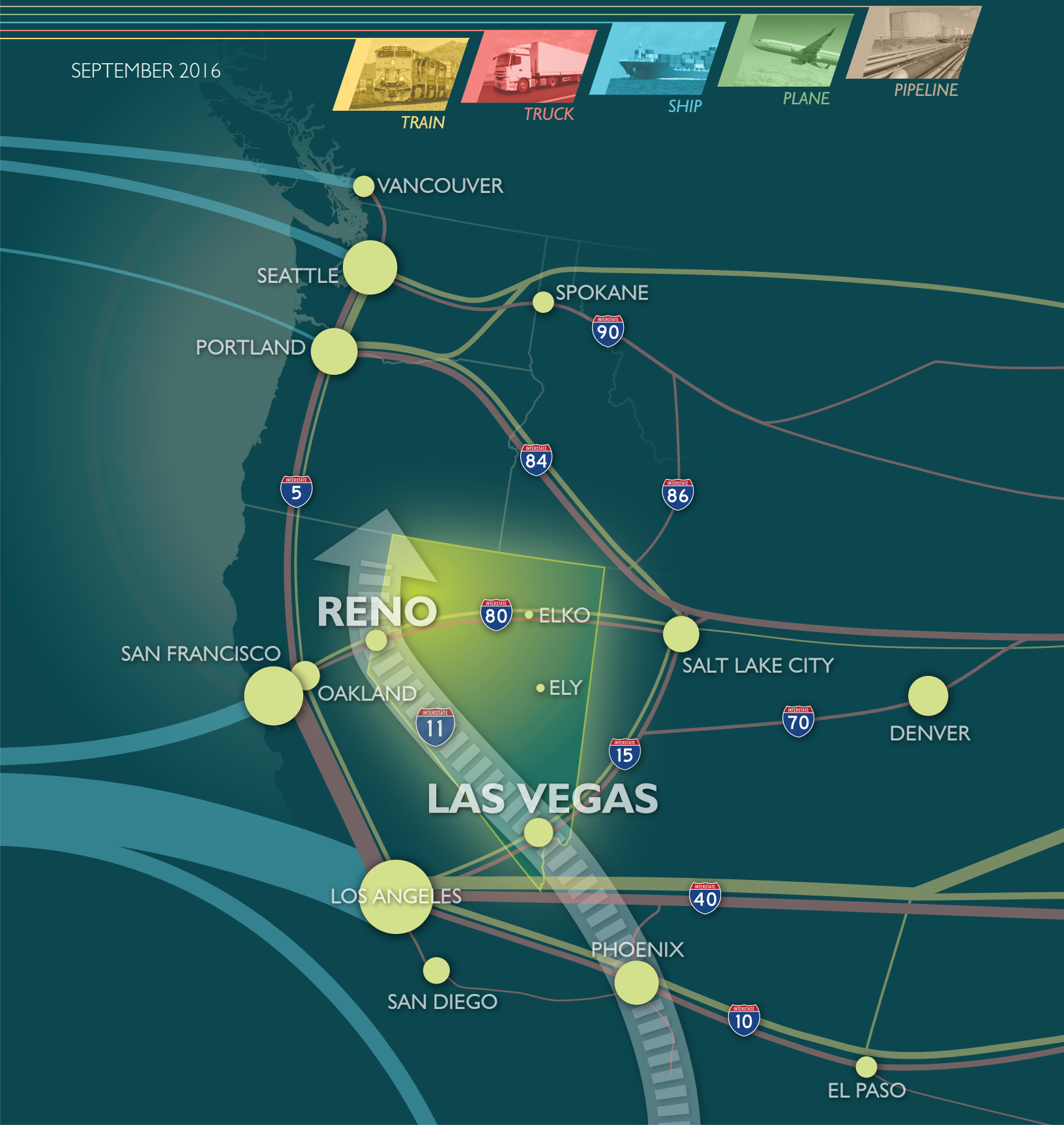
NEVADA STATE FREIGHT PLAN

APPENDIX 3:
CONTEXT AND COMPETITIVE MARKET ANALYSIS

A strategic framework for freight mobility and economic competitiveness

SEPTEMBER 2016



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Competitive Market Analysis

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Nevada Department of Transportation

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Acronyms & Abbreviations

BEA	Bureau of Economic Analysis
BTR	Beyond the Rack
GDP	Gross Domestic Product
GOED	Governor's Office of Economic Development
GRP	Gross Regional Product
LAS	McCarran International Airport
LAX	Los Angeles International Airport
MTA	Major Trade Area
NAFTA	North American Free Trade Agreement
NESOI	Not Elsewhere Specified or Indicated
NSFP	Nevada State Freight Plan
O&D	Origin and Destination
RNO	Reno-Tahoe International Airport
SF	San Francisco
SFO	San Francisco-Oakland International Airport
sq. ft.	square feet
TEU	Twenty-foot Equivalent Unit
TRIC	Tahoe-Reno Industrial Center
US	United States
UP	Union Pacific Railroad
UPS	United Parcel Service

1 Introduction

This white paper provides a competitive analysis of Nevada and its hubs in the global, national, and Western US context that can be used as a framework and transformative vision to guide the decision-making process. It is organized as follows:

- Section 1 introduces the concepts and framework necessary for understanding the competitive market analysis.
- Section 2 assesses current freight conditions in Nevada and urbanization and economic patterns in the national context to build the case for the new model.
- Section 3 introduces the new economic and logistics model by which Nevada can begin an evolutionary process toward a new future expanding access and increasing modal integration.
- Section 4 states the key Northern, Southern, and Eastern Nevada relationships and findings.
- Section 5 establishes the key drivers, opportunities, and challenges to be considered.

1.1 Intention of the Freight Plan

The Nevada State Freight Plan (NSFP) is not just a transportation plan, but rather is intended to strengthen the state's logistics infrastructure in order to provide it with the competitive advantage necessary to grow and diversify its economy. Freight planning must understand that the cost and time required for the transportation of goods has become embedded in every economic activity and is no longer a separate function. The NSFP is intended to create an actionable blueprint to help ensure that Nevada's freight infrastructure and policies bolster the efficiency and growth of its service modes and the industries they serve. It aims to provide a long-term framework for identifying and capturing new and emerging opportunities to strengthen Nevada's freight logistics network. In order to grow, Nevada's current and emerging industries need robust multimodal connections to regional, national, and global supply chains. By focusing on essential connections, the NSFP can contribute to maximizing Nevada's commercial advantages that will attract new business and otherwise strengthen the state's economic base. The plan could contribute to the construct of building a New Nevada envisioned by Governor Sandoval in his January State of the State Address.

1.2 Freight as a Component of the Global Network

People, goods, and information move continuously around the world. Freight and passengers often find themselves in conflict, as the efficient movement of passengers and freight often converge on the same highway or at the same crossing points between modes, such as rail crossing a highway or passenger access to an airport. Developing freight plans becomes an important part of not only providing reliable, cost effective, and safe freight transportation to support local economic activity, but also in addressing the passenger freight conflicts that have negative effects on non-freight related economic and social activity.

1.2.1 Freight Categories

For simplicity sake, freight can be divided into four categories: bulk, general freight, specialized freight, and intermodal. Any location looking to increase its competiveness should have the capability to handle cargo in these essential forms.

- Bulk refers to freight that is "unpackaged and in large quantities," such as: fuels, including coal, oil, and liquefied natural gas; food stuffs, wheat, rice or barley; building materials, wood, gravel, etc. Primarily, bulk moves via high volume systems (e.g. trains, barges, and pipelines) in seasonal cycles and is less sensitive to precise delivery schedules.

- General freight refers to goods or commodities that do not require the use of specialized equipment. This freight is generally palletized, and carried in a box, container, or van trailer. Many general freight commodities of lower value (e.g. general merchandise) can be transported by rail boxcar.
- Specialized freight includes those commodities that require specialized handling, such as refrigeration and unique platforms (e.g. autos). These goods can be handled by many modes separately or intermodally in special containers.
- Intermodal freight generally refers to packaged goods. Its key handling characteristic is that it can be placed in a container and thus can be transported by a variety of vehicles, such as container ships, semi-trailer trucks, and trains. Its strength is that it can take advantage of the best characteristics of several modes; for example, it uses air and ocean transport to overcome surface and distance limitations, and trucking to make the initial pickup and final delivery. These combined movements and transfers must move on a more rigorous schedule. Thus, the demands of reliability, division of costs, and safety are of greater concern than they are for bulk movements, except in the case of special types, such as hazardous fuels and others.

Nevada mining, agriculture, and construction industries generated a significant amount of bulk freight. Its major urban centers also consume and produce finished products that generate major general freight, specialized freight, and intermodal activity. Although intermodal freight volumes are comparatively low in comparison to combined bulk and general commodities, their value is significantly higher. The presence of efficient intermodal terminals in Nevada is essential to increase the state's direct reach to overseas markets helping to facilitate the rapid movement of small packages and fulfillment orders by air/truck, and in the movement of priority mail.

1.2.2 Supply Chains

Transportation services are the essential means for creating the production and distribution unity that culminates with product purchase and consumption. Competitive advantages result from lower costs in the assembly stages of product fabrication, sub-product, and product movement through distribution channels between manufacturer, retailer, and consumer. Multidimensional and efficient connection through transportation hubs and corridors greatly facilitate the volume and commercial value derived from industrial activity.

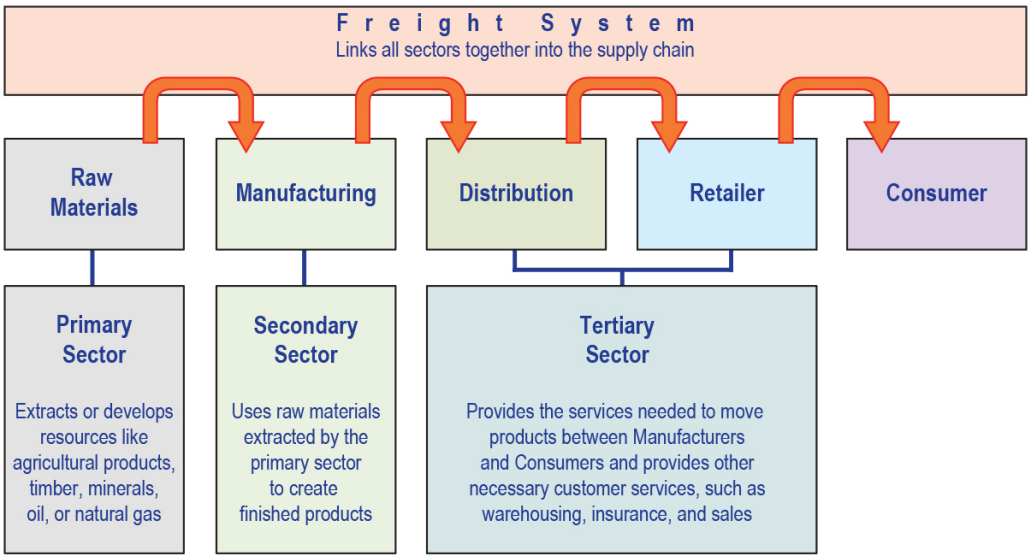


Figure 1
Supply Chain Overview
All finished goods follow a similar path from raw material collection to consumer ownership as illustrated by this supply chain diagram (Source: Michael Gallis & Associates (MG&A), 2015 recreated from Business Case Studies, Lafarge Case Study).

This analysis will recommend a freight-focused competitive development strategy to strengthen the economic benefits available to Nevada taking into account its location, business, cost, and the transportation systems it needs to prosper.

1.3 Global & Local Competitive Focus

Traditionally, state freight plans tend to focus solely on the freight transportation system and within state boundaries and thereby lose the connection to the economy and the larger context within which opportunities to strengthen their competitive positions are found. Instead, this plan has multiple scales of focus; not only on the network elements within state boundaries, but also on the broader analysis of Nevada's role and function within the regional, national, continental, and global economic and freight logistics network.

Every city, state, and nation is connected to the global network and competes as a hub in the global marketplace. Freight transportation infrastructure and logistics provides each hub with the means of facilitating the movement of goods, import or export, needed to grow its economy. Therefore, the quality of hub's infrastructure has a direct impact on its economic performance as inefficiencies add a cost to every good consumed or produced in that area.

As part of the larger global logistics network, every hub is competing to increase their market share of trade activity; a foundation for building greater economic activity. Hubs that fail to strengthen their connections and functions will inevitably lose market share over time. Determining where Nevada fits in the world is fundamental to strengthening future connections and functions that will ultimately enhance the state's economic competitiveness.

1.3.1 Freight Hubs: Global, Inland Port, and Local

There are three tiers of freight hubs in the global trading network: global, inland port, and local. Hubs are defined as the points in the network that have facilities where passengers and goods can arrive or depart by any available mode in the transportation system: air, water, rail, or road. Thus, every city and town connected to the global transportation network is a hub in the network.

Global hubs, the largest of the three tiers, are where international goods arrive by air and sea, and goods produced within the country are exported internationally. Inland Ports, the second tier, are defined as those hubs within a nation that perform internal distribution functions or transloading functions. Local hubs, the third tier, only provide services for the communities where they are located. All three tiers of hubs serve local distribution functions.

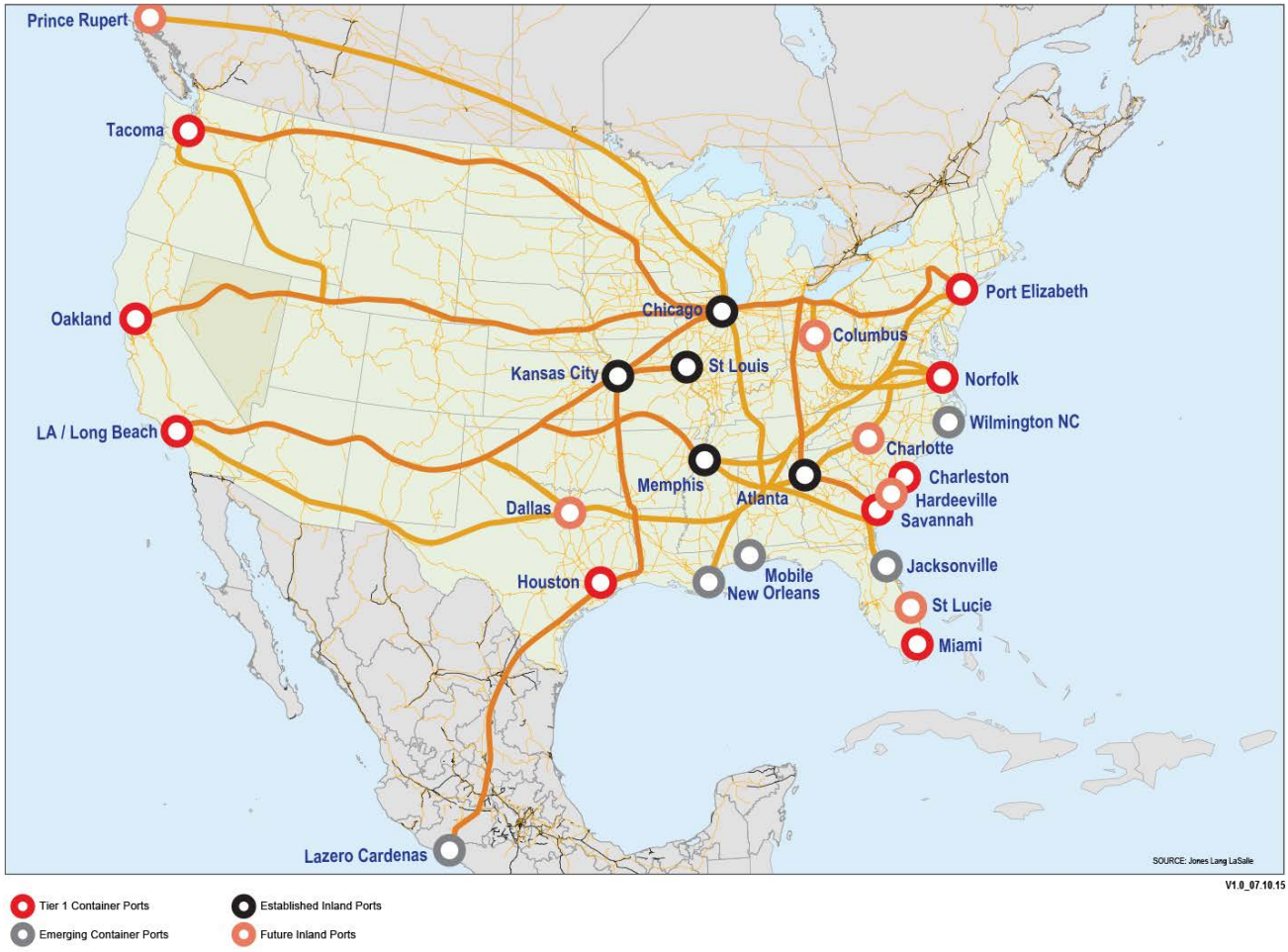
In other words, every city and metro performs local distribution and consolidation function, as each consumes and produces products and must have the distribution and consolidation facilities necessary to serve its local market. Although not every city or metro region is an inland port or global hub, every inland port and global hub is also a local hub. Therefore, in addition to the infrastructure needed to serve the local market, the global hubs and inland ports have developed infrastructure to serve the transshipment or global shipping functions. This may take the form of expanding the existing rail, truck, air, or seaport facilities or adding other facilities that will provide the services needed to handle larger volumes of freight.

Global hubs and Inland ports serve as junction points where freight bound for destinations other than the local metro area is transferred either within a mode or between modes. For example, a global air shipment arrives and is transferred to a domestic air flight, an air shipment transferred to a truck, or a shipment arriving by sea that is transferred to rail. As these shipments are not bound for the city or metro where they are being transferred but rather somewhere else in the world or nation, this transfer freight is of a more diverse nature than the freight destined for the local market and adds more value to the freight system.

FIGURE 2

Inland Port Connections

The map below is a re-creation of national developer Jones LaSalle's 2011 Midwest and Eastern Centric view of inland port connections. It highlights the numerous container, emerging container, established, and future inland ports in the Eastern US, while in the Western US, there are only the West Coast tier 1 ports and corridors for movement eastward. Salt Lake City is shown as an intersection, but not a hub (Source: MG&A, 2015 recreated from Jones Long LaSalle, 2011).



Local hubs are considered origin & destination (O&D) points of freight serving local demand created by its population, institutions, businesses, and industries. While the freight infrastructure in local hubs must serve the needs of that area, the only goods arriving and departing are those destined for that location or produced at that location. This tier of hubs provides logistics services for the distribution, import related, or consolidation, export related, of goods that serve the needs of the city or metropolitan area they are located within.

Moreover, within each tier that is a hierarchy of size and function. Some global hubs may only have small volumes of freight and be rifle-like in their distribution purpose, such as the Port of Prince Rupert in Canada, which exists to expedite transfers of Asian trade to the Industrial Midwest. Others are massive multi-channel hubs such as the San Pedro Ports at Los Angeles and Long Beach which link the China trade to several metros in the US. And some are inland depots such as metro Chicago where they comingle international and domestic output for multi-regional distribution. Hubs may also be limited in scope to function along domestic traffic lanes (e.g. the automotive parts network in the Ohio Valley) and NAFTA rather than create global supply lanes. The same is true for inland ports; they vary in size and function depending on their location and position within the national transportation network. Therefore, when analyzing a hub, it is important to understand not only its physical infrastructure, but also its origin to destination flows.

With the global population and economic growth, more freight is moving through expanding global networks. Some metropolitan areas are realizing the opportunity to grow their freight functions; taking the initiative to expand, add, or modify key components to their freight infrastructure in order to provide additional value-added services. Typically, these additions are inland port functions whereby they can attract a more diversified freight stream to be handled and transferred within their community.

1.3.2 Economic Implications of Hub Status

Each of the three tiers of hubs has a very different effect on the local economy. Local hubs have an effect on the existing industries found within the area, but have little power to attract other industry to the area. Inland ports and global hubs are a major attraction for industry and have a positive effect on growing and diversifying metro economies.

The reason that global hubs and inland ports have such an influence on attracting industry is that the high cost freight collecting at the transfer points (where goods are either being loaded or off loaded) is overcome by: the lower cost line haul portion (e.g. intermodal rail), lack of a modal substitute (e.g. ocean carriage and international air cargo), or a combination of factors, including the fit of the hubs services with a shippers overall distribution network. These include value added distribution at or near the point where the goods are being transferred, such as assembly of products or adding chain store markings to products.

Hub points are built on their intermodal connectivity. For example, moving efficiently by rail can be seamlessly transferred to trucks and taken to any number of plants or processing within the hubs service zone. A bootstrapping effect is in play here; the larger and more diverse the volume of freight that can be clustered for processing and distribution, the greater the number of industries will be attracted to a hub point that has land, labor, and cost advantages to exploit. To produce such an effect requires a strong policy focus on the part of both public and private sectors at a potential hub in order to successfully undertake a concerted development of transportation and industrial logistics assets.

At local hubs, the freight infrastructure must serve the needs of that area; however, the only goods arriving and departing are goods destined for that location and goods produced at that location. While improving the freight infrastructure in local hubs has a beneficial effect on the local economy, it may not serve to attract additional industry, as does the diversity and volume of goods flow and infrastructure additions that can result in the development of an Inland Port or Global Hub.

Another reason for the attraction of industry to hubs is that products are no longer made anywhere in the world. Rather, they are assembled from components, parts, and pieces that are made all over the world. The process of completing a final assembly involves moving a myriad of parts from multiple locations around the world in a series of steps from a parts point of manufacture, its origin, to its final inclusion in a finished product. At each step in the supply chain, various value added functions are performed involving sub-assembly, additional processing or modifications. The final assembly is made from a set of preassembled components that are only finally put together to create a finished product at a specific location to serve a market. Therefore, the larger and more diverse the volume of goods being transferred at a hub, the greater the attraction to a wider range of industry and thereby the greater economic diversity.

1.4 Competitive Market Analysis

This competitive market analysis analyzes Nevada's economic and logistics functions within the global and national freight network, and Western US, especially its relationship with the California economy and logistics network. Logistics infrastructure, economic relationships, and industrial real estate are used to describe the current conditions and competitive relationships of the Reno and Las Vegas hubs within the global context, and more specifically within the Western United States.

Logistics Infrastructure

The competitive analysis seeks to determine the status of Nevada's logistics hubs within the global context and the functions they are performing in relationship to the other Western US hubs. The nearby West Coast hubs of Seattle, San Francisco, and Los Angeles are global hubs with different scales and functions, while other hubs in the West (e.g. Phoenix) are essentially local hubs, except for Salt Lake City, which has inland port functions. The next group of inland ports and global hubs are transcontinental hubs along the Mississippi that function as transshipment points. This analysis seeks to review the modal services and freight flows in Nevada's hubs to identify key elements of a long-term plan to strengthen their position within the Western trade network.

Economic Relationships

The competitive market analysis seeks to understand the economic relationships of Nevada's hubs within the domestic and global context. As each metro area is a point of consumption and production, each hub has consumption functions that sustain the metropolitan population and support business activity. This analysis seeks to determine how the economy of Nevada and more specifically each of its regions relate to the larger Western US economy and the hubs in neighboring states. Particularly, Nevada's close proximity to the two large Northern and Southern California economies is examined in greater depth to explore the current status and future trends that form the relationship between California and Nevada.

Industrial Real Estate

The competitive market analysis uses industrial real estate data as an indicator of economic relationships. While freight does serve the residential and commercial (office, retail, and hotel) markets, it is primarily destined for the industrial markets that include warehousing, manufacturing, and distribution activities. This analysis examines the relationship between industrial markets in the Western US, using their size, absorption, construction, lease rates, and vacancy rates as a measure of the level of freight-related economic activity and their transportation needs as generators of freight. It is important to note that the statistics used are averages for the entire market area and thereby do not reveal the significant variability between the submarkets of each metro area.

2 Building the Case: A Freight System for Economic Development

Based on political and technological changes, globalization has created the emerging prospect for a one-world economy. This economy is evolving a pattern that extends to regional blocks as part of the basic foundation necessary for economic globalization to serve as a vehicle for prosperity. However, the North American trading bloc has sub-elements from a pattern of national, regional, and state economic activity that began at an earlier localized phase of development. Thus, Nevada has emerged as part of a geographic, economic, and even cultural affinity pattern in the Western US. Within this framework, metropolitan economic clusters formed off the base of earlier mining, agricultural, and trading activities have become centers for manufacturing, services, and transportation logistics hubs.

These hubs are connected by a now globalized transportation network, including seaports, airports, regional railroads, and interstate highways. These assets create a modal services grid that helps unite the region and provides a foundation for trade with other parts of the country and the world. Nevada's primary gateway to overseas trade is through West Coast seaports via regional highway, rail, and air networks. Nevada's reach to the East and beyond the United States is through the same systems.

As part of a dynamic economy, the Western metro clusters have developed unique attributes. For example, Los Angeles is America's largest trade gateway, San Francisco's Bay Area is a center for technological innovation, and Las Vegas utilized its open spaces to build an impressive platform for leisure activities. However, the elements for a stable and prosperous economy are evolving and activities that once singularly generated strong economic benefits have shown limits to their growth. Greater economic diversity is recognized as a key means to ensure stability and long-term prosperity. Achieving this diversity, particularly in light of similar efforts taking place within the region, requires a freight transportation system that strongly supports and creates economic development in Nevada.

The first steps toward an integrated and interactive transportation system must be to understand:

- The function and quantity of present Nevada freight services;
- The markets they would serve and currently cannot serve; and
- The interregional connections that both foster the required improvements in the transportation system and increase freight manufacturing and logistics production to feed and sustain regional growth.

This effort includes the recognition that the economies of both Northern and Southern Nevada are strongly influenced by their relationships to the Western US, primarily those to Northern and Southern California, and asking how Nevada can capture spillover economic activity to create major metro freight hubs.

2.1 Assessment of the Freight System on Economic Activity

2.1.1 Overview

In 2012, a total of $150.0 billion in value and 146.9 million tons of freight either originated from or terminated in Nevada, equaling 0.75% and 0.86% of US totals, respectively. This is relatively proportional to its 0.89% share of the US population (NSFP, 2015). However, Nevada's exports, currently $7.7 billion, account for 0.5% of national totals and its imports, currently $7.8 billion, account for 0.3% of the US total; a much smaller proportion (US Census Bureau, 2014).

Based on these existing flows, Nevada is primarily a consuming economy (see Figure 3 below). This is likely linked to the lower-than-national-average share of manufacturing employment in the State. Additionally, although 56.5% of Nevada's tonnage flows are within the state, they account for only 29.6% of the value.

Moreover, inbound freight volume and value exceeds outbound movements at a two-to-one ratio, highlighting the potential for improvement in Nevada's export generation.

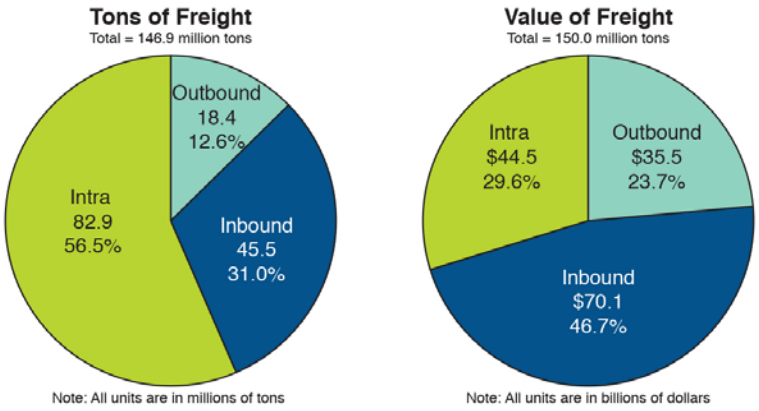


FIGURE 3
Nevada Statewide Freight Flows by Direction of Movement, 2012
These two charts depict the total outbound, inbound, and intra flows by tonnage (left) and value (right). A comparison between inbound and outbound flows reveals the imbalance between the two, with inbound being the dominant by both weight and value. Intra flows are dominated by weight and not value (Source: MG&A, 2015 based on: NSFP, 2015 – FAF3 data).

2.1.2 Major Corridors

The majority of Nevada's high performance freight infrastructure exists along two multimodal corridors: I-80 (plus local connector I-580) in the North and I-15 (plus local connectors I–215 and I–515) in the South.[1] Both corridors are regionally important multimodal and multi-jurisdictional networks that connect major clusters of freight activities, providing a foundation for supply chain operations and serving as major economic integrators of regional activities. For example, export manufacturing and distribution growth which are responsive to market connectivity.

2.1.2.1 The Northern Corridor

The Northern multimodal corridor is over 400 miles long through the state of Nevada, consisting of I-80 and Union Pacific (UP) Railroad's Overland route. This corridor originates in San Francisco and passes just south of Chicago on its way to its termination in New York, providing regional, national and global connectivity for the Reno-Sparks-Carson City area. Along this corridor in Nevada, there are 65 truck firms, three rail yards (one intermodal), industrial and distribution facilities (e.g. the Tahoe-Reno Industrial Center where the Tesla facility is being built), fuel storage depots, Reno-Tahoe International Airport and Elko Regional Airport. Neither the railway or highway elements suffer from significant traffic volume constraints within Nevada. However, routes crossing the Sierra Nevada Mountain Range produce seasonal impediments and added operating costs (RCG Economics, LLC & Schlottmann, A., 2012).

2.1.2.2 The Southern Corridor

The Southern intermodal corridor is over 100 miles long through the state of Nevada, consisting of I-15 and UP's South Central Route. This corridor originates in Los Angeles and goes north through Montana to Alberta, Canada providing connectivity for the Las Vegas metro area to the national and global marketplace. Along this corridor in Nevada are trucking terminals, 2 rail yards (one intermodal), industrial and distribution centers (e.g. T.J. Maxx distribution centers), fuel storage depots, and McCarran International Airport. The South Central rail route is generally unconstrained; however, sections of I-15 and local arterials in Las Vegas often experience major traffic delays (Velotta, 2014).

2.1.2.3 Other Corridors

A large amount of Nevada's road network consists of its other East-West routes: primarily two-lane undivided highways often extending through mountainous terrain and include US 93 on the Eastern side of the state, US 95 on the Western side, and US 50 traversing the middle of Nevada. There are five branch lines, primarily located in rural northern Nevada, that supplement Nevada's railroad system.

[1] Further information on these corridors can be found in their master plans, completed in 2014 and 2012, respectively.

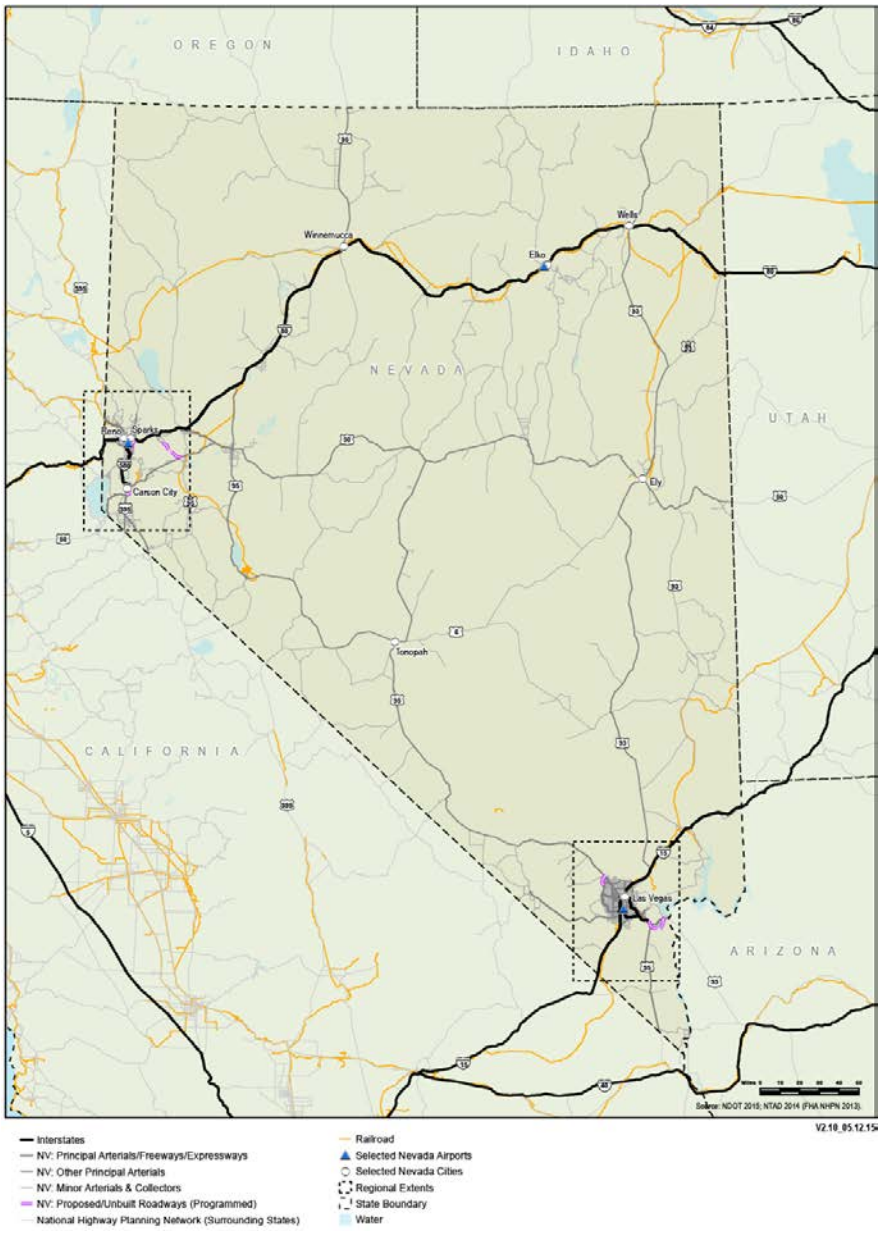


FIGURE 4
Nevada's Existing Freight System Infrastructure
This figure depicts the existing freight infrastructure in Nevada, including highways, railways, airports, and freight facilities and their connections to surrounding states. The regional extents are depicted in greater detail in ***Attachment*** *E, p. A-21 (Source: MG&A, 2015 based on Jacobs, 2013 data).*

2.1.2.4 The Missing Major Corridor: I-11

The I-11 and Intermountain West Corridor provides some fulfillment of the congressionally designated CANAMEX Corridor, which was originally intended to connect Mexico, the US, and Canada via the US 93 corridor to I-15. Rather than connecting from Las Vegas along I-15 to Salt Lake City, the I-11 study found a need to connect major activity centers through the Intermountain West, including Reno, thereby creating the vision of a new corridor between I-5 and I-15. Not only would the corridor create economic synergies between the two largest metros in Nevada, but it also has the potential to facilitate greater production sharing between Las Vegas, Phoenix, and Mexico. For example, North-South connectivity would provide a better connection between two major retail distribution facilities in the cities that trade goods on a daily basis via US 93 and receive their goods from Asia via the Los Angeles and Long Beach ports. Unlike trade with Asia, integrated production sharing between the US and Mexico has led to greater employment growth in manufacturing in both countries.

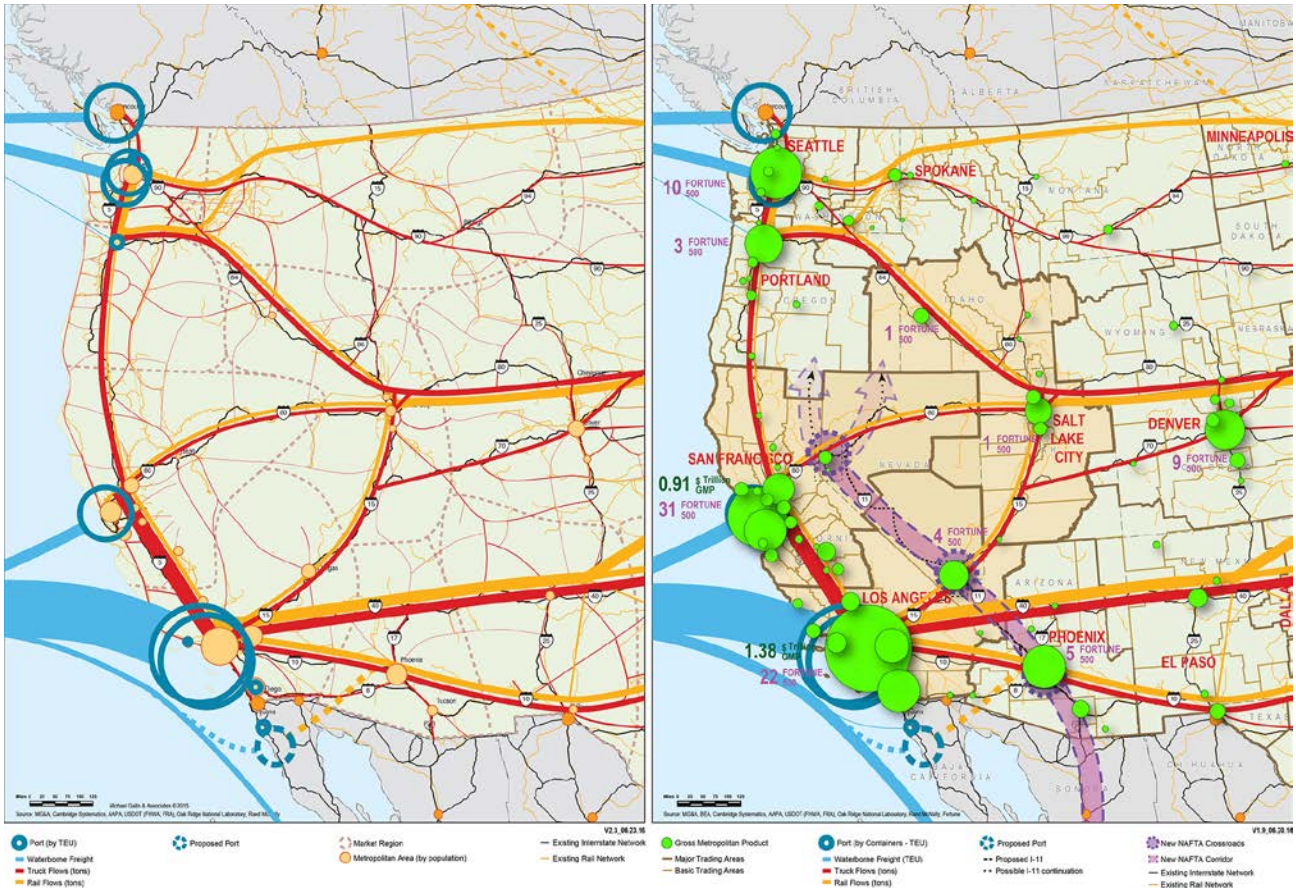
Most importantly, the proposed I-11 and Intermountain West Corridor would provide both Las Vegas and Reno with a strong Northwest-Southeast connection and could be the foundation upon which to facilitate

greater NAFTA trade. This would allow the population centers to become crossroads that could serve distribution functions, rather than simply points along the I-15 and I-80 corridors.

FIGURE 5

Creating the Future Corridor System of Nevada in the Western US

The image on the left depicts current freight flows in the Western US, showing that Nevada's major metros of Las Vegas and Reno are simply stops along corridors, while the image on the right depicts a potential new future with Nevada's major metro hubs as crossroads having NAFTA connectivity and increased market access. Larger versions of these diagrams are found on pp. 3-1 and 3-2 (Source: MG&A, 2015 based on USDOT, (FHWA, FRA), AAPA, Oak Ridge National Laboratory, Rand McNally, Census Bureau, Bureau of Economic Analysis, Fortune data).



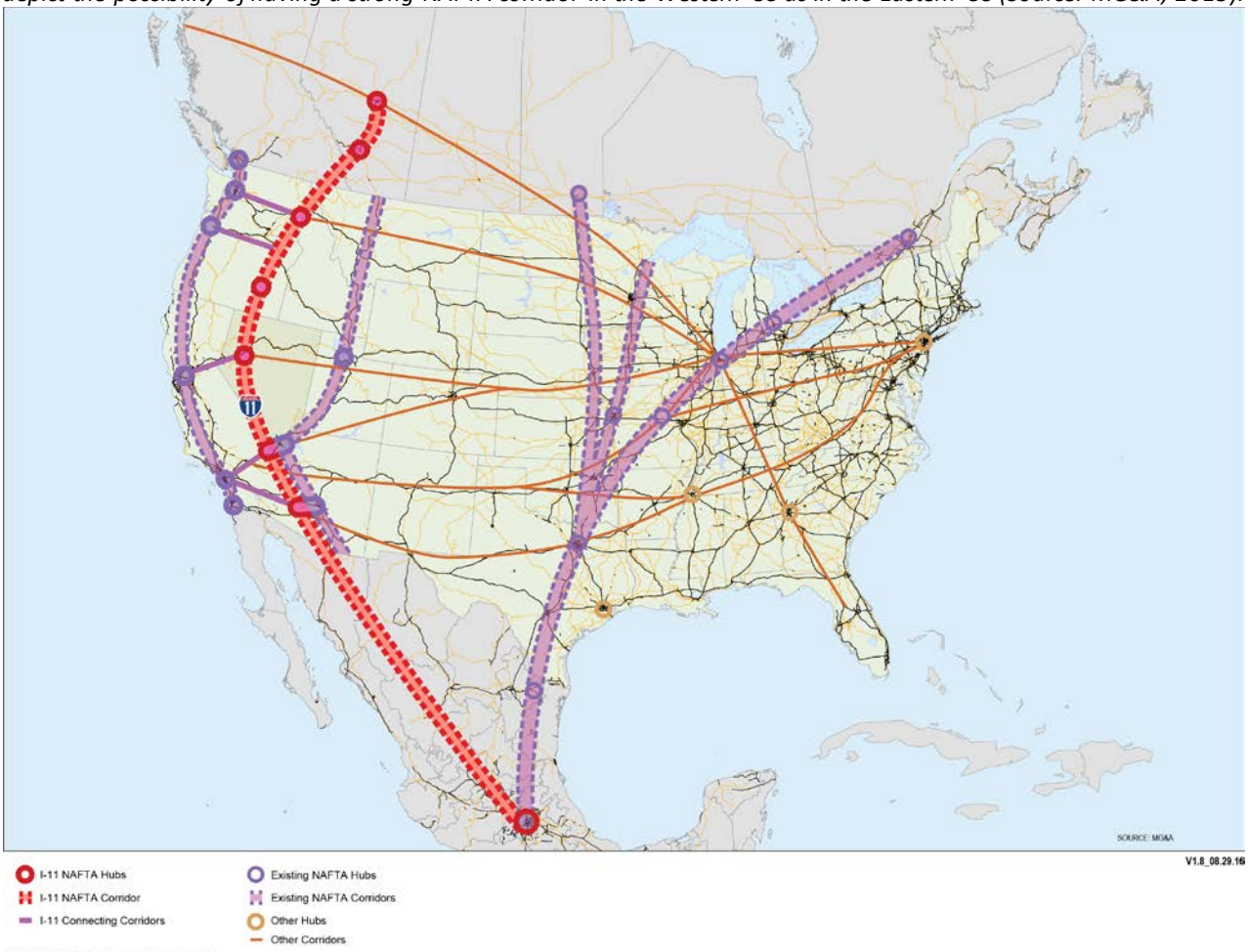
The West Coast corridor that extends from Southern California to Vancouver is a short corridor that does not extend far into Mexico or Canada at either end. At the south end, it connects to Mexico in Tijuana and Ensenada, but not to Baja California as it is a peninsula with very little settlement. At the north end, it is blocked just past Vancouver because of the mountainous terrain. As such, it is not a truly international corridor linking the three NAFTA nations.

The I-11 corridor could extend from Mexico City, the central hub of the Mexican economy, and further to reach a greater portion of the Western Canadian economy by connecting to Edmonton and Calgary. Because of the greater access to the Mexican and Canadian economies, I-11 has the potential to become a continental trade corridor feeding the Western US metropolitan areas.

FIGURE 6

Conceptual Diagram of the Western NAFTA Corridor in the National Context

This conceptual diagram depicts the Eastern US NAFTA Corridor and the potential for I-11 to be part of a Western US continental corridor. Within this conceptual configuration, the West Coast Corridor, I-5, would function as an arterial distributor, while I-11 would become the continental super highway connecting the three nations of North America. It is important to note that this is a conceptual diagram that does not show exact alignments, but is rather intended to depict the possibility of having a strong NAFTA corridor in the Western US as in the Eastern US (Source: MG&A, 2015).



2.1.3 Trading Partners

Analysis of the largest trading partners for Las Vegas, Reno, Carson City, and the remainder of Nevada reveal and emphasize the strong relationships with California and other Western states. Las Vegas' total trade value was $55.469 billion, while Reno and Carson City combined totaled $39.062 billion, and the remainder of the state traded $23.666 billion (Brookings, 2013). In Las Vegas, 12 of the 25 largest trading partners were located in the Western US, with 4 in Northern California and 2 in Southern California. In Reno and Carson City, 16 of the 25 largest trading partners were located in the Western US, with 6 in Northern California, 3 in Southern California and 1 being the remainder of California. In the remainder of Nevada, 12 of the 25 largest trading partners were located in the Western US, with 4 in Northern California and 2 in Southern California. These numbers show that Las Vegas is closely tied with Southern California while Reno and Carson City are more closely tied with more market areas in Northern California totaling a higher value than their trade with Southern California markets. The remainder of Nevada has higher value of trade flowing between it and Southern California, but is connected to more markets in Northern California than in Southern California.

TABLE 1

Total Trade with 25 Largest Trading Partners

The Brookings Institution has released a vast amount of new data that shows goods movements from city to city, including the value of goods traded, all commodities, for 449 market geographies. The three tables below highlight the 25 largest trading partners by value for Las Vegas, Reno and Carson City combined, and the remainder of Nevada. Trade within Nevada is highlighted in yellow, while trade between Nevada and Western US regions is highlighted in beige. The data for Reno and Carson City was combined for the purposes of this NSFP analysis (Source: Brookings, 2013).

Total Trade between Las Vegas and Largest Trading Partners			Total Trade between Reno / Carson City and their 25 Largest Trading Partners			Total Trade between the Remainder of Nevada and its Largest Trading Partners		
Rank	Trading Partner	Value $bn	Rank	Trading Partner	Value $bn	Rank	Trading Partner	Value $bn
1	Los Angeles, CA	10.922	1	Los Angeles, CA	3.538	1	Los Angeles, CA	2.338
2	Phoenix, AZ	3.580	2	Sacramento, CA	2.625	2	Salt Lake, UT	1.684
3	Riverside, CA	2.324	3	Nevada (remainder)	2.013	3	Reno, NV	1.334
4	New York, NY-NJ-PA	2.182	4	Salt Lake City, UT	1.378	4	Ogden, UT	0.853
5	China	1.992	5	Seattle, WA	1.320	5	Sacramento, CA	0.683
6	Chicago, IL-WI-IN	1.248	6	San Jose, CA	1.296	6	Carson City, NV	0.679
7	Salt Lake City, UT	1.045	7	San Francisco, CA	1.221	7	San Jose, CA	0.661
8	San Diego, CA	0.847	8	New York, NY-NJ-PA	1.035	8	China	0.617
9	Seattle, WA	0.791	9	Btwn Reno & Carson City	0.897	9	Las Vegas, NV	0.612
10	Mexico	0.784	10	Stockton, CA	0.867	10	San Francisco, CA	0.585
11	PA (Remainder)	0.782	11	China	0.840	11	Utah (Remainder)	0.523
12	Canada	0.706	12	Las Vegas, NV	0.801	12	New York, NY-NJ-PA	0.516
13	AZ (Remainder)	0.694	13	Phoenix, AZ	0.669	13	Houston, TX	0.493
14	Reno, NV	0.662	14	Dallas, TX	0.555	14	Seattle, WA	0.458
15	Oxnard, CA	0.637	15	Modesto, CA	0.554	15	Canada	0.448
16	Philadelphia, PA-NJ-DE-MD	0.637	16	Riverside, CA	0.503	16	Dallas, TX	0.431
17	Minneapolis, MN-WI	0.615	17	California (remainder)	0.498	17	Phoenix, AZ	0.422
18	Nevada (Remainder)	0.612	18	Chicago, IL-IN-WI	0.494	18	Riverside, CA	0.382
19	San Jose, CA	0.588	19	Portland, OR-WA	0.490	19	Chicago, IL-IN-WI	0.319
20	Dallas, TX	0.588	20	San Diego, CA	0.439	20	Savannah, GA	0.277
21	San Francisco, CA	0.564	21	Fresno, CA	0.423	21	Mexico	0.221
22	Japan	0.531	22	Philadelphia	0.378	22	Detroit, MI	0.219
23	Bakersfield, CA	0.494	23	Oregon (remainder)	0.375	23	Portland, OR-WA	0.204
24	Detroit, MI	0.491	24	Canada	0.356	24	Japan	0.201
25	Denver, CO	0.451	25	Ogden, UT	0.351	25	Stockton, CA	0.201

2.1.4 Modal Analysis

2.1.4.1 Trucking

Goods carried by trucks in metropolitan areas are non-metallic minerals and non-metallic mineral products, many of which are used in construction (e.g. sand, gravel, building stone, and cement). Trucks also carry waste generated in metropolitan areas to landfill locations. Among the high-valued goods, trucks carry a majority of the manufactured goods (e.g., machinery, electrical and electronic equipment, apparel and accessories, and miscellaneous), pharmaceutical, other chemical products, and mixed freight.

Trucking is the essential or preferred mode for most Nevada movements, accounting for over 78% in value and 83% in tonnage of the total freight flows (NSFP, 2015). Trucks are flexible, ranging from large 18-wheelers to small service vans. As a result, for-hire truckers provide door-to-door service to warehouses, retail outlets, and householders; heavy hauling for Nevada's mining, construction, and waste industries, and specialized intermodal services between seaports and rail yards. They also make final deliveries of high value air freight and small packages.

Shippers of extra heavy loads and/or weights beyond the national interstate limits have a twofold Nevada advantage. Nevada is part of a 16-state Western alliance that allows the movement of larger heavy vehicles with special permits along designated multi-state routes and has its own in-state permitting system that allows higher limits on an exceptional permitted basis.[2]

FIGURE 7

Western US Highway Freight Flows, 2010

This map depicts the volume of freight flows on interstate and non-interstate highways. The highway freight flows in California are much larger than those across the rest of the Western US, while flows along I-40 and I-10, as well as I-15 from Salt Lake City are also significant. Flows in Nevada are relatively much smaller in tonnage along I-80 and I-15 (Source: MG&A, 2015 based on USDOT, FHWA data).

[2] For more information, see http://www.dmvnv.com/mcpermits.htm

2.1.4.2 Rail

Rail is a lifeline for the natural resources and mining industry and the scrap metal industry. With the exception of a few ores and minerals, such as gold, mined resources are generally low-valued goods. Rail also brings essential commodities into Nevada from outside the state; for example, delivering coal, wood products, paper, grain, and other agricultural products, which have limited or no local supply. A small volume of imported manufactured goods, mixed freight (a variety of household and office supplies) and automobiles also are moved by intermodal rail service. However, large volumes of this high value rail freight move past Nevada's metro areas between California and major Midwest or Eastern intermodal hubs, such as Chicago. As congestion grows within the communities surrounding California major ports in particular, greater rail intermodal may be essential to maintain and grow Nevada's external markets.

Nevada's primary rail corridors generally run Southwest to Northwest across the state and also include supplemental branch lines. UP operates both the Northern and Southern corridors. As a condition for merger approval, BNSF has trackage rights on nearly three quarters of the UP routes in the state. A two-route northern corridor serves Reno, as well as other northern Nevada communities, and connects with Salt Lake City and Denver to the east and with Sacramento and San Francisco to the west. The southern corridor serves Las Vegas and connects it with Salt Lake City to the northeast and with Los Angeles to the southwest. Although there are intermodal yards serving both Reno and Las Vegas, these yards are very small and handle diminutive amounts of freight.

Nevada is essentially a pass-through state, with 92% of its mainline freight rail traffic consisting of through shipments traveling to and from the coastal ports and metro areas of California. There are rail intermodal and transloading facilities on these lines, but they are small. Their size and layout limit the prospects for expansion by splicing freight onto trains with other origins and destinations in Nevada (RCG Economics, LLC & Schlottmann, A., 2012). In 2012, the rail-only mode handled only 1.3% ($2,000,000) in value and 8.0% in tonnage (11,700 tons) of the total freight flows for Nevada. Future 2035 projections see only modest growth in Nevada's rail freight services. However, the commodities handled, generally raw materials or construction products, are the base components to manufactured products of much higher value.

FIGURE 8

Western US Railroad Freight Flows, 2010

This map depicts the volume of freight flows on railroads in the Western US. It is significant that much of the railroad freight flow from Southern California travels along I-40 just south of Nevada (Source: MG&A, 2015 based on Surface Transportation Board data).

