Colorado Aerotropolis Visioning Study

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Colorado Aerotropolis
Economic and Financial Analysis

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Executive Summary

Bordering multiple jurisdictions and surrounded by several thousand acres of undeveloped land, Denver International Airport (DIA) is a regional asset with immense economic development potential. The ability to realize DIA's long-term economic potential by attracting additional airport-related uses is enhanced by coordinated regional land use planning and infrastructure investment. The Colorado Aerotropolis Visioning Study defines an Aerotropolis Scenario that achieves this vision of coordinated planning and investment through increased interagency and inter-jurisdictional collaboration between cities, counties, utilities, and the airport authority.

This economic and financial analysis examines some of the key quantitative economic and fiscal benefits to the Colorado region of implementing an Aerotropolis Scenario—increased employment, government revenues, real estate development, and commercial activity. In developing the assumptions and methodology for estimating benefits, this analysis used the Denver Regional Council of Governments (DRCOG) 2040 population and employment projections as a baseline scenario representing "business as usual." The Business as Usual (BAU) Scenario assumes there is little coordinated land use planning or additional infrastructure investment associated with an Aerotropolis Scenario.

The fundamental tenet is that, by opening up additional land for development and creating favorable market conditions through infrastructure investment, an Aerotropolis Scenario would induce additional growth above and beyond what DRCOG currently projects for the Aerotropolis study area. It is possible that some of the additional growth could be diverted from elsewhere in the region. However, much of it would represent a net gain in economic and fiscal benefits for the Denver metropolitan area because of DIA's proximity to it and because DIA offers the unique commercial opportunities for specialized industry sectors that locate near an airport.

The key components of an Aerotropolis Scenario would include:

- A $750 to $800 million (2015 dollars) investment in transportation network enhancements surrounding DIA, consisting of about 75 linear miles of new roadways and/or multimodal transportation facilities.
- Approximately 12,000 acres of off-airport land adjacent to new/improved arterials directly available for commercial development (determined through a ¼-mile buffer calculation), complementing the 1,500 net leasable acres made available for on-airport commercial uses under the recently executed amendment to the Intergovernmental Agreement.
- Establishment of concentrated employment nodes, in which similar industries and businesses cluster together, within a Concentrated Development Area (CDA) adjacent to DIA as part of the overall study area.

Compared to the BAU Scenario, an Aerotropolis Scenario is estimated to create an additional 74,000 jobs, drive demand for 18 to 32 million square feet of additional commercial

development (in addition to the baseline scenario of 3 million square feet for a total of 21 to 35 million square feet), and require the construction of just over 75,000 new housing units to achieve a balanced, sustainable pattern of regional growth.

The development projection ranges associated with the Aerotropolis Scenario assume the same number of additional jobs, but a different distribution of those jobs among various employment sectors, resulting in a "low" and "high" estimate of square feet (SF) of new development.

The mix of jobs associated with the Low SF scenario closely resembles the density of the existing Denver Technological Center (DTC), with a higher concentration of employment growth in sectors that demand office space. The High SF scenario closely resembles the mix of off-airport jobs inventoried around Los Angeles International Airport (LAX), which leverages the proximity to major trade corridors (interstate highways and the Ports of Los Angeles and Long Beach) and its high volume of international flights to attract a high percentage of space-intensive industrial and service jobs. The level of Aerotropolis development would likely fall somewhere between the Low SF and High SF ranges. A summary of the growth potential under an Aerotropolis Scenario is shown in Table 1.

Table 1 Growth Potential of an Aerotropolis Scenario

	BAU	Aerotropolis (Including BAU)		Difference
		Low SF	High SF	
Increase in Employment	**6,000**	**80,000**	**80,000**	**74,000**
Accommodation and food services	1,590	4,700	12,984	
Transportation and warehousing	1,028	748	7,866	
Manufacturing	(115)	819	2,362	
Wholesale trade	873	5,541	3,735	
Administrative and Waste Services	373	6,926	3,401	
Professional and Technical Services	333	13,893	3,033	
Health care and social assistance	298	3,323	2,714	
Retail trade	325	5,339	2,655	
Real estate and rental and leasing	467	1,930	2,655	
Educational services	291	1,396	2,647	
Other/Unclassified	263	1,588	2,393	
Management	162	5,726	1,478	
Finance and Insurance	143	15,885	1,305	
Information	(119)	10,534	517	
Public Administration	52	1,616	477	
Commercial Development (sq ft)	**2,718,000**	**20,874,350**	**34,728,000**	
Industrial	1,581,000	4,337,500	19,404,000	
Retail	766,000	4,015,600	9,983,000	
Office	371,000	12,521,250	5,340,000	
Increase in Population	**48,719**	**258,715**		**209,996**
Additional Housing Units	**14,139**	**89,223**		**75,084**
Single-Family Dwellings	12,725	71,355		
Multifamily TOD	1,414	17,869		

Source: Aerotropolis Study Team.

This analysis estimated the employment growth potential of an Aerotropolis Scenario by analyzing the ratio of on-airport to off-airport jobs in other successful Aerotropolis districts in the U.S. (between 6 and 13 to 1), and using a growth target with these ratios. With DIA poised to open up an additional 1,500 net leasable acres of airport land for commercial development as a result of the amended IGA, and assuming a conservative ratio of 3 off-airport jobs for every 1 on-airport job, the analysis estimates that the CDA would support an additional 18,500 on-airport and 55,500 off-airport jobs by 2040, for a total of 74,000 new jobs, above and beyond DRCOG long-term employment projections.

Collectively, over a 25-year period (2016-2040), the employment nodes in the CDA envisioned under an Aerotropolis Scenario are anticipated to attract jobs in a variety of industry sectors supporting (and supported by) operations at DIA. These Aerotropolis-related jobs would in turn draw an estimated 210,000 additional residents.

The net increase in assessable property value would be about $30 billion under either scenario. The revenue streams that would be generated under the Aerotropolis Scenario compared to the BAU Scenario are summarized in Table 2. Increased residential and commercial property taxes associated with new Aerotropolis-related real estate development, increased sales taxes associated with additional household and business spending, and additional residential development impact fees are estimated to yield an additional $600 to $630 million over a 25-year period. The addition of commercial development impact fees would further raise revenue to better match the costs of infrastructure.

Table 2 BAU Scenario and Aerotropolis Scenario Revenue Streams (2015-2040)

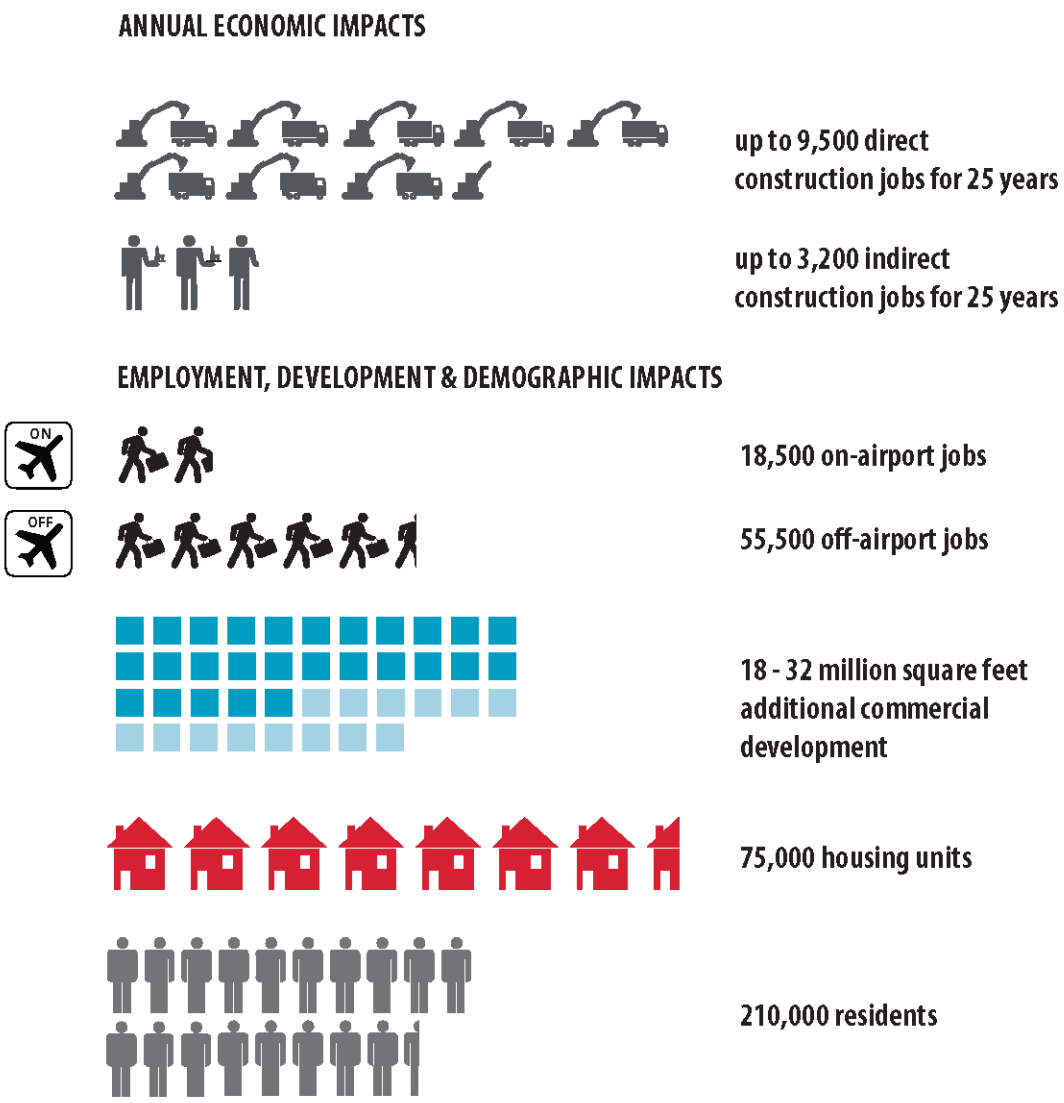
Revenue Stream	BAU Scenario ($M)	Aerotropolis Scenario ($M)		Difference ($M)
		Low SF	High SF	
Commercial Property Tax	$19.0	$130.4	$158.6	
Residential Property Tax	$37.2	$295.1	$295.1	
Development Impact Fees	$30.3	$193.9	$193.9	
Sales Taxes	$18.1	$86.6	$86.6	
Total	**$104.6**	**$706.0**	**$734.1**	**$601.4 - $629.5**

Source: Aerotropolis Study Team.

With an estimated $21 billion in construction value, an Aerotropolis Scenario would also generate a significant number of direct and indirect construction jobs. Real estate development is estimated to create approximately 9,500 direct Full Time Equivalent (FTE) construction jobs and 3,200 indirect FTE jobs annually during the 25-year analysis period. Initial infrastructure investment is estimated to create an additional 400 direct FTE construction jobs and 200 indirect FTE jobs annually over a 20-year build-out period.

The growth potential of an Aerotropolis Scenario is illustrated in Figure 1.

Figure 1 Summary of Aerotropolis Scenario Growth Potential Above Business as Usual



Conclusion

An Aerotropolis Scenario would bring a multitude of economic and financial benefits to the Denver region by spurring robust employment growth and market demand for new development. A key consideration in this analysis is the extent to which the infrastructure required to attract this new growth can be funded and/or financed by the additional incremental revenue streams that would accrue directly to local cities and agencies under an Aerotropolis Scenario. In the aggregate, these local revenues range between $705 and $735 million and are roughly similar to the costs associated with additional infrastructure investment in the range of $750 to $800 million (in 2015 dollars), indicating the potential for value capture revenues to provide a significant funding share over the 25-year analysis period. This fiscal impact estimate may skew conservative because it is limited to revenue sources

directly controlled by local cities and agencies, and it does not count other "downstream" revenue sources, such as passenger facility charges associated with additional enplanements at DIA**,** that would also be directly attributable to an Aerotropolis Scenario, but not necessarily available for infrastructure investment.

There are other significant, qualitative economic benefits to be reaped from increased regional land use coordination and infrastructure investment that strategically channel new growth into target areas under an Aerotropolis Scenario. The concentration of growth into dense employment nodes would create an "agglomeration" effect, whereby the proximity of similar industries and businesses to one another increases labor productivity and attracts a highly qualified talent pool. Airports have been shown to be a major driver of agglomeration economies by creating direct linkages (and decreasing travel times) to otherwise distant markets, increasing workforce mobility, and leveraging the significant economic impacts associated with commercial air travel. These benefits, while not quantified in this analysis, should be taken into consideration in understanding the growth potential and advantages of an Aerotropolis Scenario.

In contrast, the BAU Scenario will see incremental employment gains within the study area, with correspondingly modest levels of real estate development that is more dispersed. More importantly, by not investing in the additional infrastructure needed to open up land adjacent to the airport for commercial development, the BAU Scenario will not fully capitalize upon the economic potential of neighboring DIA.

It must be noted that implementation of an Aerotropolis Scenario raises numerous challenges. Many of the revenue streams identified in this analysis may be available to the area jurisdictions to invest in new infrastructure, but not available to finance it up front. Timing of costs versus revenues is one critical consideration.

