

Final Yuma County Economic and Freight Profile TECHNICAL MEMORANDUM NO. 1

YUMA COUNTY RAIL CORRIDOR STUDY



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Submitted to
**Yuma Metropolitan
Planning Organization**

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Introduction

The goal of the Yuma County Rail Corridor Study is to recommend ways to improve freight rail service and access within the Yuma County region and to identify rail infrastructure requirements that would support freight mobility improvements and economic development within the region. The project also investigates whether regional rail initiatives could provide an efficient means of improving freight mobility for Yuma County. This could involve rail connections to adjacent areas in Mexico or California.

This is the first of four technical memoranda that will be prepared for this study as follows:

- Tech Memo 1: Yuma County Economic and Freight Profile
- Tech Memo 2: Evaluation of Rail Alternatives
- Tech Memo 3: Implementation Plan for Preferred Alternative
- Tech Memo 4: Economic Impact

The purpose of this technical memorandum will be to provide background information that will later be used in considering rail alternatives for Yuma County. It will provide direction on a specific subset of alternatives that warrant additional consideration. Specifically, this technical memorandum considers the types of industries that are located in Yuma County and their likely usage of rail, the current status of rail service in Yuma County, and the nature of Yuma County's trading relationships, particularly with Mexico. This technical memorandum also provides a freight profile of Yuma County's neighboring regions of Imperial County, CA and Sonora, Mexico. Finally, this technical memorandum will presents a consideration of rail's role in the U.S. transportation system, and how this might impact options to improve rail service in Yuma County.



Economic Profile

Yuma County Employment Concentrations by Industry

The economy of Yuma County has been characterized as a “three legged stool” with one leg being agriculture, another being government employment associated with the military, and the other being tourism. A review of employment and agricultural production data for Yuma County generally supports this view.

Agriculture

According to the latest available employment statistics from U.S. Department of Agriculture,¹ the County was the work place for 4,737 farm workers in 2007 (**Table 1**), compared to the 53,600 in total non-farm employees for that year. Yuma County’s Farm: Non-Farm Ratio of 1-in-11.3 workers is high, compared to the Arizona statewide ratio of 1-in-93.1 (28,754 farm employees to 2,676,800 non-farm employees), or the national ratio of 1-in-52.2 workers (2,636,509 farm employees to 137,598,000 total non-farm employment in 2007).

Table 1: Comparison of Agriculture in Yuma County to that in Arizona Statewide

	Pct of Land	Pct of Workforce	Value Per Acre	Total Farm Payroll
Yuma County	6%	8.8%	\$4,558	\$77,446,000
Arizona	36%	1.1%	\$124	\$380,491,000
United States	41%	1.9%	\$323	\$21,877,661,000

Source: U.S. Census Bureau

Despite being home to 3.1 percent of Arizona’s population, Yuma County was responsible for 20.4 percent of the state’s farm payroll in 2007 (**Table 1**). Nationally, \$1 in every \$286 in American agricultural payroll is spent in Yuma County, while only 1 out of every 1,578 people live there.

According to the U.S. Department of Agriculture (USDA) 2007 Census of Agriculture, Yuma County producers sold agricultural products worth nearly \$1 billion in 2007. This value of production makes Yuma not only the top agricultural producing county in Arizona, but 23rd among all counties in the United States. This agricultural production is dominated by winter produce. Vegetables are 70 percent of the value of Yuma County’s agricultural production. Yuma County is ranked third for vegetable production nationwide. Yuma County produces most of the leafy greens that are consumed nationwide during winter months.

Government Services and Tourism

Aside from agriculture, pluralities of jobs in Yuma County are either for federal, state, and local agencies or hospitals and schools. Over 31 percent of nonfarm jobs in Yuma County are in government services. Most of these positions (11,500 of 15,300 in Yuma County) serve state and local governments, while the remainder (3,800) is federal and military roles. Military roles, as of 2011, constitute 2.56 percent of the labor force, suggesting Yuma County would have higher than average concentrations of public sector

¹ U.S. Department of Agriculture (USDA). 2009. *Census of Agriculture: 2007* (Updated 2009). United States: Summary and State Data. Volume 1. Geographic Area Series. Part 51. Washington, D.C. USDA.



employment without the current military presence. The share of positions in the trade, transportation, and utilities field in Yuma County (18.7 percent) nearly mirrors the prevailing statewide rate of 19.6 percent in those industries. Yuma County is also nearly at parity with the statewide share of jobs in the education and health service fields (14.8 percent statewide and 13.6 percent in Yuma County). In leisure and hospitality roles, tourism supports 10.8 percent of Yuma County jobs, as is the case statewide. In **Table 2** below, those industries for which the employment concentration is higher than the statewide are highlighted.

Table 2: Arizona and Yuma County Employment by Industry, 2011

Industry	Arizona		Yuma County	
	Jobs	% of Jobs	Jobs	% of Jobs
Total Nonfarm Payroll Employment	2,405,500	100.0%	49,100	100.0%
Government (Any Level)	410,400	17.1%	15,300	31.2%
Federal Government	56,900	2.4%	3,800	7.7%
State and Local Government	353,500	14.7%	11,500	23.4%
Private Sector	1,995,100	82.9%	33,800	68.8%
Goods-Producing Industries	272,900	11.3%	4,000	8.1%
Service-Providing Industries	2,132,500	88.7%	45,200	92.1%
Private Service Providing	1,722,200	71.6%	29,900	60.9%
-	-	-	-	-
Trade, Transportation and Utilities	472,600	19.6%	9,200	18.7%
Education and health services	354,900	14.8%	6,700	13.6%
Professional and Business Services	343,400	14.3%	5,500	11.2%
Goods-Producing Industries	272,900	11.3%	4,000	8.1%
Leisure and Hospitality	259,100	10.8%	5,300	10.8%
Financial Activities	166,000	6.9%	1,300	2.6%
Manufacturing	149,700	6.2%	1,800	3.7%
Other Services (except Public Administration)	89,600	3.7%	1,400	2.9%
Information	36,600	1.5%	500	1.0%

Source: Arizona Department of Administration, Office of Employment and Population Statistics. 2012. Note that column percentages are not additive.

Performance of Yuma County's Economy

Long-Term Population Growth

Long-term, Yuma County's population and economy have grown considerably. Arizona's population has outpaced that of the United States, and Yuma County is one of the fastest growing counties in Arizona. Between 1970 and 2010, Yuma County's population grew by 322 percent while Arizona's population grew by 261 percent, and the overall U.S. population grew by 51 percent (**Table 3**). This points to impressive long-term job creation, since people tend to move to locations of employment and move away from locations of low employment.

Table 3: Comparison of U.S., Arizona, Arizona County Population Growth

Polity	1970 Population ²	2010 Population ³	Population Growth	Percent Change (Growth ÷ 1970)
United States	204,053,325	308,745,538	104,692,213	51%
State of Arizona	1,770,900	6,392,017	4,621,117	261%
-	-	-	-	-
Mohave County	25,857	200,186	174,329	674%
Yavapai County	36,733	211,033	174,300	475%
Pinal County	67,916	375,770	307,854	453%
Yuma County	60,827	195,751	135,464	322%
Maricopa County	967,522	3,817,117	2,849,595	295%
Santa Cruz County	13,966	47,420	33,454	240%
Pima County	351,657	980,263	628,606	179%
Coconino County	48,326	134,421	86,095	178%
Navajo County	47,715	107,449	59,734	125%
Graham County	16,578	37,220	20,642	125%
Apache County	32,298	71,518	39,220	121%
Cochise County	61,910	131,346	69,436	112%
Gila County	29,255	53,597	24,342	83%
Greenlee County	10,330	8,437	-1,893	-18%
La Paz County	(Created 1983)	20,489	-	-

Shifting Employment Trends in Yuma County (2005-2011)

According to the Arizona Department of Administration’s Office of Employment and Population Statistics (**Table 4**), employment in Yuma County contracted with a net loss of jobs between 2005 and 2011.⁴ Employment in Yuma County, as elsewhere, has so far peaked in 2007. Total non-farm employment in Yuma County declined 3.5 percent, while statewide non-farm employment declined 4.2 percent. Nationally, the decline in non-farm employment was 1.8 percent in the same period. Arizona and Yuma County were hit harder by the recession than other parts of the nation. Bulwarks against job loss in Yuma County have been state and local government which grew 7.5 percent there (compared to 0.7 percent statewide and 0.9 percent nationally) and the federal government, whose employment totals in Yuma County, grew 26.7 percent (compared to 9.8 percent statewide growth and 4.6 percent

² U.S. Census Bureau. *Census of Population: 1970. Vol. I: Characteristics of the Population. Part A: Number of Inhabitants. Section 1: United States, Alabama-Mississippi.* U.S. Government Printing Office, Washington, D.C.

³ U.S. Census Bureau. *State and County QuickFacts.* Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Non-employer Statistics, Economic Census, Survey of Business Owners, Building Permits, Consolidated Federal Funds. Last updated January 17, 2012. Available online at: <http://quickfacts.census.gov/qfd/states/04000.html>.

⁴ Ibid.

national growth). The manufacturing sector, as well as trade, transportation and utilities were impacted the hardest by the recession.

Table 4: Percent Change in Major Yuma County Industries Compared to State and National Trends, 2005-2011

(Instances of job growth or loss mitigation at or above statewide rate are highlighted)

Industrial Category	Yuma County	Arizona	United States
Total Non-farm Payroll Employment	-3.5	-4.2	-1.8
State and Local Government	7.5	0.7	.9
Trade, Transportation and Utilities	-10.7	-3.3	-3.6
Education and Health Services	-8.3	27.8	14.5
Leisure and Hospitality	-1.9	1.9	3.9
Professional and Business Services	-2.4	-6.3	2.2
Federal Government	26.7	9.8	4.6
Manufacturing	-35.7	-17.9	-17.5
Financial Activities	-12.5	-4.8	-5.8
Other Services (except Public Admin)	-18.8	-2.0	-1.0
Information	0.0	-18.1	-13.0

Source: Arizona Department of Administration, Office of Employment and Population Statistics. 2012.

Manufacturing Employment

Table 5 lists the manufacturing industries in Yuma County that employ more than 100 people, as reported by the U.S. Census Bureau County Business Pattern, 2009. The results suggest that Food Manufacturing is the largest manufacturing employer, followed by Yarn Mills, Chemical Manufacturing, and HVAC Manufacturing.

Table 5: Manufacturing Industries in Yuma County that Employ More than 100 Employees in 2009

Industry	Employment
Perishable prepared food manufacturing	500-999
Yarn texturizing, throwing, and twisting mills	250-499
All other basic organic chemical manufacturing	250-499
AC, refrigeration, and forced air heating	250-499
Corrugated and solid fiber box manufacturing	100-249
All other plastics product manufacturing	100-249
Fabricated metal product manufacturing	100-249
Nonmetallic mineral product manufacturing	123
Wood product manufacturing	118

Source: U.S. Census Bureau: County Business Patterns



Yuma County Economic Development Initiatives

The primary organization tasked with leading economic development initiatives within the Yuma region is the Greater Yuma Economic Development Corporation (GYEDC). The GYEDC lists the following target industries:

- Food Processing – Food processing is seen as a logical extension of Yuma’s agricultural industry. Food processing plants can locate within close proximity of agricultural production.
- Military & Defense Testing – With the Marine Corps Air Station Yuma, the Yuma Proving Ground, and the Barry M. Goldwater Range, there is a large military presence in the region. Weapons are tested at the Yuma Proving Ground. This would make the region a natural location for companies that supply the military and whose weapons would need testing.
- Industrial Manufacturing – Proximity to Mexican and California markets is seen as an advantage for the Yuma region in industrial manufacturing. Low unionization and relatively low wages are also seen as an advantage.
- Logistics & Distribution - Proximity to Mexican and California markets is seen as an advantage for the Yuma region in logistics and distribution. Yuma County is also considered to have an advantage because of the high capacity port of entry at San Luis II, the UP Sunset Corridor, and I-8. Yuma is also less than 250 miles from the Ports of Los Angeles/ Long Beach, CA and 498 miles from the Port of Guaymas in Mexico.
- Renewable Energy – Seven companies have committed to build utility scale renewable energy plants within three hours of Yuma. According to the Solar Foundation, Arizona is ranked third in the nation for solar. Arizona Western College Solar Array Testing Site provides research on solar energy, thus providing a connection between solar technology and the region. With its dry weather, Arizona is a logical location for solar power. Manufacturers of solar equipment would be expected to locate near locations of demand for their products, i.e. solar power production.
- Twin Plant/ Maquila Operations – Proximity to Mexican and California markets is seen as an advantage for the Yuma region in twin plant/ maquila operations. San Luis Rio Colorado is the third largest municipality within the State of Sonora.

According to GYEDC’s 2011 Annual Report, 20 of 48 business leads for locating in the Yuma region were in Manufacturing. Twenty percent were in Renewable Energy, while eight percent were in Aerospace, and ten percent were in Distribution. One issue to consider is whether rail could or would support these initiatives.

Food Processing

Presumably, food processing in Yuma County would rely on local sources of agricultural products. If rail were to support food processing, it would mostly be used to ship outbound products. As discussed above, vegetables are about 70 percent of the value of Yuma County’s agricultural production, so one would assume that vegetable processing would be the most promising type of food processing for Yuma County. **Table 6** presents the tonnage shipped in the U.S. by rail of Food or Kindred Products (STCC 20) from the U.S. Surface Transportation Board’s (STB) 2020 Public Carload Waybill Sample. Included are five digit commodity classifications, for which at least one million tons were shipped in 2010. As can be

seen, the food products with the highest tonnage of rail shipments tend to be derived from grains, rather than vegetables. However, there are some exceptions. One and a half million tons of frozen vegetables were shipped by rail nationwide in 2010, as were about a million tons of non-frozen juice, vegetables, and fruit. Rail could play a role for shipping these types of products.

Table 6: Food Products Carried by Rail in the United States in 2010

STCC	Commodity Description	Percent	Tons
20923	Soybean Cake, Flour, Grits, Meal	15%	20,228,371
20461	Corn Syrup	11%	14,964,384
20859	By-Product of Liquor Distilling or Mineral Waters	7%	9,715,236
20421	Animal Feed, excl Dog, Cat	7%	9,518,783
20921	Soybean Oil	5%	6,951,960
20411	Wheat Flour	5%	6,213,384
20621	Granulated Sugar	4%	5,305,652
20933	Nut or Vegetable Oils	4%	5,040,888
20831	Malt	3%	3,614,048
20939	Nut or Vegetable Oil Cake or Meal or other By-Product	2%	3,270,284
20821	Beer	2%	3,244,240
20995	Mixed Loads of Food	2%	2,895,348
20419	Flour	2%	2,755,100
20823	Malt Extract, Spent Grains	2%	2,641,919
20462	Corn Starch	2%	2,462,976
20143	Grease, other Inedible Animal Oil Mill Products	2%	2,279,604
20841	Wine and Brandy	2%	2,059,372
20467	Wet Process Corn	1%	1,576,652
20373	Frozen Vegetables	1%	1,529,804
20441	Cleaned Rice	1%	1,490,620
20144	Animal Refuse, By-Products	1%	1,478,148
20336	Catsup or Other Tomato Sauces	1%	1,305,680
20465	Corn Oil	1%	1,107,752
20334	Juice, Fruit or Vegetable, Not Frozen	1%	1,052,840
20413	Corn Meal or Flour, excl Feed	1%	1,019,860

Source: 2010 STB Public Carload Waybill Sample

It is also useful to consider generally the types of farm products that are carried by rail. **Table 7** displays the tonnage and carloads of farm products carried by rail in the United States in 2010. The results suggest that rail's primary role in regards to agricultural products relates to shipping grain. However, to a lesser extent rail is also used for shipping fresh vegetables.

Table 7: Farm Products Carried by Rail from 2010 Public Waybill Sample

STCC	Commodity	Carloads	Tons
01132	Corn	778,623	79,284,419
01137	Wheat	482,873	49,407,350
01144	Soybeans	289,979	29,819,246
01139	Grain, NEC	183,188	5,423,660
01131	Barley	34,160	3,066,626
01136	Sorghum Grains	29,105	2,987,174
01133	Oats	18,165	1,540,290
01149	Oil Kernels	14,720	1,173,648
01341	Peas	13,060	1,064,320
01141	Oil Kernels	11,462	973,386
01342	Dried Peas	6,068	603,210
01195	Potatoes	8,364	514,024
01159	Field Seeds	7,748	413,552
01399	Fresh Vegetables	19,720	388,280
01143	Peanuts	4,240	359,600
01129	Raw Cotton	16,960	352,240
	Other	70,128	3,201,920

Source: STB Waybill Sample

Military & Defense

According to the STB 2010 Public Waybill Sample, U.S. railroads shipped 8,024 carloads of Ordinance & Accessories (STCC 19) in 2010. Unfortunately, the Waybill Sample does not provide detail on the types of military hardware that this includes. Other military cargoes were also probably shipped by rail under different commodity classifications. Rail is often used for moving military “project” cargoes that would be difficult to ship over highways, such as tanks. The largest rail movements of military hardware often relate to deployments, where military units are moved along with their equipment from domestic bases to ports and then to overseas locations. These types of movements are significant at locations such as the rail lines connecting Fort Hood, TX with the Port of Beaumont, TX. However, military testing operations would likely generate a much smaller volume of rail shipments. Rail’s support for Yuma County’s military testing economic development initiatives would likely be minimal.

