:

- Portland Economic Opportunities Analysis (2010)
- West Hayden Island Economic Foundation Study (2010)
- West Hayden Island: Marine Cargo Forecasts & Capacity Assessment (2010)
- Portland Vancouver Trade Capacity Analysis (2006)
- West Hayden Island Planning Document
- Oregon Commodity Flow Forecast (2005)
- Portland's Working Rivers: The Heritage and Future of Portland's Industrial Heartland (2008)
- Port of Portland annual reports

ECO focused on data and text related to historical trends and future projections for economic growth: in the region in general and the Portland Harbor in particular.

- **Secondary data sources**. ECO incorporated many secondary data sources into its analysis.[11] As with "existing studies," the objective is to leverage past research efforts to answer the questions posed in this study. Examples of secondary data sources we used are:
  - Buildable Lands Inventory (City of Portland). This source includes multiple data layers in the City's Geographic Information System (GIS)
  - Port of Portland Marine Terminal Statistics
  - Multnomah County Assessment & Taxation
  - RLIS (Metro)
  - Quarterly Census of Employment and Wages
  - IMPLAN
- **Interviews**: Many people in the Portland area have special knowledge of, and interest in, the Portland Harbor. ECO interviewed individuals from both the public and private sectors, and reviewed notes on past interviews that had been conducted for recent related studies. Interviewees included:

[11] Secondary data sources are ones collected and readily available by someone other than the user (in this case ECONorthwest). Typical secondary sources are government agencies (e.g., U.S. Census, ODOT, Metro, Port of Portland).

- Port of Portland officials
- Port of Vancouver officials
- Authors of relevant studies and reports
- Members of the Working Waterfront Coalition
- Other local economic development professionals

Data from these sources were used to address the three specific questions that are the focus of this study. The next sections explain how.

A.3.2 EVALUATION OF PRIOR EFFORTS TO IDENTIFY LAND SUPPLY IN THE PORTLAND HARBOR

The City asked ECO to evaluate whether the methods the City used to estimate the location and amount of vacant, partially vacant, and potentially buildable industrial land in the Portland Harbor area likely to yield reasonable estimates? More specifically, the question was whether it is reasonable to assume that the two sites that the City identified (Atofina and Times Oil) are the only two in the Harbor study area (as defined in Exhibit A-1) that are of a size and location that they *might* be suitable for a new Port of Portland marine terminal?

To answer that question we needed an estimate of the minimum feasible size of a marine terminal. Maul, Foster & Alongi provided that estimate (documented in Section 3.2 of the report and Appendix B): 50 acres. We then looked for 50 acres of vacant land with waterfront access in the study area by:

- Reviewing studies summarizing industrial and harbor land supply: *Industrial Districts Atlas* (2004) and *Harbor ReDI Industrial Sites Analysis* (2009).
- Reviewing GIS shape files and cross-referencing to Google Earth aerial photos (August 2011).
- Discussing methods with BPS staff, and comparing those to standard methods for developing land inventories and identifying buildable land.

A.3.3 ADDRESSING THE POTENTIAL SITES FOR NEW MARINE TERMINALS

Much of the analysis in this report deals with the supply of harbor industrial lands in general: it includes both public and private ownership and uses of the land. This task deals specifically with land supply for new, public, marine terminals.

To determine which sites might best accommodate a public marine terminal, we began by identifying the technical site requirements for a marine terminal. ECO interviewed representatives of the Port of Portland to identify their ideal site requirements, as well as which of these requirements could be reduced while still accommodating a working port facility. ECO compared these site requirements with the findings of the Worley Parsons, a consultant to the City evaluating the potential site design of a new marine terminal on West Hayden Island. Finally, ECO turned to internal team members with experience running west coast ports, and looked for creative ways to adjust these site requirements to create a working terminal on smaller or otherwise constrained sites.

BPS staff identified only two sites that could potentially meet these criteria. ECO, reviewed the sites identified by the City of Portland, and evaluated maps of the Portland Harbor, including zoning, infrastructure and aerial photographs. Our preliminary review confirmed the City's findings, that most of the Portland Harbor has active development on it, and these two sites have the greatest opportunity to accommodate new public marine terminals.

The ECONorthwest Team, including Maul Foster & Alongi, Inc., toured these sites with BPS staff. Maul Foster & Alongi, Inc. conducted a visual inspection of the sites, documenting conditions affecting the suitability of each site for the proposed development. Key factors considered in our analysis were: site access, existing uses, natural features, and contamination/remediation. After conducting this site visit, we developed a set of criteria for evaluating site feasibility for typical port terminals. This set of criteria is included with this document as Appendix C.

Using these criteria, Maul Foster & Alongi evaluated the potential opportunities and constraints of these sites to accommodate development of a public marine terminal. A cursory site visit is insufficient to make a final determination of site feasibility. Nonetheless, our methods are consistent with our scope and budget, and are sufficient for identifying major opportunities and constraints for these potential sites, and making a preliminary determination of site feasibility.

A.3.4 ADDRESSING THE ROLE OF VANCOUVER IN HARBOR INDUSTRIAL LAND SUPPLY

The third question we were asked by the City is: What role can the Port of Vancouver play in accommodating forecast demand for cargo volumes in the Portland region? To answer this question, we used a combination of interviews with port officials and reviews of past reports.

We began by attempting a data-driven analysis. In principle, if we knew the capacity of existing marine terminals in Portland and Vancouver, and subtracted the forecast future demand for these areas, then we could identify the amount of demand that could not be accommodated by existing facilities. This demand (in tons of cargo) could then be translated into the acres of land necessary for new terminals to accommodate this growth. Comparing the required acres to support new terminals with the available land supply in the Portland Harbor and in Vancouver, we could identify how much of Portland's demand might need to be accommodated in Vancouver, and whether or not Vancouver had sufficient land to accommodate it.

The specific steps in our analysis, and detailed tables showing our results are contained in Appendix C: Analysis of Harbor Land Capacity and Demand, Portland and Vancouver. In short, we relied on the following data sources:

- Capacity of existing facilities: Estimates for the public marine terminals in the Port of Portland were taken from the *West Hayden Island Economic Foundation Study*, prepared by Entrix for the City of Portland in May 2010. These estimates were produced in interviews conducted by Entrix with Port of Portland staff. For estimates of capacity of private terminals in the City of Portland, as well as all terminals in the City of Vancouver, we relied on historical data on cargo volumes reported by BST Associates in their *Portland and Vancouver Harbor Forecast Update*, prepared for the Port of Portland in February 2012. Our estimates were confirmed and refined through interviews with Port of Portland officials.

- Future cargo demand: Estimates of cargo demand for all public and private terminals in the cities of Portland and Vancouver in the year 2040 were taken from the BST Associates *Portland and Vancouver Harbor Forecast Update*. These forecasts included a low and high scenario.

- Acreage necessary for new terminals: Estimates of the acreage required for new marine terminals were taken from a variety of sources, including the *West Hayden Island Economic Foundation Study* (Entrix, 2010), the Draft Report on *Operational Efficiencies of Port/Terminal World Wide* (Worley Parsons, 2012), and the Maul Foster and Alongi evaluation criteria included with this report as Attachment B.

- Available land supply: Finally, estimates of available land in the Portland Harbor are based on our own analysis of developable sights, described in Sections A.3.2 and A.3.3. Estimates of available

land in Vancouver, were based on the *West Hayden Island Economic Foundation Study* (Entrix, 2010), and verified through GIS analysis, and conversations with officials from the Port of Vancouver.

The data-driven method described above has many advantages: it is a logical way to conduct the analysis, it relies on the best and most recent data and forecasts, and with any one-set of assumptions used in the analysis, it results in a definitive answer of the acres of land needed for new terminal development. However, there is one major limitation to this method: it relies on so many assumptions, which can be pulled from such a broad range, with each assumption compounding on all previous assumptions, that using different sets of reasonable assumptions can create largely different results.

Therefore, our analysis uses the data to establish a high and low boundary for the potential land need, and describes a "most-likely" scenario that falls between the two extremes. In order to give these numbers more context, and to help us arrive at the most-likely scenario, we also conducted numerous interviews with representatives of the ports of Portland and Vancouver.