In addition, while the analysis indicates that an Aerotropolis Scenario may generate revenues in excess of investments, the ability of local cities and agencies to capture these revenue streams would depend on an effective governance structure and a high level of regional coordination to establish uniform fee levels and special tax districts that earmark the revenue streams for Aerotropolis-related infrastructure investment. Transportation infrastructure would likely compete for these revenues against other regional priorities, including other forms of infrastructure, such as community facilities, hospitals, and schools.

Achieving the Aerotropolis Scenario employment growth targets would require the local jurisdictions to collaboratively develop a robust economic development strategy with land use regulations, transportation infrastructure, and other incentives. The Denver region would be competing on a national and potentially international level with other major airport hubs to attract a limited pool of jobs in airport-related industries, some of which are highly specialized and require a supportive already-established ecosystem of related industries in the area where they choose to locate.

It is recognized that as more detailed economic studies are conducted, assumptions and economic benefits will be updated and revised.

Table 3 summarizes some of the opportunities and challenges associated with implementation of an Aerotropolis Scenario.

Table 3 Aerotropolis Scenario Opportunities and Challenges

Issue	Opportunities	Challenges
Funding	Revenue streams generated by new development may be able to offset a portion of the additional infrastructure cost associated with an Aerotropolis Scenario.	An effective governance structure would be required to capture the revenue streams generated by new development and commercial activity, as other infrastructure needs would likely be competing for a portion of these same revenue streams.
Financing	Property taxes represent a significant share of estimated future Aerotropolis-related revenues and have historically been leveraged using tax-increment financing and other mechanisms to finance improvements.	Due to uncertainty over future development forecasts, the initial share of project construction costs financeable by value capture may be limited.
Development Potential	Abundant developable land adjacent to DIA creates the potential for significant growth at a competitive cost.	Land prices are likely to increase rapidly in response to new infrastructure investment and marketing, narrowing the price differential with metropolitan Denver and other market competitors over the long term.
Balanced Regional Growth	A significant number of new jobs would be added to the Denver region, increasing regional income and economic opportunity.	The creation of major new employment centers must be accompanied by a significant provision of additional housing in close proximity to those centers to avoid increasingly dispersed commuting patterns and diluting the agglomeration benefits of an Aerotropolis district.
Land Consumption	A compact development footprint, in which all land uses are located within ¼ mile of new transportation infrastructure, could reduce land consumption and minimize trip lengths.	Some but not all single-family housing demand can be accommodated within this compact footprint. Higher-density housing may reduce land consumption, but could also increase costs of development and may not be economically viable in the near term or align with market preferences.
Infrastructure Costs	The fiscal benefits of an Aerotropolis Scenario outweigh the costs in present value terms, indicating a potentially positive return on investment.	Additional investment in other forms of infrastructure (community facilities, institutional uses) would be needed to accommodate the totality of residential and commercial development needs created by the levels of anticipated Aerotropolis-related employment.

Introduction and Overview

An Aerotropolis is an urban plan in which the layout, infrastructure, and economy are centered on an airport.

The Colorado Department of Transportation (CDOT) conducted a study regarding the infrastructure requirements that could enhance economic development surrounding Denver International Airport (DIA). The Colorado Aerotropolis Visioning Study, funded by a Federal Highway Administration grant, along with additional funds from DIA, collaboratively engaged local jurisdictions to examine the benefits and impacts of a proactively planned Aerotropolis infrastructure surrounding DIA. An infrastructure framework for transportation, water, wastewater, power, communications, and drainage is critical to fostering and supporting economic development surrounding the airport.

CDOT engaged Adams County, City of Aurora, City of Brighton, City of Commerce City, City and County of Denver, as well as DIA, in the Visioning Study.

Study Vision

At the onset, study participants jointly developed a vision for a Colorado Aerotropolis:

A sustainable, efficient, well-connected, and globally recognized Colorado Aerotropolis that capitalizes on the economic opportunity surrounding the Denver International Airport through collaborative planning, development, and marketing.

Study Objectives

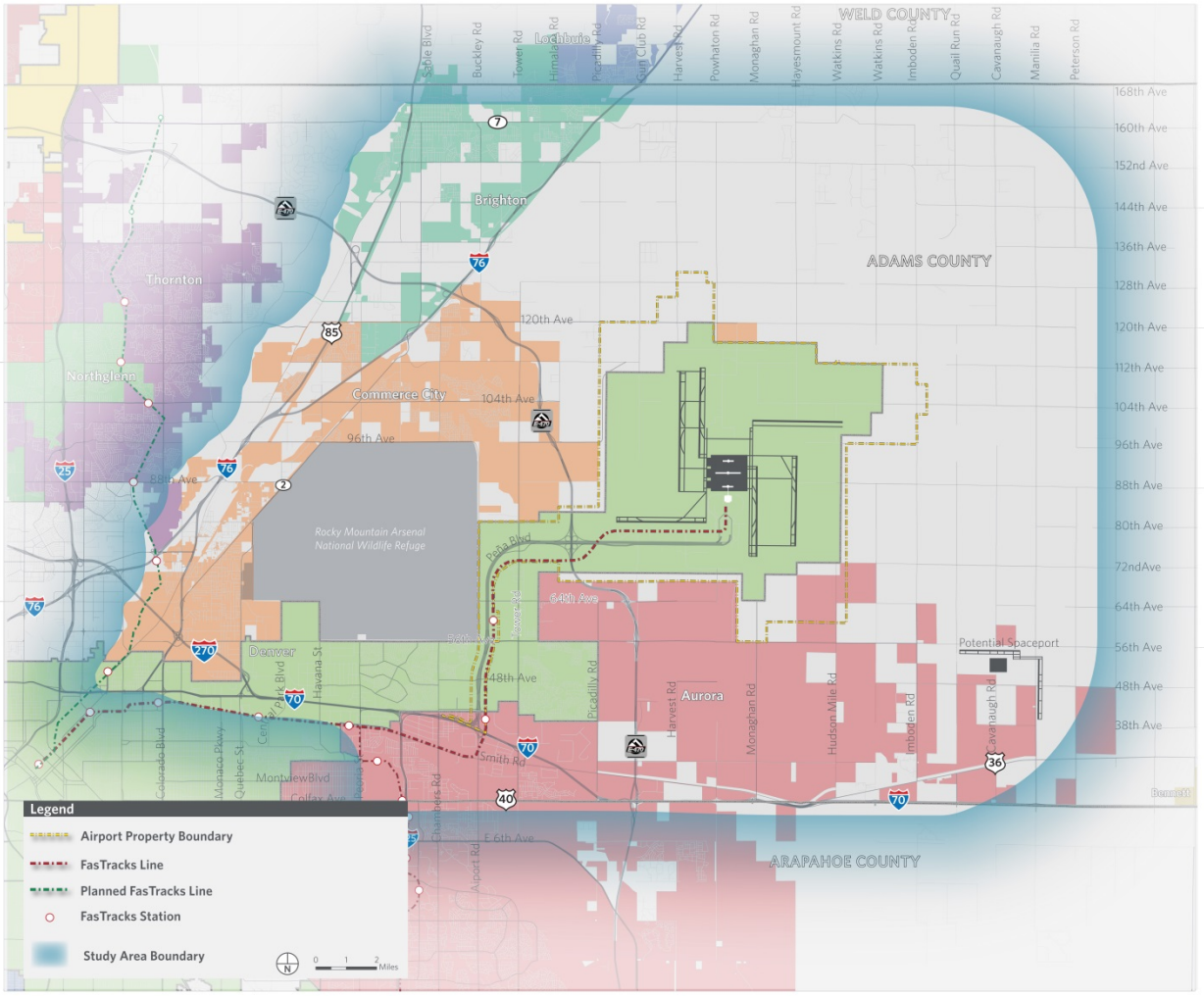
CDOT had the following objectives for the study:

- Agree on a collaborative vision for a Colorado Aerotropolis.
- Learn about the aerotropolis concept.
- Identify commonalities among the local plans.
- Quantify the potential for economic growth—with or without a Colorado Aerotropolis.
- Identify a framework of possibilities for collaboration on infrastructure investments.
- Outline regional governance options to implement investments in transportation, water, wastewater, drainage, power, and communications systems.

Study Area

Figure 2 displays the study area of the Colorado Aerotropolis Visioning Study. The study area boundaries defined an area of influence that impacts or will be impacted by the current and future economic conditions both on and off airport.

Figure 2 Study Area for the Colorado Aerotropolis Visioning Study



Source: Aerotropolis Study Team.

Areas of Focused Economic Development

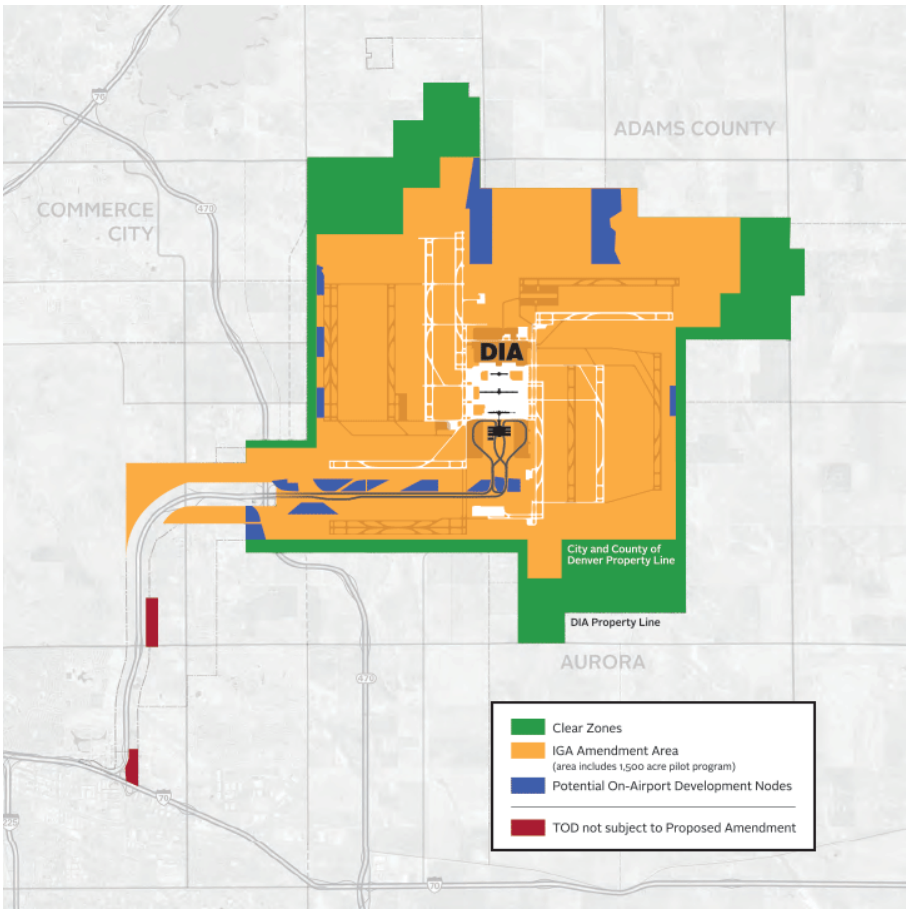
The following two areas of development were the primary areas used for this economic and financial analysis.

IGA Amendment Pilot Program

One of the assumptions of the Aerotropolis Scenario is that the recently executed amendment to the Denver and Adams County Intergovernmental Agreement (IGA) Amendment would result in additional and/or accelerated investment in infrastructure improvements and additional on-airport development. The recently executed amendment will create a 1,500-acre pilot program for commercial development leases on airport property. The 1,500 net

leasable acres are located "within the fence," at several nodes along Peña Boulevard and the DIA property boundary where there would be new access roads. At each node, development would occur both on and off airport property. Figure 3 displays the potential development nodes. In addition to the 1,500 net leasable acres, Adams County and Denver could agree at a later date to open more airport land to development.