Industrial Manufacturing, Twin Plant/ Maquila Operations

Rail supports a broad range industrial manufacturing operations, transporting both inbound supplies and outbound finished products (**Table 8**). Currently within Yuma County and across the border in San Luis Rio Colorado are manufacturers of electronics, machinery (commercial air conditioning), containerboard recycling, automotive supply (batteries), and other. Of the commodity categories of which these companies are part, rail’s usage for transporting Pulp, Paper, or Allied Products and Transportation Equipment is much higher than rail’s usage for transporting machinery, both electrical and non-electrical.

Table 8: Sample of Manufactured Products Carried by Rail in 2010

STCC 2	Commodity Description	Carloads	Tons
26	Pulp, paper, or allied products	821,560	43,487,000
37	Transportation equipment	1,903,600	39,109,056
36	Electrical machinery, equipment, or supplies	149,268	1,910,456
35	Machinery, excluding electrical	54,886	1,345,714
39	Miscellaneous products of manufacturing	66,760	783,252

Source: 2010 STB Public Carload Waybill Sample

Within the commodity category, Transportation Equipment, rail is most often used for transporting finished cars and trucks, but is also used for transporting vehicle parts (**Table 9**). Trailer-on-flatcar and container-on-flatcar are often used for transporting automotive parts.

Table 9: Top Transportation Equipment Categories Carried by Rail in 2010

STCC	Commodity Description	Tons	Percent
37111	Assembled Motor Vehicles	16,371,120	42%
37112	Assembled Trucks	8,316,200	21%
37149	Motor Vehicle Parts	5,790,600	15%
37422	Freight Train Cars	5,459,256	14%
37147	Motor Vehicle Body Parts	1,259,240	3%
	Other	1,912,640	5%

Source: 2010 STB Public Carload Waybill Sample

Within the commodity category, Pulp, Paper, or Allied Products, rail is most often used for shipping Fiberboard, Paperboard, or Pulpboard (**Table 10**).

Table 10: Top Pulp, Paper or Allied Product Categories Carried by Rail in 2010

STCC	Commodity Description	Tons	Percent
26311	Fiberboard, Paperboard, Pulpboard	17,827,800	41%
26111	Pulp	9,730,004	22%
26213	Printing Paper	6,191,524	14%
26212	Ground Wood Paper, Uncoated	2,569,160	6%
26211	Newsprint	2,273,080	5%
	Other	4,895,432	11%

Source: 2010 STB Public Carload Waybill Sample

The results of this analysis suggest that rail could support economic development initiatives aimed at industrial manufacturing in Yuma, but the extent to which rail will be relevant will depend upon the precise nature of the industrial manufacturing.



Logistics and Distribution

Rail could support economic development initiatives aimed at securing logistics and distribution employment in Yuma County. However, rail's role will depend upon the nature of products that are to be distributed. Rail is heavily used for transporting construction supplies, so if Yuma County is to be a hub for shipments of construction supplies, rail would be a logical transportation choice to support this initiative. As shown in **Table 9**, rail is used for transporting finished automobiles. An automotive ramp would depend on rail. General retail or other distribution facilities are often constructed in conjunction with intermodal ramps. However, to be successful Yuma County would need to generate above a threshold level of intermodal traffic. Intermodal ramps tend to be located in larger metropolitan areas.

Renewable Energy

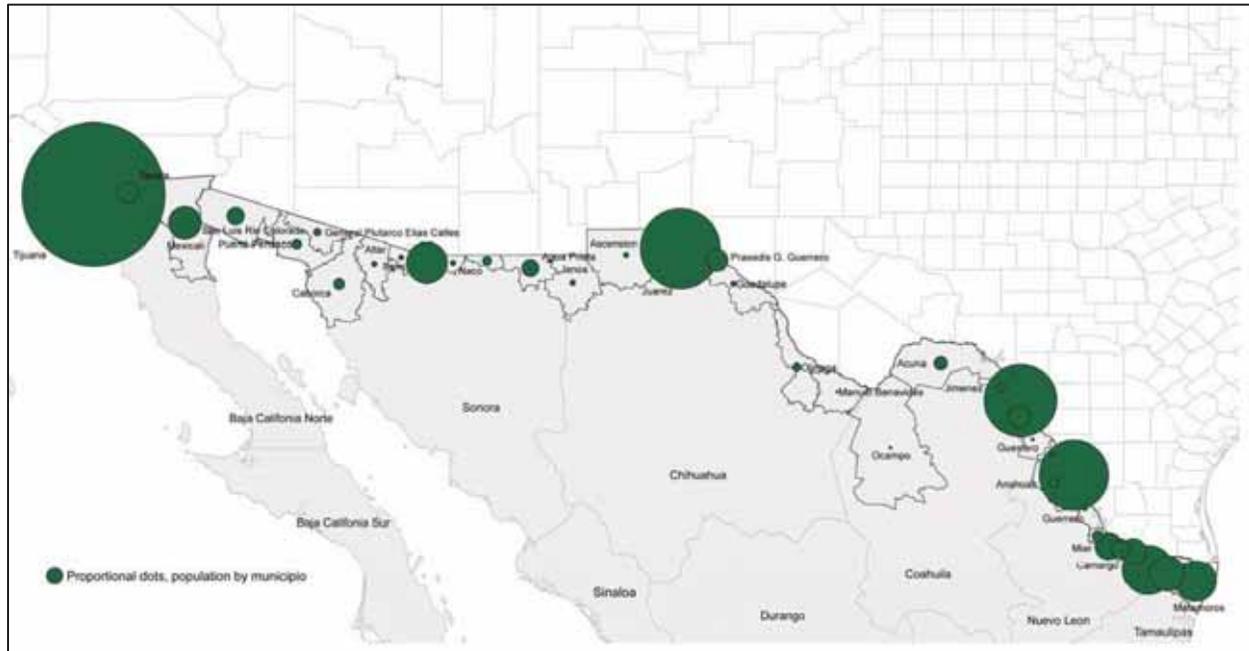
Currently, there are no solar manufacturing establishments located in Yuma County. Solar manufacturing is considered a target industry, since not only will the generation of solar power be centered in the Southwest, but the manufacturing to feed this industry would logically be located in the Southwest as well. Rail is often used for wind projects, since wind turbine components are too large to transport easily over the highway system. For solar, the collectors and mirrors themselves would not likely be shipped by rail. However, the steel girders and support structures that hold solar apparatus may be shipped by rail.

Regional Economic Profile – Mexico

South of the United States border, the mouth of the Colorado River separates the two Mexican states of Baja California in the west and Sonora in the east. Two municipalities, San Luis Río Colorado and Mexicali, provide the bulk of the population opposite Yuma on the Mexican side of the border (**Figure 1**). Though the region receives less than 6 inches of rainfall per year, the Colorado River supplies the necessary hydration to support substantial agricultural activities, and wheat and cotton figure prominently in the economy of both municipalities.⁵

⁵ Instituto Nacional para el Federalismo y el Desarrollo Municipal y el Gobierno del Estado de Sonora. 2005. *Enciclopedia de los Municipios de México*. Estado de Sonora: San Luis Río Colorado.

Figure 1: 2004 Population of Mexican Colonia's along the Border



Source: U.S. Mexico Border Counties Coalition

San Luis Río Colorado: Population and Employment

East of the Colorado River, the municipality⁶ of San Luis Río Colorado was recorded in the most recent *Censo de Población y Vivienda* (2010), as being home to 178,380 people, roughly 6.7% of Sonora’s 2,662,480 people.⁷ In land area, the *municipio* totals 8,413 square kilometers (3,248 square miles), making it roughly 60% the size of Yuma County.

The population of San Luis Río Colorado was estimated to contain 72,983 economically active adults and 59,934 economically inactive adults in the most recent municipal encyclopedia (2010),⁸ though the second category contains adults engaged in the informal economy as well as intermittent or transient employment that is more difficult to record and categorize. Trade employment (jobs associated with retail, crafts and small scale, artisanal manufacturing) provides the most jobs for economically active adults in the *municipio*. According to the most recent *Enciclopedia de los Municipios de México* that categorizes employment by sector, trade employment totaled 15,870 jobs in that year, roughly 46

⁶ In Mexico, the term *municipio* takes on an administrative meaning akin to ‘county’ in the United States, to signify the secondary level of public administration beneath the state. Within *municipios* are *localidades*, which are cities, towns, and villages.

⁷ Instituto Nacional de Estadística y Geografía (INEGI). México in Cifras. Información Nacional, Por Entidad Federativa y Municipios. *Censo de Población y Vivienda 2010: San Luis Río Colorado, Sonora*. Tabla Estadística. Available online at: <http://www.inegi.org.mx/sistemas/mexicocifras>.

⁸ Instituto Nacional para el Federalismo y el Desarrollo Municipal y el Gobierno del Estado de Sonora. 2010. *Enciclopedia de los Municipios de México*. Estado de Sonora: San Luis Río Colorado.



percent of all jobs in this district. Artisanal craft include beadwork, which is then incorporated into bags, necklaces, belts, and other items.

Agriculture is a major source of employment, as the soil at the mouth of the Colorado River is highly fertile and subject to little erosion. The *municipio* is home to 29,355 hectares of agricultural land (72,538 acres), of which 27,915 hectares (68,979 acres), or 95.1%, is supported by irrigation infrastructure rather than local rainfall. Most of this land (15,549 hectares, or 38,422 acres) is planted with durum wheat. Additionally, the farmers of San Luis Río Colorado have diversified, planting 5,000 acres in the municipality with onions, cauliflower, grapes, melons, asparagus, and zucchini. Fruits grown in the *municipio* include dates, peaches, grapes, and figs. In terms of animal husbandry, 800,000 hectares (1,976,843 acres) of pasture support 2,547 head of cattle. Most are exported to the United States as calves. Agriculture employs 9,651 people. This is approximately 28 percent of all employed adults in the *municipio*.

After agriculture, industrial and manufacturing jobs constitute the third largest category of employment. In 2005, manufacturing plants at 27 *maquiladora* sites employed 7,700 people. All employment classified as industrial included 9,057 jobs in 2005, approximately 26 percent of all employed persons.

Tourism employed 2,324 people, approximately 7% of jobs, in the most recent count. Attractions include an annual cotton festival, duck hunting, and a biological preserve centered around the Pinacate volcanic region. In 2005, the district had 675 hotel rooms.

Mexicali: Population and Employment

West of the Colorado River—and therefore west of a portion of Yuma County and south of California—the municipality of Mexicali

The *municipio* of Mexicali has a population of 936,826, which equates to 30 percent of Baja California's total population of 3,155,070. In terms of physical geography, the *municipio* covers 13,700 square kilometers (5,290 square miles, equivalent to 96 percent of the land area of Yuma County). Mexicali's *municipio* boundaries contain 18% of the state of Baja California. As on the Sonoran side, settlement of this portion of Baja California began in earnest in the early 20th century when a number of irrigation canals were completed, allowing more intensive use of Colorado River water resources south of the United States border. Mexicali, the largest urban settlement in the *municipio* of the same name, was founded in 1903. Today, public works are extensive, including connections to the FerroMex Chihuahua al Pacifico route to the port at Topolobampo, Sinaloa.

An economic census of Mexicali recorded 404,701 economically active adults and 298,456 economically inactive adults in the most recent count (2010). Again, 'economically inactive' in this classification includes adults engaged in the informal economy as well as employment that is more difficult to record. From 1950 to present, Mexicali has experienced incredible growth within its boundaries, growing from a population of 124,362 in 1950 at a combined annual growth rate (CAGR) of 3.42% per annum, largely achieved through migration. Jobs associated with trade, commerce and tourism constituted 50.63 percent of all employment, followed by manufacturing and utilities at 33.34 percent, and agriculture and fisheries at 11.33 percent.



The trade and commerce sector benefits from Mexicali being a prime retail center for the region, as well as the collocation of a number of wholesalers and distributorships. Service sector employment includes adults working in banking, installation and service of HVAC systems, repair of motor vehicles, and jewelry. Tourism activities are concentrated in Rio Hardy and San Felipe, a seaside town on the Gulf of California that is within the boundaries of the district. The University also draws visitors to the municipality.

Over 190 *maquiladora* plants employed 55,850 people, or 19.4 percent of employed adults, according to the latest data available. Heavy manufacturing sites are concentrated around the production of automotive components and entail the refinement or assembly of metal, glass, plastic, and textile inputs. In addition to manufacturing of durable goods, many factories are engaged in activities related to dairy pasteurizing, beverage bottling, milling wheat, producing tortillas, and meatpacking. Combined, 40 key product groups earned \$2.4 billion in revenues for Mexicali manufacturers in 2005.

Agriculture has always been a major industry in this *municipio*. Of the statewide total of 222,527 hectares (549,876 acres) of land harvested in Baja California, approximately 70 percent—155,491 hectares (384,226 acres)—is located in Mexicali,⁹ demonstrating the primacy of the Río Colorado system within the region's agricultural sphere. Fisheries are also comparatively important: 20,000 hectares (49,421 acres) of land in the Mexicali municipality are used to farm catfish and bass. Freshwater catch from the Hardy River and seafood from the Gulf of California also draw substantial earnings.

Regional Agricultural Production

Yuma County's immediate neighbors are the states of Sonora and Baja California. Together, both states produced \$690 million in agricultural products in 2010. While much of this is consumed domestically in Mexico, a significant amount is exported to the United States and other nations.

Sonora ranks sixth in Mexican states in terms of annual agricultural produce value, marketing \$582 million per year (**Table 11**). (By comparison, top producers nationally include Veracruz at \$1.57 billion and Michoacán at \$1.43 billion annually.) Sonoran crops are worth nearly \$3,000 per acre at harvest. Baja California markets substantially less agricultural volume. In 2010, the state produced \$108 million, placing it 22nd among 32 states. Baja California crops are worth an average of \$1,312 per acre at harvest.

⁹ Servicio de Información Agroalimentaria y Pesquera (SIAP). Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA). 2010. *Cierre de la Producción Agrícola por Estado*.

Table 11: Top Eight States Ranked by Value of Agricultural Production, Annual (2010)

State	Value (Thou.USD)	Value/ Acre (Harvested)	Acres Planted	Acres Harvested	%Nat'l Value
Veracruz	\$ 1,573,783	\$ 856	1,897,646	1,838,552	15.0
Michoacán	\$ 1,433,960	\$ 2,008	771,363	713,964	13.7
Chiapas	\$ 822,075	\$ 642	1,353,170	1,281,019	7.9
Jalisco	\$ 770,410	\$ 571	654,551	1,349,530	7.4
Oaxaca	\$ 629,306	\$ 404	1,647,993	1,557,835	6.0
Sonora	\$ 582,268	\$ 2,990	202,147	194,725	5.6
Chihuahua	\$ 515,535	\$ 1,481	389,455	348,068	4.9
Guerrero	\$ 339,978	\$ 448	768,012	759,408	3.2

Source: Servicio de Información Agroalimentaria y Pesquera. SAGARPA. 2010. Available online at: <http://www.siap.gob.mx>.

Regional Economic Profile – Imperial Valley, CA

Imperial County Employment Concentrations by Industry

The main drivers of economic activity in Imperial County are government services; trade, transportation, and utilities; and agriculture.

Agriculture

The latest Agricultural Census from the USDA (2007) recorded that Imperial County, California, 7,003 hired farm workers had an agricultural payroll for of \$107,670,000 on 267 farms (**Table 12**). (This approximates the estimate of the State of California that 17.4 percent of employed adults in Imperial County engage in work related to agriculture.) In the same year, 199 farms used contract labor (though not necessarily to the exclusion of hired labor), with a payroll of \$50,330,000. Countywide, 452 farms occupy 427,349 acres, representing a decline of 17 percent in active farmland (86,750 acres on 85 farms) since 2002. Compared to the national ratio of 1-in-52.2 employed people being engaged in farm labor, Imperial County demonstrates a higher than average concentration of agricultural activity with 1-in-8.2 workers (in a pool of 57,170 that year) being engaged in farm work.

Table 12: Comparison of Agriculture in Imperial County to that in California Statewide

Area	Pct of Land	Pct of Workforce	Value Per Acre	Total Farm Payroll
Imperial County	16%	12.2%	\$3,019	\$107,670,000
California	25%	2.6%	\$1,336	\$5,015,513,000
United States	41%	1.9%	\$323	\$21,877,661,000

Source: U.S. Department of Agriculture. 2007. Census of Agriculture.