A.3.5 ADDRESSING THE POTENTIAL FOR INCREASED EFFICIENCIES

Section A.2.4 provides a context for defining and evaluating the efficiency of the use of industrial land. This section builds on that context to describe specific data and analytical techniques that this study uses.

The City is interested in knowing if industrial land in the Portland Harbor can be used more efficiently in the future. To answer we looked at recent economic trends in the Portland Harbor and in the City of Portland as a whole for changes in land-use efficiency for industrial users. For this analysis, we considered several measures of output in an efficiency measure: employment, real market value, value added, and tonnage.

Ideally, we would like to have data with a long time series (20 – 30 years) for each efficiency measure. But changes in the type, definition, and collection of data make it impossible to get consistent time-series data for both the numerators and denominators of efficiency measures. Our method is an approximation based on available data. We create different measures of efficiency for two different time periods: (1) 2002 – 2008, when detailed and consistent data are available on both output and land area, and (2) 1960 - 1997 when the Port of Portland did occasional studies of its land and activity.

For 2002- 2008 we began by identifying all parcels in the Portland Harbor using GIS. We examined data from two different years: 2002 (one of the earliest years that data are available using NAICS codes), and 2008 (the most recent year QCEW data are available). Comparing data from the two years we calculated the change in developed acreage in the Harbor, and the corresponding change in real market value, and employment.

We also collected data from different sources for two alternative measures of output (for the denominator): value added and cargo (volume, tonnage, and value). Unlike employment, and real market value, data for value added and cargo tonnage is not tracked at a parcel specific level. Instead, data is available at the regional, City, zip code or Census tract level. For our analysis, we used Port of Portland data on historical levels of cargo tonnage in the Portland Harbor, and the IMPLAN economic model for the zip codes that most closely align with the boundaries of the Portland Harbor for value added. We used the same years (2002 and 2008) as were used for other measures of efficiency.

In summary, we created various measures of change in land-use efficiency between 2002 and 2008.

This method has limitations. Six years is not a long time to observe economic trends and changes in land-use efficiency if one is hoping to use those trends as a basis for long-run forecasts. Moreover, the period includes the recent recession, which began in 2007. Ideally, our analysis would include years before 2002, as well as years later than 2008. However, data after 2008 are not yet available, and data before 2002 have significant limitations. Prior to 2000, employment was recorded by SIC codes, rather than NAICS. The change in classification makes comparing data across this time period difficult and unreliable for time-series analysis. Additionally, land-use data, including data from the County Assessor is less accurate prior to 2000, as GIS and other technology had not yet been widely adopted.

For a long-run look at trends, we used yet another method based on cargo tonnage as a measure of output. The Port of Portland conducts periodic studies of land use and development in the Portland Harbor. The earliest Port study dates back to 1960, with additional studies in 1990 and 1997. Additionally, various data sources, including the Port of Portland, the US Department of Transportation, and the Corps of Engineers track cargo tonnage that is shipped through the Portland Harbor. Comparing these datasets, we were able to calculate the tons of cargo that were shipped per developed acre in the Portland Harbor from 1960 through 1997, and observe trends over this 37-year period.

Appendix B Criteria for Evaluating Potential Sites for Marine Terminals

One of the four questions that this study addressed was, "How well do the characteristics of the Atofina and Time Oil sites (the two identified by the City as meeting the minimum requirements for size and waterfront access) match the characteristics that would be needed to create a reasonable probability the sites could be developed as marine terminals?" To answer that question the consultant team had to specify those characteristics. Team member Maul, Foster & Alongi created the evaluation criteria summarized in the table that follows. Those criteria are used in the evaluation reported in Section 3.2 of the main report.

Marine Terminal Criteria

Criteria	Considerations	Comments
Water Access	Depth	Both berth and channel water depth are limiting considerations on vessel size and ultimately cargo type: (1) Barge: 15 to 20'; (2) Bulk: 35 to 52'; (3)Break Bulk: 30 to 40'
	Dredge Maintenance	Ability to maintain navigational depth through routine dredging. It is a function of siltation rate, cost, regulatory hurdles and physical restraints such as the presence of contaminated sediments.
	Pier Face Capacity	Vessel length and number of number of berths determine cargo type: ▪ Barge: 200 to 500' ▪ Bulk: 330 to 1200' ▪ Break Bulk: 400 to 800
Land side transportation	Mainline Rail	Multiple rail service is desirable for competitive rates.
	Rail Siding	On site useable rail siding with sufficient on site car storage. The requirements for train length storage awaiting loading or unloading is a function of the cargo type. Bulk facilities including autos require 9.000 to 12,000 feet of track, whereas specialty project cargos can be managed on much smaller sidings and onsite storage track systems.
	Road	Proximity and ease of access to interstate freeway systems is an important criterion for marine terminals. Access should be on designated, all-weather truck routes with high levels of service including the access ramps to the interstate system.
Size	Total Acreage	Minimal acreage for cargo handling is required for various cargo types:* ▪ Barge: 10 to 75 acres (Mixed, bulk and project cargos) ▪ Bulk: 10 to 200 acres (Liquid and dry commodities) ▪ Break Bulk: 20 to 100 acres (Project cargos; autos)

Criteria	Considerations	Comments
Size (continued)	Unity of Ownership	Total acreage is a critical consideration and the assembly of property is often hampered by cost and timely assembly.
	Configuration	Parcel shape for marine terminals has an impact on terminal operating efficiency, most notably distance to pier face from remotest staging area. Configurations vary with cargo type and loading techniques. Dry conveyor and liquid piping configurations as well as auto handling are somewhat more forgiving.
Physical	Slope and elevation	Generally speaking facilities need to have minimal elevation change and slope. Bank heights have practical limitations, but fixed pier systems can be engineered to accommodate water to upland elevation differentials.
	Utilities	Power demands are limited to electricity for equipment operation and "at berth" vessel operations for on board systems to avoid ship engine fuel burn consistent with zero discharge environmental goals. Stormwater management is also a prime concern, but can readily be managed on most sites.
	Encumbrances	Encumbrances include easements, public rights of way and other deed restrictions that restrict or otherwise limit a site's efficient use.
Regulatory	Zoning	Appropriate zoning is required consistent with local land use regulations. In Portland, although several zoning classifications may be appropriate for some aspects of marine terminals, the heavy industrial (IH) zone allows for the widest range of primary and assessor uses necessary for marine terminals; such as rail yards or handling of hazardous materials.
	Overlay Regulations	While Oregon does not have shoreline regulations, the City of Portland has overlay zones which may impose additional restrictions and protections.

Criteria	Considerations	Comments
Environmental and Natural Resources	Contamination	Shipping terminals have historically been in industrial sites which quite frequently have been exposed to contamination. Remediation of these sites are typically held to a long time industrial use standard and as a result continuing industrial use for shipping are wholly compatible with industrial level cleanup standards. However it should be noted that previously remediated sites are likely to have deed covenants on future use such as restrictions on potable water wells (not an encumbrance in a serviced urban environment), penetrations into protective caps and disruption of in situ treatment processes.
	Flood Plain	Flood plains are a consideration as most shipping terminals are at elevations that are often included in exposure areas.
Cultural & Historic	Historical and Cultural Significant Sites	Like critical areas, industrial properties that have been historically used for industrial purposes are unlikely to present any encumbrances for cultural and historical uses.

*Acreages vary considerable depending on the precise cargo handling and storage requirements. Storage and handling approaches that dramatically affect the required acreage include: on site storage in rail cars, bulk tanks and silos; warehouses and open air facilities, as well as handling mechanisms such as cranes, loading ramps and bulk material (dry and liquid) conveyors. These ranges are generally useable for the cargo category, but need to be further refined for a specific cargo. In selecting a site, one would err to the higher side of the range to afford the maximum market flexibility. The planned use of rail storage sidings has the single greatest impact on size, and materially affects a site's usability.

Appendix C Analysis of Harbor Land Capacity and Demand, Portland & Vancouver

The City of Portland asked us: to what extent can the Port of Vancouver play a role in accommodating forecast cargo demand in the Portland region? This question is addressed Section 3.3 of the main report. This appendix provides additional tables with more detail than was presented in the main report. Our analysis finds that the Portland Harbor has very limited capacity to accommodate future demand for public marine terminals, but that the Port of Vancouver may technically have sufficient capacity to accommodate all forecast demand for cargo for both the cities of Portland and Vancouver through the year 2040.