Figure 3 Potential Development Nodes Along the DIA Property Boundary

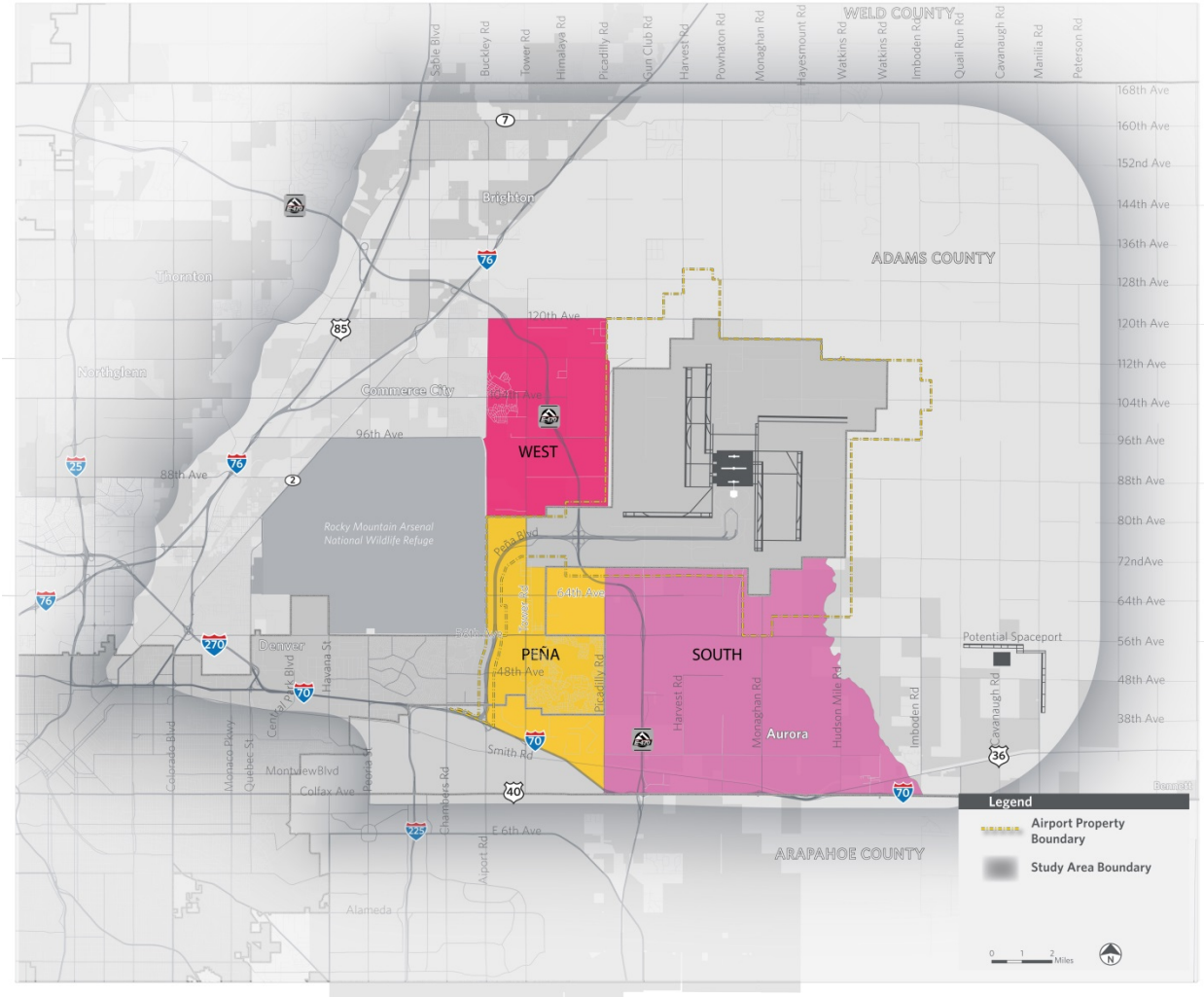


Source: Denver International Airport.

Concentrated Development Area

Overall, the initial investments are anticipated to largely occur in a Concentrated Development Area (CDA) in the south and west portion of the larger Aerotropolis study area (shown in Figure 4). The 67-square-mile area is targeted for growth in several local and regional land use plans. This growth would attract additional off-airport employment above and beyond the DRCOG 2040 projections, which would increase commercial and residential development levels. The assumptions supporting off-airport employment are detailed in the *Assessment of Growth Projections for the Colorado Aerotropolis Study Area* working paper (Aerotropolis Study Team 2016).

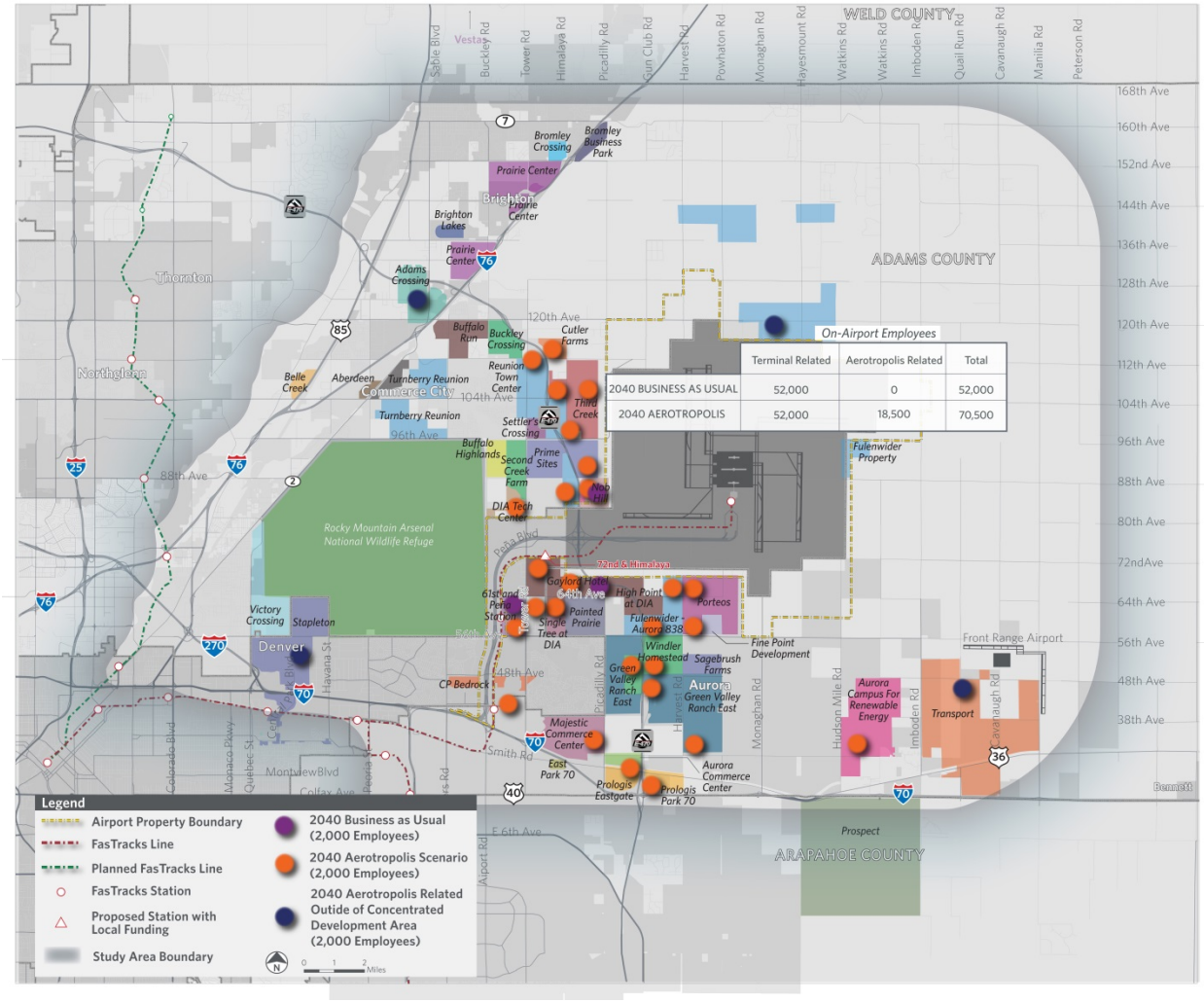
Figure 4 South and West Concentrated Development Area



Source: Aerotropolis Study Team.

Figure 5 shows a conceptual allocation of growth under an Aerotropolis Scenario in the CDA and other areas. Each of the orange circles represents an approximate area of 160 acres and 2,000 jobs.

Figure 5 Growth Allocation under Aerotropolis Scenario



Source: Aerotropolis Study Team.

Economic and Financial Analysis

This analysis quantifies the economic impacts and revenue generation potential (revenue streams) and economic benefits (construction jobs) associated with the implementation of an Aerotropolis Scenario around DIA. It also identifies the level of infrastructure investment needed to support the Aerotropolis Scenario development.

Employment Estimates

Under an Aerotropolis Scenario, employment was estimated for the 1,500 net leasable acres from the IGA Amendment (on-airport property) and the CDA (on- and off-airport property)—herein referred to as Aerotropolis-related employment. This Aerotropolis Scenario estimate reflects a conservative level of activity given available capacity for the hypothetical

comparison to the BAU Scenario, in contrast to a demand market analysis. Assuming a conservative 3:1 ratio of off-airport to on-airport employment, there are projected to be 18,500 on-airport and 55,500 off-airport jobs by 2040 above and beyond the BAU Scenario of approximately 6,000 additional jobs—for a total of almost 80,000 additional jobs by 2040. Table 4 compares the future employment estimates of the BAU Scenario to those calculated for the Aerotropolis Scenario. The basis for estimates of future employment is detailed in *Assessment of Growth Projections for the Colorado Aerotropolis Study Area* working paper (Aerotropolis Study Team 2016).

Table 4 Aerotropolis Employment Projections

Area	Category	2015 Existing	2040 BAU Scenario		2040 Aerotropolis Scenario		
			Growth	Total	*Growth from Aerotropolis*	*Total Growth (includes BAU)*	Total
On-Airport	Terminal Related	35,000	*17,000*	52,000	*0*	*17,000*	52,000
	Aerotropolis Related	0	*0*	0	*18,500*	*18,500*	18,500
	Subtotal	35,000	*17,000*	52,000	*18,500*	*35,500*	70,500
Off-Airport (Concentrated Development Area)	Terminal Related	n/a	n/a	n/a	n/a	n/a	n/a
	Aerotropolis Related	11,000	*6,000*	17,000	*55,500*	*61,500*	72,500
	Subtotal	11,000	*6,000*	17,000	*55,500*	*61,500*	72,500
On- and Off-Airport	Aerotropolis Related Subtotal	11,000	*6,000*	17,000	*74,000*	*80,000*	91,000
	Total	**46,000**	***23,000***	**69,000**	***74,000***	***97,000***	**143,000**

Sources: Aerotropolis Study Team, DRCOG 2040 RTP, DIA.

Two sets of employment growth projections were developed for the Aerotropolis Scenario. Both assume the same number of additional jobs, but a different mix of industry sectors and associated levels of demand for office, retail, and industrial space. This difference results in a low and high range estimate of the number of square feet of new commercial development.

The low square footage or Low SF scenario is characterized by a higher concentration of future employment in sectors that demand office space, including the fire, insurance, real estate (FIRE), information, and professional and technical services sectors. This mix of jobs closely resembles the density of the existing DTC. Because office uses are less space-intensive, the overall level of commercial development is lower (21 million square feet) compared to the high square footage or High SF scenario (35 million square feet), which is characterized by a greater emphasis on the accommodation and food services, transportation and warehousing, and manufacturing sectors. Growth in these sectors is correlated with demand for industrial and retail space, with generally more square feet required per

employee in these sectors than the FIRE sectors. The High SF scenario closely resembles the mix of off-airport jobs inventoried around LAX, which leverages the proximity to major trade corridors and its high volume of international flights to attract a high percentage of industrial and service jobs. Table 5 displays the commercial square footage of the two scenarios.

Table 5 Future Commercial Square Footage Estimates

	BAU	Aerotropolis (Includes BAU)		Difference
		Low SF	High SF	
Increase in Employment	**6,000**	**80,000**	**80,000**	**74,000**
Accommodation and food services	1,590	4,700	12,984	
Transportation and warehousing	1,028	748	7,866	
Manufacturing	(115)	819	2,362	
Wholesale trade	873	5,541	3,735	
Administrative and Waste Services	373	6,926	3,401	
Professional and Technical Services	333	13,893	3,033	
Health care and social assistance	298	3,323	2,714	
Retail trade	325	5,339	2,655	
Real estate and rental and leasing	467	1,930	2,655	
Educational services	291	1,396	2,647	
Other/Unclassified	263	1,588	2,393	
Management	162	5,726	1,478	
Finance and Insurance	143	15,885	1,305	
Information	(119)	10,534	517	
Public Administration	52	1,616	477	
Commercial Development (sq ft)	**2,718,000**	**20,874,350**	**34,728,000**	**18,000,000-32,000,000**
Industrial	1,581,000	4,337,500	17,823,000	
Retail	766,000	4,015,600	9,217,000	
Office	371,000	12,521,250	7,688,000	

Source: Aerotropolis Study Team.

These additional jobs would create demand for additional residential and commercial uses. To estimate the number of jobs across employment sectors and land use categories, the study team researched the distribution of on-airport and off-airport jobs at airport activity centers comparable to DIA. Table 6 and Table 7 summarize how the additional 80,000 jobs would likely be distributed across employment sectors and associated land use categories.

Table 6 2040 Jobs Distributed Across Employment Sectors and Associated Land Uses—Low SF Scenario

Employment Sector	2040 Jobs	Percent of Total Employment	Land Use Category	Office	Retail	Industrial
Accommodation and food services	19,132	5.9%	Retail	-	3,110	-
Transportation and warehousing	11,590	0.9%	Industrial	-	-	(280)
Manufacturing	3,481	1.0%	Industrial	-	-	934
Wholesale trade	5,503	6.9%	Office/Industrial	2,566	-	2,102
Administrative and waste management	5,012	8.7%	Office	6,553	-	-

Table 6 2040 Jobs Distributed Across Employment Sectors and Associated Land Uses—Low SF Scenario

Employment Sector	2040 Jobs	Percent of Total Employment	Land Use Category	Office	Retail	Industrial
Professional, scientific and technical services	4,469	17.4%	Office	13,560	-	-
Health care and social assistance	3,999	4.2%	Office	3,025	-	-
Retail trade	3,912	6.7%	Retail	-	5,014	-
Real estate and rental and leasing	3,912	2.4%	Office	1,463	-	-
Educational services	3,901	1.7%	Office	1,105	-	-
Other services	3,526	2.0%	Office	1,325	-	-
Management	2,178	7.2%	Office	5,564	-	-
Finance and insurance	1,923	19.9%	Office	15,742	-	-
Information	761	13.2%	Office	10,653	-	-
Public Administration	703	2.0%	Office	1,564	-	-
Aerotropolis-related Employment	**74,000**			**63,120**	**8,124**	**2,757**
BAU Scenario Employment	**6,000**			**2,468**	**1,915**	**1,581**
2040 Total Employment	**80,000**			**65,588**	**10,039**	**4,338**

Source: Aerotropolis Study Team.