2.1.4.3 Ocean and Foreign Trade

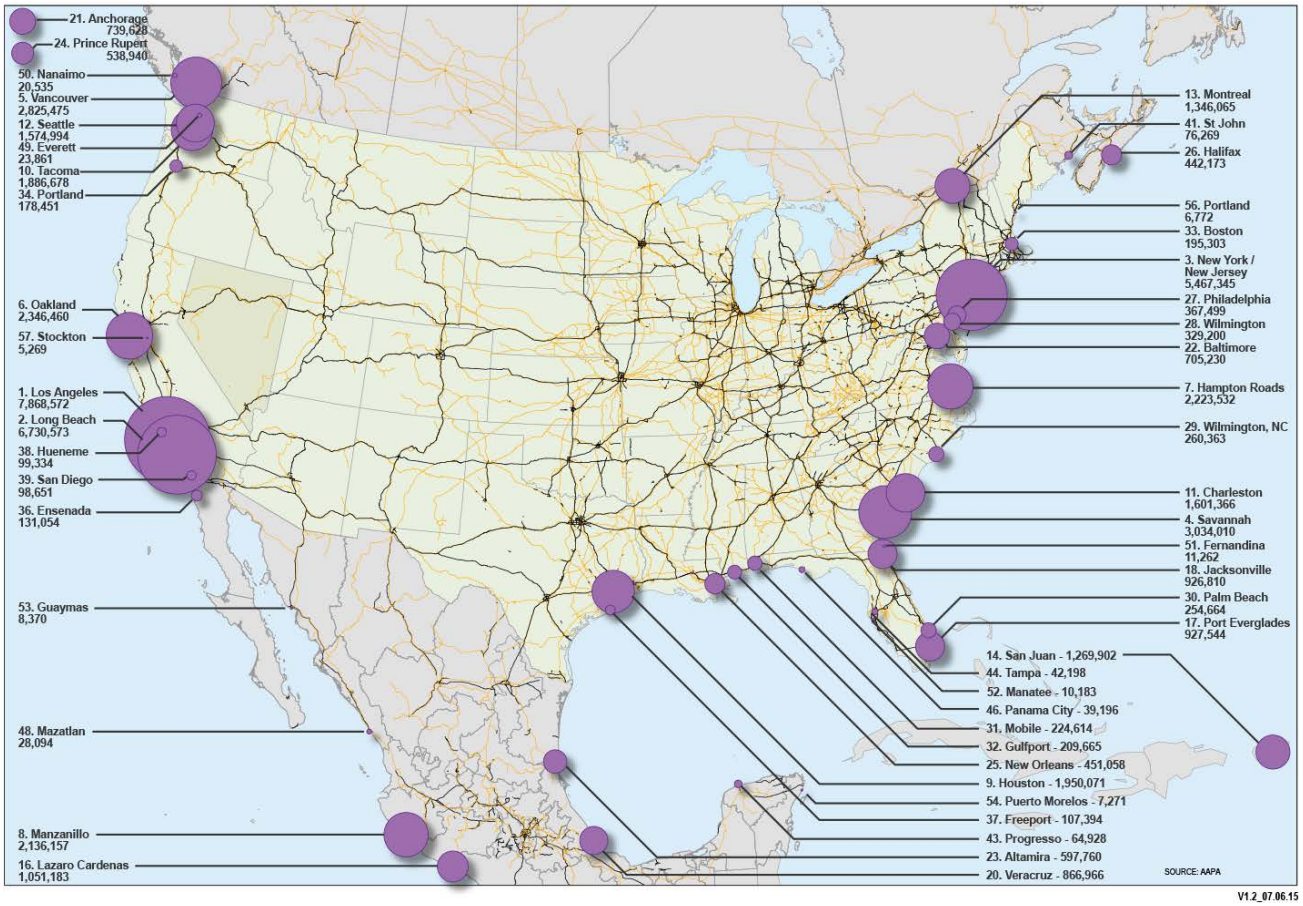
Approximately 95% of the world's population and 80% of the world's purchasing power are beyond US borders (US Chamber of Commerce, 2012). Thus, future economic growth and jobs for Nevada and America increasingly depend on expanding trade and investment opportunities in the global marketplace. Access to foreign markets already brings great value to the Nevada economy. Imports and exports (including Canada and Mexico trade) total over $15 billion and the Commerce Department estimates that Nevada exports accounted for nearly $7.7 billion in value and over 30,000 jobs in 2014 (International Trade Administration, 2015). Trade related jobs tied to both exports and imports (including services), grew 4.9 times faster than total Nevada employment from 2004 to 2013 and Nevada's goods exports have grown more than four times faster than state GDP since 2003 (Thomas, 2015).

Nevada's connection to overseas trade comes through West Coast seaports, particularly through California's major ports and Seattle/Tacoma. Nevada is well positioned with five of the nation's top 10 ports (or top 12 North American ports) by container volume two delivery days or less away: Los Angeles, Long Beach, Oakland, Seattle, and Tacoma. A review of 2011-2014 US trade statistics underscores Nevada's favorable geographic position relative to these Asian trade oriented ports. Four of the state's top seven major export partners by value include China, India, Japan, and Hong Kong, and six of its top 10 imports customers include China, South Korea, Taiwan, Malaysia, India, and the Philippines (US Census Bureau, 2015). China is Nevada's leading international trading partner with over $3.8 billion in two-way trade, and approximately half of Nevada's top 25 import and export trade partners are countries located in Europe and the Middle East, with Israel (US Census Bureau, 2015).

FIGURE 9

North American Ports by Container Traffic, 2013 (TEU)

This figure ranks and depicts the relative size of North American ports by their 2013 container traffic in TEUs (Source: MG&A, 2015 based on AAPA data).



The importance of Eastern markets and ports may gain greater significance if the locus of US overseas trade shifts away from China to production points in Southeast Asia and the East Coast of South America, which are more efficiently accessible by East Coast all water services using the Suez Canal. Such a potential market shift is likely to be of greater significance to Nevada than the 2016 opening of the expanded Panama Canal. In fact, much of the shift to the East Coast has already taken place over the last decade because of existing cost or service advantages. Issues like longer ocean shipping times, withheld inventory in transit, high transit fees for Canal use, and higher or equivalent unloading costs on the East Coast limit prospects for diversion.

Another limiting factor is the continued growth of the size of single container ships in the world's fleet. The maximum size of vessels that can traverse the expanded Panama Canal is approximately 12,000 TEUs, while ships that can sail the Pacific to the West Coast ports can carry 18,000 TEUs. Moreover, ports on both the East and West Coast are struggling with flow delivery issues resulting from changes in the flow of containers through the port platform and out the gate. It is unclear how all of these factors and others will ultimately resolve themselves in the supply chain. However, it is clear is that accessibility to the intermodal network and inland hubs will be an important advantage in assuring regional freight access to ports on either coast.

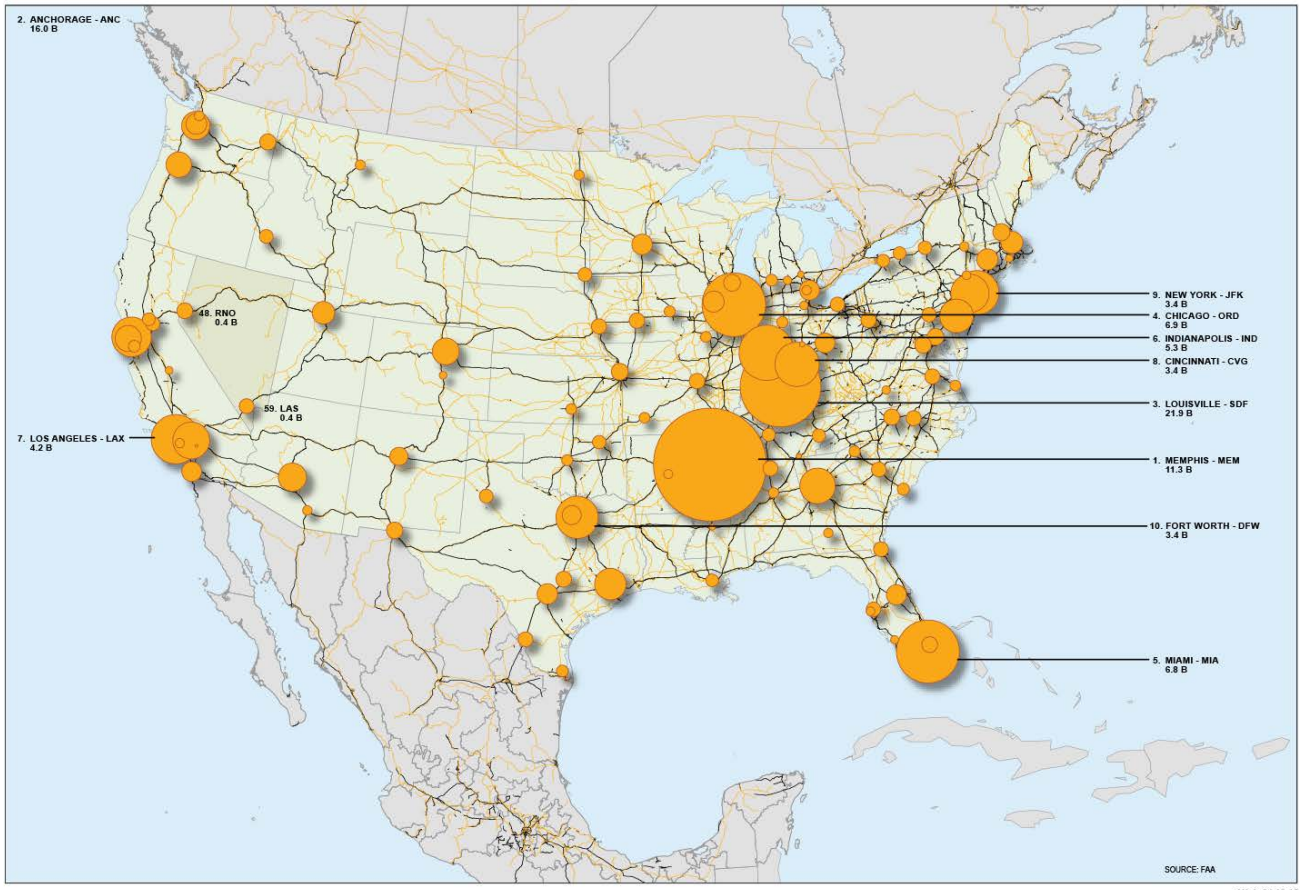
2.1.4.4 Air

General characteristics of air cargo commodities include: perishable, short-shelf life, high value to weight ratio, higher security requirements, and less predictable on demand profile. Nevada's economy does currently not produce large quantities of air commodities. Commodities moving by air and handled by truck for final deliveries (including multiple modes and mail) account for less than 3% of the volume of all Nevada freight flows, however they produce over 17% of total value (NSFP, 2015).

FIGURE 10

Airports by Total Landed Weight of All-Cargo Aircrafts, 2013

This figure depicts the relative size of cargo functions at US airports, ranking the airports by total landed weight of all-cargo aircrafts. The size of the dot is relative to the number of pounds (Source: MG&A, 2015 based on FAA data).



FedEx and UPS largely carry air cargo in Nevada, accounting for a combined 74% of the state total (USDOT; US Census Bureau, Foreign Trade Statistics). Nevada's international air exports are largely handled by LAX, at 28% of the state total (USDOT; US Census Bureau, Foreign Trade Statistics). According to 2013 statistics, McCarran International Airport (LAS) ranked 38th in North American air-cargo tonnage, likely a result of the fact that it is a service-oriented economy which does not drive the density of air cargo as manufacturing economies do (ACI-NA). Outside of integrated carriers, Reno-Tahoe International Airport (RNO) is dominated by narrow body air services that have limited carrying capabilities and ranks 60th amongst North American airports (ACI-NA). For further information, *Attachment F* contains an in-depth overview of Air Cargo at the global and national scale.

Both RCG Economic's Inland Port study and recent interviews with Reno-Tahoe Airport staff indicate that there is sufficient on ground capacity to grow the size of this market. Also, Reno-Tahoe International airport is further west than Los Angeles and more north than San Francisco, making it closer for air freight from Asia traveling over Alaska, providing a potentially huge competitive advantage for the region (Baumer, 2013). However, major growth in this area would be predicated on greater economic activity to demonstrate that there are sufficient volumes to make service to the market more attractive to the airlines. Nevada has developed primarily an import economy, but is also within trucking distance of the LAX and SFO markets, and so could develop its export function. Air cargo, like most Nevada freight flows, is heavily inbound with much smaller product headed out. However, companies like Medco and Amazon are taking advantage of this current reality to obtain favorable rates for nationwide distribution of their product. As McCarran has numerous international air city-pairs, there is underutilized potential to capture the wide belly capacity of passenger aircrafts for increased air freight.

2.1.4.5 Intermodal Rail

Intermodal services, including transfers from ocean carriers to railroads, air cargo to trucks or domestic truck to rail, are of themselves unique modes of transport that have major efficiency and environmental benefits. Therefore, this combination of service should be taken into account in freight planning.

The importance of rail connections to major ports on the East and West Coast cannot be understated. Beginning in the 1990s and with the advent of double-stacked rail services, ports and the railroads have made cumulative investments in the billions to improve their connectivity. Ports have expanded their facilities to handle steady growth in overseas trade, particularly from China, while the railroads have responded by providing efficient, reliable, and truck-competitive services to major inland markets particularly to national distribution hubs such as Chicago or Atlanta. Ever larger ships, high-speed cranes, and increasing ocean terminal and rail yard automation create competitive economy of scale network connections between high volume intermodal hubs.

As intermodal transfer efficiencies increase, the cost-effective distance for truck competitive rail service has decreased. West Coast railroads view intermodal services most competitive on trips over 500 miles, typically over 1000 miles. This is disadvantageous for both of Nevada's major hubs. On the other hand, East Coast railroads see intermodal opportunities within 500 miles on less busy traffic lanes. Intermodal rail services are at the top or close to the top of revenue generators for most railroads.

A strongly emerging growth trend in the intermodal rail sector is the transloading of ocean-originated freight from 40-foot marine containers into 53-foot domestic rail boxes. For most consumer products, the contents of three ocean containers can be shipped within two 53 footers. Transloading allows postponement of the routing of overseas goods until they arrive at the port instead of making the distribution arrangements from the point of foreign origin to domestic delivery. This gives company logisticians greater time to get the goods to where domestic demand is the highest.

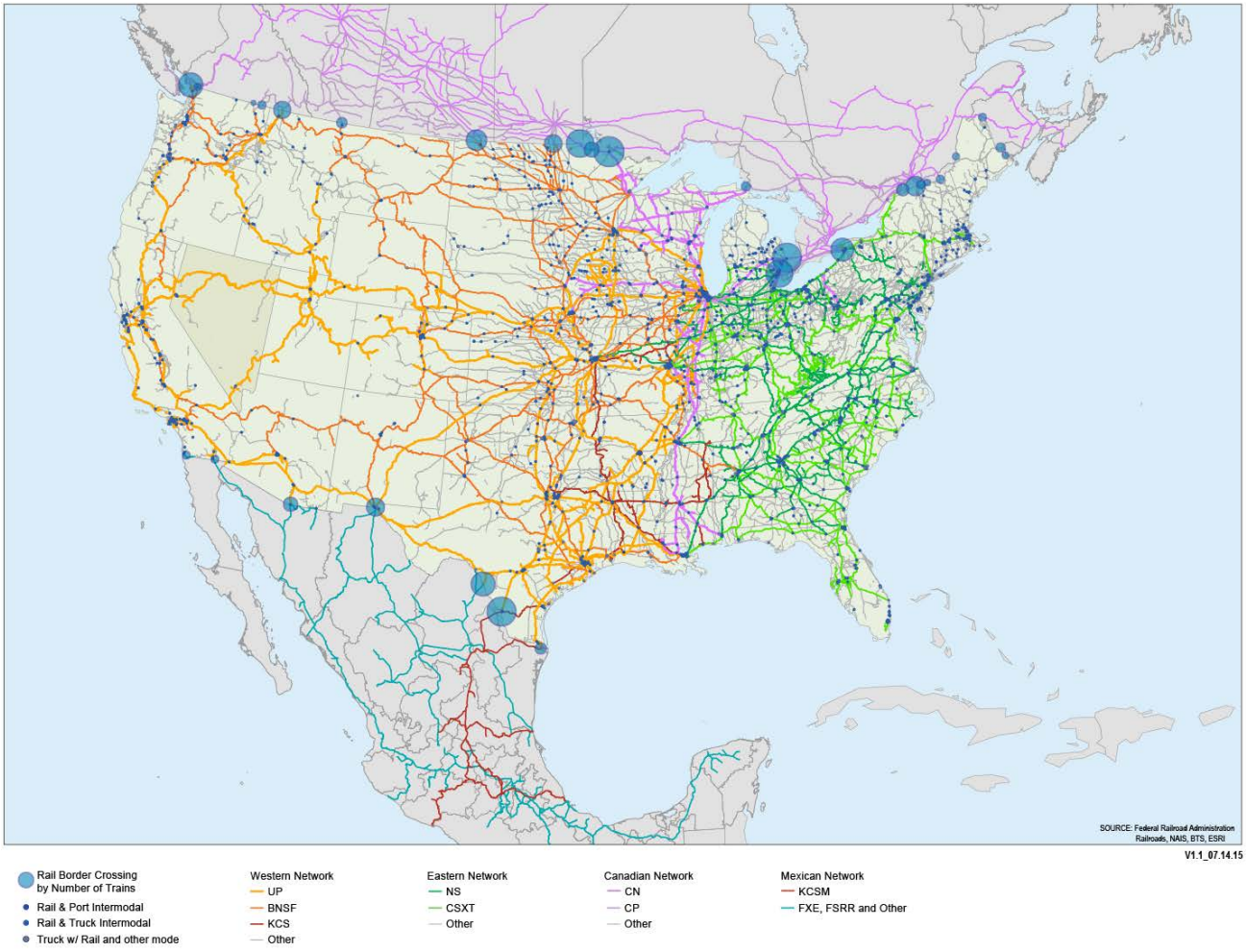
Although transloading occurs at many ports, Southern California is the epicenter of transloading in North America, with facilities concentrated at the Inland Empire. More than 40 percent of all US containerized imports from Asia move through Los Angeles-Long Beach (Mongelluzo, 2014). The ports also benefit from

frequent and extensive intermodal rail services and ample supplies. Transloading of marine containers to domestic rail accounted for a record 47.7% of all shipments moved by rail from Los Angeles-Long Beach up from 33.2% in 2006 (Mongelluzo, 2014).

FIGURE 11

The North American Intermodal Rail System

The map below highlights the conductivity between the North American intermodal rail system and major seaports and border crossings. It also depicts the ownership of rail lines across the continent, with the Canadian National railroad purchasing lines in the US to Chicago and New Orleans giving them port access to the Caribbean, and Kansas City Southern purchasing lines in Mexico to Mexico City and to Pacific and Caribbean ports. The US intermodal pattern below emphasizes the large gap between the northern and southern Nevada logistics hubs (Source: MG&A, 2015, based on FRA, NAIS, BTS, ESRI data).

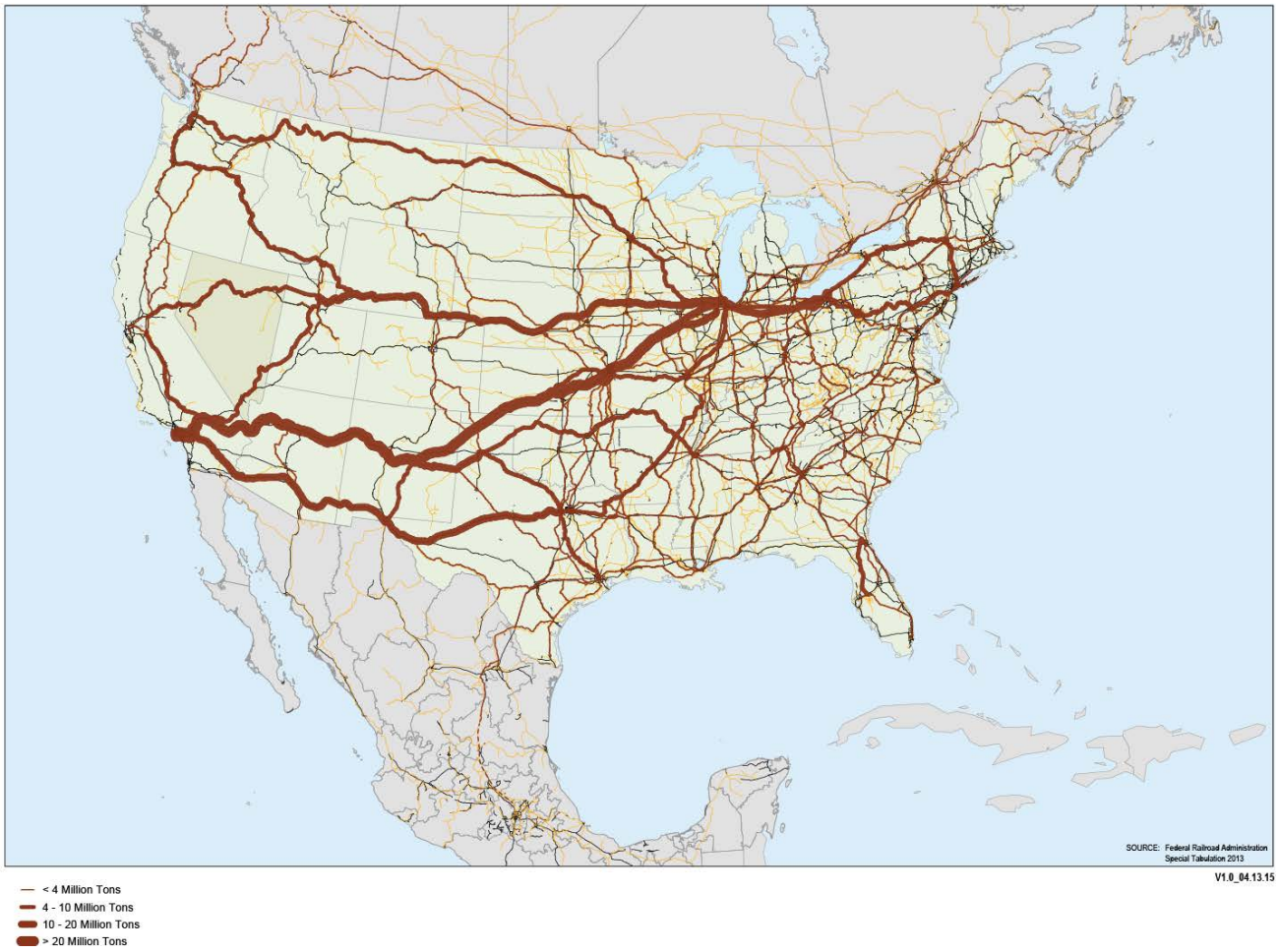


As shown in Figure 11 above, both Reno and Las Vegas are on major national intermodal rail lines. A major investment in state-of-the-art intermodal terminals would be necessary to serve and attract shippers to both metro areas. However, an interim intermodal base of business could be developed for Nevada metro customers through efficient trucking connections to California rail yards (e.g. Lathrop Yard near Stockton).

FIGURE 12

North American Rail Intermodal Freight Flows, 2011 (Tons)

This figure depicts 2011 trailer-on-flatcar and container-on-flatcar rail intermodal movements across North America by tons. It is evident that the largest flows come from the Southern California region to Chicago and the Northeast as well as a smaller but still significant flow to Dallas along I-10. Flows from Nevada and the Northwest merge in Salt Lake for distribution or to head east to Chicago (Source: MG&A, 2015 based on FRA Special Tabulation, 2013 data).



2.1.4.6 Pipelines

Much of Nevada's energy supply is provided through 86 miles of refined petroleum products pipelines connecting at Reno to the North and 160 miles of pipeline connecting at Vegas to the South. These pipelines are important to meeting the fuel needs of the aviation industry, both domestic and military (i.e. Nellis Air Force Base). An additional 1900 miles of pipeline run through the state and are a matter of concern given potential negative environmental consequences from service disruption (Jacobs, 2013).

2.2 Nevada in a National Context: Urbanization & Economy

The freight logistics network of Nevada serves its urban and rural areas. Nevada, once a state of primarily tourism, resource extraction and agriculture, is beginning to increase manufacturing and technology industry bases, adding important economic components that continue to alter the demands on its freight logistics system. Understanding its pattern of urbanization and economy are important to understanding the future demands that will emerge for the freight logistics system.

2.2.1 Urbanization

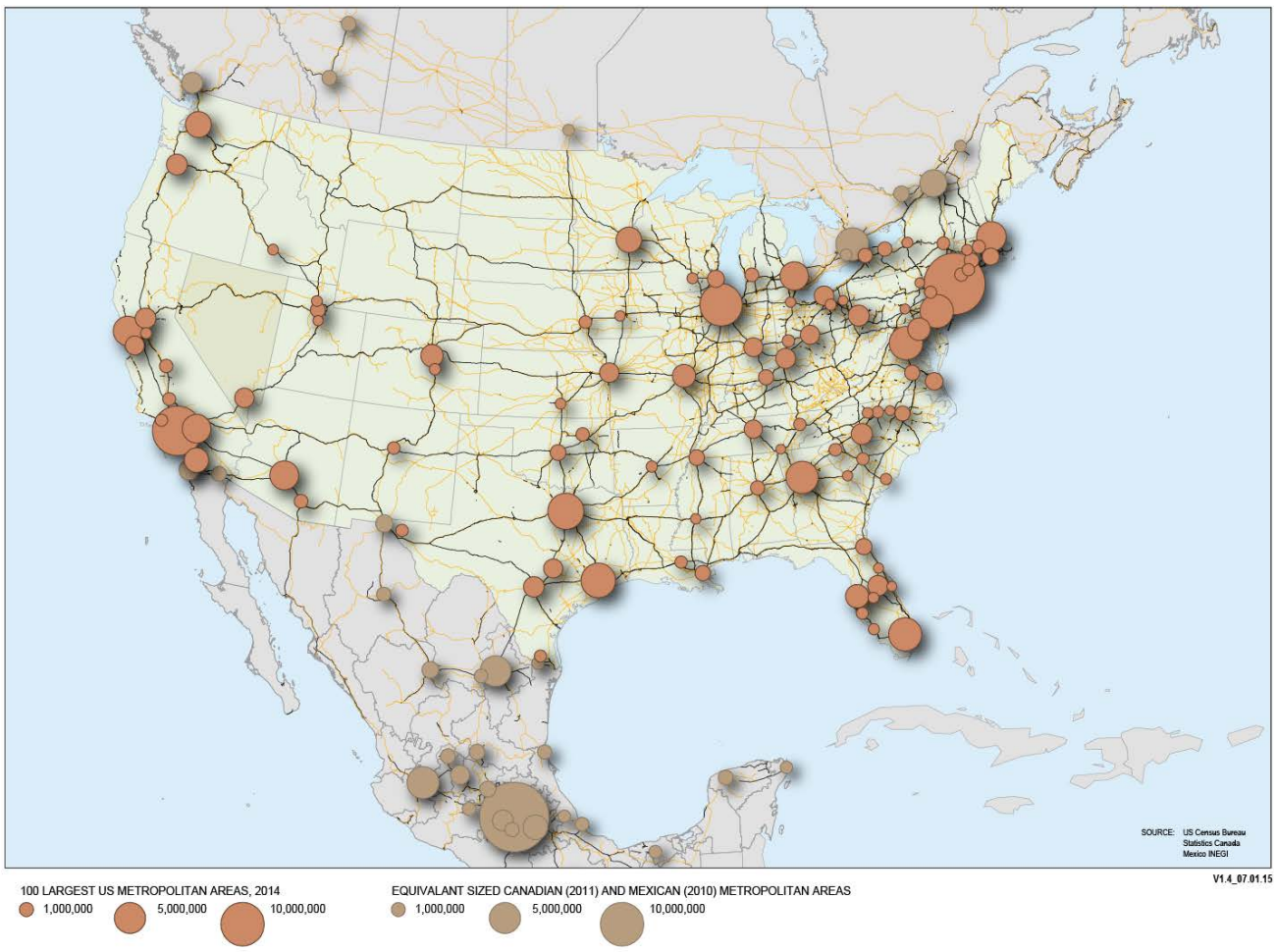
Nevada is part of the widely spaced network of urban areas in the Western US. The largest urban center is located in the southern part of the state, the Las Vegas metropolitan area composed of 4 cities that have

grown together to become one continuous urbanized area within Clark County. The second largest concentration of population is found in the Northern part of the state, however, the pattern of urbanization is significantly different as it represents more a network of cities than a single large cluster. In Nevada, the Las Vegas-Henderson-Paradise was the only metro area to make the top 100 in terms of population, ranking 30th with 2,069,681 residents. The cities of Reno and Sparks have grown together to form one continuous urban area. However, while this core area is the largest concentration in the North, it is part of a larger network that extends to Carson City to the South, Incline Village at Lake Tahoe and East towards Fernley. Reno ranks 116th, with a much smaller 443,990 people and Carson City is the smallest classified metro area ranked 381st with 54,522 people. Just nine miles east of Reno-Sparks along I-80 is the Tahoe-Reno Industrial Center (TRIC) that is emerging as the world's largest industrial park and a growing employment center for the Northern Nevada urban network. Of the total state population, these three metro areas make up over 90%, with Las Vegas contributing the vast majority, at 73%, and Reno-Sparks-Carson City contributing approximately 18%. The Eastern part of the state is characterized as a set of smaller urban areas clustered along the State's two primary corridors, I-80 and I-15, with a number of small cities and towns serving the mining and agricultural businesses located throughout the area.

FIGURE 13

100 Largest Urban Areas, 2014

This map highlights the 2014 top 100 largest metro areas in the US by population. The top 10 largest MSAs are: New York, Los Angeles, Chicago, Dallas, Houston, Philadelphia, Washington, Miami, Atlanta, and Boston. The Northeast is the most populous region in the US, with the New York-Newark-Jersey City metro having by far the greatest population of any urban area at 20,092,883. California, adjacent to Nevada, is the most populous state in the US, holding the second and 11th largest metro areas of Los Angeles-Long Beach-Anaheim at 13,262,220 and San Francisco-Oakland-Hayward at 4,594,060 (Source: MG&A, 2015 based on US Census, Statistics Canada, & Mexico INEGI data).



By 2007, more than 50% of the world's population was living in urban areas and that number is projected to surpass 70% by 2050 (Site Selection Magazine & IBM Global Business Services, 2013). As in at the global scale, census maps showing historical population distribution of the United States demonstrate the westward expansion and increasing urbanization of the nation. In fact, approximately 80% of US residents live in urban areas that are increasingly larger and denser, with the total expected to reach almost 90% by 2050 (UN Department of Economic and Social Affairs, 2014). With such a vast majority of individuals and families living in urban areas, cities are viewed as the drivers of economic growth and their competitiveness increasingly important (Site Selection Magazine & IBM Global Business Services, 2013).

It is clear that metro and micro areas are unequally distributed across the nation. The geographic pattern, the spacing between them, and the relative sizes are significantly different in the Eastern US than in the Western, as divided by the Mississippi River. East of the Mississippi, metro and micro areas are more evenly spaced in a denser pattern with closer proximity to each other. The largest and densest clusters are in the Northeast and Upper Midwest. The area west of the Mississippi can be divided into two basic divisions: 1) between the Mississippi River and a line formed by the I-35 starting in San Antonio and continuing Northward through Dallas to Kansas City and Minneapolis; 2) West of I-35 to the Pacific Ocean where the metro and micro areas are widely scattered between vast areas of low density, with the exception of two dense clusters around and between the Los Angeles and San Francisco metro areas. Within this zone, there is a high degree of isolation between the metro areas, where largely rural areas surround single large metros or urbanized corridors, resulting in a very dispersed and fragmented market. This wide spacing translates to higher transportation and freight operation costs for businesses as compared to the East Coast.

2.2.1.1 Population Growth

The pattern of growth across the United States has significantly changed since the Great Recession that began in 2007. In the period of recovery, a new pattern of growth has emerged, with some of the fastest growing states and metropolitan areas, especially those in Nevada, exhibiting a slowdown of growth while others are exhibiting greater increases. The Western US was one of the fastest growing areas in the US and the metropolitan areas of Las Vegas and Phoenix were among the top 10 metros (over 1 million) in growth. However, since 2010, growth in Nevada and Arizona has slowed compared to its previous rate, yet they still remain rapidly growing metropolitan areas.

Between 2000 and 2009, the Southwest and Intermountain West metros were among the fastest growing of large metros (over 1 million) in the US, along with the Lower Midwest and Southeast. Between 2000 and 2009, the top 10 metros in terms of percentage growth with populations over one million in order were: Las Vegas, Austin, Phoenix, Charlotte, Atlanta, Riverside, Orlando, Dallas, Houston, and San Antonio. However, since 2010, the pattern of population growth has shifted, revealing that the Lower Midwest and Southeast are again the fastest growing. Las Vegas has fallen from the fastest growing large metro (over 1 million) to the 16th in terms of percentage growth and 22nd in terms of absolute growth, while Reno is yet slower at 88th and 99th, respectively.

2.2.1.2 Population Impact on Freight Patterns

Freight transportation as a derived demand is driven by the base of consumers and the inputs and outputs of manufacturing and distribution resources. Nevada as a state, and even its metro hubs, are comparatively low in population and industrial/distribution output than the larger metro markets in Southern and Northern California as well as metro areas in Utah and Arizona. In this context, larger metro centers tend to provide the base for manufacturing and distribution that is consumed by the smaller region. This is indicated by the large spread of inbound with respect to outbound freight in Nevada.

Freight service times are the limiting factor for Nevada's metro areas to serve the larger market area in the Western US. Thus, to bolster a competitive advantage for the delivery of goods that Nevada produces or may distribute beyond its borders, it must develop a competitive advantage by providing lower cost and more efficient services.

A competitive advantage the state now enjoys is that its current infrastructure is largely uncongested and has future capacity. Its population continues to grow albeit at a less frantic pace that took place earlier in the century. The high cost of bringing goods into the state creates backhaul advantages for products produced and distributed from Nevada. As congestion builds in major nearby hubs and as population and business move further inland to escape this congestion, Nevada's reach as a distribution point increases. Nevada has comparatively good access to West Coast port facilities and its tourism industry attracts airport services, which provide a basis for an expanded air distribution role.

2.2.2 Economic Activity

Large metropolitan areas and smaller cities and towns represent the concentrations of production and consumption that form the basic market areas served by the transportation network. Building up the export component of the Nevada state economy is one of the important drivers of the future freight system, as all economic activity requires getting products to market. Building the strength of Nevada's metros within the global supply chains, from producer to consumer, is one of the important factors in establishing a competitive advantage. Without greater export functions, Nevada's freight logistics infrastructure will essentially remain a service in support of industry and not a foundation for the attraction of new industry. The World Bank's *Connecting to Compete* report (2014) states "supply chains are the backbone of international trade and commerce." The report clearly establishes that improving logistics performance is fundamental to economic growth and competitiveness (The World Bank, 2014).

Moving products efficiently and reliably to market requires nations, states, and metro areas to reduce trading costs and adopt policies that support trade. In fact, countries that want their firms to move up in global and regional value chains must provide the conditions for predictable and reliable supply chains (World Bank, 2014). This same concept can be applied to states and metropolitan areas, as they must also develop reliable and cost efficient systems. The networked structure of global and regional trade means that small disruptions at one point can spread to other points and those countries that do not provide such conditions will become increasingly disconnected from world markets (World Bank, 2014). Though cities do not move, trade patterns do, and they move towards the points of greatest efficiency. In this context, it is important for Nevada to strengthen its connection to the global freight network in order to strengthen its competitive position.

Targets for Nevada Growth Found in Export Trade Statistics

Unlike most states and the nation as a whole, Nevada's international trade is generally in balance with respect to imports and exports; large import deficits in the China trade are offset by the export of gold to Switzerland. A Nevada-favorable trade pattern is indicated in the top 25 six-digit HS commodities statistics: the strong rises in export sales of electronics, photosensitive semiconductors, and food preparations commodities (Bureau of Labor Statistics, 2014). In fact, *Electronics Integrated Circuits-NESOI*, *Processors and Controllers-Electronic Integration*, and *Memories-Electronic Integrated Circuits* have shown large gains in their export value, while the value of imports of these commodities is simultaneously declining (Bureau of Labor Statistics, 2014).

Moreover, the export value of *Electronic Integrated Circuits and Micro assemblies* and *Electronic Machinery Appliances Having Individual Functions* have grown over three times between 2011 and 2014 to $43 million and $38 million respectively (Bureau of Labor Statistics, 2014). This information tracks well with 2012 domestic two-digit commodity figures which show electronics as Nevada's number two traded commodity both in terms of inbound and outbound value (NSFP, 2015). Additionally, recent economic reports from Brookings, among others, stress that US products from industries where advanced manufacturing processes are applied, such as electronics, are highly competitive in all markets.

Besides computer and electronic products, primary metal manufacturers stand out, bringing in nearly $3 billion from overseas (Bureau of Labor Statistics, 2014). The Existing Freight Flows Memorandum supports the identification of domestic outbound commodities evidencing strong growth. Nevada companies with export products that demonstrate market competitiveness in either US or foreign markets would gain further advantage with improved freight networks, and their business lines provide targets for recruitment to Nevada locales.

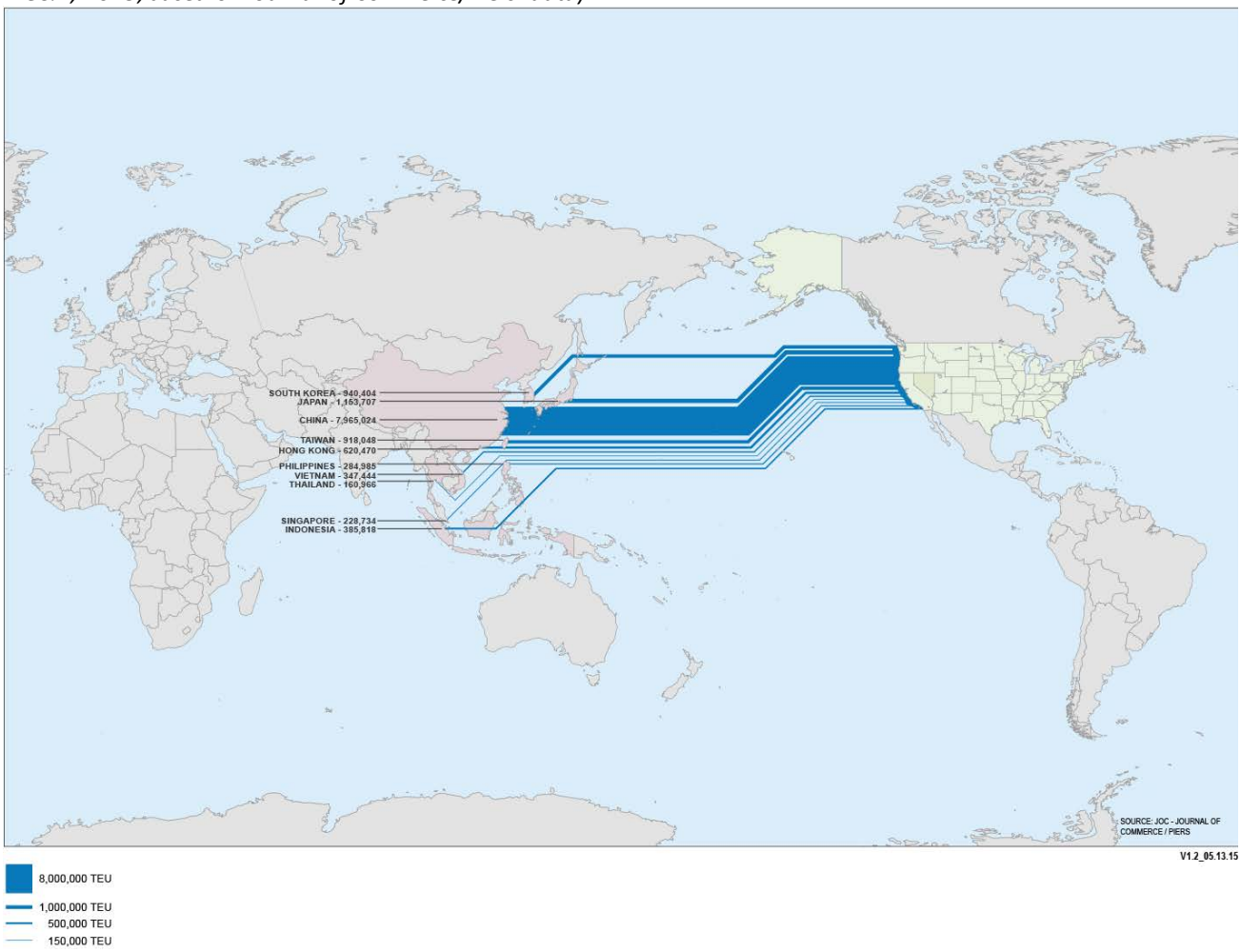
2.2.2.1 Growth and Change in the World Economy

The state of Nevada has the potential to greatly benefit from the major shifts taking place in the world economy. Understanding the new trade patterns is fundamental to understanding Nevada's fit within the national and continental economies. The major trade corridors linking the US to the world economy have shifted from the Atlantic to the Pacific, resulting in the growth of trade across the Western US and the state of Nevada. Since the collapse of communism in 1991, the shift of manufacturing from the US Midwest to overseas locations especially in Asia has reignited the Pacific trade lanes. As the growth rate of the Asian Pacific economies (especially China and Southeast Asia) continue to lead the world, an increasing amount of trade between Asia and the US is arriving on the West Coast. Once the dominant ports, the East Coast has been surpassed by total trade through the West Coast ports. This has led to the vast expansion of trade flows from the West Coast to the larger consumer markets on the East Coast via the primary corridors extending from the three major port concentrations at Los Angeles, San Francisco, and the Northwest.

FIGURE 14

US West Coast Containerized Ocean Trade via Asian Ports, 2014

The West Coast is intricately tied to Asia, especially China, through container trade flows arriving at the ports (Source: MG&A, 2015, based on Journal of Commerce/Piers data).



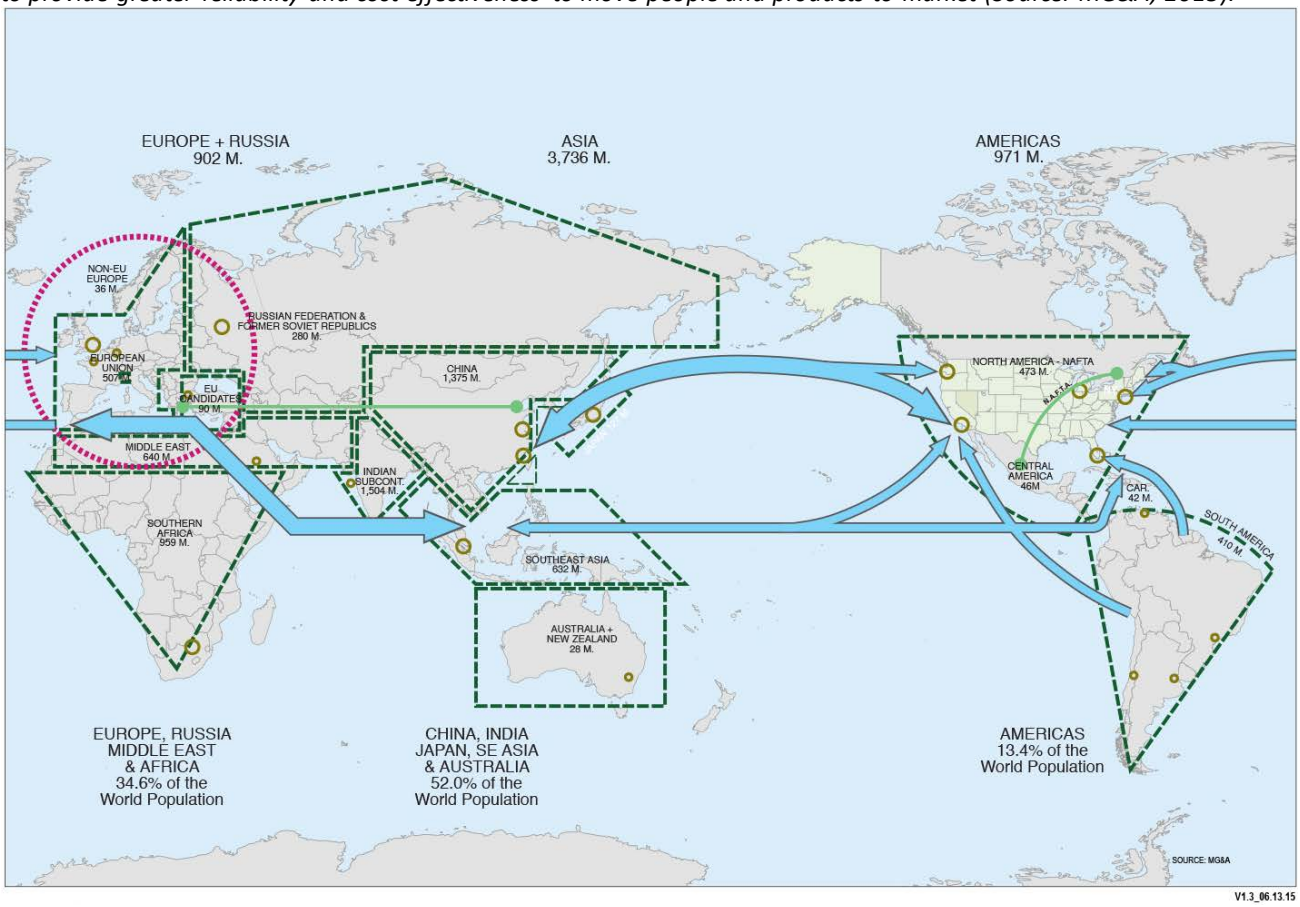
The entry of super large nations, such as China and India, whose populations are more than four times the size of the US provide them with economies of scale that were once enjoyed by the US within the Free World economy. As the world marketplace integrated after 1991, the competitive advantage that the US enjoyed by having the largest economy of scale among the Free World nations disappeared as now China and India had a far greater economy of scale. This drove the creation of trading blocs among the smaller nations of the world in Europe, North America, and the Former Soviet Union.

Driven by changes in the global economy, the three nations of North America formed the North American trading bloc. For the first time in history, this has resulted in new North-South trade flows between Mexico, the US, and Canada. The largest flow of goods is in the Eastern US, with the primary NAFTA corridor extending from Mexico City through Monterrey, Mexico into Texas and the upper Midwest and north into Toronto, Canada. This corridor serves the largest population and economic centers in all three nations. A Western NAFTA corridor has also emerged, although the Western infrastructure was never developed to connect the three nations and therefore suffers from a set of discontinuities in the interstate and rail grid that are not as efficient as those found in the Eastern US.

FIGURE 15

Global Trading Blocs

The emergence of super large nations, China and India, with populations over 1 billion, have provided them with a competitive advantage of economies of scale. This has resulted in the need for smaller nations found in Europe and North America to develop into trading blocs that can compete more effectively in the integrated global marketplace. Within these new trading blocs as well as the super large nations, massive investments in infrastructure are being made to provide greater reliability and cost effectiveness to move people and products to market (Source: MG&A, 2015).



The initial period in the redistribution of global economic activity favored Asia and became known in the US as outsourcing of US manufacturing to other parts of the world. Recently, a counter move has begun, referred to as insourcing, as many companies have chosen to return to North America. However, many companies have not returned their manufacturing to the US, but rather to locations in Mexico along the US border that can easily take advantage of Mexican labor rates while serving American consumers. This has increased the importance of the NAFTA corridors, as the North-South movement of goods is increasing. However, Nevada does not have a North-South Corridor that can serve as a conduit for the distribution of goods moving between the US, Mexico, and Canada.

2.2.2.2 GDP by Metropolitan Area

Nevada's primary economy is concentrated in its metropolitan areas, with important contributions from its mining, resource extraction, and agricultural components found in the rural areas of the state. The growing importance of Nevada's metro areas is that they represent concentrated centers of economic activity and serve as incubators for development and innovation.

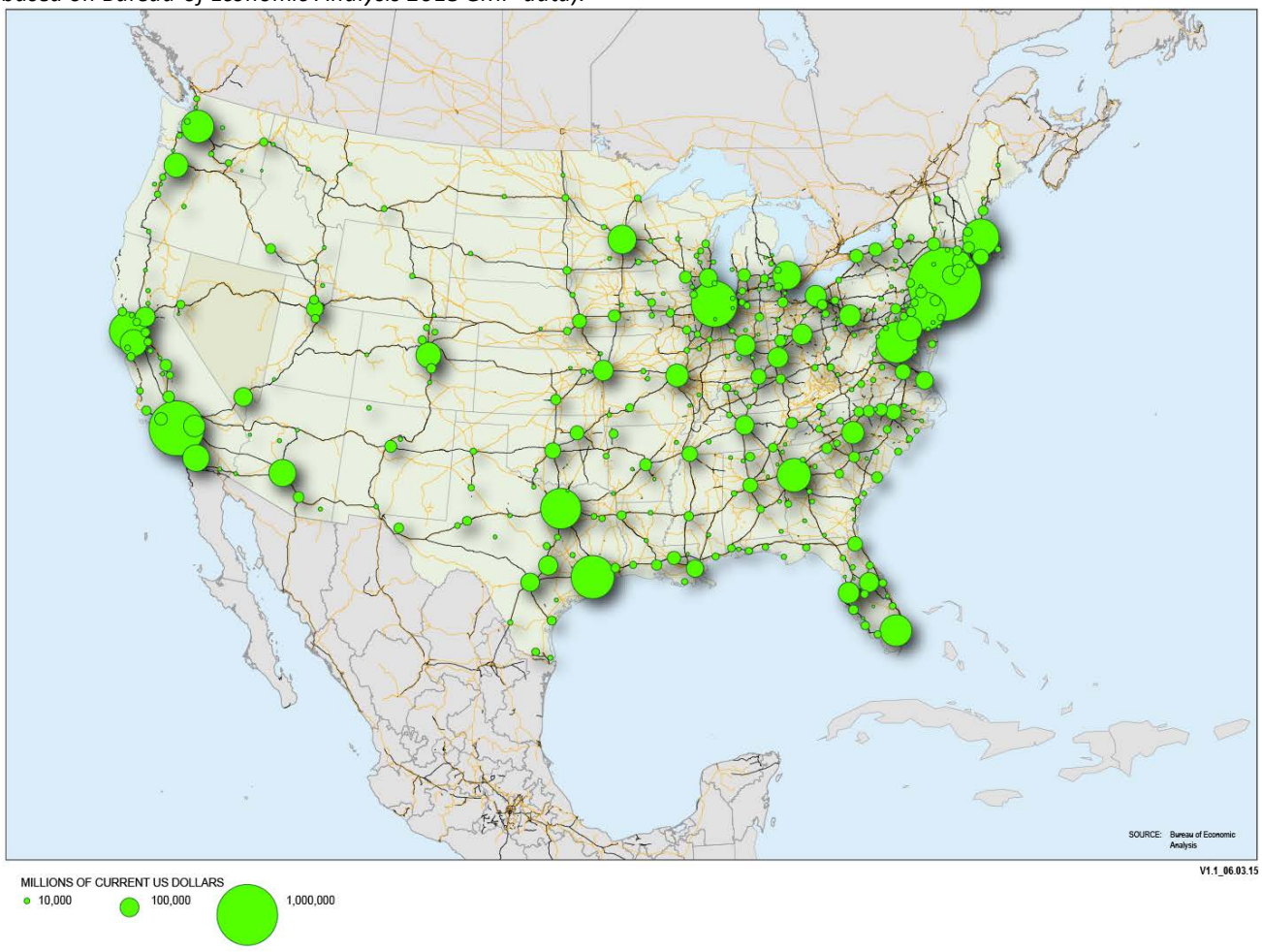
The metropolitan areas in the Eastern US are more closely spaced and therefore have a higher degree of economic interaction that allows each to benefit from the synergies that develop through those interactions. The pattern of economic centers in the Western US is marked by a more widely spaced pattern through which each function as islands of economic activity and not as an interactive component of a larger marketplace (Western Regional Alliance, 2012).

Nevada has a specific advantage over many of the Western US metro areas as it has a very close proximity with the massive economic centers found in Northern and Southern California. Between the Nevada metros and the dense pattern found in the Eastern US are a set of metros that are much more isolated and function as more independent economic units. Capitalizing on Nevada's proximity to California will create a greater economic synergy between the two states that will be of significant benefit to both as synergy increases the potential of both components.

FIGURE 16

Gross Metropolitan Product, 2013

The distribution of metropolitan economies in the US is not even. The Eastern US has a more densely packed pattern that provides greater synergy to each metropolitan economy, while the Western metros operate as economic islands. Nevada benefits from its close proximity to the massive economic concentrations in California (Source: MG&A, 2015, based on Bureau of Economic Analysis 2013 GMP data).



2.2.3 Unemployment

Nevada was particularly hard hit most recently during the global economic downturn known as the Great Recession, which had a tremendous but uneven impact on unemployment rates throughout the United States (see Figure 17 below). The national average reached an annual average high of 9.6% in 2010, which was a large jump from its pre-recession annual average rate of 4.6% in 2006 and 2007. The pattern of unemployment at the height of the recession in 2010 indicates that the Western US, including Washington, Oregon, California, Nevada, Arizona, and New Mexico along with the Eastern Mid-West and Southeast suffered from higher unemployment. Unemployment rates throughout the Central and especially Upper Midwest, the agricultural economies, and the Northeast corridor urbanized area from Washington, D.C. through Boston were not as high.

Nevada's economy proved extremely volatile as its rapid upward rise in the period prior to 2007 was matched with an equally rapid decline after 2007. Unemployment in the state, which had fallen to one of the lowest levels in the nation, reached one of the highest levels of the nation. In the post-recession recovery, Nevada's unemployment rates have not declined to pre-recession levels. Unemployment rates are widely recognized as indicators of labor market performance and economic conditions. Unemployment rates follow economic cycles; they are low during good economic times and high during recessions. However, economic volatility differs by metro area, with stable and diversified metro economy exhibiting less volatile unemployment rates through the cycles.

FIGURE 17

Unemployment Rates in the United States, 2010

This map depicts the uneven distribution of unemployment rates throughout the US at the height of the Great Recession (Source: MG&A, 2014, based on Bureau of Labor Statistics 2010 data).