C.1 DISCLAIMER

All of this analysis described in this appendix depends on estimates of current variables that are uncertain, and forecasts that are even more uncertain, and themselves dependent on a wide range of possible assumptions. Like any analysis of future economic conditions, this one is built upon many layers of assumptions: each assumption widens the range of potential outcomes, and each layer of assumptions compounds on the previous layer to provide an even wider range of potential results. That fact does not necessarily make the analysis irrelevant: it can definitely inform public policy about possible and likely futures. Despite the uncertainty inherent in this analysis, it is helpful for bookending the potential land need for public marine terminals. Assumptions in the middle of the range give conclusions that should be useful for planning purposes, even if actual results may vary.

C.2 DEMAND FOR MARINE CARGO

We were tasked with obtaining and reviewing the most recent forecasts. These forecasts were contained in the *Portland and Vancouver Harbor Forecast Update* (BST Associates, 2012). These forecasts were based on a 2010 study by BST Associates, but were refined to specifically call out cargo demand for the City's of Portland and Vancouver, and were updated with the most recent economic data. Exhibit C-1 shows the forecast demand for public and private marine terminals in the City of Portland in 2040.

Exhibit C-1. Forecast cargo demand, public and private marine terminals, City of Portland, 2040

Cargo Type	Low	Mid-Range	High
Automobiles (units)	811,000	912,500	1,014,000
Containers (TEUs)	379,000	452,500	526,000
Metric Tons			
Automobiles	1,076,000	1,206,000	1,336,000
Containers	2,162,000	2,583,500	3,005,000
Breakbulk	1,132,000	1,242,000	1,352,000
Grain	6,686,000	9,078,000	11,470,000
Dry Bulk	10,278,000	14,093,500	17,909,000
Liquid Bulk	6,912,000	7,461,500	8,011,000
Total	**28,246,000**	**35,664,500**	**43,083,000**

Calculated by ECONorthwest with source data from BST Associates (2012).

Exhibit C-2 shows the forecast demand for public and private marine terminals in the City of Vancouver in 2040.

Exhibit C-2. Forecast cargo demand, public and private marine terminals, City of Vancouver, 2040

Cargo Type	Low	Mid-Range	High
Automobiles (units)	159,000	197,000	235,000
Containers (TEUs)	-	-	-
Metric Tons			
Automobiles	226,000	278,500	331,000
Containers	-	-	-
Breakbulk	534,000	568,500	603,000
Grain	3,808,000	4,109,000	4,410,000
Dry Bulk	5,931,000	11,663,500	17,396,000
Liquid Bulk	510,000	802,500	1,095,000
Total	**11,009,000**	**17,422,000**	**23,835,000**

Calculated by ECONorthwest with source data from BST Associates (2012).

BST Associates estimates that the regional demand for cargo at marine terminals will range from 39,255,000 to 66,918,000 metric tons in 2040, with roughly two thirds of the demand coming from Portland, and the remainder from Vancouver. Dry bulk is forecast to be the cargo type with the most demand (as measured by tonnage) in 2040, comprising just over half of total tonnage in the region.

C.3 EXISTING CAPACITY

Estimates of existing cargo capacity are difficult to obtain, particularly since our analysis looked at multiple geographies (Portland and Vancouver), and multiple ownerships (public and private). We used two methods to bookend our estimates of existing capacity, based on two different assumptions (1) assuming current facilities operate at 100% of maximum capacity before new terminals are needed, and (2) assuming all

growth in demand is from new opportunities that require new facilities, and current facilities continue to operate at current levels.

The Port of Portland provided us with estimates of maximum capacity, as well as annual historical cargo volumes for each cargo type for public marine terminals in the City of Portland. These estimates of capacity are shown in Exhibit C-3.

Exhibit C-3. Existing cargo capacity, public marine terminals, City of Portland

Cargo Type	Estimated	Recent Peak Volume	Peak Year
Automobiles (units)	675,000	460,000	2006
Containers (TEUs)	700,000	330,000	1995
Metric Tons			
Automobiles	889,000	606,000	
Containers	3,999,000	1,885,000	
Breakbulk	2,100,000	1,130,000	2007
Grain	4,100,000	5,400,000	1995
Dry Bulk	10,700,000	5,460,000	2008
Liquid Bulk	-	-	N/A
Total	**21,788,000**	**14,481,000**	

Calculated by ECONorthwest with source data from the Port of Portland, 2012.
Note: Recent peak volume for grain is no longer applicable, as the Terminal 4 grain elevator has closed since 1995 when the peak was measured.

For private marine terminals in the City of Portland, we compared historical data for total cargo volumes for the years 2000 and 2010 from the BST report with anecdotal data and conversations with the Port of Portland to determine the estimated current capacity. Key assumptions are that all historical liquid bulk cargo, and that none of the automobile and container cargo shown in the BST report for the City of Portland is handled by private marine terminals. For private marine terminals we only used one method for estimating existing capacity, under the assumption that existing facilities do not have significant excess capacity, and that recent historical peaks are a reasonable estimate of capacity.

Exhibit C-4. Existing cargo capacity, private marine terminals, City of Portland

Cargo Type	Estimated	Notes
Automobiles (units)	-	No private auto terminals
Containers (TEUs)	-	No private container terminals
Metric Tons		
Automobiles	-	
Containers	-	
Breakbulk	250,000	Conversation with Port of Portland.
Grain	3,000,000	Existing private terminals are old and nearing obsolesence
Dry Bulk	1,500,000	Conversation with Port of Portland, recent historical peak.
Liquid Bulk	8,280,000	BST reports citywide liquid bulk in 2000.
Total	**13,030,000**	

Source: ECONorthwest, informed by "Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012) and conversations with officials from the Port of Portland.

For the City of Vancouver, we were unable to obtain estimates of capacity from the Port of Vancouver or from the Port of Portland. Nor were we able to obtain detailed historical data by cargo type isolating public terminals from private terminals. Instead, we relied on the BPS report, which reported cargo volumes for just two years: 2000 and 2010. In our evaluation of Port of Portland public marine terminals (described previously in this section), we found that the recent peak volumes were equal to 66% of the total capacity. We applied that same percentage to the recent peak volumes for the City of Vancouver to estimate the total capacity, shown in Exhibit C-5. One adjustment, however, had to be made. The Port of Vancouver is in the planning process of developing a potash terminal, which will have capacity for up to 16 million tons of dry bulk. We added this capacity to the estimated capacity shown in Exhibit C-5.

Exhibit C-5. Existing cargo capacity, public and private marine terminals, City of Vancouver

Cargo Type	Estimated	Recent Peak	Peak Year
Automobiles (units)	90,000	60,000	2010
Containers (TEUs)		-	
Metric Tons			
Automobiles	137,000	91,000	
Containers	-	-	
Breakbulk	531,000	354,000	2000
Grain	5,544,000	3,696,000	2010
Dry Bulk	17,556,000	1,037,000	2010
Liquid Bulk	1,110,000	740,000	2000
Total	**24,878,000**	**5,918,000**	

Source: ECONorthwest, informed by "Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012) and conversations with officials from the Port of Portland.

C.4 CAPACITY SHORTFALL

Determining the capacity shortfall should be as simple as subtracting the existing capacity from the projected demand. However, we have two different estimates of capacity, and three different estimates of demand. And since we are interested in identifying the shortfall for public marine terminals, we also need to make assumptions for what portion of future demand for what cargo types will be accommodated by private terminals.