Table 7 2040 Jobs Distributed Across Employment Sectors and Associated Land Uses—High SF Scenario

Employment Sector	2040 Jobs	Percent of Total Employment	Land Use Category	Office	Retail	Industrial
Accommodation and food services	19,132	25.9%	Retail	-	19,132	-
Transportation and warehousing	11,590	15.7%	Industrial	-	-	11,590
Manufacturing	3,481	4.7%	Industrial	-	-	3,481
Wholesale trade	5,503	7.4%	Office/Industrial	2,752	-	2,752
Administrative and waste management	5,012	6.8%	Office	5,012	-	-
Professional, scientific and technical services	4,469	6.0%	Office	4,469	-	-
Health care and social assistance	3,999	5.4%	Office	3,999	-	-
Retail trade	3,912	5.3%	Retail	-	3,912	-
Real estate and rental and leasing	3,912	5.3%	Office	3,912	-	-
Educational services	3,901	5.3%	Office	3,901	-	-
Other services	3,526	4.8%	Office	3,526	-	-
Management	2,178	2.9%	Office	2,178	-	-
Finance and insurance	1,923	2.6%	Office	1,923	-	-
Information	761	1.0%		761	-	-
Public Administration	703	0.9%		703	-	-
Aerotropolis-related Employment	**74,000**			**33,134**	**23,043**	**17,823**

Table 7 2040 Jobs Distributed Across Employment Sectors and Associated Land Uses—High SF Scenario

Employment Sector	2040 Jobs	Percent of Total Employment	Land Use Category	Office	Retail	Industrial
BAU Scenario Employment	**6,000**			**2,468**	**1,915**	**1,581**
2040 Total Employment	**80,000**			**35,602**	**24,958**	**19,404**

Source: Aerotropolis Study Team.

Next, employment levels were converted into land area and square feet of development, using prototypical densities for residential, office, retail, and industrial uses. Assumptions for the number of square feet per employee are based on Urban Land Institute planning metrics; assumptions for land use development intensities are based on comparable activity centers in the Denver metropolitan area.

Density for commercial uses is typically measured in terms of floor area ratio (FAR); density for residential uses is measured in dwelling units per acre (du/ac). A certain level of higher-density mixed-use, transit-oriented development (TOD) that has both residential and commercial uses is assumed to occur near two FasTracks stations located within the CDA. For TOD, the site FAR is assumed to be 2.0, split between multifamily housing (1.25 FAR) and office space (0.75 FAR), with some additional standalone (non-mixed use) multifamily housing constructed within TOD districts to satisfy residential demand for walkable, transit-accessible communities.

Table 8 and Table 9 show how the 2040 employment levels for the BAU Scenario, the Aerotropolis Scenario, and the combined total would translate to land area (acres) and square feet of commercial development for the Low SF and High SF scenarios respectively. Up to 20 percent of new commercial development (around 5.3 million square feet under the Low SF scenario) is assumed to be located in TOD districts adjacent to FasTracks stations.

Table 8 Potential 2040 Commercial Development—Low SF Scenario

Land Use	Acres	FAR	Total SF	BAU Scenario SF	Aerotropolis Scenario SF	SF/ Emp	Total Emp	Aero Emp
Industrial	332	0.3	4,337,500	1,581,000	2,756,500	1,000	4,338	2,757
Retail	230	0.4	4,015,600	766,000	3,249,600	400	10,039	8,124
Office	329	0.5	7,155,000	314,670	6,840,330	150	47,700	45,602
TOD Mixed Use Commercial	164	0.75	5,366,250	111,060	5,255,190	150	17,888	17,517
Total	**1,055**		**20,874,350**	**2,717,200**	**18,157,150**		**79,964**	**74,000**

Source: Aerotropolis Study Team.

Table 9 Potential 2040 Commercial Development—High SF Scenario

Land Use	Acres	FAR	Total SF	BAU Scenario SF	Aerotropolis Scenario SF	SF/ Emp	Total Emp	Aero Emp
Industrial	1,485	0.3	19,404,000	1,581,000	17,823,000	1,000	19,404	17,823
Retail	573	0.4	9,983,000	766,000	9,217,000	400	24,958	23,043
Office	178	0.5	3,884,000	315,000	3,569,000	150	25,892	23,794
TOD Mixed Use Commercial	89	0.75	1,456,000	56,000	1,401,000	150	9,710	9,339
Total	**2,281**		**34,727,000**	**2,718,000**	**32,010,000**		**79,964**	**74,000**

Source: Aerotropolis Study Team.

Absorption Rates

To better understand the level of projected Aerotropolis-related development in the context of historical market demand within the metropolitan Denver area, annual net absorption rates for office, retail, and industrial uses were inventoried going back to 2009 to capture a rolling average. Net annual absorption can be roughly used as a proxy for the levels of annual new construction (or "deliveries") that the metropolitan Denver market can support. Because real estate development is inherently cyclical, supply and demand may be mismatched in a given year but typically balance each other out in the long run. The rolling average for each land use was then compared to the annual build-out assumptions used for the Aerotropolis Low SF and High SF scenarios.

Table 10 Net Annual Absorption Rates

	Total	Office	Retail	Industrial
Net Absorption Rates (2009-2015)				
Minimum	(744,000)	(398,000)	(46,000)	(300,000)
Maximum	7,851,000	2,126,000	1,475,000	4,250,000
Average	**3,820,000**	1,210,000	840,000	1,770,000
Average Annual Deliveries—Low SF	908,000	544,000	175,000	189,000
Average Annual Deliveries—High SF	1,319,000	318,000	367,000	706,000
Percent of Average Net Annual Absorption	24 - 36%	26 - 45%	21 - 44%	11 - 40%

Source: CBRE, Colliers.

As shown in Table 10, annual projected levels of Aerotropolis-related commercial development would represent 24 to 36 percent of the Denver metropolitan area average over the past seven years. Because Aerotropolis-related development is assumed to be above and beyond the DRCOG long-term growth projections, it should be noted that this percentage does not represent a "capture rate" per se for the Northeast/Airport commercial real estate submarket in which the CDA is located, but rather a level of development that should be considered largely *additive to the regional total*. In other words, the fundamental premise of the Aerotropolis Scenario is that DIA is an underutilized asset that can catalyze additional employment (and population) growth in excess of the DRCOG long-term forecasts.

While the average annual deliveries (i.e., levels of new construction) associated with the Aerotropolis Scenario are significant, Aerotropolis-related growth would only modestly

increase the size of the Northeast/Airport commercial real estate submarket relative to the total inventory of the Denver metropolitan area over the 25-year build-out period. The current share of the Northeast/Airport submarket would increase from 17.5 percent to between 17.4 and 19.7 percent, as illustrated in Table 11.

Table 11 Aerotropolis Growth as a Percentage of Total Existing and Projected Market Inventory

	Total	Office	Retail	Industrial
Total Existing Market Inventory (sq ft)	492,990,000	142,640,000	121,380,000	228,970,000
Northeast/Airport Submarket	86,040,000	7,780,000	12,070,000	66,190,000
Percent of Existing Market Inventory	17.5%	5.5%	9.9%	28.9%
Total Projected 2040 Market Inventory	613,573,000	182,624,000	148,230,000	282,719,000
Northeast/Airport Submarket--Low SF	106,914,350	20,301,250	16,085,600	70,527,500
Northeast/Airport Submarket--High SF	120,768,000	15,468,000	21,287,000	84,013,000
Percent of Projected 2040 Market Inventory	17.4 - 19.7%	8.5 – 11.1%	10.9 – 14.4%	24.9 – 29.7%

Source: CBRE, Colliers, Aerotropolis Study Team.

The increase in the size of the Northeast/Airport commercial submarket under an Aerotropolis Scenario would vary considerably by land use. The office market size would undergo significant expansion, doubling to tripling its regional share of total inventory, while the industrial market size is projected at best to retain its regional share of total inventory by 2040. In fact, a potential decrease in industrial market share would occur under the Low SF scenario because the employment base surrounding DIA diversifies into sectors that have traditionally demanded office space (see Table 5).

Residential Development

The additional employment would lead to additional housing needs. The housing need associated with the additional 74,000 Aerotropolis-induced on-airport and off-airport jobs was calculated using the regional person-to-jobs ratio of 2.84 (DRCOG 2015). This translates into a population increase of almost 210,000; however, not all of the Aerotropolis-related employees would live in or near the Aerotropolis. In the 2010 Census, 12.4 percent of all Denver County commuters had a trip to work in excess of 45 minutes. Applying this percentage to the Aerotropolis Scenario provides a reasonable estimate of the number of longer-distance commuters not needing housing in the CDA. An additional 184,000 residents may be expected to live within the CDA and the study area. Assuming 2.45 persons per household, this would result in an estimated need for just over 75,000 new housing units by 2040.

The calculations are shown in Table 12.

Table 12 Calculation of Aerotropolis-related Housing Needs

	Metric
Aerotropolis-Related Employment	74,000
Regional Persons:Jobs Ratio	2.84
Aerotropolis-Related Population	209,996
Less out-of-area commuters	(26,039)
Additional Residents	183,957
Persons per household/housing unit	2.45
Net housing units required within CDA	**75,084**
TOD-Multifamily	15,037
Single Family Dwellings (SFD)	60,047

Source: DRCOG, US Census, Aerotropolis Study Team.

Approximately 20 percent of new residential development is assumed to be multifamily units located in TOD districts and 80 percent in traditional single-family dwellings (SFD). The implied residential density of 1.25 FAR for TOD Mixed-use Residential is approximately 50 du/ac, or 4-story wrap configuration apartments. As summarized in Table 13, the Aerotropolis Scenario is likely to create demand for an additional 180 million square feet of residential development.

Table 13 Aerotropolis-related Residential Development in the CDA (2040)

Land Use	Acres	Average Density		Aerotropolis SF	SF/ DU	Total DU
TOD Mixed-use Residential [1]	112 - 187	1.25	FAR	15,037,000	1,000	15,037
Single-family Dwelling Residential	20,016	3	du/ac	126,099,000	2,100	60,047
Total	**20,128 - 20,203**			**178,116,000**	**0**	**75,084**

[1] The land area occupied by TOD Mixed-use Residential is partially accounted for in Table 8 and Table 9 under the land area occupied by TOD Mixed-Use Commercial.

Source: Aerotropolis Study Team.

Employment Centers

The study team examined existing commercial development (industrial, retail, and office) at major peer employment centers in the Denver metropolitan area to compare an Aerotropolis Scenario to these centers. The employment centers are the Denver Central Business District (CBD), the DTC, Aurora City Center, Downtown Boulder, Cherry Creek, and Interlocken. For comparison purposes, the Aerotropolis study area is shown in Figure 6. The employment centers (as defined by DRCOG) are shown in Figure 7.

The centers vary in age and size. The two primary ones are the CBD and the DTC, both with approximately 50 million square feet of commercial space. The CBD has had a long history of being an employment and commerce center, while the DTC was established in the 1970s. The Aurora City Center includes Aurora's civic center, as well as a significant amount of retail and some office space. Downtown Boulder includes the Pearl Street Mall. Cherry Creek includes the Cherry Creek Mall, Cherry Creek north boutique retail, and a significant amount of office

space. Interlocken is a relatively newer employment and retail center along the US 36 Corridor in Broomfield, with significant room to grow.