While constituting less than half of one percent of California's population, Imperial County attracts 2.2 percent of the state's agricultural payroll. Nationwide, while 1-in-1,770 Americans live in Imperial County, 1-in-\$203 of America's agricultural payroll is earned there.



The recent USDA Census recorded \$1.3 billion in agricultural products sold having originated in Imperial County. This positions Imperial County as tenth in the state and eleventh in the nation in terms of annual value of agricultural products sold by County. (Yuma is 23rd when ranked by annual value of agricultural produce.) Cattle and calves, earning \$530.6 million in 2007, represent 41 percent of Imperial County's agricultural output by value. Vegetables, melons, potatoes, and sweet potatoes constitute the next 26 percent of the County's value, earning \$337.8 million. Hay and other similar crops represent a further 21 percent, at \$268.6 million. Imperial County is ranked ninth for cattle nationwide, seventh for vegetables, and second for hay and related crops.¹⁰

Government Services, Transportation and Utilities, and Retail

Combined with agriculture, government services; trade, transportation and utilities; and retail constitute 84 percent of the jobs in Imperial County, California. In the category of government employment, Imperial County is home to 18,200 jobs in the public sector (**Table 13**). This equates to 33.8 percent of all employed adults in the County. In this regard, Imperial County is an outlier in California, where statewide, government employment engages 16.6 percent of employed adults. Most of the public sector jobs in Imperial County are found in local government, which houses 12,800 positions, or 23.7 percent of all employment in the County. State government ranks second with 2,900 jobs (5.4 percent of employed adults), followed third by the federal government, with 2,500 jobs (4.6 percent). Though disaggregated data is unavailable detailing the nature of federal employment in Imperial County, anecdotally, many of the positions can be assumed to support Customs and Border Patrol, the Bureau of Land Management, and the Department of Defense. There is a large military installation in Imperial County, the Chocolate Mountain Aerial Gunnery Range (CMAGR).

Trade, transportation, and utilities together constitute 10,500 (19.5 percent of the jobs) in Imperial County. This is slightly above the statewide average of 18.4 percent, perhaps spurred by the County's location as an entry point for many goods crossing from Mexicali. At the County level, wholesale trade is a fairly small portion of this category (3.2 percent of jobs), with retail (12.8 percent of county employment) driving the bulk of activity in this sector.

¹⁰ USDA. 2007. *Census of Agriculture: County Profile – Imperial County, California*.

Table 13: Comparison of Employment Categories in Imperial County to those of California Statewide, 2011 Annual

Industry	California Employment	% California Employment	Imperial County Employment	% Imperial County Employment
Total Wage and Salary	14,445,700	100.0%	53,900	100.0%
Total Nonfarm	14,060,500	97.3%	44,500	82.6%
Total Farm	582,200	4.0%	9,400	17.4%
Service Providing	12,232,500	84.7%	40,600	75.3%
Goods Producing	1,828,000	12.7%	3,900	7.2%
-	-	-	-	-
Government	2,398,700	16.6%	18,200	33.8%
Federal Government	255,100	1.8%	2,500	4.6%
State Government	483,700	3.3%	2,900	5.4%
Local Government	1,659,900	11.5%	12,800	23.7%
-	-	-	-	-
Total Private	11,661,800	80.7%	26,400	49.0%
Residual-Private Services Providing	9,833,800	68.1%	22,500	41.7%
Trade, Transportation and Utilities	2,662,900	18.4%	10,500	19.5%
Retail Trade	1,532,000	10.6%	6,900	12.8%
Educational and Health Services	1,833,600	12.7%	3,700	6.9%
Leisure and Hospitality	1,530,300	10.6%	3,400	6.3%
Manufacturing	1,245,800	8.6%	2,600	4.8%
Professional and Business Services	2,126,300	14.7%	2,400	4.5%
Transportation, Warehousing and Utilities	471,900	3.3%	1,900	3.5%
Wholesale Trade	659,000	4.6%	1,700	3.2%
Financial Activities	761,500	5.3%	1,300	2.4%
Natural Resources, Mining and Construction	385,300	2.7%	1,300	2.4%
Other Services	486,900	3.4%	800	1.5%
Information	432,400	3.0%	400	0.7%

Source: State of California, Employment Development Department. 2012.

Performance of Imperial County's Economy

Long-Term Population Growth

Imperial County's population growth between 1970 and 2010 makes it rank 27 out of California's 58 counties (**Table 14**). With a 134 percent increase, Imperial County experienced a larger relative change than the State of California, which increased by 87 percent in those four decades. While growing faster than the nation, as a whole, that witnessed a 51 percent increase in four decades, Imperial County could not match Yuma County's 322 percent growth in the same period.

Table 14: Comparison of U.S., California, and California County Population Growth (Ranked by Percent Change, 1970-2010)

Polity	1970 Population ¹¹	2010 Population ¹²	Population Growth	Percent Change (Growth ÷ 1970)
United States	204,053,325	308,745,538	104,692,213	51%
State of California	19,953,134	37,253,956	17,300,822	87%
State of Arizona	1,770,900	6,392,017	4,621,117	261%
Yuma County	60,827	195,751	135,464	322%
Imperial County	74,492	174,528	100,036	134%

Shifting Employment Trends in Imperial County (2005-2011)

As elsewhere statewide and nationwide, Imperial County's total non-farm employment contracted from 2005 to 2011, and by the close of that six year period had still not regained its 2005 strength (posting a loss of 1.8 percent) (**Table 15**). While service industries in California suffered relatively little, those in Imperial County shed employees at a rate more than ten times the state average for 2005 to 2011. Goods providing industries in Imperial County fared relatively well, gaining 6.3 percent in these six years, compared to statewide losses of 24.8 percent of goods producing jobs in California, and 18.8 percent loss nationwide.

Government employment grew faster in Imperial County than statewide in California during these years, over four times the amount of growth in government employment nationwide. Federal employment in Imperial County grew 31.6 percent, compared to statewide growth in federal employment at 4.6 percent. State employment in Imperial County (11.5 percent) grew more than twice as much as state employment growth statewide (4.4 percent).

The private sector economy in Imperial County has proven comparatively resilient, outperforming the state economy in every category except the vague 'Other Services'. Manufacturing employment increased 13 percent from 2005 to 2011, while statewide and national losses were over 17 percent.¹³

¹¹ U.S. Census Bureau. *Census of Population: 1970. Vol. I: Characteristics of the Population. Part A: Number of Inhabitants. Section 1: United States, Alabama-Mississippi*. U.S. Government Printing Office, Washington, D.C.

¹² U.S. Census Bureau. *State and County QuickFacts*. Data derived from Population Estimates, American Community Survey, Census of Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Non-employer Statistics, Economic Census, Survey of Business Owners, Building Permits, Consolidated Federal Funds. Last updated January 17, 2012. Available online at: <http://quickfacts.census.gov/qfd/states/06000.html>.

¹³ However, less than 5% of Imperial County's employed adults are engaged in manufacturing, and this 13 percent change represents a growth of 300 jobs from 2,300 to 2,600 from 2005 to 2011. Additionally, due to the federal government's definition of 'manufacturing,' Imperial County's large employers engaged in both beef packing and sugar refining activities are included in this category for Imperial County. More traditional manufacturing activities in Imperial County pertain to the production of gypsum products (wallboard, plaster, ornamental moldings, statuary, and architectural plaster work).

Table 15: Percent Change in Major Imperial County Industries Compared to State and National Trends, 2005-2011

(Instances of job growth or loss mitigation at or above statewide rate are highlighted)

Industrial Category	Imperial County	California	United States
<i>Total Wage and Salary</i>	1.7	-4.8	*
Total Non-Farm	4.7	-5.0	-1.8
Service Providing	-11.3	-1.1	-1.6
Goods Providing	6.3	-24.8	-18.8
-	-	-	-
<i>Government</i>	8.3	-0.9	1.4
Federal Government	31.6	1.9	4.6
State Government	11.5	4.4	1.0
Local Government	4.9	-2.7	0.9
-	-	-	-
<i>Total Private</i>	2.7	-5.8	-2.4
Residual Private Services Providing	5.1	-1.2	1.7
Trade, Transportation and Utilities	-2.8	-5.6	-3.6
Retail Trade	-5.5	-7.7	-4.2
Educational and Health Services	32.1	15.1	14.5
Leisure and Hospitality	9.7	3.7	3.9
Manufacturing	13.0	-17.1	-17.5
Professional and Business Services	9.1	-1.6	2.2
Transportation, Warehousing, and Utilities	5.6	-3.1	-1.6
Wholesale Trade	0.0	-2.5	*
Financial Activities	0.0	-17.3	-5.8
Natural Resources, Mining, and Construction	-31.6	-58.5	-21.0
Other Services	-20.0	-3.7	-1.0
Information	0.0	-8.7	-13.1

Source: State of California, Employment Development Department. 2012.

* Not all categories available on state and federal tables. Farm employment change data are only recorded in years ending in '2' and '7' by the USDA Census of Agriculture.

Yuma County Freight Flows

Truck Flows

The study team has analyzed truck flows to and from Yuma County using the U.S. Federal Highway Administration’s (FHWA) Freight Analysis Framework – 3 (FAF3). The FAF database is in its third iteration. Its estimates rely on the 2007 U.S. Commodity Flow Survey as well as a variety of other sources. Flows are estimated between 123 domestic zones, which correspond to states and major metropolitan area. Within Arizona are three FAF zones, the Phoenix and Tucson metropolitan areas, as well as the remainder of Arizona. FAF3 estimates international trade flows with eight foreign trade zones, one of which is Mexico. Commodities are categorized into 43 groups that correspond to the two-digit Standard Classification of Transported Goods (SCTG) which is used by the U.S. Census Bureau. Yuma County is part of the “Remainder of Arizona” FAF zone, which includes all parts of Arizona outside of the Tucson and Phoenix metropolitan areas. In order to capture those truck flows specific to Yuma County, flows to and from the Remainder of Arizona FAF zone were disaggregated using input-output tables which capture the usage and generation of commodities by industry. Flows are allocated to specific counties based upon the presence of applicable industries within each county. The model is then calibrated based upon actual truck counts. This disaggregation model currently serves as an input into the Arizona statewide transportation demand model. The results of **Table 16** suggest that truck traffic to and from Yuma County are dominated by other parts of Arizona, as well as the Los Angeles and Phoenix metropolitan areas. These three FAF zones account for 83 percent of Yuma County truck movements. The three are by far the largest sources of both inbound and outbound truck traffic. Overall truck traffic to and from Yuma County is expected to more than double between 2012 and 2035. The same six FAF zones remain Yuma County’s largest trading partners, although Los Angeles is expected to overtake the Remainder of Arizona FAF zone as the single largest trading partner.

Table 16: Top Six FAF Zone Origins/ Destinations of Truck Traffic to/ from Yuma County 2012, 2035

Freight Analysis Framework Zone	2012		2035	
	Tons	Share of Tonnage	Tons	Share of Tonnage
Remainder of Arizona	6,654,593	32%	8,930,684	28%
Los Angeles CA CSA	6,427,673	31%	10,128,109	31%
Phoenix AZ MSA	4,042,922	20%	7,509,994	23%
Las Vegas NV CSA	848,355	4%	1,408,294	4%
San Diego CA MSA	599,009	3%	1,083,026	3%
Tucson AZ MSA	594,382	3%	1,040,046	3%
Other FAF Zones	1,455,825	7%	2,243,094	7%
Total	20,622,759	100%	32,343,248	100%

Source: FAF3 and Parsons Brinckerhoff

Data suggests that the highest tonnage products shipped by truck into and out of Yuma County are building materials such as Gravel, Nonmetallic Mineral Products, as well as agricultural and food products (**Table 17**).

Table 17: 2012 Tonnage Originating and Terminating in Yuma County by Commodity

Originating In Yuma County		Terminating in Yuma County	
Commodity	Tons	Commodity	Tons
Gravel	2,357,046	Nonmetal min. prods.	1,408,940
Other ag prods.	1,499,843	Gravel	1,061,559
Nonmetal min. prods.	1,464,213	Gasoline	772,343
Nonmetallic minerals	922,178	Waste/ scrap	508,510
Waste/ scrap	866,057	Other ag prods.	473,269
Base metals	590,390	Mixed freight	434,422
Animal feed	435,982	Paper articles	386,353
Building stone	410,032	Nonmetallic minerals	362,293
Newsprint/ paper	368,200	Other foodstuffs	330,931
Cereal grains	303,872	Meat/ seafood	256,725
Other	2,406,217	Other	3,003,386

Source: FAF3 and Parsons Brinckerhoff

Gravel, Waste/ Scrap, and Building Stone are expected to account for the largest increase in tonnage originating in Yuma County while the Mixed Freight, Nonmetallic Mineral Products, and Miscellaneous Manufactured Products are expected to account for the largest increase in tonnage terminating in Yuma County (**Table 18**).

Table 18: Change in Tonnage Originating and Terminating in Yuma County by Commodity between 2012 and 2035

Originating In Yuma County		Terminating in Yuma County	
Commodity	2012 – 2035 Chg Tons	Commodity	2012 – 2035 Chg Tons
Gravel	2,196,143	Mixed freight	600,264
Waste/ scrap	1,788,200	Nonmetal min. prods.	535,934
Building stone	480,247	Misc. mfg. prods.	428,979
Other ag prods.	446,438	Other foodstuffs	427,739
Base metals	420,269	Paper articles	354,428
Nonmetal min. prods.	359,147	Other ag prods.	335,668
Textiles/ leather	242,592	Gravel	335,303
Natural sands	199,326	Waste/ scrap	325,366
Cereal grains	179,296	Chemical prods.	249,753
Nonmetallic minerals	160,617	Alcoholic beverages	203,973
Other	100,273	Other	1,350,534

Source: FAF3 and Parsons Brinckerhoff

Rail Flows

A disaggregation of FAF3 data to and from the Arizona Remainder FAF zone suggests that existing rail traffic to and from Yuma County consists primarily of agricultural products, agricultural inputs, as well as various other products, such as chemicals (**Table 19**).

Table 19: 2010 Rail Tonnage Originating and Terminating in Yuma County by Commodity

Originating In Yuma County		Terminating in Yuma County	
Commodity	Tons	Commodity	Tons
Animal feed	13,000	Cereal grains	212,000
Paper articles	1,000	Fertilizers	79,000
Other	0	Basic chemicals	35,000
		Milled grain prods.	26,000
		Newsprint/paper	17,000
		Other	46,000

Source: FAF3 and Parsons Brinckerhoff

Cereal Grains into Yuma County originate in the Midwest, primarily Nebraska. Fertilizer shipped to Yuma County originates in a variety of locations, including Oklahoma, Idaho, and Louisiana. Shipments of Basic Chemicals to Yuma County primarily originate in Texas.

FAF3 forecasts suggest that inbound rail shipments of Cereal Grains to Yuma County are expected to grow by about 71 percent between 2010 and 2035, while shipments of Basic Chemicals will increase by 43 percent. However, shipments of fertilizer are expected to remain about the same.

Cross-Border Trends/ Flows

As the data in **Table 20** suggests, San Luis is the fifth busiest border crossing among the primary points of entry in Arizona, California and Mexico. The increase in traffic at San Luis has been slower than the overall increase in trade flowing across Arizona and California ports of entry. Between 1997 and 2011, overall trade increased by 137 percent or six percent per year, while traffic at San Luis increased by 37 percent or two percent per year. Data suggest that traffic has generally consolidated at larger border crossings. Otay Mesa and Calexico-East, CA and Nogales were already the busiest border crossings in 1997, but their share has grown over the following 14 years. The volume of traffic at each went up by over 150 percent, whereas the overall level of trade increased by 137 percent.

Table 20: Comparison of the Value of Goods Moving across Border at San Luis to Other CA and AZ Crossings

Port of Entry	1997	2011	Percent Change	Annual % Change
OTAY MESA, CA	\$12,304,303,073	\$33,173,583,134	170%	7%
NOGALES, AZ	8,830,939,184	22,106,382,872	150%	7%
CALEXICO-EAST, CA	4,601,855,339	11,766,636,147	156%	7%
DOUGLAS, AZ	920,608,352	2,150,447,640	134%	6%
SAN LUIS, AZ	766,263,430	1,049,964,463	37%	2%
TECATE, CA	807,367,006	755,275,601	-6%	0%
CALEXICO, CA	997,240,577	238,398,615	-76%	-10%
SAN YSIDRO, CA	846,103,394	161,039,009	-81%	-11%
NACO, AZ	149,597,398	123,182,949	-18%	-1%
LUKEVILLE, AZ	6,704,066	6,082,370	-9%	-1%
ANDRADE, CA	1,328,224	334,371	-75%	-9%
Total	30,232,312,040	71,531,329,182	137%	6%

Source: U.S. Bureau of Transportation Statistics

As shown in **Table 21**, most imports and exports crossing in the Remainder of Arizona FAF zone originate or terminate in either Arizona or Michigan. Arizona and Michigan account for 80 percent of imports and 73 percent of exports. The Arizona Remainder FAF zone includes ports of entry at Nogales, Douglas, and San Luis.