We created three scenarios for cargo capacity: low, high, and most likely. These scenarios are based on the following assumptions:

- The low shortfall scenario takes the estimates of facility capacity and subtracts the low BST forecast for 2040 demand. This assumes that all existing facilities are pushed to 100% of capacity to accommodate the forecast future demand.
- The high scenario takes the recent peak volume for facility capacity, and subtracts the high BST forecast for 2040 demand. This assumes that all facilities continue to operate at their current levels and that all additional demand will need to be accommodated in new facilities.[1]
- The most-likely scenario takes the estimates of facility capacity and reduces them by 10% (this reduction reflects the fact that some forecast demand will be from new market opportunities that will not be able to take advantage of existing facilities, and therefore despite forecasting a capacity shortfall in the aggregate, not all existing facilities will be operating at 100% of capacity), then subtracts the mid-range demand forecasts (that we calculated as the average of the high and low BST forecasts). This scenario assumes that demand will fall in the middle of the range that BST forecast, and that existing facilities will be able to accommodate some of the future growth, but will never operate at 100% of capacity.

Exhibits C-6 through C-8 show the forecast of the cargo capacity shortfall for public marine terminals in 2040 for each of these three scenarios. In Exhibit C-6, we see the shortfall for the City of Portland public marine terminals could range from 187,000 metric tons to more than 17 million metric tons, with the medium scenario showing some shortfall for automobiles, grain, and dry bulk cargoes.

[1] Since the recent historical peak for grain for public marine terminals in the City of Portland is not applicable, due to the removal the Terminal 4 grain elevator, we used the estimated capacity for grain in this scenario.

Exhibit C-6. Forecast cargo capacity shortfall, public marine terminals, City of Portland, 2040

Cargo Type	Low	Medium	High
Automobiles (units)	(136,000)	(310,000)	(554,000)
Containers (TEUs)	-	-	(196,000)
Metric Tons		-	
Automobiles	(187,000)	(410,000)	(730,000)
Containers	-	-	(1,120,000)
Breakbulk	-	-	-
Grain	-	(2,390,000)	(4,370,000)
Dry Bulk	-	(2,960,000)	(10,949,000)
Liquid Bulk	-	-	-
Total	**(187,000)**	**(5,760,000)**	**(17,169,000)**

Calculated by ECONorthwest with source data from Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012) and conversations with officials from the Port of Portland.

Exhibit C-7 shows the forecast cargo capacity shortfall for public marine terminals in the City of Vancouver could range from less than 100,000 to 1.9 million metric tons, with the medium scenario showing a shortfall of 250,000.

Exhibit C-7. Forecast cargo capacity shortfall, public marine terminals, City of Vancouver, 2040

Cargo Type	Low	Medium	High
Automobiles (units)	(69,000)	(120,000)	(175,000)
Containers (TEUs)	-	-	-
Metric Tons		-	
Automobiles	(89,000)	(160,000)	(240,000)
Containers	-	-	-
Breakbulk	(3,000)	(90,000)	(249,000)
Grain	-	-	(714,000)
Dry Bulk	-	-	(359,000)
Liquid Bulk	-	-	(355,000)
Total	**(92,000)**	**(250,000)**	**(1,917,000)**

Calculated by ECONorthwest with source data from Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012) and conversations with officials from the Port of Portland.

Exhibit C-8 shows the combined shortfall for public terminals in the City of Portland and City of Vancouver for the year 2040. The total shortfall is estimated to range from 279,000 metric tons to more than 19 million metric tons, with a medium scenario showing a shortfall of 6 million metric tons.

Exhibit C-8. Forecast cargo capacity shortfall, public marine terminals, Portland / Vancouver region, 2040

Cargo Type	Low	Medium	High
Automobiles (units)	(205,000)	(430,000)	(729,000)
Containers (TEUs)	-	-	(196,000)
Metric Tons			
Automobiles	(276,000)	(570,000)	(970,000)
Containers	-	-	(1,120,000)
Breakbulk	(3,000)	(90,000)	(249,000)
Grain	-	(2,390,000)	(5,084,000)
Dry Bulk	-	(2,960,000)	(11,308,000)
Liquid Bulk	-	-	(355,000)
Total	**(279,000)**	**(6,010,000)**	**(19,086,000)**

Calculated by ECONorthwest with source data from Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012) and conversations with officials from the Port of Portland.

C.5 TERMINAL SIZE

We were asked to translate the forecast cargo capacity shortfalls (described in Section C.4) into acres of land for public marine terminals. To accomplish this, we need assumptions on the size of public marine terminals.

As stated in Section C.1, all of this analysis suffers from a high degree of uncertainty and a wide range of possible assumptions. This aspect of the analysis (converting tons of cargo into acres of land for new terminals) is probably the most uncertain. There is no accepted rule of thumb for the minimum size of marine terminals, let alone the standard or average size. Some aspects of marine terminal size can scale with cargo volumes (e.g., an automobile terminal moving 100,000 cars may require roughly half the acreage of an automobile terminal moving 200,000 cars.). However, other aspects of terminal size may not scale proportionately to cargo volume.

We attempted to assemble recent studies from the City of Portland to see what we could learn about the likely size of marine terminals that would be needed to accommodate future demand in the City of Portland. The West Hayden Island Economic Foundation Study (Entrix 2011), provided a summary of site characteristics for marine-related land uses, including an acreage approximation for terminals of various cargo types in the Portland Harbor and other west coast harbors. The Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011 – Draft) provides other assumptions for terminal sizes for automobiles, grain, and dry bulk, based on case studies from North American and European terminals. The Worley Parsons analysis also provides a range of potential throughput per acre based on these case study ports.

Ultimately, we looked at both of these sources of data, and the Criteria for Evaluating Potential Sites for Marine Terminal produced by Maul, Foster & Alongi as part of the consultant team for this study (included as Appendix B to this same report) to determine a range of reasonable terminal sizes. These assumptions are shown in Exhibit C-9. We show both a minimum size, and a practical, case study-supported size. Note that the size for these marine terminals does not necessarily reflect land required for rail infrastructure to support these terminals.

Exhibit C-9. Summary of assumptions on acreage requirements for public marine terminals by cargo type

	ENTRIX		Worley Parsons		For This Analysis	
Cargo Type	Minimum	Practical	Minimum	Practical	Minimum	Practical
Automobiles	75	100	47	150	50	150
Containers	50	200			50	200
Breakbulk	15	50			15	50
Grain	40	50	15	45	30	50
Dry Bulk	5	100	30	30	20	70
Liquid Bulk	5	20			5	20

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)

Other experts and stakeholders may have different opinions on what is truly a practical size for a new marine terminal. The assumptions used in this analysis, are not asserted as the definitive answer for what size terminal is best for any and all new marine terminals. These assumptions simply reflect the range of terminal sizes that were reported as reasonable and practical in the two source documents that we reviewed. For this reason, in the rest of this document, we refer to the "practical" terminal sizes in Exhibit C-9, as "case study supported" terminal sizes.

C.6 EVALUATION OF LAND NEED FOR PUBLIC MARINE TERMINALS

Determining the land needed for public marine terminals is as simple as multiplying the demand shortfall (in metric tons) by a ratio of tons per acre for cargo size. However, the estimate of shortfall does not tell us how many terminals will be needed. If for example, we see a shortfall of 10 million tons of dry bulk, it could potentially be accommodated in one terminal, or in many terminals. For each of the terminals, they could be operating at 100% of capacity, or at only a small fraction of capacity (if they were sized to accommodate future growth, beyond the 2040 horizon). Additionally, we have multiple scenarios for the cargo capacity shortfall (low, medium, and high), and multiple measures of cargo size (minimum, and case study-

supported). One final challenge is that some terminals will require rail access, and if a dedicated rail loop is needed, then it will require about 100 acres of land, regardless of our other assumptions on minimum or case study-supported terminal size.

In this section, we present results only in terms of the minimum number of acres needed to absorb the capacity shortfall, and do not estimate the number of terminals the acreage equates to. We ultimately provide assumptions for determining the number of terminals required to accommodate the projected cargo capacity shortfall.

Exhibits C-10 through C-12 show projected capacity shortfall, needed acreage to fulfill the shortfall, and whether new terminal space is needed for the six cargo types under the lowest scenario in the City of Portland, City of Vancouver, and the two combined. This scenario uses the low estimate of cargo capacity shortfall and assumes the minimum acreage requirement for each cargo type.

For the City of Portland automobile shortfall, we used an estimate of throughput per acre from the Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2012), which used case study examples to show that automobile terminals can achieve 2,688 autos per acre. For the City of Vancouver automobile shortfall, we assumed the 89,000 metric tons, could be accommodated by improved efficiencies at their existing facility, and would not be sufficient demand to necessitate development of a new terminal. Exhibits C-10 through C-12 show the results of the lowest scenario for public marine terminals in Portland and Vancouver.