Figure 6 Aerotropolis Study Area and all Employment Centers

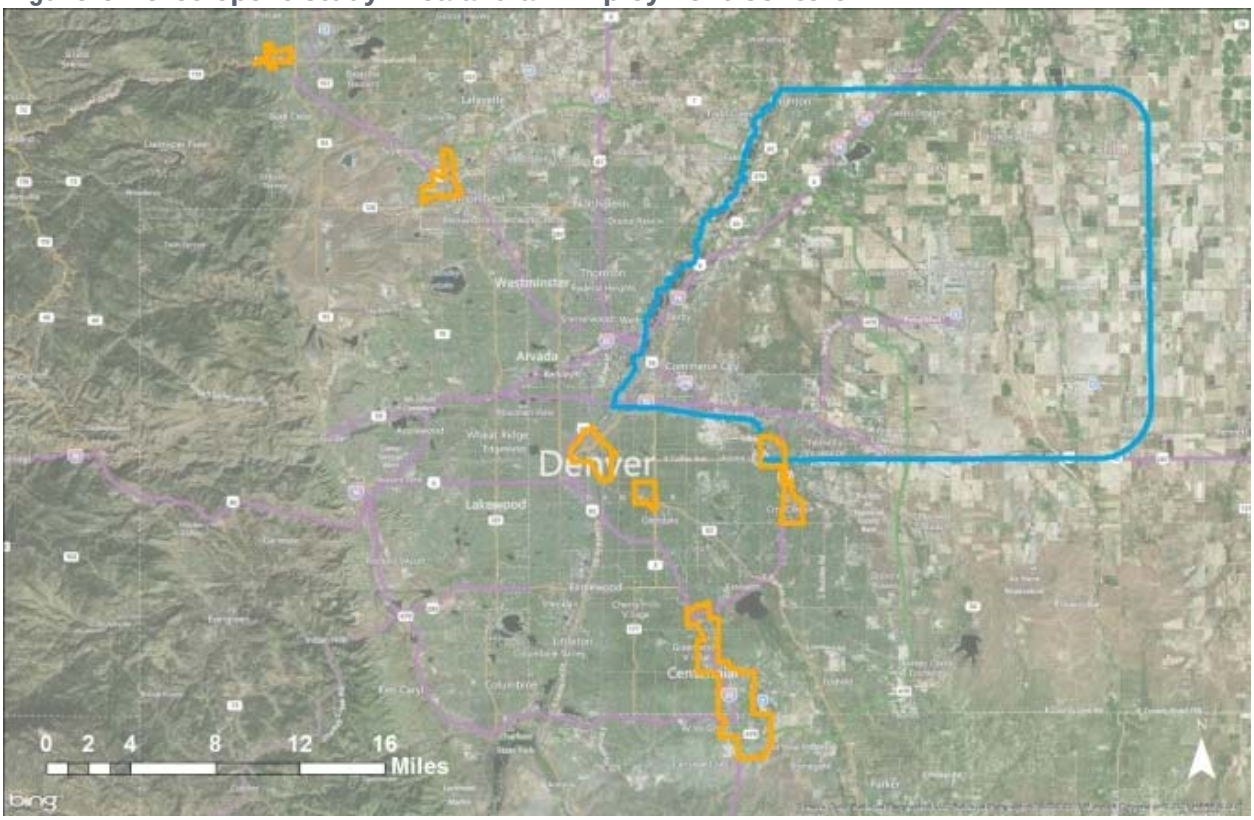
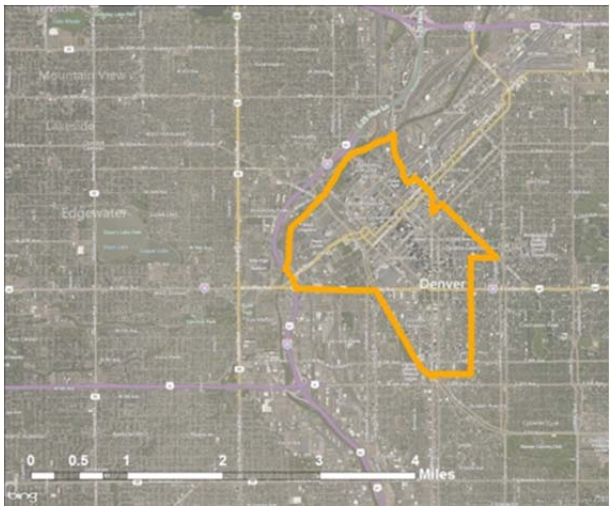
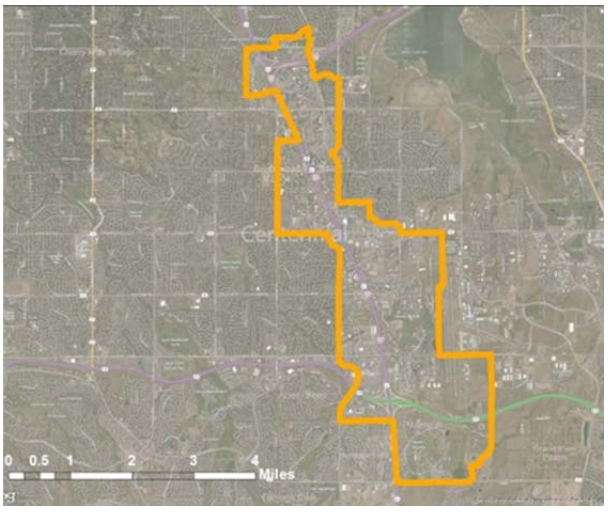


Figure 7 Employment Centers in DRCOG's Greater Transportation Region



Denver Central Business District (CBD)



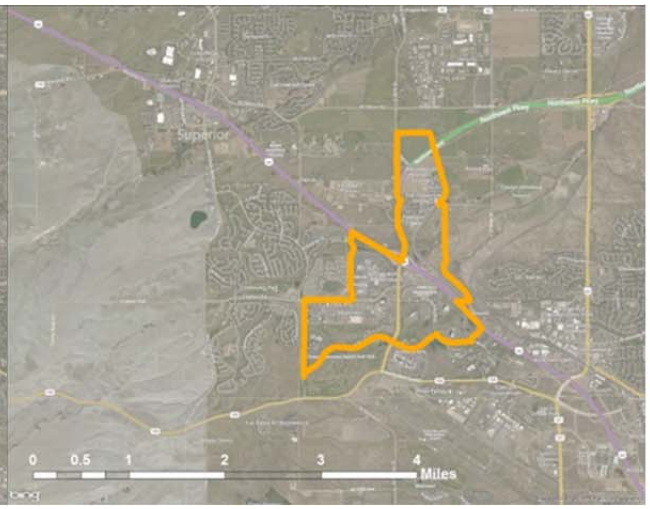
Denver Technological Center (DTC)

Figure 7 Employment Centers in DRCOG's Greater Transportation Region

Aurora City Center

Downtown Boulder

Cherry Creek



Interlocken

Table 14 shows the size of the commercial development in each of these centers. The CBD and the DTC are the largest at over 50 million square feet each and comprise mostly office development. The other centers are comparatively much smaller, ranging from 3.9 to 8.2 million square feet of commercial space.

Table 14 Commercial Square Footage at Employment Centers

	CBD	DTC	Aurora City Center	Downtown Boulder	Cherry Creek	Interlocken
Industrial	2,779,059	5,031,916	168,568	84,069	1,663	175,267
Retail	4,574,451	7,603,263	3,007,899	4,143,793	2,477,230	2,544,136
Office	43,272,864	38,120,405	771,372	3,968,346	3,616,750	2,332,005
Total	**50,626,374**	**50,755,584**	**3,947,839**	**8,196,208**	**6,095,643**	**5,051,408**

Source: CoStar, Aerotropolis Study Team

Table 15 shows the percentage breakdown by type of space. The highest percentage of commercial space in the CBD and the DTC is office, while the highest percentage of commercial space at the Aurora City Center is retail. Downtown Boulder, Cherry Creek, and Interlocken are more evenly balanced between office and retail space. Industrial space is a relatively small percentage of overall commercial space in all of these employment centers.

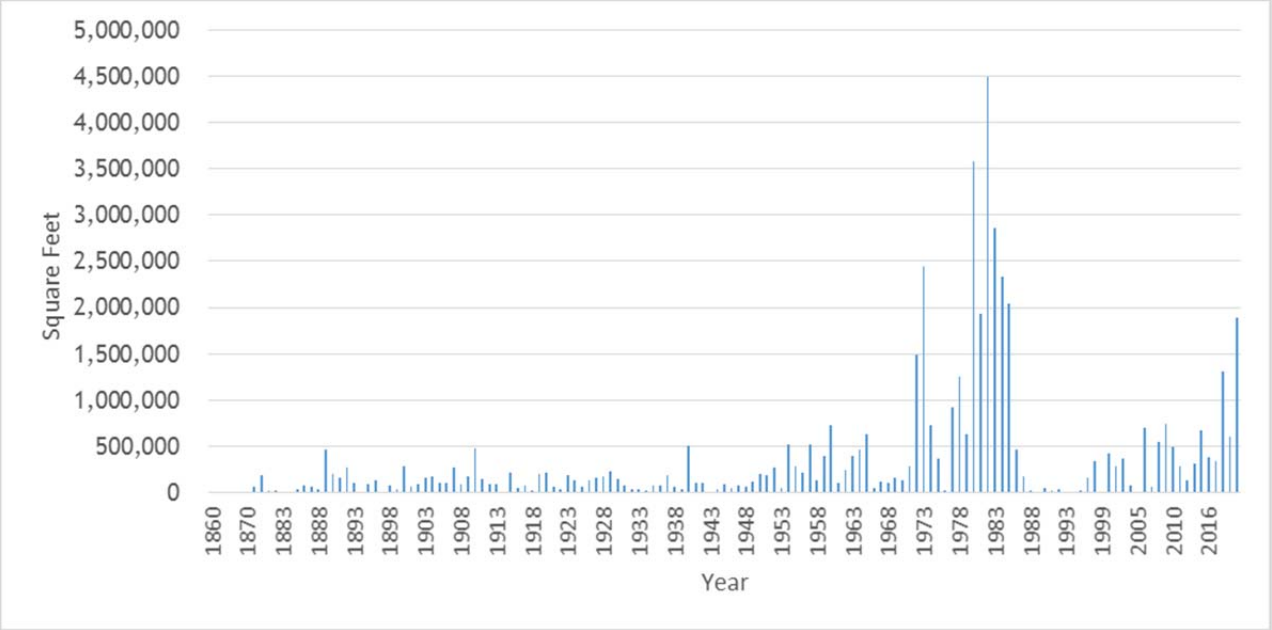
Table 15 Distribution of Commercial Square Footages at Employment Centers

	CBD	DTC	Aurora City Center	Downtown Boulder	Cherry Creek	Interlocken
Industrial	5.5%	9.9%	4.3%	1.0%	0.0%	3.5%
Retail	9.0%	15.0%	76.2%	50.6%	40.6%	50.4%
Office	85.5%	75.1%	19.5%	48.4%	59.3%	46.2%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

Source: CoStar, Aerotropolis Study Team

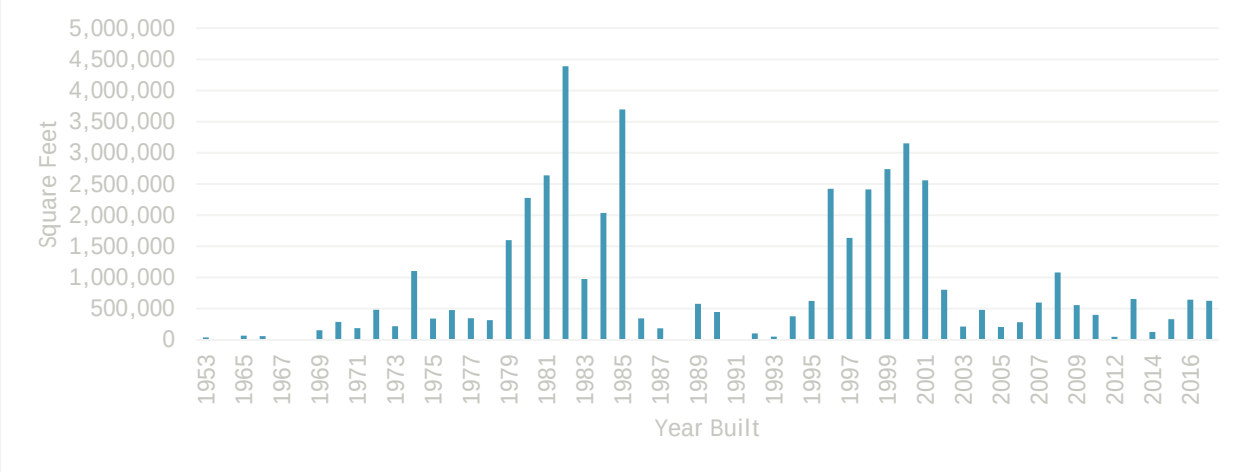
Figure 8 depicts the development of commercial space over time in each of these centers. The graphs show the year of construction and amount of square footage for the buildings in existence today. Buildings that were constructed and then subsequently demolished are not reflected. This may undercount some of the square footage that has been built historically particularly for the older CBD and Downtown Boulder, which have seen redevelopment over the years.