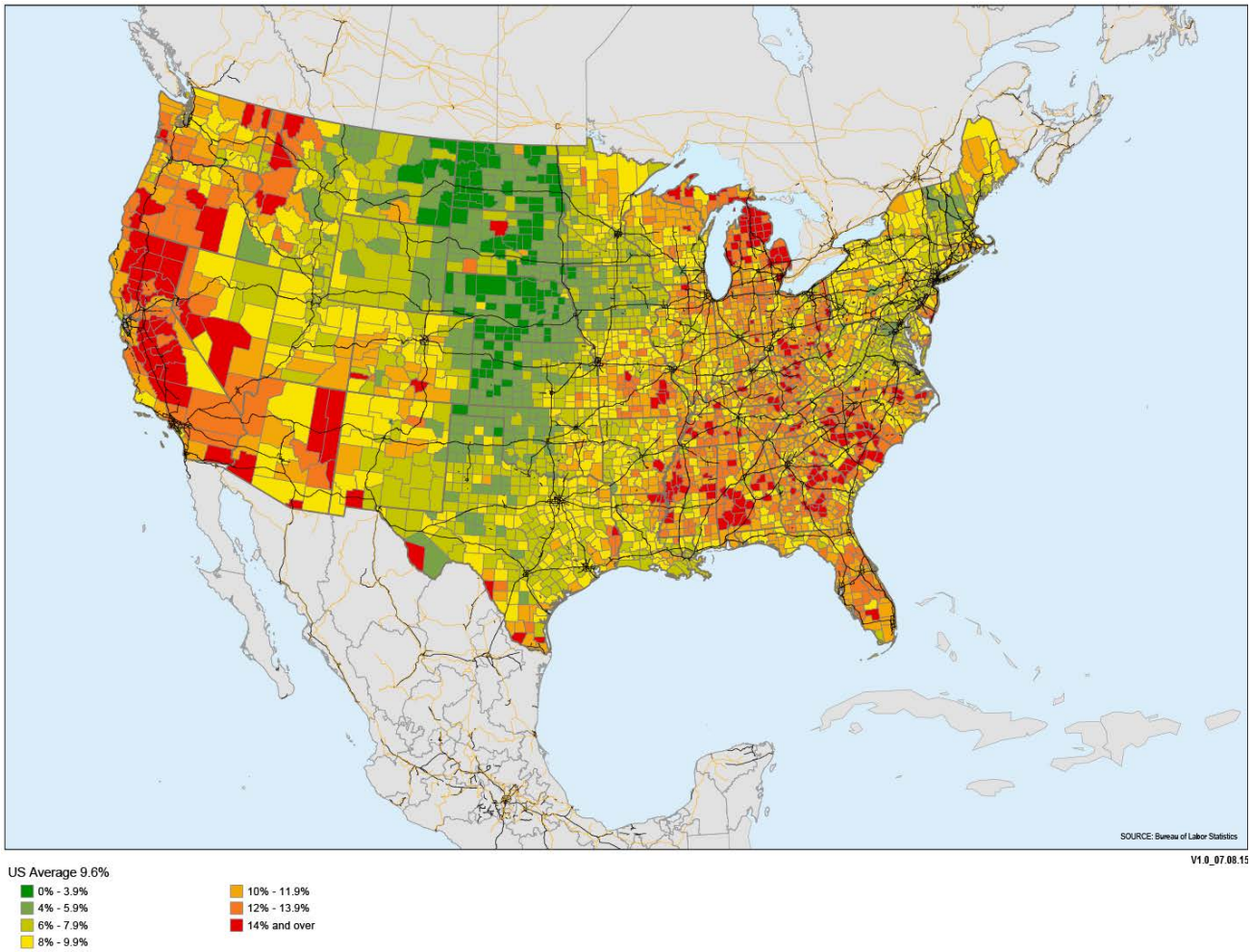
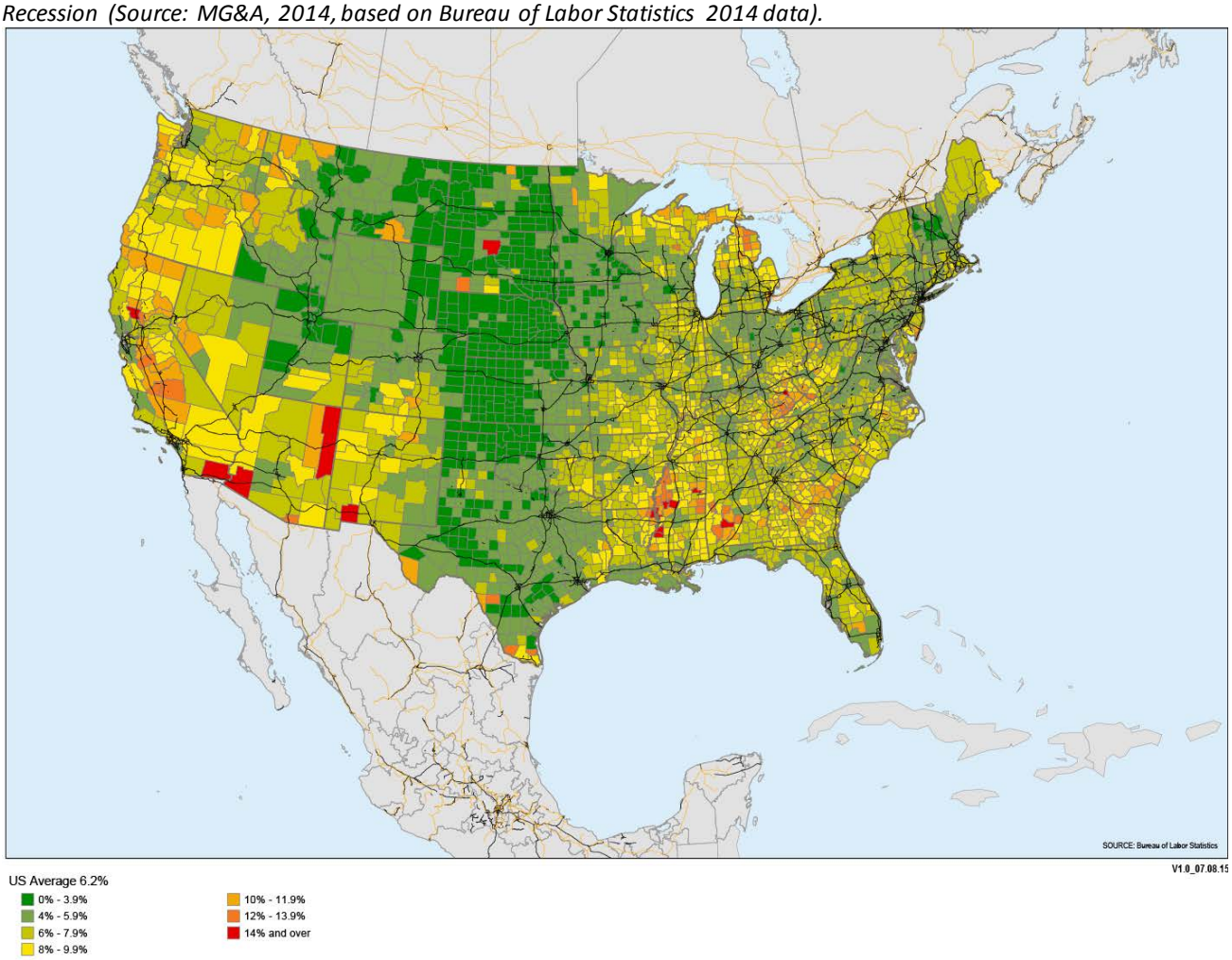


FIGURE 18

Unemployment Rates in the United States, 2014

This map depicts the uneven distribution of unemployment rates throughout the US in its recovery from the Great Recession (Source: MG&A, 2014, based on Bureau of Labor Statistics 2014 data).



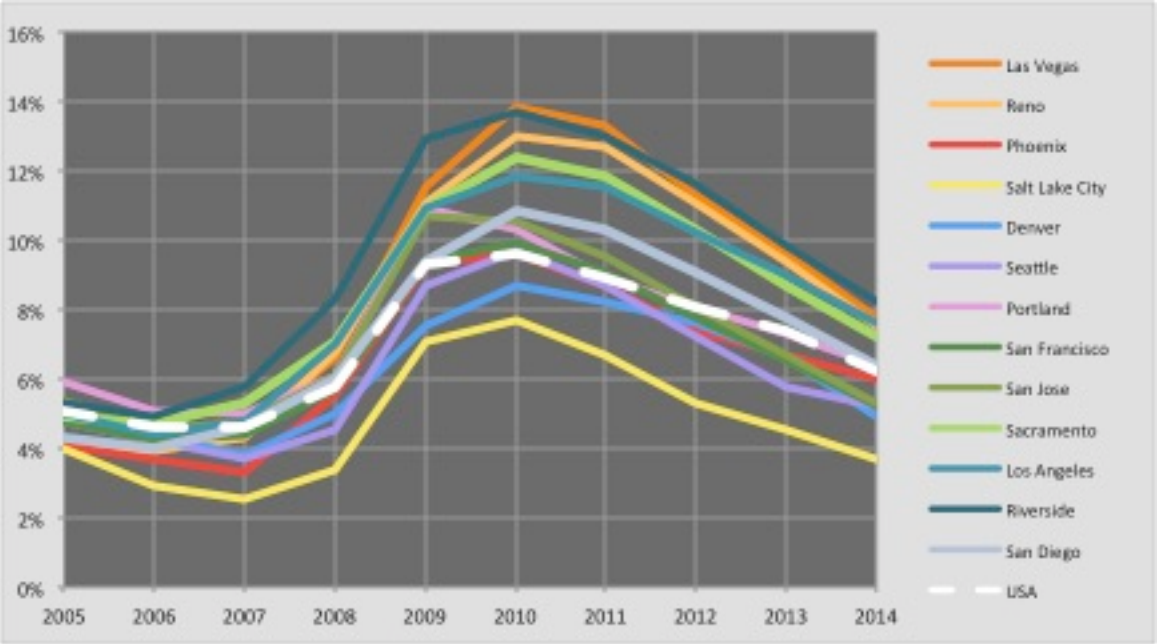
Through the recovery, national unemployment has dropped gradually but not yet reached pre-recession levels, with an annual average rate of 6.2% in 2014. Figure 18 shows the current pattern of unemployment across the nation. It is a similar pattern albeit with lower rates overall than in 2010. Very few counties remain at the 14% and over range, while many that were over 10% have dropped to less than 7.9% unemployment. Notably, the global gateways with more diversified economies suffered less than their more inland counterparts and bounced back more quickly. Creating a more stable and sustainable economy will require strengthening Nevada's position within the global trading network and specifically, the Western US freight and logistics grid. Having a stronger infrastructure serving broader continental and global markets can provide the foundation for attracting a more diverse and growing economy.

The unemployment rates in Nevada have remained well above the national average, with Las Vegas reaching 13.8% in 2010, dropping to 7.8% in 2014, and Reno-Sparks reaching 13% in 2010 falling to 7.4% by 2014. This also puts both metros among the highest in comparison to other Western US metros, as shown in Figure 19 below. Salt Lake City has consistently had the lowest unemployment rate and is the closest to reaching its pre-recession rate. Currently, Phoenix, San Francisco, San Jose, Denver, Seattle, and Salt Lake City are below the national average, while San Diego, Riverside, Los Angeles, Sacramento, Portland, Las Vegas, and Reno are above. The chart also indicates that the gap between metros is larger than it was in 2005.

FIGURE 19

Annual Average Unemployment Rates in Western US Metros

Unemployment rates in the Western US follow a similar trend line as the US average, though Nevada and California metros suffered more than in Phoenix, Denver, Seattle, and especially Salt Lake City (Source: MG&A, 2014, based on Bureau of Labor Statistics data).



2.2.4 Fortune Global 500 Headquarters: 1990-2014

As the pattern of economic activity shifts, so too does the geographic pattern of global corporations. In the Western US, only four states are home to Fortune Global 500 headquarters: California with 14, Washington with three, and Arizona and Oregon with one each (Fortune, 2015).

The distribution of Fortune Global 500 companies has radically changed since the collapse of the Soviet Union, as illustrated below (Fortune, 2015). Asia has established a significant lead, with Europe and North America falling further behind. The US, once the dominant center of corporate headquarters is now being challenged by China, the nation with the single largest gain since 1990. Southeast Asia, Latin America, Russia, and the former Soviet Bloc nations have also experienced increases. While some European nations have added Fortune 500 headquarters, most have experienced significant losses, as has Japan, the US, and to a lesser degree, Canada.

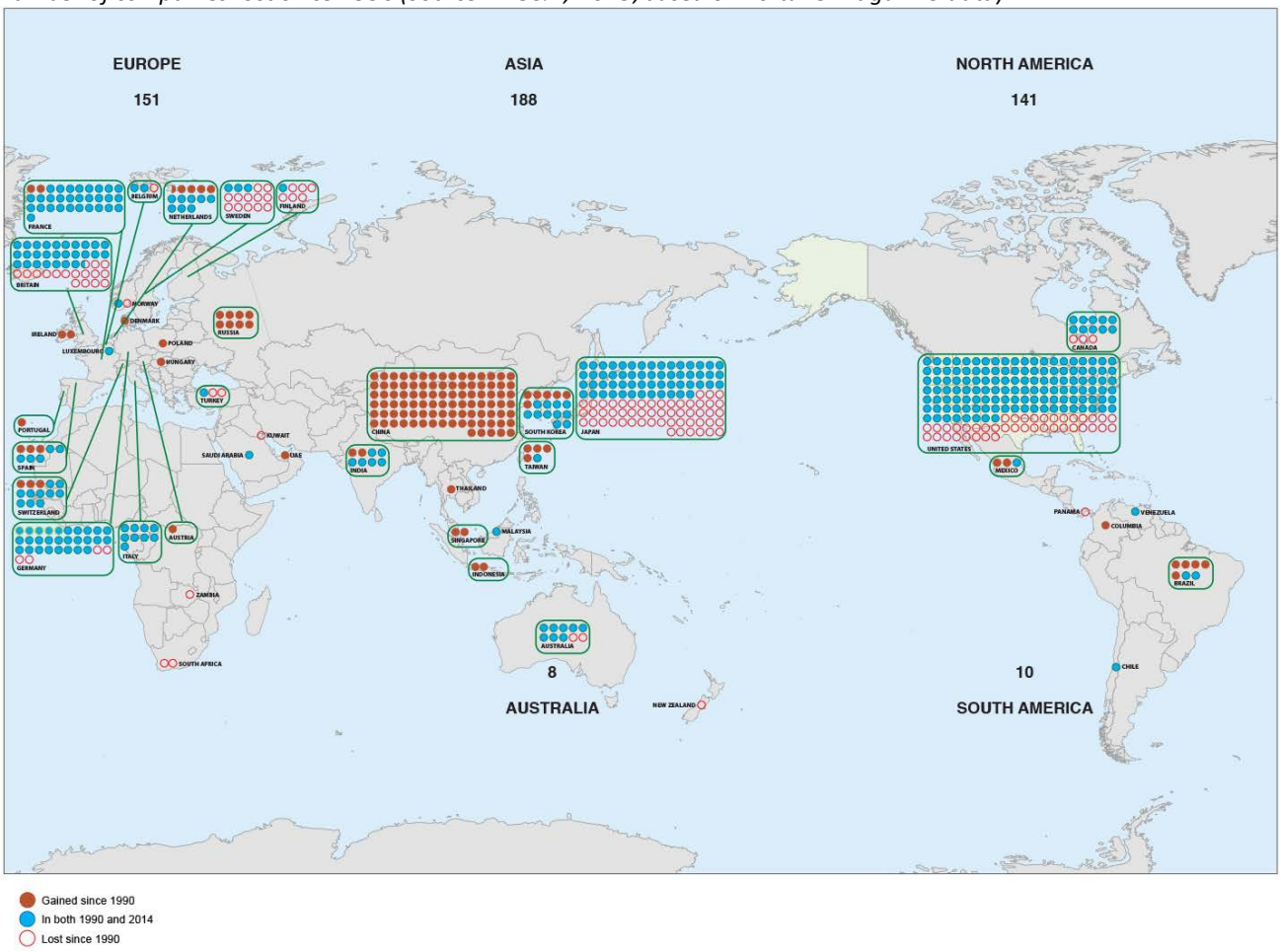
As regions connect and develop to become larger and more competitive, companies move and merge together in ways that increase their competitive advantage and allow for more cost effective operations. Nations, regions, and metros that have world 500 headquarters have a competitive advantage as these companies play a vital role as partners at the local, state, and national level in competing for global economic activity.

While there are limited numbers of the Fortune Global 500 in the Western US, there are a significant number of the Fortune US 500 companies. The distribution of US Fortune 500 companies across the Western US in 2015 reveals an uneven pattern in both the number and types of companies located in the different states and metropolitan areas. Using the state totals, California has the most Fortune 500 companies with a total of 53; 31 of which are located in Northern California, and 22 in Southern California (Fortune, 2015). Washington ranks second in the Western US, with ten Fortune 500 companies, followed by Colorado with nine, Arizona with five, Nevada with four, Oregon with three, and Idaho and Utah with one each (Fortune, 2015). There are no US Fortune 500 companies in Wyoming, Montana, or New Mexico (Fortune, 2015).

FIGURE 20

Distribution of Fortune Global 500 Companies

Blue Circles represent the number of Fortune Global 500 companies that existed in 1990 and remain by 2014, while Red circles represent the number of Fortune Global 500 companies gained since 1990, and empty red circles represent the number of companies lost since 1990 (Source: MG&A, 2015, based on Fortune Magazine data).



Further analysis of these numbers reveals that Northern California is the only region with companies ranked in the top 10, having 3rd ranked Chevron located in San Ramon, and 5th ranked Apple located in Cupertino (Fortune, 2015). Northern California has two more ranked in the top 20, an additional two in the top 50, four ranked between 52nd and 84th, making a total of ten in the top 100, which are also Fortune Global 500 companies (Fortune, 2015). Washington fares second best in terms of rankings with 18th ranked Costco in Issaquah, 29th ranked Amazon.com in Seattle, and 31st ranked Microsoft in Redmond (Fortune, 2015). Southern California also has three companies ranked in the top 100, albeit all having lower rankings than those in Washington. Located in the region is Disney at 57th located in Burbank, 62nd ranked Ingram Micro in Santa Ana, and 95th ranked DirecTV in El Segundo (Fortune, 2015). These three companies, as well as Qualcomm, ranked 113th, are also a Fortune Global 500 companies (Fortune, 2015). Oregon and Arizona come close to the top 100 with Nike ranked 106th and Avnet ranked 108th, respectively, both of which are Fortune Global 500 companies (Fortune, 2015). Idaho, Nevada, Utah, and Colorado all contain lower ranked companies (Fortune, 2015).

Analysis by sector reveals that Southern California has the greatest diversity in its headquarters, with 22 companies in a total of 12 different sectors and 17 industries (Fortune, 2015). Northern California follows with 31 companies in a total of 9 sectors and 20 industries; the region specializes in Technology, with 16 headquarters (Fortune, 2015). Washington has 10 companies in 6 sectors, 9 industries; the state has three headquarters in the technology sector (Fortune, 2015). Colorado, Oregon, and Arizona exhibit diversity in

their sectors as well (see Attachment E). In contrast, Nevada's four Fortune 500 companies are all located in Las Vegas and fall within the Hotels, Restaurants, and Leisure sector: Las Vegas Sands ranked 209th, MGM Resorts International at 289th, Caesars Entertainment at 328th, and Wynn Resorts ranked 477th (Fortune, 2015). However, recent news includes the announcement that Fidelity National Financial, "a diversified company with holdings in title insurance, payroll processing systems, and restaurants," will be relocating its headquarters from Jacksonville, Florida to Las Vegas in the next few months; a diversifying move that is not yet reflected in the 2015 Fortune data (Velotta, 2015). The company is currently ranked 314th in the Fortune US 500 list (Fortune, 2015).

2.2.4.1 Interaction between Fortune 500 Companies and Freight Patterns

The presence of Fortune Global and US 500 company headquarters is one measure indicating a metro areas level of strength in the national or global marketplace. The shift of companies to Asia is a sign of their increasing economic strength in the world economy. Headquarters are the location of high-end jobs, have significant influence on public policy and investment, partner with government in creating jobs and are typically innovators in new product development that reach the world marketplaces. The type and location of headquarters in Northern California indicates the regions' strength in the high-tech realm. Recognizing Nevada's proximity to these large headquarter concentrations allows it to build stronger relationships that can result in attracting new business development to Nevada. A recent example is the symbiotic relationships between Reno as a manufacturing center and a headquarters in the Bay Area is the Tesla battery factory with Tesla headquarters. As the Las Vegas-based Fortune 500 companies are all in the hospitality and accommodations industry, they do not produce any products for export, but rather support the economy of consumption. However, with the recent announcement of a financial company moving to the region, Nevada may continue this trend of economic diversification and attract yet more headquarters.

2.3 Conclusion

Nevada is an import economy with a significant imbalance between inbound and outbound flows, at a ratio of two to one. In order to build a stronger freight infrastructure, the state must build its export functions. Nevada is situated well in the Western US, with freight delivery distances of two-days or less by truck, despite the widely spaced urban networks. However, with only East-West corridors that do not interact, Nevada has limited access to the Western region and serves mainly O & D functions. The I-80 serves the Northern and Eastern regions of the state, while I-15 serves the Southern region. Most truck and rail freight passes through the state along these corridors. Nevada's hubs and freight facilities are essentially stops along corridors.

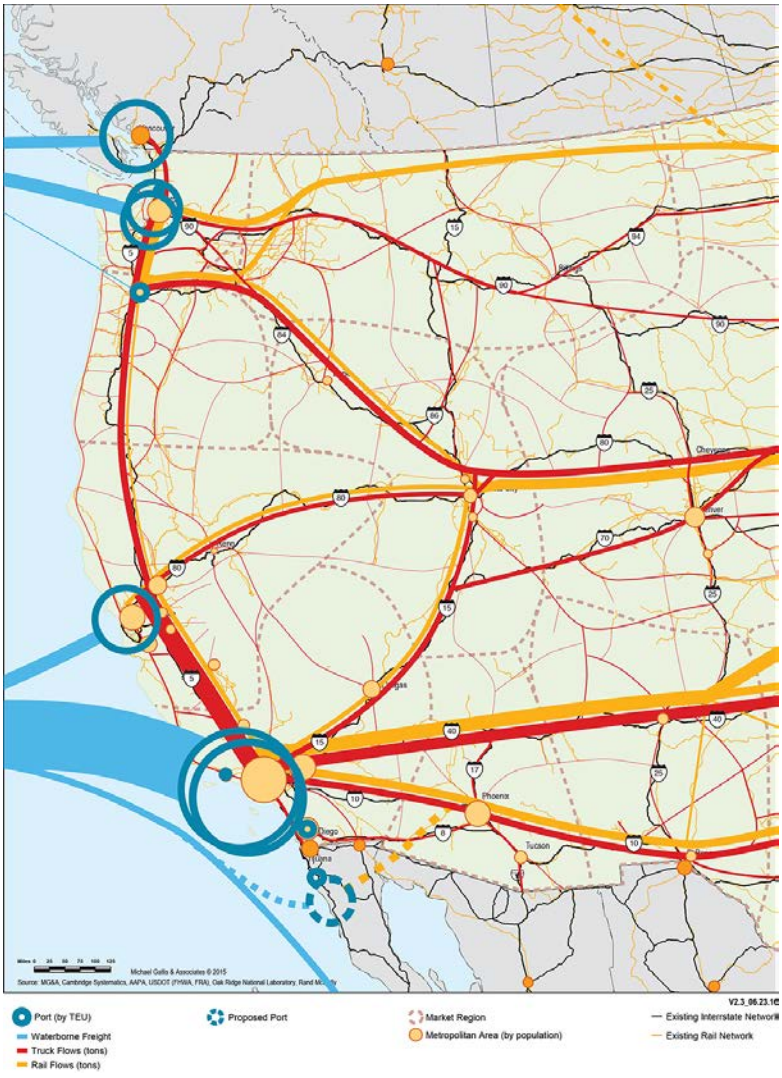
Without a North-South corridor as a crossroads through the two major hubs of Reno-Sparks-Carson City and Las Vegas, the state's ability to serve the NAFTA and Western regional markets will be severely limited. As intermodal rail services are the top revenue generators for railroads, Nevada should make major investments in intermodal rail terminals integrated with the airports and highways to capture more value-added distribution functions.

3 A New Freight Logistics Model for the New Nevada

3.1 The Existing Freight Logistics Model

Nevada's existing logistics model has evolved incrementally over the past century as a system of "Stops Along Corridors" between seacoast gateways and inland hubs to serve the state's rural and urban economies. Urban areas, Las Vegas and Reno, became the processing or distribution zones for external freight flows of manufactured and retail products as well as a service conduit to rural areas that were primarily involved in resource extraction and agriculture. Thus, they function primarily as O & D points spatially located between the superior crossroads to their West and East: Northern and Southern California and Salt Lake City.

As Nevada's existing logistics model evolved, it became a model based on a response to local conditions within a series of West-East corridors that are largely determined by forces outside and beyond the state: the ports in California and their connections to the Midwest Hubs onto Eastern US markets. In other words, Nevada's metro areas deliver consumer goods from other hubs. The ratio of goods received from external sources is much larger than the output of goods created or distributed from within Nevada. The freight corridors that Nevada relies on are serving the inland port and global hubs where intermodal and multi directional transfers can take place. Therefore, the urban centers and rural economy are simply stops along these corridors and not primary multichannel assembly or retail points serving a larger Western US distribution network.



Las Vegas and Reno are both local hubs that are located in close proximity to two of the nation's largest global hubs, Los Angeles and San Francisco. Incremental improvements to the existing system can have beneficial effects on local economies, but they will not have the transformative effects of adding the inland hub functions that are needed to create and sustain the competitive advantages necessary to grow and diversify Nevada's economy.

FIGURE 21
Existing Hubs & Corridors
Nevada's existing access is limited to functioning as 'stops along corridors' or O&D points in the Western US freight logistics system (Source: MG&A, 2015 based on Cambridge Systematics, USDOT, Oak Ridge National Laboratory, and Census data).

Instead, Nevada's best long-term economic results would come from a major change in the current logistics role within the Western trade pattern and a major improvement in its intermodal infrastructure to increase its distribution functions. Such a transformational investment requires adding assets and market size needed to create sub hubs that offer auxiliary space and services to the larger global hubs, eventually generating the growth in distribution and manufacturing needed to become bona fide inland ports.

3.2 Redefining the Freight Logistics Model

Urban growth and economic activity in California, the Western US, and the state of Nevada is transforming the state and its relationship to the domestic and global trading network. Now is the time to identify and respond to crucial factors influencing Nevada's multimodal, domestic, and global connection to its California and Western US trading partners to create a new long range State freight plan. This will result in a long-term model or framework to guide shorter-term decision-making about the policies, regulations, and investments needed to initiate an evolutionary process towards transformation of the state's freight infrastructure and competitive position within the Western US contributing to statewide efforts to create a New Nevada.

There are three ways in which Nevada can develop a competitive advantage. One is to strengthen its geometry within the distribution network; that is, adding strong crossroads connections to gain broader access to more markets from all major points on the compass. Another is to increase Nevada's capacity and efficiency for intermodal rail–truck and air–truck transfers through a more integrated multimodal configuration. The third is to be conscious of capacity and performance issues that must increase in size and efficiency in order for Nevada to realize its full potential. Nevada requires a strategy that bolsters freight generation from manufacturing and distribution centralization to feed the development of regional competitive intermodal transfer facilities.

Building the capacity for crossroads freight movements is not enough without more efficient modal integration in the hubs, just as modal integration is not enough without strengthened network access. A strategy addressing crossroads support, modal development, and capacity is required for Nevada to develop a multidimensional competitive advantage.

FIGURE 22
Potential Future Hubs & Corridors
Nevada's future freight system could function as integrated-hub crossroads with increased access to Western US and global markets with improved capacity and performance (Source: MG&A 2015, from Cambridge Systematics, AAPA, USDOT, Oak Ridge National Laboratory, BEA, Rand McNally).

Creating a new aspirational plan provides a framework for prioritizing decision making by establishing a new vision and set of goals for the future of the freight logistics system. A New Nevada will be well served by a concerted public and private sector effort to improve market access, modal configuration, and capacity and performance simultaneously in order to build a more competitive freight network that is reliable, cost effective, and safe.

Such a framework would help focus public and private sector resources on Reno and Las Vegas' proximity to major California gateways and to their Phoenix and Salt Lake connections to explore how Nevada's production, transportation, and communication assets can be applied to foster competitiveness and growth. The framework will also support global logistics based growth through the creation of a vital trade crossroads with the addition of a NAFTA freight corridor through Nevada, such as I-11, to link Reno, Las Vegas, and Phoenix together and to Canada and Mexico.

Without the visionary concept, Nevada will simply continue to grow incrementally and maintain the same economic and freight logistics relationships: functioning as local hubs or stops along the corridor that serve O & D functions. Through identifying the long-term concept of Nevada's hubs functioning as crossroads with integrated modal configuration and increased capacity and performance, the state can determine the best path of incremental improvements towards the visionary goal of a New Nevada.

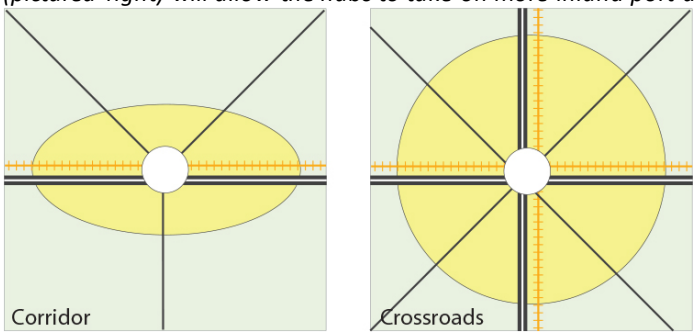
3.2.1 Market Access: From Corridors to Crossroads

Multi-dimensional access improvements include additions to the direction from which freight can be competitively collected and distributed as well as improvements in the facilities that transfer goods from one mode to another. At present, both Las Vegas and Reno have limited market access due to the road and rail pattern in Nevada. The two primary corridors traversing the state, I-15 and I-80, provide only East-West access. Thus, Las Vegas and Reno are classified as having single dimensional distribution, as they are simply stops along corridors I-15 and I-80, respectively. Adding North-South connections between and beyond both Reno and Las Vegas will greatly improve the range in which freight could be collected and distributed from these points and improve connectivity to the growing NAFTA trade. An intermodal I-11 corridor represents a significant opportunity to increase both hubs' ability to perform distribution functions, becoming crossroads with multi-directional access points. This added connectivity would increase Nevada's synergy between its major hubs as well as improve their access to Western US markets and eventually to Canada and Mexico.

FIGURE 23

Increasing Market Access: Corridor vs. Crossroads

Both Las Vegas and Reno are currently stops along corridors (pictured left); however, adding crossroads functions (pictured right) will allow the hubs to take on more inland port distribution functions (Source: MG&A, 2015).



Improvements in West-East intermodal rail would add additional freight capabilities for Nevada shippers and receivers. Large volumes of freight transferred from super post-Panamax vessels can nearly triple the amount of TEUs released to a port from a single vessel. The efficient inland distribution of such volumes on the land side will increasingly require railroad economies of scale connections to overcome the inherent inefficiencies clearing these containers: one container, per one chassis, per one truck. The ability of Nevada rail yards to efficiently handle marine cargo and domestic intermodal containers would remove large

volumes of containerized cargo from congested urban highways, thereby adding highway capacity and improving air quality along the service corridor. With large enough manufacturing logistics distribution bases at Reno and Las Vegas, intermodal rail would provide efficient lower cost services by splicing into larger intermodal trains moving between California and major inland ports to the East.

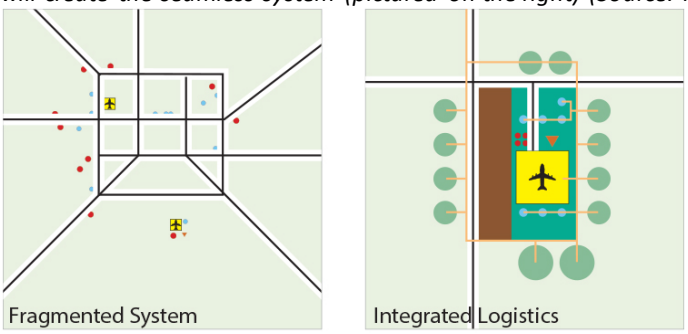
3.2.2 Metro Modal Configuration: From Fragmentation to Integration

Historically, each mode developed independent of the others at a different time in history, a different period in the urban growth, and under different economic conditions. As a result, the freight infrastructure in metropolitan areas around the US is typically fractured and freight movements require a dray function to provide the connectivity between the yards, terminals, ports, airports, and other ancillary freight services and facilities. Modal fragmentation causes two problems within metropolitan areas. One is that it induces unnecessary conflict between freight and passenger volumes that are involved in transfer between the dispersed facilities in metropolitan areas, which reduces reliability and safety. The second is that these trips add cost and increase negative environmental effects. Mode integration seeks to use future capital investments as the financial vehicle for either creating better connectivity or relocating facilities closer together to coterminous locations where transfers can take place without the need of a dray.

FIGURE 24

Modal Configuration: Fragmented System vs. Integrated Logistics

Both Las Vegas and Reno currently have fragmented systems (as pictured on the left); however, increasing integration will create the seamless system (pictured on the right) (Source: MG&A, 2015).



As in most urban centers in the US, Las Vegas and Reno have a scattered and fragmented pattern of air, rail, trucking, customs, and other freight service functions and have never emerged as major freight centers. This fragmented pattern of logistics forces trucks involved in freight movements and transfers through heavily urbanized areas results in numerous conflicts and inefficiencies. However, consolidating intermodal rail yards, truck terminals, and freight service at the major airports would increase efficiency while reducing urban truck transfer traffic. Linking together the modes would form highly efficient and integrated logistics centers in both Las Vegas and Reno and provide them with a competitive advantage over other metropolitan areas.

One planning concept that has been used since the 1960s as an integrative model in Europe, Asia, and North America is the freight village. A freight village is a similar but broader facilities concept than an inland port. It is an area within which various operators carry out all activities relating to transport, logistics, and the distribution of goods, national and international. Its primary features include multimodal service, warehousing, distribution, intermodal terminal, customs service, and freight forwarding. Ancillary services can include restaurants, motels/hotel, post office, transit connections, and banking services.

Unsurprisingly, US freight villages are of larger acreage than their European counterparts, reaching up to 17,000 acres with an average of 3,088 acres (Boile, Theofanis, & Strauss-Wieder, 2008). Besides the intermodal facilities at Charlotte and the Rickenbacker Intermodal Facility Columbus OH which are profiled in *Attachment A*, US freight villages include: US CenterPoint development in Joliet IL, Alliance TX, Pureland Industrial Complex NJ, Raritan Center NJ, Heller Industrial Park NJ, Hunts Point NY, Winter Haven FL,

Mesquite Intermodal Facility/Skyline Business Park TX, Guild's Lake Industrial Sanctuary OR, Dallas Intermodal Terminal/Dallas Logistics Hub TX, California Integrated Logistics Center Shafter CA, Salt Lake City Intermodal Facility UT, and Cumberland Valley Business Park PA (Boile, Theofanis, & Strauss-Wieder, 2008).

3.2.3 Capacity and Performance

Capacity constraints and performance inhibitors are typically barriers to improving the freight system and can affect the reliability and efficiency of the freight network. Capacity constraints typically arise due to the urban growth that takes place around transportation facilities limiting their ability to increase in size and add capacity. For example, facilities are typically "locked" and unable to grow in their current locations, which requires the creation of a new facility at another location or the entire relocation of a facility to a location where it can assemble the required amount of land to add capacity.

Performance inhibitors are also typically the result of urban growth that does not allow a system to modify or adapt itself to the changing needs of the system. This can take place in terms of everything from storage areas to number of lanes, turning radiuses, heights of bridges, and other inhibitors to the movement through the system that would affect its operational performance.

The capacity constraints and performance inhibitors are addressed in the Statewide Inventory technical memorandum submitted separately as part of the NSFP effort.

3.3 Preliminary Insights from the Profile Analysis

The essential requirements of a growth-facilitating hub system are evident from a review of other metro areas (e.g. Columbus, OH; Charlotte, NC; Eastern PA), where transportation assets create advantages for firms who do business at these locations. As noted in the preceding discussion, there are three essential elements needed to optimize freight transportation's contribution to regional and statewide growth: access, integration, and capacity.

A competitive metro hub provides a multimodal crossroads system that allows freight to flow north and south as well as east and west; Nevada does not have this. There are no interstate or rail connections between Las Vegas and Phoenix; the only two top 100 US Metro areas that lack such interstate connections. Moreover, there is no interstate or rail connections connection between Las Vegas and Reno-Sparks-Carson City. The lack of these connections add time and cost to trucking services, inhibit intermodal growth at prospective rail hubs at Las Vegas and Reno, and limit greater Nevada participation in NAFTA trade.

Another is that the location provides efficient intermodal interchanges, which facilitate the transfers between an efficient and high volume mode such as rail, the long distance reach provided by air, and flexible pick-up and delivery by truck. Nevada has extremely modest intermodal yards in both Reno and Las Vegas, as well as a few bulk transloading facilities throughout the state. There is major through railroad activity in Nevada but the trains do not stop in the state nor do they create cost and congestion relief advantages for Nevada shippers going east and west. This is a major inhibitor to a development-positive rail system that will be needed to further unite the state into the global economy and to increase its logistic function within its Western US context. Nevada airports have both the capacity and the desire to increase their air cargo role; however, more locally generated freight volume is needed to create greater interest among the airlines. The third is increased capacity and performance to strengthen the last mile services, which are addressed in the Statewide Inventory.

For maximum effectiveness and efficiency, such systems would be developed as part of overall regional planning efforts to integrate the location of transportation hub facilities with industrial plants and distribution centers, taking into account environmental sustainability and the overall mobility needs of the regional population. As the freight flow figures indicate, Nevada's industrial production and distribution role is significant but does not yet provide a strong enough base to attract greater interest for rail and air services and facility expansion. Just as it takes a village to raise a child; it takes a freight village to attract

industrial and logistics distribution companies and their freight volumes. This type of configuration does not exist at either Reno or Las Vegas.

It takes a concerted freight development strategy that engages both public and private sectors leaders to help generate that high enough volume manufacturing and distributed products to attract airlines or railroads and partners at the other end of the supply chain to support the development and operation of intermodal transfer facilities. GOED's *Diversify Nevada* development campaign provides a high level organizational point for such a public and private sector effort to both improve Nevada's essential transportation facilities and to grow it as a market for high quality freight services.

Nevada is well served by its trucking industry, which is its primary freight delivery mode both within and outside of the state. The trucking industry needs support to be the best that it can be; this includes infrastructure-focused initiatives to improve the quality of highway facilities in the last mile connections to manufacturing and distribution centers and an active participation in overall freight strategy development to, among other things, improve the balance between inbound and outbound freight which would strengthen trucking's role as an engine for economic development.

4 Nevada's Economic & Freight Logistics Relationships

4.1 Economic Regions

The economic regions of the Western US do not follow political jurisdictional lines but rather have formed economic trade areas. Each Major Trade Area (MTA) is divided into a set of minor trade areas. The state of Nevada is divided between three major trade areas: San Francisco, Los Angeles, and Salt Lake City. Within the San Francisco MTA, there are 15 minor trade areas, including the Reno-Sparks area that overlaps into California in Lake Tahoe and part of the Sierra Nevada Mountain Range. Within the Los Angeles MTA, there are 7 minor trade areas, including Las Vegas as part of a minor trade area that overlaps into Northwest Arizona. Within the Salt Lake City trade area, there are 5 minor trade areas, one of which overlaps into East Central Nevada.

As Nevada does not have its own MTA, understanding the economies of Northern, Southern, and Eastern Nevada must be understood in the context of the greater economic trade area in which they are located. This relationship can be understood by analyzing their freight logistics and trade functions as expressed in commodity flows and logistics infrastructure, the economic structure of Nevada's regional economies and their relationships to the MTAs, and the industrial real estate that is the primary indicator of development activity and dependent on logistics infrastructure. Each of these has an influence on the relationship and defines Nevada's hub functions and its role in the Western US regional economy.

FIGURE 25
Major and Minor Trade Areas
The economic geography of the state of Nevada is divided between three major trade areas. The Northern part of Nevada is part of the San Francisco MTA, the Southern part of Nevada is part of the Los Angeles MTA, and the East-Central section of Nevada is part of the Salt Lake City MTA (Source: MG&A, 2015 based on Rand McNally Commercial Atlas & Marketing Guide, 2010 data; Fortune 2015; BEA 2013).

4.2 A State in Transition

Nevada is a state currently in transition. Economic activity in the state of Nevada is traditionally understood as being regionally divided into three regions: Northern Nevada, Southern Nevada, and Eastern Nevada. Its principle economic regions are also in transition, although each exhibits very different characteristics and global relationships. The relationship between these three regions and their respective MTAs are evolving in very different ways. Understanding the relationships and the direction of their evolution is key to understanding the freight logistics strategy that can most benefit the future economy of the state.

At present, Nevada's hubs are simply stopping points and do not serve an extra regional distribution function that would increase the volume and market reach of its manufacturing and distribution facilities. Nevada's most important relationship is with the large global hubs in California and its future economy and role in the Western US will be strongly linked to this relationship. Nevada is a combination of a traditional economy (resource extraction, agriculture, and tourism) and a growing new economy with sustained export growth in advanced manufacturing (e.g. Tesla, food preparation, and computer/electronics).

4.3 Economic Activity & The Freight Network

Across the world, economic activity and the freight and logistics network are closely related as freight networks have developed to serve the economy. Additionally, in the global economy, economic activity is increasingly attracted to efficient supply chain hubs and networks, as they provide the highest level of access and greatest efficiency in the distribution of products. As a result, economic growth is increasingly centered in the urban areas where freight logistics infrastructure, including airports, rail yards, and truck terminals concentrate, as evidenced by the increasing proportion of people and jobs located in urban centers. Within the US, the top 100 Metro areas produce over 80% the value of all goods traded, 75% of US GDP, and contain 66% of the national population (Brookings, 2013).

The current freight logistics network serving the three Nevada regions has evolved to fit the size of their populations and the type and structure of economic activity. Currently in Nevada, over 90.4% of the state's population and over 87.8% of its GSP is located in the Las Vegas and Reno-Sparks-Carson City metro areas (Census Bureau, 2014; Bureau of Economic Analysis, 2013). Las Vegas is the largest concentration with just over 2 million people, 72.9% of the state total, and economic activity at $92.9 billion or 70.4% of GSP (Census Bureau, 2014; Bureau of Economic Analysis, 2013). The Reno-Sparks-Carson City area is the second largest concentration with 498,512 people, 17.6% of the state's population, and economic activity representing a proportional $23 billion or 17.4% of the state total (Census Bureau, 2014; Bureau of Economic Analysis, 2013). The remainder of the state's population, 270,906 people or 9.5%, and economic activity, $16.1 billion or 12.2% is dispersed in larger and smaller towns, mining centers, and agricultural areas across the state (Census Bureau, 2014; Bureau of Economic Analysis, 2013).

Las Vegas' freight infrastructure has largely evolved to serve the tourism economy, heavily dependent on imports and producing few exports. Machinery and mixed freight, which are heavily represented by consumer goods, is its largest value traded commodity (NSFP, 2015). Reno traditionally had evolved the same way as Las Vegas, but has begun an evolution towards a more diverse manufacturing and service economy. Electronics and mixed freight's consumer products are its highest value traded commodities (NSFP, 2015). The rural areas in North Central Nevada remain primarily mining and agriculture and are home to the nation's largest gold reserve and a variety of non-metallic mineral mines. Thus, the natural resources and mining industry sector is very important from a real GDP contribution perspective (NSFP, 2015). The ores, minerals, and their products, which are mainly produced in the State's metro areas, have national and global markets.

Each region of Nevada has to attract industry based on either a cost advantage in land, labor, and buildings, or on a compatibility basis, based on similar industries that share similar labor and management skills. With California's tax rates and regulations changing, Nevada is becoming a popular alternative for distribution centers (Bauman, 2013). However, crossroad cities that become distribution centers attract industry

because they have a structural advantage in that as more goods are handled for distribution to larger markets, it provides a very different infrastructure that supports a wider range of business activity.

Thus, the growth of Nevada's logistics functions will be a function of its growth as a more diversified economy with stronger export functions and volumes and major investments in its surface grid of highway interstates and rail to transform the Northern and Southern Nevada regions into crossroads.

As the value of goods increase and as predicted markets expand throughout the Far East, the multimodal side of the business becomes more important. Also, aviation and the airports become more important because these are the conduits for higher value goods. Lastly, the flows of goods through intermodal rail connections and to and from seaports and border crossings becomes more important if Nevada is going to reach its growth potential. This means a need to ensure high-quality intermodal connectivity.

4.3.1 Northern Nevada/California

The Reno-Sparks-Carson City is becoming a more diverse and integral subcomponent of the Northern California market. Traditionally, it was a tourism market that attracted people from the Northern California area. Increasingly, Northern California companies are seeing Reno as an extended submarket that has competitive advantages over the traditional California markets centered in the San Francisco Bay Area and the Central Valley. This information does not as yet show up in the freight flow data because recent announcements are not yet completed and the freight flows that would serve them have not yet begun to take place. A publicly known example of this is the $5 billion dollar investment made by Tesla for their Gigafactory in the TRIC.

The Northern Nevada/California economic region represents the second largest economic concentration in the Western US. Traditionally, the Reno-Sparks market area was considered a market independent of the Northern California market. For example, the Inland Port Study notes "historically, Midwest manufacturers shipped to Reno for West Coast distribution but when manufacturing shifted to Asia it changed the dynamics. There is much less rail traffic from the East to Reno" (RCG Economics, LLC & Schlottmann, A., 2012).[3] However, recent developments in this market area indicate that the Reno-Sparks market is moving toward greater economic integration with Northern California.

The growing and diversifying export economy of Reno and the Northern Nevada region is creating significant potential to develop a much stronger infrastructure platform that can attract a much wider range of freight related economic activity. Some of the infrastructure development will involve internal improvements to the Northern Nevada regional infrastructure, higher levels of modal integration, and increased capacity and performance. A second set of improvements will have to address external conditions focused on Northern Nevada's access to the Mexican and Canadian markets via the proposed I-11 corridor. Due to the issues of crossing the Sierra Nevada Mountains, a deeper partnership with California will be required to resolve the lack of reliability in the trans-Sierra freight movements.

4.3.1.1 Logistics Infrastructure Overview

In an examination of truck intermodal in the Nevada market, Cambridge Systematics found that Northern California currently has sufficient intermodal capacity to serve the Central Valley. Seemingly, it is only when that capacity is reached at Lathrop that it would be feasible to consider the development of intermodal service in Reno. However, this proposition is based on the idea that Reno does not generate enough homegrown logistics and manufacturing volumes to reconsider major intermodal service development. It is anticipated that Tesla will change this situation, fostering a new transportation and development dynamic in the region.

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[3] The entire quote is worth capturing: "Historically, Midwest manufacturers shipped to Reno for West Coast distribution but when manufacturing shifted to Asia the changes dynamics. There is much less rail traffic from East to Reno. This is the reason for the rise of Lathrop with the UP no longer stopping in Reno/Sparks. If Nevada stakeholders do not develop a strategy to have rail shipments dropped in Reno then Lathrop with its easy access to the port of Oakland will become the logistics center in the north to the detriment of Reno." From Nevada Inland Ports Viability & Funding Study, Part One: VI–28.

Currently, Reno is only a stop along the I-80 corridor and not a crossroads that could evolve into a transshipment or transloading point that could reach other markets. As a result, the only intermodal service that could be provided in Reno would be relative to the Northern California market. To start, development agencies in Northern Nevada could work with the region's shippers, UP and BNSF, to determine what volume of freight is needed to build unit trains at Reno and at what cost point this service would become viable to justify the establishment of a major intermodal rail yard. It may be possible for the Reno rail yard to develop an exchange relationship with Lathrop that favors Reno intermodal consolidation for East-West moves and Lathrop for north-south rail connections. Such a relationship over an immediate and interim period would improve freight connectivity for Reno as its direct north-south capabilities with an I-11 multimodal corridor can be designed and completed. A strong NAFTA corridor connection is needed to allow Reno shippers to efficiently distribute north, into the Northwest and Canada, and south, into Southern California, Arizona, and Mexico.

FIGURE 26
San Francisco Region Freight System Elements
The largest concentration of intermodal facilities in the Northern California/Nevada region is near the Port of Oakland with additional yards in the Stockton area, where the North-South rail connects with the East-West line. Reno-Sparks growth in intermodal will be a function of capacity in the Northern California market and significant improvements in the access that a North-South corridor could provide to the Reno market (Source: MG&A, 2015 recreated from the California Freight Mobility Plan).

TABLE 2

Distance and Time from Northern Nevada to California Destinations

Reno's distance from both Sacramento and San Francisco can be accommodated in a one-day truck turn. San Francisco is 218 miles from Reno and Sacramento is just 132 miles away. This distance and spatial relationships provides an opportunity for firms to use lower back-haul rates from Reno to these points and balance and integrate freight moves along this corridor (Source: MG&A, 2015 based on Google Maps data).

From	To	Route	Driving Miles	Driving Time w/o Traffic
Reno	Sacramento	via I-80	132	2h 1min
		via US-50	177	3h 39min
	San Francisco	via I-80	218	3h 20min
		via US-50 & I-80	249	4h 15min
	Port of Oakland	via I-80	212	3h 11min
		via US-50 & I-80	243	4h 5min
	Los Angeles	Via US 395	472	7h 14min
		Via I-80 & I-5	518	7h 16min
Carson City	Sacramento	via I-80	144	2h 28min
		via US-50	130	2h 25min
	San Francisco	via I-80	230	3h 48min
		via US-50 & I-80	215	3h 43min
	Port of Oakland	Via I-80	224	3h 38min
		via US-50 & I-80	209	3h 34min
	Los Angeles	Via US 395	438	6h 41min

4.3.1.2 Economic Overview

The San Francisco (SF) Bay Area within Northern California is the high-tech center of the world and one of the greatest wealth producing regions on the planet. The population of Northern California and Northern Nevada combined[4] is approximately 14,611,069 as of 2014 (Census Bureau, 2014). The addition of micro areas brings that total to 15,215,336 (Census Bureau, 2014). The total GDP of these metros as of 2013 was nearly a trillion-dollar economy, at $910.4 billion (Bureau of Economic Analysis, 2013). This economy increased by 15.6% over the 3-year period between 2010 and 2013 (Bureau of Economic Analysis, 2013).

The rapid growth in size and value of the SF Bay Area economy has resulted in a large shift of industrial activity out of the Bay Area and into the Central Valley. The Central Valley was traditionally a rural agricultural area with small towns and cities that provided services to the farming areas surrounding them. With the growth in the SF Bay Area, these cities along the I-99 corridor from Sacramento to the north, and especially south towards Fresno and Modesto, are being transformed into industrial and manufacturing areas. The freight logistics infrastructure set up to serve these agricultural communities is now being used to serve the growing industrial base in the Central Valley.

More recently, Northern California companies have come to realize that Reno-Sparks area has cost and logistics advantages that can better serve the growth in the Northern California economy. No longer is Reno considered a separate location on the other side of the Sierra Nevada Mountains, but is in the process of becoming more integrated into the San Francisco Bay Area economy.

Economic data was obtained for the two counties within the Reno metropolitan area, Washoe County and Storey County. Washoe County makes up the largest percentage of Reno metro population and economy: 446,039 of the metro's 449,959; 216,067 of the metro's 221,414 jobs; and $20.96 billion of the metro's $21.6 billion GRP (GOED, 2015a). Washoe County has a highly diverse economy, as NAICS industry breakouts show a healthy mix of industry in line with the nation. In contrast, Storey County's economy is far less diverse and reliant on three industries for the majority of GRP and employment: transportation & warehousing (25%); manufacturing (24%); and information (20%) (GOED, 2015b). Unlike Northwestern

[4] This includes the following metros in order of population size: San Francisco-Oakland-Hayward, Sacramento-Roseville-Arden-Arcade, San Jose-Sunnyvale-Santa Clara, Fresno, Stockton-Lodi, Modesto, Santa Rosa, Visalia-Porterville, Reno, Salinas, Vallego-Fairfield, Merced, Chico, Redding, Yuba City, Madera, Hanford-Corcoran, Napa, and Carson City.

metros such as San Jose, Seattle, and Portland, both with strong manufacturing above the national average, Storey County's industry composition is highly concentrated in only three areas. Other metros with strong manufacturing have also attracted industries such as real estate services and professional, scientific, and technical services that diversify the metro economy.

Reno's (MSA) top NAICS 2-digit industries, determined by percentage of total GDP, were Real Estate, Rental & Leasing and Finance & Insurance, 19.6% (combined); Manufacturing, 8.9%; Retail Trade, 6.9%; Wholesale Trade, 6.7%; and Accommodation & Food Services, 6.6% (BEA, 2013).

Transportation and warehousing accounted for 5.1% of Reno's metro GDP, higher than the national average of 2.9% (BEA, 2013). With the exception of San Jose, Northern California and Northwestern markets were generally within one percentage point of the national transportation & warehousing average. Transportation accounted for 25% of 2013 Storey County GRP, 21% of County exports, and supported 3,097 jobs of the County's 5,347 total (GOED, 2015b). Transportation & warehousing occupations were found to be the fastest growing jobs in Storey County, supporting a growing transportation economy as Northern Nevada strengthens its manufacturing market. Transportation & warehousing accounted for 4% of 2013 Washoe County GRP, supporting 12,086 jobs of the County's 216,067 total with general warehousing and storage jobs seeing the strongest 10-year growth in Washoe County (GOED, 2015a).

Though Manufacturing was a top GDP producing industry in Reno, it fell below the national average, 11.9%. Compared to other Northwestern markets, Reno was the second lowest in GDP from manufacturing, as Northwestern markets of Portland, 34.6%, San Jose, 23.4%, and Seattle, 15.7% have continued to see strong manufacturing growth in the past decade. Manufacturing was the second largest industry by GRP in Storey County, accounting for 24% of 2013 GRP, 718 jobs (13% of County jobs), and 41.8% of County exports (GOED, 2015b). Manufacturing accounted for 7% of Washoe County 2013 GRP, 12,466 jobs (5.76% of County jobs), and 13% of County exports (GOED, 2015a).

Wholesale Trade GDP in Reno, 6.7%, was only slightly higher than the national average, 6.2% (BEA, 2013). Retail accounted for 6.9% of 2013 Reno GDP, above the national average, 5.6%, and the highest among Northwestern metros; however, Reno's 2013 Retail GDP remained below 2001 GDP levels, $1.311 billion and $1.338 billion respectively signaling a slower recovery out of the recession (BEA, 2013). Construction accounted for 3.6% of the national GDP in 2013. In Reno, Construction 4.7%, accounted for a greater percentage of industry GDP than the nearby California markets of San Francisco, San Jose, and Sacramento as well as Portland and Seattle (BEA, 2013). All Northwestern markets experienced a decline in Construction leading up to the recession in 2007.

4.3.1.3 Industrial Real Estate Overview

Of the Western US markets analyzed, the second largest market outside of Southern California is the combined San Francisco Bay Area market at 539,937,770 sq. ft., of which 197,023,051 is in Oakland, 170,035,673 in Sacramento, 101,888,757 in Silicon Valley, and 70,990,289 in the Peninsula (CBRE, 2015). Reno had the smallest industrial market of those analyzed in the Western US, with 77,082,219 sq. ft. as of Q1 2015, a slight decline of about 200,000 sq. ft. from 2014 (CBRE, 2015).

From 2005 to 2015, the San Francisco Peninsula, Silicon Valley, and Sacramento grew slowly with a range of 2.9 to 4.9 million sq. ft. in growth, while Reno's industrial market grew by 14.6 million sq. ft. (CBRE, 2015). Net absorption in the Reno market exceeded Las Vegas by approximately 2.5 million square feet in the period from 2009 through 2014, and has been positive every year since 2010 (CBRE, 2015). This is indicative of Reno's efforts to capitalize on its geographic proximity to the Northern California Markets.

Reno has a competitive lease rate advantage, at 38 cents, over any of the four Northern California markets: the San Francisco Peninsula, at 90 cents, Silicon Valley at 61 cents, Oakland at 56, and Sacramento at 44 cents (GOED, 2015). Reno has remained low and fairly stable over the decade, with a range of only 11 cents between its maximum of 38 cents per sq. ft. per month and its minimum of 27 cents per sq. ft. per month (CBRE, 2015). As of Q1 2015, the industrial market lease rate in Reno is slightly higher than its pre-recession

rate at 38 cents per sq. ft. per month, which ranges from 6 to 52 cents cheaper than the four Northern California markets included in the analysis: San Francisco Peninsula, Silicon Valley, Sacramento, and Oakland (CBRE, 2015). This makes it very competitive for capturing potential spillover. However, once the Tesla plant is complete and in operation, it is expected that there may be a significant increase in at least short-term rates as suppliers and others react to the growing demands of the Tesla plant.