Exhibit C-10. Lowest Scenario, Forecast land need for new public marine terminals, City of Portland, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Minimum Acres Needed
Automobiles	(187,000)	Yes	51.0
Containers	-	No	-
Breakbulk	-	No	-
Grain	-	No	-
Dry Bulk	-	No	-
Liquid Bulk	-	No	-
Total	**(187,000)**		**51.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

Exhibit C-11. Lowest Scenario, Forecast land need for new public marine terminals, City of Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Minimum Acres Needed
Automobiles	(89,000)	No	-
Containers	-	No	-
Breakbulk	(3,000)	No	-
Grain	-	No	-
Dry Bulk	-	No	-
Liquid Bulk	-	No	-
Total	**(92,000)**		**-**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

Exhibit C-12. Lowest Scenario, Forecast land need for new public marine terminals, cities of Portland and Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Minimum Acres Needed
Automobiles	(276,000)	Yes	51.0
Containers	-	No	-
Breakbulk	(3,000)	No	-
Grain	-	No	-
Dry Bulk	-	No	-
Liquid Bulk	-	No	-
Total	**(279,000)**		**51.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

The previous set of tables show that in the lowest scenario, demand for new public marine terminals in Portland and Vancouver could be as low as 51 acres. Exhibits C-13 through C-15 show the opposite bookend, the highest scenario. This scenario uses the high estimate of cargo capacity shortfall, assumes low estimates of throughput per acre for automobile terminals, and assumes terminals for dry bulk, grain, and containers require a dedicated rail loop.

Exhibit C-13. Highest Scenario, Forecast land need for new public marine terminals, City of Portland, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Maximum Acres Needed
Automobiles	(730,000)	Yes	577.0
Containers	(1,120,000)	Yes	100.0
Breakbulk	-	No	-
Grain	(4,370,000)	Yes	100.0
Dry Bulk	(10,949,000)	Yes	200.0
Liquid Bulk	-	No	-
Total	**(17,169,000)**		**977.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

Exhibit C-14. Highest Scenario, Forecast land need for new public marine terminals, City of Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Maximum Acres Needed
Automobiles	(240,000)	Yes	180.0
Containers	-	No	-
Breakbulk	(249,000)	Yes	50.0
Grain	(714,000)	Yes	100.0
Dry Bulk	(359,000)	Yes	100.0
Liquid Bulk	(355,000)	Yes	50.0
Total	**(1,917,000)**		**480.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

Exhibit C-15. Highest Scenario, Forecast land need for new public marine terminals, cities of Portland and Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Maximum Acres Needed
Automobiles	(970,000)	Yes	757.0
Containers	(1,120,000)	Yes	100.0
Breakbulk	(249,000)	Yes	50.0
Grain	(5,084,000)	Yes	200.0
Dry Bulk	(11,308,000)	Yes	300.0
Liquid Bulk	(355,000)	Yes	50.0
Total	**(19,086,000)**		**1,457.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

The previous set of tables for the highest scenario show that up to 1,457 acres of land could be needed to accommodate the 19 million metric tons of cargo capacity shortfall. Given the assumptions about minimum and case study-supported terminal size shown in Exhibit C-9, a shortfall of this size would probably require on the order of 10 new terminals of average size.

Both the lowest and highest scenarios are possibilities, but unlikely.[2] These scenarios do help to show the extreme ends of the spectrum, but it is better to focus our attention on the medium scenario. For this scenario, we used the medium estimate of cargo capacity shortfall, and assumed all demand for each cargo type in each City could be accommodated by one terminal.

Exhibit C-16 shows our medium forecast of acres needed for public marine terminals in the City of Portland in 2040. It shows a total land need ranging from 170 to 470 acres, depending on the size and efficiency of new terminals, and the need for dedicated rail infrastructure.

[2] This is not to imply the underlying "high-scenario" cargo forecast from BST is unreasonable. In fact, the forecast demand for cargo in the high scenario averages 3.1% growth per year, which is less than the 4.1% per year that has been experienced on the Columbia River between 1962 and 2011. However, the compounding assumptions for capacity (existing facilities only operate at current levels, and accommodate none of the future growth), terminal size (rail loops for every terminal), and number of terminals (e.g., 3 new auto terminals to accommodate total demand of less than 1,000,000 tons per year), all combine to make this scenario unrealistic.

Exhibit C-16. Medium Scenario, Forecast land need for new public marine terminals, City of Portland, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Acres Needed		
			Minimum	Case Study Examples	w / rail
Automobiles	(410,000)	Yes	120.0	270.0	270.0
Containers	-	No	-	-	-
Breakbulk	-	No	-	-	-
Grain	(2,390,000)	Yes	30.0	50.0	100.0
Dry Bulk	(2,960,000)	Yes	20.0	70.0	100.0
Liquid Bulk	-	No	-	-	-
Total	**(5,760,000)**		**170.0**	**390.0**	**470.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

Exhibit C-17 shows our medium forecast of acres needed for public marine terminals in the City of Vancouver in 2040. It shows a total land need ranging from 40 to 100 acres to accommodate 160,000 metric tons of automobiles.

Exhibit C-17. Medium Scenario, Forecast land need for new public marine terminals, City of Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Acres Needed		
			Minimum	Case Study Examples	w / rail
Automobiles	(160,000)	Yes	40.0	100.0	100.0
Containers	-	No	-	-	-
Breakbulk	(90,000)	No	-	-	-
Grain	-	No	-	-	-
Dry Bulk	-	No	-	-	-
Liquid Bulk	-	No	-	-	-
Total	**(250,000)**		**40.0**	**100.0**	**100.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

The combination of demand for public marine terminals in the cities of Portland and Vancouver are shown in Exhibit C-18. It forecasts a need for 210 to 570 acres.

Exhibit C-18. Medium Scenario, Forecast land need for new public marine terminals, cities of Portland and Vancouver, 2040

Cargo Type	Capacity Shortfall (Tons)	New Terminal Space Needed	Acres Needed		
			Minimum	Case Study Examples	w / rail
Automobiles	(570,000)	Yes	160.0	370.0	370.0
Containers	-	No	-	-	-
Breakbulk	(90,000)	No	-	-	-
Grain	(2,390,000)	Yes	30.0	50.0	100.0
Dry Bulk	(2,960,000)	Yes	20.0	70.0	100.0
Liquid Bulk	-	No	-	-	-
Total	**(6,010,000)**		**210.0**	**490.0**	**570.0**

Source: ECONorthwest, with original data and input from:
West Hayden Island Economic Foundation Study (Entrix, 2011)
Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011- Draft)
Appendix B: Criteria for Evaluating Potential Sites for Marine Terminal (Maul, Foster & Alongi, 2012)
Portland and Vancouver Harbor Forecast Update" (BST Associates, 2012)
Conversations with officials from the Port of Portland

In Exhibits C-10 through C-18 we purposely showed estimates of "acres needed" and not "number of terminals needed." Moving from cargo to land adds uncertainty; moving from acres to terminals adds even more. Exhibit C-9 is a basis for the conversion, but it shows a range of possible terminal sizes.[3] Moreover, terminals may not be used to capacity, technologies may change, and so on. That said, a rough application of estimates of terminal size supported by the case studies (in acres, Exhibit C-9) to estimates of needed acres under medium assumptions (Exhibit C-18), yields estimates of number of new terminals needed by 2040 as follows: automobiles, 1 – 4 terminals; grain, 1 – 3 terminals; dry bulk, 1 – 3 terminals.

[3] The ranges in Exhibit C-9 are based on all available data sources: existing terminal sizes at the Port of Portland and Vancouver, conversations with officials at both ports, and case studies included in the report on Operational Efficiencies of Port/Terminal World-Wide (Worley Parsons, 2011 Draft). Ultimately, however, these assumptions were a judgment call on the part of ECONorthwest, and represent our best guesses for a lowest, highest, and medium scenario.