Table 21: Domestic Origins/ Destinations of Mexican Imports and Exports Crossing in the Remainder of Arizona FAF Zone - 2010

Destination of Imports		Origin of Exports	
FAF Zone	Tons (000's)	FAF Zone	Tons (000's)
Phoenix AZ MSA	2,131	Phoenix AZ MSA	2,430
Tucson AZ MSA	667	Detroit MI CSA	682
Remainder of Arizona	360	Tucson AZ MSA	411
Detroit MI CSA	179	Los Angeles CA CSA	347
Remainder of Michigan	122	Remainder of Arizona	310
Los Angeles CA CSA	84	Remainder of Michigan	269
Grand Rapids MI CSA	80	San Francisco CA CSA	240
Iowa	76	Grand Rapids MI CSA	145
Seattle WA CSA	73	Chicago IL-IN-WI CSA (IL Part)	142
Houston TX CSA	58	Dallas-Fort Worth TX CSA	82
Other	589	Other	745

Source: FAF3

Unsurprisingly, the traffic between Mexico and Michigan is predominantly automotive-related (**Table 22**). For the exports, about 53 percent of Arizona exports to Mexico that cross within the Remainder of Arizona FAF zone are metallic minerals, while another 20 percent are plastics and rubber. Of the imports from Mexico into Arizona, about 85 percent are agricultural products. Mexican imports are dominated by produce. Rail traffic crossing in the Remainder of Arizona region (Nogales) is 83 percent Metallic Ores and Motorized Vehicles.

Parsons Brinckerhoff has also calculated the origins/destinations of Mexican imports and exports that cross specifically in Yuma County, i.e. at San Luis. The results suggest that Phoenix and Tucson and the largest origins of exports to Mexico and destinations of imports from Mexico. These two metropolitan areas are the origin of 57 percent of exports and the termination of 56 percent of imports.

Table 22: FAF Zone Origins and Destinations for Mexican Imports/ Exports Crossing at San Luis - 2012

Destination of Imports		Origin of Exports	
FAF Zone	Tons	FAF Zone	Tons
Phoenix AZ M SA	657,483	Phoenix AZ M SA	307,868
Tucson AZ M SA	111,168	Tucson AZ M SA	106,222
Los Angeles CA CSA	85,791	Remainder of Arizona	62,090
Remainder of Arizona	84,488	Seattle WA CSA	26,018
San Francisco CA CSA	60,143	Los Angeles CA CSA	25,047
Chicago IL-IN-WI CSA (IL Part)	32,383	Detroit MI CSA	18,688
Dallas-Fort Worth TX CSA	28,898	San Francisco CA CSA	17,204
New York NY-NJ-CT-PA CSA (NY Part)	26,120	Remainder of Washington	14,158
Houston TX CSA	25,474	Remainder of Michigan	12,426
Remainder of California	15,717	Grand Rapids MI CSA	9,043
Other	219,012	Other	140,755
Total	1,346,676	Total	739,517

Source: FAF3 and Parsons Brinckerhoff

Agricultural products are by far the largest commodity category imported through San Luis, accounting for 73 percent of the total (**Table 23**). By contrast, the share of exports to Mexico through San Luis is more evenly divided among a number of commodities.

Table 23: Commodities of Mexican Imports/ Exports Crossing at San Luis, 2012

Imports		Exports	
Commodity	Tons	Commodity	Tons
Other ag prods.	977,355	Live animals/ fish	130,884
Electronics	78,926	Transport equip.	112,430
Machinery	51,514	Newsprint/ paper	96,573
Live animals/ fish	38,734	Tobacco prods.	78,135
Base metals	28,431	Building stone	70,748
Other foodstuffs	21,319	Natural sands	36,387
Textiles/ leather	19,213	Gravel	35,528
Plastics/ rubber	18,873	Coal	29,287
Nonmetal min. prods.	17,139	Crude petroleum	26,870
Articles-base metal	15,766	Gasoline	23,452
Other	79,406	Other	99,223
Total	1,346,676	Total	739,517

Source: FAF3 and Parsons Brinckerhoff

Trade with Mexico passing through San Luis is expected to grow much faster than overall traffic into and out of Yuma County, with imports through San Luis growing 120 percent between 2012 and 2035 and exports growing 300 percent. Phoenix and Tucson are forecasted to remain the largest origins/destinations of imports and exports crossing at San Luis (**Table 24**).

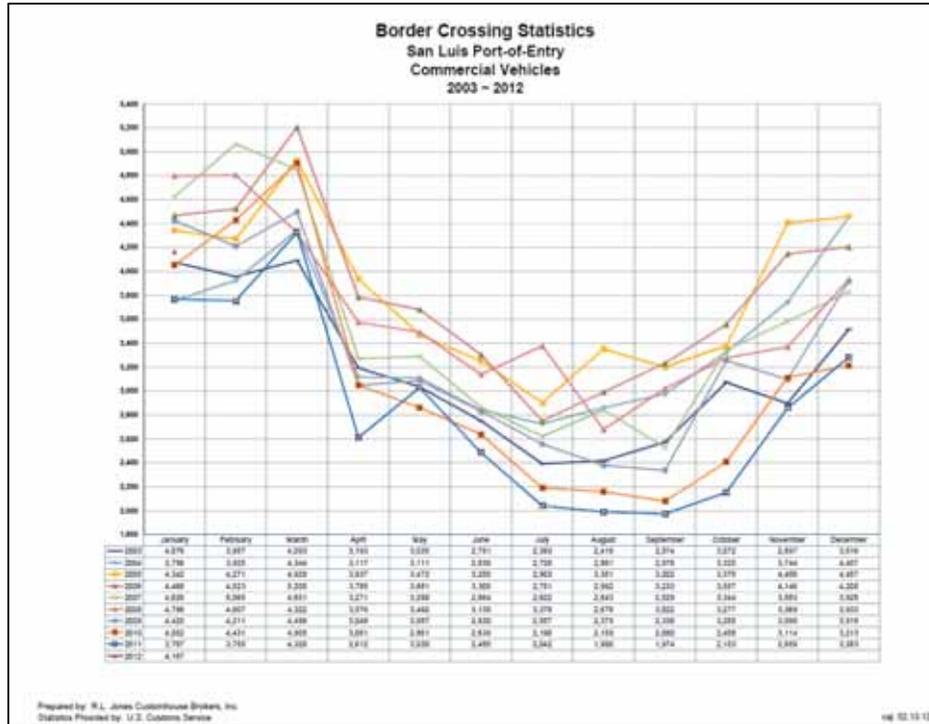
Table 24: FAF Zone Origins and Destinations for Mexican Imports/ Exports Crossing at San Luis - 2012

Destination of Imports		Origin of Exports	
FAF Zone	Tons	FAF Zone	Tons
Phoenix AZ MSA	1,431,066	Phoenix AZ MSA	752,799
Tucson AZ MSA	238,442	Tucson AZ MSA	288,609
Los Angeles CA CSA	196,779	Remainder of Arizona	180,595
Remainder of Arizona	183,823	Detroit MI CSA	88,339
San Francisco CA CSA	135,247	Los Angeles CA CSA	84,323
Chicago IL-IN-WI CSA (IL Part)	80,418	San Francisco CA CSA	69,074
Dallas-Fort Worth TX CSA	62,102	Seattle WA CSA	61,547
New York NY-NJ-CT-PA CSA (NY Part)	58,268	Remainder of Michigan	51,250
Houston TX CSA	55,482	Grand Rapids MI CSA	44,062
Remainder of California	35,006	Remainder of Washington	29,058
Other	480,991	Other	385,042
Total	2,957,624	Total	2,034,699

Source: FAF3 and Parsons Brinckerhoff

Given the preponderance of agricultural products, crossings at San Luis are highly seasonal. Crossings are high during the winter growing season (**Figure 2**) and low during the summer.

Figure 2: San Luis Truck Crossings by Month



Source: Greater Yuma Port Authority

Mexican imports of agricultural products are expected to account for by far the largest growth in cross-border tonnage at San Luis (**Table 25**). The composition of growth in U.S. exports to Mexico through San Luis is expected to be more diverse, consisting of a range of raw materials and finished products.

Table 25: Change in Tonnage of Commodities of Mexican Imports/ Exports Crossing at San Luis from 2012 to 2035

Imports		Exports	
Commodity	2012 – 2035 Chg Tons	Commodity	2012 – 2035 Chg Tons
Other ag prods.	1,205,213	Electronics	328,430
Electronics	125,616	Paper articles	229,550
Machinery	83,124	Plastics/rubber	169,690
Plastics/rubber	25,663	Base metals	130,197
Live animals/ fish	25,117	Other ag prods.	109,368
Articles-base metal	20,135	Machinery	74,527
Textiles/leather	19,731	Motorized vehicles	51,989
Precision instruments	14,750	Chemical prods.	45,074
Base metals	12,477	Articles-base metal	30,978
Nonmetal min. prods.	12,438	Coal-n.e.c.	19,361
Other	66,683	Other	106,018
Total	1,610,948	Total	1,295,182

Source: FAF3 and Parsons Brinckerhoff

It is important to note that trade with Mexico is a relatively small share of freight flows into and out of Yuma County. Mexican imports account for only 0.33 percent of inbound truck traffic into Yuma County, (Table 26) while exports to Mexico account for only 0.51 percent of outbound truck traffic from Yuma County.¹⁴ To place this into perspective, the tonnage between Yuma County and Mexico is less than a sixtieth of the tonnage between Yuma County and the Los Angeles metropolitan area, and less than one fortieth of the trade between Yuma County and the Phoenix metropolitan area. Most freight that crosses the border at San Luis passes through Yuma County in route to/from Phoenix, Tucson or other large metropolitan area. However, Yuma County trade with Mexico is expected to grow faster than overall Yuma County truck traffic.

Table 26: Ratio of Yuma County Trade with Mexico to Total Yuma County Truck Tonnage

Item	2012	2035
Exports to Mexico as a percentage of total outbound truck tons from Yuma County	0.33%	0.61%
Imports from Mexico as a percentage of total inbound truck tons to Yuma County	0.51%	0.72%

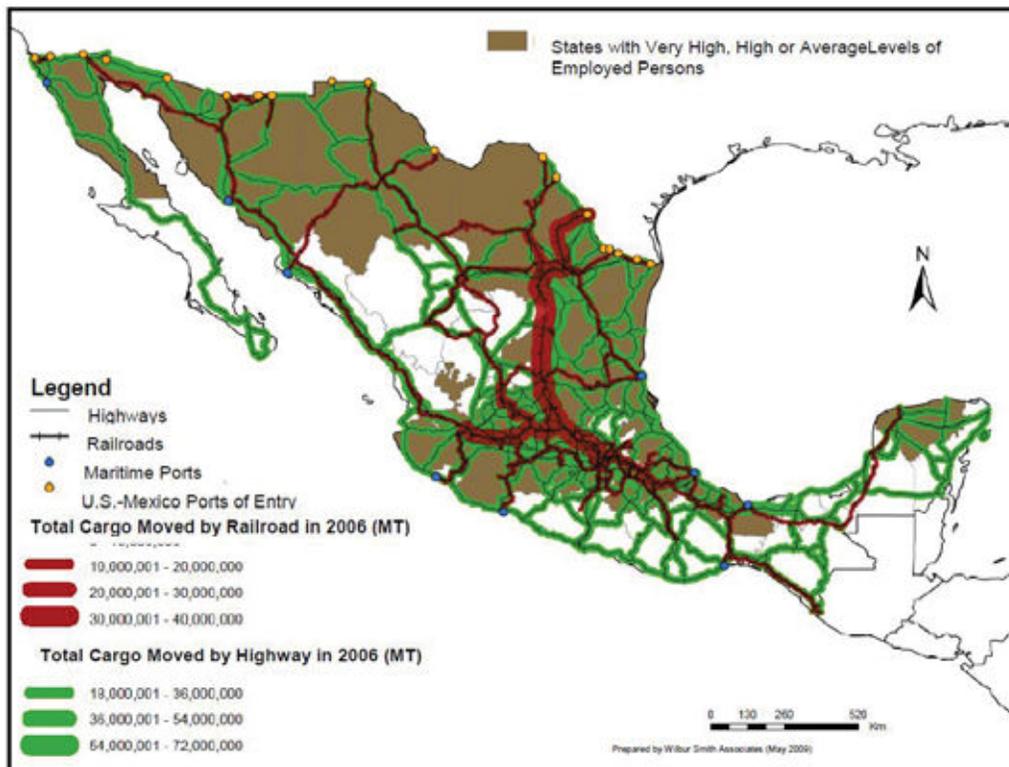
Source: FAF3 and Parsons Brinckerhoff

¹⁴ FAF3 cross-border estimates are based upon data compiled by U.S. Customs. Because maquiladora traffic does not need to clear customs, flows associated with maquiladora/twin plans are not included.

Freight Flows within Mexico

Several years ago, the Mexican Secretaria de Comunicaciones y Transporte (SCT) commissioned the *Master Plan for the Multimodal Corridors of Mexico*. This study included an analysis of freight flows within Mexico, probably the only data source of its kind currently available. The study's findings suggest that the rail line between Mexicali and Hermosillo, which passes south of Yuma, is a relatively low density rail line (**Figure 3**). The volume of traffic on this rail line is much less than that on the KCS mainlines between Mexico City and Laredo, TX, or between Mexico City and Guadalajara and San Luis Potosi. However, Mexican Route 2, the primary highway which parallels the border south of Yuma, is a heavily used freight corridor.

Figure 3: 2006 Density of Rail Lines and Highways in Mexico



Source: Wilbur Smith Associates, *Master Plan for the Multimodal Corridors in Mexico*

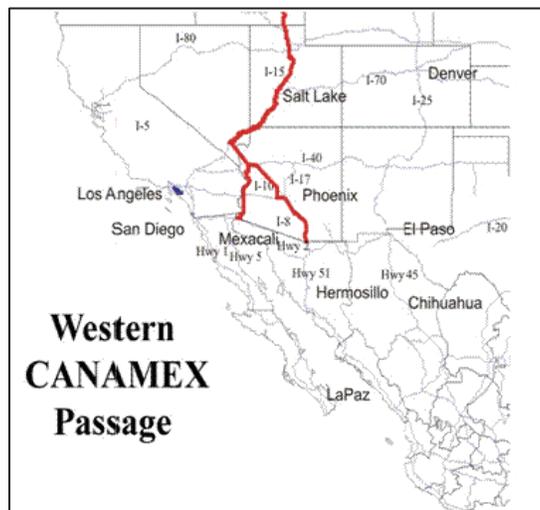
Factors that Will Influence Cross-Border Trade

This section considers logistics developments that could increase or decrease cross-border trade between Mexico and Yuma County.

Western CANAMEX Passage

The CANAMEX Trade Corridor was designated by U.S. Congress as a High Priority Corridor in the 1995 National Highway Systems Designation Act (**Figure 4**). The corridor as described by Congress should travel from Nogales, Arizona, through Las Vegas, Nevada, to Salt Lake City, Utah, to Idaho Falls, Idaho, to Montana, to the Canadian Border. Officials for Yuma have advocated for a “Western Passage” of the CANAMEX corridor which would come through Yuma.

Figure 4: Western CANAMEX Passage



Source: Greater Yuma Port Authority

Port of Guaymas

The Port of Guaymas has been identified as a logical port which could serve the Arizona market. Currently, at least one Yuma shipper receives bulk commodities through the Port of Guaymas. The port is also used by Arizona copper mines for shipping outbound loads of copper extract. Compared to relatively small port but with ambitious plans for expansion. The Port of Guaymas currently is primarily used for handling bulk commodities. Until the past month or so, a single shipping line used the port roughly four times per month (compared to the Port of Manzanillo with 23 shipping lines and 93 stops per month).

The port is the site of six separate berth positions, the longest being 297 meters (974 feet) in length, with the others averaging 200 meters (656 feet) in length. (The longest berth is not currently operational.) Harbor depth at these docks is 13 meters (42.5 feet), with the exception of the main CEMEX dock, at 12 meters (39 feet) in depth. The port’s access channel is 4,200 meters (2.6 miles) long at a consistent 13 meter (42.5 feet) depth.



Within the port, there are 87,200 square meters (938,600 square feet) of yard space, 20,500 square meters (220,600 square feet) of warehouse storage, and 9,000 square meters (96,875 square feet) of covered shed storage.