Vacancy rates over the same decade were volatile in Reno, with a range of 10.4% (CBRE, 2015). With a pre-recession rate of 4.3% in 2006, Reno suffered through the recession, reaching a high of 14.7% in 2009 (CBRE, 2015). Though the market has filled up in the past few years, reaching 6.7% as of Q1 2015, it has yet to recover back to its pre-recession low and remains higher than the majority of metros analyzed.

Additionally, in San Francisco's East Bay, developers are building over 2 million square feet of industrial space despite lack of tenant commitments as a result of the scarcity of vacant warehousing space (Li, 2015). In contrast, there is very little office construction occurring in the region. This is particularly due to demand outdoing supply, with e-commerce, traditional manufacturing, technology manufacturing, and shipping continuing to grow (Li, 2015). Moreover, many industrial buildings are being converted into office space for technology companies (Li, 2015).

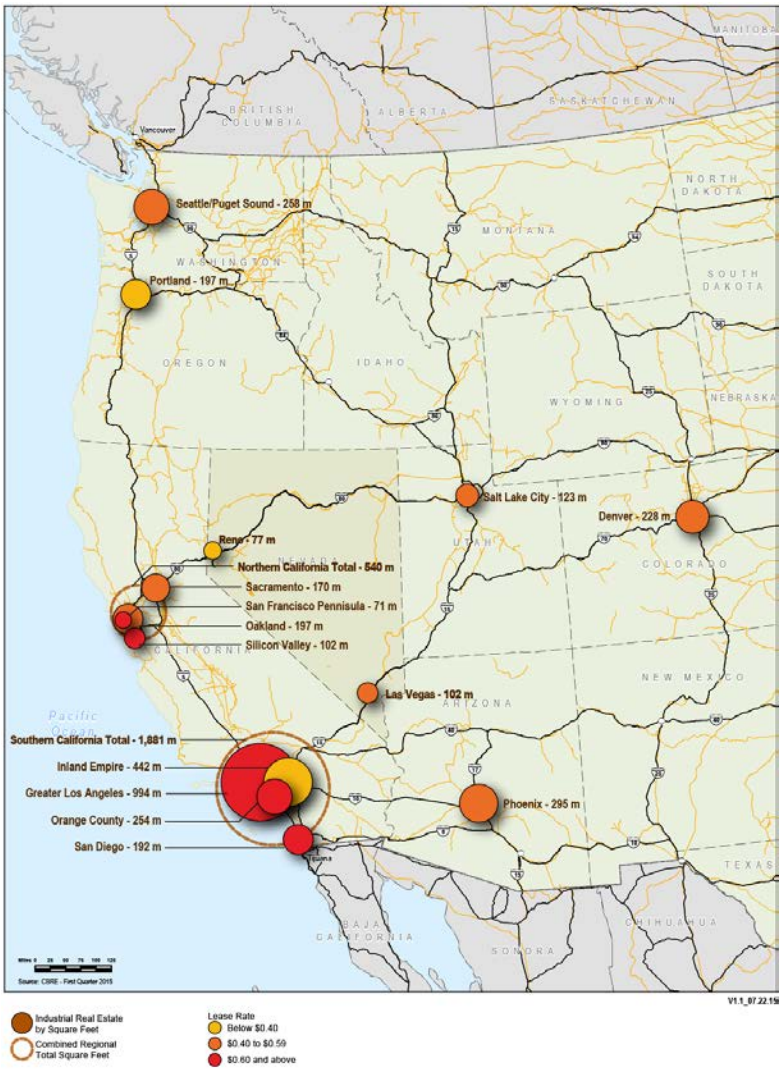

FIGURE 27
Industrial Real Estate Market Size in the Western US
This map depicts the industrial real estate market size and lease rate in each of the Western US markets analyzed for this study. It also shows the combined sizes of the Northern and Southern California markets, revealing the vast amount of industrial space in Southern California. It is also reveals the cost advantage that Reno has over markets in Northern California, while Las Vegas and Phoenix are more expensive than the Inland Empire in Southern California (Source: MG&A, 2015 based on CBRE, Q1 2015 data).

4.3.1.4 Recent Developments Indicating Future Trends

The Tesla Example: World's Largest Industrial Park Locating in Reno

Northern Nevada has captured widespread attention as Tesla Motors, Inc. has decided to build a five-billion-dollar lithium battery factory in the Tahoe-Reno Industrial Park, which is currently under construction (Hull, 2015). Tesla chose this location not only because of the $1.25 billion in subsidies, but because Nevada's high unemployment rate meant an available workforce, not only to work in the plant, but also to build it (Cohn, 2015). As a technology and manufacturing company, Tesla has diverse needs, hiring high tech workers with PhDs as well as employees for the assembly line (Cohn, 2015). The deal was also made because of the land availability and the active lithium mining operation in Nevada (Business Facilities, 2015).

Tesla's Gigafactory in Reno will be the largest lithium battery production plant in the world located in the world's largest industrial park, TRIC, at 110,000 acres (Business Facilities, 2015; CalSTA, 2014). This highlights Reno's projected major rise as a manufacturing and distribution location. In fact, the impact on economic development and employment is likely to move the Reno-Sparks metro area to into the top 100 (Business Facilities, 2015). The project has already increased commercial and residential real estate values, added a direct flight from Reno to New York, and spurred the movement of Bay Area and other future employees to relocate (Hull, 2015). In fact, the median home price is up 19 percent since last May (Hull, 2015).

This investment represents an incredible opportunity for transformation, with long-term benefits including economic diversification and attracting more manufacturing to the region. An economic impact analysis completed through the Governor's Office of Economic Development (GOED) stated that Tesla will support transportation and utility infrastructure improvements to "greatly enhance the region's competitiveness for future manufacturing and logistics projects," while the state has committed to "$100 million in infrastructure improvements to support the Gigafactory" (Applied Economics, 2014; Business Facilities, 2015). This investment will include the state purchasing the right of way needed to link I-80 and US Highway 50 to the TRIC site in Storey County with the proposed USA Parkway Project (Business Facilities, 2015; NDOT).[5] The 20-year forecast is that Tesla will generate $97 billion in economic activity and boost regional GDP by 26 percent (Hull, 2015).

A key requirement built into the deal is the guarantee that half of the factory workers must be residents of Nevada (Hull, 2015). It is projected that the company will create 6,500 jobs in the next four years at an average wage of $27.35 per hour, thereby increasing the metro area's manufacturing employment by over 50 percent (Applied Economics, 2014). The multiplier effect of this increase means translates to an additional 16,200 jobs and 855.3 million in annual payroll that could be supported at other local businesses (Applied Economics, 2014). Moreover, construction of the facility will create 9,000 direct jobs and 4,700 indirect (Applied Economics, 2014). Overall, this represents a tremendous gain for Nevada: state employment will rise 2% and regional employment will increase by 10% (Business Facilities, 2015).

Additionally, large technology companies have relocated some of their operations to Reno, including an Apple data center, an Amazon distribution center, and a Microsoft licensing unit (Business Facilities, 2015). Apple's data center has attracted what is now known as 'Startup Row' in Reno; a string of e-Commerce ventures including Zulily (Business Facilities, 2015). Reno is capitalizing on its proximity to Silicon Valley and emphasizing the lack of corporate and inventory taxes (Business Facilities, 2015). In order to truly capitalize on the job growth potential associated with these developments, the region will need to ensure, create, and attract a technically skilled workforce.

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[5] From the NDOT Website: The USA Parkway Project is a proposed transportation link between Interstate 80 (I-80) in Storey County and US 50 in Lyon County, approximately 18 miles total. A six-mile portion of the roadway already exists in Storey County servicing an industrial center. This estimated $70 million project would provide a new north-south link between I-80 and US 50 that will enhance local and regional access and mobility. It would provide an alternative route for traffic in case of an emergency or closure on I-80, US 50, or US 95. USA Parkway would support planned land uses and economic development and improve efficiency of freight movement from areas east of Reno to points south. The project is currently under Environmental Review and is projected for completion by 2017.

Powdered Milk Processing Plant in Fallon

Nearby in Fallon, Perrazo Brother's dairy company has added a new milking barn and is capitalizing on a new market overseas using a new powdered milk processing plant that opened a short five miles from their dairy farm in 2014 (Breen, 2015). Alan Perazzo has stated that he now has the opportunity to increase production with a stable market that does not require shipping to California anymore (Breen, 2015).

4.3.2 Southern Nevada/California

While the Las Vegas regional economy is becoming a more diverse, it remains primarily a tourism market based on accommodations, entertainment, retail, and gaming. As it has traditionally, it continues to attract a large percentage of its tourists from the Southern California area. Unlike Reno-Sparks, Southern California companies do not see Las Vegas as an extended submarket that has competitive advantages over the traditional California markets centered in the Los Angeles Area or the Inland Empire. While the Reno-Sparks area recently announced a $5 billion dollar investment in manufacturing, the Las Vegas area announced a $4 billion dollar investment in a new Resort on the Strip. The recent completion of the City of Rock and the new Las Vegas Arena both add to the venues along the Strip and reinforce the continued focus on the Tourism economy as the primary sector of the Southern Nevada economy. However, recent announcements by Switch, of a billion dollar investment in Las Vegas, a second billion is going into Reno, along with the Amazon announcement of a distribution center, and Zappos' focus on developing an innovation economy in downtown Las Vegas point towards a long-term interest in economic diversification. Additionally, UNLV has also recently published their Tier One Initiative with a vision to become Nevada's first top 100 American Public Research University by 2025 (UNLV, 2015).

The Southern Nevada/California economic region represents the largest population, logistics, and economic concentration in the Western United States. Unlike the Northern Nevada/California market, the Las Vegas metropolitan economy is not moving towards a higher level of integration with the Los Angeles metropolitan economy, rather Southern California remains a large source for Las Vegas's tourism market.

Despite the trend towards greater diversity, it remains a small fraction of the larger and dominant tourism economy that remains consumption-, not export-oriented economy. Under the present consumption focused freight model, Las Vegas' economy will grow in increments related to population increases and general freight activity, but not in its relationship to attracting spillover from the Los Angeles economy. As a result, freight will continue to be import dominated. Both Phoenix and Las Vegas are essentially freight satellites of the Los Angeles logistics concentration and do not function as freight centers on their own as neither forms a crossroads in the Western US distribution network.

While the Reno-Sparks area sits atop the singular corridor extending from the San Francisco Bay area logistics concentration to Chicago and the Northeast, Las Vegas sits atop one of three primary corridors (I-15, I-40 and I-10) connecting Southern California to the East Coast markets. In that context, Las Vegas faces a much different competitive landscape in strengthening its role and function as a logistics hub serving the Western US. However, only Las Vegas and Phoenix are large enough population centers with major airports, interstate, and rail corridors to evolve into significant logistics centers. Neither Phoenix nor Las Vegas are crossroads although Phoenix and Barstow could compete for a similar role that could be played by Las Vegas. Like Reno-Sparks, Las Vegas would significantly benefit from the development of an I-11 interstate and rail corridor that could transform it into a crossroads that could serve a larger market region.

4.3.2.1 Logistics Infrastructure Overview

At present, Las Vegas is only a stop along the I-15 corridor and not a crossroad. Its rail services, especially its intermodal connections, are limited. The Union Pacific Railroad serves southern Utah on a line that runs Northeast/Southwest through Clark County and has access to several industrial sites. Its intermodal facility at Valley yard offers inbound service from Chicago to Las Vegas and outbound service from Las Vegas to Los Angeles. However, there is no outbound service from Las Vegas to Chicago or any other destination (Mesquite Regional Business, Inc., 2015).

These factors make the crossroad strategy with improved direct intermodal connections more difficult to realize than it may be in Northern Nevada. Nevertheless, Las Vegas does have a well-established logistics and operation base that employs over 38,000 workers (which constitute the labor base of its logistics supply services) and that sector has increased the number of jobs in this category by nearly 4,000 between 2004 and 2014 (GOED, 2015c).

One of the strongest beneficial connections between tourism and trade in greater Las Vegas is McCarran International Airport, which connects to nearly 140 different destinations including points in Central America, Europe, and Asia (LVGEA). Each day, the airport transports approximately 101,000 arriving and departing passengers, 611,000 pounds of arriving /departing cargo, 1,400 aircraft operations and 3,300 international passengers (Mesquite Regional Business, Inc., 2015). It is the base for air cargo operations of several airlines including US Airways and Southwest and also serves freight logistics specialist United Parcel Service and Federal Express (LVGEA). Its 200,000 ft. freight and distribution facility completed in 2010 is a transfer hub for approximately 611,000 pounds of cargo arriving/departing daily (LVGEA).

Based on national statistics, Las Vegas may be served well with growth in international connectivity. Statistics indicate that air freight between the US and the rest of the world in the month of December 2014 increased 10% from December 2013 to 867,093 tons (USDOT, 2014). For the year-ended December 2014, world air freight increased 6.8% over the previous year to 9.94 million tons (USDOT, 2014).

One of the major limiting factors for Las Vegas logistics development is the high inbound to outbound ratios: 42,000,000 tons of freight come and only 8,000,000 tons go out; and in terms of value, inbound moves generate $44 million while outbound movements less than $13 million (NSFP, 2015). This imbalance affects air freight growth because Las Vegas generates little outbound traffic in comparison to the goods it may be able to bring in. Likewise, the truckload shipping costs in serving this consumer base market suffers from a similar imbalance. The Inland Port Viability report indicates truckload rates from Los Angeles to Las Vegas as $875 while Las Vegas to Los Angeles is $450 (RCG Economics, LLC & Schlottmann, A., 2012).

However, it may be possible for Las Vegas to serve intermediary distribution and value-added services, with consolidation and cross dock services on triangular traffic lane involving Los Angeles which is only 270 miles from Las Vegas, Phoenix which is 292 miles away, and Salt Lake City which is reachable at 518 miles. This puts Las Vegas in the range for one day out-and-back trucking operations between each of these points with an opportunity to limit some of the imbalance of flows for services between these points. As is the case with Reno, the growth in industrial output would strengthen its regional opportunities.

There is little doubt that growth in transportation logistics in Las Vegas would benefit from I- 11 connections from the Mexican border through Phoenix and on to Reno and beyond. Growth in Mexican-related trade is likely as relative time distances between the Nevada and Mexican markets shorten.

Seemingly, Las Vegas' best intermodal rail connections may lie just to the south in Arizona, where UP's major East-West intermodal route passes from California through to Texas and continues east. A combination of improved drayage from both Las Vegas and Phoenix to a new intermodal facility on this route may produce enough volume, increasing Las Vegas' logistic choices and accessibility to larger markets.

FIGURE 28

Los Angeles Freight System Elements

Southern California is the largest logistics infrastructure, air, sea, rail, and road, in the US, handling over 14 million containers per year (AAPA, 2013). It is also the largest population concentration in the Western US. Its close proximity to Southern Nevada provides the Las Vegas region with an important opportunity to capitalize on its relationship to this massive market and attract business activity to diversify and grow its economy and freight functions (Source: MG&A, 2015 recreated from the California State Freight Mobility Plan).

TABLE 3

Distance and Time from Southern Nevada to California Destinations

The Las Vegas region is just slightly farther from Southern California than Reno is from Northern California. However, increasing traffic in the Southern California highway system makes predictable times highly problematic and unreliable. This offers an opportunity for Las Vegas to provide lower cost and more reliable distribution services to the Western markets although lack of a North-South corridor limits this potential (Source: Google Maps).

From	To	Route	Driving Miles	Driving Time w/o Traffic
Las Vegas	Barstow	Via I-15	156	2h 12min
	Victorville	Via I-15	188	2h 36min
	Los Angeles	via I-15 & I-10	270	3h 50min
	Port of Los Angeles	via I-15, CA210 & I-605	289	4h 9min
	Port of Long Beach	via I-15, CA210 & I-605	286	4h 6min
	San Francisco	Via I-15 & I-5	568	8h 3min

4.3.2.2 Economic Overview

The population of Southern California and Southern Nevada combined[6] is approximately 25,860,192 as of 2014 (Census Bureau, 2014). The total GDP of these combined metros as of 2013 is $1,375.7 billion (Bureau of Economic Analysis, 2013). This economy has increased by 10.3% over the 3-year period between 2010 and 2013 (BEA, 2013).

Although Las Vegas is located in close proximity to Southern California, the companies that choose to locate in Las Vegas want to be there because of the resorts or to serve the population (Roberts in Baumer, 2013). The region is more focused on supplying the resort and entertainment industry than on exporting goods (Baumer, 2013). This claim is supported by NAICS industry data that found Las Vegas' top NAICS 2-digit industries, determined by percentage of total GDP, were Accommodation & Food Services, 17.7%; Real Estate, Rental & Leasing, 16.4%; and Retail Trade, 7.3% (BEA, 2013). Las Vegas was the only metro in which accommodation and food services was a top NAICS industry, accounting for 27% of jobs, or 266,944 of the 973,762 jobs in Clark County (GOED, 2015d).

Northern Nevada/California NAICS analysis compared Las Vegas to three Southern California metros: Los Angeles, Riverside, and San Diego. Phoenix was also included as the metro is a direct competitor with Las Vegas for industrial space and freight movements westward out of the major California ports. Professional, Scientific, and Technical Services was the leading industry in Los Angeles and San Diego (BEA, 2013). Retail trade was a top industry in Las Vegas, Riverside and Phoenix (BEA, 2013).

Manufacturing accounted for only 3.3% of the Las Vegas GDP for 2013, the lowest percentage for any metro analyzed (BEA, 2013). Manufacturing jobs in Clark County accounted for 21,727 jobs, only 2.2% of the County total (GOED, 2015d). Southern California metro economies had larger manufacturing economies, though each of the metros remained below the US average, 12% (BEA, 2013). Manufacturing was a leading industry in Los Angeles, Riverside, San Diego, and Phoenix, ranging from 8.1% to 9.5% of GDP (BEA, 2013).

Transportation and warehousing accounted for 4.5% of Las Vegas metro 2013 GDP, above the national average of 2.9% (BEA, 2013). Transportation and warehousing accounted for 38,027 jobs (GOED, 2015c). Historical data showed that transportation and warehousing industries did not experience significant declines among the Southwestern metros compared to other industries such as construction and wholesale trade.

Wholesale trade accounted for 6.2% of the 2013 national GDP (BEA, 2013). Wholesale trade accounted for only 3.6% of Las Vegas GDP in 2013, below the national average and the lowest of all Southern metros analyzed (BEA, 2013). San Diego had the second lowest GDP from wholesale trade of the Southern metros, 4.8%. Los Angeles, 7.1%, and Riverside, 6.9%, were both above the national average, with Los Angeles GDP from wholesale roughly 4 times larger than Phoenix, the second highest wholesale GDP of the Southern metros (BEA, 2013). Compared to the Southern metros, Las Vegas had the smallest GDP from wholesale trade, 17 times smaller than Los Angeles (BEA, 2013). Retail trade accounted for 7.3% of the Las Vegas metro 2013 GDP, above the 5.6% national average, and 107,959 jobs, 11% of the Clark County total (GOED, 2015d).

Construction accounted for 4.7% of the 2013 Las Vegas metro area GDP, ending slightly above the national average of 3.6% (BEA, 2013). Construction accounted for 5.8%, or 57,417 of the 973,762 Clark County jobs (GOED, 2015d). Los Angeles, 2.6%, and San Diego, 3.2%, were both slightly below the national average (BEA, 2013). Riverside, 5.3%, had the highest percentage of construction of the Southern metros (BEA, 2013).

4.3.2.3 Industrial Real Estate Overview

The industrial markets in the Western US are dominated by the sheer size of the Greater Los Angeles market. This market is about 6.5 times larger than the other markets on average, ranging from about 2.25

[6] This includes the following metros in order of population size: Los Angeles-Long Beach-Anaheim, Riverside-San Bernardino-Ontario, San Diego-Carlsbad, Las Vegas-Henderson-Paradise, Bakersfield, Oxnard-Thousand Oaks-Ventura, Santa Maria-Santa Barbara, San Luis-Obispo-Paso Robles-Arroyo Granda, Lake Havasu City-Kingman, and El Centro.

the size of the Inland Empire market to 14 times larger than the San Francisco Peninsula and Reno markets. In Q1 2015, the combined size of the Southern California markets was 1,689,500,142 sq. ft., of which 993,852,371 is the Greater Los Angeles market, 441,986,528 in the Inland Empire, and 253,661,243 in Orange County (CBRE, 2015). Las Vegas had the second smallest industrial market size of the markets analyzed, with 102,439,330 sq. ft. as of Q1 2015, an increase of half a million sq. ft. from 2014 (CBRE, 2015).

Over the decade from 2005 to 2015, the Inland Empire exhibited the largest increase in industrial market size by 84.3 million sq. ft., while Las Vegas at grew fourth fastest of the 11 analyzed metros increasing by 19.5 million (CBRE, 2015). Net absorption in Las Vegas was negative from 2009 through 2012, while the Inland Empire and Greater Los Angeles only exhibited negative absorption in 2008 (CBRE, 2015). With its close proximity to the Ports of Los Angeles and Long Beach, the Inland Empire has seen great increases in net absorption since 2008, reaching a level much higher than the other Western US markets (CBRE, 2015).

Las Vegas is a more expensive market than Reno, though its lease rate was much higher pre-recession, 75 cents per sq. ft. per month, than it stands today at 56 cents per sq. ft. per month (CBRE, 2015). The Las Vegas industrial lease rate is 17 cents higher than the current average lease rate in the Inland Empire at 39 cents and therefore less competitive as an alternative to continued expansion in the Inland Empire (CBRE, 2015). The current lease rate in Phoenix and Las Vegas are comparable, with only two cents difference; both are higher than the Inland Empire (CBRE, 2015). Based on the lease rate, it is unlikely that these markets will capture excess demand generated in the Southern California region until rates in the Inland Empire significantly exceed those in Las Vegas and Phoenix.

Vacancy rates over the same decade were least volatile in the Greater Los Angeles and Orange County markets, with ranges of 1.9% and 2.9%, respectively (CBRE, 2015). Conversely, submarkets more inland such as Phoenix and Las Vegas are more susceptible to economic cycles, with ranges of 10.5% and 9%, respectively. With a pre-recession rate of 3.4% in 2006, Las Vegas was hit hard by the recession, reaching a high of 12.4% in 2012 (CBRE, 2015). Vacancy has since declined, reaching a much lower 6.3% as of Q1 2015, but it has yet to recover back to its pre-recession low and remains higher than most of metros analyzed (CBRE, 2015). However, this number is slightly lower than Reno and much better than Phoenix where vacancy is highest in the Western US at 11% (CBRE, 2015).

Overall, there is more competition for Las Vegas in absorbing Southern California spillover with the nearby Inland Empire and Phoenix submarkets as well as the Stockton, Barstow, and Bakersfield locations, which are closer to the ports and within state lines.

4.3.2.4 Recent Developments Indicating Future Trends

Genting Resort Investment Indicating Continued Dominance of Tourism Industry

Southeast Asia's Genting Group is constructing a $4 billion dollar gaming resort on the Las Vegas Strip (Stutz, 2014). This investment is similar in dollar amount to Tesla in Reno and will act to reinforce and grow the tourism economy and increase the import side of the freight logistics movements. This development will create several thousand short-term construction jobs in Las Vegas (Stutz, 2014) and produce long-term employment effects that will be concentrated in accommodations and food service jobs.

Beyond the Rack Distribution Center in North Las Vegas

Since March 2012, North Las Vegas has been home to the West Coast Distribution Center of Beyond the Rack (BTR), one of the fastest growing e-commerce sites in North America. BTR is a private online shopping club for men and women seeking designer brand apparel, accessories, and home goods at up to 80% off. The factor that drove the decision to open a facility in this part of the country was to reduce ship-times to US customers. The company originally considered locating its West Coast Distribution Center in Los Angeles, the source of many of the apparel items it sells, but upon closer examination of the advantages and disadvantages, the executive team decided on Southern Nevada. With its lower rents, larger work force, and greater support from state government leaders, Las Vegas was the smartest choice (LVGEA).

4.3.3 Eastern Nevada/Utah

Eastern Nevada is primarily a rural region with a mining, energy, and agricultural-based economy. The pattern of cities and towns grew up to serve the local economy and is generally located along the primary transportation corridors, I-80 and I-15, the major roads traversing the region, US 93, US 50, and US 6, and the resource extraction and agriculture communities.

While the I-80 corridor is considered part of the San Francisco trade area, the more Eastern section including Elko and Wells would appear to be equally oriented toward Utah and the Salt Lake City region. Due to the energy reserves in Utah, Eastern Nevada has opportunities to participate in the energy economy that originates in Utah.

Unlike Northern and Southern Nevada, the Eastern Nevada freight logistics infrastructure is not concentrated in a single location, but rather developed on a more site specific basis to serve the specific needs of the industry or combination of industries (mining, agriculture, or energy) that are located in that specific area. These improvements tend to be either capacity or performance enhancements rather than hub related strategies.

4.3.3.1 Logistics Infrastructure Overview

The logistics infrastructure in Eastern Nevada is primarily formed by the interstate corridors of I-80 and I-15 together with the matrix of US highways and State highways. In addition, the two mainline freight rail corridors follow the two primary interstate corridors along I-80 and I-15. The BHP Nevada Railroad, a short line extending from Ely to Shafter was constructed and operated to serve the mining industry along the US 93 corridor. However, this line is typically only in operation when there is a boom in gold and copper at a price that generates sufficient volumes to justify activating the line. Most recently the line operated from 1996 to 1999. However, when copper mines were reopened in 2004, trucks rather than rail were used to haul copper.

The demand for freight logistics services in Eastern Nevada is driven by highly cyclical commodity volumes. These commodities reflect a heavy mix of bulk products including gravel, sands, coal, and nonmetal minerals. Given the nature of such products, 63% of the 51 million tons of freight produced here moves within the state (NSFP, 2015). Trucking is the predominant mode handling 77% of Eastern Nevada's freight movement and rail holds a 14.3% market share (NSFP, 2015).

Transportation and warehousing in the Elko area provide support services, employing over 754 workers and generating $32.6 million and payroll. Manufacturing has a light presence here with 24 firms generating $8.4 million in wages (NV Energy, 2011).

Nearby, Utah is a major trading partner and freight transfer hub for this region (Brookings, 2013). Improvements in rail service and in transloading capabilities would facilitate growth in its major industry. Being part of a concerted state effort to grow its manufacturing base along with processing associated with its bulk commodities would be helpful to this region. Growth in freight outputs in Nevada's major Metropolitan areas, coupled with an integrated intermodal service base would likely have a networking effect and attract more output and freight services in Nevada's Eastern sector.

4.3.3.2 Economic Overview

The Eastern Nevada economy is subject to rather dramatic cycles based on the commodities market and the cycle of the general economy. Since the late 19th century, the boom and bust cycle in metals prices have had dramatic effects on population and economic activity. General economic cycles that affect the national economy also have significant impacts on the local economy due to the downturn in manufacturing and construction that reduces the demand for minerals and energy. Unlike Northern and Southern Nevada, the

cities and towns in Eastern Nevada tend to be smaller. Due to their size, they tend to be more industry specific rather than diversified economic centers, making them more vulnerable to single industry trends.

Economic diversification is also a major economic goal for this region as it is for the state as a whole and there are signs of diversity based on the value of its outbound production. For example, mixed freight, pharmaceuticals, and electronics produce over 25% of its $11.7 billion total (NSFP, 2015).

Since the BEA does not provide GDP by industry data for micropolitan areas, NAICS by industry data was obtained from various sources, including the Elko County Business Overview and the Nevada Governor's Office of Economic Development's County Economic Overviews. Salt Lake City industry data was used for comparison as Eastern Nevada is oriented toward the Salt Lake City economic trade region.

The Elko micropolitan statistical area is made of two counties: Elko County and Eureka County. The population of Elko and Eureka County is approximately 55,428 (GOED, 2015e). The total Gross Regional Product (GRP) of these combined metros as of 2013 is $5.692 billion (GOED, 2015c). This economy has increased by 10.3% over the 3-year period between 2010 and 2013 (BEA, 2015). Elko County has seen a 9.8% growth in jobs between 2005 and 2015; similarly, Eureka County saw a 14.6% growth in jobs between 2005 and 2015 (GOED, 2015f).

Manufacturing accounted for only 0.8% of the combined Elko and Eureka County 2013 GRP (GOED, 2015). below the national average, 11.9% (BEA, 2015). Salt Lake City manufacturing accounted for 13.4% of the total metro GDP (BEA, 2015), above the national average. Historical analysis of Salt Lake City NAICS data showed consistent growth in manufacturing through the recession, growing 24% from 2008 to 2009 while other metros studied saw steep declines in the same time period (BEA, 2015). Manufacturing growth in Salt Lake City slowed through 2010 and 2011, but has picked up again and will likely continue to exhibit strong growth as the economy comes fully out of the recession (BEA, 2015).

Transportation and warehousing accounted for 1% of the total combined Elko and Eureka County 2013 GRP (GOED, 2015), below the national average, 2.9% (BEA, 2015). Salt Lake City transportation and warehousing accounted for 3.9% of total 2013 GMP, above the national average.

Wholesale trade accounted for 3.9% of the total combined Elko and Eureka County 2013 GRP (GOED, 2015e and 2015f), which is below the national average of 6.2% (BEA, 2015). Wholesale trade in Elko County alone accounted for 7% of the 2013 County GRP (GOED, 2015f). Wholesale trade data was unavailable for Salt Lake City.

Construction accounted for 3.1% of the total combined Elko and Eureka County 2013 GRP (GOED, 2015e and 2015f), similar to the national average, 3.6% (BEA, 2015). Salt Lake City construction accounted for 3.9% of total 2013 GMP, on par with the average (BEA, 2015).

Mining accounted for 58.9% of the total combined Elko and Eureka County 2013 GRP (GOED, 2015e and 2015f), well above the national average 2.2% (BEA, 2015). Salt Lake City mining accounted for 2.2% of total 2013 GMP, on par with the national average (BEA, 2015). Eureka County accounted for the majority of mining activity, mining, quarrying, and oil & gas extraction, as 93% of the Eureka county GRP was produced in these industries (GOED, 2015e).

Almost all exports from Eureka are mining exports, it's the bulk of the employment in the County (3,824 jobs out of 4,463) and 35% of County GDP (GOED, 2015e). Mining is a major activity employer in the Eastern part of the state; according to the US Commerce Department it's the ninth largest economic sector in Nevada based on GDP and supported 12,600 direct jobs in 2012. Mining, quarrying, oil and gas extraction have 33

businesses, employing over 4,750 workers and produces in annual payroll of nearly $454 million in the Elko micro statistical area (NV Energy, 2015). The related construction trade is a big employer generating over 1,000 jobs in approximately 62,000,000 and payroll in the Elko MSA (NV Energy, 2015). Gold-mining is especially significant, as 79% of all gold in the US is mined in Nevada. Unsurprisingly, it is Nevada's number one and most volatile value export, as export values fluctuate dramatically. Copper ores and concentrates export value follows a similar pattern, susceptible to major highs and lows in value from year to year.

4.3.3.3 Industrial Real Estate Overview

The Eastern Nevada industrial market tends to be a single tenant market developed in response to the specific needs of the mining, energy, and agricultural sectors. Unlike Northern and Southern Nevada, there is not a significant multi-tenant market that results in speculative industrial construction. The major national real estate information services, including CBRE, the company used as the real estate data source for this report, do not track industrial real estate markets in Eastern Nevada as they tend to serve only single tenant who build on an as-needed basis to fulfill specific industry needs.

5 Conclusions

The new model for a New Nevada and its freight logistics hubs in Reno-Sparks and Las Vegas is focused on initiating a long-term shift away from being "stop-and-drop" secondary service O&D points to regional hubs that are well positioned to serve regional, national, and international markets. The key element of the strategy is to unite the focus of Nevada stakeholders around creating a strong crossroad intermodal network (North-South as well as East-West) to feed a strong logistics and manufacturing base supported by high quality and integrated multimodal transfer facilities. To do so requires an awareness of competitive services close to Nevada's metro hubs and their ability to capture distribution and manufacturing growth emanating from Southern and Northern California, as well as take into account the logistics hub services of other major metro areas, including Salt Lake City and Phoenix.

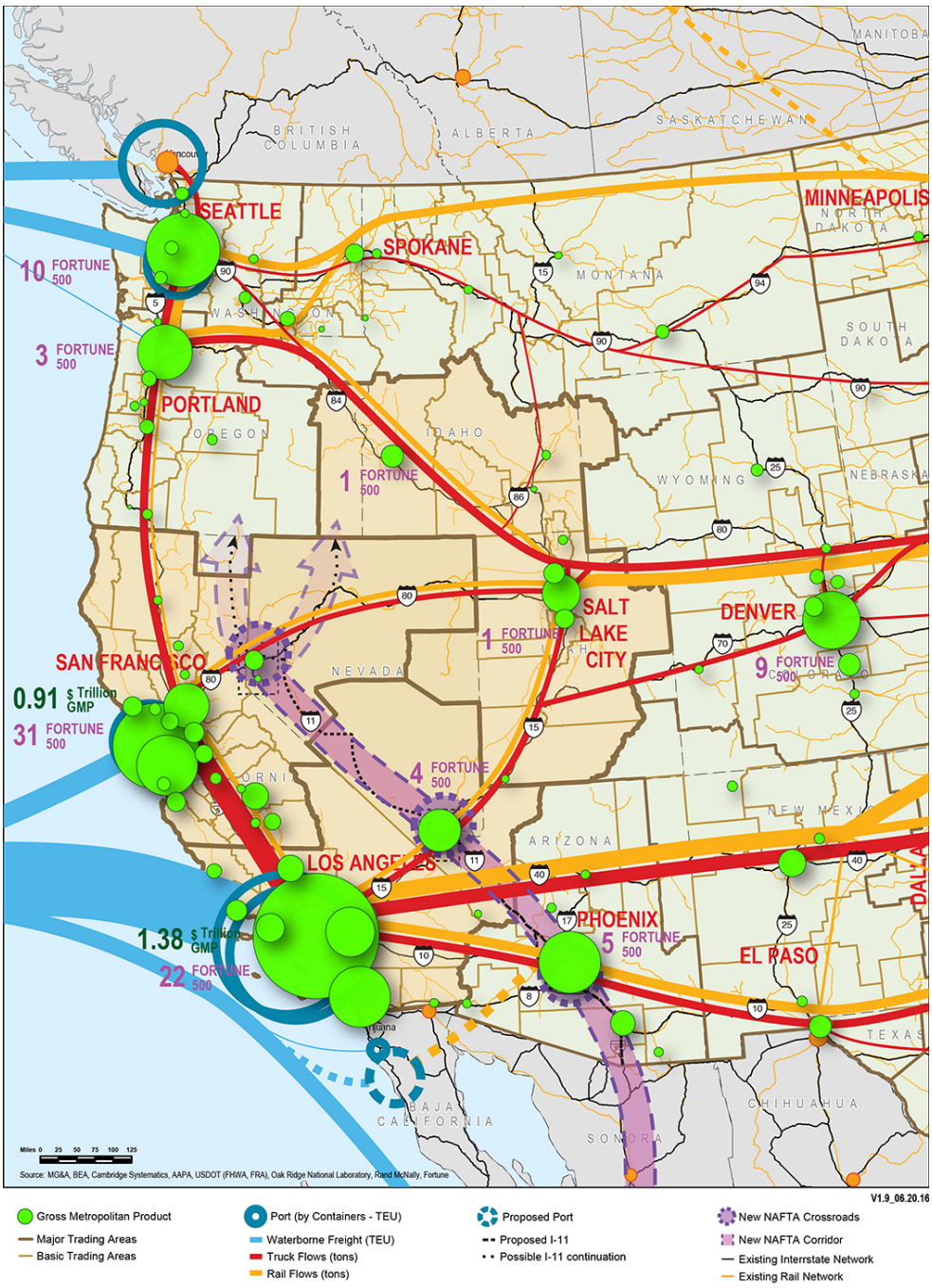

FIGURE 29
A Freight System to Support the New Nevada
A new freight logistics model for Nevada could strengthen the relationships between Northern and Southern Nevada and to the Western US metros and potentially to Mexico and Canada, ultimately serving, strengthening, and diversifying Nevada's local and regional economies (Source: MG&A 2015, Cambridge Systematics, AAPA, USDOT, FRA, Oak Ridge National Laboratory, BEA, Rand McNally).

5.1 Key Drivers, Opportunities, and Challenges

Resources, locations, and technologies represent a set of tools that can be utilized to capture the opportunities and advance the state and meet the challenges that are the barriers to achieving higher-level economic activity or quality of life. Capitalizing upon opportunities and challenges requires developing strategies and an implementation plan. Reconfiguring relationships and adding or modifying freight logistics components can lead to greater synergies needed to transform the state and metropolitan futures.

History has shown that metropolitan areas and regions that define opportunities and challenges in a global context have achieved transformational effects. Synergies produced by interactions with the global economy are much greater than those achieved on a local and more limited basis.

5.1.1 Preliminary Opportunities

1. **The I-80 and I-15 multimodal corridors are primary national trade corridors and are the commercial lifelines for Nevada**. Nevada's high through volumes sustain national trade from coast to coast and provide the state with an opportunity to tap into their current and future flows by adding additional logistics infrastructure and services to create value within the state.
2. **Add a North-South crossing multimodal, interstate and rail, corridor to expand the market space served by the Northern and Southern Nevada freight logistics hubs.** Currently, Reno is located along an East-West corridor and Las Vegas is located along a Northeast to Southwest corridor. The metros function as O&D points with limited market access to the Western US.
3. **Develop modally integrated hub facilities with industrial and distribution functions to serve a larger Western US market space.** Current hub facilities could evolve in the long term towards a higher level of integration between truck, rail, and air-based multimodal/intermodal. These more modally integrated facilities should be planned in conjunction with and in close proximity to industrial, distribution, and ancillary services that serve the needs of metro California as well as Nevada. Nevada's "business friendly" reputation is attractive to investors and developers. The state's metro hubs have favorable land, taxation, labor, and development policies that make them much less expensive than California.
4. **Capitalize on Nevada's growing identity as a manufacturing state.** The Tesla project is almost single-handedly changing the way the outside world looks at Nevada for manufacturing, production, and distribution. Create synergistic strategies that can have a domino effect in accelerating industry and distribution logistics as a growth area in the state economy.
5. **Utilize close proximity to the California economic regions to increase Reno and Las Vegas' role in the Western US truck distribution network.** The travel distances from Reno and Las Vegas to the major metro areas in the region are favorable to increasing Nevada's role in the Western US for truck distribution. Reno's city center is about 220-230 miles from the center of San Francisco and the port at Oakland. The Las Vegas city center is about 270-285 miles from Los Angeles/San Pedro Bay ports. This translates to about 4 to 5 hours of city driving by truck under off-peak (55mph) travel conditions. There is also a "backdoor" corridor reach between Reno and Salt Lake City, at 518 miles, and between Las Vegas at 420 miles. Likewise, with improved connections between Las Vegas and Phoenix, at 292 miles, the trip could become a one-day turn.
6. **Nevada's major cities can add to the base of hub customers.** Northern and Southern Nevada have developable industrial spaces and logistics-favorable workforces. Both regions are close to California's most populated metro areas and to a number nearby of agricultural and industrial producers.
7. **Manage the imbalance between imports and exports necessary to improve the overall cost effectiveness of freight movements in Nevada.** Nevada has a much larger consumer economy than a producer economy. This creates an imbalance between inbound and outbound truck traffic that is generally negative because of high back-haul cost. The imbalance creates lower costs for Nevada's outbound freight and results in strong interests on the part of major inbound shippers to find freight that can be exported to achieve cost balance.
8. **Nevada's metropolitan hubs can offer shippers a place to go where there is still a manageable level of congestion that allows them to keep their supply chains reliable and cost effective.** An increase in traffic congestion in the California metro area is increasingly resulting in a deterioration of service and reliability issues along the entire regional network.

FIGURE 30
Approximate Truck Distances from Las Vegas and Reno
This figure indicates truck travel times from Reno and Las Vegas, showing their reach for one- and two-day truck services within the Western US (Source: MG&A 2015, based on NV Energy and Rand McNally data).

5.1.2 Preliminary Challenges

1. **The economic output of the Las Vegas and Reno-Sparks-Carson City metropolitan areas does not yet command the high focus and attention of the logistics community.** Despite the major freight demand created by tourism, manufacturing, and construction concentrated in these two hubs, it has not resulted in attracting additional investments by the logistics community for a stronger and more diversified freight platform.
2. **The I-80 and I-15 trade corridors are more subject to negative weather conditions than I-40.** The Nevada crossroads pass through mountainous regions that create difficult, albeit seasonal and situational, travel conditions. Such conditions produce higher average truck operating costs (fuel, wear-

and-tear cost, etc.) than I-40 on a per mile basis. Thus, I-40 has the current competitive advantage with its greater freight traffic flows and cost savings.

3. **Nevada's I-15 corridor competes with other East-West trade corridors.** The primary competition for trade and logistics services along the I-15 corridor is with I-40 and I-10 corridors to the south, which both connect Los Angeles to Texas, the Midwest, and the Eastern markets.
4. **There is a shortage of data necessary to measure truck volumes and commodities on the I-80 and I -15 multimodal corridors.** This is a barrier to understanding and exploiting the market opportunities available.
5. **There is a lack of state-of-the-art intermodal rail transfer facilities in Reno and Las Vegas.** Currently, there are intermodal yards in the Central Valley between Nevada and the California ports that have additional capacity for growth. Until these yards reach capacity, rail investment in Reno and Las Vegas will be limited.

5.2 Where do we go from here?

The competitive analysis and data herein points to a freight planning and development strategy that is focused on elevating the market access, modal integration, capacity, and performance of Nevada facilities and transportation services to create intermodal hubs that are primary, not secondary, in their regional impact and global outreach.

"I skate to where the puck is going to be, not where it has been."

– Wayne Gretzky

This goal is constant with Nevada's economic aspirations. It points towards new fundamentals that seemingly are developing within Nevada's transportation and economic development communities that are responsive to global trends. It is aiming to be where (metaphorically) the puck will be, and exploring the options to get there will undoubtedly result in additional options. The advantage of having an ambitious and long-term target in mind is that it discourages purely incremental approaches and short-term activities that solve current problems but do not address long-term growth and diversification functions. The greatest opportunity is to achieve a superior future.

The important issues that need to be addressed in developing a suite of solutions and implementation strategy are:

1. Can Nevada generate the wherewithal to develop the intermodal corridor that it needs to develop crossroads at its major hubs?
2. Can the state improve its intermodal rail connections to ensure, among other things, reduced highway congestion as well as access to seaports and to diverse continental markets?
3. Can the state accelerate its efforts to grow and diversify its economy and develop the industrial and logistics base needed to generate enough outbound traffic to eventually create a tipping point in its favor?
4. At what point will regional shippers and the modes that serve them begin to recognize Reno and Las Vegas as distribution hubs in the regional and national market space, rather than O&D points with limited service within the state?

"Let's start at the very beginning. A very good place to start."

– Oscar Hammerstein

At this new beginning, recommended next steps would have much to do with answering questions posed above. They include:

- Greater outreach to major stakeholders within Nevada and beyond its borders to create and implement the freight plan.
- Creating a greater unity between industrial and freight transportation development for the common purpose of growing the economy. This should be based on the recognition that the development growth in technology-based services can help advance transportation system industries.
- Improving the technical data available for decision-making, including improved measures of the type and volumes of freight moving through Nevada's major corridors.
- Generating support for actions that are essential for advancing major projects, including completion of intermodal I-11 corridor planning and developing a public-private sector partnership to strengthen and market Nevada intermodal rail services.

Nevada is already beginning to create an environment that facilitates business start-ups and establish an ambitious vision for the future as a New Nevada as outlined by Governor Sandoval in his January State of the State Address (Sandoval, 2015). Several important projects underway are transforming the identity of the state. For example, the Tesla Gigafactory and the development of the transportation tools of the future (drone aircraft and driverless trucks) are evidence of a new economic future. An equal opportunity exists to transform Nevada's freight logistics infrastructure to support economic growth and diversification in this New Nevada.

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Attachment A: Informing the Analysis – Nevada's Existing Freight Logistics and Economic Plans

Freight Logistics Recommendations

Since the beginning of the century, the state of Nevada has commissioned three major planning reports that focus on the important links and contributions that Nevada's freight system makes in supporting its general economy. They are:

1. Nevada Department of Transportation's (NDOT) 2000 Nevada Statewide intermodal Goods Movement Study which inaugurated a major effort to identify issues, concerns, and opportunities regarding freight movement to, from, and within the state – and to determine the effectiveness of previous implemented recommendations.
2. In 2013, NDOT completed a Nevada Freight Program Assessment to update its evaluation of the freight industry from an economic perspective, to identify areas for potential growth and development and to serve as a framework for the Nevada Freight Plan that conforms with the program and goals of moving ahead for progress in the 21st century MAP – 21). [7]
3. In 2012 the Governor's Office for Economic Development (GOED) instituted a legislatively approved Nevada Inland Ports Viability and Funding Study to determine if Nevada could successfully create a logistics platform that would facilitate the movement of containers from Western ports to hinterlands further east and in doing so create efficiencies and jobs beneficial to Nevada.[8]

Each of these studies recognized the importance of freight transportation to the overall economy but also as a service sector that included distribution centers and value-added functions as well as trucking, rail, air and multimodal freight modes. The two recent studies were influenced by the Brookings "Unify, Regionalize, Diversify" Report published in 2011. For example, the Inland Port Study notes the development of four of these clusters would benefit from the application of supply chain transportation and distribution center organization and technology: Logistics and Operations; Mining, Materials, and Manufacturing; Business IT Ecosystems; and Aerospace and Defense. [9]

Highlights of Previous Major Freight Reports

Following are analysis highlights and major recommendations from the latter two (most recent) reports that are germane to the present competitive analysis.

The Statewide Freight Assessment updates data collected in 2011 for the 1997 addressing goods moved outbound and exports, inbound imports, internally within Nevada by truck, rail, air, multiple modes (e.g., truck and rail) and pipeline into and from domestic and international origins/destination. It includes an updated inventory of the state's infrastructure system, describing elements of the state economy dependent on freight serves and highlights industries and commodities with the greatest growth potential – and adds time series commodity forecasts for 2022 and 2033 against a 2012 baseline.

The Study recommends that the NDOT provide performance measures for its projects that address mobility, accessibility, safety, resource impacts, modal comparisons performance, operating efficiency and fiscal impact; initiate low cost roadway capacity improvements including pavement preservation, ITS, safety, connectivity, congestion reduction, etc. on I-80, I-15, US 595 and US 593, as well as study and advance major projects (such as I-11 use the state rail plan to coordinate service improvements with UPRR and BNSF). [10]

The Inland Ports Viability and Funding Study provides an analysis that Identifies major West Coast ports and their current capital plans, an assessment of Mexico's Manzanillo port's competitive

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[7] The Goods Movement and Freight Assessment Report are available through links at https://www.nevadadot.com/About_NDOT/NDOT_Divisions/Planning/Freight/Freight_Assessment.aspx

[8] http://www.diversifynevada.com/uploads/studies/Final_Nevada_Inland_Port_Report.pdf

[9] Inland Port Study – – Introduction at page 6.

[10] The report's recommendations were limited -- its major purpose was to provide an assessment to help set the table for a final Nevada freight plan

advantages/disadvantages vs. California ports, and discusses the potential effects of Panama Canal expansion. It defines and describes the attributes of inland ports including the functions of logistics/distribution centers of which they are a subset and discusses funding options for a logistics focused growth support strategy. The study includes extensive appendix material regarding companies and employment prospects for firms engaged in logistics and operations as well as interviews and other materials describing Nevada's freight and logistics resources.

It concludes that the prospects for an inland port within Nevada are long term – not immediate, reasoning that: California Ports (the primary target) have a surplus of existing capacity for regional and national distribution and don't require another inland node to improve their efficiency; that even under more positive market circumstances, Nevada locations may not offer the port or shippers requisite cost and service advantages; that truck drayage costs to Nevada are too high; and that Nevada truck and rail connections to primary markets are limited by negative distance and network connectivity factors and that the lack of backhaul traffic for truckers results in high inbound costs to Nevada locations.

The study recommends that the State: revamp the State's seven key industry clusters by combining manufacturing and logistics into a single supply chain strategy. The idea is to balance freight flows in Nevada's favor by turning low value inbound goods into high-end "value added" outbound product. Strengthen businesses that are unique to Nevada such as Bally Industries – they prosper because of local expertise, low manufacturing costs and positive tax policies that make high worldwide distribution costs manageable; and focus on fulfillment center distribution that can speed goods to accessible large markets. Trucks would feed California and Nevada markets from Northern Nevada. Growth in air freight services would help small parcel-based Nevada businesses reach broad national and international markets and understand that economic development is a process of progressive steps, one building upon previous steps.

Key Takeaways From 2000-2012 Reports

- Nevada has not only been growing in population it also has been creating jobs, receiving increased freight flows from other states' regions and countries; and moving more freight within its borders.
- Trucking has continued to dominate among the modes; rail freight services have grown slowly, and multimodal services, such as truck to seaport and airport connectivity, and intermodal rail are growth areas. These intermodal movements combine to deliver and export higher value freight.

The Nevada economy is sharply distinctive in its regional features:

- Metro Las Vegas exchanges commodities supportive of its huge gaming and accommodations platform, serves a modest manufacturing base and overall commerce strongly tied to greater Los Angeles.
- Metro Reno is more diversified in its commerce and serves as a logistics base for northern Nevada with major trade ties to the Bay Area as well as to Metro Los Angeles.
- The remainder of Nevada, reflecting its role as a major mining production and processing point, has more trading activity from Salt Lake City as a Gateway – and leads the whole of Nevada in the production of bulk materials for export.

- The Nevada major Metro areas have good connections to major California economic and transportation hubs and have potential to become significant sub hubs in providing spillover logistic services related to nearby congested California growth centers. Generally, it has capacity in its local roadway, rail, and aviation systems to meet growing freight demand.
- The state also has significant commercial relationships with points eastward that include Metro areas that house major port facilities and major distribution hubs such as Chicago and NY-NJ-PA metro areas.
- Nevada's freight infrastructure has a major weakness: it lacks efficient highway and rail connections between the North and South. This limits its connectivity to growing the NAFTA trade as well as internal

movement between its two metro areas, and connectivity to major points to the South such as Phoenix, Arizona.

- Freight flows to and from Nevada's major Metro areas are overwhelmingly in favor of goods coming into the state. This imbalance of flows leads to higher overall transportation costs because trucks and rail cars that stop here are returning at less than full capacity. However, this imbalance can work in the state's favor for goods manufactured or arranged for distribution that are available to fill the backhaul.
- Current factors do not favor Nevada strategy solely tied to a port distribution role, although there are other more domestically and regionally responsive distribution models that may prove successful in the near and intermediate future.

The data and analysis presented in these reports covered the Nevada economy between 1997 and 2011, therefore they are but a snapshot of recent historical activity. The reports barely reflect emerging overseas exports and prospects for growth in both Omni Dimensional logistics distribution (goods to retail stores and internet order fulfillment) or as an effective service base for advanced manufacturing represented by the Tesla facility and other industries as diverse as robotics and the growth in the solar energy industry.

Economic Development

This section contains a summary of the economic development studies that have been developed in Nevada to deal with the essential problems that plagued the Nevada economy during the last recession. These approaches recognize that in order to build a more solid economic base in Nevada, each region needs to diversify its key economic components and facilitate new market growth.

Statewide

Unify, Regionalize, Diversify: An Economic Development Agenda for Nevada

This Brookings/SRI report published in 2011 calls for the state to: establish a clear and unified model or framework for pursuing growth; support regional development efforts and strategies to spur growth, innovation, and job creation; and set the stage for broad-based growth. The plan set out to provide analytic and policy background for state planning initiatives, defining the current situation and paths toward achieving diversification. In doing so, the report identifies seven major target industries as holding the most potential for economic growth and diversification: 1) Tourism, Gaming and Entertainment; 2) Health and Medical Services; 3) Business IT Ecosystems; 4) Clean Energy; 5) Mining, Materials, and Manufacturing; 6) Logistics and Operations; and 7) Aerospace and Defense.

The report also states that other industries may also be high-potential activity clusters, and so the state should remain open to new developments, including but not limited to, agriculture and Food Processing, Water and Water Tech; and Financial and Intangible Enterprise.

Moving Nevada Forward

Building off of the Brookings Report, this plan was published February 2012 by the Nevada Board of Economic Development. This plan also established the need to expand to develop a broader economic foundation while maintaining traditional sectors of tourism, mining, and agriculture. It acknowledges Nevada's challenges of geography and climate that put limitations on efficient and effective economic development. The vision of the plan is "a vibrant, innovative, and sustainable economy," while the mission is "high quality jobs for Nevada." Objectives include: establishing a cohesive economic development operating system, advancing the targeted sectors and opportunities, expanding global engagement, catalyzing innovation in core and emerging industries, and increasing opportunity through education and workforce development.

GOED Target Industries

In order to achieve the vision and mission set forth in Moving Nevada Forward and capitalize upon opportunities for diversification, the plan recognizes that Nevada cannot abandon its traditional sectors of tourism, mining, and agriculture; but that it can expand other industries to establish a much broader and more stable economic base. With that, the industries targeted closely mirror those recognized by Brookings; However, the seven have been re-ordered and agriculture, intangibles and financial enterprises, and water technology were added as additional promising possibilities. The re-ordered list of target industries is:

1. Tourism, Gaming, and Entertainment
2. Clean Energy
3. Health and Medical Services
4. Aerospace and Defense
5. Mining, Materials, and Manufacturing
6. Business IT Ecosystems
7. Logistics and Operations
8. Additional Promising Possibilities: Agriculture, Intangibles and Financial Enterprises, Water Technology

Las Vegas Region

Unify, Regionalize, Diversify: An Economic Development Agenda for Nevada

The Brookings effort involved identifying concentrations of expertise and existing firms, concluding that Southern Nevada should focus economic development work in the industries of Tourism, Gaming, and Entertainment; Business IT Ecosystems; Health and Medical Services; Energy Efficiency; and Logistics and Operations.

Comprehensive Economic Development Strategy (CEDS)

The Las Vegas Global Economic Alliance (LVGEA) published the CEDS in July 2013, representing collaboration between Southern Nevada's counties, municipalities, business, labor, and non-profit communities, as led by the LVGEA. This document states that although the economy of Southern Nevada has been successful, it is too narrowly defined, and so it presents strategies and recommendations to broaden the economic base while strengthening the core industries. The aim is to foster a more diversified regional economy that is global in nature and capable of responding to the needs of the 21st century. The industries compatible with this global vision include: 1) Gaming, Tourism, and Conventions; 2) Logistics, Manufacturing, and Assembly; 3) Health Care and Life Sciences; 4) Business and IT Ecosystems; 5) Clean Technology; 6) Defense and Unmanned Aerial Systems; and 7) Global Finance, Banking, and Business Services. Thus, albeit worded slightly differently, the Las Vegas CEDS closely mirrors the Brookings identified target industries, but adds global finance, banking, and business services to the mix while leaving out Mining and Materials, but including Manufacturing as part of the Logistics sector.