C.7 IMPLICATIONS

The City of Portland identified the two sites in the Portland Harbor that are most likely to be suitable for development of a new public marine terminal: the Atofina site, and the Time Oil site. Of these two sites, development is technically possible on either, but there are major hurdles that would add significant costs. Both sites have some level of contamination, both sites would require negotiation and property acquisition from numerous property owners, and both sites are smaller than desirable, which precludes the possibility of an onsite rail loop. Depending on the specific parcels that would be acquired and aggregated to make development of these sites possible, each site could range in size from 50 to 100 acres, for total developable acreage of 100 to 200 acres.

When considering the potential cargo capacity shortfall, the two sites in the Portland Harbor could potentially accommodate the one dry bulk and one grain terminal that are anticipated to be needed. These terminals are expected to require between 20 and 200 acres, which matches fairly well with the capacity of the two potential sites. However, if these potential terminals require a dedicated rail loop, or if they are unable to overcome the barriers to redevelopment at each site, then the forecast capacity shortfall will need to be accommodated elsewhere in the region.

Assuming each new port terminal requires a dedicated rail loop, it would appear that the total acreage needed to accommodate regional cargo volumes in 2040 exceeds the current supply of 350 acres of vacant developable land at the Port of Vancouver planned for marine terminal development.[4] However, the Port of Vancouver has about 200 acres of vacant developable land that could technically accommodate marine terminal development, but is planned for other industrial uses. If these acres were included in the total supply, then it would appear that the Port of Vancouver would have about the right supply of land to accommodate regional cargo demand through 2040. While this is technically possible, that does not mean that it is politically feasible or consistent with adopted policies of the affected jurisdictions.

While it is possible that the Port of Vancouver could accommodate the regional demand for cargo through 2040, it is also possible that Vancouver's land supply could fall far short. Using the high-scenario demand forecasts, and assuming rail loop access for all terminals, the region could have a

[4] It is important to note that these projections are based on our medium scenario. The range of possible assumptions that could be used in this analysis is significant. When using our most conservative assumptions, our analysis showed a regional land need as low as 70 acres, and our most aggressive assumptions resulted in a land need of over 2,250 acres.

shortfall of up to 1,457 acres. If only 350 acres at the Port of Vancouver are available for marine terminal development, as is their current stated policy, then that would leave over 1,100 acres of unmet demand for public marine terminals in the region.

Our analysis finds that the Portland Harbor has very limited capacity to accommodate future demand for public marine terminals, but that the Port of Vancouver has capacity to accommodate some (but not necessarily all) forecast demand for cargo for both the cities of Portland and Vancouver through the year 2040 under our medium scenario.

Appendix D Mapping Analysis

As part of the background research for the Harbor Lands Contract, Bureau of Planning and Sustainability staff conducted a visual survey of aerial maps of the Portland Harbor to classify the lands in one of several categories. The first reason for undertaking this review was to provide the consultant for the Harbor Lands Analysis, ECONorthwest (ECO), with a visual representation of current Portland Harbor development so that they could analyze this and confirm potential sites to consider for assembly into larger parcels. The second reason for this effort was to help validate the initial acreage findings of the draft Economic Opportunities Analysis (EOA).

Lands were split into various development types, including buildings, other structures/tanks, exterior work/storage areas, loading & maneuvering areas, parking areas, rail yards, vacant land and a few residual categories (see chart below). Once these lands were categorized, they were compared with the lands that are considered environmentally constrained or brownfields. The intent was to specifically consider whether vacant lands predominantly had one of these constraints applied to them. While the visual survey and analysis was initially considered to cover the lands that staff wanted ECO to review along the harbor, it was also refined to incorporate the boundary of the EOA for the Portland Harbor sub-geography to determine whether the acreage was significantly different. The findings are provided in a table attached to this summary.

Within the Portland Harbor sub-geography, the visual survey identified a total of 590 acres of lands that were considered vacant. However, of this acreage, approximately 412 acres either contained medium or high level natural resources (174.4 acres), were existing brownfields (145.2 acres), or were brownfield sites with resources as well (92.6 acres). This left approximately 174 acres that were not constrained. This number exceeds the amount of unconstrained vacant land determined by Hovee (108 acres). This is partially due to the fact that the visual survey included vacant portions of otherwise developed parcels, and was not constrained by lot lines. Thus vacant portions of lots were included in the aerial survey that were not included in the EOA. Within the EOA update, Hovee had separated out the Harbor Access Lands from the larger Columbia Harbor subgeography. In either case, the unconstrained land represents a minority of the overall vacant land in the harbor.

For the ECO analysis, the maps helped illustrate the potential vacant sites that could be looked in greater detail in their report. This led to the consideration of the Time Oil and Atofina sites as possible areas for consideration of a marine terminal. The report includes the analysis on these sites.

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Category #	Category Description	**TOTAL Acres Harbor Lands Study Area**	(1)Acres in med/high NRI resources ONLY	(1) Acres both NRI & Brownfields	(1)Acres in vacant Brownfields ONLY (2009+11)	**TOTAL Acres PDX *Harbor Access Lands (2)**	**Acres in med/high NRI resources* ONLY (2)**	**Acres both NRI AND Brownfields (2)**	**Acres in vacant Brownfields ONLY(2009+11)* (2)**	Acres Port of Vancouver
1	building	**415.1**	0.6	0.1	5.2	**267.2**	0.4	0.1	4.8	65.7
2	other structures, tanks, utilities	**197.1**	2.6	0.0	1.5	**92.1**	2.2	0.0	1.5	72.6
3	exterior storage & work areas	**1,326.0**	26.9	1.1	20.7	**994.0**	23.9	1.0	10.3	435.7
4	loading/maneuvering	**295.0**	14.0	0.2	0.2	**181.9**	13.4	0.2	0.2	134.9
5	rail yards	**457.3**	38.4	0.3	3.3	**138.0**	5.2	0.3	0.0	72.1
6	employee/guest parking	**143.2**	6.7	0.1	1.1	**94.5**	1.5	0.0	1.1	12.0
7	vacant land	**1,739.4**	328.1	127.9	214.4	**586.0**	174.4	92.6	145.2	1,442.5
8	parks	**110.0**	103.2	0.8	0.4	**3.0**	1.0	0.0	0.0	0.0
9	taxloted water	**89.3**	88.9	0.0	0.0	**89.3**	88.9	0.0	**0.0**	101.8
10	misc right of way	**25.3**	6.8	0.0	0.0	**15.6**	4.1	0.0	0.0	0.0
	Total	**4,798**	**616**	**131**	**247**	**2,462**	**315**	**94**	**163**	**2,337**