The current terminals now in use are:

- *Agricultural bulk terminal:* Largely used for grain, there are 72 storage silos associated with this berth. The silos have a storage capacity of 68,000 metric tons (74,955 short tons). Additional equipment includes rail and trucking scale, and a basic agricultural laboratory.
- *CEMEX terminal:* This area is dedicated to handling cement and associated inputs. It is currently under concession to CEMEX, the state-owned Cement Company, and mostly ship's cargo to Pichilingue, Baja California.
- *Pemex terminal:* This berth is operated under concession by the state-owned petroleum company and handles petroleum and associated derivatives. This is the largest and most consistent cargo volume handled by the Port of Guaymas.
- *Ferry (transbordadores) terminal:* The few passengers that arrive at the port are accommodated at this terminal, in addition to small amounts of general cargo, and supplies bound for the minor Port of Santa Rosalía in Baja California.
- *Copper terminal:* This terminal, privately operated by Grupo Mexico, is dedicated to the shipping and receiving of copper concentrates and derivatives.
- *Iron ore terminal:* This mineral product terminal is operated by Arcelor Mittal, a steel manufacturer that transports iron ore from the region to the Port of Guaymas for shipment to Lázaro Cárdenas.
- *Fertilizer terminal:* Some grain is shipped and received at this fertilizer terminal, opened in 2009. This terminal is operated under concession, and has no waterfront access. Current storage capacity allows for 30,000 metric tons (33,070 short tons) of ore in a dome, with an additional 10,000 metric tons (11,023 short tons) of canned materials in an adjacent warehouse.

Additionally, the port yard used for construction and repair of vessels is privately operated under concession by a private company. In 2009, Guaymas handled 1.5 percent of all Mexican port tonnage.

Guaymas handles petroleum derivatives shipped to Sonora from Oaxaca. Coal coke from the United States is also a substantial import. Forty percent of exports are wheat shipments bound for Algeria, and 40 percent are sulfuric acid bound for Chile's copper producing regions. The port is small relative to Manzanillo, which handled 14 percent of Mexican port volumes in 2009.

The Port of Guaymas is accessible by Ferromex. Outside the port, shippers can connect with Federal Highway 15 within a 1.8 kilometer drive (1.12 miles) from the terminals. This highway runs from central Mexico to Nogales. The United States border is 400 kilometers (250 miles) to the north, with four lanes the entire way. Tucson is 315 miles north.

In February of 2012, the Port of Guaymas signed an agreement with Mediterranean Shipping Company (MSC) to develop container operations there. Extensive addition of capacity at Guaymas is being



undertaken concurrently to the enlargement of the Mariposa Port of Entry in Nogales, which by 2014 will offer 21 traffic lanes and accompanying inspection booth

Punta Colonet

Ever since the Mexican Federal Government announced plans to build a mega-seaport at Punta Colonet, located in northern Baja California, this project has been the subject of considerable attention in Yuma County (**Figure 5**). The primary reason for the attention is the fact that the logical location for a rail line connecting the port to the U.S. rail network would be Yuma County. When the project was initially under consideration, a rail alignment was proposed that aroused local opposition, since it cut through highly productive farm land. Some growers claim that they did not oppose a rail alignment through the area per se, just that they would have like to have been consulted on the alignment.

But several questions have yet to be entirely answered about the project:

1. Would it ever be built? At times, the Mexican government has characterized the port one of the highest priority projects in the nation. It was originally conceived as a reliever port for Los Angeles/Long Beach (LA/LB). It was thought that LA/LB was at capacity, and Punta Colonet could handle the overflow when LA/LB exceeded capacity. Furthermore, labor strikes and other issues afflicted the LA/LB ports, which presumably would be less problematic at Punta Colonet. However, capacity issues at LA/LB do not appear to be as pressing as they once seemed. The Port of Los Angeles is proceeding with the construction of a new terminal. Cargo handled per acre is low by international standards, so LA/LB should be able to expand on its existing footprint. Were the Port of Punta Colonet built, this might spur a competitive reaction from LA/LB, reducing the new port's relative desirability. The likelihood of Punta Colonet being constructing varies with Mexican politics and administrations. In March of 2012, the CEO of National Bank of Public Works and Services (Banobras) announced in a public meeting that the project is unviable in the present trade climate. However, others say that the project could be viable as soon as the economy recovers.
2. Would it benefit Yuma County? Some have wondered whether a rail line connecting Punta Colonet to the Sunset Corridor could create logistics, distribution, and other jobs within the region. Perhaps, value-added activities could be performed in Yuma County associated with intermodal trains passing through the region. Certain railcar swapping activities would need to be performed if Punta Colonet and the rail connection through Yuma County were built, but it was not a certainty that these activities would be performed in Yuma County.

Figure 5: Rail Alignment between Punta Colonet and UP Sunset Corridor



Source: Maricopa Association of Governments, excerpt from “Arizona Deep Water Ports”

Impact of Panama Canal Widening

Currently, much of the containerized cargo that reaches the United States from Asia passes through West Coast ports, of which Los Angeles/ Long Beach are by far the largest. Containers bound for the eastern half of the U.S. are put onto trains for what is referred to as a “land bridge” movement. These combined trans-Pacific/land bridge movements to the eastern U.S. compete with trans-Pacific all-water service through the Panama Canal. Instead of being transferred to rail on the West Coast, containers from Asia are carried through the Panama Canal and directly to East Coast ports. However, traditionally the all-water movements through the Panama Canal had been at a disadvantage because the dimensions of the Canal. Currently, the largest ship that could pass through the Panama Canal (so-called Panama vessels) could only carry 4,500 to 5,000 twenty foot equivalent units. Container ships are subject to economies of scale. It is less expensive per container to ship in a large ship than a smaller vessel. Ongoing plans to enlarge the capacity of the canal, will allow longer, wider, and heavier ships to traverse the system of locks with a new maximum capacity of 12,600 TEU. Most ships currently afloat would be able to fit through the Canal, although new emerging designs would not.

Industry analysts have not yet reached consensus on the impact of the canal widening upon the American port and logistics network. One school of thought suggests that the widening project will fundamentally shift the ratio of demand for port services from the West Coast to the East Coast because the economics of all-water transport to East Coast ports will improve. Another perspective questions the scale of the shift to East Coast ports. West Coast port growth was driven by trade with China, but the



drivers of this growth (namely differentials in labor and transport costs) are beginning to slow and even reverse. Furthermore, the economies of scale made possible by conveying containers on the larger vessels that will now be able to transit the Panama Canal will only amount to \$200 per container, or a 0.2 percent decrease in the total landed cost of a product held in an average container (with a content value of \$100,000). The all-water route is also slower. Transit times to the East using the West Coast/land bridge service are much faster. The added time may outweigh any transportation savings.

For the purposes of Yuma County, the widening of the Panama Canal increases the uncertainty in regards to Punta Colonet. If freight diverts from West Coast to all-water service by the Panama Canal, this may lessen the need to construct a new mega-port in Mexico.

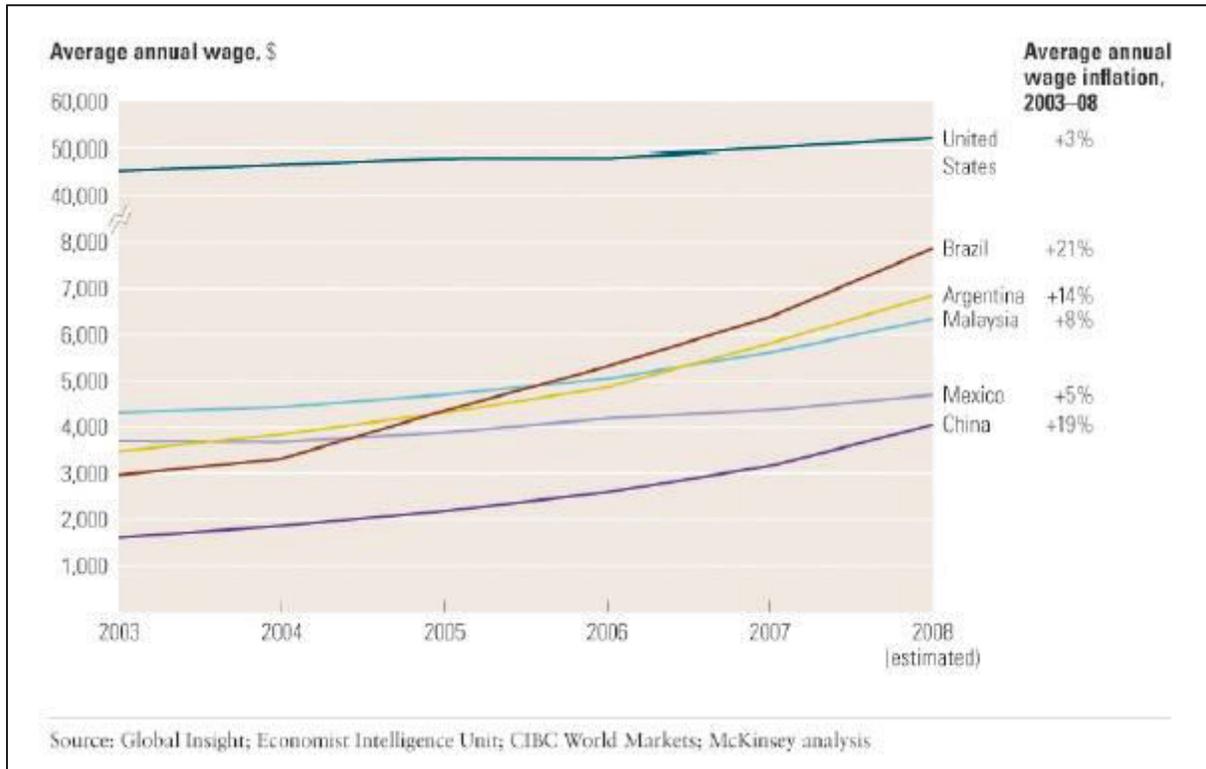
Maquiladora Operations

New developments point to the potential for increased cross-border trade associated with maquiladora operations. This could boost the level of economic activity between Yuma County and Sonora/Baja, Mexico.

According to a recent report by McKinsey & Company (**Figure 6**), in constant dollars, an oil price of \$100 per barrel this year creates the equivalent of an 11 percent tariff on imported goods traveling to the West Coast of the United States from China and Southeast Asia in 2000.¹⁵ The same McKinsey study found that Chinese wages increased by 19 percent from 2003 to 2008, while in the same period wages in Mexico grew only five percent and three percent in the United States. Since 2000, the gap between Chinese and Mexican labor rates has been quickly narrowing, and there will likely be a point where the added transportation costs from Chinese ports to American population centers will make Asian production uncompetitive for many products, compared to the *maquiladora* model of Mexico-U.S. trade.

¹⁵ “Time to rethink offshoring?,” *The McKinsey Quarterly*, September 2008. The tariff comparison was first documented in “Stung by Soaring Transport Costs, Factories Bring Jobs Home Again,” in the *Wall Street Journal*, June 13, 2008.

Figure 6: Comparison of Wage Inflation by Nation



Source: McKinsey & Company

Maquiladoras Offer a Shorter Supply Chain

A typical supply chain from a Chinese production center to an American consumer in the Midwestern United States may be 26 to 28 days. Conversely, a Mexican supply chain for a comparable product flow may only be two to six days. Thus, a move from Southeast Asian manufacturing centers to *maquiladoras* on the U.S. border offers immediately recognizable benefits in reduced inventory costs.

Lengthening the global supply chain, inherent in the decision to offshore to China and other southeast Asian nation, has made supply chains less flexible and more vulnerable to shocks (natural disasters, work stoppages, and other events) or rapid changes in quality or quantity of consumer demand.

Customization becomes more difficult, both in terms of producing a variety of options per product (and responding to demand for each variation) as well as rapidly rerouting goods to areas where unanticipated demand surfaces.

Mexico will Surpass China in Supply Chain Visibility Advantages

Supply chain visibility entails detailed tracking of orders, inventory, and shipments across the supply chain, with the goal of using this data to inform a more agile supply response to changing demand circumstances in the market.¹⁶ Common metrics tracked through visibility platforms include: order

¹⁶ Aberdeen Group, November 2006. *The Supply Chain Visibility Roadmap: Moving from Vision to True Business Value*.



acknowledgment and matching with purchase orders, arrival of raw materials at supplier, supplier production events, quality control events, carrier pick-up of goods, customs clearance, invoice status with customers and suppliers, and other events.¹⁷

Asia-Pacific Economic Cooperation (APEC)'s Transportation Working Group¹⁸ began to focus in 2012 on the lack of visibility in many aspects of the China-U.S. supply chain. In the digital realm, APEC notes the difficulties of establishing a common platform of interoperability encompassing the data requirements of shippers, forwarders, carriers, customs, and recipients. In the physical space between a factory in China and the receipt by the final customer visibility of product amount and location is extremely limited, hindering intelligent decision-making based on demand changes occurring during the 28 day Chinese supply chain. A more recent industry survey, completed by Archstone Consulting in 2008, recorded that more than half of executives currently off-shoring to China described diminished 'visibility, coordination and control over the supply chain' as a soft cost making the value proposition of Chinese manufacturing less attractive from the perspective of total landed cost.

Other Trends Considerations and Risks

The risks of theft and security breach of import shipments to the United States must also be counted in the analysis. *Inbound Logistics* reports that one in 300 shipments to or from the Mexican interior is breached, either through theft or through the comingling of drugs or other illicit cargos with the legal load. The previously commissioned *Arizona CyberPort* technical guidance illustrates the importance of this issue as shipping companies demonstrating impeccable records are allowed screening and border crossing priority, while those companies with poor records must wait while cargoes are inspected more thoroughly. This may delay such shipments by as much as 30 hours.¹⁹ (Some 3PLs in Mexico are now countering this risk by hiring their own security employees and specialized canine teams to detect drugs placed in legitimate cargo loads.) Additionally, irregular freight documentation and inconsistent maintenance of the present fleet of equipment transporting goods to the U.S. border now lead to delays as these problems are cited and recorded by U.S. authorities controlling entry at the border. Delays caused by this type of poor management on behalf of shipping companies may add substantially to inventory and shipping costs passed to customers. As the 'middle ground' between Chinese and U.S./Canadian labor rates, Mexico may be in a position in which production shifts are headcount-neutral, possibly achieving little incremental gain as Chinese production migrates to Mexico, while the same economic factors return existing Mexican production to the United States. In 2012, General Motors returned production facilities to Baltimore, Maryland from Mexico.²⁰

¹⁷ Aberdeen Group, March 2012. *Supply Chain Visibility Excellence: Mastering Complexity and Landed Costs*.

¹⁸ The 35th Meeting of the Asia-Pacific Economic Cooperation (APEC) Transportation Working Group. *Supply Chain Visibility Initiative*. February 22, 2012. Presentation to APEC member states in Bangkok, Thailand.

¹⁹ Industry average wait times at U.S. points of entry are 18 to 20 hours per shipment. Some well managed firms with good security records are able to pass in two to four hours (*Inbound Logistics*, June 2009).

²⁰ "New GM plant will bring jobs from Mexico to Baltimore County," in *Baltimore Sun*. February 15, 2012.

Role of Freight Rail within North American Transportation Network

Before considering alternatives for rail in Yuma County, it is important to define the role of rail within the North American freight network. This can help the Yuma community to predict which rail services would likely be successful and which would face greater challenges.

Freight Rail Economics of Distance and Volume

Every five years, the U.S. Census Bureau conducts the Commodity Flow Survey, which provides information on the type, value, weight, origin and destination, and mode of transportation of commodity shipments originating from manufacturing, mining, wholesale, and select retail establishments located in the 50 states and the District of Columbia. This survey is a key input into the U.S. Federal Highway Administration’s (FHWA) Freight Analysis Framework (FAF). The results of the Commodity Flow Survey for 2007 suggest that rail carries about 15 percent of the tonnage of freight for those industries sampled. Trucking is by far the dominant mode of transportation for moving freight in the United States, about 70 percent of tonnage.