When the recession hit, Southern Nevada suffered longer and harder because the region lacks the foundation for long-term economic growth. Thus, the CEDS establishes five key goals to get the region on the path toward long-term economic sustainability: 1) offer the best and most innovative business climate in the Western United States and provide high quality services that will result in the startup, recruitment, retention, and expansion of businesses in Southern Nevada; 2) support and retain Southern Nevada's entrepreneurs; 3) Spur connectivity through local, regional, national, and global partnerships; 4) Improve Southern Nevada's workforce and education systems to develop, retain, and attract a skilled, educated, and talented workforce; 5) expand the LVGEA so that it has the organizational capacity and regional support to be successful. Each goal also has an assigned set of objectives and programs to be considered.

Reno-Sparks-Carson City Region

Unify, Regionalize, Diversify: An Economic Development Agenda for Nevada

The Brookings report concluded that Northern Nevada should focus economic development work in the industries of Clean Energy, Mining, Materials and Manufacturing, Logistics and Operations, Aerospace and Defense, and Business IT Ecosystems. The document states,

"Northern Nevada's critical mass and competitive advantage in logistics and operations is evident in the wide range of national-name logistics/distribution companies that have already set up operations in the region. Linked with these activities are a number of assembly-based and light manufacturing operations that have also set up facilities in Northern Nevada, primarily to serve as a West Coast hub and take advantage of the region's strong distribution and transportation network."

Comprehensive Economic Development Strategy (CEDS)

The Western Nevada Development District (WNDD) published their CEDS in February of 2014. The vision statement is "Western Nevada is an innovative, regional economy, rooted in sustainable development and enriched by the area's abundant natural resources and the collaboration of its independent unique communities. Region-wide, these prosperous communities demonstrate a forward-moving commitment to quality of life and to opportunity for all residents." The document further states that the industries present in the region with potential for growth are: business and financial services, energy, mining, agriculture, biomedical, defense, manufacturing, transportation and logistics, and arts, entertainment and recreation (tourism).

Greater Reno-Sparks-Tahoe Economic Development Three-Year Strategic Plan

EDAWN submitted this EDSP to the State in April of 2012 as part of efforts to continue the region's economic diversification. The plan identifies target industries based on the Brookings/SRI study, the state's economic development plan, *Target2010*, and recent expansions, relocations, and inquiries. Target industries in this plan include: 1) Aerospace, Aviation, and Defense 2) Back Office, Business Support (Call Centers); 3) Clean Energy with an emphasis on geothermal; 4) Distribution and Logistics; 5) E-Commerce Fulfillment; 6) Financial and Intangible Assets; 7) Manufacturing; and 8) Headquarters of any industry type.

The main goal of this EDSP was to create 7,500 jobs in the Greater Reno-Sparks-Tahoe region by 2015. Key objectives for this job development included: 1) Entrepreneurial growth; 2) Retaining and expanding existing Greater Reno-Tahoe companies and jobs; 3) Attracting companies from outside the Greater Reno-Tahoe region that provide jobs with salaries above the regional average in target sectors; 4) Facilitating educational development of the existing and future workforce; and 5) Enhancing the community so that it continues to evolve as an attractive, competitive place to do business and live.

Rest of the State

Unify, Regionalize, Diversify: An Economic Development Agenda for Nevada

The Brookings report (2011) suggested that rural Nevada can build strong bases in Mining, Materials, and Manufacturing; Tourism, Gaming, and Entertainment; and Clean Energy.

Northeastern Nevada Regional Development Authority

The Northeastern Nevada Regional Development Authority states that the region has industry concentrations in industrial, transportation, renewable energy, manufacturing, mining, and retail. Elko County is the fourth largest gold producing area in the world, which provides the state with an important source of income.

Attachment B: Case Studies of Freight Infrastructure Investments in the US

Alameda Corridor

With the rapid rise of China following the collapse of the Soviet Union and especially after 2000, the Pacific became the world's foremost frontier of trade and China became the primary manufacturing center of the world. Thus, the West Coast ports experienced a rapid rise in container trade and a subsequent dramatic increase in rail and truck traffic needed to service the ports. Rail traffic slowed, adding cost, reducing reliability, and increasing the friction between freight, rail, auto, and truck traffic at crossing points to the detriment of both the freight and passenger systems. The Alameda corridor was constructed in 2002 to capture the economic opportunity presented by the massive increase in freight flows and to meet the challenges presented by the conflicts between freight and passenger rail and road traffic. It is a 20-mile long corridor connecting downtown LA to the Ports of L.A. and Long Beach (FHWA, 2004, 1). The project removed 200 highway-rail crossings at grade, widened Alameda Street, and improved traffic signals in order to have the outcomes of reducing traffic delays, enhancing safety, improving rail operations and minimizing truck drayage both in and around the two ports (FHWA, 2004, 1).

Heartland Corridor

In response to rapidly growing East Coast port container traffic and an estimated 92% growth in US freight by 2035, Norfolk Southern set out to improve efficiency and strengthen connections between its busy eastern port in Norfolk and the Midwest regional economy (Norfolk Southern Corp, 2010). Norfolk Southern proposed a new high capacity double-stack train route from Virginia through five states to Chicago to increase freight traffic and reduce travel time by one day (Norfolk Southern Corp, 2010). The Heartland Corridor was created by a $290 million dollar investment made possible through a public-private partnership between the FHWA's Eastern Federal Lands Highway Division, USDOT, Ohio, Virginia, West Virginia, and Norfolk Southern (Norfolk Southern Corp, 2010). It has provided economic advantages to the states and the country, creating jobs, increasing tax revenue, and simulating further business growth (Norfolk Southern Corp, 2010). The project nearly doubled Norfolk Southern's capacity to handle the growth of international intermodal shipments, as it is estimated that one intermodal train can take 300 trucks off the highway (Norfolk Southern Corp, 2010). The three-year reengineering effort to modernize existing infrastructure worked along 375 miles of track at 53 project sites, raising vertical clearance for the double stack trains in 28 tunnels in three states (Norfolk Southern Corp, 2010). Other improvements along the route have reduced the need for maintenance and improved reliability throughout the corridor. The project also added additional terminals along the route for loading and unloading. Proximity to intermodal facilities provided more efficient movement to and from other modes of transport, such as airports and highways (Norfolk Southern Corp, 2010).

Along with providing access to world markets, the project reduced highway congestion, fuel cost and usage, and emissions, while creating new jobs throughout the region and improving public safety. Norfolk Southern believed that the partnership would be more beneficial to state and federal governments:

> *"This was another huge win-win for all stakeholders because a dollar spent on rail infrastructure will provide more cargo carrying capacity than a dollar spent on highway infrastructure. Not only do the states benefit with increased revenue but also the federal government, who oversees interstate highways, sees tremendous environment and economic benefits."*
> (Norfolk Southern Corp, 2010) *-Deb Bultler, Norfolk Southern EVP Planning & CIO*

Crescent Corridor

Norfolk Southern has also partnered with 13 states to complete the Crescent Corridor, strengthening freight transportation between the Gulf Coast, the Southeast and the Mid-Atlantic by connecting a 2,500 mile network of existing rail lines with regional freight distribution centers (Norfolk Southern Corp, 2010). Upon completion in 2020, the $2.5 billion dollar project will: modify existing track by straightening curves and adding passing lanes, double tracks, and signals; build 300 miles of new track; and create new terminals in Birmingham, AL, Memphis, TN, Charlotte, NC, and Greencastle, PA. (Norfolk Southern Corp., 2010; Norfolk Southern Corp., 2011; Norfolk Southern Corp., n.d.). Moreover, Norfolk Southern touted the environmental benefits of the system: 170 million gallons of fuel saved in one year alone, reducing carbon emissions by

almost 2 million tons per year (AAR, 2014; Norfolk Southern Corp., n.d.). The Crescent Corridor is projected to take more than one million trucks per year off the interstates, improving public safety and reducing highway delays (Norfolk Southern Corp., 2011.).

Charlotte Douglas Multimodal Hub

Charlotte had to overcome the challenge of not being a trade center in the East Coast in order to gain access to the global marketplace. Albeit situated at the crossroads of I-85 and I-77, Charlotte was not considered a global nor an East Coast logistics hub, but rather a local distribution center that served only the regional market. The East Coast trade hubs with greater access to the world are Miami, Atlanta, and New York. However, in understanding the competitive landscape, the Charlotte region developed an integrated systems strategy for linking road, rail, and air into a multimodal Hub at Charlotte Douglas International Airport. By capitalizing on transportation assets and developing an integrated approach, Charlotte became part of the pattern of trade hubs along the East Coast and established access to the global marketplace.

The development of the multimodal hub at the airport was intended to strengthen the entire regional economy, especially the logistics industry. As supply chains depend on reliability, low cost, and safety, the multimodal hub provided a new framework for the transfer of goods between modes within a single public facility that did not require any freight to move across public highways or city streets. Thus, it eliminated the need for drays and thereby provided a more reliable, lower cost, and safer point of transfer than any competing center on the East Coast. This has allowed Charlotte to more effectively compete with the three much larger and more established trade hubs.

Rickenbacker Global Logistics Park and Inland Port

Originally a military base, Rickenbacker Airport was realigned to civilian use in the 1980's, serving primarily as a cargo airport for the Columbus, Ohio region. The airport's location and infrastructure allowed it to grow into an international logistics hub, with the beginnings of its air cargo and trucking freight facilities, a foreign trade zone designation, and the relocation of the Columbus Port US Customs office to the airport. The 1996 strategic plan recognized the airport's strategic location in the changing global and national transportation grid, especially its proximity to the planned Norfolk Southern rail Heartland Corridor and the potential of the largely undeveloped area around the airport, and laid out a vision of an integrated multi-modal logistics center. With limited international air freight service already running, and a location that put Rickenbacker within a 500 mile drive for trucks to more than 50% of the us population, and 60% of the country's manufacturing facilities (RPA, 1996), Rickenbacker was able take advantage of the planned development of Norfolk Southern's Heartland Corridor rail infrastructure to add a rail intermodal yard in 2008, and become a truly integrated logistics center. The Global Logistics Park encompasses over 1,500 acres capable of handling 28 million square feet of development (Duke, 2011).

Rickenbacker is now a key hub on the Heartland Corridor, which opened to double-stack service in 2010, as well as having direct cargo flights to Asia and strong trucking networks. A 2008 independent study concluded that the intermodal facility alone would contribute a $660 million savings in transportation costs to shippers in the first 10 years, and is estimated to have an economic impact of over $15 billion in the next 30 years (Byrum, 2008).

Both Charlotte and Rickenbacker had a favorable geometry already in place, and so adding the integrated modal configuration gave them a competitive advantage in the marketplace.

State of Connecticut Transportation Strategy Board

Acknowledging in 1999 that the State of Connecticut, and the rest of New England, would suffer economically if the trend of deteriorating transportation infrastructure continued, Connecticut created a Transportation Strategy Board to create a 20-year, long-range action plan for prioritizing investments and a sound financial plan to ensure that the recommendations could be carried out. The Strategy Board was intended to overcome the fragmentation and modal compartmentalization of planning transportation

improvements in order to establish an overall 'big-picture' vision for the transportation system to serve the State's economic competitiveness and quality of life. The TSB was comprised of business leaders, commissioners of state agencies including DOT, Economic and Community Development, Public Safety, Environmental Protection, and the Office of Policy and Management, as well as representatives appointed by top legislators.

The TSB established five Transportation Investment Areas, with working groups that would play important roles in implementing the projects resulting from the vision, and an extensive public input process. The TSB created an Economic Strategy, a Movement of People Strategy, a Movement of Goods Strategy (encompassing all modes), a Special Financing Strategy, and an Ongoing Funding Strategy, resulting in a plan for capital investments of almost $5 billion, with the financial plan to fund it (TSB, 2003).

Attachment C: Western US Industrial RE Analysis[11]

Note: The statistics used are averages for the entire market area and thereby do not reveal the variability within the submarkets of each metro area.

[11] Industrial real estate encompasses facilities where space is used primarily for research, development, service, production, storage or distribution of goods and which may include some office space. This type of real estate is further divided into three primary classifications: manufacturing which involves the production of products/goods; warehousing/distribution facility, used for the storage or distribution of material goods or merchandise and flex facilities; and industrial building which allows its occupants flexibility of alternative uses usually in an industrial park setting (NAIOP, 2012).

The Western US Industrial markets are a distinctive subset of the US market. They are driven by several key factors, including access to the Pacific trade corridors linking the US to Asia, the size and spatial distribution of the metropolitan areas, the economic characteristics of each metro, and its role and function within the Western US. Traditionally, the Western market, other than the Los Angeles, San Francisco, and Seattle markets, were primarily agricultural and resource extraction economies that primarily served local markets. This is in contrast to the Eastern markets where the close proximity of large metropolitan areas had made them more interactive, and industrial markets often served their local and other regional markets. As a result, the Los Angeles and San Francisco industrial markets are much larger and more diverse than those found in the remainder of the Western US. The two primary Nevada markets, Reno and Las Vegas, originally evolved as more separate and isolated markets serving local metropolitan needs. These two markets are now in a process of transformation as they become more closely linked, especially Reno, to California. As Reno is becoming more economically integrated with the Northern California market, its market performance is benefitting from its growing relationship with the Northern California economy. Las Vegas has not experienced the same kind of economic integration with the Southern California economy. Rather, Southern California remains an important area for attracting tourists to the Las Vegas market while more diversified economic integration is occurring in the Reno/Northern California market.

FIGURE 31
Western US - CBRE Industrial Real Estate Markets
This figure shows the geographic location and size of each industrial real estate market included in this study of the Western US, as defined by CBRE

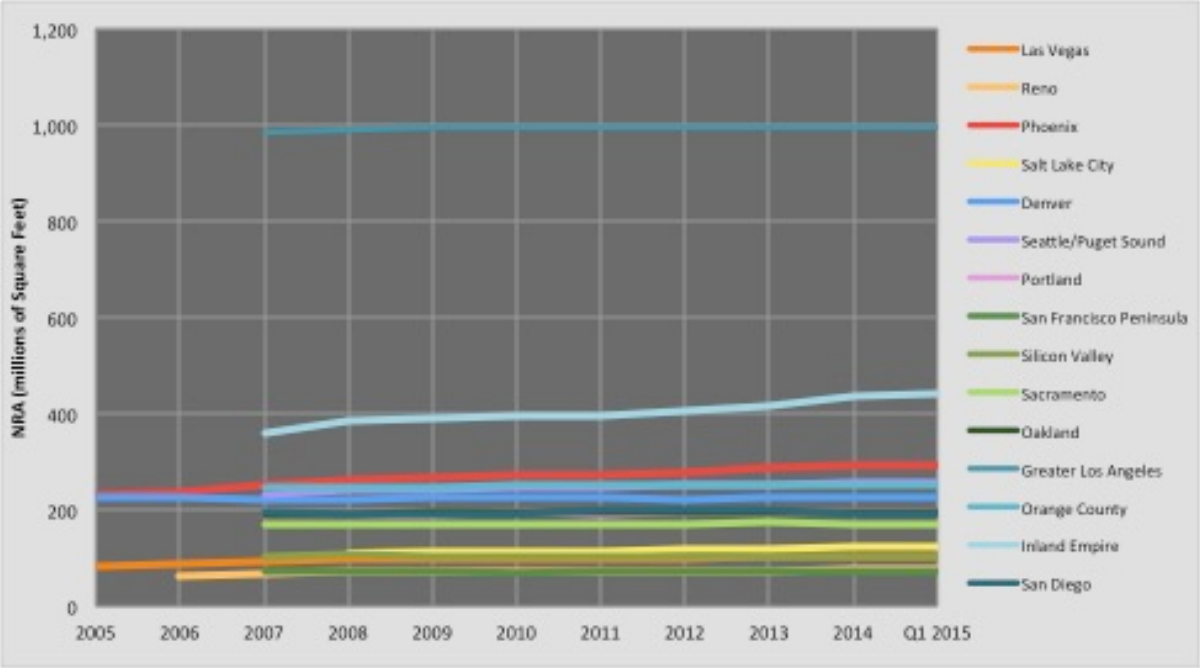
The analysis of warehousing and distribution trends was based on data collected for each prominent CBRE-defined industrial real estate markets in the project-defined Western US region: Las Vegas, Reno, Phoenix, Salt Lake City, Denver, Seattle-Puget Sound, Portland, San Francisco Peninsula, Silicon Valley, Sacramento, Greater Los Angeles, Orange County, Inland Empire, San Diego, and Oakland. The data collected included:

Net Rentable Area, Net Absorption, Construction Deliveries, Lease Rate, and Vacancy Rate for years available between 2005 to Q1 2015[12] (CBRE, 2015).

Market Size: Net Rentable Area

The industrial markets in the Western US are dominated by the sheer size of the Greater Los Angeles market. This market is about 6.5 times larger than the other markets on average, ranging from about 2.25 the size of the Inland Empire market to 14 times larger than the San Francisco Peninsula and Reno markets. In Q1 2015, the combined size of the Southern California markets was 1,689,500,142 sq. ft., of which 993,852,371 is the Greater Los Angeles market, 441,986,528 in the Inland Empire, and 253,661,243 in Orange County. The second largest market outside of Southern California is the combined San Francisco Bay Area market at 369,902,097 sq. ft., of which 197,023,051 is in Oakland, 101,888,757 in Silicon Valley, and 70,990,289 in the Peninsula. Outside of these two major industrial markets, Phoenix is the third largest, at 295,232,362 sq. ft. Of the eleven combined (Southern California – 3 markets, and San Francisco Bay Area – 3 markets) and individual markets, the Nevada industrial markets rank as the two smallest of the tracked markets in the Western United States; Las Vegas with 102,439,330 sq. ft. ranked 10th and Reno with 77,082,219 sq. ft., ranked 11th.

FIGURE 32
Annual Net Rentable Area in Western US Industrial Markets



Of the fifteen individual markets, eight, Las Vegas, Reno, Denver, Sacramento, Silicon Valley, Greater Los Angeles, Orange County, and San Diego, experienced slight declines in market size from 2011 to 2012 as the Great Recession took its toll, while the other seven grew slightly at varying rates. Thus, both of the Nevada markets experienced slight declines in this period. Of the eight markets that declined, six, exhibited positive growth again between 2012 and 2014, with the exception of Sacramento and San Diego. Both Nevada markets returned to positive growth in this period. However, Reno experienced a slight decline of 200,000 sq. ft. from 2014 to the first quarter of 2015, Las Vegas increased slightly by half a million sq. ft.

Over the decade, the Inland Empire exhibited the largest increase in industrial market size by 84.3 million sq. ft., significantly more than the second highest increase in Phoenix, at 65.5 million sq. ft. The third highest total growth was in Puget Sound at a much smaller 26 million sq. ft., followed by Las Vegas at 19.5 million,

[12] Note: some markets did not have information available for all years, so their trend lines begin at 2007, and 2008. Data Credit: JJ Peck of CBRE.

Reno at 14.6 million and Salt Lake City at 13.5 million. Denver, Orange County, San Diego, and the Greater Los Angeles markets experienced growth between 6.3 and 9.3 million sq. ft., while the San Francisco Peninsula, Silicon Valley, and Sacramento were much slower with a range of 2.9 to 4.9 million sq. ft. growth. Both Nevada markets showed moderate growth over the decade.

Net Absorption

All industrial markets in the Western US included in this study exhibited significant decline as a result of the Great Recession. While Greater Los Angeles and the Inland Empire industrial markets hit bottom in 2008, all others hit bottom in 2009. The Inland Empire and Greater Los Angeles felt the effects more briefly than other markets and were able to bounce back from their low in 2008 as other markets continued to have negative absorptions. Moreover, the Inland Empire has seen great increases in net absorption since 2008, reaching a level much higher than the other markets. This is indicative of the congestion and minimal warehousing space available at the Ports of Los Angeles and Long Beach leading tenants to locate in the nearby Inland Empire submarket, with its greater availability and close proximity.

In the Nevada markets, the data reveals that net absorption in Reno has been positive every year since 2010, as compared to Las Vegas where net absorption remained negative through 2012. In the period 2009 through 2014, Reno's net absorption exceeded Las Vegas by approximately 2.5 million square feet, indicating Reno's efforts to capitalize on its geographic proximity to the Northern California markets. The Las Vegas market would appear to remain dependent on the tourism market as it performs an entirely different economic function relative to California than does Reno.

FIGURE 33
Annual Net Absorption in Western US Industrial Markets

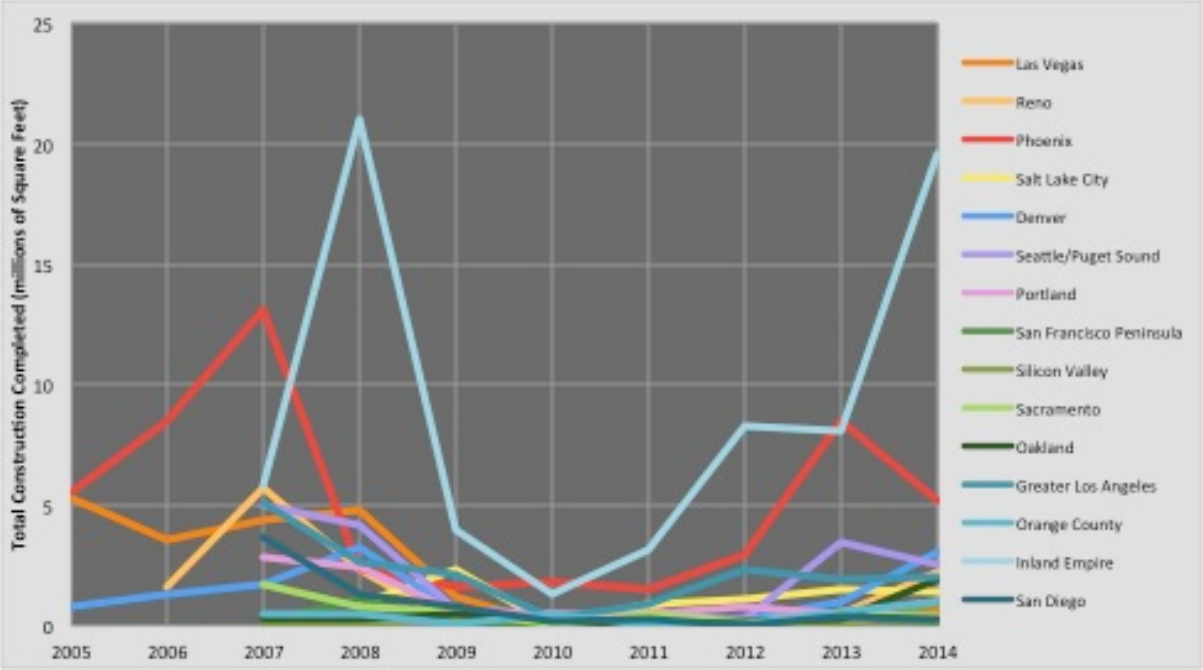
Construction Deliveries

Construction deliveries in the Western US do not exhibit the same type of consistency that is seen in market size nor net absorption. While some markets exhibit a high degree of fluctuation in deliveries, others remain relatively constant and flat. Phoenix and especially the Inland Empire exhibit higher amounts and volatility of construction as compared to the other markets. The Inland Empire market is driven by its relationship to the Los Angeles market and the recent increase in construction could indicate the trending shift outward from

the Los Angeles and Long Beach ports as they become built out and increasingly congested. Additionally, Phoenix experienced a boom of construction in 2013 with 8.5 million sq. ft., indicating their potential to act as an inland port distribution point as the California markets need a spillover point, although in 2014 it turned back downward. Phoenix, Seattle/Puget Sound, Portland, Sacramento, Greater Los Angeles and the Inland Empire did not have a single year where no construction was completed, while the other markets show one or more years of no construction. Silicon Valley had four years with no construction completed between 2007 and 2014, indicating the region's resistance to industrial in favor of R&D and office space to serve its technology industry resulting in the zoning out of industrial.

In the Nevada markets, Reno had experienced a spike in 2007, but declined in 2008 and 2009. It then remained flat through 2013 and spiked upward in 2014 with 2.2 million sq. ft. delivered to the market. Prior to the recession, Las Vegas was one of the strongest industrial markets, delivering between 3.5 and 5.3 million sq. ft. per year between 2005 and 2008. However, since 2009, the Las Vegas market has declined and remained relatively static with two years of no deliveries and four years with deliveries well under a million sq. ft. delivered.

FIGURE 34
Annual Construction Deliveries in Western US Industrial Markets



Lease Rates

All industrial market lease rates in the Western US follow similar trend lines although at differing levels. The data indicates that the San Diego industrial market has by far the highest lease rate per sq. ft. per month, currently at 99 cents, while the San Francisco Peninsula is second, at 90 cents. Orange County and Greater Los Angeles have the next most expensive and rates at 70 and 66 cents per sq. ft. per month, respectively, while Portland and Reno have the least expensive rates at a much lower 38 cents per sq. ft. per month, followed by the Inland Empire at 39 cents.

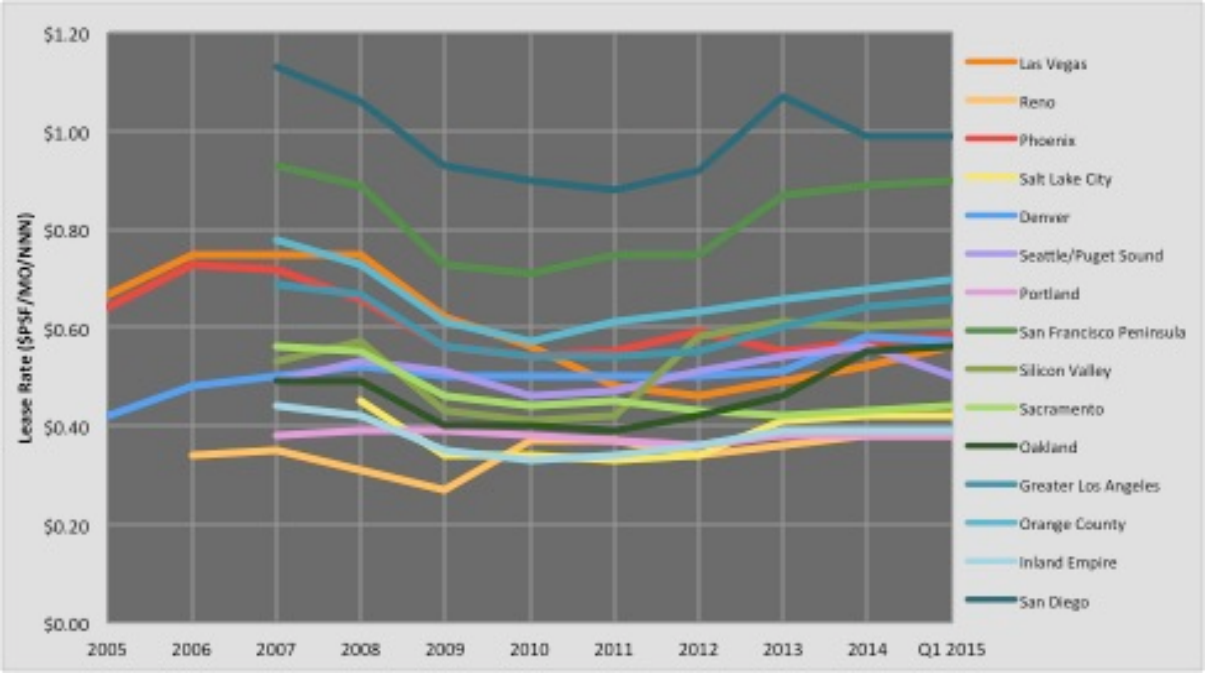
The Nevada markets exhibited very different patterns in their industrial lease rates over the last decade. Las Vegas is a more expensive market than Reno. The Las Vegas market experienced a decline from the high reached in 2006 to 2008 period and went into decline in 2009, continuing the downward trend through 2012. It began recovery in 2013 and continued upward through the first quarter of 2015 although it has not reached its pre-recession price. Reno is much cheaper and has been fairly stable over the decade, with a

range of only 11 cents between its maximum, 38 cents, and minimum price, 27 cents, while Las Vegas had a difference of 29 cents from its highest, 75 cents, to lowest rate, 46 cents.

In the Western markets that could capture spillover, lower lease rates are extremely important in creating a competitive attraction. However, Las Vegas and Phoenix both have rates about 20 cents higher than the Inland Empire, so it is unlikely that they will capture excess demand generated in the Southern California region until the Inland Empire is completely absorbed and built out. Conversely, the industrial market lease rate in Reno currently ranges from 6 to 52 cents cheaper than the four noted Northern California markets and is therefore an attractive alternative for cost savings as congestion increases and availability declines.

FIGURE 35

Average Asking Lease Rates in Western US Industrial Markets



Vacancy Rates

The effects of the Great Recession are also evident in the pattern of vacancy rates in Western US industrial markets. The Phoenix and Reno markets experienced the highest vacancy rates in the Western US in 2009, at 16.1% and 14.7%, respectively. The Greater Los Angeles and Orange County markets, closest to the Ports of Los Angeles and Long Beach, experienced the lowest decline in vacancy rates and the least volatility throughout the decade.

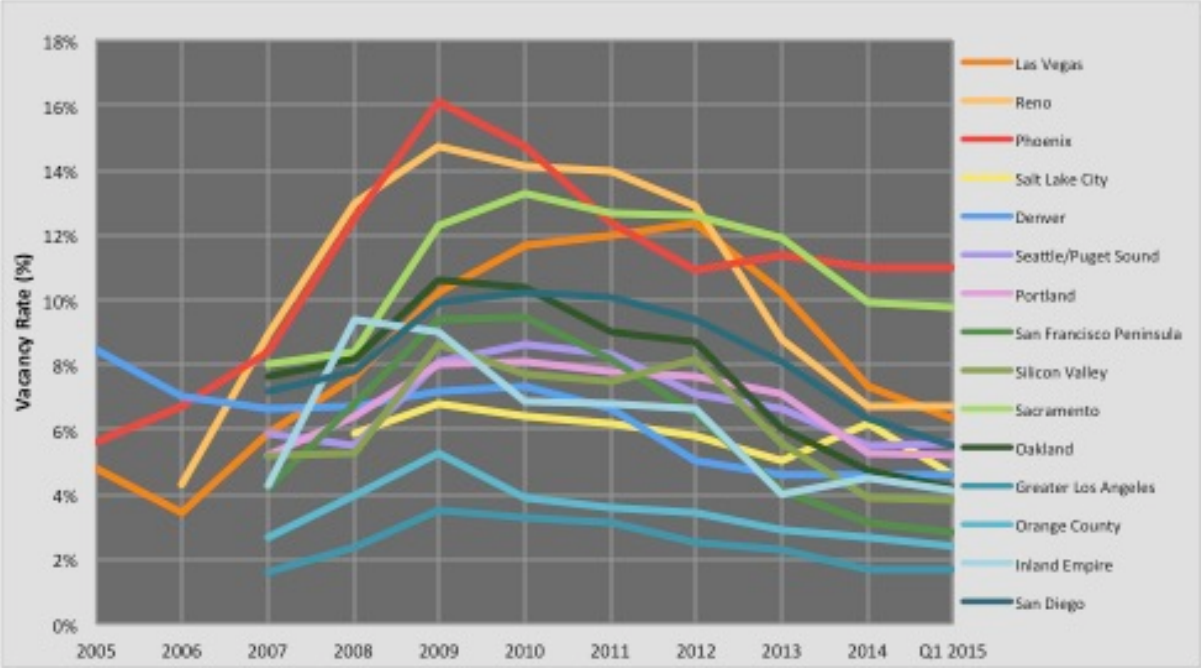
The submarkets more inland, not directly adjacent to the ports, tend to be more susceptible to economic cycles as tenants take advantage of the declining lease rates in more desirable markets. For example, vacancy rates in Phoenix, Reno, and Las Vegas had a range of 10.5%, 10.4%, and 9%, respectively, while Greater Los Angeles, Orange County, and Portland had ranges of 1.9%, 2.9%, and 2.9%, respectively. However, even further inland markets that are more strategically located along prominent freight corridors and have established competitive positions in the network also experience much less volatility. For example, Salt Lake City had a range in vacancy of only 2.2% between 2008 and 2015.

Phoenix, Las Vegas, Reno, and Sacramento are the only four industrial markets included in this study that have not yet recovered back to their lower pre-recession vacancy rates, while all other markets have either recovered or are now below their pre-recession rates.

The Nevada markets have followed similar trend lines to the more volatile markets in the Western US. While they suffered sharp rises in their vacancy rates, both had pre-recession vacancy rates in the 4% range,

Reno's vacancy rose to near 15% in 2009 and Las Vegas rose to over 12% in 2012. Reno continued to have high vacancy rates through 2012, the same year that Las Vegas reached its peak. Since 2012, vacancy rates in both metro markets began to decline, although not yet reaching their pre-recession lows. Both markets currently stand at higher vacancy rates than most of the others in the Western US, except for Sacramento and Phoenix, where vacancy rates are much higher.

FIGURE 36
Annual Vacancy Rates in Western US Industrial Markets



Conclusions

The dominant industrial markets in the Western US are located in Southern California, with the largest market sizes, net absorption, and construction deliveries, and the lowest vacancy rates. The Northern California industrial markets, although smaller in size than their Southern counterparts, also experience low vacancy rates and high lease rates compared to other included Western US markets. The logistics functions and the massive economic concentrations in both Northern and Southern California are key anchors for the entire Western US. Phoenix tends to stand out amongst the other markets in most categories, with its large market size and higher net absorption, construction deliveries, and vacancy rates. Overall, the Nevada markets are much smaller, with net absorptions, construction deliveries, and lease rates lower than most other markets.

Impact on Freight Patterns

The Las Vegas market is primarily shaped by the distribution needs of its hospitality and accommodations industry and, at the moment, does not have space available at a price that would substantially shift businesses from other locations in Southern California. On the other hand, the Reno market is increasingly tied to serving markets in Northern California as well as within its metro area. It is price competitive with other Northern California competitors. Thus, at present, Reno is more attractive and ripe for distribution center and manufacturing development.

Channel distribution and technology-boosted advanced manufacturing may be increasingly attracted to Nevada sites with low property development and labor cost. Analysis by the Brookings Institution indicates that both the San Francisco Bay Area and to a lesser extent Utah's Salt Lake City and Provo metro areas are leading advanced manufacturing business development. This may open up a leakage opportunity for the

Reno area as a lower cost production site for such businesses. Increased manufacturing and distribution functions in Reno or Las Vegas are important to attract the development of intermodal rail terminals, which would lower distribution costs and attract port-based intermodal travel.

Attachment D: Fortune US 500 Companies in the Western US, 2015

TABLE 4

Fortune 500 Companies in the Western US, 2015

Below are listed the Fortune US 500 companies in the selected Western US States: rank, company name, and location in the state, sector, and industry. The totals are listed below each state name to give a measure of economic strength and diversity (Source: Fortune, 2015).

Rank		Company	Location	Sector	Industry
US	Global				
Arizona					
5	***1***	***Totals***	***2***	***4***	***4***
108	474	Avnet	Phoenix	*Wholesalers*	*Wholesalers: Electronics and Office Equipment*
137		Freeport-McMoRan	Phoenix	*Energy*	*Mining, Crude-Oil Production*
323		Republic Services	Phoenix	*Business Services*	*Waste Management*
386		PetSmart	Phoenix	*Retailing*	*Specialty Retailers: Other*
493		Insight Enterprises	Tempe	*Wholesalers*	*Wholesalers: Electronics and Office Equipment*
Northern California					
31	***10***	***Totals***	***19***	***9***	***20***
3	12	Chevron	San Ramon	*Energy*	*Petroleum Refining*
5	15	Apple	Cupertino	*Technology*	*Computers, Office Equipment*
11	29	McKesson	San Francisco	*Wholesalers*	*Health Care*
19	50	Hewlett-Packard	Palo Alto	*Technology*	*Computers, Office Equipment*
30	89	Wells Fargo	San Francisco	*Financials*	*Commercial Banks*
40	162	Google	Mountainview	*Technology*	*Internet Services and Retailing*
52	195	Intel	Santa Clara	*Technology*	*Semiconductors and Other Electronic Components*
60	214	Cisco Systems	San Jose	*Technology*	*Network and Other Communications Equipment*
81	306	Oracle	Redwood City	*Technology*	*Computer Software*
84	252	Safeway	Pleasanton	*Food & Drug Stores*	*Food and Drug Stores*
118		Gilead Sciences	Foster City	*Health Care*	*Pharmaceuticals*
172		eBay	San Jose	*Technology*	*Internet Services and Retailing*
182		PG&E Corp.	San Francisco	*Energy*	*Utilities: Gas and Electric*
188		Gap	San Francisco	*Retailing*	*Specialty Retailers: Apparel*
220		Synnex	Fremont	*Wholesalers*	*Wholesalers: Electronics and Office Equipment*
238		Visa	Foster City	*Business Services*	*Financial Data Services*
242		Facebook	Menlo Park	*Technology*	*Internet Services and Retailing*
269		Ross Stores	Dublin	*Retailing*	*Specialty Retailers: Apparel*
319		Applied Materials	Santa Clara	*Technology*	*Semiconductors and Other Electronic Components*
335		Franklin Resources	San Mateo	*Financials*	*Securities*
352		Core-Mark Holding	South San Francisco	*Wholesalers*	*Wholesalers: Food and Grocery*
389		Agilent Technologies	Santa Clara	*Technology*	*Scientific, Photographic, and Control Equipment*
405		Symantec	Mountainview	*Technology*	*Computer Software*
408		SanDisk	Milpitas	*Technology*	*Semiconductors and Other Electronic Components*

Rank		Company	Location	Sector	Industry
US	Global				
428		NetApp	Sunnyvale	*Technology*	*Computer Peripherals*
432		Sanmina	San Jose	*Technology*	*Semiconductors and Other Electronic Components*
435		Charles Schwab	San Francisco	*Financials*	*Securities*
469		Clorox	Oakland	*Household Products*	*Household and Personal Products*
473		Advanced Micro Devices	Sunnyvale	*Technology*	*Semiconductors and Other Electronic Components*
474		Netflix	Los Gatos	*Retailing*	*Specialty Retailers: Other*
483		Salesforce.com	San Francisco	*Technology*	*Computer Software*
Southern California					
22	***4***	***Totals***	***14***	***12***	***17***
57	232	Walt Disney	Burbank	*Media*	*Entertainment*
62	256	Ingram Micro	Santa Ana	*Wholesalers*	*Electronics and Office Equipment*
95	379	DirecTV	El Segundo	*Telecommunications*	*Telecommunications*
113	480	Qualcomm	San Diego	*Technology*	*Network and Other Communications Equipment*
145		Amgen	Thousand Oaks	*Health Care*	*Pharmaceuticals*
205		Western Digital	Irvine	*Technology*	*Computer Peripherals*
216		Health Net	Woodland Hills	*Health Care*	*Health Care: Insurance and Managed Care*
226		Edison International	Rosemead	*Energy*	*Utilities: Gas and Electric*
239		Jacobs Engineering Group	Pasadena	*Engineering & Construction*	*Engineering, Construction*
264		Farmers Insurance Exchange	Woodland Hills	*Financials*	*Insurance: Property and Casualty (Mutual)*
270		Sempra Energy	San Diego	*Energy*	*Utilities: Gas and Electric*
283		Reliance Steel & Aluminum	Los Angeles	*Materials*	*Metals*
301		Molina Health Care	Los Angeles	*Health Care*	*Health Care: Insurance and Managed Care*
321		CBRE Group	Los Angeles	*Financials*	*Real estate*
340		Broadcom	Irvine	*Technology*	*Semiconductors and Other Electronic Components*
343		AECOM	Los Angeles	*Engineering & Construction*	*Engineering, Construction*
380		Allergan	Irvine	*Health Care*	*Pharmaceuticals*
387		Pacific Life	Newport Beach	*Financials*	*Insurance: Life, Health (stock)*
392		Live Nation Entertainment	Beverly Hills	*Media*	*Entertainment*
427		Avery Dennison	Glendale	*Chemicals*	*Chemicals*
439		Mattel	El Segundo	*Household Products*	*Toys, Sporting Goods*
444		A-Mark Precious Metals	Santa Monica	*Materials*	*Miscellaneous*
Colorado					
9	***0***	***Totals***	***5***	***8***	***9***
131		Arrow Electronics	Centennial	*Wholesalers*	*Wholesalers: Electronics and Office Equipment*
208		DISH Network	Englewood	*Telecommunications*	*Telecommunications*

Rank		Company	Location	Sector	Industry
US	Global				
231		DaVita Health Care Partners	Denver	*Health Care*	*Health Care: Medical Facilities*
263		Liberty Interactive	Englewood	*Technology*	*Internet Services and Retailing*
332		Ball	Broomfield	*Materials*	*Packaging, Containers*
379		Newmont Mining	Greenwood Village	*Energy*	*Mining, Crude-Oil Production*
401		Level 3 Communications	Broomfield	*Telecommunication*	*Telecommunication*
468		Western Union	Englewood	*Business Services*	*Financial Data Services*
L 480		CH2M Hill	Englewood	*Engineering & Construction*	*Engineering, Construction*
Idaho					
1	***0***	***Totals***	***1***	***1***	***1***
190		Micron Technology	Boise	*Technology*	*Semiconductors and Other Electronic Components*
Montana					
None					
Nevada					
4	***0***	***Totals***	***1***	***1***	***1***
209		Las Vegas Sands	Las Vegas	*Hotels, Restaurants & Leisure*	*Hotels, Casinos, Resorts*
289		MGM Resorts International	Las Vegas	*Hotels, Restaurants & Leisure*	*Hotels, Casinos, Resorts*
328		Caesars Entertainment	Las Vegas	*Hotels, Restaurants & Leisure*	*Hotels, Casinos, Resorts*
477		Wynn Resorts	Las Vegas	*Hotels, Restaurants & Leisure*	*Hotels, Casinos, Resorts*
New Mexico					
None					
Oregon					
3	***1***	***Totals***	***3***	***3***	***3***
106	462	Nike	Beaverton	*Apparel*	*Apparel*
302		Precision Castparts	Portland	*Aerospace & Defense*	*Aerospace and Defense*
482		Lithia Motors	Medford	*Retailing*	*Automotive Retailing, Services*
Utah					
1	***0***	***Totals***	***1***	***1***	***1***
259		Huntsman	Salt Lake City	*Chemicals*	*Chemicals*
Washington					
10	***3***	***Totals***	***5***	***6***	***9***
18	60	Costco	Issaquah	*Retailing*	*Specialty Retailers: Other*
29	112	Amazon.com	Seattle	*Technology*	*Internet Services and Retailing*
31	104	Microsoft	Redmond	*Technology*	*Computer Software*

Rank		Company	Location	Sector	Industry
US	Global				
158		Paccar	Bellevue	*Motor Vehicles & Parts*	*Motor Vehicles and Parts*
187		Starbucks	Seattle	*Hotels, Restaurants & Leisure*	*Food Services*
224		Nordstrom	Seattle	*Retailing*	*General Merchandisers*
355		Weyerhaeuser	Federal Way	*Materials*	*Forest and Paper Products*
413		Expeditors Internal of Washington	Seattle	*Transportation*	*Transportation and Logistics*
458		Expedia	Bellevue	*Technology*	*Internet Services and Retailing*
484		Alaska Air Group	Seattle	*Transportation*	*Airlines*
Wyoming					
None					

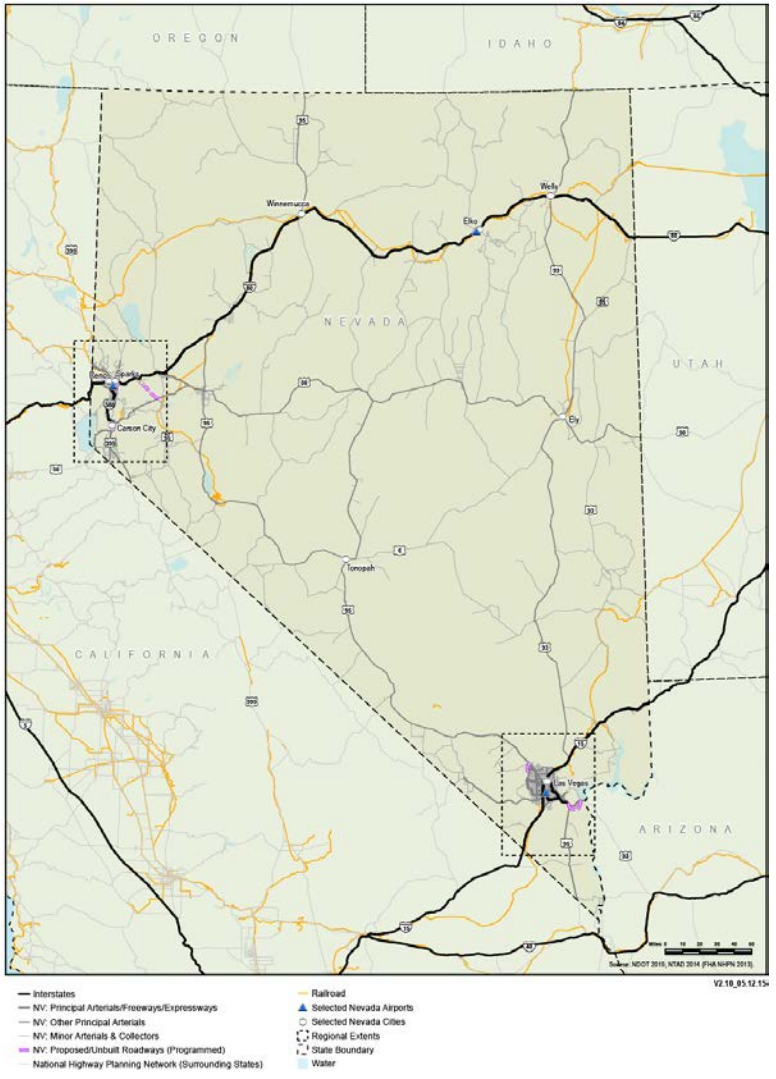
Note: Reno, NV's top company is Amerco, ranked 787 in the Fortune US 500 list, in the Transportation sector, Trucking & Truck Leasing industry.

Attachment E: Project-Defined Geographies

In developing the framework for evaluating Nevada's competitive position, the Consultant team, with guidance from the Client, established the following base maps to depict the scales of analysis: Global, National, Western Regional, Statewide, Northern Nevada, and Southern Nevada.

FIGURE 37 *(LEFT)*
Western Regional Extent
This extent includes Canada and Mexico to show Nevada's proximity to the NAFTA markets. States included are: Arizona, California, Idaho, Montana, Nevada, Oregon, and Washington; and parts of Colorado, Nebraska, New Mexico, North Dakota, South Dakota, and Texas.

FIGURE 38 *(RIGHT)*
Nevada Statewide Extent
This extent does not stop at state lines in order to show the context of transportation connections to adjacent states via the National Highway and UP and BNSF Rail Systems.



As states are artificial political geographies, they do not fit trade flows and economic activity patterns. Thus, it is essential to not only look at the state as a whole, but to look more closely at its major metropolitan areas of Las Vegas and Reno. Moreover, the economies of Northern and Southern Nevada are very different, with different relationships and connectivity levels to each other, to neighboring states, and to the world. For consistency, both extents encapsulate the same geographic size.

FIGURE 39 *(LEFT)*
Southern Nevada/Las Vegas Regional Extent
This extent was selected to include Apex Industrial Park to the North, the proposed Ivanpah International Airport and Primm to the South, and Boulder City to the East.

FIGURE 40 *(RIGHT)*
Northern Nevada/Reno-Sparks-Carson City Regional Extent
This region includes Fernley and Silver Springs to the East, all of Lake Tahoe to the Southwest and therefore the connection to Eastern California.

Attachment F: Air Cargo Industry Overview

Nevada State Freight Plan: Air Cargo Industry Overview

General Characteristics of Air Cargo Commodities

General characteristics of air cargo commodities include: perishable, short-shelf life, high value to weight ratio, higher security requirements, or less predictable on-demand profile. Perishable goods are subject to physical deterioration over time (e.g. fresh fish, cut flowers, vegetables). Items with a short shelf life are those that decline in value over time due to obsolescence, including fashion items and electronic devices. Higher value commodities (high value to weight ratio) can absorb the higher costs of air transport, while bulk commodities are often better shipped via surface or water transportation modes. Commodities subject to high rates of pilferage or theft, with higher security requirements, such as gold, certain electronics, and military items, are also often shipped via air. Finally, air is utilized for sudden or unexpected increases in demand as the commodities can travel much faster to their destination. For example, albeit a heavy commodity with low value and no delicate handling requirements, tires were once shipped by air from a US Michelin plant in South Carolina to Tokyo because they had a shortage of tires and the cargo ships were delayed as a result of storms in the Pacific. Since the tires were needed to complete the manufacturing process, even though it was very high cost, their transport by air was worth the potential loss of production time.

Air Cargo Industry Background

There are three primary models that companies use for shipping via air, and there is a value vs. price trade off between them. The three models are:

1. *Self-managed model* – in-house transportation/logistics departments; lowest level of sophistication
2. *Non-integrated carrier model* – use of freight forwarders and third-party logistics providers to coordinate with operators of passenger and all-cargo aircraft; typically serves lower cost customers that do not require premium service; multiple parties involved
3. *Integrated carrier model* – use of integrated express carriers to execute all major functions of the shipping process including ground transportation, air transportation, tracking, billing; serves customers that require a higher level of service and willing to pay premium price; all internal: door-to-door under control of a single company (e.g. Fed Ex, UPS).

It is important to note that most companies use the non-integrated or integrated carrier model and the lines have been blurring between the two. For example, FedEx, UPS, and DHL have established trucking networks and freight forwarding units, while freight forwarders are taking on some residential door-to door delivery and chartering dedicated cargo aircraft. The technology tracking advantage that was once held by FedEx and UPS is now available to others. Amazon is putting packages and goods on all flight types – integrated and non-integrated. Thus, the trend is that large global companies tend to use all three models, depending on the particular details of their shipments.

Main Stakeholders and Roles in the Air Cargo Industry

1. Shippers – companies/individuals demanding air cargo for the shipment of goods; demand drivers of air cargo; companies, users, manufacturers of products on outbound side or demanding components and raw materials on inbound side.
2. Freight forwarders and trucking companies – freight forwarders sometimes have in-house or partner trucking companies; movement between the producing/manufacturing group and the air transportation group; providing the pick up/delivery coordination function between the

factory and the airline and then airline to destination; also known as the middleman; sales function is to bring consolidated individual customers to create larger shipments/economies of scale to negotiate better pricing for shipping; replaces companies' shipping/logistics department by finding the most efficient (price and service) way to go to market.

3. Third-party logistics providers – non-asset based service providers; whereas freight forwarders have cargo facilities and perhaps even their own trucking; do not have the warehousing or trucking but rather have the systems and relationships needed to coordinate those functions through others.
4. Air Carriers – passenger airlines using belly capacity; integrated/express carriers such as FedEx, UPS, freighter operators (all cargo aircraft with no passenger component (e.g. Atlas Air, Polar, China Air Cargo); some passenger airlines also have freighter aircraft, (e.g. Emirates, China Airlines) however there are no US passenger airlines that also operate wide-body freighter aircraft.

Global Air Cargo Perspective

Major global air cargo flows involve the largest economies. In 2013, the largest intercontinental air cargo markets were: Asia to North America at 2.18 million metric tons; Europe to Asia at 2.13 million metric tons; Asia to Europe at 2.07 million metric tons; North America to Asia at 1.52 million metric tons; and Europe to North America at 1.46 million metric tons (Boeing World Air Cargo Forecast, 2014-2015). After the recovery from the global economic crisis, global air cargo growth stagnated between 2011-2013; however, 2014 showed positive year-over-year growth of 4.5% (IATA).

TABLE 5:

YOY Growth in Freight-Tonne-kilometers, 2007-2014

This table highlights the stagnant air cargo market numbers in FTK from 2011-2013, with a recent increase in growth through 2014.

Year	***YOY Growth in Freight-Tonne-Kilometers (FTK)***
2007	4.3%
2008	-4.0%
2009	-10.1%
2010	20.6%
2011	-0.7%
2012	-1.5%
2013	1.4%
2014	4.5%

Source: International Air Transportation Association

From the standpoint of growth, the main regions have been Asia to Europe over the Middle East, Intra-Asia, and Latin America to North America. Domestic China and Intra-Asia has been experiencing high growth in terms of intensity, with vast amounts of air cargo shipped North-South along the coast of Asia, from China and Japan down to Indonesia. As these countries are islands, there is an increased need for shipping via air. Although the flows from Latin America to North America are currently not high in volume, they are growing.

Global Air Cargo Industry Trends

The globalization of trade has led to more goods flowing between world regions and over long distances. Air carries 0.5% of global trade in terms of weight, but 35% in terms of value, as determined by the types of commodities suited for air cargo and time/cost factors (Air Transport Action Group).

Modal shifts in intercontinental air cargo are increasingly impacted by competition from ocean container shipping while domestic and regional air cargo is impacted by a modal shift to trucking. Both ocean container shipping and trucking are lower cost alternatives and albeit slower, their production schedules can be controlled to ensure reliability on certain set delivery dates. The high cost of jet fuel has also made these modes more attractive than air.

Near shoring, or a shift in the location of production and manufacturing, also leads to a modal shift and facilitates reliable delivery often at a lower cost. For example, mode choices are different if production occurs in Asia than if it occurs in Mexico.

Belly capacity from wide body, long-haul passenger aircraft is offsetting the demand for all-cargo freighter capacity. These aircraft, such as the B787 and A350, have been configured to maximize belly space, allowing medium sized markets to ship directly rather than through very large hubs, and more people travelling by air has led to an induced increase in capacity for airlines to carry freight. Thus, there is a trend toward medium sized hubs putting larger emphasis on more efficient cargo operations to capture the increased opportunities in air freight.

Since 9/11, security and screening requirements have increased significantly. Thus, to be part of the air cargo industry, airports need to have the new technology, equipment, and certified personnel required for tight security and screening, which involves an expensive fixed-cost investment. In an effort to control investments in these security-related resources, freight forwarders are motivated to consolidate and ship freight at large hub airports, thereby limiting air cargo activity at the medium-sized hubs.

Technology Trends in the Air Cargo Industry

There are several technology trends in the air cargo industry, including but not limited to:

- New wide body aircraft types (B787, A350) that can serve “thinner” long-haul international passenger routes but have substantial belly cargo capacity. These planes can serve medium sized markets rather than just the very large hubs and allow them to ship directly rather than through the large hub.
- GPS, RFID technology ensuring higher visibility/transparency of shipments: location/time tracking, temperature control, vibration recordings etc. This trend also increases reliability and is a value-add.
- High-tech air freight containers with built-in temperature controls etc. which expands the market for air freight.
- New Security/Screening technologies, as mentioned in the above section.
- Electronic air waybills: paperless initiative to increase air cargo processing efficiency
- Future trend: drone delivery systems and other automated cargo handling technologies could vastly expand the air cargo market.