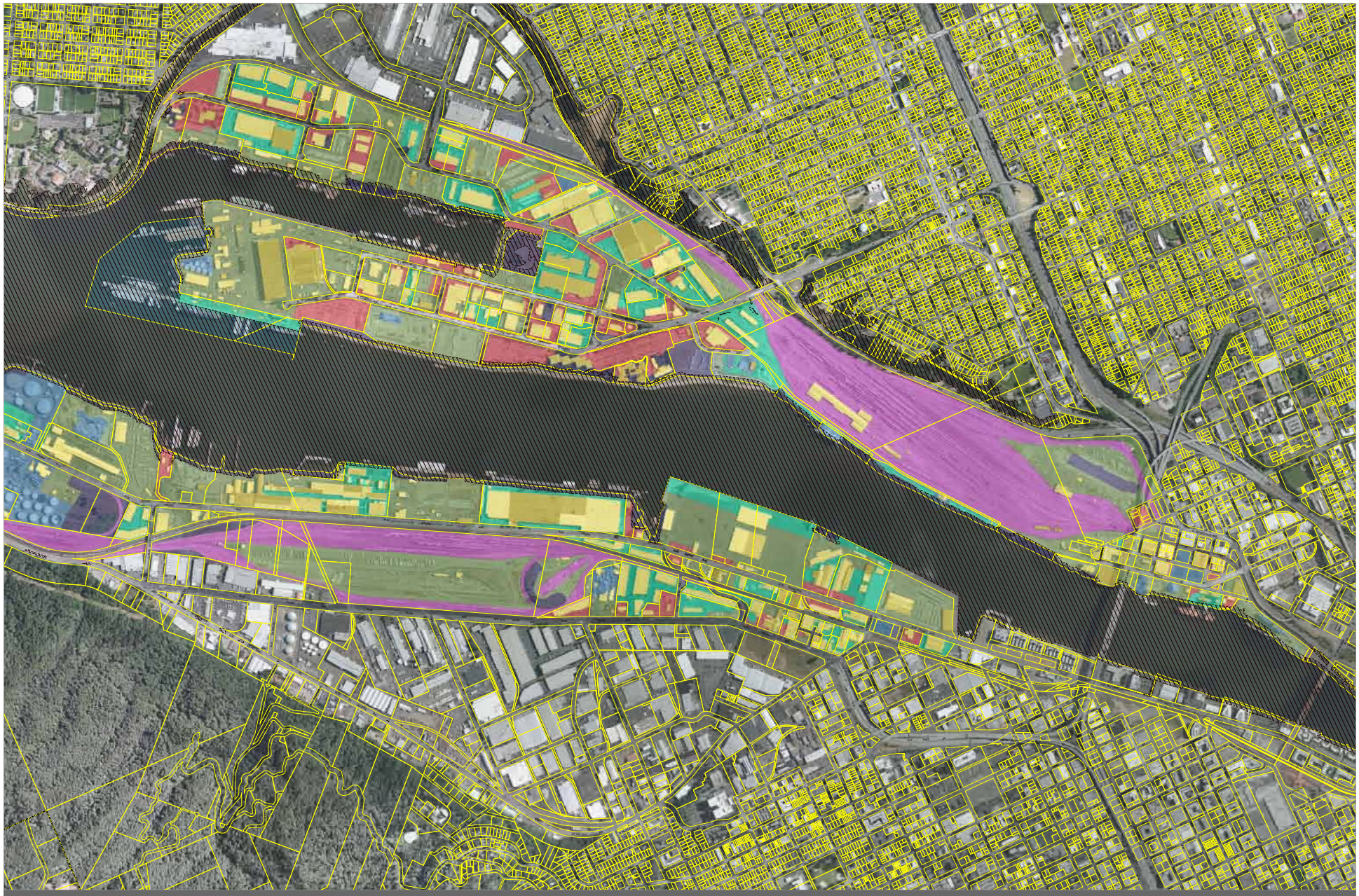
Revised 3/19/2012

*Harbor Access Lands dataset = river overlay zones created by Hovee

(1)Acres within the Harbor Lands Boundary

(2)Acres within *Harbor Access Lands dataset (hovee's river overlay zone shapefile)

NOTE: West Hayden Island NRI not included.



Harbor Lands Inventory - 2009 aerials - MAP 1

inventory categories

- 0 - no value/no data
- 1 - building
- 2 - other structures, tanks, utilities
- 3 - exterior storage adn work areas
- 4 - loading/maneuvering
- 5 - rail yards/lines
- 6 - employee/guest parking
- 7 - vacant land
- 8 - parks
- 9 - water (taxloted)
- 10 - misc right of way
- ranked natural resources

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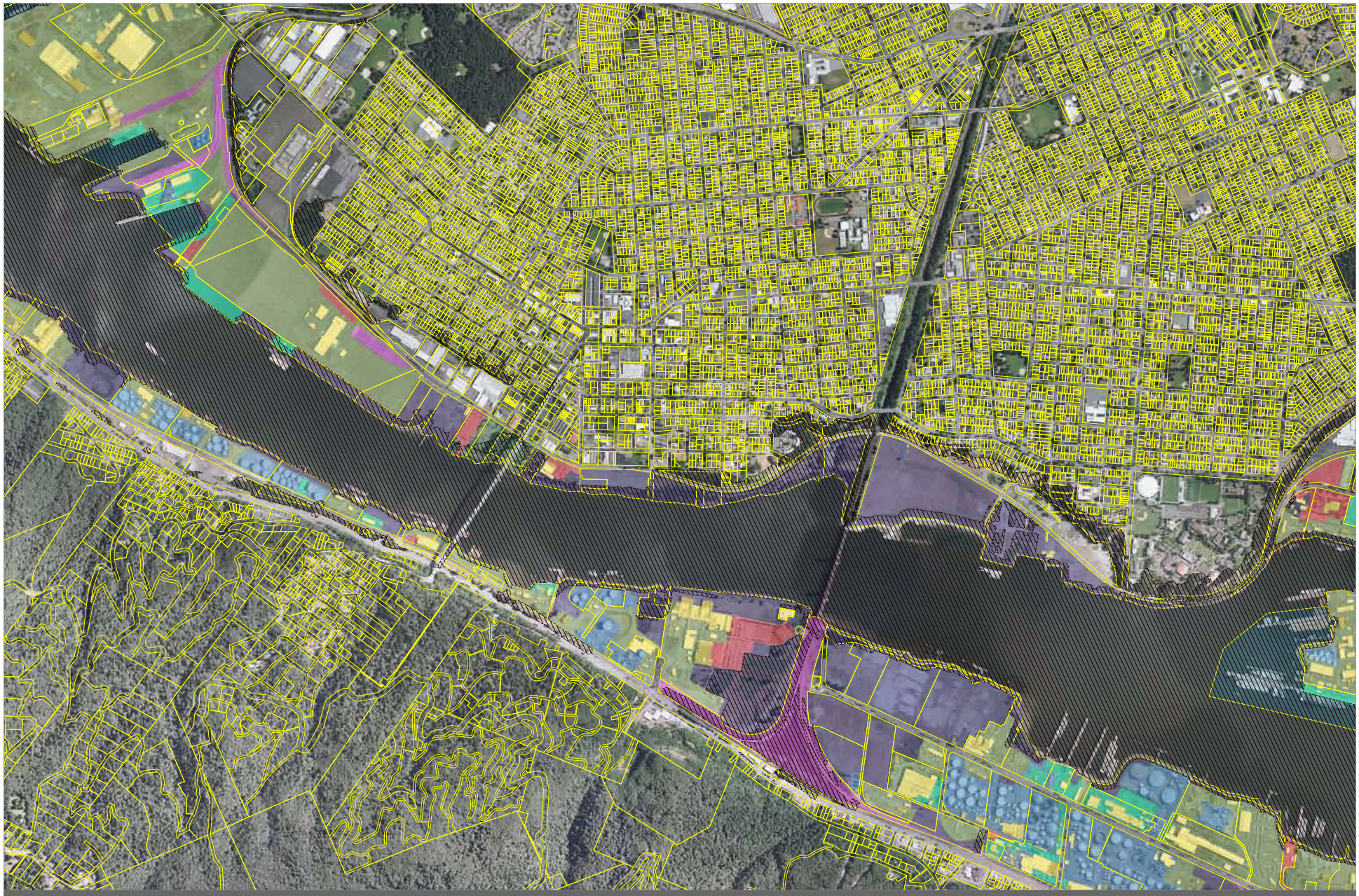

Harbor Lands Inventory - 2009 aerials - MAP 2

inventory categories

- 0 - no value/no data
- 1 - building
- 2 - other structures, tanks, utilities
- 3 - exterior storage adn work areas
- 4 - loading/maneuvering
- 5 - rail yards/lines
- 6 - employee/guest parking
- 7 - vacant land
- 8 - parks
- 9 - water (taxloted)
- 10 - misc right of way
- ranked natural resources