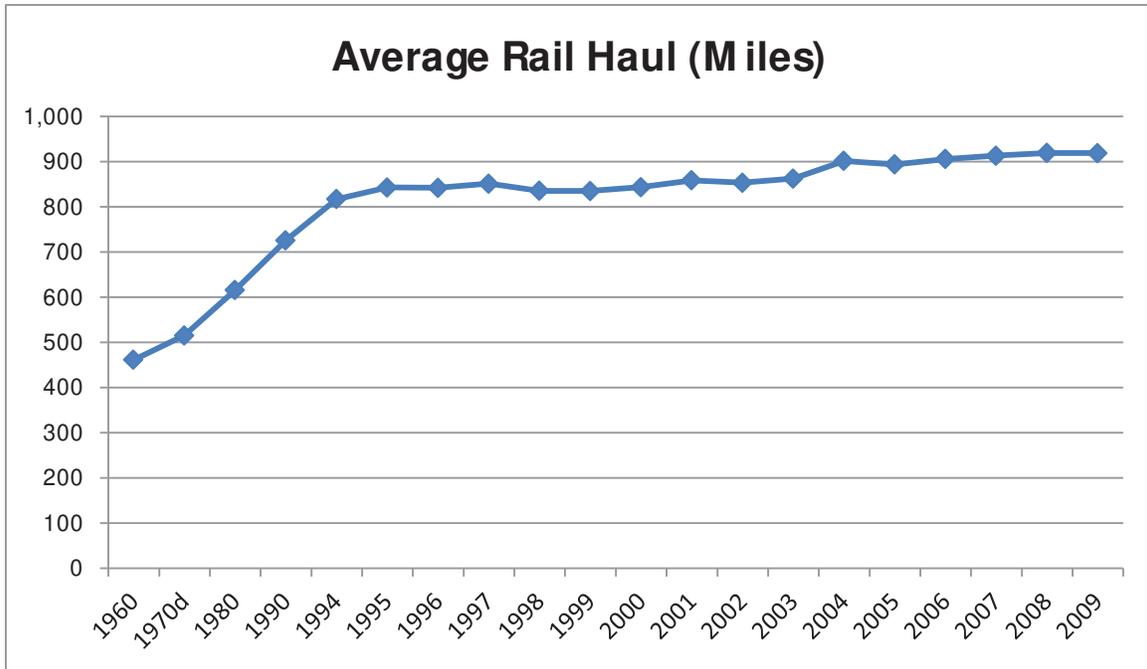
Rail is primarily used for shipping products relatively long distances. As shown in **Table 10**, most freight is hauled relatively short distances. About 65 percent of freight hauled is carried less than 100 miles. These movements are dominated by truck transportation. For movements less than 100 miles, trucking carries 82 percent of the tonnage. Only about four percent of all tons carried less than 100 miles are transported by rail. Rail does not begin to have a sizeable share of the market until at least 250 miles.

Table 10: 2007 Tonnage (000’s) by Mode by Distance from Commodity Flow Survey

Distance Range	All Modes	Rail	Truck	Other	% Rail
Less than 50 miles	13,897,488	505,008	11,497,265	1,895,215	4%
50 - 99 miles	2,510,268	197,490	1,918,711	394,067	8%
100 - 249 miles	3,170,630	687,285	1,940,368	542,977	22%
250 - 499 miles	2,119,980	671,176	1,046,340	402,464	32%
500 - 749 miles	1,237,915	523,644	462,975	251,296	42%
750 - 999 miles	1,031,758	574,882	262,550	194,326	56%
More than 1,000 miles	1,086,505	531,139	374,975	180,391	49%

Furthermore, the average distance of rail moves is increasing. According to data maintained by the U.S. Bureau of Transportation Statistics, the average length of rail haul has increased from 461 miles in 1960 to 919 in 2009 (**Figure 7**).

Figure 7: Average Rail Length of Haul



Rail tends to be used for relatively distant moves because of the economics of railroad transportation. A number of the cost components of rail moves relate to neither tonnage nor distance shipped, but are incurred at the outset of a rail move, whether a railcar is moved 10 or 1,000 miles. The U.S. Surface Transportation Board (STB) maintains the Uniform Rail Costing System (URCS), a software package that is used to determine whether the STB has jurisdiction over railroad rates. The inputs for this software package are derived from detailed reports supplied by all Class I railroads operating in the United States. Below are a series of cost estimates derived from the URCS software package, using Class I railroad data for 2010. Each rail move was assumed to represent a shipper contracting to have a single rail car moved by a Western railroad (BNSF, UP, KCS, CP). Each railcar is assumed to carry 80 tons worth of grain and is carried in a railroad-supplied covered hopper railcar. As shown in **Table 11**, the cost of shipping the railcar 250 miles is about 90 percent higher than shipping the car 10 miles, although the product is being shipped 25 times as far.

Table 11: Variable Cost of Moving 80 Ton Covered Hopper of Grain

Mileage	Variable Cost	Variable Cost per Ton-Mile
10	\$596.09	\$0.75
20	\$659.29	\$0.41
30	\$679.84	\$0.28
40	\$700.38	\$0.22
50	\$720.93	\$0.18
100	\$823.66	\$0.10
250	\$1,131.84	\$0.06
500	\$1,645.47	\$0.04
750	\$2,159.10	\$0.04
1,000	\$2,672.74	\$0.03

As reference, the American Transportation Research Institute (ATRI) estimates that the marginal cost per mile of operating a truck is about \$1.73.²¹ If a truck has a payload of 20 tons, the marginal cost per ton-mile is \$0.09. Given the results of **Table 19**, rail in this instance does not become a less expensive option than trucking until the distance is over 100 miles. And this does not include the additional convenience and lower transit times of shipping by truck.

Rail transportation also is subject to the economics of shipment volumes. It is far less expensive per ton to ship an entire trainload of a given commodity than to ship a single carload. In order to ship the carload, a railroad must gather each individual car, consolidate cars into a train. Trains are then broken down and reassembled at intermediate classification yards. Then, individual carloads are delivered to industry. If the same train can travel back and forth between two locations as a unit, costs are much lower, not to mention the transit times. **Table 20** below includes the same information on the left hand columns as **Table 19**, but the URCS model was also used to estimate the variable cost of shipping 80 car train-loads of covered hopper railcars, each containing 80 tons of grain. As can be seen, the costs per ton-mile decline dramatically when cars are shipped in unit trains. Unit train service is also much faster. A shipper who delivers products 1,000 miles by unit train could potentially expect the train to complete one cycle within a week. In contrast, a shipper delivering product 1,000 miles by carload service would likely wait for weeks before seeing the now empty railcar re-appear at his/her location.

²¹ http://www.atri-online.org/research/results/economicanalysis/Operational_Costs_OnePager.pdf

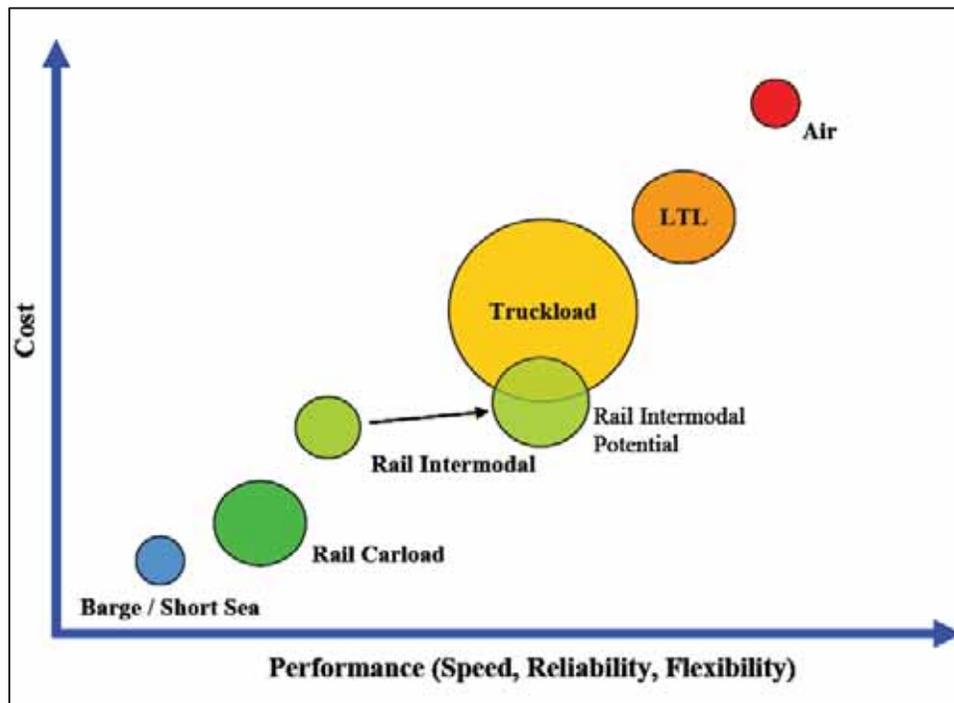
Table 20: Comparison of Moving Covered Hoppers of Grain by Carload and Unit Train

Mileage	Single Car		80 Car Unit Train	
	Variable Cost	VC per Ton-Mile	Variable Cost	VC per Ton-Mile
50	\$720.93	\$0.18	\$17,190.80	\$0.05
100	\$823.66	\$0.10	\$22,563.26	\$0.04
250	\$1,131.84	\$0.06	\$38,680.65	\$0.02
500	\$1,645.47	\$0.04	\$65,542.97	\$0.02
750	\$2,159.10	\$0.04	\$92,405.29	\$0.02
1,000	\$2,672.74	\$0.03	\$119,267.60	\$0.02

Freight Rail Usage by Commodity

Modal usage by shippers is influenced by both the level of service per mode as measured by transit time, reliability, flexibility and the transportation cost of moving goods by that mode. Generally, inexpensive transportation modes offer lower service levels than more expensive transportation modes. As shown in **Figure 8**, rail provides relatively low cost, low performance transportation service

Figure 8: Modal Service versus Cost Continuum



Source: *The Arizona Multimodal Freight Analysis Study*

Due to the relative cost of holding inventory in transit compared to transportation costs, rail tends to be used for moving bulky commodities with low value per ton. However, other factors influence the usage

of rail transportation as well, such as whether commodity distribution patterns lend themselves to those commodities being shipped in trainload quantities. **Table 30** displays the tonnage by commodity shipped by truck and rail, as well as the average value per ton of commodities. Commodities are displayed by Standard Classification of Transported Goods (SCTG). As can be seen, rail usage is highly concentrated among a few commodities. For only two commodity groups is the majority of tonnage shipped by rail. Rail's share exceeds five percent for only 20 of 42 SCTG commodity categories. For a number of commodity categories, rail's share of shipments is negligible. The results of **Table 30** suggest that it is important to understand the nature of what is being shipped to determine if rail service between two markets would likely play a significant role.

Table 30: Commodity Tonnage (000's) Transported by Truck and Rail, Value per Ton

Row Labels	All modes	Rail	Truck	% Rail	Value per Ton
Coal	2,832,322	2,030,365	433,919	72%	\$27
Metallic ores and concentrates	138,005	89,721	12,744	65%	\$448
Cereal grains	1,025,286	321,909	467,833	31%	\$165
Basic chemicals	825,163	209,327	398,243	25%	\$658
Plastics and rubber	372,783	76,129	259,068	20%	\$2,626
Fertilizers	298,726	57,537	193,705	19%	\$292
Pulp, newsprint, paper, and paperboard	290,761	55,999	205,574	19%	\$873
Base metal in primary or semifinished forms and in finished basic shapes	729,880	95,387	572,667	13%	\$1,338
Coal and petroleum products, nec	1,156,376	143,253	679,900	12%	\$464
Transportation equipment, nec	13,629	1,628	9,316	12%	\$25,517
Nonmetallic minerals nec	543,091	59,107	402,772	11%	\$62
Waste and scrap	611,756	60,331	496,056	10%	\$269
Animal feed and products of animal origin, nec	490,721	46,314	406,537	9%	\$360
Other agricultural products	423,780	31,120	308,269	7%	\$678
Milled grain products and preparations and bakery products	240,046	17,180	204,717	7%	\$1,193
Alcoholic beverages	228,025	13,694	203,372	6%	\$1,389
Other prepared foodstuffs and fats and oils	936,870	53,193	842,129	6%	\$1,024
Motorized and other vehicles (including parts)	266,252	13,937	212,688	5%	\$6,815
Chemical products and preparations, nec	247,073	12,642	216,315	5%	\$2,685
Wood products	647,547	29,152	585,193	5%	\$568
Articles of base metal	263,846	11,329	237,610	4%	\$2,943
Gravel and crushed stone	4,078,913	162,319	3,570,852	4%	\$10
Natural sands	919,252	26,956	815,651	3%	\$15
Nonmetallic mineral products	2,313,580	44,559	2,187,233	2%	\$170
Logs and other wood in the rough	214,162	3,381	204,364	2%	\$63
Paper or paperboard articles	164,466	2,384	154,638	1%	\$1,436
Electronic and other electrical equipment and components and office equipment	95,056	1,160	75,810	1%	\$22,018

Row Labels	All modes	Rail	Truck	% Rail	Value per Ton
Machinery	133,456	998	119,034	1%	\$9,415
Meat, fish, seafood, and their preparations	196,824	1,447	188,589	1%	\$2,817
Printed products	102,869	735	90,947	1%	\$3,702
Fuel oils	1,279,618	7,125	668,207	1%	\$584
Miscellaneous manufactured products	183,688	727	160,804	0%	\$5,338
Gasoline and aviation turbine fuel	1,916,610	6,661	1,093,506	0%	\$692
Mixed freight	601,844	1,741	585,502	0%	\$3,098
Furniture, mattresses and mattress supports, lamps, lighting fittings, and illuminated signs	53,266	99	49,358	0%	\$5,718
Textiles, leather, and articles of textiles or leather	93,456	72	80,179	0%	\$10,135
Pharmaceutical products	38,152	1	29,522	0%	\$40,431
Commodity Unknown	342	0	781	0%	\$8,500
Live animals and live fish	11,081	0	10,904	0%	\$1,676
Monumental or building stone	57,477	0	55,057	0%	\$181
Precision instruments and apparatus	11,337		7,149	0%	\$53,739
Tobacco products	6,577		6,472	0%	\$21,454

Role of the Shortline and Regional Railroad Industry

“Short line railroad” is an umbrella term that is often applied to Class II and Class III rail carriers. Per current definition by the U.S. Surface Transportation Board, a Class I rail carrier has annual revenues in excess of \$398.5 million; a Class II carrier has revenues between \$31.9 million and \$398.5 million per year, while Class III carriers have revenues less than \$31.9 million per year. Many of today’s short line railroads were created through the divestiture of low volume/low density branch rail lines by Class I carriers. Rail lines were divested following deregulation of the rail industry through the Staggers Rail Act of 1980. As the chairman of the Aberdeen & Rockfish Railroad noted in his brief history of the short line industry, “*The Staggers Rail Act of 1980 ended most of the economic regulation on the rail industry and among many things gave railroads an exit strategy for unprofitable lines. The major railroads quickly began to market unproductive branches to short line operators and the small railroad industry began an unprecedented rebirth.*”²² Small railroads are able to operate rail lines which were unprofitable to larger carriers because their cost structures are lower. In many cases, the investment needs of these rail lines outstrip the resources of short line rail carriers, and small railroads receive assistance by public entities for major capital projects, such as through state short line rehabilitation programs, tax credits, or other means.

The president of the ASLRRA recently referred to the short line industry as providing the “First Mile-Last Mile for Shipper / Receiver.”²³ Short Line railroads perform a gathering function, collecting individual or groups of railcars to interchange with Class I rail carriers, which perform the long distance line haul

²² American Short Line and Regional Railroad Association, *Short Line and Regional Railroad Facts and Figures, 2007 Edition*.

²³ Richard F. Timmons, President of the American Short Line and Regional Railroad Association, “Connecting the Dots,” presentation to the RailTrends 2011 Conference, New York City, NY, November 1-2, 2011.

function. About 50 percent of rail traffic on short lines is received from another carrier, while 36 percent is forwarded to another carrier.²⁴ A relatively small portion of short line traffic is “local,” i.e. originates and terminates on one rail carrier’s system.

Trends of Railway Mileage

Most of the railway network within the United States was constructed before 1915. The rail network peaked at about 250,000 miles around 1915. Since this time, the network has been rationalized. As shown in **Table 20**, the mileage of the U.S. rail network declined by over half between 1960 and 2000. Over the same time, the volume of traffic on the remaining network as measured by ton-miles nearly tripled. Much of the reduction mileage was the result of deregulation as mentioned earlier. Reduction of mileage in the U.S. rail network has slowed recently as abandonments in most areas have dropped off. However, as show in **Table 20**, much of the emphasis within the industry has focused on placing more traffic on the existing network.

Table 12: Trends in Road Mileage, Ton-Miles, Ton-Miles per Mile

Year	Revenue Ton-Miles of Freight (millions)	Miles of Road	Ton-Miles/Mile (Millions)
1960	572,309	207,334	2.8
1970d	764,809	196,479	3.9
1980	918,958	164,822	5.6
1990	1,033,969	119,758	8.6
1994	1,200,701	109,332	11.0
1995	1,305,688	108,264	12.1
1996	1,355,975	105,779	12.8
1997	1,348,926	102,128	13.2
1998	1,376,802	100,570	13.7
1999	1,433,461	99,430	14.4
2000	1,465,960	99,250	14.8
2001	1,495,472	97,817	15.3
2002	1,507,011	100,125	15.1
2003	1,551,438	99,126	15.7
2004	1,662,598	97,662	17.0
2005	1,696,425	95,664	17.7
2006	1,771,897	94,801	18.7
2007	1,770,545	94,313	18.8
2008	1,777,236	94,082	18.9
2009	1,532,214	93,921	16.3

Source: U.S. Bureau of Transportation Statistics

While the general trend of the U.S. rail industry has been toward a reduction of rail track mileage and “rationalization” of the rail network, there have been some instances of new rail lines proposed and/or constructed. **Table 21** displays ongoing applications to the U.S. Surface Transportation Board for

²⁴ Richard F. Timmons, President of the American Short Line and Regional Railroad Association, presentation to the Government Accountability Office, March 30, 2010.

authority to construct new rail lines since 2007. Generally, the proposed new alignments are put forward to serve a very specific purpose, such as to serve a specific industrial park, producer or consumer of raw materials, etc. Proposals involving significant project complexity or generating public opposition, such as the Tongue River Railroad, or the DM & E build out to the Powder River Basin, have languished for years.