National Air Cargo Perspective

The US air cargo industry is mature and growing slowly, at approximately 3.0% per year (Boeing). FedEx and UPS dominate the US domestic market, with market shares of 47% and 27%, respectively. The mature and slow growth market is attributed to consolidation over the past 15 years, which has led to fewer providers of air cargo services, as well as more sophisticated and dependable trucking services, which has allowed for expedited freight to migrate away from expensive air transportation.

The US international market is served by major carriers with both passenger belly and freighter capacity. Growth in international air cargo to/from the US exceeds US domestic air cargo growth, at 5.1% year-over-year (yoy) and 3.1% yoy respectively, with Asia being the primary market driving volume and growth rates followed by Europe (US Census, Foreign Trade Statistics and A4A).

Major US airport gateways are John F. Kennedy International Airport (JFK), Miami International Airport (MIA), Chicago O'Hare International Airport (ORD), and Los Angeles International Airport (LAX). Each handles large shares of air cargo, collectively over 20%, due to their extensive capacity offered by passenger and all-cargo carriers. Moreover, integrator hubs for FedEx, Memphis International Airport (MEM) and Indianapolis International Airport (IND), UPS, Louisville International Airport (SDF) and Ontario International Airport (ONT), and DHL, Cincinnati/Northern Kentucky International Airport (CVG) also rank high for total air cargo volume (USDOT and ACI-NA). Up-and-coming gateways that are taking freight away from some of these major gateways include Hartsfield-Jackson Atlanta International Airport (ALT) and Dallas/Fort Worth International Airport (DFW).

Moreover, as aircraft technology advances and more wide body aircraft, such as B787 and A350 fly direct to more US airports, the trend may see more cargo diversifying to non-traditional US gateways. With these new aircraft, large hub functions are less important. Additionally, routing structures have changed, with more international flights from non-traditional hubs. For example, the British Airways B787 flight added from Austin, Texas to London, Heathrow provides nonstop inter-continental service to a mid-size US passenger market. This flight is only viable due to having the right-sized aircraft and its ability to carry large amounts of air cargo, for example the high-tech goods produced in Texas. Another competitive factor within the US air cargo industry structure is consolidation, which occurs at airports with high capacity and numerous flight frequencies allowing air carriers to get better pricing and risk aversion with delayed or cancelled flights. Moreover, road feeder services enable shipper's access to global air cargo networks by providing dependable, efficient trucking services. High congestion in and around global gateway airports is affecting reliability and driving producers to seek alternate locations as departure points. This may become important for Las Vegas and Reno located in close proximity to the highly congested hubs of San Francisco and Los Angeles.

Western US Air Cargo Perspective

LAX, San Francisco International Airport (SFO), Seattle-Tacoma International Airport (SEA), and Phoenix Sky Harbor International Airport (PHX) handle 49% of the total air cargo weight in the Western US, while Oakland International Airport (OAK) and ONT are major integrator hubs for FedEx and UPS respectively, representing 18% of the total (USDOT). Airports on the West Coast are particularly strong with air cargo related to trade between the US and Asia, as well as serving the Western US, where distances between major markets are often greater than in the Eastern US. The infrastructure and scale of operations at LAX encourages the utilization of LAX for import/export shipments facilitated by extensive trucking networks.

Additionally, as belly freight increases, freighter demand may decline because there will be less over flow. Yet, as global air trade still outstrips belly capacity and certain items are restricted, there will

remain a certain level of demand for freighter operations. For example, commodities that are too large or contain hazardous materials cannot go in the belly of passenger aircraft.

Nevada Air Cargo Perspective

FedEx and UPS, together amounting to 74% of the state total, largely carry air cargo in Nevada (USDOT; US Census Bureau, Foreign Trade Statistics). Nevada's international air exports are largely handled by LAX, at 28% of the state total (USDOT; US Census Bureau, Foreign Trade Statistics). According to 2013 statistics, McCarran International Airport (LAS) ranked 38th in North American air-cargo tonnage, likely a result of the fact that it is a service-oriented economy which does not drive the density of air cargo as manufacturing economies do (ACI-NA). Outside of integrated carriers, Reno-Tahoe International Airport (RNO) is dominated by narrow body air services that have limited carrying capabilities and ranks 60th amongst North American airports (ACI-NA, 2013).

Moreover, Nevada's economy does not produce a lot of commodities that use air cargo (*see General Characteristics*). The state is more of an import economy, but is also within trucking distance of the LAX and SFO markets, and so could develop its export function. In order to do so, the attitude of the airports toward air freight is also important. With so many of Las Vegas' city pairs being international, the additional revenue from belly freight could be an important opportunity to explore.

Attachment G: Competitive Market Analysis Presentation Slides

The following slides were presented as part of a larger presentation to Focus Groups in Las Vegas, Reno, and at a Webinar on July 28-30, 2015.

NEVADA'S CHANGING ECONOMIC RELATIONSHIPS

Northern Nevada/California

Reno-Sparks is becoming an integrated submarket of Northern California, with strong institutional assets, benefitting from the concentration of headquarters

Southern Nevada/California

Las Vegas remains an independent economy and a trade satellite of Southern California

Eastern Nevada/Utah

Eastern Nevada is equally connected to Utah and Northern California

NEVADA'S INDUSTRIAL REAL ESTATE RELATIONSHIPS

Northern Nevada/California
Reno-Sparks has a competitive advantage within its trade area

Southern Nevada/California
Las Vegas has a cost parity within its trade area as the Inland Empire retains the cost advantage

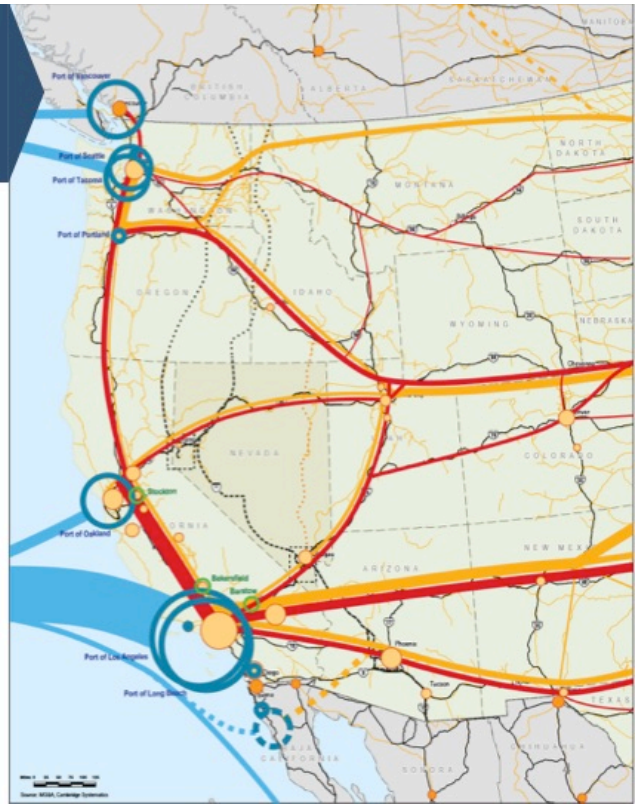
Eastern Nevada/Utah
The Eastern Nevada market is a single tenant, industry-specific real estate market serving local and regional industry

EXISTING HUBS & CORRIDORS

1. Nevada's Access
limited access O & D points, only 'Stops along Corridors'

2. Fragmented Hubs
non-optimal relationships between modes, road, rail, air, distribution and manufacturing centers

3. Capacity & Performance
a wide range of conditions



COMPETITIVE MARKET ANALYSIS
THE VISIONARY CONCEPT

LIMITATIONS OF THE EXISTING FREIGHT LOGISTICS NETWORK

Nevada's existing Freight Logistics Model has evolved principally along two separate and independent corridors, I-80 and I-15. The logistics hubs that serve the large urban areas and small towns developed as O & D points or 'Stops Along the Corridors.'

LOGISTICS RELATIONSHIPS ARE CHANGING

Urban growth and economic activity in the state of Nevada, its close relationship to California, and in the Western US is transforming the state and its potential for new relationship to the all domestic and global trading networks.

NEED FOR A NEW MODEL

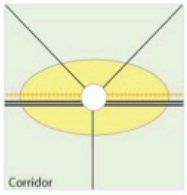
There is a need to redefine the existing freight logistics model in Nevada in order to initiate an evolutionary long-term process towards a new and stronger position within the global marketplace. Only incremental improvements to the existing system will have no transformative effect on strengthening Nevada's role in the global trading network.

Nevada is challenged to <u>simultaneously</u> improve its hub access, integration, and facilities to attract more economic activity from out-of-state sources and increase the generation of freight originating in the state.

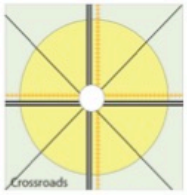
5

COMPETITIVE MARKET ANALYSIS
DEVELOPING A COMPETITIVE ADVANTAGE

1. FROM CORRIDORS TO CROSSROADS: RENO & LAS VEGAS

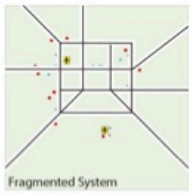


Corridors provide access in only two directions, limiting market access

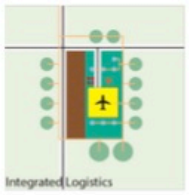


Crossroads provide multidirectional access to a larger market space

2. FROM FRAGMENTATION TO INTEGRATION



Fragmented modal configurations cause increased conflicts and inefficiencies



Integrated modal configurations lead to highly efficient freight systems

3. IMPROVE CAPACITY & PERFORMANCE

6

FREIGHT & LOGISTICS THREE STRATEGIES FOR A VISIONARY FUTURE

1. Increased Access

Create crossroads to expand reach Western US and global markets

2. Integrated Hubs

Improved intermodal relationships to provide competitive advantage over surrounding hubs

3. Strengthen Capacity & Performance

Enhancements necessary to ensure long-term viability developed through public-private sector leadership team

CREATING A NEW ECONOMIC & LOGISTICS FUTURE

COMPLEMENTARY REGIONS

Northern Nevada/California

Strengthen the Northern California economic and freight logistics relationships

Southern Nevada/California

Transform Las Vegas into a more diversified economy and distribution hub serving Southern California and the Western US

Eastern Nevada/Utah

Freight Infrastructure enhancements to serve local and regional industries

OPEN DISCUSSION

How do you view Nevada's position within the Western US?

How could increased access to the Western US markets benefit Nevada's hubs?

How could Nevada's hubs create a competitive advantage?

How do you see the direction of economic relationships between Nevada and California, Northern and Southern?

Nevada's Share of Employment and Personal Earnings by Economic Region

Prepared for
Nevada Department of Transportation

September 2016

MICHAEL GALLIS & ASSOCIATES
ch2m
CAMBRIDGE SYSTEMATICS

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Acronyms & Abbreviations

BEA	Bureau of Economic Analysis
BLS	Bureau of Labor Statistics
BTA	Basic Trade Area
CA	California
CSA	Combined Statistical Area
GDP	Gross Domestic Product
GOED	Governor's Office of Economic Development
MSA	Metropolitan Statistical Area
MTA	Major Trade Area
NAICS	North American Industry Classification System
NV	Nevada
US	United States

1 Introduction

1.1 Purpose

This report presents a more detailed economic analysis of Northern and Southern Nevada within the context of their respective economic regions. While their percentage of population, GDP, and industrial real estate activity have been documented in the *Competitive Market Analysis*, a complete description of the structure of their economies and their percentages of earnings and employment within the larger Major Trade Areas (MTA) has not yet been documented.

The purpose of this report is to provide a deeper understanding of employment and personal earnings by two-digit North American Industry Classification System (NAICS) codes, or industry sectors, in the MTAs of San Francisco and Los Angeles MTAs. The analysis is intended to determine the industry focus and strengths of each MTA and the profile of Northern and Southern Nevada within them in order to define the potential impact that an improved freight system could have on each industry.

1.2 Economic Geography

The economic geography of the Western US has little relationship to the political geography. Economic regions are defined as market areas with interactive economic activities and are not defined by political boundaries. Economic geography is defined by Major Trade Areas (MTAs), which are anchored by major urban areas that form the primary economic concentrations and transportation hubs of larger areas with many smaller cities and towns. MTAs are named according to their major urban areas or anchors.

Within the Western US, only two of the ten MTAs, Phoenix and Seattle, are contained within a single state although they only cover a portion of each state and thus do not follow the political geography (see Figure 1). Of the remaining eight MTAs, each covers parts of more than one state: one is a two-state region, two are three-state regions, three are four-state regions and two are five-state regions.

While Nevada is one state from political point of view, it is divided into three different regions from an economic point of view. Parts of Nevada are contained within three MTAs: San Francisco, Los Angeles, and Salt Lake City. The Salt Lake City MTA includes only one Nevada County, White Pine County, located in Eastern Nevada. As this report is based on MSA data and there are no MSAs in White Pine County, there is no ability to include comparison of Eastern Nevada as defined within the economic geography as there is no equivalent data available.

As shown in Figure 1, each MTA is further divided into a set of Basic Trade Areas (BTAs). There is also a set of Combined Statistical Areas (CSAs) and MSAs as data is not collected by BTA, employment and earnings data used for this analysis was collected by CSA and MSA to break the analysis into smaller economic units than the large MTAs. Each MTA was therefore subdivided into a set of economic sub-areas defined by a set of characteristics including location, level of internal interactions, geographic linkage, economic relationship, and data availability.

1.2.1 The San Francisco MTA: Northern California & Northern Nevada

The San Francisco MTA includes most of Northern California (one Northern California County is included in the Portland MTA) and all of Northern Nevada. There are 13 BTAs within the San Francisco MTA; one of which contains all of Northern Nevada and a portion of Northern California in the Lake Tahoe area.

The San Francisco MTA was divided into four economic sub-areas by MG&A according to the interactions and geographic proximity of the basic trade areas (see Figure 2). The four sub-areas are: the San Francisco region, Northern 99 Corridor, Other Northern California peripheral, and Northern Nevada.

The largest sub-area is the San Francisco region. This sub-area has one CSA, the San Jose-San Francisco-Oakland CSA, which contains 6 MSAs: San Francisco-Oakland-Hayward, San Jose-Sunnyvale-Santa Clara, Santa Rosa, Vallejo-Fairfield, Santa Cruz-Watsonville and Napa. As the San Jose-San Francisco-Oakland CSA includes the Stockton-Lodi MSA, which is identified as part of the 99 Corridor sub-area, it has been subtracted from the total of San Jose-San Francisco-Oakland CSA and reallocated to the Northern 99 Corridor sub-area.

The second sub-area is the Northern 99 Corridor; the central spine linking a set of statistical areas in the Central Valley area, including the Sacramento Valley in the North and the San Joaquin Valley in the South. The lower portion of the San Joaquin Valley is part of the Los Angeles MTA, while the remainder of the Central Valley is within the San Francisco MTA. The 99 Corridor sub-area in the San Francisco MTA includes 3 CSAs and 6 MSAs that are located on or around California State Route 99: Stockton-Lodi MSA, Sacramento-Roseville CSA, Fresno-Madera CSA, Salinas MSA, Modesto-Merced CSA, Visalia-Porterville MSA, Chico MSA, Yuba City MSA, and Hanford-Corcoran MSA.

Outside of the San Francisco region and Northern 99 Corridor is the third sub-area, Other Northern California peripheral, including California counties that are loosely linked and not closely tied to the primary economic sub-area. This sub-area contains two MSAs: Salinas and Redding.

Finally, the Northern Nevada sub-area contains one CSA, Reno-Carson City-Fernley, which combines two MSAs, Reno and Carson City, and the Micropolitan Statistical Areas adjacent to them.

1.2.2 The Los Angeles MTA: Southern California, Southern Nevada & Northwest Arizona

The Los Angeles MTA contains 7 Basic Trade Areas and includes all of Southern California, all of Southern Nevada and a county in Northwest Arizona. All of Southern Nevada and a portion of Northwest Arizona comprise one BTA

The Los Angeles MTA was divided into five sub-areas by MG&A: the Los Angeles region, San Diego region, Southern 99 Corridor, Other Southern California peripheral, and Southern Nevada.
The Los Angeles region is the largest and densest component of the Los Angeles MTA. This sub-area is a continuous urbanized metropolis with a network that spreads across three MSAs: Los Angeles-Long Beach-Anaheim, Riverside-San Bernardino-Ontario, and Oxnard-Thousand Oaks-Ventura.
Immediately south of the L.A. region, the San Diego region includes the San Diego-Carlsbad and El Centro MSAs. Despite it is close proximity to Los Angeles; it forms a distinct urban and economic sub-area within the Los Angeles MTA.

The Southern 99 Corridor sub-area includes the Bakersfield MSA, located near the L.A. region at the south end of the San Joaquin Valley. Access to the 99 Corridor from the L.A. region is difficult due to the need to pass over the Coast Range Mountains into the Valley. As a result, the areas north of Bakersfield are more closely tied to the San Francisco MTA because of the accessibility differentials between the core area of San Francisco and Los Angeles.

North of the L.A. region is the Other Southern California peripheral sub-area. This region is connected to but not an integrated part of the L.A. region and includes the Santa Maria-Santa Barbara and San Luis Obispo-Paso Robles-Arroyo MSAs.

The Southern Nevada BTA is used to define the Southern Nevada sub-area for analysis purposes within this study of earnings and employment. It extends across all of Southern Nevada and a part of Northwest Arizona. Within this sub-area are the Las Vegas-Henderson-Paradise MSA, connected to the L.A. region by the I-15 corridor, and the Lake Havasu City-Kingman MSA, connected to the L.A. region by the I-40 corridor.

Figure 1: Major and Basic Trading Areas

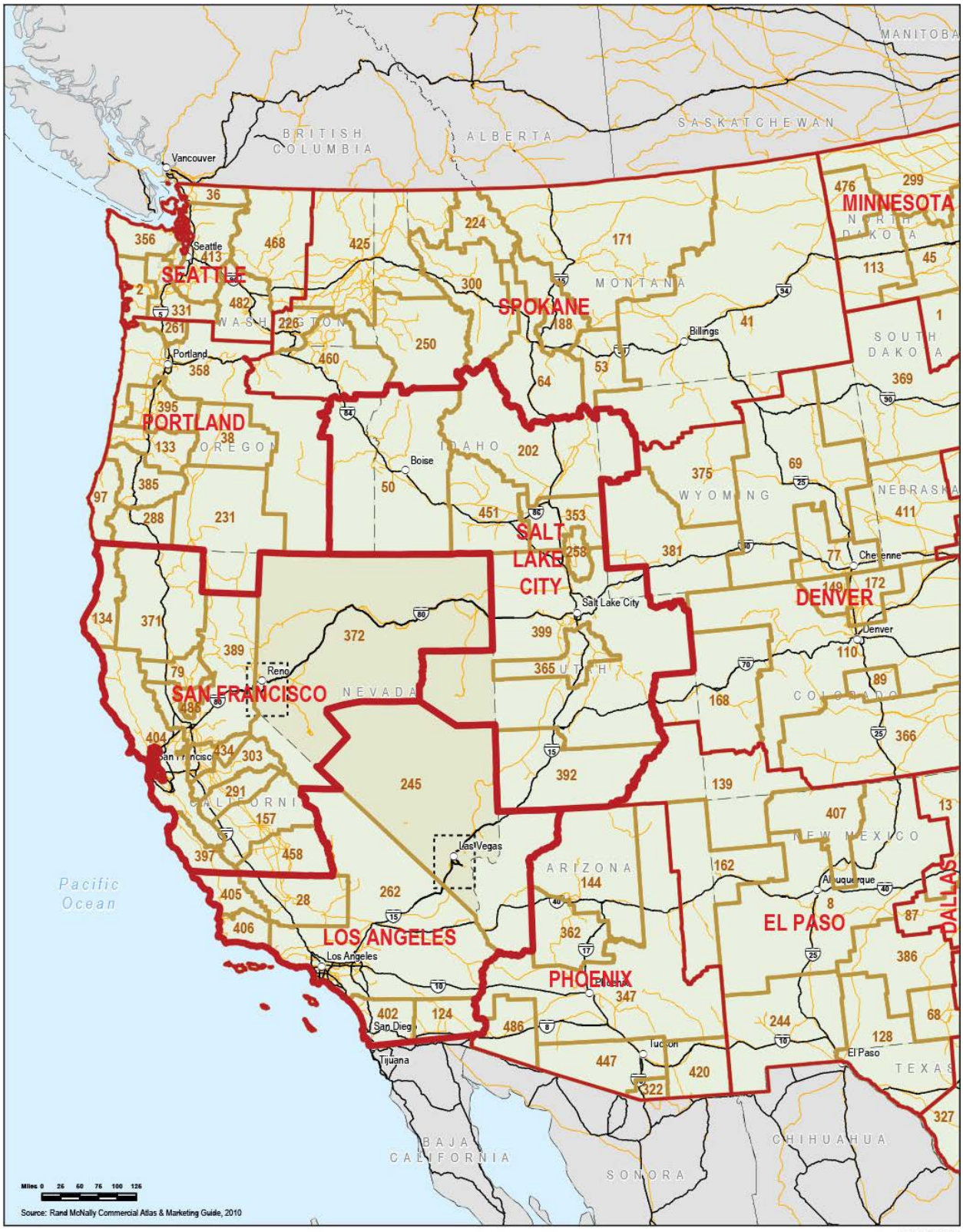
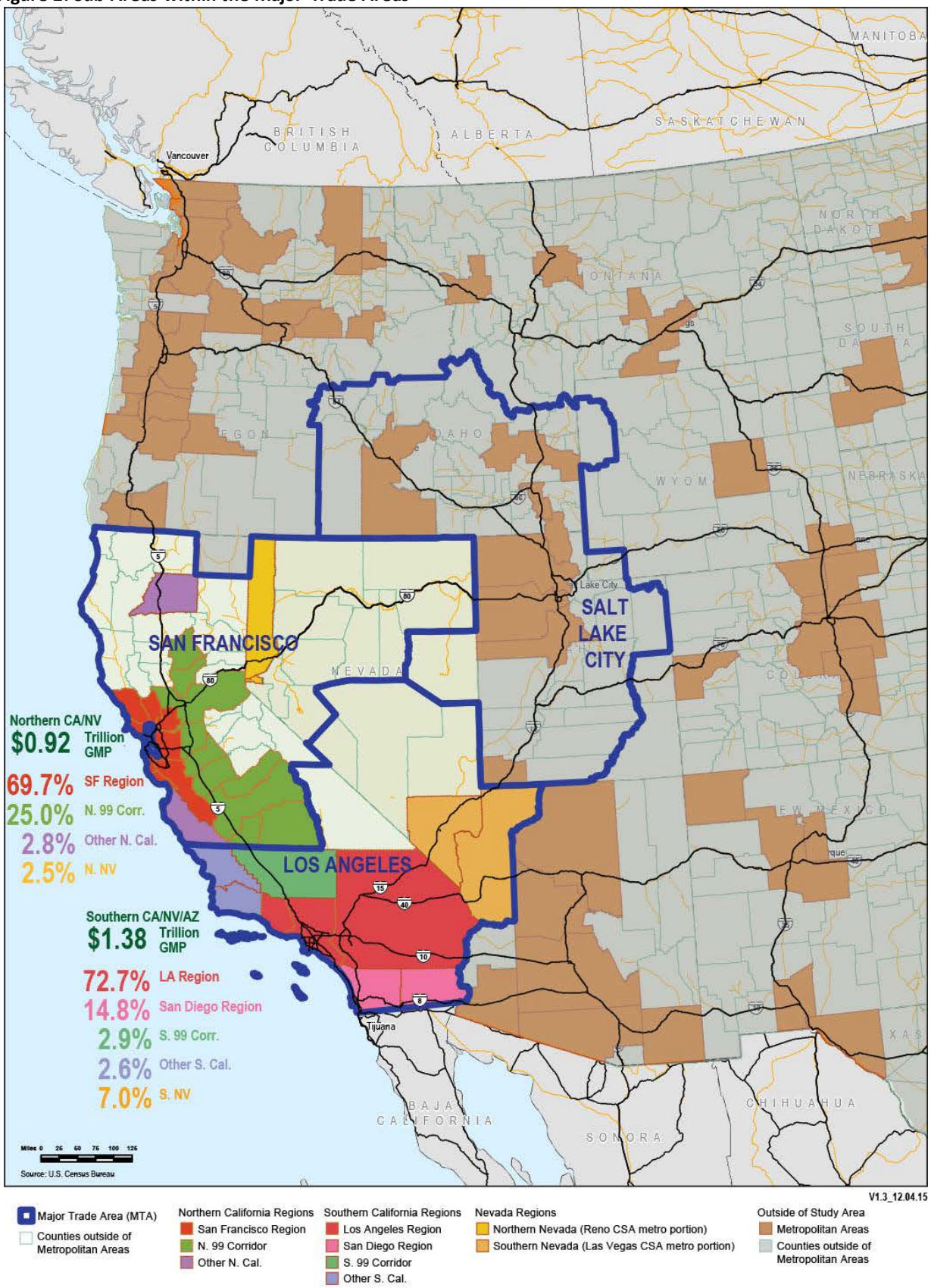


Figure 2: Sub-Areas within the Major Trade Areas



1.3 Data Strategy

1.3.1 Potential Sources Analysis

To assemble the necessary employment and earnings data, three sources were reviewed: 1) Nevada Governor's Office of Economic Development (GOED); 2) the Bureau of Labor Statistics (BLS); and 3) the Bureau of Economic Analysis (BEA).

The GOED data portal contains comprehensive statistics describing Nevada's economy at the county level. However, it does not include county level data for California, so the level of specificity was not available for the entire MTA to complete the data. GOED's data portal also contains a location comparison section which provides a selection of economic data describing a limited number of Metropolitan Statistical Areas (MSAs) in the Western US, including San Francisco and Los Angeles. However, it does not include all metros in California, so complete data about the Major Trade Areas could not be gathered from this source.

The BLS does not specify data to the two-digit NAICS level, which makes it impossible to make specific industry comparisons of earnings and employment data.

The earnings and employment data from the BEA also has its shortfalls within this analysis albeit to a lesser extent than the BLS and GOED. The most important is that the BEA avoids the disclosure of confidential information by not providing complete industry data at the MSA level for categories where the number of business fell below a minimum threshold. Thus, in order to gather a more comprehensive set of equivalent industry data for all sub areas within the MTAs, CSA data was used rather than MSA data as this level had far fewer missing data sets. Although the CSAs and MSAs do not include earnings and employment data for all of the counties or basic trade areas within the MTAs, they are more complete and comparable than the other data sources.

However, it should be noted that earnings and employment data is focused on the more urbanized and economically developed areas within the MTA, with the less urbanized rural counties not being fully included. Because the majority of economic activity and employment is concentrated in urban areas, the lack of data from the more rural areas does not create significant distortions in the comparisons of industry data.

In comparison to the BLS and GOED data sets, the BEA was found to contain the most complete and geographically refined earnings and employment data that allows for comparison of economic activities by industry across the MTAs. As a result, the Bureau of Economic Analysis was selected as the best data source for this analysis. All numbers outlined herein are directly from, or calculated from, the BEA 2013 datasets pertaining to employment and earnings (See Table 1 & 2, p. 18-21)

1.3.2 Missing Data

The BEA's MSA and CSA data was used to determine the earnings and employment characteristics of each sub-area in Nevada's three MTAs. As previously noted, the MSAs and CSAs do not cover the entire MTA; however, they are the best available data for comparing the sub-areas and understanding their size and relationship within the MTAs.

For each sub-area as defined within an MTA, MSA data for employment and personal earnings by NAICS code was collected from the Bureau of Economic Analysis (see Tables 1 & 2). As previously

mentioned, for MSAs with multiple industry values missing, CSAs were used instead because the availability of data increases at the broader geographic scale. However, some data cannot be retrieved even at this scale as it would violate the confidentiality of the companies. As a result, outcomes obtained from calculations including missing data are excluded from the analysis.

These missing data include: Mining (21), Utilities (22), and Wholesale Trade (42) in the Northern 99 Corridor sub-area; Mining (21) in the San Diego region sub-area; Management of Companies and Enterprises (55) in the Southern Nevada sub-area; and Utilities (22) and Transportation and Warehousing (48) in the Other Southern California peripheral sub-area.

1.3.3 Freight Dependent Industries

Of the 20 two-digit NAICS codes, eight are considered to be freight-dependent to different degrees, while 12 are not considered to be freight-dependent as they use the freight system to a much lesser degree. The eight freight-dependent industries identified are: Agriculture, Forestry, Fishing and Hunting (11), Mining (21), Utilities (22), Construction (23), Manufacturing (31), Wholesale Trade (42), Transportation and Warehousing (48), and Accommodation and Food Services (72). Companies classified under these industries depend on the freight system either to obtain raw materials from another region or to ship their final products to market.

Produce from the Agriculture, Forestry, Fishing and Hunting (11) and Mining (21) are bulk commodities, the companies in these industries depend on the freight transportation system to transport their goods to the next destination. Construction (23) depends on the freight transportation system to obtain the raw materials needed for construction. Wholesale Trade (42) depends on the freight transportation to coordinate and facilitate the movement of goods between manufacturers and distribution to retail outlets. In Accommodation and Food Services (72), the freight transportation system is especially important to the convention activity component as large scale displays that are required to be delivered, set up, broken down, and removed in short amounts of time depend on an efficient freight services.

2 The San Francisco and Los Angeles MTAs in the U.S. Context

The San Francisco MTA and Los Angeles MTA together represent a very high percentage of employment and earnings in the U.S. Within these two MTAs are two global gateways and transportation hubs, which have evolved very different types of economy as reflected in the employment and earnings characteristics.
There are a total of 22,700,302 people employed in the San Francisco MTA and Los Angeles MTA, representing 14.3% of total employment in the country. The highest level of employment is within the major metropolitan areas, with significant spillover employment in the sub-areas directly connected to the metropolitan areas. Other fringe areas that are not directly connected to the metropolitan centers have much fewer jobs as they remain primarily rural areas. Overall, Nevada's share of the MTA employment is a small but growing percentage.

The total personal earnings in these two MTAs is $1.4 trillion, representing 15.3% of the total personal earnings in the country; a slightly higher percentage than for employment, indicating that the jobs may be higher wage than the nation as a whole. Average personal earnings are $61,709 for the two MTAs combined (see Appendices), while the average personal earnings for the U.S. is $57,820. By comparison, the average personal earnings for the San Francisco MTA and Los Angeles MTA are 6.7% higher than the national average.

2.1 San Francisco MTA

There are a total of 8,484,225 jobs in the San Francisco MTA, which accounts for 5.4% of total employment in the United States. Of the four sub-areas within the San Francisco MTA, the San Francisco sub-area accounts for 58% of these jobs, while the 99 Corridor sub-area accounts for 34.3%, Northern Nevada sub-area accounts for 4%, and Other Northern California Peripheral accounts for 3.8% of the total employment in this MTA. Northern Nevada sub-area is the third largest employment sub-area within the San Francisco MTA.

Total personal earnings in the San Francisco MTA are $586.4 billion, accounting for 6.4% of in the U.S. total. Relative to employment, this percentage is higher, meaning this MTA contains higher wage jobs. Within this MTA, the San Francisco region accounts for 67.5%, the Northern 99 Corridor accounts for 26.9%, Other Northern California peripheral accounts for 2.8%, and Northern Nevada accounts for 2.8% of the total personal earnings.

Average personal earnings are $69,116 in the San Francisco MTA, which is 19.5% higher than the national average of $57,820 and 20.7% higher than the Los Angeles MTA at $57,288. Thus, the difference between Northern NV/CA and Southern NV/CA is significant.

The sub-area with highest average personal earnings in this MTA is the San Francisco region at $80,510, which is 16.5% higher than the MTA average. Average personal earnings in the other three sub-areas, from highest to lowest, is $54,246 in the Northern 99 Corridor, $51,705 in Other Northern California Peripheral and 47,753 in Northern Nevada. Personal earnings in the Northern Nevada sub-area are 30.9% lower than the MTA average, and 40.7% lower than personal earnings in the San Francisco region. The gap between the highest and lowest personal earnings in this MTA is $32,757.

2.1.1 Sub-Area Industry Analysis

Within the Major Trade Area, earnings and employment data were analyzed to determine which sub areas contained relatively higher or lower percentages in various industries. The point was not to determine the percentages within each sub area, but rather as a comparison between sub areas. For example, within the San Francisco region sub-area, 8.6% of employment is in Retail Trade (44) which is higher than in Manufacturing (31) at 7%; however, retail trade percentages in the remaining sub areas are higher than in the San Francisco region, while their manufacturing percentages are lower.

2.1.1.1 San Francisco Region

Compared to the other sub-areas within the San Francisco MTA, the San Francisco region has the highest employment percentage in five industries: Manufacturing (31), Information (51), Professional, Scientific, and Technical Services (54), Management of Companies and Enterprises (55) and Educational Services (61).

Within the San Francisco region sub-area, 7% of the total employment is in Manufacturing (31). This is around 100 basis points higher than Northern Nevada, 200 basis points higher than the Northern 99 Corridor, and 400 basis points higher than Other Northern California Peripheral.

Employment in Information (51) is another industry that the San Francisco region sub-area is much higher than the other sub areas, at 3.3% of the total employment, at three times the percentage of the other three sub-areas. The percentage of employment in Management of Companies and Enterprises (55) and Educational Services (61) are 1.6% and 2.8%, which are about two times the percentage for each within the other San Francisco MTA sub-areas.

Within the San Francisco region, the three two-digit NAICS categories with the highest average earnings ire Information (51), Utilities (22), and Management of Companies and Enterprises (55), with average personal earnings of $227,435, $185,026, and $161,639 respectively. Average personal earnings in the Information (51) industry in the San Francisco sub-area are more than twice that of Northern Nevada. The large employment in Information (51), multiplied by the high average personal earnings in this category has the effect of raising the entire average personal earnings in the San Francisco MTA. This masks the fact that average personal earnings are low in the rest of the sub-areas.

2.1.1.2 Northern 99 Corridor

Compared to the other sub-areas in the San Francisco MTA, The Northern 99 Corridor sub-area has the highest industry employment percentage in Health Care and Social Assistance (62), Other Services, Except Government (81) and Public Administration (92). The percentage of employment in Public Administration (92) is very high, accounting for 17.5% of the total employment, 200 basis points higher than Other Northern California Peripheral, 500 basis points higher than Northern Nevada and 800 basis points higher than the San Francisco region.

The three highest average personal earnings in the Northern 99 Corridor are $151,685 in Utilities (22), $98,396 in Information (51) and $87,084 in Public Administration (92). The high employment and average personal earnings in Public Administration (92) makes this industry a large part of total personal earnings in the Northern 99 Corridor sub-area.

The earnings and employment data for the Northern 99 corridor is incomplete as no data is shown in the MSA for Mining (21), Utilities (22), and Wholesale Trade (42). All three are freight dependent industries, and as a result, the total figures and the total for freight dependent industries are lower than the actual amount of employment. As this corridor is continuous as a major distribution corridor serving the California and Nevada markets, the missing data poses a significant problem for fully accurate analysis.

2.1.1.3 Other Northern California Peripheral

Compared to the other sub-areas in the San Francisco MTA, the Other Northern California Peripheral sub-area has the highest industry employment percentage in Agriculture, Forestry, Fishing and Hunting (11), which accounts for 15.9% of the employment. The percentages in this industry are around 1% for San Francisco sub-area and Northern Nevada sub-area and 5% for the 99 Corridor sub-area.

The three highest average personal earnings in the Other Northern California Peripheral sub-area are $143,482 in Utilities (22), $96,958 in Wholesale Trade (42) and $86,622 in Public Administration (92). Average personal earnings for Wholesale Trade (42) in this sub-area is the second highest within the MTA and is only slightly lower than the San Francisco Region sub-area at $100,391.85.

2.1.1.4 Northern Nevada

In comparison to the other sub-area within the San Francisco MTA, the Northern Nevada sub-area has the highest industry employment percentage in Construction (23), Retail Trade (44), Transportation and Warehousing (48), Finance and Insurance (52), Real Estate and Rental and Leasing (53), Administrative and Waste Management Services (56), Arts, Entertainment, and Recreation (71) and Accommodation and Food Services (72).

The Northern Nevada sub-area has a much higher percentage of employment in Transportation and Warehousing (48), which accounts for 4.5% of the employment, compared to the 2.9% for the MTA. This sub-area also has a much higher percentage of employment in Accommodation and Food Services (72), which accounts for 11.7% of the total employment, compared to the 7.2% for the MTA.

However, Northern Nevada has a low comparative percentage of employment in Information (51) and Educational Services (61), each of them accounting for 1% of the total employment, only half of the percentage for the MTA. Another industry that the Northern Nevada sub-area has a relatively low percentage of employment in is the Professional, Scientific, and Technical Services (54), which accounts for only 6.2% while the MTA average is 9.5%. The industry with the highest employment in Northern Nevada is Public Administration (92), which accounts for 12.7% of the total employment in the sub-area. The next two highest employment percentage industries are Accommodation and Food Services (72) and Retail Trade (44), accounting for 11.7% and 10.4% of the total employment, respectively.

The highest three industries in terms of average personal earnings in the Northern Nevada sub-area are $131,283 in Utilities (22), $96,772 in Management of Companies and Enterprises (55), and $77,228 in Public Administration (92). Most of the industries in Northern Nevada have lower average personal earnings than the MTA averages.

2.2 Los Angeles MTA

There are a total of 14,216,077 jobs in the Los Angeles MTA, which accounts for 9% of total employment in the US. Of the total employment within Los Angeles MTA, the Los Angeles region sub-area accounts for 71.7%, San Diego region sub-area accounts for 14.2%, Southern Nevada sub-area at 8.3%, Southern 99 Corridor sub-area accounts for 2.8%, and Other Southern California Peripheral at 3%.

Compared to the U.S., the Los Angeles MTA has a higher percentage of employment in Agriculture, Forestry, Fishing and Hunting (11), Information (51), Real Estate and Rental and Leasing (53), Arts, Entertainment, and Recreation (71), and Accommodation and Food Services (72) and a lower employment percentage in Health Care and Social Assistance (62) and Public Administration (92). Percentages of employment in the rest of the 2-digit NAICS industries are close to the national average.

Total personal earnings in the Los Angeles MTA are $814.4 billion, of which the L.A. region sub-area accounts for 72.4%, the San Diego sub-area accounts for 15%, the Southern 99 Corridor sub-area accounts for 2.9%, Other Southern California Peripheral accounts for 2.7%, and Southern Nevada accounts for 7%. The Los Angeles MTA represents 8.9% of total personal earnings in the US. Compared to the U.S., the Los Angeles MTA has a higher percentage of personal earnings in: Agriculture, Forestry, Fishing and Hunting (11), Retail Trade (44), Information (51), Real Estate and Rental and Leasing (53), Arts, Entertainment, and Recreation (71), Accommodation and Food Services (72), and Public Administration (92), while the remaining 2-digit NAICS industries have percentages close to the national average.

Average personal earnings are $57,288 in the Los Angeles MTA, which is very close to the national average of $57,820. The highest average personal earnings within this MTA by sub-area are $60,843.15 in the San Diego region, which is 6.21% higher than the MTA average. Average personal earnings for the other four sub-areas from highest to lowest are: $58,544 in the Southern 99 Corridor sub-area, $5,7810 in the L.A. region sub-area, $51,673 in the Other Southern California Peripheral sub-area and $48,322 in the Southern Nevada sub-area. The personal earnings for Southern Nevada sub-area are 15.7% lower than the MTA average. It also shows that the personal earnings for Northern Nevada are 20.6% lower than the personal earnings for San Francisco sub-area. The gap between the highest and lowest personal earnings in this MTA is $12,521. The gap in Los Angeles MTA is smaller than the gap in San Francisco MTA.

Average personal earnings in the Los Angeles MTA are 17.1% lower than average personal earnings in the San Francisco MTA. However, total employment in the Los Angeles MTA is much higher, which makes the Los Angeles MTA a larger economy body, and thus it has a larger influence.

2.2.1 Sub-Area Industry Analysis

2.2.1.1 Los Angeles Region

Compared to the other sub-areas in the Los Angeles MTA, the L.A. Region has the highest industry employment percentage in Manufacturing (31), Wholesale Trade (42), Information (51), Administrative and Waste management services (56), Health care and Social Assistance (62), Arts, Entertainment, and Recreation (71) and Other Services, Except Government (81). This is especially true in Wholesale Trade (42), which accounts for 4.4% of the employment in the L.A. Region; twice the

percentage in each of the other four sub-areas. The percentage of employment in Information (51) is 2.5%, which is also twice the percentage in the other MTA sub-areas.

The three highest average personal earnings industries in the L.A. region are $145,171 in Utilities (22), $118,401 in Information (51), and $107,858 in Management of Companies and Enterprises (55). The L.A. sub-area has the three highest average personal earnings in the same three industries as San Francisco sub-area, but earnings are lower in the L.A. sub-area.

2.2.1.2 San Diego Region

Compared to the other sub-areas in the Los Angeles MTA, the San Diego region sub-area has the highest industry employment percentage in Professional, Scientific, and Technical Services (54), Educational Services (61) and Public Administration (92). In all of these three industries, the percentage of employment is much higher than each of the other four sub-areas.

In the San Diego region, the three industries with the highest average personal earnings are $168,311 in Utilities (22), $129,506 in Management of Companies and Enterprises (55) and $94,668 in Information (51). The San Diego region has the highest average personal earnings in the same three industries as the L.A. sub-area. However, in the San Diego sub-area, average personal earnings in Management of Companies and Enterprises (55) are higher than in Information (51), while in the L.A. sub-area, it is the opposite.

2.2.1.3 Southern 99 Corridor

Compared to the other sub-areas in the Los Angeles MTA, the Southern 99 Corridor sub-area has the highest industry employment percentage in Agriculture, Forestry, Fishing and Hunting (11), and Construction (23). The percentage of employment in in Agriculture, Forestry, Fishing and Hunting (11) for 99 Corridor is extremely high, at 14.6%, with the second highest in this industry being 6.2% in the Other Southern California Peripheral subarea and less than 1% in the other three areas.

In the Southern 99 Corridor, the three highest average personal earnings are $142,532 in Utilities (22), $92,131 in Management of Companies and Enterprises (55) and $84,423 in Public Administration (92).

2.2.1.4 Other Southern California Peripheral

Of the five sub-areas, the Other Southern California Peripheral sub-area has a close-to-highest percentage of employment in Construction (23) and Other Services, Except Government (81), which account for 5.3% and 6.2% of the total employ in this sub-area respectively.

The three highest industries in terms of average personal earnings in the Other Southern California sub-area are $105,504 in Utilities (22), $102,513 in Management of Companies and Enterprises (55), and $82,028 in Public Administration (92).

2.2.1.5 Southern Nevada

Compared to the other sub-areas in the Los Angeles MTA, the Southern Nevada sub-area has the highest industry employment percentage in Retail Trade (44), Finance and Insurance (52), Real Estate and Rental and Leasing (53), Management of Companies and Enterprises (55), and Accommodation and Food Services (72).

In Southern Nevada, 22% of employment is in Accommodation and Food Services (72), which is much higher than the other four sub-areas. Moreover, Southern Nevada area has an exceptionally low percentage of personal earnings in Manufacturing (31), Wholesale Trade (42), Information (51), Finance and Insurance (52), Professional, Scientific, and Technical Services (54), and Educational Services (61).

The three industries with the highest average personal earnings in Southern Nevada sub-area are $135,677 in Utilities (22), $122,350 in Management of Companies and Enterprises (55), and $79,558 in Public Administration (92). In Southern Nevada sub-area, average personal earnings in Accommodation and Food Services (72) is $41,879, which is not the highest among the 20 two-digit NAICS industry categories, but it is twice as much as that in the other Los Angeles MTA sub-areas.

2.3 Freight Dependent Industry Analysis

As previously mentioned, eight of the 20 2-digit NAICS codes are considered to be freight-dependent to different degrees: Agriculture, Forestry, Fishing and Hunting (11), Mining (21), Utilities (22), Construction (23), Manufacturing (31), Wholesale Trade (42), Transportation and Warehousing (48), and Accommodation and Food Services (72). This section seeks to determine the percentages of freight-dependent jobs and their relative earnings within the MTAs and their sub-areas.

2.3.1 San Francisco MTA

In the San Francisco MTA, approximately 27% of jobs are in freight-dependent industries. This total differs by sub area, with Other Northern California Peripheral having the most jobs in freight dependent industries at 36.5%, followed by Northern Nevada at 32%, Northern 99 Corridor sub-area at 27% and San Francisco region at 26%. The actual percentage in the Northern 99 Corridor sub-area is larger than found in this analysis because employment data is not available for Mining (21), Utilities (22) and Wholesale Trade (42).

In the San Francisco MTA, average personal earnings in freight-dependent industries are approximately $69,089. Once again, this number varies by sub-area, with the average being $83,368 in the San Francisco region, $55,687 in the Northern 99 Corridor, $51,411 in the Other Northern California Peripheral sub-area and $49,355 in Northern Nevada.

2.3.2 Los Angeles MTA

In the Los Angeles MTA, 27.7% of jobs are in freight-dependent industries: slightly higher than in the San Francisco MTA. Again, this total differs by sub-area, with the Southern 99 Corridor employing 40.4% of workers in freight dependent industries, followed by Southern Nevada at 35.4%, Other Southern California Peripheral with 29.5%, the San Diego region at 23.8%, and the Los Angeles region at 27%. It is important to note that data is not available for Mining (21) in the San Diego region sub-area; Utilities (22) and Transportation and Warehousing (48) in the Other Southern California Peripheral sub-area. As a result, the actual percentage is higher than listed. However, based on the available data, Southern Nevada sub-area has the second highest employment percentage in freight dependent industries within the Los Angeles MTA.

In the Los Angeles MTA, average personals earnings in freight-dependent industries are approximately $61,685. As expected, this number varies by sub-area, with those in the Southern 99 corridor being of

the highest wage at an average of $67,077, followed by the San Diego region at $59,678, Los Angeles Region at $59,188, Southern Nevada at $50,080, and $49,743 for Other Southern California Peripheral. Personal earnings data is also incomplete for the same industries and subareas as indicated above in the employment data. As a result, there is difference between the actual average personal earnings and calculated average personal earnings in the freight-dependent industries.

2.3.3 Northern and Southern Nevada

Based on available data for the San Francisco MTA, Northern Nevada has the second highest total percentage of employment in industries that highly dependent on freight transportation system. Although almost one-third of the regions' employment is in freight-dependent industries, Northern Nevada has the lowest average personal earnings in freight-dependent industries, 29.6% lower than the MTA average and 19.5% lower than the national average.

Based on available data, Southern Nevada also has the second highest total percentage of employment in freight-dependent industries within the Los Angeles MTA. With over a third of employment in freight dependent industries, the average personal earnings in Southern Nevada are 14.1% lower than the MTA average and 18.3% lower than the national average.

Thus, Southern Nevada has a slightly higher percentage of employment in freight dependent industries than Northern Nevada, at 35.4% and 32%, respectively. Average personal earnings the Nevada sub-areas are also very similar, with Southern Nevadans earning $50,080 and Northern Nevadans earning $49,355.

3 Conclusions

Despite Nevada being one state politically, it is divided into three different economic regions, or MTAs, within the national economy. Each of the three MTAs has a different type and structure of economic activity and contains multiple sub-areas, one of which is part of Nevada and others that are parts of an adjoining state or states. Each sub-area has its own specific pattern and structure of economic activity. As a result, it is important to recognize the economic pattern and structure of the Nevada sub-areas in comparison to the other sub-areas within their MTAs as well as to the overall economy of their MTA. Understanding the uniqueness of economic activity within the MTAs and within each of Nevada's sub-areas provides the framework for understanding the type of infrastructure investments that an have the greatest impact on growing Nevada's economy.

3.1 Basic Employment Characteristics

There are four basic employment characteristics that need to be understood as the foundation for infrastructure investments that can grow economic activity. The first is the share of employment and earnings that each of the Nevada sub-areas contain relative to their MTA they are located within. The second and third are to understand the similarities and differences between the employment characteristics in Northern and Southern Nevada. The fourth is to compare the individual categories in the two sub-areas.

3.1.1 Nevada Sub-Areas' Relative Shares of MTA Employment

Both the Northern and Southern Nevada sub-areas have a relatively small share of employment within their respective MTAs. The Northern Nevada sub-area holds only 4% of the employment within San Francisco MTA, while the Southern Nevada sub-area holds 8.3% of total employment within the Los Angeles MTA. Thus, the Southern Nevada sub-area contains a larger share of employment within its MTA, more than double that of Northern Nevada's share.

3.1.2 Similarities and Differences in Nevada Sub-Areas' Employment Profiles

The Northern and Southern Nevada sub-areas have many similarities in their employment characteristics among the 20 two-digit NAICS code categories and some notable exceptions. The top three employment categories in the Northern Nevada sub-area each contain over 10% of the region's total employment: Public Administration (92) at 12.7%, Accommodation and Food Services (72) at 11.7%, and Retail Trade (44) at 10.4%. Six employment categories contain over 5%: Health Care and Social Assistance (62), Professional, Scientific, and Technical Services (54), Administrative and Waste Management Services (56), Real Estate and Rental and Leasing (53), Manufacturing (31), and Finance and Insurance (52). The remaining eleven categories contain fewer than 5% of the region's total employment.

The top industries in the Southern Nevada sub-area are the same three as Northern Nevada. However, in Southern Nevada, Accommodation and Food Services (72) accounts for almost 22%; a much larger share than in Northern Nevada where Accommodation ranks second at near half of the Southern Nevada percentage. This reveals the high degree of specialization and lack of diversity within Southern Nevada's economy. The other two top-three employment categories have relatively similar shares as

Northern Nevada with Retail Trade (44) at 10.8% and Public Administration (92) at 10%. Another five employment categories have over 5% of Southern Nevada's total employment, unlike Northern Nevada, which has six over the same percentage. However, these five are also over 5% in Northern Nevada: Health Care and Social Assistance (62), Administrative and Waste Management Services (56), Real Estate and Rental and Leasing (53), Finance and Insurance (52) and Professional, Scientific, and Technical Services (54). The missing category over 5% in Southern Nevada is Manufacturing (31), which has only 2.3% in the region, less than half of that found in Northern Nevada.

Thus, although Northern and Southern Nevada have very similar percentages in 18 of the 20 NAICS code categories, there are two important exceptions. The Northern Nevada sub-area has more than double the percentage of employment in Manufacturing (31) in comparison to Southern Nevada and the Southern Nevada sub-area has nearly double the percentage of employment in Accommodation and Food Services (72) in comparison to Northern Nevada.

3.1.3 Comparison of Nevada Sub-Areas' Employment Profiles

Comparing Northern Nevada and Southern Nevada sub-area, Northern Nevada sub-area has a higher percentage of employment in Agriculture, Forestry, Fishing and Hunting (11), Mining (21), Wholesale Trade (42), Transportation and Warehousing (48) and Public Administration (92), and has a slightly higher percentage of employment in Professional, Scientific, and Technical Services (54), Educational Services (61), Health Care and Social Assistance (62), and Arts, Entertainment, and Recreation (71).

Southern Nevada has a slightly higher percentage of employment in Information (51), Real Estate and Rental and Leasing (53) and Administrative and Waste Management Services (56). Both Northern Nevada sub-area and Southern Nevada sub-area have an almost the same percentage of employment in Utilities (22), Construction (23), Retail Trade (44), Finance and Insurance (52), Management of Companies and Enterprises (55), and Other Services, Except Government (81).

As previously mentioned, the Northern Nevada sub-area doubles the percentage of employment in Manufacturing (31) in comparison to the Southern Nevada sub-area and Southern Nevada doubles the percentage of employment in Accommodation and Food Services (72) in comparison to Northern Nevada.

3.2 3.2 Basic Earnings Characteristics

3.2.1 Nevada Sub Areas' Relative Shares of MTA Earnings

The Northern and Southern Nevada sub-areas have some similarities in their earnings characteristics, but their relationship to the MTAs they located in are very different. The average personal earnings in the Northern and Southern Nevada sub-areas are very similar, with a difference of only $569: $47,753 in Northern Nevada and $48,322 in Southern Nevada. However, because the average personal earnings are much higher in the San Francisco MTA than in the Los Angeles MTA, the Nevada comparisons to California differ greatly. The average personal earnings in Northern Nevada are 30.9% lower than the San Francisco MTA average, while the average personal earnings in Southern Nevada are only 15.7% lower than the Los Angeles MTA average. Thus, the gap between Nevada sub-areas and their respective MTA is larger for Northern Nevada than for Southern Nevada.

3.2.2 Similarities and Differences in Nevada Sub-Areas' Earnings Profiles

In the Northern Nevada sub-area, the highest average personal earnings are in Utilities (22) at $131,282, Management of Companies and Enterprises (55) at $96,772, and Public Administration (92) at $77,227. In the Southern Nevada sub-area, the same three two-digit NAICS categories have the highest average personal earnings in the same ranking order but with different values: Utilities (22) at $135,677, Management of Companies and Enterprises (55) at $122,349, and Public Administration (92) at $79,558. Thus, the average personal earnings of each of these categories are higher in Southern Nevada than in Northern Nevada.

Aside from these top three industries, average personal earnings in Northern Nevada are 20% or more higher than the overall Northern Nevada average in the following two-digit NAICS code categories: Wholesale Trade (42) at $72,875, Manufacturing (31) at $64,206, Mining (21) at $58,790, Health Care and Social Assistance (62) at $58,509, Construction (23) at $57,330, and Professional, Scientific, and Technical Services (54) at $57,201.

Aside from these top three industries, average personal earnings in Southern Nevada are 20% or more higher than the overall Southern Nevada average in the following two-digit NAICS code categories: Wholesale Trade (42) at $71,820, Professional, Scientific, and Technical Services (54) at $68,150, Health Care and Social Assistance (62) at $57,540, Construction (23) at $65,581 Manufacturing (31) at $61,853, and Information (51) at $58,555.

These relatively high earning industry categories are similar in both Northern and Southern Nevada, except for in Mining (21) and Information (51). Earnings in Mining (21) are almost 50% lower than overall average earnings in Southern Nevada, while they are 23% higher in Northern Nevada. Earnings in Information (51) are more than 20% higher than the overall average in Southern Nevada, while they are only 10% higher than the overall average in Northern Nevada.

3.2.3 Comparison of Nevada Sub-Areas' Earnings Profiles

Comparing Northern to Southern Nevada, the Northern Nevada sub-area has higher (15% or more) average personal earnings than the Southern Nevada sub-area in Mining (21) by 136%, Agriculture, Forestry, Fishing and Hunting (11) by 52%, and Finance and Insurance (52) by 19%. The Southern Nevada sub-area has higher (15% or more) average personal earnings than the Northern Nevada sub-area in Arts, Entertainment, and Recreation (71) by 62%, Accommodation and Food Services (72) by 40%, Management of Companies and Enterprises (55) by 26%, Professional, Scientific, and Technical Services by 19%, and (54) Real Estate and Rental and Leasing (53) by 19%.