Figure 8 Annual Square Footage Growth of Employment Centers



Denver Central Business District (CBD)

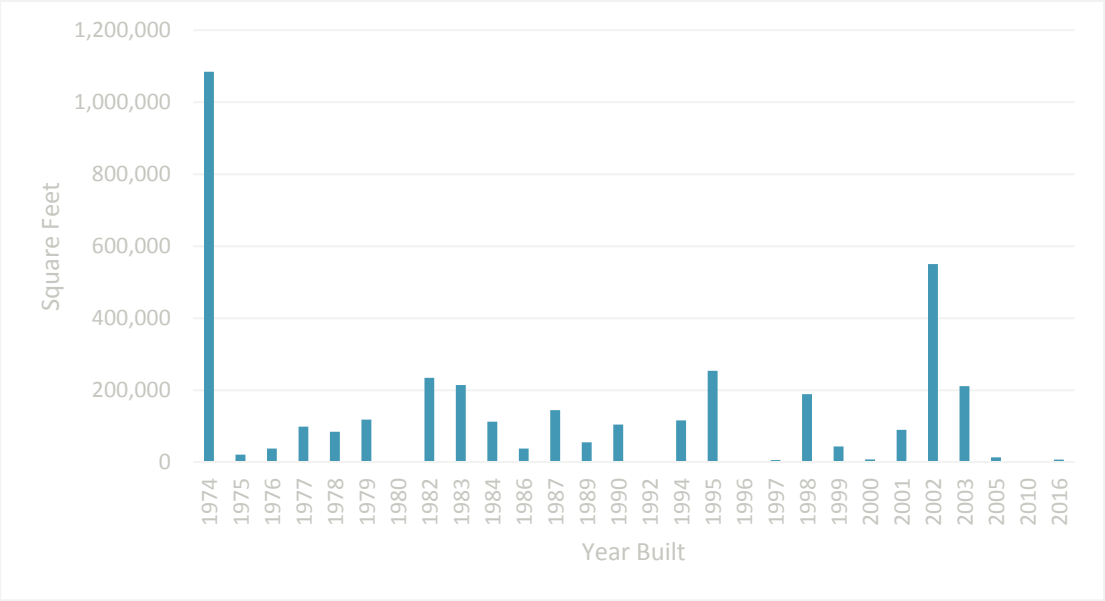
The CBD saw its greatest period of growth in the 1980s. It has a long history, with the construction of some of its current office spaces dating back to 1860. The CBD has enjoyed a recent resurgence with the development of major office projects near Denver Union Station.



DTC

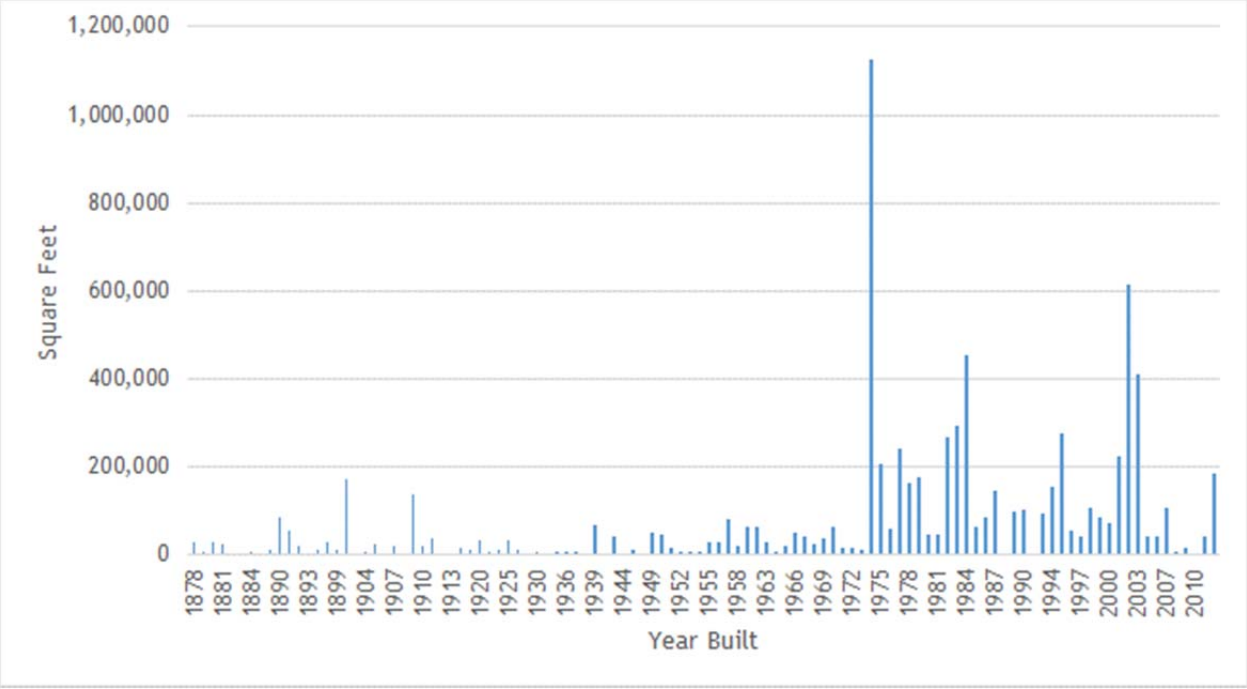
The DTC saw most of its major development in the 1980s, the late 1990s and early 2000s, although it still remains a very competitive office and retail center.

Figure 8 Annual Square Footage Growth of Employment Centers



Aurora City Center

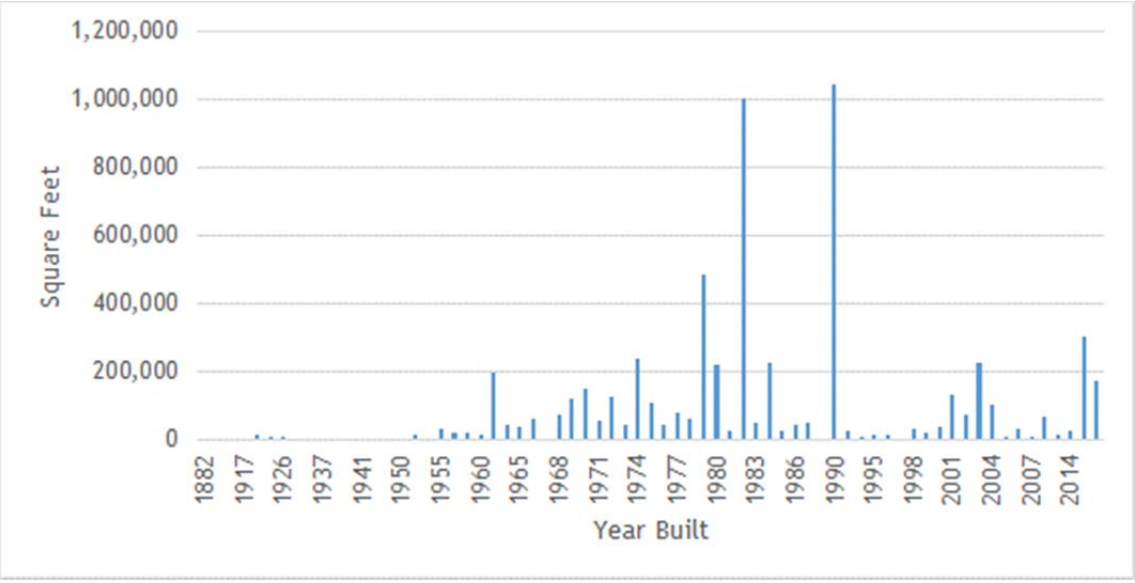
The commercial space at the Aurora City Center, which was developed in 1974, is primarily retail. However, there has been subsequent development of commercial space around the center, most recently centered primarily around the Fitzsimons Medical Campus.



Downtown Boulder

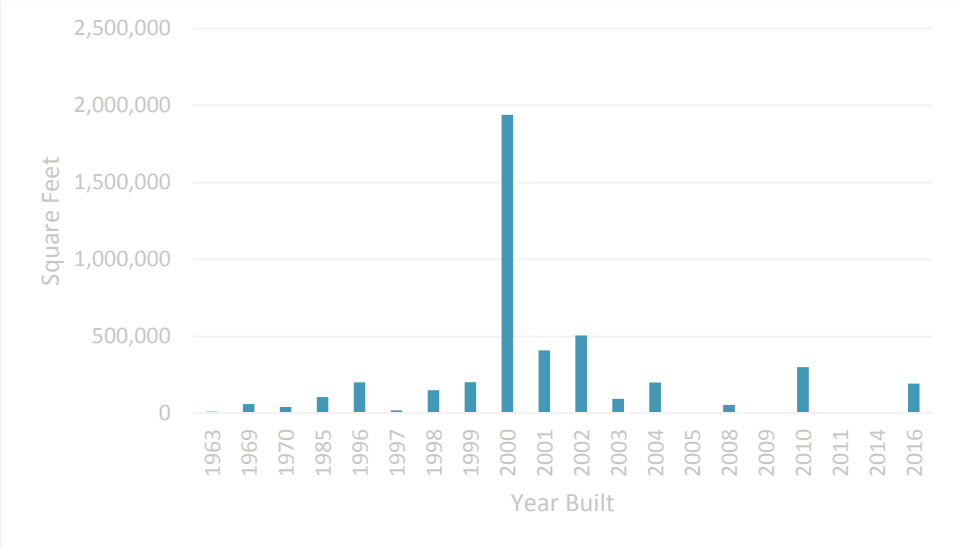
Downtown Boulder saw its greatest development in the early 1970s and early 2000s. Like the CBD, some of its existing commercial commercial buildings date back to the late 1800s.

Figure 8 Annual Square Footage Growth of Employment Centers



Cherry Creek

Cherry Creek saw significant commercial development in the early 1980s and the Cherry Creek Mall opened in 1990. It also has some historical buildings. Cherry Creek has also recently seen a significant amount of residential condo and apartment development.



Interlocken

Interlocken along US 36 saw its initial commercial development in 1963 with a significant amount of development in 2000.

Source: CoStar, Aerotropolis Study Team.

Table 16 outlines the total growth of each of these centers between 1970 and 2016. During this time, there were both downturns and upticks in the local economy, reflected in the graphics in Figure 8.

The CBD saw fairly intense development between 1970 and 2016 at an annual average growth rate of 700,000 to 1 million square feet. During this time period, the DTC saw the vast majority of its development. Its average annual addition to inventory during this time period was 980,000 to 1.1 million square feet. The other centers were comparatively much smaller, but all saw a commensurate amount of growth.

Table 16 Growth of Commercial Space at Area Employment Centers 1970-2016

	Total Commercial Development (millions sq. ft.)	Average Annual Change (sq. ft.)	
		Minimum	Maximum
CBD	34.6 - 36.5	700,000	1,000,000
DTC	46.0 - 50.4	980,000	1,100,000
Aurora City Center	3.7	96,000	96,000
Downtown Boulder	6.3 - 6.5	140,000	144,000
Cherry Creek	5.5 - 5.7	122,000	126,000
Interlocken	4.4 - 4.9	97,000	108,000
Total		**2,135,000**	2,574,000

Source: CoStar, Aerotropolis Study Team.

Using these comparison centers to validate the assumptions underlying the Aerotropolis Scenario projections, it is estimated that, at full build-out, the aggregate level of development built under the Low SF and High SF scenarios would be roughly 40 to 70 percent of the overall size of the DTC, respectively, with average annual absorption rates for commercial space that are comparable to those experienced by the DTC over a 25-year period from the late 1970s to the early 2000s. The mix of industrial, retail, and office uses envisioned under the Low SF scenario is also substantially similar to that of the DTC, while the High SF scenario is more heavily oriented toward industrial and service uses that capitalize upon DIA's hub status and potential as a center for trade and international commerce.

Public Tax Revenue Streams

The revenue generation potential of an Aerotropolis Scenario was considered over a 25-year period (2016-2040), consistent with the horizon year for DRCOG demographic projections. Because the revenues from residential and commercial development associated with an Aerotropolis Scenario are expected to be generated incrementally in the future, the analysis discounted those revenue streams to their present value (PV) 2015 dollars to compare revenues and costs. For the purposes of the cash flow analysis, the phasing of new growth is assumed to occur on a straight-line basis starting in 2018, with approximately 4 percent of total development coming on line each year through 2040. Assuming a discount rate of 4

percent, the PV of those future revenue streams could range between an additional $600 to $630 million in revenues above the baseline scenario of $100 million.

The $600 to $630 million in revenue potential from commercial and residential property taxes, sales taxes, and residential development impact fees associated with the Aerotropolis-related commercial and residential development was quantified as described in the following sections.

Increases in Property Taxes

The increase in property taxes collected by the counties is derived from the increase in assessed property values associated with new development. To quantify the increase attributable solely to an Aerotropolis Scenario, this analysis nets out the existing land value and the value of development that would have otherwise occurred under the BAU Scenario (Table 17 and Table 18).

Table 17 Calculation of Net Increase in Property Values Associated with Aerotropolis Low SF Scenario

Land Use	Acres	Aerotropolis SF	$ PSF	Aerotropolis Property Value
Commercial				
Industrial	332	2,756,500	$90	$248,085,000
Retail	230	3,249,600	$145	$471,192,000
Office	329	6,840,330	$180	$1,231,200,000
TOD Mixed-use Commercial	164	5,255,190	$217	$1,140,376,000
Residential				
TOD Mixed-use Residential	112	12,610,000	$233	$2,938,130,000
SFD Residential	20,825	131,197,000	$177	$23,221,869,000
Total	**21,992**	**161,908,600**		**$29,250,85200,000**
Agricultural Land Value Per Acre	$1,740			
(Less Existing Agricultural Land Value)				($34,800,000)
Net Increase in Assessable Property Value				**$29,216,052,000**

Source: Aerotropolis Study Team.