Table 13: Proposed New Rail Alignments before the U.S. Surface Transportation Board

Applicant	Nature of Project	Mileage	Built?	Comments
Tongue River Railroad (TRR)	Construct a rail line between Miles City and Decker, MT to serve as shortcut for BNSF coal trains from Powder River Basin (PRB) to Upper Midwest. Also provide access to new coal mining areas.	130	No	The original application associated with the TRR was filed in 1983. Nothing has been built.
Vaughan Railroad Company (CONSOL Energy)	Construct rail to serve new coal mine in Monongalia County West Virginia	5.55	No	Application process began in 2008. Not yet built.
Alaska Railroad Corporation (ARRC)	Construct a new line to serve Port MacKenzie from ARRC's existing line.	30 – 45	No	Application process began in 2008. Not yet approved.
City of Davenport, IA	Construct rail line to the Eastern Iowa Industrial Park	2.8	Under construction sched. completion summer 2012	
Port of Moses Lake, WA	Construct new rail line in addition to rehabilitate existing rail line in order to provide a rail bypass for the town of Moses Lake and to provide access to industrial park	7.6 new alignment	No	Environmental work has been completed, but the construction of the project is currently unfunded.
Arizona Eastern Railroad (AZER)	Construct rail line in Graham County to access Safford copper mine	12.1	No	
Southwest Gulf Railroad	Build a rail line to Vulcan Materials Quarry in Medina County, TX	7	No	Approved by the STB but challenged in court.
Itasca County	Build a rail line to a new steel	9	No	Steel plant has



Applicant	Nature of Project	Mileage	Built?	Comments
Regional Rail Authority	mill owned by Minnesota Steel Industries, LLC at Nashwauk, MN			been built.
Six County Association of Governments	Rail access to coal mine 30 miles east of Salina, UT owned by Southern Utah Fuel Company	43	No	Approved by STB.
Dakota, Minnesota & Eastern Railroad (DM&E)	Build a rail line from South Dakota to Powder River Basin coal mining region of Wyoming and Montana	280	No	Approved by STB, but project relied on financing from FRA, which fell through.
Ameren Energy Generating Company	Build out to competing railroads from Coffeen generating station in Coffeen, IL	13	No	

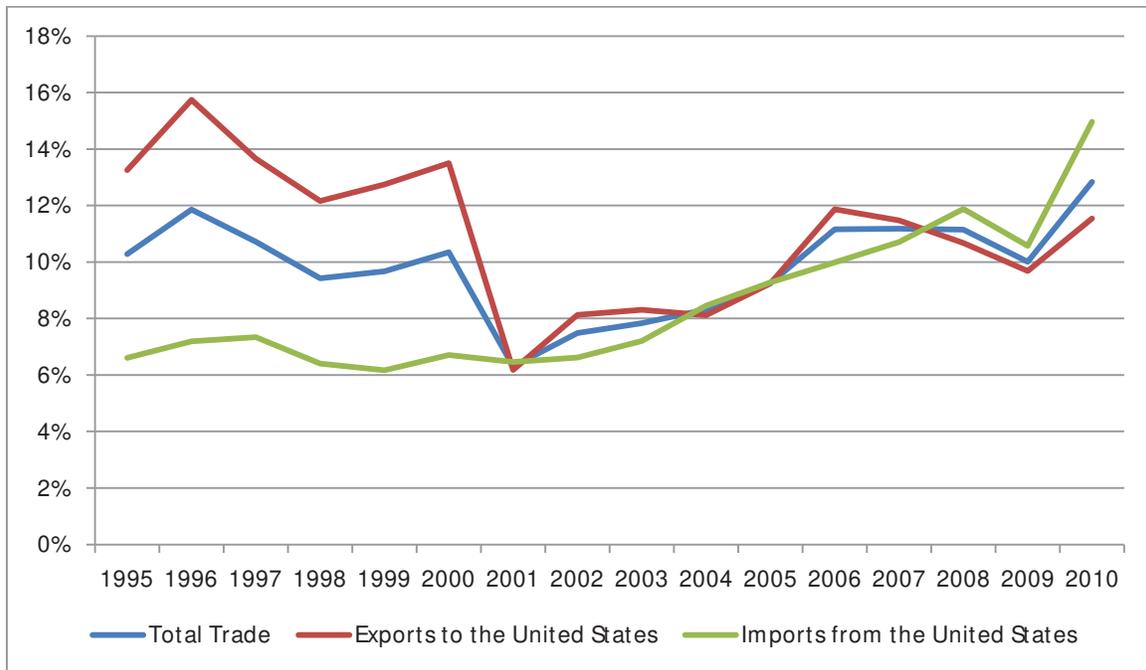
In certain cases, rail lines can be built without STB approval, such as when the track is considered a “spur” that does not increase the extent of the rail network. For example, the Indiana Rail Road recently completed a new 5.2 mile rail line to serve the Bear Run Coal Mine in Sullivan County, IN. As **Table 13** suggests, additions to the U.S. rail network are relatively rare and difficult to accomplish.

Role of Freight Rail within Mexican Transportation System

Rail has a lower market share in Mexico relative to rail within the United States. For example, data by the U.S. Bureau of Transportation Statistics suggests that U.S. railroads handled about 39 percent of all ton-miles of freight in the United States in 2007, whether carried by truck, rail, maritime, air, or pipeline.²⁵ Comparable statistics for rail in Mexico suggest the Mexican carriers handle only about 11 percent of ton-miles in that country. The percentage of tonnage handled by Mexican railroads is less, at about seven percent of all tons of freight in 2007. However, rail’s share of U.S./Mexico cross-border trade is higher. In 2007, rail was about 11 percent of cross border tonnage and increased to 13 percent in 2010. Rail’s share of cross border tonnage decreased between 1996 and 2001, bottoming out at just above six percent. Since that time, rail’s share of cross-border freight has doubled. Rail’s share of U.S. exports to Mexico has increased in particular. This southbound traffic consists primarily of grain and agricultural products.

²⁵ Most recent year for which data is available. Because rail moves are longer on average, rail’s percentage of ton-miles exceeds rail’s percentage of tons carried.

Figure 9: Percentage of U.S./ Mexico Trade Carried by Rail in Tons



While the trends shown in **Figure 9** are encouraging, it is important to keep in mind that while rail fulfills a transportation niche within the United States, that niche is more limited in Mexico and in the U.S.

Divertible Truck Traffic

An analysis has been completed, which estimates the volume of truck traffic to and from Yuma County that could potentially divert to rail. The source information for the truck traffic is the disaggregated FAF3 data summarized in **Table 22** and **Table 23**. Traffic is identified as potentially divertible based the truck/ rail modal share by commodity and distance as reported by the U.S. Census Bureau Commodity Flow Survey. The modal share source data is the same as that which underlies **Table 18** and **Table 30**. The nationwide modal split is assumed to represent a rough approximation of the economics of shipping rail versus truck by distance and commodity. The distance between each domestic FAF zone and Yuma County is categorized into one of the mileage ranges as found in **Table 18**. For a given distance range and commodity, if rail has a 50 percent market share nationwide while truck has a 50 percent market share, half of the tonnage of Yuma County truck flows of that commodity and distance are assumed to be truck/ rail divertible.

The intent of this analysis is to gain a general sense of some of the commodities and truck moves that could potentially be shifted to rail were rail access and infrastructure improved in Yuma County. This analysis has a number of limitations. For instance, some traffic may move by truck or rail for reasons unrelated to distance or commodity. FAF3 flows are grouped into 43 commodity categories. Within each commodity category are a broad range of products, some of which could be appropriate for rail



transportation, while some are not. National averages may not be applicable to specific flows to/from Yuma County. But this analysis is not intended to be precise. Rather it illuminates potential alternatives rather than specific recommendations.

The results (**Table 22**) suggest that the FAF zones with the highest volumes of truck traffic to/from Yuma County which could be diverted to rail are areas within other parts of the Southwest. Although rail market share tends to increase with distance and markets within the Southwest are relatively close, these are the areas with which Yuma County conducts by far the most trade, so the volume of divertible truck tonnage is higher.

Table 14: Truck Traffic to and from Yuma County that is Potentially Divertible to Rail by FAF Zone - 2012

FAF Zone	Tons
Phoenix AZ MSA	736,807
Los Angeles CA CSA	472,254
Remainder of Arizona	367,446
Las Vegas NV CSA	259,055
Tucson AZ MSA	234,054
Salt Lake City UT CSA	134,650
New Mexico	76,510
Remainder of California	76,213
San Diego CA MSA	49,863
Remainder of Utah	26,043
Remainder of Nevada	19,516
Other	183,176

Source: FAF3, Commodity Flow Survey and Parsons Brinckerhoff

Potentially divertible commodities carried by truck to and from Yuma County include a range of materials, some of which currently move by rail as well, such as Cereal Grains, Fertilizer, Basic Chemicals (**Table 23**). Others do not currently move to/from Yuma County by rail, such as Gravel, Waste/ Scrap.

Table 15: Truck Traffic to and from Yuma County that is Potential Divertible to Rail by FAF Commodity - 2012

Commodity	Tonnage
Gravel	602,988
Waste/scrap	343,103
Metallic ores	301,722
Other ag prods.	188,715
Nonmetallic minerals	163,455
Base metals	139,331
Cereal grains	137,061
Nonmetal min. prods.	120,329
Fertilizers	84,208
Animal feed	83,223
Plastics/rubber	82,323
Newsprint/paper	80,331
Coal-n.e.c.	73,723
Basic chemicals	68,441
Natural sands	67,282
Other	99,351

Source: FAF3, Commodity Flow Survey and Parsons Brinckerhoff

Southwestern metropolitan areas are expected to account for the fastest increase in truck tonnage that could potentially divert to rail between 2012 and 2035 (**Table 24**).

Table 16: Increase in Divertible Truck Tons between 2012 and 2035 by FAF Zone

FAF Zone	2012 – 2035 Chg Tons
Phoenix AZ MSA	872,256
Tucson AZ MSA	293,457
Los Angeles CA CSA	259,051
Las Vegas NV CSA	178,852
New Mexico	69,514
Salt Lake City UT CSA	66,410
San Diego CA MSA	17,224
Remainder of California	15,699
Remainder of Tennessee	13,737
Remainder of Utah	11,511
Other	57,976

Source: FAF3, Commodity Flow Survey and Parsons Brinckerhoff

The commodities with the highest existing volumes that could potentially divert to rail are the same commodities with the highest expected increase in rail divertible tonnage between 2012 and 2035 (Table 25).

Table 17: Increase in Divertible Truck Tons between 2012 and 2035 by Commodity

Commodity	2012 – 2035 Chg Tons
Gravel	843,196
Waste/ scrap	551,480
Other ag prods.	81,849
Base metals	79,944
Natural sands	78,882
Cereal grains	78,515
Nonmetal min. prods.	48,491
Plastics/ rubber	45,588
Nonmetallic minerals	37,447
Animal feed	20,449
Chemical prods.	20,119
Other foodstuffs	15,448
Other	-45,719

Source: FAF3, Commodity Flow Survey and Parsons Brinckerhoff

Yuma County Freight Rail Needs

Summary of Rail Lines in Yuma County

With the exception of shipper operations at the southern end of the Wellton rail line, rail service Yuma County is exclusively provided by the Union Pacific Railroad (UP). UP owns and operates actively used rail property within the county (**Figure 10**).

Figure 10: Rail Network in Yuma County



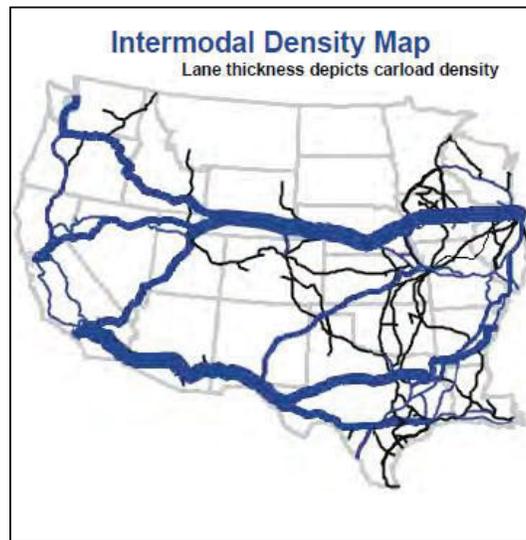
Sunset Corridor

Crossing the county is UP's Sunset Corridor. The Sunset Corridor connects the Union Pacific Railroad between Los Angeles California and El Paso Texas. The Union Pacific Railroad Sunset Corridor enters Yuma County as a single track on the northeast corner of downtown Yuma. The Sunset Corridor then travels to the south approximately 2.5 miles where the track then turns back to the east and extends to the northern tip of the Gila Mountains. Once reaching the Gila Mountains the Sunset Corridor generally follows the Gila River to the eastern boundary of Yuma County.

The Sunset Corridor is a very heavily used rail line. The 2007 State of Arizona Railroad Inventory and Assessment reported that approximately 44 to 49 trains per day travel on the Sunset Route in Southern Arizona. The Sunset Corridor, in addition to the BNSF Transcontinental (Transcon) rail line, is a primary conduit by which consumer products from Asia travel from the Ports of Los Angeles/ Long Beach to the interior of the nation. The typical television purchased in the United States and manufactured in China may very well travel through Yuma on the Sunset Corridor before making its way to a retail

establishment in the eastern portion of the nation. Intermodal is the dominant train type on the Sunset Corridor (**Figure 11**). The mainline speed of the Sunset Corridor around Yuma is relatively fast for a freight rail line at about 65 miles per hour. In general, because intermodal trains run on a scheduled service, they are required to operate at faster speeds than general freight trains. As an example, UP's average train speed in March 2012 was 26.0 miles per hour, while the average intermodal train speed was 31.7.²⁶ Because intermodal is the dominant train type passing through Yuma County, these have a faster required speed than most freight trains.

Figure 11: UP Intermodal Density - First Half of 2006



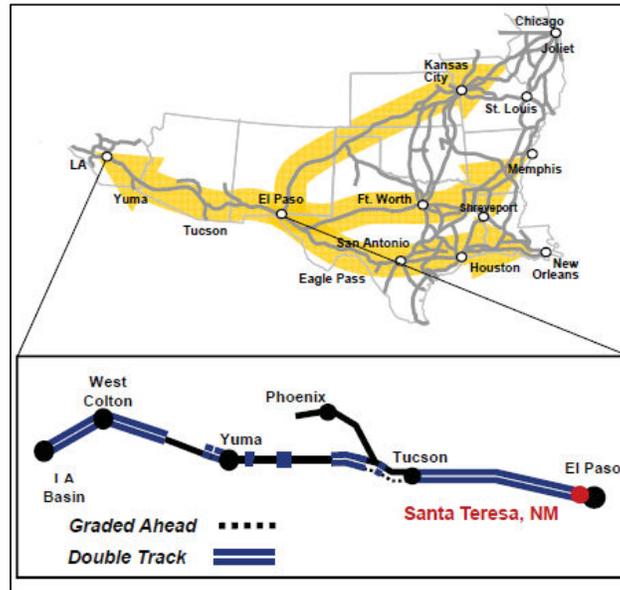
Source: UP Railroad

Due to the strategic importance of the Sunset corridor, UP has embarked upon a major investment program to add a second parallel track to increase the capacity of the Sunset Corridor (**Figure 12**). According to UP, the railroad expects to have double tracked 70 percent of the Sunset Corridor by the end of 2012.²⁷

²⁶ <http://www.railroadpm.org/home/RPM/Performance%20Reports/UP.aspx>

²⁷ Eric Butler of the Union Pacific Railroad presentation to the Los Angeles Transportation Club, April 3, 2012.

Figure 12: Double Tracking the Sunset Corridor



Source: UP Railroad

In this, Yuma County represents somewhat of a bottleneck for the railroad. There is little room to build a second track at UP's current crossing over the Colorado River. There has been discussion of building a crossing at a new location, but this alternative has additional logistical problems.