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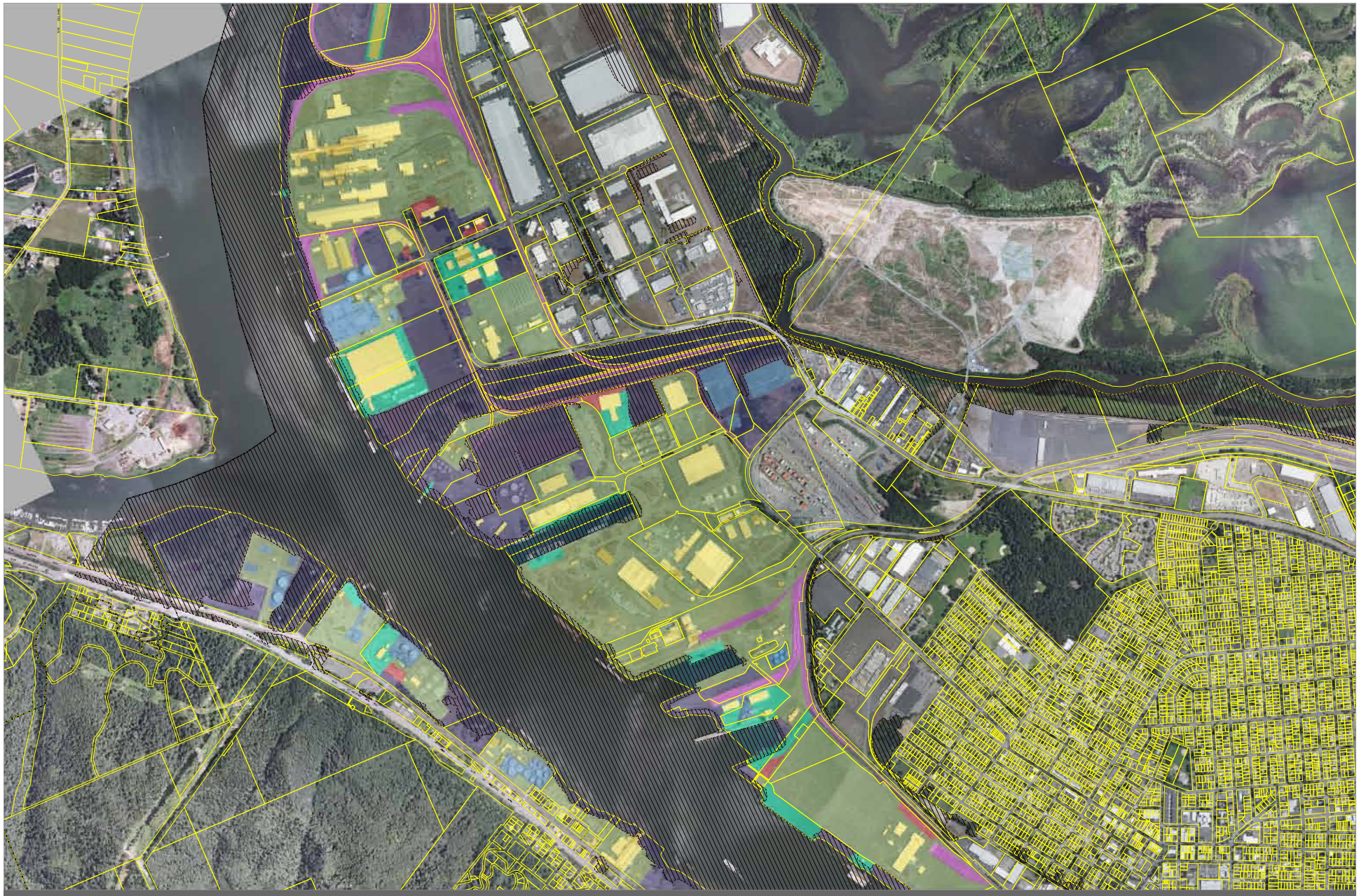

Harbor Lands Inventory - 2009 aerials - MAP 3

inventory categories

- 0 - no value/no data
- 1 - building
- 2 - other structures, tanks, utilities
- 3 - exterior storage adn work areas
- 4 - loading/maneuvering
- 5 - rail yards/lines
- 6 - employee/guest parking
- 7 - vacant land
- 8 - parks
- 9 - water (taxloted)
- 10 - misc right of way
- ranked natural resources

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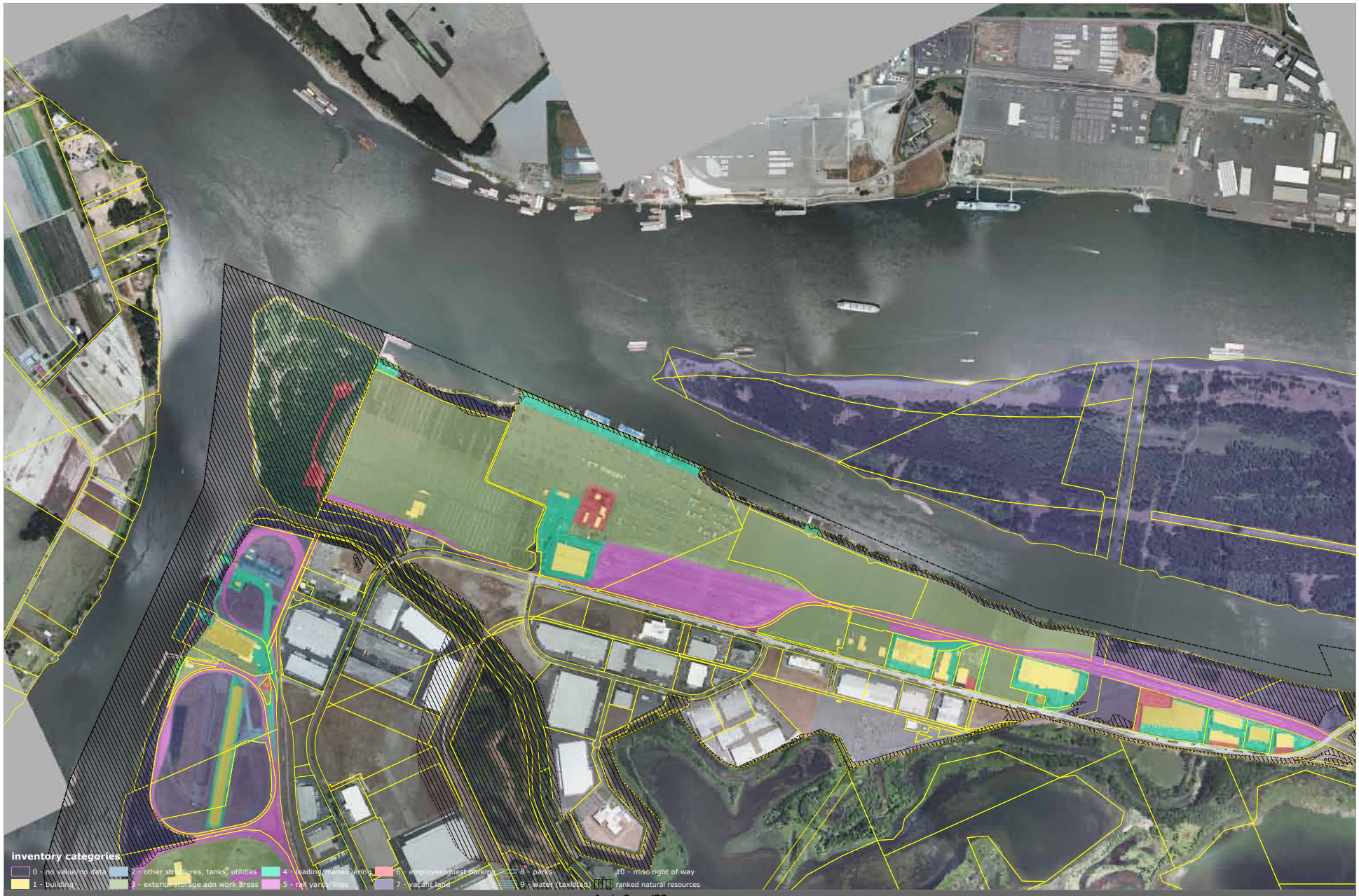

Harbor Lands Inventory - 2009 aerials - MAP 4

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Harbor Lands Inventory - 2009 aerials - MAP 5

inventory categories

- 0 - no value/no data
- 1 - building
- 2 - other structures, tanks, utilities
- 3 - exterior storage adn work areas
- 4 - loading/maneuvering
- 5 - rail yards/lines
- 6 - employee/guest parking
- 7 - vacant land
- 8 - parks
- 9 - water (taxloted)
- 10 - misc right of way
- ranked natural resources

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Harbor Lands Inventory - 2007 aerials - Vancouver

- 1 - building
- 2 - other structures, tanks, utilities, concrete plant
- 3 - exterior storage and work areas
- 4 - loading/maneuvering
- 5 - rail yards/lines
- 6 - employee/guest parking
- 7 - vacant land
- 9 - water (part of lot)
- Not Port owned

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