3.3 Freight Dependencies

Nevada has a high degree of economic dependency on freight-dependent industries as shown by the fact that both the Northern Nevada and Southern Nevada sub-areas have a high percentage of employment in freight-dependent industries then their MTA total percentages. Northern Nevada sub-area has 32% of its employment and 33.2% of its personal earnings in freight-dependent industries. Southern Nevada sub-area has 35.4% of its employment and 36.6% of its personal earnings in freight-dependent industries. Thus, the state has a high economic dependency on freight-dependent industries.

3.3.1 Employment to Earnings Relationships in Nevada

However, in contrast to the high percentage of employment in freight-dependent industries, the average personal earnings in freight-dependent industries are low in both Northern and Southern Nevada. The average personal earnings in freight-dependent industry categories are$49,355 in the Northern Nevada sub-area and $50,080 in the Southern Nevada sub-area. The gap between Northern Nevada and the San Francisco MTA is much larger than that between Southern Nevada and the Los Angeles MTA, at 30.1% lower and 14.1% lower, respectively.

3.3.2 Nevada's Shares of Respective MTAs

The Northern Nevada sub-area is located in the same MTA as the San Francisco region, a well-developed and affluent sub-area and a world leader in Technology. The San Francisco MTA, compared to Los Angeles MTA, is also leading in personal earnings. However, Northern Nevada has a small share of the total economy of San Francisco MTA. In contrast, Los Angeles is a large employment region although not as affluent as San Francisco MTA, the Southern Nevada sub-area takes a larger share of the total economy of the Los Angeles MTA. It also indicates that the Northern Nevada sub-area has huge potential to grow and diversify to become a more competitive economic region if it can capture a larger share of employment and earnings within the San Francisco MTA.

3.3.3 Nevada's High Degree of Dependency

Both the Northern Nevada and Southern Nevada sub-areas have a high dependency on freight-dependent industries. As a result, an improved freight system with better connectivity between these two sub-areas and the dominant economy within their respective MTAs could be extremely beneficial for both Northern and Southern Nevada. These two sub-areas can and should become more integrated parts of their respective MTAs in order to capture a larger share of economies and develop a competitive advantage in the global and Western US marketplace.

Table 1: Total Full-Time and Part-Time Employment by NAICS Industry and Major Trade Area (Sub-areas)
Source: Bureau of Economic Analysis, 2013

Area	Sub-Area	Total Employed	2-Digit NAICS Industry Code																			
			11	21	22	23	31	42	44	48	51	52	53	54	55	56	61	62	71	72	81	92	Total Freight Dependent
San Francisco Major Trade Area: Northern California & Nevada																							
San Jose-San Francisco-Oakland, CA (CSA) minus Stockton	S.F.	4,917,896	37,729	11,478	14,137	228,161	344,746	155,735	422,425	122,036	161,131	249,419	270,724	614,378	76,169	296,275	139,649	529,273	132,760	358,645	265,796	487,230	1,272,667
Stockton-Lodi, CA (MSA)	N. 99	286,296	18,415	473	1,341	13,031	19,150	12,866	31,715	18,671	2,498	10,999	14,416	9,861	1,840	16,969	5,782	33,660	3,969	17,820	16,238	36,582	101,767
Sacramento-Roseville, CA (CSA)	N. 99	1,351,792	21,290	(D)	2,959	74,576	43,163	33,946	132,170	36,416	18,382	71,459	76,684	96,771	13,736	83,528	23,056	150,934	32,352	88,371	77,386	270,987	300,721
Fresno-Madera, CA (CSA)	N. 99	521,483	25,789	(D)	2,403	21,024	29,152	17,372	49,227	16,875	5,139	20,490	21,330	19,607	3,191	30,906	6,328	67,917	6,557	30,946	30,025	76,371	143,561
Salinas, CA (MSA)	Other N. CA	233,000	49,062	680	891	7,887	6,259	6,381	20,492	4,518	2,153	6,089	10,048	11,045	1,141	9,119	3,268	18,876	5,041	21,003	12,162	36,885	96,681
Modesto-Merced, CA (CSA)	N. 99	319,863	18,539	(D)	(D)	13,779	30,094	(D)	36,127	13,728	1,761	9,462	13,921	11,358	2,693	15,264	2,921	39,820	4,056	20,575	17,546	44,321	96,715
Visalia-Porterville, CA (MSA)	N. 99	193,397	38,478	204	634	6,752	12,262	4,914	20,734	7,573	1,135	5,808	7,387	4,979	891	10,824	1,825	15,190	1,03	10,268	10,180	31,656	81,085
Chico, CA (MSA)	N. 99	106,538	4,740	228	567	5,308	4,859	2,254	12,517	1,659	1,329	3,674	5,157	5,631	855	5,064	1,263	18,279	2,048	7,609	8,269	15,228	27,224
Yuba City, CA (MSA)	N. 99	72,300	6,233	372	(D)	2,998	2,628	(D)	7,643	2,08	570	2,048	3,799	2,728	802	3,481	572	8,115	1,331	4,227	3,878	16,226	19,166
Hanford-Corcoran, CA (MSA)	N. 99	56,488	6,965	204	92	1,294	4,650	769	5,184	1,297	236	1,051	1,471	1316	117	1,211	421	6,543	404	3,050	2,432	17,781	18,321
Redding, CA (MSA)	Other N. CA	87,939	1,811	(D)	404	4,817	2,894	2,096	11,202	2,289	904	3,713	4,533	4,521	888	4,592	1,149	14,269	1,763	6,186	5,828	12,783	20,497
Reno-Carson City-Fernley, NV (CSA)	N. NV	337,233	2,033	3,219	789	16,602	19,920	10,932	35,035	15,300	3,429	19,074	20,075	20,902	4,988	20,680	3,453	30,046	11,571	39,277	16,333	42,820	108,072
MTA Total	5.35 %	8,484,225	231,084	16,858	24,217	396,229	519,777	247,265	784,471	243,070	198,667	403,286	449,545	803,097	107,311	497,913	189,687	932,922	203,555	607,977	466,073	1,088,870	2,286,477
Industry Percentage			2.72%	0.20%	0.29%	4.67%	6.13%	2.91%	9.25%	2.86%	2.34%	4.75%	5.30%	9.47%	1.26%	5.87%	2.24%	11.00%	2.40%	7.17%	5.49%	12.83%	26.95%

Table 1: Total Full-Time and Part-Time Employment by NAICS Industry and Major Trade Area (Sub-areas)

Source: Bureau of Economic Analysis, 2013

Area	Sub-Area	Total Employed	2-Digit NAICS Industry Code																			
			11	21	22	23	31	42	44	48	51	52	53	54	55	56	61	62	71	72	81	92	Total Freight Dependent
S.F. Metro	58%	4,917,896	37,729	11478	14137	228161	344746	155,735	422,425	122,036	161,131	249,419	270,724	614,378	76,169	296,275	139,649	529,273	132,760	358,645	265,796	487,230	1,272,667
Industry %			0.77%	0.23%	0.29%	4.64%	7.01%	3.17%	8.59%	2.48%	3.28%	5.07%	5.50%	12.49%	1.55%	6.02%	2.84%	10.76%	2.70%	7.29%	5.40%	9.91%	25.88%
99 Corridor	34.3 %	2,908,157	140,449	1,481	7,996	138,762	145,958	72,121	295,317	98,927	31,050	124,991	144,165	152,251	24,125	167,247	42,168	340,458	52,420	182,866	165,954	509,152	788,560
Industry Percentage			4.83%	0.05%	0.27%	4.77%	5.02%	2.48%	10.15%	3.40%	1.07%	4.30%	4.96%	5.24%	0.83%	5.75%	1.45%	11.71%	1.80%	6.29%	5.71%	17.51%	27.12%
Other N. CA	3.78 %	320,939	50,873	680	1,295	12,704	9,153	8,477	31,694	6,807	3,057	9,802	14,581	15,566	2,029	13,711	4,417	33,145	6,804	27,189	17,990	49,668	117,178
Industry %			15.85%	0.21%	0.40%	3.96%	2.85%	2.64%	9.88%	2.12%	0.95%	3.05%	4.54%	4.85%	0.63%	4.27%	1.38%	10.33%	2.12%	8.47%	5.61%	15.48%	36.51%
North NV	3.97 %	337,233	2033	3,219	789	16,602	19,920	10,932	35,035	15,300	3,429	19,074	20,075	20,902	4,988	20,680	3,453	30,046	11,571	39,277	16,333	42,820	108,072
Industry %			0.60%	0.95%	0.23%	4.92%	5.91%	3.24%	10.39%	4.54%	1.02%	5.66%	5.95%	6.20%	1.48%	6.13%	1.02%	8.91%	3.43%	11.65%	4.84%	12.70%	32.05%
U.S. (Metro)		158,497,018	571,241	1,021,408	460,989	7,910,615	10,260,926	5,719,548	15,809,294	5,193,778	3,030,326	9,036,709	7,206,544	11,688,157	2,141,158	10,351,115	3,894,186	18,214,829	3,720,984	11,484,584	9,223,062	20,277,118	42,623,089
Industry %			0.36%	0.64%	0.29%	4.99%	6.47%	3.61%	9.97%	3.28%	1.91%	5.70%	4.55%	7.37%	1.35%	6.53%	2.46%	11.49%	2.35%	7.25%	5.82%	12.79%	26.89%
Los Angeles Major Trade Area: Southern California & Nevada, Eastern Arizona																							
Los Angeles-Long Beach-Anaheim, CA (MSA)	L.A.	7,960,945	11,245	22,081	16,645	304,703	568,364	367,143	696,548	242,049	271,547	429,868	498,383	681,359	91,441	564,970	19,2932	915,442	285,072	554,290	527,323	719,540	2,086,520
San Diego-Carlsbad, CA (MSA)	S.D	1,935,464	15,258	4,660	7,057	88,654	104,486	57,036	176,144	31,437	30,717	92,845	117,145	197,153	21,686	119,937	46,075	179,772	49,884	151,941	114,679	328,898	460,529
Riverside-San Bernardino-Ontario, CA (MSA)	L.A.	1,795,498	18,674	3,552	5,882	109,203	97,689	69,115	208,168	98,351	15,956	66,624	101,398	80,262	9,526	141,371	24,473	204,869	33,895	129,129	121,794	255,567	531,595
Las Vegas-Henderson-Paradise, NV (MSA)	S.NV	1,121,180	571	3,169	2,738	51,917	23,561		117,688	40,335	13,572	64,497	75,384	58,512	18,011	80,532	9,877	83,444	35,811	254,716	52,149	110,064	401,639
Oxnard-Thousand Oaks-Ventura, CA (MSA)	L.A.	438,876	26,242	2,584	1,158	20,332	32,550	16,055	48,093	6,759	7,007	27,019	24,271	31,991	2,135	28,256	7,832	419,65	11,239	30,488	25,217	47,683	136,168
Bakersfield, CA (MSA)	S. 99	401,231	58,749	15,201	1,484	23,835	15,675	11,272	37,100	13,330	3,159	11,719	15,453	18,145	3,621	20,767	2,835	38,715	4,794	22,435	22,192	60,750	161,981

Table 1: Total Full-Time and Part-Time Employment by NAICS Industry and Major Trade Area (Sub-areas)
Source: Bureau of Economic Analysis, 2013

Area	Sub-Area	Total Employed	2-Digit NAICS Industry Code																			Total Freight Dependent
			11	21	22	23	31	42	44	48	51	52	53	54	55	56	61	62	71	72	81	92	
Santa Maria-Santa Barbara, CA (MSA)	Other S. CA	262,261	19,196	2,029	339	11,631	13,793	5,885	23,364	3,957	5,395	8,354	14,731	21,726	2,156	15,935	4,795	25,723	7,128	22,915	15,420	37789	79,745
San Luis Obispo-Paso Robles-Arroyo Grande, CA (MSA)	Other S. CA	159,647	7,066	625	(D)	10,529	6,573	3,546	17,903	(D)	1,926	5,947	10,635	11,096	655	9,421	1,658	15,481	3,989	16,204	10,592	20,995	44,543
El Centro, CA (MSA)	S.D	78,116	3173	(D)	486	2,619	2,927	2,381	10,326	2,705	414	1,772	2,050	1,983	492	2,928	523	9,313	389	4,071	4,224	17,945	18,362
Lake Havasu City-Kingman, AZ (MSA)	S. NV	62,859	622	741	465	3,566	3,090	976	9,787	1,968	838	2,136	4,183	2,056	(D)	3,846	664	8,476	1,160	5,509	4,151	8,356	16,937
Total	8.97 %	14,216,077	160,796	54,642	36,254	626,989	868,708	558,041	1,345,121	440,891*	350,531	710,781	863,633	1,104,283	149,723 *	987,963	291664	1,523,200	433,361	1,191,698	897,741	1,607,587	3,938,019
Industry %			1.13%	0.38%	0.26%	4.41%	6.11%	3.93%	9.46%	3.10%	2.47%	5.00%	6.08%	7.77%	1.05%	6.95%	2.05%	10.71%	3.05%	8.38%	6.31%	11.31%	27.70%
LA metro	71.7 %	10195319	56,161	28,217	23,685	434,238	698,603	452,313	952,809	347,159	294,510	523,511	624,052	793,612	103,102	734,597	225,237	1,162,276	330,206	713,907	674,334	1,022,790	2,754,283
Industry %			0.55%	0.28%	0.23%	4.26%	6.85%	4.44%	9.35%	3.41%	2.89%	5.13%	6.12%	7.78%	1.01%	7.21%	2.21%	11.40%	3.24%	7.00%	6.61%	10.03%	27.02%
San Diego	142%	2013580	18,431	4,660	7,543	91,273	107,413	59,417	186,470	34,142	31,131	94,617	119,195	199,136	22,178	122,865	46,598	189,085	50,273	156,012	118903	346,843	478,891
Industry Percentage			0.92%	0.23%	0.37%	4.53%	5.33%	2.95%	9.26%	1.70%	1.55%	4.70%	5.92%	9.89%	1.10%	6.10%	2.31%	9.39%	2.50%	7.75%	5.91%	17.23%	23.78%
99 Corridor	2.82 %	401,231	58,749	15,201	1,484	23,835	15,675	11,272	37,100	13,330	3,159	11,719	15,453	18,145	3,621	20,767	2,835	38,715	4,794	22,435	22,192	60,750	161,981
Industry %			14.64%	3.79%	0.37%	5.94%	3.91%	2.81%	9.25%	3.32%	0.79%	2.92%	3.85%	4.52%	0.90%	5.18%	0.71%	9.65%	1.19%	5.59%	5.53%	15.14%	40.37%
Other S. CA	2.97 %	421,908	26,262	2,654	339	22,160	20,366	9,431	41,267	3,957	7,321	14,301	25,366	32,822	2,811	25,356	6,453	41204	11,117	39,119	26,012	58,784	124,288
Industry %			6.22%	0.63%	0.08%	5.25%	4.83%	2.24%	9.78%	0.94%	1.74%	3.39%	6.01%	7.78%	0.67%	6.01%	1.53%	9.77%	2.63%	9.27%	6.17%	13.93%	29.46%
L.V.	8.33 %	1,184,039	1,193	3,910	3,203	55,483	26,651	25,608	127,475	42,303	14,410	66,633	79,567	60,568	18,011	84,378	10,541	91,920	36,971	260,225	56,300	118,420	418,576
Industry %			0.10%	0.33%	0.27%	4.69%	2.25%	2.16%	10.77%	3.57%	1.22%	5.63%	6.72%	5.12%	1.52%	7.13%	0.89%	7.76%	3.12%	21.98%	4.75%	10.00%	35.35%
US (Metro)		158,497,018	571,241	1,021,408	460,989	7,910,615	10,260,926	5,719,548	15,809,294	5,193,778	3,030,326	9,036,709	7,206,544	11,688,157	2,141,158	10,351,115	3,894,186	18,214,829	3,720,984	11,484,584	9,223,062	20,277,118	42,623,089
Industry %			0.36%	0.64%	0.29%	4.99%	6.47%	3.61%	9.97%	3.28%	1.91%	5.70%	4.55%	7.37%	1.35%	6.53%	2.46%	11.49%	2.35%	7.25%	5.82%	12.79%	26.89%

Table 2: Average Personal Earnings by NAICS Industry (dollars) and Major Trade Area (Sub-areas)

Source: Bureau of Economic Analysis, 2013

Area	*Sub-Area*	*Total Employed*	2-Digit NAICS Industry Code *11*	*21*	*22*	*23*	*31*	*42*	*44*	*48*	*51*	*52*	*53*	*54*	*55*	*56*	*61*	*62*	*71*	*72*	*81*	*92*	*Total Freight Dependent*
San Francisco Major Trade Area: Northern California & Nevada																							
San Jose-San Francisco-Oakland, CA (CSA) minus Stockton	S.F	395,939,257	1,589,999	958,458	2,615,713	17,733,136	48,687,395	15,634,524	19,123,411	7,893,642	36,646,902	24,420,438	11,182,874	67,289,279	12,311,863	14,805,125	6,918,967	33,290,838	4,185,223	10,986,428	11,538,483	48,126,559	106,099,295
Stockton-Lodi, CA (MSA)	N. 99	14,616,337	1,216,623	13,071	183,961	789,577	1,216,127	871,771	1,069,015	1,081,774	153,147	443,074	427,752	438,516	170,422	493,099	226,871	1,791,864	75,648	355,682	594,005	3,004,338	5,728,586
Sacramento-Roseville, CA (CSA)	N. 99	79,535,481	1,025,531	86,311	444,555	4,440,778	3,553,831	2,402,846	4702639	1,795,842	2,153,699	4,315,950	2,131,538	6,664,786	1,146,280	3,004,916	745,540	8,951,975	696,119	2,002,300	2,993,953	26,239,733	15,751,994
Fresno-Madera, CA (CSA)	N. 99	26,188,511	2,534,995	(D)	355,792	1,196,874	1,707,352	1,140,373	1,656,000	896,755	442,328	873,126	705,973	1,013,847	210,848	873915	182839	3,484,359	111,494	627,500	1,053,166	5,770,370	8,459,641
Salinas, CA (MSA)	Other N. CA	12,827,898	2,602,196	41,165	123,989	443,463	368,005	713,031	733,980	271,853	157,804	299,554	309,056	583,334	91,453	279546	116,326	988,114	212,076	661,319	452,157	3,379,477	5,225,021
Reno-Carson City-Fernley, NV (CSA)	N. NV	16,103,756	73,077	189,246	103,582	951,808	1,278,995	796,678	1130728	762,753	179,524	797,918	259,266	1,195,626	482,701	622,841	112,569	1,757,972	267,758	1,177,757	628,351	3,306,884	5,333,896
Modesto, CA (MSA)	N. 99	11,424,317	1,247,997	3,436	(D)	548,644	1,505,091	(D)	881,097	510,663	726,83	277,473	290,675	380,616	134,557	332,822	76,643	1,826,507	46,550	298,407	420,677	2,069,282	4,114,238
Visalia-Porterville-Hanford, CA (CSA)	N. 99	12,907,499	2,977,072	5,561	96,870	432,567	1,053,166	389,974	830,810	493,096	103,315	264,722	136,957	288,448	67,692	330,170	68,095	927,325	32,403	254,737	457,559	3,696,960	5,703,043
Merced, CA (MSA)	N. 99	4,953,878	856,141	(D)	46,015	183,679	534,960	141,774	306,382	196,307	25,317	74,924	64,614	99,972	71,308	97,540	7,279	453,867	18,004	95,403	183,722	1,265,682	2,054,279
Chico, CA (MSA)	N. 99	4,616,164	267,017	4,239	85,682	258,334	233,955	127,436	410,043	71,590	75,246	145,817	91,298	246,796	28,402	147,413	30,271	908,012	23,941	146,359	279,570	1,034,743	1,194,612
Yuba City, CA (MSA)	N. 99	3,515,010	381,862	20,227	(D)	147,565	145,457	(D)	237,341	128,056	29,446	62,206	59,997	104,058	15,214	88,949	14,226	418,958	16,669	82,652	145,176	1,257,959	905,819
Redding, CA (MSA)	Other N. CA	3,766,380	10,711	(D)	61,820	248,590	137,683	108,879	378,630	106,527	45,105	137,574	67,805	196,212	42,553	123,601	32,460	729,559	29,252	124,963	206,199	922,841	799,173
Total	6.40%	586,394,488	14,783,221	1,321,714	4,117,979	27,375,015	60,422,017	22,327,286	31,460,076	14,208,858	40,084,516	32,112,776	15,727,805	78,501,490	14,773,293	21,199,937	8,532,086	55,529,350	5,715,137	16,813,507	18,953,018	100,074,828	161,369,597
Industry Percentage		6.40%	2.52%	0.23%	0.70%	4.67%	10.30%	3.81%	5.37%	2.42%	6.84%	5.48%	2.68%	13.39%	2.52%	3.62%	1.46%	9.47%	0.97%	2.87%	3.23%	17.07%	27.52%
S.F	67.5%	395939257	1589999	958458	2615713	17733136	48687395	15634524	19123411	7893642	36646902	24420438	11182874	67289279	12311863	14805125	6918967	33290838	4185223	10986428	11538483	48126559	106099295
Industry Percentage		67.52%	0.40%	0.24%	0.66%	4.48%	12.30%	3.95%	4.83%	1.99%	9.26%	6.17%	2.82%	16.99%	3.11%	3.74%	1.75%	8.41%	1.06%	2.77%	2.91%	12.16%	26.80%
99 Corridor	26.9%	157,757,197	10,507,238	132,845	1,212,875	7,998,018	9,949,939	5,074,174	10,093,327	5,174,083	3,055,181	6,457,292	3,908,804	9,237,039	1,844,723	5,368,824	1,351,764	18,762,867	1,020,828	3,863,040	6,127,828	44,339,067	43,912,212
Industry Percentage		26.90%	6.66%	0.08%	0.77%	5.07%	6.31%	3.22%	6.40%	3.28%	1.94%	4.09%	2.48%	5.86%	1.17%	3.40%	0.86%	11.89%	0.65%	2.45%	3.88%	28.11%	27.84%
Other Areas	2.83%	16,594,278	2,612,907	41,165	185,809	692,053	505,688	821,910	1,112,610	378,380	202,909	437,128	376,861	779,546	134,006	403,147	148,786	1,717,673	241,328	786,282	658,356	4,302,318	6,024,194
Industry Percentage		2.83%	15.75%	0.25%	1.12%	4.17%	3.05%	4.95%	6.70%	2.28%	1.22%	2.63%	2.27%	4.70%	0.81%	2.43%	0.90%	10.35%	1.45%	4.74%	3.97%	25.93%	36.30%
North NV	2.75%	16,103,756	73,077	189,246	103,582	951,808	1,278,995	796,678	1,130,728	762,753	179,524	797,918	259,266	1,195,626	482,701	622,841	112,569	1,757,972	267,758	1,177,757	628,351	3,306,884	5,333,896
Industry Percentage		2.75%	0.45%	1.18%	0.64%	5.91%	7.94%	4.95%	7.02%	4.74%	1.11%	4.95%	1.61%	7.42%	3.00%	3.87%	0.70%	10.92%	1.66%	7.31%	3.90%	20.53%	33.12%
United States (Metropolitan Portion)		9,164,370,536	70,595,483	124,453,101	65,734,260	499,003,664	836,551,694	478,229,011	538,149,427	303,667,784	325,017,827	695,830,588	201,111,760	965,297,263	259,743,619	381,059,497	159,794,210	1,010,684,540	105,200,543	285,833,483	333,180,845	1,525,231,937	2,664,068,480
Industry Percentage			0.77%	1.36%	0.72%	5.45%	9.13%	5.22%	5.87%	3.31%	3.55%	7.59%	2.19%	10.53%	2.83%	4.16%	1.74%	11.03%	1.15%	3.12%	3.64%	16.64%	29.07%
Los Angeles Major Trade Area: Southern California & Nevada, Eastern Arizona																							
Los Angeles-Long Beach-Anaheim, CA (MSA)	L.A.	482,457,229	288,194	2,484,754	2,550,786	19,458,738	44,564,903	28,843,640	27,379,116	14,802,819	33,440,589	32,893,302	18,337,379	56,283,062	10,061,111	22,053,103	8862,743	46,531,400	13,149,429	15,228,417	17,977,552	67,266,192	128,222,251
San Diego-Carlsbad, CA (MSA)	S.D	118,646,587	443,231	94,186	1,214,381	5,702,086	9,610,482	4,592,427	6,338,096	1,448,377	2,925,899	5,805,046	4,714,386	17,867,139	2,860,191	4,523,975	1,918,862	10,018,100	1,491,741	4,254,155	3,991,987	28,831,840	27,359,325

Table 2: Average Personal Earnings by NAICS Industry (dollars) and Major Trade Area (Sub-areas)

Source: Bureau of Economic Analysis, 2013

Area	*Sub-Area*	*Total Employed*	2-Digit NAICS Industry Code																			*Total Freight Dependent*
			11	*21*	*22*	*23*	*31*	*42*	*44*	*48*	*51*	*52*	*53*	*54*	*55*	*56*	*61*	*62*	*71*	*72*	*81*	*92*	
Riverside-San Bernardino-Ontario, CA (MSA)	L.A.	82,214,667	546,838	214,352	718,794	5,883,270	5,981,063	4,254,909	7,093,321	5,088,554	909,677	2,370,056	2,217,202	3,540,479	793,587	3,914,094	815,484	9,650,837	708,017	2,894,639	3,991,400	20,628,094	25,582,419
Las Vegas-Henderson-Paradise, NV (MSA)	S. NV	54,772,437	17,898	59,118	391,814	3,516,413	1,499,942	1,798,512	4,069,229	2,291,093	804,321	2,269,992	1,162,393	4,054,680	2,203,643	2,512,653	356,292	4,782,143	1,366,632	10,784,626	1,888,042	8,943,001	20,359,416
Oxnard-Thousand Oaks-Ventura, CA (MSA)	L.A.	24,719,536	1,240,942	476,176	168,789	1,095,697	3,833,495	1,336,193	1,680,706	340,685	520,030	1,573,307	732,043	1,846,857	265,651	1,066,076	249,094	2,216,031	209,894	722,595	914,595	4,230,680	9,214,572
Bakersfield, CA (MSA)	S. 99	23,489,576	3,743,480	2067,741	211,518	1,479,180	1,079,184	918,430	1,311,578	913,444	184,731	511,542	411,166	1,075,436	333,607	676,797	71,400	1,796,340	88,649	452,300	1,034,345	5,128,708	10,865,277
Santa Maria-Santa Barbara, CA (MSA)	Other S. CA	14,340,692	819,389	267,175	35,766	676,889	1,108,310	465,437	884,745	210,542	516,779	504,050	452,718	1,440,006	236,385	599,987	174,052	1,479,551	144,419	645,091	555,324	3,124,077	4,228,599
San Luis Obispo-Paso Robles-Arroyo Grande, CA (MSA)	Other S. CA	7,460,755	254,128	16,957	(D)	624,336	462,032	204,605	612,988	(D)	116,488	229,510	275,114	479,209	51,779	282,399	32,307	816,749	51,861	391,768	339,523	1,697,872	1,953,826
El Centro, CA (MSA)	S.D	3,865,953	561,519	(D)	55,190	116,675	129,838	151,420	268,048	126,612	21,199	68,720	32,741	70,563	11,989	81,982	10,217	209,863	5,003	78,812	112,148	1,500,486	1,220,066
Lake Havasu City-Kingman, AZ (MSA)	S. NV	2,442,478	10,329	38,146	42,760	122,232	148,507	40,663	310,164	87,010	39,459	78,096	58,421	73,068	(D)	112,359	20,205	506,985	20,680	113,385	134,346	478,263	603,032
Total	8.89%	814,409,910	7,925,948	5,718,605	5,389,798	38,675,516	68,417,756	42,606,236	49,947,991	25,309,136	39,479,172	46,303,621	28,393,563	86,730,499	16,817,943	35,823,425	12,510,656	78,007,999	17,236,325	35,565,788	30,939,262	141,829,213	229,608,783
Industry Percentage		8.89%	0.97%	0.70%	0.66%	4.75%	8.40%	5.23%	6.13%	3.11%	4.85%	5.69%	3.49%	10.65%	2.07%	4.40%	1.54%	9.58%	2.12%	4.37%	3.80%	17.41%	28.19%
LA metro	72.4%	589,391,432	2,075,974	3,175,282	3,438,369	26,437,705	54,379,461	34,434,742	36,153,143	20,232,058	34,870,296	36,836,665	21,286,624	61,670,398	11,120,349	27,033,273	9,927,321	58,398,268	14,067,340	18,845,651	22,883,547	92,124,966	163,019,242
Industry Percentage		72.37%	0.35%	0.54%	0.58%	4.49%	9.23%	5.84%	6.13%	3.43%	5.92%	6.25%	3.61%	10.46%	1.89%	4.59%	1.68%	9.91%	2.39%	3.20%	3.88%	15.63%	27.66%
San Diego	15%	122,512,540	1,004,750	94,186	1,269,571	5,818,761	9,740,320	4,743,847	6,606,144	1,574,989	2,947,098	5,873,766	4,747,127	17,937,702	2,872,180	4,605,957	1,929,079	10,227,963	1,496,744	4,332,967	4,104,135	30,332,326	28,579,391
Industry Percentage		15.04%	0.82%	0.08%	1.04%	4.75%	7.95%	3.87%	5.39%	1.29%	2.41%	4.79%	3.87%	14.64%	2.34%	3.76%	1.57%	8.35%	1.22%	3.54%	3.35%	24.76%	23.33%
99 Corridor	2.88%	23,489,576	3,743,480	2,067,741	211518	1,479,180	1,079,184	918,430	1,311,578	913,444	184,731	511,542	411,166	1,075,436	333,607	676,797	71,400	1,796,340	88,649	452,300	1,034,345	5,128,708	10,865,277
Industry Percentage		2.88%	15.94%	8.80%	0.90%	6.30%	4.59%	3.91%	5.58%	3.89%	0.79%	2.18%	1.75%	4.58%	1.42%	2.88%	0.30%	7.65%	0.38%	1.93%	4.40%	21.83%	46.26%
Other S. CA	2.68%	21,801,447	1,073,517	284,132	35,766	1,301,225	1,570,342	670042	1,497,733	210,542	633,267	733,560	727,832	1,919,215	288,164	882,386	206,359	2,296,300	196,280	1,036,859	894,847	4,821,949	6,182,425
Industry %		2.68%	4.92%	1.30%	0.16%	5.97%	7.20%	3.07%	6.87%	0.97%	2.90%	3.36%	3.34%	8.80%	1.32%	4.05%	0.95%	10.53%	0.90%	4.76%	4.10%	22.12%	28.36%
L.V.	7.03%	57,214,915	28,227	97,264	434,574	3,638,645	1,648,449	1,839,175	4,379,393	2,378,103	843,780	2,348,088	1,220,814	4,127,748	2,203,643	2,625,012	376,497	5,289,128	1,387,312	10,898,011	2,022,388	9421264	20,962,448
Industry %		7.03%	0.05%	0.17%	0.76%	6.36%	2.88%	3.21%	7.65%	4.16%	1.47%	4.10%	2.13%	7.21%	3.85%	4.59%	0.66%	9.24%	2.42%	19.05%	3.53%	16.47%	36.64%
US (Metro. Portion)		9,164,370,536	70,595,483	124,453,101	65,734,260	499,003,664	836,551,694	478,229,011	538,149,427	303,667,784	325,017,827	695,830,588	201,111,760	965,297,263	259,743,619	381,059,497	159,794,210	1,010,684,540	105,200,543	285,833,483	333,180,845	1,525,231,937	2,664,068,480
Industry %			0.77%	1.36%	0.72%	5.45%	9.13%	5.22%	5.87%	3.31%	3.55%	7.59%	2.19%	10.53%	2.83%	4.16%	1.74%	11.03%	1.15%	3.12%	3.64%	16.64%	29.07%

Major Multimodal Freight Transportation Drivers and Critical Issues

Prepared for
Nevada Department of Transportation

September 2016

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Acronyms & Abbreviations

3PL	third-party logistics
AAR	Association of American Railroads
ASCE	American Society of Civil Engineers
ASEAN	Association of Southeast Asian Nations
CA	California
CARB	California Environmental Protection Agency Air Resources Board
CSA	Compliance, Safety, Accountability Program
DMV	Department of Motor Vehicle
EDI	electronic data information system
EU	European Union
FAA	Federal Aviation Administration
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
ghg	greenhouse gas
GOED	Governor's Office of Economic Development
HOS	hours of service
IANA	Intermodal Association of North America Statistics
LAS	McCarran International Airport
M&A	mergers and acquisitions
NAFTA	North American Free Trade Agreement
NHTSA	National Traffic Safety Administration
OAK	Oakland International Airport
ONT	Ontario, California
P3	public-private partnerships
PHX	Phoenix Sky Harbor International Airport
PTC	Positive Train Control
RNO	Reno-Tahoe International Airport
RPA	Regional Plan Association
SEA	Seattle-Tacoma International Airport
SFO	San Francisco International Airport
STB	Surface Transportation Board
UAV	unmanned aerial vehicle
UP	Union Pacific
USDOT	United States Department of Transportation

1 Introduction

There are driving forces rooted in changes taking place within the global and national economies and our physical environment that will strongly influence Nevada supply chains and the modes that serve them now and in the future. These drivers include large economic and environmental changes affecting commerce, the impact of game changing technologies and factors affecting future energy supply and use. The description of these factors is followed by a context setting description of the role of each mode and the critical issues facing them. Included are Nevada takeaways that give focus to impacts and actions that should be considered within this freight plan and its relationship to Nevada's overall economic competitiveness.

2 A New Economic Order

2.1 End of Bi-polar Political Divisions

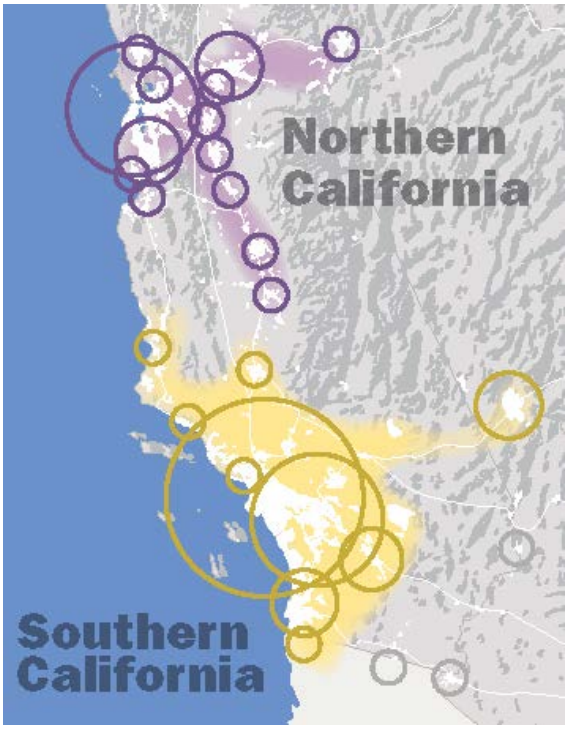
Since the collapse of the Iron Curtain and the division it imposed on world order, the global economy has been restructuring itself into a pattern of increased trade among nations; a dynamic pattern rooted in economic, geographic and/or cultural affinities. The creation of the European Union, the commercial rise of China and other nations in East and Southeast Asia are signs of ongoing changes in global economic relations. This restructuring is abetted by the lowering of tariff barriers as well as the introduction of infrastructure and technology improvements that have linked production in low-cost labor markets with demand in developed economies. Population growth and increasing wealth in formerly underdeveloped countries has expanded both domestic and global commercial opportunities throughout much of the world.

2.2 Emergence of Trading Blocs

International commerce is evolving into patterns of regional and continental trade blocs, such as the European Union (EU), North American Free Trade Agreement (NAFTA), and Association of Southeast Asian Nations (ASEAN). In fact, over 80% of the consumption of goods will be in markets beyond our national border (Bingham, 2014). It is apparent that economic downturns among any one major trading partner can impact the prosperity of others well beyond their borders. Moreover, unstable political conditions create ongoing threats to global supply lines as evidenced by piracy in the Indian Ocean and the prospect that the Suez supply route will suffer disruption as a result. These and other factors (i.e. advances in technology and demographic changes) are feeding greater inter bloc trade.

2.3 Advent of Urban Mega-Regions

Organizations such as the Regional Plan Association (RPA) and the Brookings Institute note that US demographic growth and shifts are resulting in mega-regional economic relationships where urbanized areas increasingly converge into larger networks. These metro-centric networks result in inter-urban trade flows that are the foundation of the domestic economy and international trade. It is forecast that by 2050, 75% of the nation's inhabitants will live in 11 RPA identified mega-regions and 80% of the nation's population growth will occur there (FRA, 2010). The 11 mega-regions include: Cascadia, Northern California, Southern California, Arizona Sun Corridor, Front Range, Texas Triangle, Gulf Coast, Great Lakes, Piedmont Atlantic, Florida, and the Northeast (FRA, 2010). Many of the goods consumed by these densely populated areas will be supplied by the surrounding rural regions and nearby ports. Traffic congestion and lost productivity as well as their related effects will threaten to diminish the quality of life in and around these megaregions. Two regions identified by the RPA are especially germane to the Nevada freight study: Northern California and Southern California.



The Northern California mega-region's principal cities include Oakland, Reno, Sacramento, San Jose, and San Francisco (RPA, 2005). The Southern California mega-region's principal cities include Los Angeles, San Diego, Anaheim, Long Beach, and Las Vegas (America 2050, 2015). Together, these regions accounted for 12% of the US 2005 Gross Domestic Product with 5% in Northern California and 7% in Southern California (America 2050, 2015).

FIGURE 1: Northern and Southern California Mega-Regions
This image depicts the metros included in the two California regions as defined by America 2050.

2.4 Nevada Takeaways

- The macro scale economic trends noted above are setting the framework for Nevada's participation in commerce on a global, national, regional, and local scale. This structure is geared toward increasing trade among nations and regions and thus requires strong multimodal links at key urban hubs for full state participation. The breadth and quality of Nevada's multimodal and intermodal freight transportation network is and will continue to be a major determinant in the state's ability to receive and trade goods with others.

- Nevada's current truck, rail and air links demonstrate both strengths and weaknesses. It strengths include strong east – west highway connectivity, particularly to California as its dominant trading partner and gateway to overseas trade. Weaknesses include a lack of strong north-south connections, and weak connectivity to intermodal rail services. Nevada gets little relief from its railroad services as intermodal and general freight trains mostly pass-through the state. The state needs stronger intermodal rail connections to relieve highway congestion, especially for trade with California. It needs to develop an outbound traffic base and requisite intermodal terminal facilities to create point-to-point shuttle services from rail yards at or near California port facilities. This would ensure economic scale match ups within a logistics, supply chain that includes huge ocean carriers, and large intermodal rail transfers emanating from California ports. Nevada's airports have the capacity to expand air freight services to international markets if their direct air passenger services to those markets continue to grow. However, congestion, particularly outside of Nevada borders, is limiting the efficiency of the highway system. Importantly, Nevada lacks direct north-south highway and rail systems to efficiently move goods to its US, Mexican, and Canadian neighbors.

- Nevada is below the national average in its manufacturing output and participation in overseas and NAFTA trade. A major part of the remedy may rest with the success of the state's current efforts to diversify its economy to create more output through manufacturing and distribution services and simultaneously improve its multimodal and intermodal links. If Nevada is to have an attractive balanced transportation system, it needs to produce more goods for export to other states and other nations.

- Future success enjoyed by Nevada will have much to do with its relationship to the large California economy. Northern Nevada (Reno-Sparks-Carson City) is becoming a valuable and diversified submarket of the Bay Area regional economy and serving as a growing base for both manufacturing and distribution to this regional market. However, the Southern Nevada economy is more of an outpost than an integrated part of the Southern California economy. Nevertheless, Las Vegas has a large population and growing base that requires freight carrier and distribution services to supply daily tourism and convention needs. With an increased output of goods, the freight system will become more balanced to Nevada's advantage.

3 A Changing Logistics Order

3.1 Nearshoring and Reshoring

The return of production to the US or to those countries near our borders is growing. The concept of moving operations back to its country of origin (i.e., USA) is referred to as "reshoring," while relocating manufacturing to a nearby country (i.e. Mexico, Canada) is known as "nearshoring." A 2013 survey by the Boston Consulting Group found that 54% of executives at US companies with sales in excess of $1 billion are planning to return production to the US. That figure is a sharp increase from the 37% who said they were considering reshoring just one year prior (Purolator International, 2015). This movement is primarily away from Asian production towards returning at least some of their manufacturing to North America, recognizes that Asia is no longer the low-cost option it once was and that keeping manufacturing closer to home makes good logistical and financial sense. The authors of the recent MIT survey in this area stated that 'We are in the middle of a transformation from a global manufacturing strategy, where the focus is on low cost countries, to [one] where China is for China, US (or Mexico and Latin America) is for the Americas and Eastern Europe is for European markets (Goodwill, 2015).

3.2 Carrier Industry Consolidation and Collaboration

A major ongoing trend affecting carriers across the modes and freight forwarders or third-party logistics providers (3PL) is the pursuit of growth and market dominance. This trend manifests itself in the form of alliances among former competitors (e.g. ocean carriers) and mergers and acquisitions (M&A) among motor carriers and freight forwarders. These actions are evidence of logistics industry wariness, based on historic experience, that individual asset acquisition and in the singular pursuit of market share growth often can result in oversupply of capacity and lower rates. Therefore, the hope is that shared use of common assets, such as oceangoing vessels in trucking equipment by motor carriers, will increase productivity and efficiency. For motor carriers, M&A is a means to gain entry into new markets and have access to equipment and drivers that would otherwise be in short supply. Non-asset service providers such as freight forwarders look for synergistic service match ups, for example between companies that are efficient at filling empty backhauls with firms that have a large customer base. Seaports including Los Angeles and Long Beach and Seattle and Tacoma sought and received Federal Maritime Commission permission to work cooperatively to increase port operational productivity at their contiguous terminals.

3.3 Regulatory Change[13]

Transportation systems and modes are among the nation's most heavily regulated industries. This, in large measure, is due to the important role they play in the economy and their major impact on safety and the environment. There is an ongoing debate regarding the cost-effectiveness of regulations in achieving their intended goals. During the 1980s, there was a

[13] Major freight transportation regulatory issues are also covered in the modal discussions that follow.

[2] See *American Trucking Associations Inc. v. City of Los Angeles,* (U.S., No. 11-798, 6/13/13) in which the U.S. Supreme Court ruled that provisions of the Los Angeles Port's Clean Truck Program that are backed by criminal penalties are preempted by federal law.

major shift in national transportation policy away from expensive economic regulation of aviation, railroading, and motor carriage. This shift has had profound effects on the structure and economic health of these industries. Most economists agree that this major relaxation of economic regulation has produced positive consumer benefits, and in the case of the railroads, reduced regulation was an important factor in their return to general economic health. Safety is always a paramount goal of carriers and the public sector responsible for much the nation's transportation infrastructure and the regulation of vehicular use.

Likewise, rules mandating improvements in vehicle miles per gallon and reductions in emissions are generally credited with positive energy use and environmental results. Nevertheless, controversy continues over the cost of the technological improvements required to advance environmental and safety goals and their economic impacts on the modes and the economy in general. In fact, these controversies constitute major part of the political dialogue between the railroads (e.g. Positive Train Control implementation, competitive trackage access) and the motor carrier industry (e.g. driver hours of service, permissible truck sizes and weight) with federal agencies and Congress. On occasion, conflicts develop among governmental agencies over whether or not state and local regulations targeted to local conditions are constitutionally permissible given Commerce Clause restrictions prohibiting restraints on interstate trade.[14]

3.4 Nevada Takeaways

- The partial reshoring of manufacturing may create opportunities to increase Nevada's industrial base as a cost-efficient business locale based on the availability of lower-cost land, labor, and efficient permitting processes, especially as a service base to the Northern California market. For Nevada to maximize opportunities associated with nearshoring shifts to Mexico or Canada may require the development of a north-south intercontinental route through a proposed I-11 or CANAMEX highway and rail corridor extending from Mexico through Canada.

- Freight carriers and forwarders are increasingly consolidating their operations to apply assets more efficiently and increase their bottom line and their transparency in relation to shippers. The public sector, as represented by the ports, are looking to establish more cooperative rather than competitive relationships, better utilize their asset bases.

- State and local governments can also foster initiatives for closer cooperation in planning and financing through their MPO's and public-private partnerships (P3) as showcased in the Tesla deal. Nevada's leadership in building a Western States Freight Coalition among the Freight Program Leads at respective DOT's is a positive step in this direction. Nevertheless, states have to be alert to the negative possibilities of mergers among large freight companies that may harm its small shippers have increased the prospects that the state may lose essential services.

- Like all other states, Nevada is challenged to use its regulatory authority prudently as well as effectively where matters of safety, security, and the environment are involved. Greater economic freedom tends to support the growth of free enterprise. Nevertheless, the state

must use its public interest powers to ensure that mergers and acquisitions that are subject to regulatory review serve the state's best interest.

- Environmental, safety, security, and economic regulations are important to the general welfare of Nevada's citizenry. State policies in these areas are colored with a heavy federal interest and do not stop at state borders, as evidenced by the impacts of California's clean-air rules on the types of trucking and rail equipment used nationwide.

- As a state where the development of both drones and driverless trucks is underway Nevada has an opportunity to work in concert with the federal government to provide effective rules for safe operation.

- Key regulations in these areas are often best advanced when done in concert with neighboring states and localities. Projects such as site selection for truck stops and the regulation of heavy and oversized tractor-trailers are well advanced through interstate compacts and cooperative multistate initiatives.

4 Demographic & Climate Change

4.1 Demographic Change

According to the USDOT, steady population and economic growth is taking place both within and beyond US borders. The U.S. economy is expected to double in size over the next 30 years. By 2045, the nation's population is projected to increase to 389 million people (approximately 21%), compared to 321 million in 2015. Americans will increasingly live in congested urban and suburban areas, with fewer than 10 percent living in rural areas by 2040, compared to 16 percent in 2010 and 23 percent in 1980 (USDOT, 2015).

A 2010 Federal Railroad Administration report estimated that that on average, Americans require the freight system to move 40 tons of freight per person annually; a figure that includes bulk commodities such as coal for power, grains for food, and high-value consumer goods (FRA, 2010). These demographic realities mean: 2.8 billion more tons of freight in the next 25 years for 70 million more people; 4 billion more tons of freight in the next 40 years to sustain an additional 100 million more Americans (FRA, 2010). Worldwide population growth is even more dramatic, as demographers predicted that just nine overseas countries (India, China, Ethiopia, Nigeria, Pakistan, Congo, Indonesia, Bangladesh, and Brazil) will add over 390 million people between 2012 and 2020. By 2020, China and India alone will have a combined population base of over 2.7 billion people (Vickerman, 2013).

Freight flow information gathered by Cambridge Systematics for this freight plan indicates that Nevada's population is expected to grow by about 17.9% or 0.8% annually between 2013 and 2033. The growth rate in population of Nevada's counties with major urban areas is expected to be higher than other counties of Nevada, following the national urbanization trend.[15] Also, the growth in population between 2013 and 2033 in Reno-Sparks-Carson City combined statistical area is about 25.6% or 1.15% without the Tesla Plant, and about 31.3% or 1.37% annually with the Tesla Plant. Per capita disposable income in the U.S. is also expected to grow (USDOT, 2015). Due to population related factors, and development bolstered economic growth, freight demand for consumer goods produced or consumed in Nevada is also likely to significantly increase. Moreover, populations in neighboring states are also expected to grow much faster than in Nevada, particularly in Arizona and Utah (USDOT, 2015). This will create new market opportunities for freight industry in Nevada such as becoming a manufacturing or value-added activity center for consumer goods or a Western hub for distribution of all types of goods.

4.2 Climate Change

Between 2013 and 2015, parts of America experienced their two worst winters in 30 years. Additionally, the Western drought and severe weather slowed goods movement and hindered the US's economic recovery. Rail operators, intermodal drayage and trucking companies, airlines, and marine operators all faced service failures and bottlenecks due to highway washouts and extreme weather conditions. Climatologists are predicting the return of El Niño winds and torrential rains to the West Coast of the US, and severe drought conditions in Australia and Southeast Asia. In addition, predictions for the rise in sea level along the East

[15] For a through discussion for both demographic, economic, and freight flows factor impacting Nevada's freight needs, see the NSFP Forecast Freight Flows Draft Memorandum included in the freight plan attachment material.

Coast are challenging storm preparedness of major cities such as New York. In other words, climate change or simply major weather volatility has entered the consciousness of freight planners and can have significant impacts on supply chain planning going forward.

4.3 Nevada Takeaways

- Part of Nevada's long-term freight planning challenges will be to meet the demands of a growing, local, statewide, and regional population. Moreover, Nevada's economic growth will be increasingly dependent on its regional freight corridor connections and on reaching overseas markets with large and growing populations like China and India. Improved connectivity to national and international multimodal, highway and rail corridors and aviation and port networks, linked to increased local output, is essential to accelerate Nevada's long-term economic growth.[16] For this reason, freight planning in Nevada should place a major focus multimodal corridor development and port connectivity as a concerted element in its long-term economic development strategy.
- Nevada's climate change response requires systems durability and emergency preparedness elements that includes plans that outline transportation alternatives for the supply of critical goods when normal supply chains are disrupted as a result of extreme weather condition.
- Nevada's long-term response should include scenario planning to create a more robust context for state responsiveness to major demographic and freight development changes. This approach would also strengthen the creation and application of requisite infrastructure construction standards that resist failure caused by climate extremes.

[16] Population-based growth and related economic factors seemingly have Nevada growing slower than the US as a whole. Something needs to be done to change that prospect.

5 Game Changing Manufacturing, Transportation, and Information Management Technologies

5.1 New Manufacturing Processes

Several new computer-based manufacturing processes are revolutionizing the manufacturing industry. Through their machine-based efficiencies (e.g. Tesla auto production techniques), these processes are helping to reduce the costs of production and distribution and in doing so, are spurring a return of manufacturing to the US. An especially revolutionary representative of such processes is additive manufacturing or 3-D printing: where a printer reads a digital blueprint and methodically drops building material according to a set of instructions, creating a final product that is built up tiny layer by tiny layer. This direct transfer from blueprint to finished products may revolutionize manufacturing and its supply chain. In effect, it allows individuals, small businesses, and corporate departments to make parts, appliances, tools, and a wide variety of materials right from the workplace or home (Intrieri, 2014). Farewell to traditional tooling, assembly lines, or supply chains. [17]

3-D printing and other computer-based inundations have a way to go before they can revolutionize major manufacturing techniques, but they are on their way. A recent survey of high-tech executives conducted by UPS found 4% reported their companies actively use the technology and 12% are experimenting with 3-D printing (Dupin, 2015a). Of those companies using 3D printers, 75% deploy it in the design process, 55% for samples, 34% for finished products, and 24% for generating spare parts (Dupin, 2015a). Early adopters of the technology include aerospace, automotive, medical and consumer products (Dupin, 2015a). The 3-D printing development firm *Underwriting Laboratories* estimates that the overall growth of $5 billion additive printing industry will be between 30% and 40% over the next few years, reaching $80 billion by 2023 (Dupin, 2015a).

TABLE 1: The Long-Term Impact of 3-D Printing on Supply Chains
This table describes the projected impact on supply chains as a result of 3D printing. It is directly reproduced from Robinson, A. 2014. INFOGRAPHIC: 3D Printing and the Supply Chain to Drastically Alter Manufacturing. Cerasis.

The Current State or Traditional Supply Chain Before Mass 3D Printing Adoption	What 3D Printing and the Supply Chain will Look Like Once Mass Adopted and Applied in the Manufacturing Process
Products are mass produced (e,g. in China)	Customized production
Manufactured goods are 'pushed out' and distributed through warehouse network to customers	'Pulled' by end customer demand; Locally printed and distributed
Long lead time	Short lead time
High transport costs	Low transport costs
Large carbon footprint	Low carbon footprint

[17] Engineers at BMW have leveraged 3D printing to create ergonomic, lighter versions of their assembly tools to increase worker productivity. By improving the design, workers are carrying 2.9 pounds less and have improved handling and balance.

5.2 Autonomous Motor Vehicles

> "Imagine a when a 91,000-pound autonomous truck picks up a load of wheat in North Dakota, travels west across Canada into Alaska and over the newly completed Bering Strait Crossing, and then reaches its destination in Russia. It's hard to envision such a scenario when the current political climate makes even maintaining our existing infrastructure difficult. Yet, futurists highlight the increasing globalization of our economy and the need for trucking to find ever more efficient ways to meet the freight demands of the world's population over the coming decades."
>
> L. Longton, 2015

In describing the major events impacting the trucking industry in 2015, the American Trucking Associations' news journal noted "history was made through the continued expansion in rapid maturity of technology" (Transport Topics, 2015). The summary highlighted the debut of Mercedes-Benz's Daimler autonomous driving Inspiration truck at the Hoover dam in early May 2015. It noted progress made by other companies, including Peterbuilt Motors that also demonstrated autonomous driving capabilities and techniques. These techniques, such as platooning, where one driver controlling multiple trucks running in a convoy, and automatic braking seem closer to reality than to science fiction compared just one year ago (Transport Topics, 2015). In fact, Nevada is a demonstration state for truck platooning, helping to further efforts to reduce fuel consumption (Transport Topics, 2014).

Transport Topics, other technology and trade publications, as well as the popular press are showcasing the fact that phased introduction of driverless vehicles for both passengers and freight is now a question of when, rather than if (Roberts, 2015). Moreover, "autonomous" technology breakthroughs extend to drone aircraft, which can be utilized for freight delivery purposes to oceangoing commercial vessels (Whelan, 2015; Ackerman, 2014).

There is no official definition of what constitutes the autonomous vehicle. However, the National Traffic Safety Administration (NHTSA) has developed a classification system which uses levels one through four to define the levels of automation present in existing or proposed motor vehicles (NHTSA, 2013). These levels reflect the degree that technology will assist vehicle operations. Major tipping points towards autonomous operations will occur at Level 3 where significant self-driving is possible with in cab driver assistance on to Level 4 where full self-driving automation is achieved (NHTSA, 2013).

As the May 2015 Mercedes-Benz Daimler test in Nevada and a subsequent on the road demonstration use in Germany indicates, commercial over the road vehicles, under test conditions, can meet NHTSA's Level 3 criteria where "automation enables the driver to cede full control of all safety-critical functions under certain traffic or environmental conditions and in those conditions to rely heavily on the vehicle to monitor for changes in those conditions requiring transition back to driver control. The driver is expected to be available for occasional control, but with sufficiently comfortable transition time" (NHTSA, 2013).