Wellton Branch

The UP owns a branch line to Roll, AZ. This rail line had previously operated continuously to Phoenix, but the segment between Roll and just west of Buckeye has been out of service since 1997, so service on the line now ends at Roll. According to the Arizona State Rail Plan, McElhanev Cattle Company has trackage rights over six miles of this rail line to serve its feedlots in Wellton. The company handles about 10,000 carloads per year, which makes it by far the largest shipper in Yuma County. The 2007 State of Arizona Railroad Inventory and Assessment identified this segment of having Federal Railroad Administration track class rating of "Class 2," which indicates that the segment is in good or fair state of repair. The estimated cost of reopening the segment between Roll and Buckeye to basic through freight operations is estimated to be about \$40 to \$60 million. Transportation officials within Arizona have also been eyeing the Wellton line for passenger rail operations. Before the connection between Phoenix and Yuma was broken, the line was used by Amtrak trains. The Arizona State Rail Plan estimates that the cost of restoring the line to accommodate passenger operations would be \$150 - \$300 million.

MCAS (Marine Corps Air Station) Spur

The MCAS Spur connects to the Union Pacific Railroad Sunset Corridor just east of Avenue 3E, south of Gila Ridge Road in Yuma. The original MCAS Spur extended south along Avenue 3E to approximately 36th Street where it entered the MCAS property. The MCAS Spur was originally constructed to provide rail

service the Marine Corps Air Station. The portion of the MCAS Spur south of 30th Street has been inactive for many years and has not been maintained. The spur tracks are abandoned in place and buried under the existing pavement at the roadway crossing of 32nd Street, just east of Avenue 3E. The northern portion from the Union Pacific Railroad Sunset Route to 30th Street experiences very limited use by local businesses. The US Department of Navy owns the existing tracks and right of way. The 2007 State of Arizona Railroad Inventory and Assessment identifies the Federal Railroad Administration track class rating as “Not in Route System”

Yuma Valley Railway (a.k.a. Somerton Industrial Lead)

The Yuma Valley Railway (**Figure 13**) was built in the early 1900’s for the Reclamation Service. The Yuma Valley Railway connected to the Southern Pacific Railroad (currently Union Pacific Railroad) near the existing Union Pacific Railroad Sunset Route crossing of the Colorado River northeast of downtown Yuma. The Railway then traveled along the east/south bank of the Colorado River to San Luis Arizona. The Yuma Valley Railway was built to aid in the development of the Yuma Valley farmland. According to the 2007 State of Arizona Railroad Inventory and Assessment the portion of the Yuma Valley Railway from Somerton to San Luis was abandoned prior to 1979 and the track was removed and no longer exists. The remaining portion from Yuma to Somerton was used as passenger tourist operation on a very limited basis from the mid 1980’s until 2005. Outreach efforts to the Arizona Corporation Commission indicate that the condition of the Yuma Valley Railway was deteriorating in the mid 2000’s that have caused the Railway to be unused at the current time. The U.S. Bureau of Reclamation owns the existing tracks and right of way. The 2007 State of Arizona Railroad Inventory and Assessment identify the Federal Railroad Administration track class rating as “Excepted Track,” meaning that it is in poor state of repair.

Figure 13: Yuma Valley Railway Line



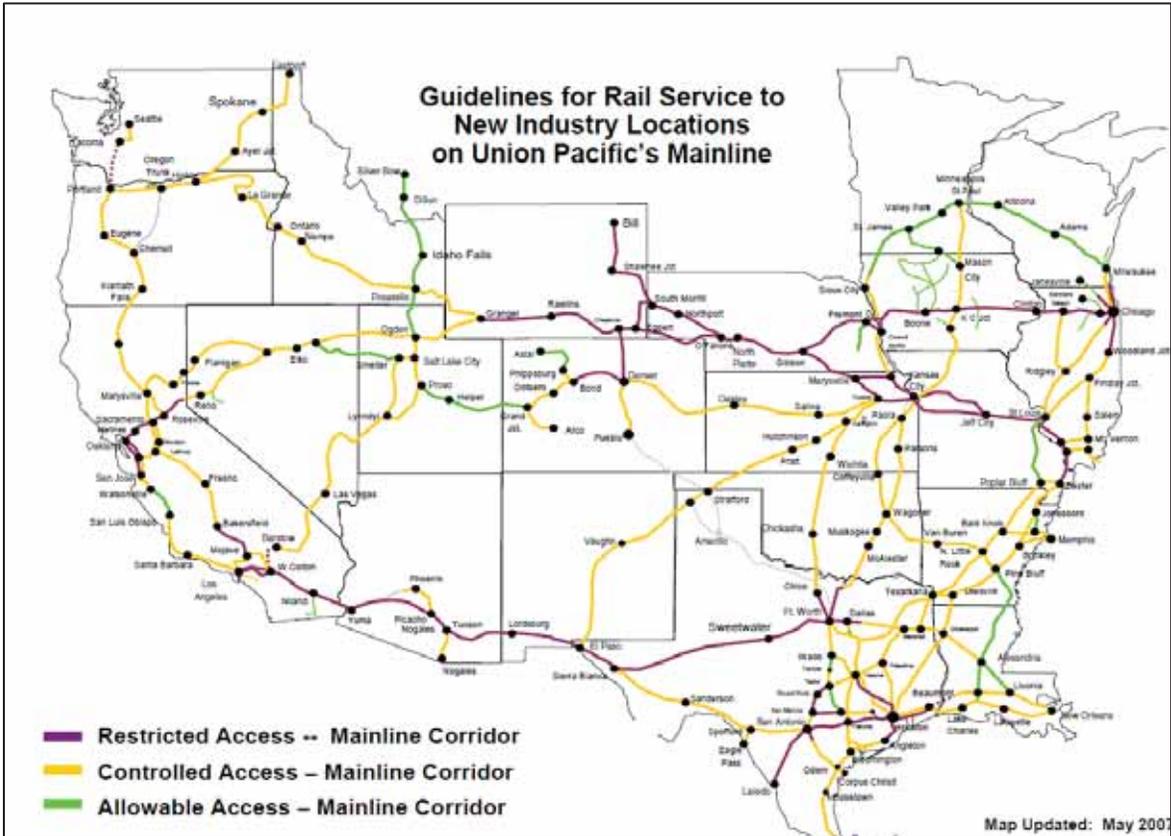
Source: Chris Guenzler

Union Pacific Industrial Standards

As described above, the Union Pacific Sunset Corridor is strategically important within UP’s network. By a roadway analogy, the Sunset Corridor is a busy interstate highway. Unfortunately, for those exploring industrial development opportunities along the Sunset Corridor, this adds to the cost of new rail development because UP considers the Sunset Corridor a “Restricted Access” area (**Figure 14**). Similar to an interstate highway, new locations on the Sunset Corridor are required to have an on-ramp and off-

ramp. Trains must enter or leave the Sunset Corridor at speed, and running track must be employed to enable trains to accelerate and decelerate to an appropriate speed, similar to an acceleration lane on a highway. UP guidance requires that customers have approximately 8,500 feet to 9,000 feet of running track capacity. However, this represents a minimum of running track, and depending upon the location and usage, UP's requirements can total up to six miles of running track.

Figure 14: Union Pacific Guidelines for New Industrial Locations



Source: UP Railroad

Stakeholder Views on Existing Rail Service in the Yuma Region

The study team spoke with a range of stakeholders about the quality of rail service in the region, including government representatives, shippers, and economic development officials. Many of the comments represent the types of concerns that rail shippers typically have across the country and are not specific to Yuma County. UP trains are sometimes late. Train crews run into their hours of service deadlines and are unable to switch cars to and from industry in a timely manner. UP does not always make equipment and train crews available as fast as shippers might like. Some concerns are more specific to Yuma County. One shipper commented that UP's service had improved recently, and that the carrier was more willing to handle carload service to/from Yuma County than was previously the case. Another commented that the railroad prefers not to serve small sidings. In a sense, these latter concerns are consistent with trends in the railroad industry. Class I railroads generally prefer to provide long-



distance, line haul transportation. They prefer to outsource local switching operations to short line railroads or other entities. At one time, the idea of a short line railroad providing local switching to customers around Yuma and Wellton was discussed.

The study team did not encounter any specific concerns with the current rail infrastructure, except for its lack of availability. Economic development officials noted that they are frequently at a disadvantage in bidding for businesses to locate in the area because relatively few available locations are rail-served. There are a number of parcels available for development along the I-8 corridor, but none have rail access. A large parcel is available in Wellton, but it has no rail access. One thousand acres are available for development near San Luis, but there is no rail access. The list of large, developable areas in Yuma County is relatively small. Only about six percent of the land in Yuma County is privately owned. Most land in the area is restricted. For those areas that are available, rail access could be a benefit.

Although no shipper specifically mentioned it, another issue in regards to rail access in Yuma County is a lack of multimodal facilities. For those shippers that do not have direct access to the rail network truck/rail multimodal facilities can provide an opportunity to access railroad transportation without building or maintaining their own rail siding. In these cases, truck provides the local connection, while rail provides the long-distance transportation service at lower costs. Multimodal facilities are typically grouped into several categories depending upon the type of service provided:

- Container-on-Flatcar (COFC) or Trailer-on-Flatcar (TOFC) intermodal terminal. These facilities represent a substantial commitment for railroads and local partners both in terms of the investment required to construct the facility and resources required to supply the service. They are typically located in large metropolitan areas. Most intermodal terminals cost at least \$15 million to construct. Railroads prefer and sometimes require that they generate sufficient quantities of rail traffic to justify regular dedicated train service. Although there are examples, particularly among eastern railroads, of intermodal terminal generating blocks of cars rather than entire train-loads.
- Transload facilities. These are used to transfer bulk commodities between truck and rail. They are much more common than intermodal terminals because they require less investment and do not require the same economies of scale. Transload facilities are located in both large and small metropolitan area. They vary considerably in the types of equipment provided. Some include extensive material storing and handling equipment, while others are more similar to a “team track,” which is essentially an area where a truck can drive next to a train for loading/unload.
- Break bulk facilities. Break bulk facilities are used for transferring materials that are neither containerized nor bulk between truck and rail. They are often constructed in conjunction with warehouses, although break bulk materials such as lumber and construction supplies can be stored outside. They can also be coupled with refrigerated facilities, by which perishable commodities are transferred between refrigerated warehouses and refrigerated railcars.
- Automotive ramps. Trainloads of cars and trucks brought to a facility and unloaded for local distribution.

To the study team’s knowledge, none of these types of facilities are available for common usage by shippers in the region. The study team is aware that the UP owns 700 acres near Redondo Drive and Arizona Ave which has been under consideration for a transload facility.

Regional Rail Network

Mexico

The closest rail line in Mexico to Yuma County is the Ferromex Puerto Penasco Subdivision which runs south of the U.S./Mexican border between Mexicali and Benjamin Hill (**Figure 15**). This line is single track and is dispatched by manual track warrant control. Most of the rail line is rated to 75 kilometers per hour or about 47 miles per hour. The longest distance between passing sidings on the line is about 41 miles. The Puerto Penasco subdivision is a relatively low capacity, low density rail line.

Figure 15: Mexican Rail Network



Source: Master Plan for the Multimodal Corridors in Mexico, SCT, 2010

Imperial County, California

The regional rail network in Imperial County, California includes a mixture of high density and low density rail lines (**Figure 16**). Within Imperial County are other segments of the Sunset Corridor. Conditions and traffic mix on this rail line in Imperial County are not substantially different from what exists in Yuma County. However, within Imperial County are several branch lines and a short line railroad. The UP Calexico Subdivision runs south from Niland to Calexico. It carries less than five million gross tons per year, which makes it a light density rail line. The UP Calexico Subdivision interchanges with the Ferromex at Calexico. Much of what crosses the border by rail at Calexico consists of petroleum and food products. The UP El Centro Subdivision runs between El Centro and Plaster City. It is also a light density rail line, carrying less than 5 million gross tons per year. It is dispatched by manual track warrant

control. The UP El Centro Subdivision interchanges with a short line railroad at Plaster City, the Carrizo Gorge Railway (CRZY). This rail line runs 114 miles between Plaster City and San Ysidro, CA, forty-four miles of which is in Mexico running between Tijuana and Tecate, Mexico. The line originally opened in 1919 but has been intermittently closed and opens during the intervening years. It was blocked during the 1980's but was reopened in 2004.

Figure 16: Rail Lines in Imperial County, CA



Conclusion and Next Steps

Conclusions

As mentioned previously, this Technical Memorandum is intended to provide information that can be used to identify priorities for rail investment in Yuma County. From data exhibited, the following conclusions can be derived:

- Agriculture is an important component of Yuma County's economy. The county has considerable advantages in producing agriculture, given the County's warm climate, access to the Colorado River, and access to inexpensive labor. Yuma County's inbound and outbound rail service is currently almost entirely devoted to agriculture, with inbound shipments of grain to feedlots, outbound shipments of grain, and shipments of fertilizer. Produce accounts for 70 percent of the value of Yuma County's agricultural production. Given its importance, agriculture would be a logical industry for rail improvements to support. For perishable commodities, rail service would need to be fast enough to bring products to market before spoiling.
- Related to agriculture, Yuma's largest manufacturing industry is perishable food manufacturing. In other locations, rail transportation is used for shipping both frozen and non-frozen fruits and vegetables. For non-frozen perishable foods, rail service would need to be fast enough to bring products to market before spoiling.



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- Within Yuma County are a range of manufacturing operations in addition to food manufacturing which could potentially be supported by rail, although none of these operations appear likely to generate a particularly large volume of rail freight. Were Yuma County to attract new manufacturing operations, the extent to which rail would support these industries would depend upon the type of operation.
- Were Yuma County successful in attracting new Logistics & Distribution business, the extent and nature of rail service to support these operations would depend upon their nature. Rail is often used to for building supply hubs. Retail distribution hubs are frequently coupled with rail intermodal service, but the volumes generated would need to be substantial for such a service to be viable.
- Imperial County's economy is similar to Yuma County's in terms of its reliance on agriculture. However, Imperial County's manufacturing sector has been more resilient than that of Yuma County. San Luis Rio Colorado has a lower population, while Mexicali's population is larger. Mexicali's population is concentrated in the City of Mexicali.
- By tonnage, Yuma County's most significant trading partners are the Los Angeles and Phoenix metropolitan areas, as well as other parts of Arizona. These three areas account for 83 percent of truck tonnage to and from Yuma County. Other high volume markets include Las Vegas, San Diego, and Tucson. Transportation improvements between Yuma and these markets will impact a high volume of freight.
- By tonnage, the highest volumes of freight to and from Yuma County are construction materials such as gravel, non-metallic minerals, etc. Transportation improvements oriented toward these types of commodities could impact a large volume of freight. The value of such improvements to Yuma County's economic development would need to be considered.
- Produce imports from Mexico represent the largest share of commodities crossing the border at San Luis. Over half of the shipments that cross at San Luis originate or terminate in Phoenix or Tucson. Trade with Mexico represents a small portion of Yuma County's inbound and outbound freight flow and is a small fraction of the trade between Yuma County and the Phoenix, Los Angeles metropolitan areas. While transportation improvements that facilitate freight trade with Mexico may be valuable to Arizona and to the United States, the impact specifically on economic development in Yuma County would be minor.
- A number of factors could increase cross-border trade, but many of these developments are uncertain, such as the development of the Port of Punta Colonet, improvements to the Port of Guaymas, the Western CANAM EX Passage, and the relative economics of maquiladora plants to manufacturing in China.
- Rail is a niche mode of transportation, which is typically used for transporting specific commodities long distances. All things being equal, the relative economics between truck and rail tends to improve with distance as well as with the ability to ship entire trainloads or commodities from one origin to one destination. Rail improvements in Yuma County would impact trade with relatively distant markets. Benefits derived would increase markedly if the volumes could justify trainload shipments.



- Most recently proposed new rail address a specific transportation need, generally accessing a particular shipper or set of shippers.
- An analysis of truck traffic that could divert to rail with improved rail service suggests that the bulk commodities such as Gravel, Waste/Scrap, and Agricultural Products may have the highest number of tons that could potentially divert to rail. Rail improvements targeted at these commodities could warrant additional consideration. The highest volumes of potentially divertible truck traffic are between Yuma and major metropolitan areas in the Southwest.
- The current rail conditions in Yuma County are analogous to a community located next to a busy interstate highway but with little ability to access the highway. The need for improved access appears to be a major issue for the region.

Next Steps

The purpose of this technical memorandum is to provide baseline data to identify priority areas for further investigation of rail improvements in Yuma County. Based upon the findings of this Technical Memorandum, the following alternatives warrant additional investigation:

- Rail improvements that benefit the transportation of Yuma County produce
- Rail improvements that benefit the transportation of other Yuma County agricultural products
- Rail improvements that benefit the transportation of Yuma County food products
- Rail improvements that will benefit future economic development initiatives, particularly in food manufacturing and industrial manufacturing
- Rail improvements that improve transportation to/from Phoenix
- Rail improvements that benefit the transportation of construction materials, such as gravel, non-metallic minerals, etc.

The next step of this project will involve developing specific project alternatives that will consider 1) the location or potential location of impacted industry(ies), 2) the type of rail service to be provided, and 3) the feasibility of connecting to existing rail infrastructure.