Table 18 Calculation of Net Increase in Property Values Associated with Aerotropolis High SF Scenario

Land Use	Acres	Aerotropolis SF	$ PSF	Aerotropolis Property Value
Commercial				
Industrial	1,485	17,823,000	$90	$1,604,070,000
Retail	573	9,217,000	$145	$1,336,465,000
Office	178	3,569,000	$180	$642,420,000
TOD Mixed-use Commercial	45	1,401,000	$217	$304,017,000
Residential				
TOD Mixed-use Residential	187	12,610,000	$233	$2,938,130,000
SFD Residential	20,825	131,197,000	$177	$23,221,869,000
Total	**23,293**	**175,817,000**		**$30,046,971,000**
Agricultural Land Value Per Acre	$1,740			
(Less Existing Agricultural Land Value)				($40,530,000)
Net Increase in Assessable Property Value				**$30,006,441,000**

Source: Aerotropolis Study Team.

This analysis assumes that the development of new residential and commercial uses in the CDA would involve the conversion of agricultural land, currently valued at a regional average of $1,740 per acre. At full build-out in 2040, the Aerotropolis Scenario would add between $29.2 and $30.0 billion in net new property value to the assessor roll. The increase in property values associated with new development was calculated using the assessment ratio for residential and commercial properties in Denver and Adams Counties (7.96 percent and 29.00 percent, respectively). For purposes of this analysis, a uniform levy rate of 10 mills was applied to all jurisdictions throughout the CDA for both residential and commercial properties. This mill levy demonstrates a general level of revenue generation that would be necessary to support the infrastructure investments needed for the Aerotropolis Scenario. In reality, the means to raise revenue in support of Aerotropolis development has not yet been determined. The *Governance Options for the Colorado Aerotropolis* working paper (Aerotropolis Study Team 2016) discusses the possibilities for future funding after a regional entity is formed.

Because properties are subject to annual reassessment based on fair market value, this analysis used an escalation schedule to take into account the likely appreciation of real property over the 2016 to 2040 period. Over the past decade, property values in Denver and Adams Counties have increased at an average annual rate of 4.4 percent. This trend is assumed to continue through 2040 and was used to estimate the per-square-foot value of new development occurring in future years.

Increases in Sales Taxes

The additional households and employees located within the CDA would pay retail sales taxes on taxable goods and services. Taxable spending is estimated at 35 to 40 percent of total household income—estimated at an average of $35 per week per employee (in addition to taxes associated with household spending). However, until retail development reaches critical mass within the CDA when residents can shop locally for goods and services, the CDA is anticipated to experience a fair amount of sales leakage to other nearby commercial developments. For example, a significant retail center to the west is Northfield Stapleton (a large regional retail lifestyle center within the study area along I-70) and other retail centers. For this reason, the increase in sales taxes collected within the CDA is based on the expenditure of only 28 percent of household income. Sales taxes on business operations other than retail would increase revenue projections from sales taxes.

Development Impact Fees

Cities and counties partner with developers and use impact fees to help defray the costs of additional facilities required to serve their new developments. For example, the Town of Castle Rock (Douglas County) currently imposes impact fees on new residential development only, set at $1,990 per multifamily residential unit and $2,173 per single-family dwelling. This analysis assumes that individual jurisdictions will coordinate to impose a uniform impact fee throughout the CDA at similar levels, with fees increasing annually in tandem with the average rate of property value appreciation (4.4 percent).

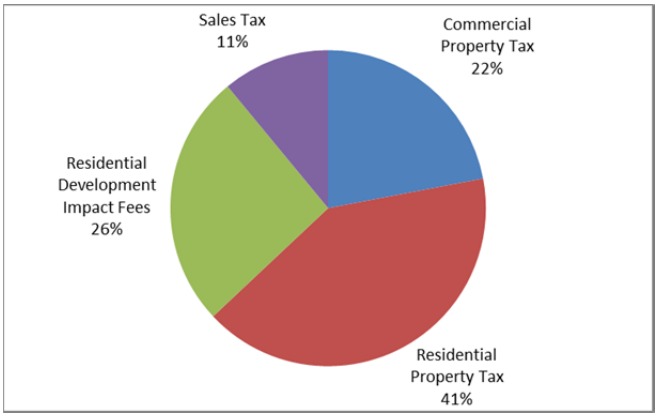
Commercial development impact fees are not assumed in this study. Imposition of impact fees on commercial development could also be considered, which could raise additional revenue.

Summary of Revenue Generation Potential

Table 19 summarizes the revenue potential from each of the revenue streams. Table 20 and Table 21 present the annual cash flows estimated for each of these revenue streams.

In total, revenues of about $1.2 to $1.3 billion (in YOE dollars) is expected over a 25-year period (2016-2040) under the Low SF and High SF scenarios. As shown in Figure 9, residential property taxes represent the largest share of revenues (41 percent), followed by residential development impact fees (26 percent), commercial property taxes (22 percent), and sales taxes (11 percent).

Figure 9 Composition of Aerotropolis Revenue Streams



Source: Aerotropolis Study Team.

The imposition of commercial development impact fees could also be considered; this would raise additional revenue greater than the estimates presented herein.

Table 19 Calculation of Net Increase in Property Values Associated with Aerotropolis High SF Scenario

Sources of New Revenue (2016-2040)	Low SF		High SF	
	Amount (in millions)		Amount (in millions)	
	YOE $	2015 PV $	YOE $	2015 PV $
Commercial Property Tax	$238.0	$111.4	$298.2	$139.6
Residential Property Tax	$550.9	$257.9	$550.9	$257.9
Development Impact Fees	$306.8	$163.6	$306.8	$163.6
Sales Taxes	$142.1	$68.4	$142.1	$68.4
Total	**$1,237.8**	**$601.3**	**$1,298.0**	**$629.5**

Source: Aerotropolis Study Team.

Table 20 Revenue Generation Potential Associated with Low SF Aerotropolis Scenario

Year		% Build-out	Escalation [1]	Commercial Property Tax	Residential Property Tax	Development Impact Fees	Escalation [2]	Sales Taxes
	Totals			**$238,045,547**	**$550,882,443**	**$306,785,922**		**$142,108,879**
	2015			$0	$0	$0	101.9%	$0
1	2016	0%	104.4%	$0	$0	$0	101.9%	$0
2	2017	0%	109.0%	$0	$0	$0	103.8%	$0
3	2018	4%	113.8%	$445,370	$1,030,671	$7,961,432	105.7%	$389,856
4	2019	9%	118.9%	$930,072	$2,152,364	$8,312,983	107.7%	$794,360
5	2020	13%	124.1%	$1,456,712	$3,371,107	$8,680,057	109.8%	$1,213,925
6	2021	17%	129.6%	$2,028,047	$4,693,285	$9,063,339	111.8%	$1,648,975
7	2022	22%	135.3%	$2,646,999	$6,125,657	$9,463,546	113.9%	$2,099,942
8	2023	26%	141.3%	$3,316,658	$7,675,374	$9,881,425	116.1%	$2,567,272
9	2024	30%	147.5%	$4,040,296	$9,350,009	$10,317,756	118.2%	$3,051,420
10	2025	35%	154.0%	$4,821,374	$11,157,571	$10,773,353	120.5%	$3,552,853
11	2026	39%	160.9%	$5,663,553	$13,106,533	$11,249,069	122.7%	$4,072,050
12	2027	43%	168.0%	$6,570,707	$15,205,860	$11,745,790	125.0%	$4,609,501
13	2028	48%	175.4%	$7,546,933	$17,465,031	$12,264,446	127.4%	$5,165,709
14	2029	52%	183.1%	$8,596,560	$19,894,068	$12,806,003	129.8%	$5,741,188
15	2030	57%	191.2%	$9,724,169	$22,503,567	$13,371,473	132.2%	$6,336,468
16	2031	61%	199.6%	$10,934,599	$25,304,731	$13,961,913	134.7%	$6,952,087
17	2032	65%	208.5%	$12,232,965	$28,309,397	$14,578,425	137.2%	$7,588,602
18	2033	70%	217.7%	$13,624,675	$31,530,075	$15,222,160	139.8%	$8,246,579
19	2034	74%	227.3%	$15,115,438	$34,979,985	$15,894,320	142.4%	$8,926,600
20	2035	78%	237.3%	$16,711,291	$38,673,090	$16,596,160	145.1%	$9,629,261
21	2036	83%	247.8%	$18,418,606	$42,624,141	$17,328,991	147.8%	$10,355,173
22	2037	87%	258.7%	$20,244,117	$46,848,717	$18,094,182	150.6%	$11,104,962
23	2038	91%	270.2%	$22,194,931	$51,363,271	$18,893,161	153.4%	$11,879,269
24	2039	96%	282.1%	$24,278,556	$56,185,174	$19,727,420	156.3%	$12,678,749
25	2040	100%	294.5%	$26,502,917	$61,332,766	$20,598,518	159.3%	$13,504,076

[1] applied to property tax assessments and impact fees; [2] applied to resident and household spending on taxable goods

Source: Aerotropolis Study Team. February 2016.

Table 21 Revenue Generation Potential Associated with High SF Aerotropolis Scenario

Year		% Build-out	Escalation [1]	Commercial Property Tax	Residential Property Tax	Development Impact Fees	Escalation [2]	Sales Taxes
	Totals			**$298,206,806**	**$550,882,443**	**$306,785,922**		**$142,108,879**
	2015			$0	$0	$0	101.9%	$0
1	2016	0%	104.4%	$0	$0	$0	101.9%	$0
2	2017	0%	109.0%	$0	$0	$0	103.8%	$0
3	2018	4%	113.8%	$557,929	$1,030,671	$7,961,432	105.7%	$389,856
4	2019	9%	118.9%	$1,165,130	$2,152,364	$8,312,983	107.7%	$794,360
5	2020	13%	124.1%	$1,824,867	$3,371,107	$8,680,057	109.8%	$1,213,925
6	2021	17%	129.6%	$2,540,596	$4,693,285	$9,063,339	111.8%	$1,648,975
7	2022	22%	135.3%	$3,315,975	$6,125,657	$9,463,546	113.9%	$2,099,942
8	2023	26%	141.3%	$4,154,877	$7,675,374	$9,881,425	116.1%	$2,567,272
9	2024	30%	147.5%	$5,061,400	$9,350,009	$10,317,756	118.2%	$3,051,420
10	2025	35%	154.0%	$6,039,879	$11,157,571	$10,773,353	120.5%	$3,552,853
11	2026	39%	160.9%	$7,094,903	$13,106,533	$11,249,069	122.7%	$4,072,050
12	2027	43%	168.0%	$8,231,323	$15,205,860	$11,745,790	125.0%	$4,609,501
13	2028	48%	175.4%	$9,454,269	$17,465,031	$12,264,446	127.4%	$5,165,709
14	2029	52%	183.1%	$10,769,169	$19,894,068	$12,806,003	129.8%	$5,741,188
15	2030	57%	191.2%	$12,181,758	$22,503,567	$13,371,473	132.2%	$6,336,468
16	2031	61%	199.6%	$13,698,100	$25,304,731	$13,961,913	134.7%	$6,952,087
17	2032	65%	208.5%	$15,324,603	$28,309,397	$14,578,425	137.2%	$7,588,602
18	2033	70%	217.7%	$17,068,039	$31,530,075	$15,222,160	139.8%	$8,246,579
19	2034	74%	227.3%	$18,935,564	$34,979,985	$15,894,320	142.4%	$8,926,600
20	2035	78%	237.3%	$20,934,736	$38,673,090	$16,596,160	145.1%	$9,629,261
21	2036	83%	247.8%	$23,073,541	$42,624,141	$17,328,991	147.8%	$10,355,173
22	2037	87%	258.7%	$25,360,413	$46,848,717	$18,094,182	150.6%	$11,104,962
23	2038	91%	270.2%	$27,804,257	$51,363,271	$18,893,161	153.4%	$11,879,269
24	2039	96%	282.1%	$30,414,477	$56,185,174	$19,727,420	156.3%	$12,678,749
25	2040	100%	294.5%	$33,201,001	$61,332,766	$20,598,518	159.3%	$13,504,076

[1] applied to property tax assessments and impact fees; [2] applied to resident and household spending on taxable goods

Source: Aerotropolis Study Team. February 2016.

Potential construction values were calculated to estimate the number of FTE construction jobs resulting from real estate development. Beginning with an assumption of property values and subtracting 10 percent for developer profit, 80 percent of the remaining value was assumed for construction, while 20 percent was assumed for land. Under the Low SF Scenario, this results in an estimate of overall construction costs of $21 billion (Table 22). Under the High SF Scenario, the estimate of overall construction costs is $21.6 billion (Table 23).

Table 22 Value of Aerotropolis-related Real Estate Development Construction (Low SF Scenario)

Land Use	Acres	Aerotropolis-related SF	$PSF Property Value	$ PSF Construction Value [1]	Aerotropolis Construction Value
Commercial					
Industrial	332	2,756,500	$90	$65	$179,173,000
Retail	230	3,249,600	$145	$104	$337,958,000
Office	329	6,840,300	$180	$130	$889,239,000
TOD Mixed Use Commercial	164	5,255,200	$217	$156	$819,811,000
Residential					
TOD Mixed Use Residential	112	12,610,000	$233	$168	$2,118,480,000.
SFD Residential	20,825	131,197,000	$177	$127	$16,662,019,000
Total	**21,992**	**161,908,600**			**$21,006,680,000**

Source: Aerotropolis Study Team.