At Level 3 autonomy, automobiles or trucks are anticipated to provide numerous advantages in terms of safety, convenience, mobility, and environmental protection over vehicle requiring full driver engagement. By freeing up a driver for other en route tasks, these vehicles will also increase the productivity of their users. The enhanced awareness and reaction capabilities of

these vehicles eventually should result in thousands of saved lives and other injuries and inconveniences as a result of avoided vehicle crashes. Intelligently coordinating the movements of driverless vehicles should eliminate or at least mitigate traffic congestion, air pollution, and human frustrations incident to everyday driving (Glacy et al., 2015).

There are several reasons specific to commercial trucking that make the eventual introduction of driverless vehicles a likely outcome. It provides an eventual solution to industry driver shortage concerns. Even as the technology is phased in, it will make the driver more productive. With semi-autonomous operations, drivers can become the equivalent of "captains of their ship," monitoring operations and communicating across the supply chain to ensure seamless connectivity as well as perform additional tasks on route. Importantly, these vehicles would relieve much of the driver fatigue involved in truck operations and likely allow for the extension of driver hours of service to increase the range and efficiency of truck services. Truck platoon operations where one driver is controlling the operations of two or more trucks in convoy would create additional efficiencies (Roberts, 2015).
However, there are major practical limitations to the rapid introduction of such vehicles including high additional capital costs and major changes in truck maintenance and operations that will slow down their introduction. Perhaps, the greatest challenges will come from the necessity to establish new federal, state, and local safety standards, as well as a new commercial law framework to govern the operation of these vehicles in a mixed driver and driverless environment. As of 2015, only Nevada, California, Florida, Michigan, and the District of Columbia have enacted legislation authorizing the testing of driverless vehicles - with Nevada allowing the testing and operation of driverless vehicles on its roads. The federal government, specifically NHTSA, remains in a research mode (Glacy et al., 2015).

Nevada is a leader in the industry and became the first state to grant a license for an autonomous commercial truck to operate on an open public highway (Daimler, 2015). The Nevada Legislature and the Department of Motor Vehicles enacted legislation in 2011 and 2013 regulating the testing and operation of autonomous vehicles in the state: 2011 Legislature Assembly Bill 511, 2013 Legislature Senate Bill 313, Nevada Revised Statutes Chapter 482A – Autonomous Vehicles, and Nevada Administrative Code Chapter 482A – Autonomous Vehicles (DMV, 2016).

> "Nevada is proud to be making transportation history today by hosting the first U.S. public highway drive for a licensed autonomous commercial truck. The application of this innovative technology to one of America's most important industries will have a lasting impact on our state and help shape the New Nevada Economy… The Nevada Department of Motor Vehicles has been closely monitoring the advancements being made in autonomous vehicle development and reviewed DTNA's safety, testing and training plans before granting permission for this demonstration of the Freightliner Inspiration Truck"
>
> Gov. Sandoval (Daimler, 2015)

Taking a leadership role in implementing favorable policies regarding this innovative technology puts Nevada ahead of the curve and gives the state a competitive edge, while helping to facilitate the trajectory of these technologies on a national scale. Daimler's experimentation in Nevada, in essence, is the "beginning of a new era of automation" (Dorrier, 2015). Governor Sandoval has further announced that by the beginning of February 2016, a center for autonomous vehicles will be created within GOED (Velotta, 2016).

To fully achieve driverless operations on a national basis, the physical highway infrastructure would need to be updated to help facilitate safe operations. Such features as electronic beacons in guard rails, that warn vehicles to steer clear to systems that minimize congestion by optimizing routing traffic signals are examples of critical infrastructure improvements that will need to be made in the long term. Governments at all levels are challenged to make up for shortfalls in current highway systems investments - significant costs lie ahead to develop the smart infrastructure ultimately needed for autonomous vehicle operations (Roberts, 2015).[18]

In sum, vehicle automation can be expected to proceed slowly. However, one industry prognosticator, Sandeep Kar, Global Vice President of Automotive and Transportation Research for Frost & Sullivan expects that by 2025, 8000 autonomous trucks will be sold globally and about 3000 of those vehicles will be operating in North America (Roberts, 2015).

5.3 Aviation Drones

Drones or unmanned aerial vehicles (UAVs) have been the subjects of much discussion over the last several years as either instruments of war or as a tool for professional and hobbyist video photography. However, companies like Amazon, Sony, and the Swiss firm Matternet are busy at work with prototype models that would use drones to facilitate e-commerce delivery (Woods, 2015). Like autonomous ground surface vehicles drone manufacturers have demonstrated that the technology is well on its way to practicable development.

Both real and potential air cargo uses include the delivery of medicine and other key supplies to rural areas, providing parts and supplies to oil rigs, moving inventory across large warehouse complexes, and in Amazon's video, delivering soccer shoes for a 10-year-old (Ball, 2015). Matternet, which has recently established development agreements with Swiss Post and Swiss World Cargo, has a bold vision in mind to establish a service network to serve the 1 billion people that have no access to all season roads and to provide air deliveries that would relieve congestion on urban highway networks (Air Cargo World, 2014).

Nevertheless, there are significant challenges to making US drone cargo systems a reality within the near term including reliability, safety, and airspace management concerns (Air Cargo World, 2014). The Federal Aviation Administration, which regulates safety is in the early stages of developing rules for the use of both commercial non-commercial UAVs. The agency is proceeding cautiously in light of rapidly proliferating incidents where unmanned vehicles fly too close to traditional aircrafts. For example, there were 780 such incidents reported in 2015 through the first week of August, as compared to 238 for all of 2014 (FAA, 2015).

In December 2015, the FAA issued rules asserting the primacy of a federal framework, and governing matters such as permissible hours of flight, line-of-sight observation, altitude, operator certification, optional use of visual observers, aircraft registration and marking, and

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[18] An extensive discussion of the technological and operational issues surrounding the future of trucking in terms of autonomous vehicles and other improvements in technology and operations can be found at: http://www.ccjdigital.com/truckings-future-now-equipment-technology-autonomous-trucks-repair-on-demand-and-cybersecurity-challenges/
This includes commentary from Jack Roberts cited herein. These discussions also provide a preliminary discussion of the Smart infrastructure that governments would be expected to provide it support of the large-scale introduction of driverless vehicles.

operational limits (FAA, 2015) The FAA has established a specific set of rules for the use of UAVs for business purposes that include:

- Special airworthiness certificates for research and development
- An airworthiness certificate in a restricted category and for special purposes
- A petition for exemption that allows the performance of commercial operations in low risk controlled environments. (FAA, 2015).

These user rules, and the development of regulatory coordination with states and localities, can be expected to slow the development of commercial cargo uses (e.g. Amazon Prime drones). Moreover, the commercial motivation for the development of these systems is not as great as it is for autonomous surface vehicles. Meanwhile, research and development on UAVs concerning their safe integration into the nation's airspace is taking place at six research centers throughout the nation, including one within the state of Nevada (FAA, 2013).

5.4 High Tech Ultra Large Ships

Perhaps the best example of 'economies of scale' advances in freight transportation technology is the widespread construction and continued addition of post Panamax or Chinamax megaships to the world's fleet inventory. As the chart below indicates, the size of ocean going container ships accessing world ports has expanded more than three times from approximately 5,300 TEUs to over 18,600 TEUs in the last 10 years. When the Panama Canal expansion was planned, it was designed to handle up to 13,000 TEU mega ships (up from its current 5,000 TEU limits). Ships that are now being introduced well beyond this size and design limit to over 21,000 TEUs. These huge vessels will operate primarily in the Asia to Europe trade as well as between East Asia and the US West coast and to the East Coast via the Suez Canal. There is also a cascading effect, as the formerly largest vessels begin to replace smaller ships for other trade). When operating at full or near full capacity, these mega-vessels have dramatically lower per slot operating costs than their smaller predecessors in part because they utilize much less fuel per unit. For example, Maersk's largest "Triple E" ships need only 0.902 tons of bunker fuel to move a 40' container today while its 2007 fleet used 1.791 tons to move the same size container (Dupin, 2015b).

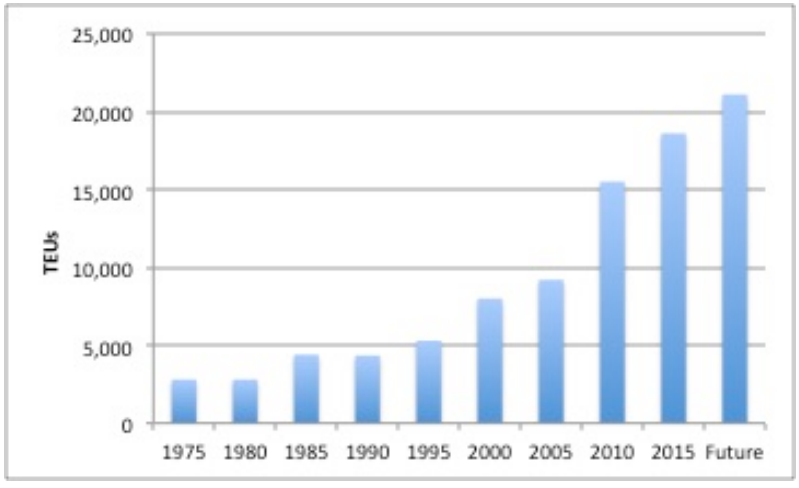

FIGURE 2: Northern and Southern California Mega-Regions
Container ships have grown exponentially in size since 1975, requiring numerous infrastructure adjustments to accommodate the increased load sizes. *(Source: Mongelluzzo, B. 2015).*

These large vessels have major impacts on the depths of channels needed to receive them as well as on landside terminals and supply networks. Ultra-large vessels require larger cranes that

can extend over 22 rows of containers. These new high volume cargo drops and pickups resulting from even a single ship visit stress current terminal operations, even at ports with the large scale facilities such as the San Pedro Bay Ports and the Port of New York and New Jersey. This new massive transfer delivery pattern is out of sync with current, more constant, but lower volume loading and unloading practices.

As a result, port terminal capacity is challenged. Surges from 4,000 to 5,000 containers discharged over the two to three days the ships are in port can choke a terminal's yard, gate operations, and rail transfers, as well as generate long lines of angry truckers at the gates. Industry experts state that a high degree of terminal automation will be required to provide efficient loading and discharge. The cost of cascading technology demands to accommodate mega-vessels are estimated in the $200 to $500 million range and require massive amounts of terminal space (Mongelluzzo, 2015). Currently, only the large West Coast ports, the Virginia ports, and the Port of New York and New Jersey have the channel depths needed for mega-ship access, although several East Coast Ports may complete access projects within the next decade. One major consequence of the increased accessibility of these ships to the East Coast via the Suez or within the new expanded Panama Canal limits is that more trade from Asia, particularly Southeast Asia will move from the West Coast to East coast gateways which are closer to large inland consumer markets in the East and Mid-West.

5.5 New Efficient and Green Truck and Train Technology

Both the trucking and the railroad industry have introduced new equipment that make their operations more energy efficient and environmentally sustainable. Trucking technologies under development aim to increase large truck gas mileage per gallon from six (and less) to nearly 10 miles per gallon with environmentally cleaner engines (DOE, 2014). UPS recently added 125 new hybrid delivery trucks to its package fleet. These trucks are 10% to 15% more fuel efficient than previous hybrid designs and offer four times the fuel economy of gasoline-powered vehicles (Kulisch, 2015). Suppliers to the trucking industry are also advancing new driverless vehicle technologies, which aim to improve the safety of their operation as well as help mitigate the driver shortages and reduce labor costs associated with trucking on long-haul routes (see Autonomous vehicle discussion above). The railroad industry has also added clean, energy efficient hybrid locomotives to yard and fleets to reduce harmful pollutants.

The West Coast states, strongly led by the state of California, are likely to be among the nations' first adapters for the use of low-to-zero emissions technology to power motor vehicles, yard tractors, and locomotives. Since the passage of AB 32, the California Global Warming Solutions Act of 2006, the state has established critical path plans to reduce greenhouse gas (ghg) emissions to 80% below 1990 levels by 2050 (Brown et.al., 2014). Moreover, in July 2015, Governor Brown called upon state leaders to develop a plan to transition to zero emission technologies in the entire freight industry by July of 2016 (Phillips, 2015). To achieve the vision of cutting ghg emissions, state plans call for a 50% reduction in petroleum use in vehicles, including heavy-duty commercial trucks by 2030 (CARB, 2016). As a result, zero emissions electric vehicles, including those used to haul containers from the ports are being tested by trucking firms at the Ports of LA and Long Beach with support from the South Coast Air Quality Management District (Lopez, 2016). Ultimately, these vehicles will be serving customers throughout the Pacific Coast and their neighboring states.

A necessary requirement for eventual use of these vehicles for both domestic and import related drayage will be the establishment of strategically-placed charging stations along major passenger and freight Highway corridors. This task is being advanced by an I-5 focused "West Coast Green Highway" partnership that includes the states of Washington, Oregon, and California, among others, to lay the groundwork and advance the widespread use of vehicles that run on electricity and other sustainable fuels (West Coast Green Highway, 2014). Nevada is now home to 128 electric stations and 355 charging outlets that are primarily in the Las Vegas and Reno areas and along I-15 and I-80 (West Coast Green Highway, 2014).

Expanding this concept, the Nevada Electric Highway is an effort jointly initiated by NV Energy and the State of Nevada to electrify Nevada's highways between Las Vegas and Reno along US 95 (NV Energy, 2016). It was first announced in June 2015, with NV Energy and the Governor's Office of Energy soliciting interest from business and government entities to host stations and support this infrastructure development in communities such as Fallon, Hawthorne, Tonopah, Beatty, and Indian Springs (NGOE, 2015). This initiative adds five EV charging stations to the 150 already installed around the state, but they are crucial because of their locations in connecting Northern and Southern Nevada (Hidalgo, 2015). Not only does this contribute to environmental sustainability, but it also furthers diversification of the economy in advancing the energy sector (Hidalgo, 2015).

5.6 Prototypes and Other Concepts

New concepts that may have major impacts on the movement of both passengers and freight are under development in the state of Nevada. They extend beyond autonomous truck and drone testing to include Elon Musk's proposed Hyperloop system that would offer travel speeds that challenge both aviation and current ground transportation technologies, as well as a proposed congestion busting multimodal Land Ferry system being developed with strong NDOT interest at UNLV.

The Hyperloop involves an enclosed surface vacuum to right-of-way that would enable the pods inside it to move that ground speeds up to 745 miles an hour in a way that would minimize energy use and drastically reduce travel time between city pairs within its system. The project developer, Hyperloop Technologies, Inc., proposes to have a commercially viable system in operation by 2020 despite the skepticism of many in the scientific community (Deutchmann, 2015). Hyperloop will begin testing in Nevada in early 2016 at a 50-acre site in North Las Vegas and engineers there are currently working out the finer details of their highly anticipated Propulsion Open Air Test

WHAT IS THE HYPERLOOP?

- Hyperloop is a proposed method of travel that would transport people or freight at 745mph between distant locations.
- It was unveiled by Elon Musk in 2013, who said it could take passengers the 380 miles from LA to San Francisco in 30 minutes - half the time it takes a plane.
- It is essentially a long tube that has had the air removed to create a vacuum.
- The tube is suspended off the ground to protect against weather and earthquakes.
- Passengers would sit in either individual or group pods, which would then be accelerated with magnets.
- Capsules carrying six to eight people would depart every 30 seconds, with tickets costing around $20 each way.
- The cost of building a line from LA to San Francisco has been estimated at $16 billion - although critics say it would be nearer $100 billion.
- California is currently in the process of considering building a high-speed rail system at a cost of about $68 billion (£44 billion).

Source: Zolfagharifard, E. 2015 in the Daily Mail, U.K.

(Deutchmann, 2015). In fact, the first tubes arrived in North Las Vegas in January of 2016 (Thompson, 2016). Though the cost of this test wasn't disclosed, the company said it has raised $37 million from investors and expects to obtain $80 million more in bond financing (Associated Press, 2015).

The Land Ferry is a locomotive powered, multimodal platform that can be assembled at various lengths to simultaneously move a combination of trucks, automobiles and passenger rail cars in a single consist, over intermediate distances along its own right of way, and includes efficient pickup and delivery terminals at each end. Proponents at UNLV and NDOT cite safety, congestion relief, travel improvements and environmental benefits and jobs creation as elements favoring its development and operation (UNLV, 2015). Proponents believe that it would be especially effective at the distances between the inland Nevada points and the California ports.

5.7 Rise of Computer Based, Internet, And Wireless Technologies

A revolution in how goods are assembled, tracked, and delivered to consumers is taking place. Retailers can now flexibly tailor their warehousing and distribution systems to speed their products to customers through new and sophisticated goods inventory and tracking technologies as well as smartphone apps that simplify purchasing and delivery. Entire goods productions and delivery networks are being reconfigured to shorten the delivery time to customers. “Prior to the rise of the Internet, consumers had no option for obtaining products beyond retail stores and catalogs. Supply chain entities were focused on providing the right product at the right place at the right time. Today, supply chain entities need to have any product available at any place at any time. This may seem impossible, yet more supply chain entities have learned to leverage consumer demand against supply chain efficiency” (Robinson, 2015). In doing so, they are changing the language of supply chain management to “clicks and bricks” retailing and the use of omni-channel distribution platforms the can serve warehouses, stores, and e-commerce customers directly.

5.8 New Terminal Management Technologies

Port and Rail terminal operators are in the process of introducing sophisticated new data driven terminal management systems (e.g. NAVIS) to better coordinate and manage ship clearance (ports), yard and gate operations (ports and rail). These systems look to the introduction of increased automation to keep pace with the speed required to handle larger ships and train consists in a timely fashion. Following European and Asian examples, these systems are seen prelude to greater seaport automation and are an ongoing source of labor management contention, as recently evidenced at the West Coast ports. Moreover, the implementation of automated systems has not gone smoothly at the San Pedro Bay and New York and New Jersey ports and elsewhere, but is critical to the long-term managing of the handling and transfer of goods from post-Panamax mega ships at US ports.

5.9 Nevada Takeaways

- Additive manufacturing (including robotics 3-D printing) is illustrative of the types of changes that can truly revolutionize the production and distribution supply chain worldwide. Current networks for subassembly processes, such as those that support automobile

manufacturing, would require much less worker labor and goods transfer. Additionally, with additive manufacturing, ingredients for manufacture would be transmitted for product completion rather than sub-parts themselves.

- Manufacturing by online transmissions of templates as opposed to the transfer of parts through the freight system could reduce motor carrier and rail trips as well as the related congestion and wear and tear on highway and rail infrastructure, and in doing so reduce some of the need for new systems capacity.

- The changes above could constitute a major future advantage for Nevada as a production hub, as manufacturing in Nevada will often enjoy lower land, facility construction and operations costs than in California and elsewhere. As a potentially rich source of rare minerals that often constitute key ingredients for 3-D printing material, Nevada could enjoy an advantage in becoming a major additive manufacturing materials provider.

- Ultra large vessel use and the consolidation of business among a few large ocean carriers is a worldwide trend to achieve economies of scale efficiencies in ocean trade. The changes taking place within the port industry will cascade through the international and domestic supply chains and will have an impact on the modal services and networks serving Nevada and other inland points.

- Inland logistics chains will need to be readjusted to bring new supply and demand patterns into equilibrium as cargo arrives and departs ports in larger and less frequent bunches. The major adjustments and economic costs to the system largely will be felt at the ports and on the first and last miles of access.

- One likely long-term result is an increased use of on intermodal rail to provide economies of scale match ups needed to move cargo beyond terminal gates to less congested interior distribution points. Reno and Las Vegas regional sites could serve as port rail shuttle terminal hubs, provided that these locations build the facilities needed to provide regional distribution and transloading of imports and generate high volumes of export freight.

- Nevada's contiguous location and integral relationship to the California economy will require systems integration to advance the use of zero emissions truck and cars along major connecting corridors. Among other things, this includes participation in plans to establish green highway corridors where electric vehicles and other equipment using alternate fuels will have the charging and fueling stations they need to extend their operations.

- Computer-based and terminal technologies are representative of how advances in computing power and communication are being utilized to add efficiency and transparency to the physical movement of goods. These advances have changed distribution to be more demand driven in time sensitive in meeting consumer needs.

- This technology allows for flexible management of inventory of must be matched with a physical network that will ultimately deliver the goods. Nevada's largely uncongested last mile at its warehouse and distribution centers and its generally lower per acre development costs compared to California locations provide attractive advantage within these networks. On the other hand, sites that are close to the heavily populated centers in Southern and Northern California speed up deliveries through retail and Internet outlets. Yet, development costs are high at these locations and congestion compromises their reliability. This suggests prospects for a more cooperative regional development of improvements in the supply chain.

- Nevada could advance the development of its distribution functions through support for cooperative working relationships with partners within greater Los Angeles and San Francisco. This would include concerted congestion management of key traffic lanes, creation of an intermodal rail shuttle network to avoid congested highways, and efforts to advance a shared set of environmental sustainability goals.

- Logistics-based information technologies require a well-educated workforce to create and manage the product. Nevada's community college and University system should include information based transportation management courses in its curriculum so that the state can supply the workforce to meet these needs rather than seek and attract talent from outside the state.

- The development of autonomous vehicle technology as well as the adoption of alternate fuels and electricity to power such vehicles would have a revolutionary impact in the provision of trucking services everywhere. However, the introduction of Level 3 technology would reduce driver fatigue and likely allow for vehicle operations that extend significantly beyond current Hours of Service limits. This change would be particularly beneficial to supply chains in Nevada and in other Western states where longer distance separate urban markets from each other. In other words, new supply chains would be possible beyond current limits, for example, between Nevada, the Pacific Northwest, and major Western urban areas such as Denver.
- The efficiency and safety of Level 3 commercial vehicles would improve their operations, even in congested urban areas. There is a concomitant state and federal commitment needed to develop the 'smart Infrastructure' to support full development.
- Nevada seemingly has common ground with other Western states in both planning and adopting regulatory and systems changes that facilitate the introduction of autonomous commercial vehicles and drones and in ensuring concerted regional and national financial support for their utilization. A planning agenda that applies common resources to address legal and public safety requirements that must be met prior to their public use may provide a common work element for the Western States Freight Coalition.
- Nevada has made it a matter of state policy to favor development and testing leading edge technology such autonomous motor vehicles, commercial drones and the Hyperloop. This cooperation between the public and private sector places the state in a position to become

an early beneficiary of these systems in support of its economic development. For example, drone deliveries could be especially useful in both the emergency and mundane freight needs of rural areas. It may be possible to create even greater synergy between these efforts through a Governor's Cabinet Coordinating Group advancing a concerted effort to link supportive initiatives: transportation, economic development and education.

- University research and development of new transportation alternatives such as the Land Ferry may lead to applied results that will attract a skilled technical workforce to Nevada; one that is attuned to its future transportation needs and also provides new in- state resources to support public and private sector project development.

6 Changes in Energy Supply and Demand

6.1 Cost, Availability, and Consumption of Fuel

During the first decade of the new millennium, the price of oil and natural gas fluctuated sharply and the high cost of fuel has had a negative effect on the bottom line of all modes. Fuel prices have stabilized over the last few years and long-term forecasts suggest that comparatively low energy costs will become the norm. This developing trend, in large part, is due to large US petroleum and natural gas reserves made available through the application of fracking technology. As a result, the US is making a transition from being a large importer of energy to becoming a major exporter, even as the internal and international demand for coal is falling.

Both the cost and availability of fuel is very important in the transport sector. Heavy-duty trucks use one fifth of the fuel consumed in the US, and fuel is a major operating cost factor for both trucks (37%) and railroads (25%) (Goodwill, 2013; AAR, 2008; AAR, 2009). For the railroads, coal has historically been the single most profitable bulk commodity, but for environmental and cost reasons, it is being supplanted by natural gas in the creation of electricity. The fact that coal volumes are likely in permanent decline is troublesome for the railroads, although over the last few years the transport of oil and natural gas from Western and Midwestern tracking wells has blunted the impact. The production of these products are now in decline, indicating the volatility of energy products for transport.

Governmental policies aimed at reducing fuel use and mitigating environmentally harmful elements of fossil fuels by technological and operational refinements will continue. Nevada is a national leader in terms of the amount of energy it derives from zero emission solar and wind power. Nevertheless, the world's freight transportation requirements are expected to consume 70% more energy in 2040 than they did in 2010; as demand for freight transportation rises in developing countries, the level of fuel consumption also increases (Goodwill, 2013).

6.2 Nevada Takeaways

- The cost and availability of fuel is a major concern to both the freight community and the general public in Nevada and elsewhere. High fuel costs have a greater impact on trucking operations and rail because it is a higher component their total cost. When fuel prices are low (like they are now) the operating costs for carrier's decline and the spending power of the general public increases. Lower energy costs lead to higher personal consumption rates, more goods being transported, and carrier operations become more profitable.

- Since Nevada is a truck-reliant state, a combination of plentiful supply and lower fossil fuel costs are positive developments. Over the long term, clean air and climate change concerns will require a greater commitment to alternative energy sources and the development of a service network the make their use possible for motorists as commercial carriers.

7 Physical and Investment Constraints

7.1 Systems Capacity Constraints and Underinvestment

System capacity constraints have been well documented on a national and regional basis indicating that critical elements of freight infrastructure are getting worse. In its 2013 report card for America's infrastructure, the American Society of Civil Engineers graded America's overall physical assets were a D+, with roads and aviation facilities receiving a D (ASCE, 2013). Reports by the US Department of Transportation, also indicate a worsening pattern of congestion along vital highway links particularly between the country's largest Metropolitan areas with projections based on population and related economic activity growth that suggest in even more constrained future. Moreover, deficiencies in America's surface transportation systems currently cost households and businesses nearly $130 billion, including approximately $97 billion in vehicle operating costs, $32 billion in travel time delays, $1.2 billion in safety costs, and $590 million in environmental costs (ASCE, 2013). If present trends continue, by 2020 the annual costs imposed on the US economy by deteriorating infrastructure will increase by 82% to $210 billion, and by 2040 the costs will have increased by 351% to $520 billion (ASCE, 2013). Thus, cumulative costs could amount to $912 billion by 2020 and $2.9 trillion by 2040 (ASCE, 2013).

7.2 Nevada Takeaways

- The deteriorating condition of our nation's infrastructure is well known and even acknowledged by political leadership. Major business groups ranging from the Chamber of Commerce to the American Trucking Associations have urged increases in the national gas tax to reduce our slide into lower service levels. The gridlock to action here rests in part in political differences in size and role of the federal government in areas where it shares infrastructure responsibility with other units of government.

- By either default or a matter of general principle, states are being encouraged to take a larger role in transportation funding within their borders. Many states have increased their share of the gas tax and others, such as Virginia, have applied regional sales taxes to bolster transportation spending. Public-private partnerships and user fees targeted to specific beneficiaries are also enjoying increased popularity. In Nevada, issues involving finding the funds to grow and sustain its key highway systems and to promote greater use of non-highway modes are doubtlessly matters for urgent public debate.

- One means of attracting funds have been the grassroots formation of coalitions at the regional level, such as the Eastern states' I-95 Corridor Coalition in which many states work closely together to improve operations and priority funding along their shared corridor. This approach, along with incentive funding programs like national TIGER Grants, help to direct limited funds to clearly shared state and regional priorities. Since Nevada's economy and is transportation system is closely integrated with the system and economy directly beyond its borders, greater interstate and regional cooperation is an apparent next step.

8 Modal Specific Critical Drivers/Issues Context

The purpose of this section is to give greater focus to the critical issues or drivers affecting the modal and intermodal operators that are major players in Nevada's freight supply chain. This information aims to provide a deeper context for the development of current and future Nevada freight plans.

8.1 Marine Industry/Ports

8.1.1 Change and Uncertainty Prevails

These are uncertain times for marine supply chain stakeholders. The economic conditions that determine national economic growth levels of international commerce are highly volatile. Major technological changes are taking place within the industry and with manufacturing processes shifting the centers of production and consumption among nations. Nevertheless, the volumes of goods produced and traded between the United States and the rest of the world is certain to grow. At this time, it is not clear which markets will lead growth and/or whether or not there will be major shifts in cargo volumes among the major US gateway ports.

8.1.2 Increased Competition for West Coast Ports

Two recent studies raise questions as to whether the West Coast ports, particularly the ports of Los Angeles and Long Beach, will continue their dominance as the leading gateway for Asian import cargo. An *American Shipper* survey of 403 shippers and 191 3PLs conducted in early 2015 (when acrimonious labor negotiations were taking place and not yet concluded) revealed that there is serious concern that congestion wrought by labor and operational difficulties that began in 2014 will be an ongoing problem (Johnson & Kasper, 2015). As a result, both large and medium/small shipper respondents indicate that they actively planning to migrate on average 20% of their volume from West to East (Johnson & Kasper, 2015).

Moreover, a recently released report by the Boston Consulting Group and C. H. Robinson concluded that up to 10% of the container traffic to the US from East Asia could shift from the West Coast ports to the East Coast ports by 2020 (BCG & Robinson, 2015). This shift is anticipated as a result of the expanded Panama Canal and current growth trends favoring East Coast ports. The report noted that in 2014 about 35% of container traffic from East Asia in the United States arrived at East Coast ports, but based on import shifts that share would rise to about 40% by 2020 without the canals expansion (BCG & Robinson, 2015). However, with canal expansion in place, the East Coast share could rise to 50% and a 10% net increase in market share (BCG & Robinson, 2015). With the size of ships able to get through the Panama Canal increasing by 2 or 3 times, the East Coast will gain cost advantages based on lower all-water costs, which bring cargo closer to their large local and hinterland markets (BCG & Robinson, 2015).

However, the West Coast ports will retain their transit time advantage in delivering northern Asia and Chinese exports to the battleground Midwest/Mississippi Valley markets, which produce 15% of the nation's GDP (BCG & Robinson, 2015). The long-standing trade-off between velocity and cost may tilt in favor of East Coast destinations if operating conditions and

reliability prove superior to West Coast services. Nevertheless, these potential losses to the market share of the West Coast ports are likely marginal. West Coast ports have the infrastructure in place to handle ultra large ships and the Western railroads have the capability to align their intermodal rates to retain market share. Additionally, the export of goods required by a growing East Asian middle class may sustain West Coast port growth. Finally, an ongoing challenge to all US ports may come from improved port systems in both Canadian (i.e. Prince Rupert) and Mexican ports improving their intermodal connections into the US Southwest and Midwest.

8.1.3 Nevada Takeaways

- Any long-term plan for economic growth must consider Nevada's access to overseas and intercontinental markets as a priority, simply because the majority of future customers and trading partners will reside there. Therefore, issues of access to major gateway ports (particularly those in California) raise important matters in long-term freight planning. Related sub-issues will involve improving intermodal rail access to ports and the potential creation of north-south infrastructure to provide a corridor for Western State and NAFTA trade as well as a means to create freight hubs at Reno and Las Vegas, which are now merely stopping points for greater east to west trade flows.

- Potential shifts in freight flows may increase the level of commercial activity between Nevada and eastward regions, particularly the growing South East. Therefore, Nevada's freight and industrial development planning must be sensitive to potential shifts and the changes they may bring to Nevada's logistics role in the broader network (e.g. as a backdoor supplier to the California market).

8.2 Air Cargo

8.2.1 Technology Trends in Air Cargo

There are several technology trends in the air cargo industry, including but not limited to:

- New wide body aircraft types (B787, A350) that can serve "thinner" long-haul international passenger routes but have substantial belly cargo capacity. These planes can serve medium sized markets rather than just the very large hubs and allow them to ship directly rather than through the large hub.
- GPS, RFID technology ensuring higher visibility/transparency of shipments: location/time tracking, temperature control, vibration recordings etc. This trend also increases reliability and is a value-add.
- High-tech air freight containers with built-in temperature controls etc. which expands the market for air freight.
- New Security/Screening technologies, as mentioned in the above section.
- Electronic air waybills: paperless initiative to increase air cargo processing efficiency
- Future trend: drone delivery systems and other automated cargo handling technologies could vastly expand the air cargo market.

8.2.2 Global Industry Trends

The globalization of trade has led to more goods flowing between world regions and over long distances. Air carries 0.5% of global trade in terms of weight, but 35% in terms of value, as determined by the types of commodities suited for air cargo and time/cost factors (Air Transport Action Group).

Modal shifts in intercontinental air cargo are increasingly impacted by competition from ocean container shipping while domestic and regional air cargo is impacted by a modal shift to trucking. Both ocean container shipping and trucking are lower cost alternatives and albeit slower, their production schedules can be controlled to ensure reliability on certain set delivery dates. The high cost of jet fuel has also made these modes more attractive than air.
Near shoring, or a shift in the location of production and manufacturing, also leads to a modal shift and facilitates reliable delivery often at a lower cost. For example, mode choices are different if production occurs in Asia than if it occurs in Mexico.
Belly capacity from wide body, long-haul passenger aircraft is offsetting the demand for all-cargo freighter capacity. These aircraft, such as the B787 and A350, have been configured to maximize belly space, allowing medium sized markets to ship directly rather than through very large hubs, and more people travelling by air has led to an induced increase in capacity for airlines to carry freight. Thus, there is a trend toward medium sized hubs putting larger emphasis on more efficient cargo operations to capture the increased opportunities in air freight.
Since 9/11, security and screening requirements have increased significantly. Thus, to be part of the air cargo industry, airports need to have the new technology, equipment, and certified personnel required for tight security and screening, which involves an expensive fixed-cost investment. In an effort to control investments in these security-related resources, freight forwarders are motivated to consolidate and ship freight at large hub airports, thereby limiting air cargo activity at the medium-sized hubs.

8.2.3 National Air Cargo Perspective

The US air cargo industry is mature and growing slowly, at approximately 3.0% per year (Boeing). FedEx and UPS dominate the US domestic market, with market shares of 47% and 27%, respectively. The mature and slow growth market is attributed to consolidation over the past 15 years, which has led to fewer providers of air cargo services, as well as more sophisticated and dependable trucking services, which has allowed for expedited freight to migrate away from expensive air transportation.

The US international market is served by major carriers with both passenger belly and freighter capacity. Growth in international air cargo to/from the US exceeds US domestic air cargo growth, at 5.1% year-over-year (yoy) and 3.1% yoy respectively, with Asia being the primary market driving volume and growth rates followed by Europe (U.S. Census, Foreign Trade Statistics and A4A).

Moreover, as aircraft technology advances and more wide body aircraft, such as B787 and A350 fly direct to more US airports, the trend may see more cargo diversifying to non-traditional US gateways. With these new aircraft, large hub functions are less important. Additionally, routing structures have changed, with more international flights from non-traditional hubs. For example, the British Airways B787 flight added from Austin, Texas to London, Heathrow provides nonstop inter-continental service to a mid-size US passenger market. This flight is only

viable due to having the right-sized aircraft and its ability to carry large amounts of air cargo, for example the high-tech goods produced in Texas. Another competitive factor within the US air cargo industry structure is consolidation, which occurs at airports with high capacity and numerous flight frequencies allowing air carriers to get better pricing and risk aversion with delayed or cancelled flights. Moreover, road feeder services enable shipper's access to global air cargo networks by providing dependable, efficient trucking services. High congestion in and around global gateway airports is affecting reliability and driving producers to seek alternate locations as departure points. This may become important for Las Vegas and Reno located in close proximity to the highly congested hubs of San Francisco and Los Angeles.

8.2.4 Western US Air Cargo Perspective

LAX, San Francisco International Airport (SFO), Seattle-Tacoma International Airport (SEA), and Phoenix Sky Harbor International Airport (PHX) handle 49% of the total air cargo weight in the Western US, while Oakland International Airport (OAK) and Ontario, CA (ONT) are major integrator hubs for FedEx and UPS respectively, representing 18% of the total (USDOT). Airports on the West Coast are particularly strong with air cargo related to trade between the US and Asia, as well as serving the Western US, where distances between major markets are often greater than in the Eastern US. The infrastructure and scale of operations at LAX encourages the utilization of LAX for import/export shipments facilitated by extensive trucking networks.

Additionally, as belly freight increases, freighter demand may decline because there will be less over flow. Yet, as global air trade still outstrips belly capacity and certain items are restricted, there will remain a certain level of demand for freighter operations. For example, commodities that are too large or contain hazardous materials cannot go in the belly of passenger aircraft.

With respect to Nevada, FedEx and UPS together account for 74% of the total air cargo in the state, (USDOT; US Census Bureau, Foreign Trade Statistics). Nevada's international air exports are largely handled by LAX, at 28% of the state total (USDOT; US Census Bureau, Foreign Trade Statistics). According to 2013 statistics, McCarran International Airport (LAS) ranked 38th in North American air-cargo tonnage, likely a result of the fact that it is a service-oriented economy which does not drive the density of air cargo as manufacturing economies do (ACI-NA). Outside of integrated carriers, Reno-Tahoe International Airport (RNO) is dominated by narrow body air services that have limited carrying capabilities and ranks 60th amongst North American airports (ACI-NA, 2013).

8.2.5 Nevada Takeaways

- Nevada's economy does not produce a lot of commodities that use air cargo. The state is more of an import economy, and is within trucking distance of the LAX and SFO facilities. Low back haul truck rates could support increased air exports for Nevada air cargo commodities through these facilities. In order to do so, the attitude of the airports toward air freight is also important.
- Both Las Vegas and Reno airports place a high priority in attracting increased passenger service from international markets. A joint marketing effort to simultaneously attract belly freight to these routes may accelerate the attractiveness of expanding overall international services at these airports.

8.3 Motor Carriers

8.3.1 Trucking's Essential Role

The motor carrier industry is the most essential mode in US freight transportation. In 2014, the trucking industry hauled 9.96 billion tons of freight, or 68.8% of total U.S. freight tonnage garnering $700.4 billion in revenue, which represents 80.3% of the nation's freight bill (ATA, 2015). The flexible nature of trucking services makes motor carriage ideal for both long and short hauls, as well as a key intermodal partner with seaports and rails for moving freight from their terminals to the final consignee. Motor carrier profitability is closely tied to the success of the general economy and is seen by economists as a leading indicator of economic conditions. There is a certain fragility to the industry based on the fact that a large number of small operators heavily populate the industry; 97.3% of the nearly 500,000 for-hire carriers and over 700,000 private carriers in the United States have fewer than 20 trucks and 90.6 % are operating six trucks or less (ATA, 2015).

The two major drivers of trucking costs are the price of fuel and labor. Currently trucking is enjoying the recent reduction in fuel costs. These costs, which are historically volatile, are expected to stay on the low side for some time to come. As the infrastructure analysis in other sections of this freight plan indicates, truckers enjoy generally good operating conditions on the state's major highways. Bottlenecks are limited to a few urban locations in Nevada. However, trucking services to key markets in major California metropolitan areas are constrained by heavy congestion at those locations.

However, from an industry-wide perspective, trucking is not without its problems. The industry faces a chronic and growing driver shortage problem as its seeks to maintain a labor force that currently includes 3.4 million truck drivers and 7.1 million total industry employees, or one out of every 16 people working in the United States (ATA, 2015). Moreover, the average age of a truck driver is currently 49, while the labor force as a whole has an average age of 42 (Morris, 2015). An essential driver availability question is: whether or not the driver shortage is driven by demographics (i.e. a smaller generation following the large number of baby boomer retirees) or a market shortage created by comparatively low pay in unsatisfactory working conditions (e.g. as evidenced by the high turnover among truck load operators, which is often over 90% per annum) (Cassidy, 2015).

Factors contributing to the capacity shortage are many. They include regulatory changes such as: the Federal Motor Carrier Safety Administration's (FMCSA) Compliance, Safety, Accountability Program (CSA), which strengthens the reporting standards and tools available for safety rule enforcement; hours of service (HOS) rule changes which reduce driver service times to include greater overnight rest; a mandate for electronic driver log devices; and new health requirements for drivers, new drug and alcohol testing databases and new requirements or driver training and minimum insurance requirements (Larkin in Beach, 2015).

On the other side of the scale, there are policy and technological factors that may mitigate the capacity crunch. These include: immigration reform; allowing longer combination vehicles; expanding US operations for Mexican trucks; and driverless truck innovations. Moreover, efficient packaging that can allow as much as 30% more freight units per trailer, network optimization technologies, and increasing allowable gross vehicle weights are also available to bolster service capacity (Beach, 2015).

In total, the driver shortage and related capacity pressures is not entirely negative for the trucking industry. Many shippers are working more closely with the truckers to ensure more efficient pick up and deliveries within their facilities. As a supply of trucking exceeds shipper demand, as is the case in our resurgent economy, truckers are able to consistently command higher rates for their services. But to do so requires truckers to deal with labor shortages as well as pressures from increased environmental and safety regulations and generally rising costs. These factors will drive many small carriers out of business and encourage large carriers to consolidate and merge

8.3.2 Nevada Takeaways

- At the moment, the effectiveness of trucking as an essential contributor to Nevada's economic growth is less a matter of the current level of service Nevada's highways and more an issue of the quality and abundance of motor carrier services available to Nevada businesses and their partners in other markets. Issues involving driver shortage and the imbalance in the flows of good moving in and out of the state and the ability to address congestion issues on a regional basis take on a high degree of importance alongside the state's ability to maintain and improve its Highway infrastructure.
- To maintain strong and efficient supply lines and to attract manufacturing and distribution firms to the state, Nevada will need to be proactive in minimizing last mile congestion at terminal and distribution center entry points. Nevada would benefit from greater cooperation with adjoining states on matters of safety, and network capacity, but also in building coalitions with shippers and carriers to define long-term needs and address patent inadequacies, such as a north-south interstate corridor to encourage regional and NAFTA trade as well as connections between Reno and Las Vegas.

- Nevada and the surrounding states will require an abundant and well-trained transportation workforce, including truck drivers, warehouse employees, and terminal staff. The state will also need to attract workers that can create and operate the information systems crucial to efficient supply chain operations. This suggests need for a greater state role in transportation-focused jobs training at the secondary and college levels.

- Nevada is a leading state in testing efforts for driverless vehicles and drones. This presents the opportunity to fashion rules and regulations that not only ensure public safety, but also create a structure that facilitates their development.

8.4 Railroads[19]

8.4.1 Policy and Service Level Challenges

Like the motor carrier industry, there is an inextricable link between the railroad sector and the broader economy. Railroads account for approximately 40% of US ton-mile freight volume, which is more than any other mode of transportation, and they and earn approximately 20% of freight revenues (AAR, 2015). Railroads excel at handling bulk and other heavy commodities, including coal, chemicals, agricultural and food products, paper and lumber, petroleum, metallic

[19] Except as otherwise noted, the facts presented in this section come from data assembled by the Association of American Railroads (AAR) and available through links at its website: https://www.aar.org/

ores, non-metallic minerals, and many other similar products. They also play an important role in moving general consumer goods in intermodal containers in partnership with seaports, domestic distribution transfer centers, and trucking firms. Railroads have a competitive as well as a cooperative relationship with trucking in major intermodal traffic lanes. Rail has the upper hand in longer distance moves, at about 1000 miles or longer. With a few exceptions, railroads are not competitive with trucking at distances under 500 miles, which is the point where trucking requires a stop and more than one driver to deliver the goods (AAR, 2015). Given the large mix of raw materials in the railroads commodity portfolio, railroad revenues are subject to volatility based on factors beyond their control, including weather and global price and currency fluctuations.

Three of the most distinguishing features of US/North American railroading are:

1. It is a private sector endeavor and thus is responsible for funding its infrastructure and operations, including the 140,000 miles of tracks and requisite terminals, locomotives and rail cars.
2. It is dominated by a small number of large North American railroads i.e., BNSF Railway, CSX Transportation, Kansas City Southern Railway, Norfolk Southern, and Union Pacific (UP).
3. It is subject to greatly diminished, but substantial economic regulation, as well as numerous safety and environmental rules. The railroads are careful to argue that the costs they must bear are fairly proportionate to the benefits that their proponents aim to achieve.

These factors give shape to the critical issues facing the railroads. The US Class I carriers generate nearly a half billion dollars in annual operating revenue, yet their need for constant cash flow is considerable given the large sums that are needed to be set aside for capital investment each year. The railroads were granted greater economic freedom to set rates on routes with competitive alternatives under the Staggers act of 1980. As a result, they have become increasingly able to find the funds to maintain and modernize their system, spending $575 billion on their networks between 1980 and 2014 (AAR, 2015). The AAR has indicated that the railroads aim to spend $29 billion in 2015 alone to maintain and grow the national railroad network (AAR, 2015).

In light of their constant need to make large infrastructure investments in their systems, the railroads are greatly concerned over policies that limit their ability to control pricing and set their operational improvement priorities. Likewise, rail shippers are concerned about the availability and quality of their services from an industry historically prone to monopolistic practices. Issues concerning rail rates and services and rail restructuring transactions (mergers) are governed by the federal Surface Transportation Board (STB), which has general regulatory powers and can adjudicate on specific issues. Matters concerning rail safety in general policy are the province of the Federal Railroad Administration (FRA). STB disputes often involve shipper complaints about rail equipment availability or issues involving rate captivity where there is little or no competition and trackage rights requests. The railroads have opposed recent legislative proposals to increase the STB's authority to rates and to require railroads to turnover traffic to

competitors. Likewise, they have resisted legislative call for new FRA safety standards and regulations for transporting crude oil by rail based on cost benefits arguments.

Among the industry's ongoing policy concerns is the mandated implementation Positive Train Control (PTC), a technology that will automatically stop or slow a train before certain accidents occur (AAR, 2015). The Federal mandate for railroads to install this train crash-prevention safety system on rail lines that include passenger and toxic inhalation hazardous materials has been a focus of the industry since Congress passed the PTC requirement in 2008 (AAR, 2015). However, the mandate takes on an even greater urgency this year, as railroads face the deadline to complete PTC implementation by December 31st, 2015; a deadline that, despite diligent efforts, the railroads are not ready to meet nationwide (AAR, 2015). The FRA acknowledges that the railroads are not ready to meet this mandate and Congress will likely grant a three-year extension in the upcoming transportation legislation. Finally, the presence of competition between trucking and railroading is evident in the rail industry's opposition to proposals touted as trucking capacity relief measures such as legislation increase the sizes and weights of motor carriers on the Interstate system (AAR, 2015).

In sum, the most critical issues facing railroads and their customers will be whether or not the railroads will be in a position to continue to make the investments in infrastructure needed to meet future demand, and, as needed, to add its current roster of 185, 000 workers (AAR, 2015). At the moment, the railroads appear to be on the right track.

8.4.2 Nevada Takeaways

- At present Nevada's railroad service is a secondary matter to both the state and the railroads that serve it. BNSF has limited trackage rights within the state providing service to a small base of long-standing customers. The Union Pacific Railway (UP) is the state's primary carrier, but its focus is primarily in providing through services between large markets in California and those in the middle of the US. However, for Nevada railroad customers who generate and receive energy bulk commodities, including mining and agricultural products, the scope and quality of railroad service is of primary importance.

- Railroading may be a sleeping giant with respect to Nevada's long-term multimodal-based business development plans. The prospective development of intermodal shuttle services is an important means to increase access for Nevada's shippers to Gateway ports in California and elsewhere. Nevada based intermodal services may prove to be an efficient means to serve future distribution and manufacturing firms, which would concentrate their business at the regional hubs of Reno and Las Vegas. If sufficient volumes warrant, the railroads could be excellent partners in public-private sector development projects.

- Currently the amount of railroad trackage in Nevada is among the lowest among all the states. Future railroad volume expansion either along current east-west routes, or involving the potential creation of services running North and South will require the acquisition of rights-of-way. Historical records indicate the mid-20th century presence of railroad rights-of-way that have since been abandoned, but may be a good path for future use. An inventory of such properties would be useful to future freight planning.

8.5 Intermodal systems

8.5.1 Many Modes but One System

One of the most significant developments in freight transportation over the past half-century has been the rapid development of intermodal freight transportation systems. Intermodalism involves an exchange of freight between two or more transportation modes including air, road, sea, rail, and pipelines. The modes use a common unit of transport, such as a container or a truck trailer, which means that the cargo does not need to be handled, rather only the unit of transfer is involved. Intermodal freight logistics include first mile collection and last mile delivery at transfer terminals and connecting line haul movements in between. Intermodalism enhances the economic performance of supply chains by using each mode in the most productive manner. For example, the use of rail, air, and water modes provide operational economies over long and intermediate distances, while trucking offers efficient and flexible pickups and deliveries. An important element of intermodalism is that the pricing and movement of goods take place under a single bill of lading and that the goods must be tracked through each modal segment and transfer.

Today's level of overseas trade would be impossible without container–based intermodal systems. "Globalization and containerization as closely interrelated. According to UNCTAD, between 1970 and 1990 trade facilitation measures accounted for 45% of the growth in global trade while membership to global trade organization such as GATT/WTO accounted for another 285%. The container accounted for an additional 790%, exceeding all the other trade growth factors put together" (Rodrigue & Slack, 2015).

The international movement of containers only began in the early 1960s, and the ocean and rail freight terminals essential to efficient transfer developed in the 70s and 80s. Refinements such as the standardization of containers into 20-, 40-, and 53-foot boxes, and the use of the TEUs (20-foot equivalent unit) for effective volume comparison soon followed. The US domestic intermodal rail systems did not blossom until the 80s with the advent of double stack rail technology. Intermodal system technological advances also include economies of scale based development of efficient large ships, well rail car technology that allows containers to be double stacked in single rail car wells, electronic data information systems (EDI) to advance billing and tracking, and computer-based terminal management systems.

Without the development of the container-based intermodal systems, railroads would be bereft of one of its high volume and profitable lines of service. According to Intermodal Association of North America Statistics (IANA), US intermodal rail use has grown steadily and totaled 14 million loadings in 2014 (Hatch, 2014). Moreover, industry experts estimate that over the next few years, annual intermodal growth will be in the 5-7% range based on positive GDP growth in international business and 2 to 3 times GDP growth in domestic intermodal transportation (Hatch, 2014).

The US intermodal market has two components that allow for this steady growth. One is the transfer of intermodal containers from East and West Coast ports to national distribution hubs at the center of the country. The other is domestic intermodal service, which uses lighter 53 foot, 48 foot, and 45 foot domestic containers to meet shipper needs (LaGore, 2013). The two lines of business intersect with respect to transloading, which involves the transfer of largely

imported goods into domestic containers for more efficient shipping. Transloading constitutes approximately one third of the cargo moving east from the Southern California ports.

Trucking companies like national TL carriers, JB Hunt, Schneider, Swift, and UPS would struggle to match long-distance line haul capacity with local pickup and delivery requirements without their bimodal rail-truck networks. Rail-truck intermodalism began to flourish when regulation of trucking and rail ended in the early 1980s. One aspect of regulation was to view and treat each mode as a competitor against the other and to discourage intermodal cooperation.

The next frontier for rail intermodal development is to penetrate the less-than-500-mile market. Major discouraging factors for doing so include the high cost of terminal development, historic lack of reliability, and low profitability on a per unit basis. Also, multimodal interchanges increase the prospects for mishandling and delay when compared to single mode systems. Trucks enjoy cost and flexibility advantages, but factors like the current driver shortage, increased environmental and safety regulations and attendant costs are placing limits on trucking productivity.

The factors in favor of intermodal growth in shorter distance markets are intermodal's ability to capture economies of scale at high-volume gateways. Ports fed by 18,000+ TEU ships will need inland rail transfers beyond the immediate points of congestion, yet close enough to urban centers to serve local markets and become regional transload centers for goods destined to the hinterlands. Furthermore, the application of improved management and tracking software and the investment in modern transfer equipment is making rail intermodal services more reliable, predictable, and able to generate the monies to fund expansion of terminals and improve rights-of-way.

Both the federal government and the states are taking a more active interest in promoting intermodal transportation because the system helps take trucks off crowded highways and has a good record with respect to overall environmental and safety performance. Under current budget constraints, one of the important questions is whether or not governments can contribute to advancing intermodal projects which relieve overall systems congestion and help clean the air.

8.5.2 Nevada Takeaways

- The ability to consolidate local truck pickups and deliveries at terminal for transfer to rail is an essential tool for transforming Reno and/or Las Vegas locations into attractive distribution and manufacturing hubs.

- Rail/truck intermodal systems require high-volumes of freight at collection and distribution points along major traffic lanes, particularly when the distances traveled are less than 500 miles. There is major congestion, safety, environmental, and business growth reasons to favor concerted efforts to develop such service for Reno and Las Vegas shippers. However, there is a chicken or egg problem to overcome. On one hand, these Nevada points need to generate much higher volumes of outbound freight to attract railroad investment services and intermodal terminal operations. At the same time, the availability of intermodal services is needed to attract manufacturing and distribution center investments.

- Nevada's major airports at Las Vegas and Reno have the capacity to increase their intermodal air freight business. However, greater connections to major foreign markets and higher volumes of Nevada generated products are essential elements in attracting such business.

- Intermodal business may be developed incrementally with regional freight consolidation services organizing bundles of freight for railroad "hook and haul" services in major intermodal traffic lanes that can later be grown to support expanded point-to-point services.

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Attachment A: Truck Driver Employment

TABLE 2: Truck Driver Employment in Nevada and its Metros, May 2014

Total employment and earnings of truck drivers in the State of Nevada and its metro areas.

State	Occupation Title	Total Employment	Hourly Wage		Annual Wage	
			Mean	Median	Mean	Median
Nevada	Heavy and Tractor-Trailer Truck Drivers	9,710	22.55	22.31	46,900	46,410
	Light Truck or Delivery Services Drivers	7,020	16.50	14.85	34,320	30,890
	Industrial Truck and Tractor Operators	2,610	16.69	16.51	34,720	34,340
	Total State	***19,340***				
By Metropolitan Statistical Area						
Las Vegas-Paradise, NV	Heavy and Tractor-Trailer Truck Drivers	4,460	21.71	21.35	45,150	44,410
	Light Truck or Delivery Services Drivers	4,690	16.57	14.94	34,460	31,060
	Industrial Truck and Tractor Operators	1,300	16.65	16.73	34,630	34,790
	Subtotal	***10,450***				
	% of State	***54%***				
Reno-Sparks, NV	Heavy and Tractor-Trailer Truck Drivers	3,030	22.83	22.27	47,480	46,320
	Light Truck or Delivery Services Drivers	1,740	16.06	14.09	33,400	29,310
	Industrial Truck and Tractor Operators	1,040	16.18	15.91	33,650	33,080
	Subtotal	***5,810***				
	% of State	***30%***				
Carson City, NV	Heavy and Tractor-Trailer Truck Drivers	70	19.07	19.29	39,670	40,120
	Light Truck or Delivery Services Drivers	120	14.10	14.62	29,320	30,410
	Subtotal	***190***				
	% of State	***1%***				
Combined MSA Total	***Subtotal***	**16,450**				
	% of State	**85%**				

Source: Bureau of Labor Statistics, 2014. Data for May 2014 Occupational Employment and Wage Estimates

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