[1] Construction value assumes that 80% of a property's value is the construction value and 20% is the land value after 10% of the property value has been subtracted to account for developer profit.

Table 23 Value of Aerotropolis-related Real Estate Development Construction (High SF Scenario)

Land Use	Acres	Aerotropolis-related SF	$PSF Property Value	$ PSF Construction Value [1]	Aerotropolis Construction Value
Commercial					
Industrial	1,485	17,823,000	$90	$65	$1,158,495,000
Retail	573	9,217,000	$145	$104	$958,568,000
Office	178	3,569,000	$180	$130	$463,970,000
TOD Mixed Use Commercial	45	1,401,000	$217	$156	$218,556,000
Residential					
TOD Mixed Use Residential	187	12,610,000	$233	$168	$2,118,480,000
SFD Residential	20,825	131,197,000	$177	$127	$16,662,019,000
Total	**23,293**	**175,817,000**			**$21,580,088,000**

Source: Aerotropolis Study Team.

[1] Construction value assumes that 80% of a property's value is the construction value and 20% is the land value after 10% of the property value has been subtracted to account for developer profit.

It was assumed that the value of labor (or jobs) was half of the estimated construction expenditures. According to the Bureau of Labor Statistics, the average annual wages for a worker in the construction and extraction field in the Denver-Aurora–Broomfield Metropolitan Statistical Area in 2014 was $45,020. *Assuming a 25-year build-out, the annual labor value under the Low SF Scenario is $420 million and equivalent to 9,300 direct construction jobs as a result of Aerotropolis real estate development. Under the High SF Scenario, assuming a 25-year build-out period, labor value is approximately $432 million and equivalent to 9,600 direct jobs.*

The Bureau of Economic Analysis provides regional input-output multipliers to help economists analyze the potential impacts of economic activities on regional economies. According to the Bureau of Economic Analysis, direct construction jobs created have a multiplier impact of 1.34 jobs, where for every one job created as a result of construction, another 0.34 jobs is created in the regional economy. *Under the Low SF Scenario, the 9,300 construction jobs related to the Aerotropolis real estate development help create an additional 3,200 indirect jobs in the regional economy for a total of 12,500 jobs. Under the High SF Scenario, the 9,600 construction jobs related to the Aerotropolis real estate development help create an additional 3,300 jobs in the regional economy for a total of almost 12,800 jobs available annually over 25 years* (Table 24).

Table 24 Aerotropolis-related Real Estate Development Direct and Indirect Construction Jobs

	Low SF Scenario	High SF Scenario
Aerotropolis Construction Value	$21,006,680,000	$21,580,100,000
Value of Labor	$10,503,340,000	$10,790,000,000
Years to Build-out	25	25
Annual Labor Value	$420,133,600	$431,601,800
Annual Wage Rate	$45,020	$45,020
Annual FTE Jobs Created (25 years)	9,300	9,600
Multiplier Effect of Jobs Created	1.34	1.34
Total Direct FTE Jobs Created (Annually for 25 years)	12,510	12,800
Total Indirect FTE Jobs Created (Annually for 25 years)	3,200	3,300

Source: Aerotropolis Study Team, Bureau of Economic Analysis.

Observations

Assuming a linear 25-year build-out, Aerotropolis-related real estate development is estimated to result in between 9,300 and 9,600 direct FTE construction jobs and between 3,200 and 3,300 indirect FTE jobs annually between 2015 and 2040. Because one construction worker may be employed on a number of different projects during the course of the build-out, the number of jobs created is not necessarily the same as the number of workers employed. Therefore, it is difficult to enumerate what percentage of these jobs would accrue to otherwise unemployed workers.

There were an estimated 60,000 construction workers in the Denver metropolitan area in 2014 according to the Bureau of Labor Statistics. The unemployment rate in the Denver metropolitan area is 3.2 percent (October 2015). If construction were to begin today, given

the number of potential workers needed, it is likely that many of the jobs would require that additional labor enter the Denver metropolitan economy, at least temporarily.

Infrastructure Construction Jobs

Over a 20-year build-out, Aerotropolis-related infrastructure development is estimated to result in 400 direct FTE construction jobs and 200 indirect FTE jobs annually. Similar to the previous scenario, it is difficult to enumerate exactly what percentage of these jobs would be for otherwise unemployed workers. Given fluctuations in the strength of the employment market, there would be years when these jobs would pick up slack in the economy, and other years when there would be a labor shortage resulting in net new jobs to the Denver metropolitan area economy.

Observations

The Aerotropolis-related infrastructure investment has been estimated between $725 and $775 million. The value of labor or jobs was assumed to be half of the overall estimated construction estimates with a 20-year build-out. The annual labor value of $13.9 million supports 400 direct FTE annual infrastructure construction jobs. With the Bureau of Economic Analysis multiplier impact of 1.34 jobs, the 400 infrastructure construction jobs would help create an additional 200 jobs in the regional economy, for a total of 600 jobs resulting from the infrastructure investment annually over 20 years (Table 25).

Table 25 Calculation of Direct and Indirect Jobs Created

Aerotropolis Infrastructure Construction Value	$750,000,000
Value of Labor	$375,000000
Years to Build-out	20
Annual Labor Value	$18,750,000
Annual Wage Rate	$45,020
Annual FTE Jobs Created	400
Multiplier Effect of FTE Jobs Created	1.34
Total FTE Jobs Created (Annually for 20 years)	600
Indirect FTE Jobs Created (Annually for 20 years)	200

Source: Aerotropolis Study Team, Bureau of Economic Analysis.

Jobs Summary

The induced employment created by the Aerotropolis Scenario is estimated at 74,000 jobs across a variety of industries. The number of construction jobs resulting from Aerotropolis-related real estate development is estimated between 12,500 to 12,900 jobs annually over 25 years. The number of construction jobs related to infrastructure construction would result in 600 FTE jobs annually over 20 years.

Infrastructure Investment

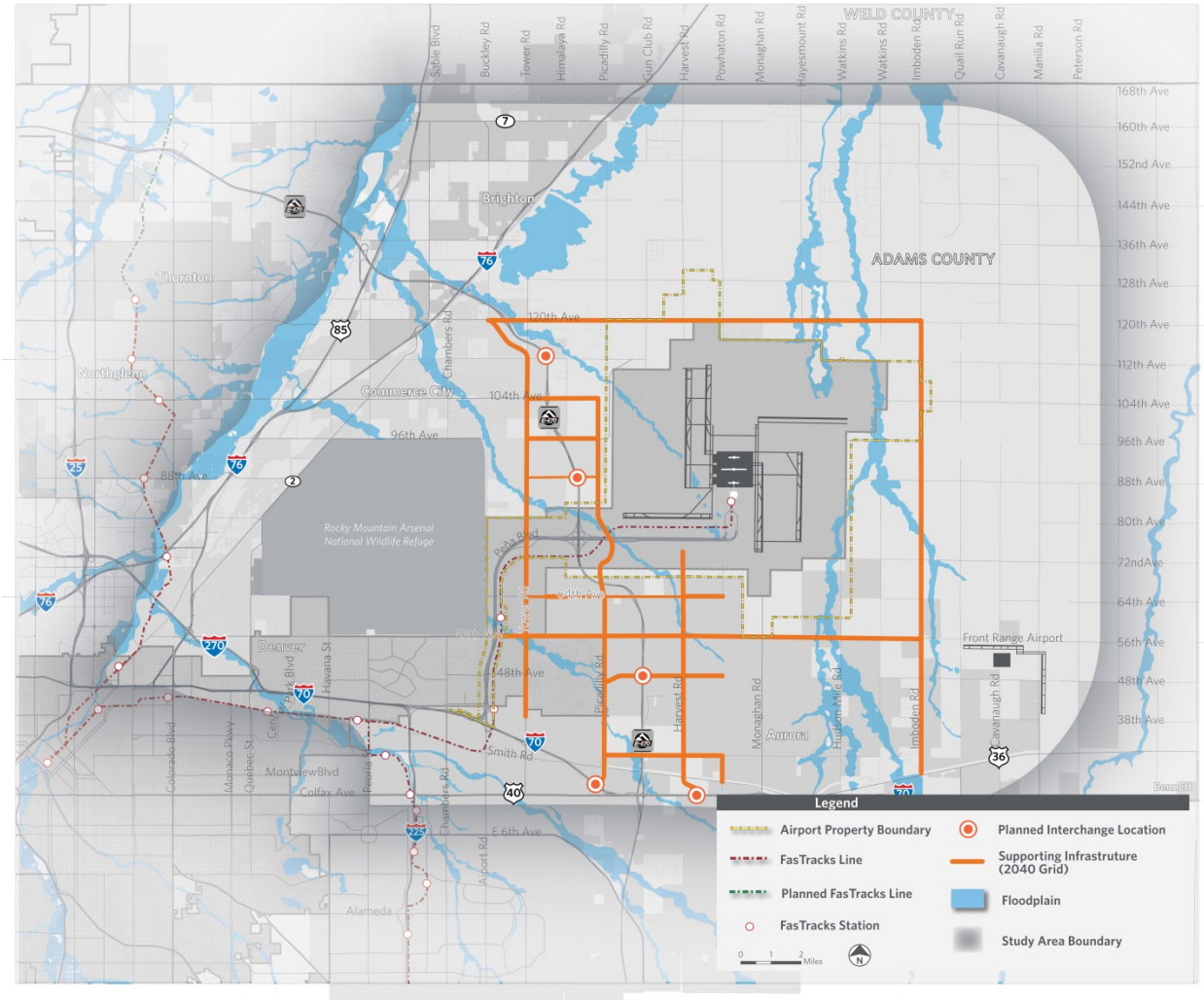
Investments in infrastructure are needed to support this new development. The transportation network shown illustrates a conceptual transportation network of 45 miles of major roadways and/or multimodal facilities in the CDA that would increase the accessibility and development readiness of at least 12,000 acres of land under the Aerotropolis Scenario.

The network would provide better connections from future developments to the airport and the surrounding transportation network. It is assumed that additional infrastructure elements would be constructed within the transportation rights-of-way to avoid future disruption of the roadway to install them. These would include water and wastewater, power, communications, and drainage facilities.

The Aerotropolis Near-term 2040 Transportation Network shown in Figure 10 illustrates the conceptual projects for the Aerotropolis Scenario, with a total construction cost estimate of $750 to $800 million PV.

Further information on the Infrastructure assumptions for the Aerotropolis Scenario is provided in the *Infrastructure Development for the Colorado Aerotropolis Study Area* working paper (Aerotropolis Study Team 2016).

Figure 10 Aerotropolis Near-term 2040 Transportation Network



Source: Aerotropolis Study Team.

Note: Assumes that wet and dry utilities would be constructed in the transportation rights-of-way to accommodate future development.

Conclusions

The present value of future revenues from the BAU, together with Aerotropolis-related development of between $705 and $735 million is roughly similar to the total estimated construction cost for the supporting infrastructure of $750 to $800 million, indicating the potential for value capture revenues to provide a significant funding share over the 25-year analysis period (2016-2040). The addition of commercial development impact fees would further raise revenue to better balance the costs. The ability of project sponsors to access these various revenue streams to finance the upfront costs of Aerotropolis-related infrastructure improvements would depend on multiple factors, including the governance structure for the Aerotropolis district and the market acceptance of the development projections. Therefore, while these revenues may indeed materialize and be available in the future to offset the cost of new infrastructure, the initial share of project construction costs financeable by the revenue streams summarized in Table 19 is likely to be less than the aforementioned revenue range.

By adding a significant number of new jobs to the Denver metropolitan area economy, an Aerotropolis Scenario raises important planning issues with respect to the overall jobs/housing balance in the DRCOG region. The creation of major new employment centers, as this scenario anticipates, must be accompanied by a provision of additional housing units in close proximity to those centers to avoid increasingly dispersed commuting patterns. Dispersion would dilute one of the key economic benefits of an Aerotropolis Scenario—that of agglomeration. This occurs when firms and people locate near one another in cities and industrial clusters. The locational proximity of firms and people has been shown to facilitate the transfer of innovative ideas and knowledge, reduce the cost of moving goods and providing services, and enhance the ability of a region to attract and retain a qualified talent pool.

To achieve the benefits of an agglomeration economy, the Aerotropolis Scenario assumes relatively compact development patterns in which all land uses are located within one quarter mile of the proposed major infrastructure network shown in Figure 10, thereby minimizing trip lengths and the need for additional infrastructure (such as arterials and local streets required to access major roadways/multimodal facilities). Under this “compact” scenario, the land area opened up for development would be approximately 12,000 acres. By contrast, the total area of residential and commercial development created by the levels of anticipated Aerotropolis-related employment would range from 22,000 to just over 23,000 acres, largely attributable to the land consumption associated with over 75,000 units of new single-family dwellings. The mix of new development types currently envisioned would therefore require additional transportation infrastructure extending beyond this one-quarter-mile radius. The cost of this additional infrastructure is not accounted for in this analysis. Increasing average residential densities and/or accommodating a greater share of the housing need in TOD districts would help to ensure that a “compact” development scenario could be achieved and that the agglomeration benefits of an Aerotropolis Scenario would be fully realized.

It is recognized that conclusions observed in this report will change as more detailed economic analyses are conducted.

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